



Project EDGE Data Specification

Part C: OE Economic Optimisation and Flex OE Desktop Analysis Data Requirements

Version: June 2023

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 C published on 14th July 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.

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DATA SPECIFICATION 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: <ul style="list-style-type: none"> • DUID Telemetry Data • Availability Forecast • Boffer as Forecast Split EDGE Data Specification into a two part document as below: <ul style="list-style-type: none"> • 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: <ol style="list-style-type: none"> Updated Sec 4. Data Requirements to include OE/FLEX OE Desktop Analysis data requirements In Part B: addition of: <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> Data requirements for DOE Economic Optimisation and Flex OE Desktop Analysis. This contains data definition for: <ul style="list-style-type: none"> ▪ NMI level Unconstrained Boffer (Flex and NMI) ▪ NMI Level telemetry data ▪ NMI level post-dispatch interval Operating Envelope ▪ NMI level Unconstrained Load/ Generation Forecast
June 2023	21 st June 2023	This release of the Project EDGE Data Specification consists of publication of Data Specification for Local Service Exchange (LSE) titled "Project EDGE – Data Specification Part D – LSE". And to the existing Part A, Part B and Part C data specification corrections and minor non-breaking updates to the data definition and providing more clarity via additional description and commentary In Part A:

Version	Effective Date	Summary of Changes
		<ul style="list-style-type: none"> • Updated Sec 2: EDGE Data Specification Overview to add detailed description of the 4 data specification documents (Part A, Part B, Part C and Part D) • In Sec 4: removed reference to Availability Forecast as it no longer required • In Sec 4: Updated data requirements to include OE and Flex OE Desktop Analysis data requirements • Update DOE (Dynamic Operating Envelope) to OE (Operating Envelope) throughout the document. • In Sec 6.5: updated the Introduction to Channel and Topic mapping EDGE • Addition of "Rated Electric Power" attribute in Sec 8.5.5 Aggregator Device Data. This is not a new addition, but this attribute was missed in the previous version of data specification. • Updated FAQs • Added AEMO Copyright statement under Important Notice • Removed Information Classification from Data Characteristics as no longer applicable <p>In Part B:</p> <ul style="list-style-type: none"> • Removed Availability Forecast data definition as no longer required • Update DOE (Dynamic Operating Envelope) to OE (Operating Envelope) throughout the document. • Added AEMO Copyright statement under Important Notice • Removed Information Classification from Data Characteristics as no longer applicable <p>In Part C:</p> <ul style="list-style-type: none"> • In Sec 3.2 Boffer Data Characteristics updated the data submission methodology to manual data submission • In Sec 4.2 Telemetry Data Replaced the nmiOeSubmissionTimestamp with nmiOEReceivedFlag with data type as Boolean • In Sec 5.1 NMI level Unconstrained Load/Generation Forecast dataChange the data type for uncontrolFcst from 'number' to 'array' with numeric value • In Sec 6 Post DI NMI Operating Envelops Update the NMI level OE data attributes to align to NMI OE v2 (CSIP) for data attribute names. • Update DOE (Dynamic Operating Envelope) to OE (Operating Envelope) throughout the document • Removed Information Classification from Data Characteristics as no longer applicable • Added AEMO Copyright statement under Important Notice

Version	Effective Date	Summary of Changes
		<p>Added Sec 7: Real and Reactive Power Measurement at NMI. This section includes the data definition for the Real (P) & Reactive (Q) Power measurements at NMI level as provided by the DNSP.</p> <p>Part D: Publication of Project EDGE – Data Specification Part D – Local Service Exchange Part D contains the data specification for the Local Support Services as designed and developed for Local Service Exchange (LSE) for trialling viability of DER to deliver local services</p>

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. Not tested in EDGE
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

Term	Explanation
	wholesale and local level (within the distribution network).
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 or FRMP), 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

Term	Explanation
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.
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).
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: <u>Variable or Proportional Controller</u> <u>Switch Controller</u>
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.

