AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Guide to AEMO VPP Demonstrations APIs

Final

May 2020

Provides details of the API specification developed for VPP Demonstrations project

Important Notice

PURPOSE

This Guide to AEMO VPP Demonstrations APIs, prepared by the Australian Energy Market Operator (AEMO), provides guidance for the VPP Demonstration project under the National NER or NGR (Rules).

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0.1 Created API guide with Enrolment API information

0.2 Added details about the API standards, and FCAS and Ops APIs

0.3 Added Telemetry Data API details and updated API URLs

1. Final Version

DOCUMENTS MADE OBSOLETE

Publication of this document makes Draft Guide to VPP Demonstrations APIs obsolete.

FEEDBACK

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

Contents

Chapter 1. Introduction

Purpose

This document provides details of the API specification developed for the Virtual Power Plant (VPP) Demonstrations project. The guide will help participants develop their own applications that will interface with Australian Energy Market Operator (AEMO) systems.

This API Specification document covers APIs for Enrolment data, FCAS Response data, VPP Operational data and Telemetry data.

Audience

The primary audience is the VPP Demonstrations participant's technical staff responsible for building applications using AEMO APIs for the VPP demonstration project.

The secondary audience is anyone who has an interest in understanding how AEMO's VPP APIs work.

Assumed knowledge

This guide assumes you have knowledge of the RESTful programming architecture.

Assumed reading and context

The Guide to VPP Demonstration APIs assumes a knowledge of the following documents that have been published in relation to the VPP Demonstration:

- Final Design Document
- Enrolment Form
- Enrolment Guide
- VPP Demonstrations Frequency Control Ancillary Services (FCAS) Specification
- Data Specification

These documents, and other reference and background material, can be found on the AEMO website[1]

[1] https://aemo.com.au/initiatives/major-programs/nem-distributed-energy-resources-der-program/pilots-and-trials/virtual-power-plant-vpp-demonstrations

How to use this guide

- This document is written in plain language for easy reading. Where there is a discrepancy between the National Electricity Rules (Rules) and information or a term in this document, the Rules take precedence.
- The references listed throughout this document are primary resources and take precedence over this document.
- Glossary terms have the meanings listed against them in the Glossary section.

What's in this guide

AEMO has produced this document to provide participants with a guideline for data interface using the APIs developed by AEMO. This detail is to assist participants with designing their own systems to use AMEO APIs. The guide explains the communication protocol and methods with examples.

Related resources

Title	Location
Guide to AEMO's e-Hub APIs	https://www.aemo.com.au/-/media/Files/Electricity/NEM/IT-Systems-and-Change/2018/Guide-to-AEMOs-eHub-APIs.pdf
Guide to User Rights Management	https://aemo.com.au/-/media/files/electricity/nem/retail_and_metering/market_settlement_and_transfer_solutions/guide_to_user_rights_management.pdf
aseXML	https://www.aemo.com.au/Electricity/IT-Systems/aseXML_standards/aseXML-Schemas
OpenAPI Specification	https://github.com/OAI/OpenAPI-Specification

Chapter 2. Overview and Interface scope

Virtual Power Plant (VPP) is an emerging concept being trialled across Australia, largely driven by subsidy schemes incentivising the uptake of thousands of residential battery units.

AEMO has launched the VPP Demonstrations to test a new specification for distributed energy resources (DER) to deliver Contingency frequency control ancillary services (FCAS), increasing competition for FCAS and allowing VPPs to explore the commercial feasibility of stacking multiple value streams.

AEMO is also developing its systems to receive operational and telemetry data from VPPs that will provide visibility of the distribution connected DER to AEMO. This will help AEMO learn how to integrate VPPs into the market at scale, which will then inform appropriate regulatory and operational changes.

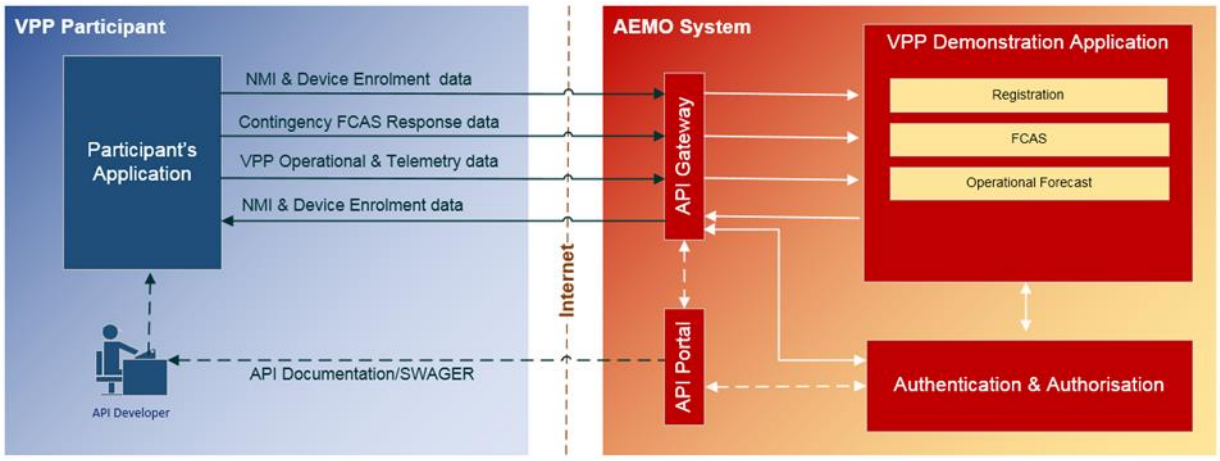
The functional scope of the demonstrations includes building a system to support the VPP demonstrations. The system will enable data transfer over the internet via APIs between AEMO and VPPs to facilitate and support the following functions:

