Project EDGE Data Specification

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

Version: Final

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

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Contents

1.	**Glossary**	**6**
1.1	Abbreviations	6
1.2	Key Concepts	10
2.	**Part C: DOE Economic Optimisation and Flex OE Desktop Analysis Data Requirements**	**12**
2.1	Part A: Introduction to Data Exchange, Data Requirements and Participant Enrolment	12
2.2	Part B: Market Participation & operational Visibility Data Requirements	12
2.3	Part C: DOE Economic Optimisation and Flex OE Desktop Analysis Data Requirements	12
3.	**NMI level Bi-directional Offer (NMI Boffer)**	**14**
3.1	NMI level Boffer	14
3.2	Boffer Data Characteristics	16
3.3	Boffer Data Definition	17
4.	**NMI level Telemetry Data**	**21**
4.1	NMI Telemetry Data	21
4.2	NMI Telemetry Data Characteristics	21
4.3	NMI Telemetry Data Definition	23
5.	**NMI level Uncontrolled Load/Generation Forecast**	**25**
5.1	NMI Uncontrolled Forecast Data	25
5.2	NMI Uncontrolled Forecast Data Characteristics	25
5.3	NMI Uncontrolled Load/Gen Forecast Data Definition	27
6.	**Post DI NMI Operating Envelopes (DOE)**	**28**
6.1	NMI DOE for Wholesale Energy	28
6.2	NMI DOE Data Characteristics	28
6.3	NMI DOE Data Definition (Post-Dispatch interval)	30

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: • Updated Sec 4. Data Requirements to include OE/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 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
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 Please note: All data provided/exchanged in Project EDGE must be DI time ending,
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 9.55 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 C: DOE 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 three-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

Part B covers the Project EDGE data requirements for market participation i.e. provision of Dynamic Operating Envelopes (DOE), Boffer submission, pre-dispatch price forecast 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.

2.3 Part C: DOE 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 DOE/Flex OE desktop analysis.

- By DOE Economic Optimisation we mean the Operating Envelopes that considers the Aggregator's NMI level Boffer as an input into the OE calculation
- 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 and provided must be at NMI level. Aggregators would need to provide NMI level Boffers, Telemetry and Forecast and DNSPs would provide post-dispatch interval operating envelopes. 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

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 unconstrainted 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	NMI level Unconstrained Boffer (quantity measured at NMI level i.e. net NMI) with quantity offered in price/ quantity pairs calculated pre-dispatch interval for 1 dispatch interval (DI) every 5 mins. • 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	NMI level Unconstrained Boffer (quantity measured at NMI level i.e. net NMI) with quantity offered in price/ quantity pairs calculated post-dispatch interval for 1 dispatch interval (DI) every 5 mins. • 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.

Item	**Item Description**	**1: Pre-dispatch**	**2: Post-dispatch**
Def. of Quantity	Where the offered quantity is measured	Flex (Aggregation of all controllable assets at a site)	NMI (Net flow at connection point)
Boffer Submission	The frequency of submission of Boffer	Batch upload/ pre-agreed frequency	Batch upload/ pre-agreed frequency
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	• Load quantity offered as '-ve' value • Generation quantity offered as '+ve' value	• 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 position) or controllable (flexible) price responsive DER Asset at the NMI level. The Boffer is submitted at the NMI level.
Information Classification	Confidential
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	• 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	nmi	NMI	String	National Meter Identifier, excluding the checksum	Y	N	10 digit alphanumeric
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	bofferTiming	Boffer Timing	String	**This specifies weather the Boffer was prepared prior to the dispatch interval or after the dispatch interval.** • PRE: refers to the Boffer computed pre-dispatch interval • POST: refers to the Boffer computed pre-dispatch interval	Y	N	A Boffer for DI ending 10:30 PRE – computed prior to 10:25 POST – computed after 10:30
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
5	energyBids[]		Array - object	Array for Wholesale Energy Boffer	Y	N	

ID	Attribute Name	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
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	• 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	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
5.3	energyPeriods		Array - Object	An array of 5min trading intervals.	Y	N	• 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. • 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	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
				• For a given trading date, Period ID must be between 1 and 288			
5.3.2	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 • This band availability provides the availability for each of the price band	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 to maximum load and generation capacity respectively
6	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

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 OEEO 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?	• 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	Daily (once a day 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.
Information Classification	Confidential
Publication Frequency	Once a day; after the fact data submission
No of records	tbc based on submission methodology

Dataset Name	NMI Telemetry
Data Submission	• NMI level Telemetry data is submitted by Aggregator to AEMO • AEMO on receipt of the data will – Acknowledge the data submission – Preform the OE/Flex OE Desktop Analysisssessment
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.