Term	Explanation
	<ul style="list-style-type: none"> • It is provided as interval ending (as in DI end time) • It is of 5-minute duration. • There are 288 5-minute DI in a NEM trading day <ul style="list-style-type: none"> – DI start time refers to the start time of the Dispatch Interval – DI End time refers to the end time of the Dispatch Interval – 1st DI in a trading day is from 04:00 AM to 04:05 AM • For Dispatch Interval of 10:00 hrs <ul style="list-style-type: none"> – DI start time would be 9.55 – DI end time would be 10.00 <p>Please note: All data provided/exchanged in Project EDGE must be DI time ending,</p>
Trading Interval (TI)	<p>A period of time prescribed in the National Electricity Rules for the wholesale exchange. It is of 5-minute duration.</p> <ul style="list-style-type: none"> • There are 288 5-minute TI in a 24-hour period. • For example - for TI 10.00 TI start time would be 9.55 and TI end time would be 10.00
Trading Day	<p>The 24-hour period from 0400 hrs to 0400 hrs the following day</p>
Gate Closure for Boffer	<p>Project EDGE has adopted the same Boffer gate closure as in NEM for existing participants.</p> <p>Gate closure for a trading day is defined as 12.30 PM the day before that Trading Day</p> <ul style="list-style-type: none"> • At this time the price bands are firmed (fixed) for the following trading day; <ul style="list-style-type: none"> – 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 trading day cannot be updated.

2. Part C: OE Economic Optimisation and Flex OE Desktop Analysis Data Requirements

EDGE Data Specification is published to provide Aggregators and interested parties with detailed overview of the integration to EDGE Marketplace and 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 four-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.

Part A contains following sections:

- Glossary of terms and key concepts
- Introduction
- Project EDGE data requirements
- Data Exchange Overview
- Message Acknowledgement
- Participant On-boarding and Enrolment Data requirements
- Appendix

2.2 Part B: Market Participation & operational Visibility Data Requirements

Part B covers the Project EDGE data requirements for market participation; 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 a 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).

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) [also used as Operational Forecast]
 - NMI Operating Envelopes (OE) v1
 - NMI Operating Envelopes (OE) v2 aligned to the CSIP AUS
 - Dispatch Instructions
- Operational Visibility data requirements in
 - DUID Telemetry Data
- Pre-Dispatch Price Forecast (5 min & 30 min)

Please refer to the Project EDGE Data Specification Part B: Market Participation & Operational Visibility Data Requirements document.

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

This document forms the Part C of the Project EDGE Data Specification. Part C covers the Project EDGE data requirements for OE/Flex OE desktop analysis.

- a. By OE Economic Optimisation we mean the Operating Envelopes that considers the Aggregator's NMI level Boffer as an input into the OE calculation
- b. By Flex OE we mean the operating envelopes which are applicable to only the aggregation of flexible assets at a site and not at the whole site (excludes customers' uncontrollable/native load).

All data required for the desktop assessment must be provided at NMI level. Aggregators would need to provide NMI level Boffers, Telemetry and Forecasts and DNSPs would provide post-dispatch interval operating envelopes (OE). Data sets for desktop analysis is expected to be provided or shared periodically in batches via a large file transfer capability within the EDGE DER Marketplace platform.

Required Datasets: The datasets to be exchanged are listed below:

From Aggregator

- 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 NMI - net of site)
- NMI Telemetry Data
 - NMI level Telemetry data including reference to DOE applied during that interval

- Forecast Data
 - Pre-dispatch Uncontrolled Load or Generation forecast at NMI level

From DNSP

- Operating Envelope:
 - Post-Dispatch DOE containing with reference to objective function
- Real & Reactive Power Data
 - Instantaneous measurements of real and reactive power at NMI level for NMIs in DNSP portfolio

What is meant by Pre-dispatch/Post-dispatch?

- Pre-dispatch: for the dispatch interval prior to the start of the subject dispatch interval.
- Post-dispatch: for the dispatch interval immediately after the completion of the subject dispatch interval.