- VPP Enrolment (i.e. enrolling in VPP demonstrations and ongoing data updates).
- Contingency FCAS assessment.
- VPP Operational data ingestion – actuals and forecasts data ingestion.
- Telemetry Data ingestion

Please note: VPP APIs are only accessible over internet.

Conceptual architecture

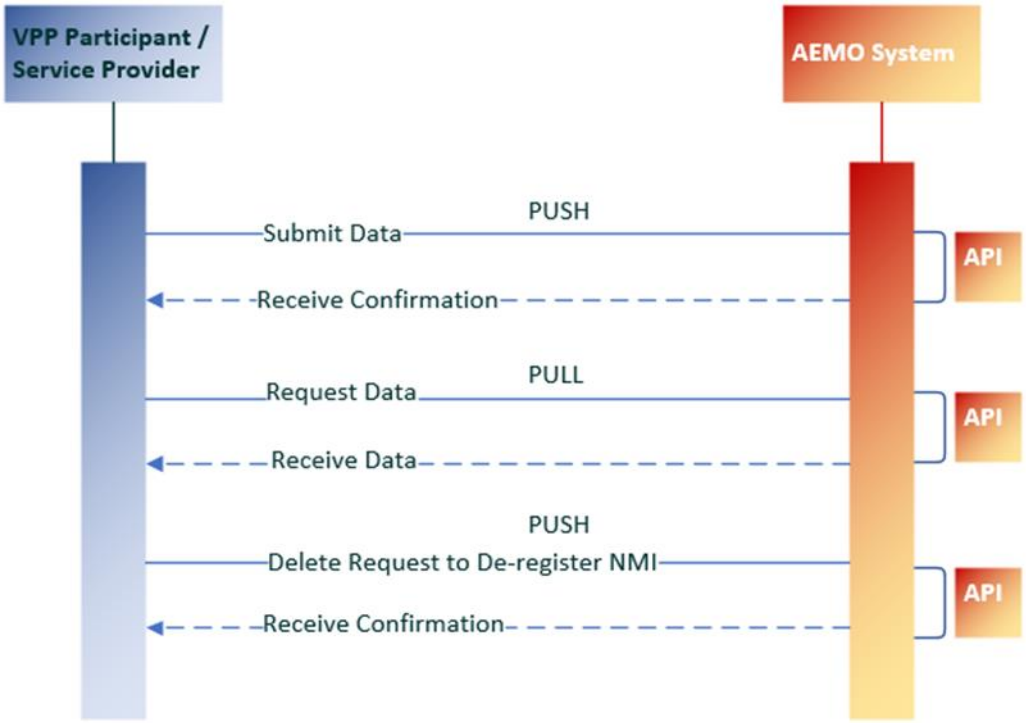
Figure 1: Architecture context diagram



Interface message pattern

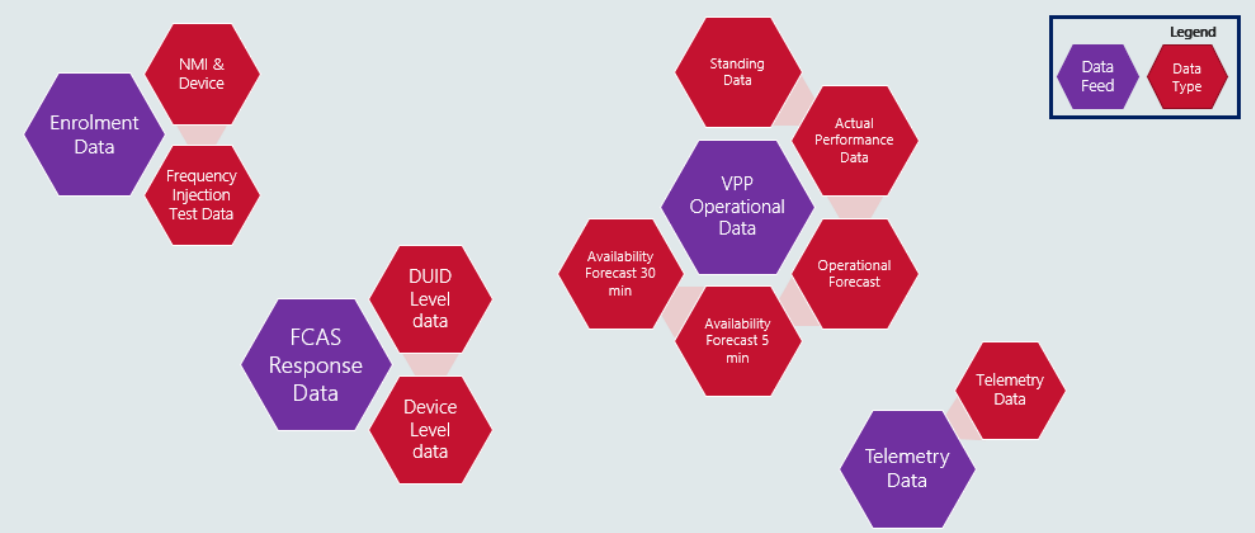
The VPP Demonstration interface follows both PUSH and PULL message patterns from the participants' perspective. The diagram below describes the data exchange pattern for the VPP Demonstrations.