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	• 10 digit alphanumeric
3	nmiTelemetryIntervals		Array	An Array of measurement time and measurements			
3.1	measurementDatetime	Measurement Date Time	String with format 'datetime'	• This specifies the measurement time of observations in NEM time. • The timestamp must align to the dispatch interval time ending.	Y	N	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00
3.2	activePower	Active Power	Number	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. This represents NMI's (or a site) active power import/export (single value) to market at specified time (kW)	Y	N	
3.3	controlledGeneration	Actual Controlled Generation	Number	Actual Controlled generation in kW: Instantaneous measurement of the sum of actual discharge/generation activity of the NMI. **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).**	Y	N	Value >= 0

ID	Attribute	Business Name	Data Type	Description	Is Mandatory	Is Nullable	Comments/ Validation Rule
3.4	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
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	nmiOeSubmissionTimestamp	NMI DOE Submission Timestamp	String 'date-time'	Specifies the date/time of record creation of NMI Operating Envelope or 'NULL' if no Operating Envelope was supplied	N	Y	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00
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	• 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	• 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	• 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	• Decimal (4,2) • Value <= 0
9	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

5. NMI level Uncontrolled Load/Generation Forecast

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

5.1 NMI Uncontrolled Forecast Data

Item	Description	NMI Uncontrolled 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 Forecast Data Characteristics

Dataset Name	**NMI Uncontrolled (Load/Gen) Forecast**
Description	Pre-dispatch Uncontrolled Load/ Gen Forecast per NMI (calculated just before Dispatch Interval)
Information Classification	Confidential
Publication Frequency	Every 5 mins
Data Submission	• NMI level Uncontrolled 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

Dataset Name	**NMI Uncontrolled (Load/Gen) Forecast**
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.

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	• 10 digit alphanumeric
2	measurementDatetime	Measurement Date Time	String with format 'datetime'	• This specifies the measurement time of observations in NEM time. • The timestamp must align to the dispatch interval time ending.	**Y**	**N**	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00
3	uncontrolFcst	Uncontrolled Load/ Generation Forecast	Number	Uncontrolled Load/ Generation forecast (in kW) measured at the NMI (i.e. connection point) • -ve value indicates uncontrolled load • +ve value indicates uncontrolled generation	Y	N	
4	submissionDatetime	Submission Date time	String with format 'datetime'	Specifies the date/time of record creation	N	Y	• Provided in NEM time • Format: yyyy-mm-ddThh:mm:ss+10:00

6. Post DI NMI Operating Envelopes (DOE)

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

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

6.1 NMI DOE for Wholesale Energy

Item	Description	Post DI NMI Operating Envelope (DOE)
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	• Active Power Import • Active Power Export • Reactive Power
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

6.2 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	• Calculated every 5 minutes after the dispatch interval
No of records	1 per NMI – DOE for each 5 min interval
Data Submission	• DOE are submitted by DNSP to AEMO for all NMIs in the EDGE

Dataset Name	**NMI Operating Envelope (DOE)**
	• 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. 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.

6.3 NMI DOE Data Definition (Post-Dispatch interval)

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. AEMO will use these DOE to check Boffers submitted by Aggregator doesn't breach any DOE; and will be compared to Pre-dispatch DOEs for further analysis. In this desktop analysis, the post-dispatch interval DOE 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	nmi	NMI	String	National Meter Identifier, excluding the checksum	Y	N	• 10 digit alphanumeric
2	oeTiming	DOE Timing	String	**This specifies weather the Boffer was prepared prior to the dispatch interval or after the dispatch interval.** • PRE: refers to the Boffer computed pre-dispatch interval • POST: refers to the Boffer computed pre-dispatch interval	Y	N	•
3	oeObjectiveFunction	Objective Function	String	Identifier for the objective function used	Y	N	
4	oeApplicationLevel	OE Level of Application	String	This specifies the level of application at which Operating Envelopes are defined by the DNSP. If • '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	Y	N	• For Net CP flow = Net NMI • For Controllable only = Flex
5	operatingEnvelopes		Array	An array of DOE			
5.1	nmi	NMI	String	NMI identifier. NMI must be submitted without the checksum	Y	Y	10 character, alpha numeric

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

ID	**Attribute**	**Business Name**	**Data Type**	**Description**	**Is Mandatory**	**Is Nullable**	**Comments/ Validation Rule**
5.2	Intervals		Array	An array of 288 5min intervals			
5.2.1	activePowerExportLimit	Active Power Export Limit	Number	Active Power Export limit applicable to the specified interval, in **kW**	Y	N	Decimal (4,2)
5.2.2	activePowerImportLimit	Active Power Import Limit	Number	Active Power Import limit applicable to the specified interval, in **kW**	Y	N	Decimal (4,2)
5.2.3	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
5.2.4	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
6	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