For example:

For DI 10:00 AM – DI start time is 09:55 and DI end time is 10:00

Pre-dispatch will be calculated before 09:55 and post-dispatch will be calculated after 10:00

3. NMI level Bi-directional Offer (NMI Boffer)

NMI level Bi-directional Offer or Boffer is submitted by the Aggregator as an input into the desktop assessment of the economically optimised operating envelope. The data definition for NMI level Boffer is based on the Boffers as described in [‘Project EDGE Data Specification Part B’](#) section 3.3 Boffer Data Definition with an addition of 1 attribute named ‘bofferTiming’ to indicate whether the Boffer is prepared prior to start of dispatch interval or after the completion of the dispatch interval. NMI level Boffers are provided as unconstrained Boffers i.e. without applying the operating envelope limits.

Data definition for NMI level Boffer is a simplified and cut down version of the existing DUID level Boffer data schema. This is done to minimise additional development effort on the Aggregators. The table below describes the various characteristics of the NMI level Boffer.

3.1 NMI level Boffer

Item	Item Description	1: Pre-dispatch	2: Post-dispatch
Boffer Characteristic	Type of Boffer	<p>NMI level Unconstrained Boffer with FLEX quantity offered in price/ quantity pairs calculated pre-dispatch interval for 1 dispatch interval (DI) every 5 mins.</p> <ul style="list-style-type: none"> This represents the Aggregators best bid for the dispatch interval approaching. Boffer must include market floor and ceiling price Boffer calculated for all NMIs in portfolio individually 	<p>NMI level Unconstrained Boffer with NMI quantity offered in price/ quantity pairs calculated post-dispatch interval for 1 dispatch interval (DI) every 5 mins.</p> <ul style="list-style-type: none"> This represents the Aggregators best bid for the dispatch interval just gone. Boffer must include market floor and ceiling price Boffer calculated for all NMIs in portfolio individually
Boffer Purpose	What is the purpose of the Boffer provided	Desktop analysis to identify potential value of economically optimising NMI level operating envelopes.	
Def. of Quantity	Where the offered quantity is measured	Flex (Aggregation of all controllable assets at a site)	NMI (Net flow at connection point)

Item	Item Description	1: Pre-dispatch	2: Post-dispatch
Boffer Submission	The frequency of submission of Boffer	Manual data submission for all NMIs in Aggregator portfolio	Manual data submission for all NMIs in Aggregator portfolio
Boffer Option	How Boffer is constructed	Quantity offered as price/quantity pairs in 20 price bands	Quantity offered as price/quantity pairs in 20 price bands
Offer Quantity	How load & generation is represented	<ul style="list-style-type: none"> Load quantity offered as '-ve' value Generation quantity offered as '+ve' value 	<ul style="list-style-type: none"> Load quantity offered as '-ve' value Generation quantity offered as '+ve' value
Re-bid	How frequently the Boffer is recalculated	Boffer calculated for each dispatch interval prior to that dispatch interval No re-bidding is required	Boffer calculated for each dispatch interval post that dispatch interval No re-bidding is required
Boffer Time Horizon	Time period covered by Boffer	1 dispatch interval or 5 minutes	1 dispatch interval or 5 mins
Boffer Composition	The aggregated level at which Boffer is constructed	Aggregated at NMI for only controllable load/generation at a site	Aggregated at NMI for all controlled and uncontrolled load/generation at a site
Quantity make-up	What does the quantity offered represents	The quantity refers to the aggregation of all controllable (load/gen) assets at a site	The quantity refers to the net flow of all assets (controllable/uncontrollable) at a site
Offer Load and/or Generation	Does the Boffer contains both load and generation	Yes	Yes
Boffer Validation	What Boffer validation are applicable per step	Schema validation	Schema validation
Boffer Gate Closure Rule	What Gate closure rule is applicable Boffer	Not applicable	Not applicable

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	NMI level Bi-directional Offers ('Boffer') for Energy submitted by the Aggregator for the total (net