Figure 2: Message pattern



Interfaces

The section below describes various data submission interfaces. Participants can use these interfaces to submit the required data. These interfaces are categorised into 4 groups based on the data feed.



Enrolment Data Interface List

Interface Number	Data Type	Message pattern	Description
Interface 1-Submit NMI & Device	NMI & Device Enrolment Data	PUSH	Participant submits list of NMIs and associated device(s) with relevant attribute values for enrolment into VPP demonstrations and for ancillary services load configuration assessment.
Interface 2-Get NMI & Device	NMI & Device Enrolment Data	PULL	Participant retrieves the list of enrolled NMIs and associated devices for a specific DUID (dispatchable unit) in a VPP.
Interface 3-Remove NMI & Device	NMI & Device Enrolment Data	PUSH	Participant submits an NMI or list of NMIs that needs to be disassociated (i.e. removed) from the DUID and the VPP. This will also disassociate all the devices attached to the NMI from the DUID in the VPP.
Interface 4-Remove Device	Device Enrolment Data	PUSH	Participant submits a device or list of devices that needs to be disassociated from an NMI. In addition to removing association to NMI, this will result in device(s) being removed from the DUID and VPP configuration as well.

Interface 5-Submit Frequency Injection data	Frequency Injection Test Data (FITD)	PUSH	Participant submits Frequency Injection test data for the device and DUID for ancillary services load configuration assessment.

FCAS Response Data Interface List

Interface Number	Data	Message pattern	Description
Interface 6-Submit DUID Response Data	FCAS Response Data for DUID	PUSH	Participant submits the FCAS Response data for the DUID post a contingency event on request of AEMO. The data is submitted for a frequency event, and contains measures on Power, Frequency and measurement datetime for use in Contingency FCAS Verification process.
Interface 7- Submit Device Response Data	FCAS Response Data for Device	PUSH	Participant submits the FCAS Response data for each device under a DUID, post a contingency event on request of AEMO. The data is submitted for a frequency event, and contains measures on Power, Frequency and measurement datetime.

VPP Operational Data Interface List

Interface Number	Data	Message pattern	Description
Interface 8-Submit VPP Standing Data	Standing Data	PUSH	Participant submit aggregated generation capacity, aggregated load capacity and total energy storage capacity. This data is submitted initially and then whenever a change in portfolio results in change in aggregated generation capacity, aggregated load capacity and total energy storage capacity.
Interface 9-Submit VPP Actual Performance Data	Actual Performance Data	PUSH	Participant submits Actual delivered aggregated generation or load under control in each VPP portfolio. The values measured must be at Dispatch Interval (DI) time ending i.e. measured at 5 min boundary, E.g. 10.00, 10.05, 10.10 etc. Received no later than 5-minutes after the fact, every 5-minutes.

Interface 10-Submit 5 min Operational Forecast Data	Operational Forecast (5-minute resolution)	PUSH	Participant submits Forecast of aggregated generation or load under control in each VPP portfolio (exclusive of any generation or load being held available for FCAS enablement). Re-forecast every 5-minutes. The values forecasted (calculated) must be at Dispatch Interval (DI) time ending i.e. forecasted at 5 min boundary, E.g. 10.00, 10.05, 10.10 etc.
Interface 11-Submit 5 min Availability Forecast Data	Availability Forecast (5-minute resolution)	PUSH	Participant submits Available capacity of generation or load in each VPP portfolio. The availability forecast is exclusive of charge and discharge expectations of the storage systems, this only reflects the total online capability. Re-forecast every 5-minutes in the pre-dispatch time period. The values forecasted (calculated) must be at Dispatch Interval (DI) time ending i.e. forecasted at 5 min boundary, E.g. 10.00, 10.05, 10.10 etc.
Interface 12-Submit 30 min Availability Forecast Data	Availability Forecast (30-minute resolution)	PUSH	Participant submits Available capacity of generation or load in each VPP portfolio. The availability forecast is exclusive of charge and discharge expectations of the storage systems, this only reflects the total online capability. Re-forecast every 30 minutes in STPASA time period. The values forecasted (calculated) must be at Trading Interval (TI) time ending i.e. forecasted at 30 min boundary, E.g. 10.00, 10.30, 11.00 etc.

Telemetry Data Interface List

Interface Number	Data	Message pattern	Description
Interface 13-Submit Telemetry Data	Telemetry Data	PUSH	Participant submits the Telemetry data for each device under the portfolio. The data is submitted at 5 min resolution, for all the devices under control of the VPP. The instantaneous values must be measured at Dispatch Interval (DI) time ending i.e. measured at 5 min boundary, E.g. 10.00, 10.05, 10.10 etc. The minimum, maximum and mean values must be measured over the Dispatch Interval (DI) i.e. 5 min duration. E.g. Maximum: Customer gross load should be maximum customer gross load within the 5 min interval (i.e. in-between start and end of dispatch interval)

Chapter 3. API Standard

The VPP demonstrations project uses AEMO e-Hub platform standards and leverages the current security framework. The AMEO e-Hub platform uses OpenAPI Specification (OAS). For details about AEMO's e-HUB platform, architecture, and common standards, refer to the AEMO e-Hub API guide. This API specification is developed based on current AEMO e-Hub specification.

VPP Demonstrations API design uses the following principles:

- APIs are RESTful and use open standards.
- APIs are secure.

API Access

AEMO's VPP APIs are exposed through the internet via an API gateway. These APIs are not accessible through MarketNet. API details, including Swagger files are available via AEMO's API Developer Portal.

Environment	API Developer Portal
Pre-Production	https://dev.preprod.aemo.com.au
Production	https://dev.aemo.com.au

API Format

VPP Demonstrations API URL design follows AEMO's e-Hub APIs standards. VPP APIs follow a verb/noun naming convention, for clear understanding of their action. VPP Demonstrations API endpoints will have the following format:

```
https://<host server>/<business function>/<API version>/<resource>?<Query string parameters>
```

Example URL for VPP Enrolment:

```
https://partner.api.aemo.com.au/NEMWholesale/DER/VPP/v1/submitNMIDevices
```

Base URLs

Environment	Base URL
Pre-Production	https://partner.api.preprod.aemo.com.au
Production	https://partner.api.aemo.com.au

Payload compression

AEMO APIs support HTTP protocol compression controlled by the HTTP request header attributes, allowing compression before sending and responding. For more information, refer to Content-Encoding and Accept-Encoding in the next section.

HTTP Request Header

Header attributes.

Parameter	Description	Value(s)
Content-Type	HTTP request format. **This is mandatory**	application/json
Accept	HTTP response format. Details the expected content type of the response	application/json
Content-Length	Content length of file. The value is populated when the request is sent. **This is mandatory**	nnn
Content-Encoding	Specifies any compression applied to the request body.	gzip compress deflate
X-initiatingParticipantID	The Participant ID who the request is from. **This is mandatory**	X-initiatingParticipantID:123456
X-market	The market type that the request applies. **This is mandatory**	NEM
Authorization	Specifies basic HTTP authentication containing the Base64[1] encoded username and password. The participant's URM username and password are concatenated with a colon separator and then Base64 encoded. **This is mandatory**	Basic YXNhc2FzOmFzYXNhc2Fz (for URM username "VPP01" and password "nsicu@$@#8asdsad") **Note:** This is an example only.
Accept-Encoding	HTTP payload compression. Specifies the encoding supported for the response	gzip compress deflate

HTTP Methods

Methods

Methods	Usage
GET	For retrieval of information (single or collation)
POST	a. To create a resource item b. To spawn an action c. Changes the state of the resource d. To disassociate NMI and/or Device from a DUID & VPP configuration

HTTP Response

The HTTP Response will have a response code and description, with

- A successful request indicated by 200 OK.
- Other response codes for technical and Payload validation failures.

Response codes

Table 1 HTTP response codes

Response Code	Description	Data Condition
200	OK	Request Processed Successfully
400	The service cannot be found for the endpoint reference	Invalid API URL
400	Bad Request	Malformed payload (JSON)
401	Unauthorised	Invalid Credentials
401	Unauthorised	Expired User Password
401	Unauthorised	No BASIC Auth information in HTTP Request Header
401	Unauthorised	Participant ID in the payload does not match to Participant ID in the URM (against the username sent in the Basic Auth)
403	Forbidden	Insufficient privileges to perform request

404	Not Found	Resource Not Found
405	Method Not Allowed	Invalid Method used (e.g. GET used instead of POST)
422	Business validation failure	Business validation failure
429	Too Many Requests	Exceeds Throttling Limits
500	Internal Server Error	Application has returned an error
502	Bad Gateway	Request could not be routed to native API
503	Service Unavailable	The requested service is temporarily unavailable

Date format

Date format follows the ISO 8601 in NEM (Market) time.