Dataset Name	Wholesale Energy Boffer
	position) or controllable (flexible) price responsive DER Asset at the NMI level. The Boffer is submitted at the NMI level.
Publication Frequency	every 5 mins i.e. for every DI
No of records in a Boffer/Re-bid submission	1 record representing data for a DI
Data Submission	<ul style="list-style-type: none"> • Boffer/Re-bid submitted by Aggregator to AEMO. • AEMO on receipt of the Boffer/Re-bid will <ul style="list-style-type: none"> – Validate Boffer & send successful acceptance or rejection acknowledgement to Aggregator
Initiating Participant	Aggregator
Recipient Participant	AEMO
Submission Acknowledgement	As the NMI level Boffers are submitted manually to AEMO no system acknowledgements or transaction acknowledgements are provided to the Aggregator or DNSP. In case of any data issues Project EDGE Trial Manager will contact the Aggregator or DNSP (as applicable) to rectify and resolve the data issue.

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	nmi	NMI	String	National Meter Identifier, excluding the checksum	Y	N	10 digit alphanumeric
2	bofferSummationLevel	Boffer Summation Level	String	<p>This specifies the capacity points summed to calculate the Boffer.</p> <ul style="list-style-type: none"> 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	bofferTiming	Boffer Timing	String	<p>This specifies weather the Boffer was prepared prior to the dispatch interval or after the dispatch interval.</p> <p>c. PRE: refers to the Boffer computed pre-dispatch interval</p> <p>d. POST: refers to the Boffer computed pre-dispatch interval</p>	Y	N	<p>A Boffer for DI ending 10:30</p> <p>PRE – computed prior to 10:25</p> <p>POST – computed after 10:30</p>
4	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

ID	Attribute Name	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
5	energyBids[]		Array - object	Array for Wholesale Energy Boffer	Y	N	
5.1	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	<ul style="list-style-type: none"> Valid Date Format: yyyy-mm-dd Trading Date must be a current date or future date. Can't be a past date
5.2	Prices[]		Array - Number	<p>The 20 price bands across which aggregators will offer quantities either as load or as generation.</p> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Multiple of 0.01; Must contain 20 items
5.3	energyPeriods		Array - Object	An array of 5min trading intervals.	Y	N	<ul style="list-style-type: none"> Unique Items = True Maximum no of items = 288
5.3.1	periodId	Period ID	Integer	Period ID refers to the 5 min Dispatch Interval Id. This is the trading Interval identifier.	Y	N	<ul style="list-style-type: none"> $1 \leq \text{periodId} \leq 288$; Minimum value = 1

ID	Attribute Name	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
				<ul style="list-style-type: none"> The 1st period starts at 0400 hrs and ends at 0405 hrs <ul style="list-style-type: none"> 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 			<ul style="list-style-type: none"> Maximum value = 288
5.3.2	bandAvail		Array	<p>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.</p> <ul style="list-style-type: none"> 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 This band availability provides the availability for each of the price band 	N	N	<ul style="list-style-type: none"> 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 to maximum load and generation capacity respectively
6	submissionDateT ime	Submission Date Time	String 'date- time'	<p>This timestamp is provided by the Aggregator in the Boffer (i.e. the Boffer Timestamp).</p> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Provided in NEM time. Expected format: yyyy-MM-ddThh:mm:ss



Following three fields are not required thus removed from the existing Boffer schema when creating NMI level Boffer schema

- maxAvailLoad
- maxAvailGen
- fixedLoad

4. NMI level Telemetry Data

NMI level Telemetry data refers to the actual measurement at the NMI level; and is the instantaneous measurements at time period ending. NMI level Telemetry data is provided after the fact by the Aggregator to AEMO for the purpose of OEE0 and Flex OE desktop assessment. NMI level Telemetry data also provides details of the operating envelopes applied at the site level (i.e. import and export limits).

Please note: NMI is the aggregation of all DER assets at a site; measurement at NMI refers to the net connection point flow at a site (import or export).