Field Type	Format	Example
Date	yyyy-MM-dd	2018-07-23
Date Time	yyyy-MM-ddThh:mm+hh:mm	2018-07-23T13:24+10:00
	yyyy-MM-ddThh:mm:ss+hh:mm	2019-05-06T23:02:38+10:00
	yyyy-MM-ddThh:mm:ss.sss+hh:mm	2019-05-06T23:02:38.350+10:00

Where:

- yyyy = four digit year
- MM = two digit month (01 = January, etc)
- dd = two digit day of month (01 to 31)
- hh = two digit of hour (00 to 23). Please note AM or PM formats are not allowed. Please provide time in 24hr format.
- mm = two digits of minute (00 through 59)
- ss = two digits of second (00 through 59)
- sss = three digit of milli second (000 through 999)

For example, 2019-09-23T09:30:15+10:00, here the time component is in NEM time and the offset specifies number of hours by which the time is ahead of UTC

Data validation

The validations for the incoming API requests are categorised as:

- Technical validations
  - Connectivity (for example, SSL authentication).
  - Throttling limits

- Payload validations
  - Schema validation (for example, validation of the JSON payload)
  - HTTP request / response header parameters (for example, missing / invalid HTTP request / response header parameters)
  - Data Attribute Validation

API Portal

AEMO provides an API developer portal for detailed documentation and access to API Swagger files.

You can access the API developer portal using the following URLs:

Environment	Base URL
Pre-Production	https://dev.preprod.aemo.com.au
Production	https://dev.aemo.com.au

Security

SSL Certificate

All communication between the e-HUB and a participant's gateway is carried out using HTTPS. HTTP is not supported by the e-HUB.

- MTLS/SSL encryption is managed using public/private key pairs, with a different key pair required to connect to each environment (pre-production/production).
- Each participant (VPPs) must create / obtain a private key and a Certificate Signing Request (CSR) during VPP Demonstrations enrolment process. A private key and CSR are usually created at the same time, making a key pair. A CSR is usually generated on the server where the certificate will be installed and contains information that will be included in the certificate such as the organisation name, common name (CN),

locality and country. It also contains the public key that will be included in the certificate.

Authentication and Authorisation

AEMO issues mTLS certificates to VPPs on request. VPPs can request for new mTLS certificates through VPP Demonstration application form during Enrolment. For more information see "Section 2.3 Pre-requisites" in VPP Demonstration Participant On-boarding guide.

When calling the VPP APIs, Participants must authenticate their identity using Basic Authentication (by passing username & password). The Participant Administrator (PA) will provide the username and password to the API development team. The HTTP Basic authentication header takes the following format:

```
Authorization: Basic {Base64 hash of user:password},
For example: Authorization: Basic QWxhZGRpbjpvcGVuIHNlc2FtZQ==
```

User Account Password

By default, User Account passwords expire every 90 days. VPPs are responsible for resetting their user account password before the expiry and Participant Administrator (PAs) can reset the password.

PAs can reset a user password if a user forgets the password or if the account is locked. As user account passwords expire every 90 days, it's advisable to define a password reset reminder on participant's end.

Please note: No automated notification is provided from AEMO to VPPs on password expiry.

For more information about user rights creating new Participant Users and assigning rights, see Guide to User Rights Management (URM).

MMS Rights

Participant Administrator must assign the rights to the correct user (credentials) in order to be able to call VPP APIs. This is required for both pre-production and production environments.

See below the MMS Rights for each data feed:

- Registration (Enrolment) APIs use and assign "MMS_VPP_REGISTRATION"
- FCAS Response Data APIs use and assign "MMS_VPP_FCAS"
- VPP Operational Data use and assign "MMS_VPP_OPS"
- Telemetry Data use and assign "MMS_VPP_TELEMETRY"

Chapter 4. VPP Demonstration APIs

Overview

The VPP must enrol NMIs and the devices under its control through the enrolment APIs. The enrolment information must include Participant ID and a NMI for each device. The following resources are implemented by AEMO for the VPP Demonstration APIs.

API summary

VPP API common header attributes

Attribute	Description
Accept	application/json
Production URL (internet)	https://partner.api.aemo.com.au /{proxy-path}
Pre-production URL (internet)	https://partner.api.preprod.aemo.com.au/{proxy-path}
Content-Type	application/json
Content-Length	nnn
Accept_Encoding	gzip
X-initiatingParticipantID	X-initiatingParticipantID:123456
X-market	NEMWholesale
Authorization	Authorization: Basic YXNhc2FzOmFzYXNhc2Fz (for URM username "VPP01" and password "nsicu@$@#8asdsad")

VPP API resources

Interface ID	Transaction	Resource name	Method	Description
1	Submit NMIs & Devices	submitNMIDevices	POST	Submit NMIs and attached devices under VPP ownership and control associated to the DUID, that are part for the VPP fleet.
2	Get NMI & Devices	getNMIDevices	GET	To retrieve a list of valid NMIs and devices along with all associated data for a specific DUID under a VPP.
3	Remove NMI & device (s) from VPP fleet	removeNMIDevices	POST	Submit a list of NMIs that needs to be disassociated from DUID and removed from the VPP fleet. Removing NMIs will also remove all the devices attached to the NMI from the DUID and the VPP.
4	Remove device(s) from VPP fleet	removeDevices	POST	Submit a list of devices that needs to be disassociated from an NMI. This will only remove the device(s) from the DUID and the VPP fleet.
5	Submit Frequency Injection Test Data (FITD)	submitFreqInjTestData	POST	Submit the FITD for ancillary services load configuration assessment for the DUID and devices (distinct batteries in VPP).
6	Submit DUID Response Data	submitDUIDResponse	POST	Submit DUID response data on request for a frequency event (post contingency event).
7	Submit Device Response Data	submitDeviceResponse	POST	Submit Device response data for a DUID on request for a frequency event (post contingency event).

8	Submit Standing Data	submitStandingData	POST	Submit VPP Standing Data. VPPs are required to submit Standing data only when there is a change in VPP portfolio. This data is not required to be submitted every 5 mins, only when there is a change in portfolio.
9	Submit Actual Performance Data	submitActualPerfData	POST	Submit Actual delivered aggregated generation or load under control in each VPP portfolio every 5 minutes
10	Submit Operational Forecast Data	submitOpsForecast	POST	Submit Forecast of aggregated generation or load under control in each VPP portfolio (exclusive of any generation or load being held available for FCAS enablement) at 5-minute resolution every 5 minutes
11	Submit Availability Forecast (5mins) Data	submitAvailForecast5Min	POST	Submit Available capacity of generation or load in each VPP portfolio at 5-minute resolution every 5 minutes
12	Submit Availability Forecast (30mins) Data	submitAvailForecast30Min	POST	Submit Available capacity of generation or load in each VPP portfolio at 30-minute resolution every 30 minutes
13	Submit Telemetry Data	submitTelemetryData	POST	Submit device level telemetry data at 5-min resolution for all devices under control in the VPP fleet.

Submission Frequency

VPPs (or aggregators or 3rd party data providers) submit data at these intervals.

Data Feed	Data Type (resource name)	Interval
Enrolment Data	**NMI & Device Data** *(submitNMIDevices)*	Any time the source record is created, updated or deleted
	Frequency Injection Test Data – Device *(submitFreqInjTestData)*	On-request from AEMO, for Load Configuration Assessment during enrolment

	Frequency Injection Test Data – DUID *(submitFreqInjTestData)*	On-request from AEMO, for Load Configuration Assessment during Registration
FCAS Response Data	**FCAS – Response Data for DUID** *(submitDUIDResponse)*	On-request from AEMO, for FCAS Verification
	FCAS – Response Data for Device *(submitDeviceResponse)*	On-request from AEMO, for FCAS Verification
VPP Operational Data	**VPP Standing Data** *(submitStandingData)*	Any time the source record is created, updated or deleted
	VPP Actual Performance Data *(submitActualPerfData)*	Every 5 mins The values measured must be at Dispatch Interval (DI) time ending i.e. measured at 5 min boundary, E.g. 10.00, 10.05, 10.10 etc
	VPP Operational Forecasts (5 min granularity) *(submitOpsForecast)*	Every 5 mins, at 5-minute resolution covering pre-dispatch time frame (48 hrs ~ 576 total intervals per forecast) – with rolling window. The values forecasted (calculated) must be at Dispatch Interval (DI) time ending i.e. forecasted at 5 min boundary, E.g. 10.00, 10.05, 10.10 etc.
	VPP Availability Forecast (5 min granularity) *(submitAvailForecast5min)*	Every 5 mins, at 5-minute resolution covering pre-dispatch time frame (48 hrs ~ 576 total intervals per forecast) – with rolling window The values forecasted (calculated) must be at Dispatch Interval (DI) time ending i.e. forecasted at 5 min boundary, E.g. 10.00, 10.05, 10.10 etc.
	VPP Availability Forecast (30-minute granularity) *(submitAvailForecast30Min)*	Every 30 mins, at 30-minute resolution covering ST PASA time frame (8 days, ~ 384 total intervals per forecast) – with rolling window The values forecasted (calculated) must be at Trading Interval (TI) time ending i.e. forecasted at 30 min boundary, E.g. 10.00, 10.30, 11.00 etc

Telemetry data	**Telemetry Data** *(submitTelemetryData)*	Any time the source record is created, updated, at 5 min resolution The instantaneous values must be measured at Dispatch Interval (DI) time ending i.e. measured at 5 min boundary, E.g. 10.00, 10.05, 10.10 etc. The minimum, maximum and mean values must be measured over the Dispatch Interval (DI) i.e. 5 min duration. E.g. Maximum: Customer gross load should be maximum customer gross load within the 5 min interval (i.e. in-between start and end of dispatch interval)

Datetime Format and time zone

All data submitted must be in NEM time, also known as Market time. Market time is defined as AEST (+10:00).