4.1 NMI Telemetry Data

Item	Description	NMI Telemetry Data
Operational data usage	What is the purpose of the Aggregated Operational data?	<ul style="list-style-type: none"> Aggregated Operational data is used to assess Aggregator’s conformance to wholesale energy dispatch target. This assessment is done post-dispatch interval.
Data aggregation	The level of aggregation required for operational data	Aggregated at NMI level (representing the net flow at a site)
Data Granularity	The resolution or the temporal qualification of the data captured	1 min
Submission Frequency	The frequency of Aggregator submission of operational data to AEMO	Weekly data submission

4.2 NMI Telemetry Data Characteristics

Dataset Name	NMI Telemetry
Description	NMI Telemetry data is provided by Aggregator to AEMO. The data is measured at 1 minute resolution (instantaneous measurement) and provided to AEMO as an input into the OE/Flex OE Desktop Analysis.
Publication Frequency	Once a day; after the fact data submission
No of records	tbc based on submission methodology
Data Submission	<ul style="list-style-type: none"> NMI level Telemetry data is submitted by Aggregator to AEMO

Dataset Name	NMI Telemetry
	<ul style="list-style-type: none"> • AEMO on receipt of the data will <ul style="list-style-type: none"> – Acknowledge the data submission – Perform the OE/Flex OE Desktop Analysis and assessment
Initiating Participant	Aggregator
Recipient Participant	AEMO
Submission Acknowledgement	As the NMI level Telemetry data files are submitted manually to AEMO no system acknowledgements or transaction acknowledgements are provided to the Aggregator or DNSP. In case of any data issues Project EDGE Trial Manager will contact the Aggregator or DNSP (as applicable) to rectify and resolve the data issue.

4.3 NMI Telemetry Data Definition

The Data is provided for the whole of the Aggregator's portfolio.

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
1	nmi	NMI	String	National Meter Identifier, excluding the checksum	Y	N	<ul style="list-style-type: none"> 10 digit alphanumeric
3	nmiTelemetryIntervals		Array	An Array of measurement time and measurements			
3.1	measurementDateTime	Measurement Date Time	String with format 'datetime'	<ul style="list-style-type: none"> This specifies the measurement time of observations in NEM time. The timestamp must align to the dispatch interval time ending. 	Y	N	<ul style="list-style-type: none"> Provided in NEM time Format: yyyy-mm-ddThh:mm:ss+10:00
3.2	activePower	Active Power	Number	<p>Instantaneous measurement of the Active Power (in kW) exported to grid or imported from grid within a dispatch interval measured at 'NMI' i.e. measured at connection point.</p> <p>This represents NMI's (or a site) active power import/export (single value) to market at specified time (kW)</p>	Y	N	
3.3	controlledGeneration	Actual Controlled Generation	Number	<p>Actual Controlled generation in kW: Instantaneous measurement of the sum of actual discharge/generation activity of the NMI.</p> <p>Note: this is not intended to include uncontrolled generation such as uncontrolled PV that is not being actively controlled</p>	Y	N	Value >= 0

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
				A positive value indicates generation (discharging).			
3.4	controlledLoad	Actual Controlled Load	Number	<p>Actual Controlled load in kW: Instantaneous measurement of the sum of actual charge/load activity of the DUID.</p> <p>Note: this is not intended to include un-controlled loads such as household appliance loads unless explicitly under control</p> <p>A negative value indicates load (charging).</p>	Y	N	Value <= 0
3.5	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	Value >= 0
4	nmiOEReceivedFlag	NMI OE Received Flag	Boolean	<p>Flag to indicate which OE are used.</p> <ul style="list-style-type: none"> ▪ False = Default envelope applied ▪ True = OE received from DSO was applied 	Y	N	<ul style="list-style-type: none"> • Must be 'True' or 'False'
5	activePowerExportLimit	Active Power Export Limit	Number	Active Power Export limit applicable to the specified interval, in kW specified in OE or use default values	Y	N	<ul style="list-style-type: none"> • Decimal (4,2) • Value >= 0
6	activePowerImportLimit	Active Power Import Limit	Number	Active Power Import limit applicable to the specified interval, in kW specified in OE or use default values	Y	N	<ul style="list-style-type: none"> • Decimal (4,2) • Value <= 0
7	reactivePowerExportLimit	Reactive Power Export Limit	Number	Reactive Power Export limit applicable to the specified interval, measured in kVar specified in OE or use default values	Y	Y	<ul style="list-style-type: none"> • Decimal (4,2) • Value >= 0
8	reactivePowerImportLimit	Reactive Power Export Limit	Number	Reactive Power Import limit applicable to the specified interval, measured in kVar specified in OE or use default values	Y	Y	<ul style="list-style-type: none"> • Decimal (4,2) • Value <= 0