For example, 2019-09-23T09:30:15+10:00.

The time component is in NEM time and the offset specifies number of hours by which the time is ahead of UTC

All the VPP Demonstration APIs have been developed to:

- validate that all timestamps in the data meet ISO 8061 format, and
- validate that all data is submitted in NEM time.

Service Notification

Operational data provided by VPP is continuously monitored for expected and regular data submissions. VPP (or aggregators or 3rd party data providers) submit data as defined in the VPP Operational data specification.

Payload

Description	Data condition
JSON Data Submission	One JSON payload per DUID per data set.
JSON Payload Size	2 MB
Time format	ISO 8601 time format with all "datetime" values in Market (NEM) time (i.e. AEST, +10:00).

Throttling Limit	AEMO implements throttling limits on number of API calls made by a Participant. Throttling is set at 1000 request per participant per minute. A 503 HTTP Response Code is returned if throttling limit is breached. We are in process of reviewing these limits as we progress through industry testing.

Order of Submission	• 1st Enrolment Data covering
	  • Site level information (NMI & Device)
	  • Frequency Injection test data (DUID and Device)
	Followed by Telemetry Data or VPP Operational Data,
	• Telemetry data:
	Note: Telemetry data is validated against enrolment data; thus can only be submitted after successfully submitting enrolment data
	• VPP Operational Data
	Note: VPP Standing data must be submitted before submitting any other VPP Operational datasets. Actual Performance data, Operational & Availability forecasts are validated against VPP Standing Data.
	Note: FCAS Response Data is submitted on request.

Baseline Performance Metrics

Data Feed Type	Resource Name	Payload Size (MB)	Max number of records/ payload	Bundling Allowed
Registration (Enrolment)	submitNMIDevices	2	~3,200	N
	removeNMIDevices	2	~3,200	N
	removeDevices	2	~3,200	N
	getNMIDevices	n.a.	n.a.	N
	submitFreqInjTestData	2	~8,300	N
	submitDuidResponse	2	~9,200	N

Data Feed Type	Resource Name	Payload Size (MB)	Max number of records/ payload	Bundling Allowed
FCAS Response Data	submitDeviceResponse	2	~9,200	N
VPP Operational Data	submitStandingData	< 1	1	N
	submitActualPerfData	< 1	1	N
	submitOpsForecast	< 1	576	N
	submitAvailForecast5Min	< 1	576	N
	submitStandingData	< 1	1	N
	submitActualPerfData	< 1	1	N
Telemetry Data	submitTelemetryData	2	~ 2000	N

Chapter 5. Enrolment APIs

The following section documents and describes the API definition of the Enrolment APIs and each end point. The section below also provides specifics of the API Method, base URLs for pre-production and production environment, request payload and example, response payload and example, response codes and query parameters where applicable. The section also describes data validation implemented in the API.

POST – submitNMIDevices

Item	Value
Resource	/submitNMIDevices
Method	POST
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/vpp/registration/v1
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/vpp/registration/v1
Request parameter	None

Request payload (Body)

```
{
data* deviceSchema
{
    vppId* string
    duid* string
    nmis*
    [{
        nmi* string
        devices*
        [device
        {
             deviceSerialId* string
             deviceModelVersion* string
             deviceControlBoxModelVersion* string
             deviceManufacturer* string
             deviceType* string
             acEquipmentType* string
             inverterManufacturer string
             inverterModelVersion string
             inverterSerialNumber string
             maxR6* number
             maxR60* number
             maxR5* number
             maxL6* number
             maxL60* number
             maxL5* number
             deviceSize* number
             uom* string
       }]
    }]
  }
}
```

Request example


```
{
  "data": {
    "vppId": " VSVAT13",
    "duid": " ASNACTEW1",
    "nmis": [
      {
        "nmi": 9901002033,
        "devices": [
          {
            "deviceSerialId": "TG9989893XX",
            "deviceModelVersion": "RESU10H",
            "deviceControlBoxModelVersion": "Reposit v2.1",
            "deviceManufacturer": "LG Chem",
            "deviceType": "Storage",
            "acEquipmentType": "Inverter",
            "inverterManufacturer": "Solar Edge",
            "inverterModelVersion": "SE5000",
            "inverterSerialNumber": "SE416735",
            "maxR6": 4,
            "maxR60": 9,
            "maxR5": 9,
            "maxL6": 9,
            "maxL60": 9,
            "maxL5": 9,
            "deviceSize": 12.6,
            "uom": "kW"
          }]
      }]
  }
}
```