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
9	submissionDatetime	Submission Date time	datetime	Specifies the date/time of record creation	N	Y	<ul style="list-style-type: none"> • Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00

5. NMI level Uncontrolled Load/Generation Forecast

NMI level Uncontrolled Load/Gen forecast is calculated just before the dispatch interval.

5.1 NMI Uncontrolled (Load/Gen) Forecast Data

Item	Description	NMI Uncontrolled (Load/Gen) Forecast
Operational data usage	What is the purpose of the NMI uncontrolled Forecast data?	As an input to OE/Flex OE desktop analysis
Data aggregation	The level of aggregation required for forecast data	NMI
Data Granularity	The resolution or the temporal qualification of the data captured	5 min: 5-minute resolution
Submission Frequency	The frequency of Aggregator submission of NMI uncontrolled forecast data to AEMO	Batch upload

5.2 NMI Uncontrolled (Load/Gen) Forecast Data Characteristics

Dataset Name	NMI Uncontrolled (Load/Gen) Forecast
Description	Pre-dispatch Uncontrolled Load/ Gen Forecast per NMI (calculated just before Dispatch Interval)
Publication Frequency	Every 5 mins
Data Submission	<ul style="list-style-type: none"> NMI level Uncontrolled Forecast data is submitted by Aggregator to AEMO AEMO on receipt of the data will <ul style="list-style-type: none"> Acknowledge the data submission
Initiating Participant	Aggregator
Recipient Participant	AEMO

Dataset Name	NMI Uncontrolled (Load/Gen) Forecast
Submission Acknowledgement	<ul style="list-style-type: none"> As the NMI level uncontrolled (Load/Generation) forecast data files are submitted manually to AEMO no system acknowledgements or transaction acknowledgements are provided to the Aggregator or DNSP. In case of any data issues Project EDGE Trial Manager will contact the Aggregator or DNSP (as applicable) to rectify and resolve the data issue.

5.3 NMI Uncontrolled Load/Gen Forecast Data Definition

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
1	nmi	NMI	String	National Meter Identifier, excluding the checksum	Y	N	<ul style="list-style-type: none"> 10 digit alphanumeric
2	measurementDatetime	Measurement Date Time	String with format 'datetime'	<ul style="list-style-type: none"> This specifies the measurement time of observations in NEM time. The timestamp must align to the dispatch interval time ending. 	Y	N	<ul style="list-style-type: none"> Provided in NEM time Format: yyyy-mm-ddThh:mm:ss+10:00
3	uncontrolFcst	Uncontrolled Load/ Generation Forecast	Array of Number	Uncontrolled Load/ Generation forecast (in kW) measured at the NMI (i.e. connection point) <ul style="list-style-type: none"> -ve value indicates uncontrolled load +ve value indicates uncontrolled generation 	Y	N	Array of 288 values representing data for a single trading day
4	submissionDatetime	Submission Date time	String with format 'datetime'	Specifies the date/time of record creation	N	Y	<ul style="list-style-type: none"> Provided in NEM time Format: yyyy-mm-ddThh:mm:ss+10:00

6. Post DI NMI Operating Envelopes (OE)

Post-dispatch interval NMI level Operating Envelopes (OEs) are published by DNSP and are provided to AEMO for the purpose of applying network limits to customer imports and exports during local network and wholesale services provision.

Post-dispatch OE are the limits recalculated based on known network data to understand what the largest capacity of the OE could have been if network conditions for the subject dispatch interval were known.

6.1 NMI OE for Wholesale Energy

Item	Description	Post DI NMI Operating Envelope
Publication Frequency	The frequency of publication of operating envelopes	Every 5 min (for each DI), after the completion of the DI
Limit Type and Direction	The type and direction of limits to be included in operating envelopes	<ul style="list-style-type: none"> Active Power Import Active Power Export Reactive Power
NMI OE Purpose	What is the purpose of the provided NMI OE	<ul style="list-style-type: none"> NMI OE are used to enforce distribution level constraints into market clearing NMI OE are used to constrain Aggregator Boffer

6.2 NMI OE Data Characteristics

Dataset Name	NMI Operating Envelope (OE)
Description	NMI level Operating Envelopes are calculated and produced by DNSP. These distribution level limits are shared with the Aggregators and AEMO.
Publication Frequency	<ul style="list-style-type: none"> Calculated every 5 minutes after the dispatch interval
No of records	1 per NMI – OE for each 5 min interval
Data Submission	<ul style="list-style-type: none"> OE are submitted by DNSP to AEMO for all NMIs in the EDGE AEMO on receipt of the OE will

Project EDGE Data Specification: Post DI NMI Operating Envelopes (OE)

Dataset Name	NMI Operating Envelope (OE)
	<ul style="list-style-type: none"> <li data-bbox="874 297 1382 394">– Validate the NMI OE & send successful/rejection acknowledgement to DNSP <li data-bbox="874 409 1430 472">– Send NMI OE for the NMIs in the Aggregator portfolio to Aggregator
Initiating Participant	DNSP
Recipient Participant	1. AEMO
Submission Acknowledgement	<ol style="list-style-type: none"> <li data-bbox="831 600 1449 875">1. As the NMI level post-dispatch interval Operating Envelopes are submitted manually to AEMO no system acknowledgements or transaction acknowledgements are provided to the Aggregator or DNSP. In case of any data issues Project EDGE Trial Manager will contact the Aggregator or DNSP (as applicable) to rectify and resolve the data issue.



6.3 NMI OE Data Definition (Post-Dispatch interval)

DNSP is required to publish and submit the NMI Operating Envelopes (OE) to AEMO for the purpose of applying limits/constraints to the market solve and generating the dispatch targets. AEMO will use these OE to check Boffers submitted by Aggregator doesn't breach any OE; and will be compared to Pre-dispatch OEs for further analysis. In this desktop analysis, the post-dispatch interval OE is calculated after the fact using actual network data and hence will represent the largest possible limit the NMI could have theoretically received.

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
1	participantId	Participant ID	String	This refers to the data provider participant ID.	Y	N	
2	oeTiming	OE Timing	String	<p>This specifies weather the Operating Envelope was prepared prior to the dispatch interval or after the dispatch interval.</p> <ul style="list-style-type: none"> • PRE: refers to the Boffer computed pre-dispatch interval • POST: refers to the Boffer computed pre-dispatch interval 	Y	N	•
3	operatingEnvelopes		Array	An array of NMIs and Interval data			
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 intervals data			
3.2.1	oeObjectiveFunction	Objective Function	String	Identifier for the objective function used	Y	N	<ul style="list-style-type: none"> • OF_MAXIMISE_S ERVICES, • OF_EQUAL_OPP ORTUNITY



Project EDGE Data Specification: Post DI NMI Operating Envelopes (OE)

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
3.2.2	derControl[]		Array	Array for limit data	Y	N	
3.2.2.1	creationTime	Creation Time	Number	Number of seconds since 1970	Y	N	1659571160
3.2.2.2	interval	Interval Data	Array - Object		Y	N	
3.2.2.2.1	start	Start of Interval	Number	Number of seconds since 1970	Y	N	
3.2.2.2.2	duration	Duration	Number	Length of interval in seconds. This must be provided in multiple of 300 i.e. 5 minute intervals	Y	N	
3.2.2.3	derControlBase	DER Control Limits	Array – Object		Y	N	
3.2.2.3.1	opModExpLimW	Active Power Export Limit	Array – Object		Y	N	
3.2.2.3.1.1	multiplier	Multiplier	Number	Multiply the value by 10^multiplier. (e.g. a multiplier of 3 means multiply the value by 1000, for kW)	Y	N	
3.2.2.3.1.2	value	Value	Number	Value of the export limit in Watts (subject to the multiplier)	Y	N	
3.2.2.3.2	opModImpLimW	Active Power Import Limit	Array – Object		Y	N	
3.2.2.3.2.1	multiplier	Multiplier	Number	Multiply the value by 10^multiplier. (e.g. a multiplier of 3 means multiply the value by 1000, for kW)	Y	N	
3.2.2.3.2.2	value	Value	Number	Value of the export limit in Watts (subject to the multiplier)	Y	N	



Project EDGE Data Specification: Post DI NMI Operating Envelopes (OE)

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
4	submissionTimestamp	Submission Datetime	datetime	Specifies the date/time of record creation (relevant to OE update)	Y	N	<ul style="list-style-type: none">• Provided in NEM time• Format: yyyy-mm-ddThh:mm:ss+10:00

7. Real (P) & Reactive (Q) Power measurement at NMI

Real and reactive power measurements at NMI level are published by DNSP and are provided to AEMO for use in desktop assessment of OE economic optimisation and Flex OE.

7.1 P&Q Power Data

Item	Description	Post DI NMI Operating Envelope
Publication Frequency	The frequency of publication of operating envelopes	Every 5 min (for each DI), after the completion of the DI
Limit Type and Direction	The type and direction of limits to be included in operating envelopes	<ul style="list-style-type: none"> Instantaneous Real (P) Power Instantaneous Reactive (Q) Power
P&Q Power data Purpose	What is the purpose of the provided PQ data.	<ul style="list-style-type: none"> PQ data is used in desktop assessment PQ data is also used in dispatch monitoring and forecast accuracy assessment.

7.2 PQ Data Characteristics

Dataset Name	PQ Power Data
Description	PQ data consists of the instantaneous measurement of real and reactive power at NMI level.
Publication Frequency	<ul style="list-style-type: none"> measured every 5 minutes after the dispatch interval
No of records	1 per NMI – OE for each 5 min interval
Data Submission	<ul style="list-style-type: none"> PQ data is submitted by DNSP to AEMO for all NMIs in the EDGE AEMO doesn't perform any business validation.
Initiating Participant	DNSP
Recipient Participant	AEMO

Project EDGE Data Specification: Real (P) & Reactive (Q) Power measurement at NMI

Dataset Name	PQ Power Data
Submission Acknowledgement	As the NMI level PQ data files are submitted manually to AEMO no system acknowledgements or transaction acknowledgements are provided to the Aggregator or DNSP. In case of any data issues Project EDGE Trial Manager will contact the Aggregator or DNSP (as applicable) to rectify and resolve the data issue.



Project EDGE Data Specification: Real (P) & Reactive (Q) Power measurement at NMI

7.3 PQ Data Definition

DNSP is required to publish and submit the instantaneous measurement of the PQ data to AEMO.

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
1	nmi	NMI	String	NMI identifier. NMI must be submitted without the checksum	Y	Y	10 character, alpha numeric
2	timeStamp	Time Stamp	String with 'date-time' format	This refers to the timestamp when PQ values are measured. This timestamp is aligned to the DI end time. The data is always provided in NEM time.			yyyy-mm-ddThh:MM:ss+10:00
3	Watt	Watt	Number	This refers to the real (P) power. For real power +ve/-ve values are acceptable. Here +ve refers to power from grid where as -ve value refers to power to grid.	Y	N	
4	Var	Var	Number	This refers to the reactive (Q) power. Similarly for reactive power both +ve/-ve values are acceptable. Here +ve refers to power from grid where as -ve value refers to power to grid.	Y	N	



Project EDGE Data Specification: Real (P) & Reactive (Q) Power measurement at NMI