Successful response

200 – Submit Data for VPP Profile – Success

Error responses

422 - Business validation failure

429 - This response is provided when the throttling limits are reached

500 - Internal Server Error

Example


```
{"transactionID": "b85a35f8-f741-40ac-a701-a8cfebb25669",
"data": {},
"errors": [
{
"code":"429",
"title": "Too Many Requests",
 "detail": "Number of inbound requests exceeded the throttling
limits; try aftersometime",
 "source": null
}
]
}
```

submitNMIDevice – Attributes

Attribute	Data Type	Description	Comments/Validations
vppId*	String	Contains VPP ID	
duid*	String	Contains DUID	
nmi*	String	Contains NMI (without checksum)	10-digit alpha-numeric
deviceSerialId*	String	The Device Serial ID as provided by the VPP. This is the serial number of the Device. For a battery this will be the Serial Number of the actual battery unit.	Alpha-numeric Non-Case sensitive Could contain "-" (dash).
deviceType*	String	Contains the primary technology used in the DER device. Some examples of Device type are Solar PV, Storage. P.S. For Battery, device type will be Storage	
deviceManufacturer*	String	Contains the name of the device manufacturer	
deviceModelVersion*	String	Contains the Model and version (where available) number of the device.	
deviceControlBoxModeVersion*	String	Contains the Model and version (where available) of the device control box	

acEquipmentType*	String	Contains AC Equipment Type in use. This refers to AC grid connection source of a DER installation. This will indicate whether the DER device is connected via an inverter or Other equipment type. Allowed values are "Inverter, Other"	
inverterManufacturer	String	Contains the Inverter manufacturer.	**Mandatory**, if AC Equipment type is Inverter
inverterModelVersion	String	Contains the Model and version (where available) of the Inverter.	**Mandatory**, if AC Equipment type is Inverter
inverterSerialNumber	String	Contains the Serial number of the Inverter.	**Mandatory**, if AC Equipment type is Inverter
maxR6*	Number	Contains maximum fast raise capability in kw i.e. max R6 in kW	
maxR60*	Number	Contains maximum slow raise capability in kw i.e. max R60 in kW	
maxR5*	Number	Contains maximum delayed raise capability in kw i.e. max R5 in kW	
maxL6*	Number	Contains maximum fast lower capability in kw i.e. max L6 in kW	
maxL60*	Number	Contains maximum slow lower capability in kw i.e. max L60 in kW	

maxL5*	Number	Contains maximum delayed lower capability in kw i.e. max L5 in kW	
deviceSize*	Number	Contains maximum output in kWh that is listed in the product specification by the manufacturer. For a better, this refers to the capacity of individual battery unit.	Must be greater than 0
uom*	String	Contains Unit of Measure for Raise and/or Lower FCAS to be provided by DUID	

submitNMIDevice – NMI & Device Uniqueness Business Rules and Composite Key

NMI & Device Uniqueness is enforced based on the business rules described below. This is achieved by using device composite key.

A **NMI and Device pair** can only be associated with DUIDs (Generation DUID and/or Load DUID) having the same technology type under the same VPP ID. If the deviceType = Storage (i.e. Battery), then the device can be attached to one Generation and Load DUID.

Rule no	Description
1	A NMI and Device pair can only be associated to 1 VPP.
2	A NMI & Device pair can only be associated once within a DUID. Meaning, a NMI & Device must not be associated more than once within a DUID.
3	A NMI & Device pair can be associated to 1 or more than 1 DUID provided both the DUID are of same technology type: a. A NMI & Device attached to an DUID (Switch, Generation) can only be attached to another DUID (Switch, Load) within the same VPP b. A NMI & Device attached to an DUID (Variable, Generation) can only be attached to another DUID (Variable, Load) within the same VPP A NMI & Device pair attached to a Switching DUID cannot be associated to Variable DUID (or vice versa) within the same VPP.
4	A Device can only be attached to 1 NMI.

Device Composite Key

Device Attributes	Device ID (composite key)
1. "deviceSerialId": "DeviceTest1-1A 2. deviceModelVersion": "SolarEdge RESU10H" 3. "deviceControlBoxModelVersion": "SE5000 Reposit", 4. "deviceManufacturer": "LG Chem", 5. "deviceType": 1, 6. ""acEquipmentType": "ACEQUIPTYPE",	DeviceTest1-1A_SolarEdge RESU10H_SE5000 Reposit_LG Chem_1_ACEQUIPTYPE

submitNMIDevice – NMI Validation Rules

Rule	Description	Applies to MC	Applies to MASP
NMI Validity	Must be a valid NMI	Y	Y
NMI Status	• Must be an active NMI. NMIStatusCode = "A". • This determines an Active NMI	Y	Y
NMI Region	NMI region must be the same as the NMI region in MSATS	Y	Y
NMI Ownership	Each NMI must pass the NMI Ownership check. This is same as FRMP (Financially Responsible Market Participant.) validation: • Identify the FRMP of the NMI in MSATS • Check whether or not the FRMP of the NMI is the same as the PID of the VPP. a. If the FRMP and PID are same Market Customer, then check pass b. If the FRMP and PID are not same Market Customer, then check fail • NMI ownership check must be done "as-of" date (date on which the data is received or date when NMI Ownership check is performed).	Y	N
NM Classification	• NMI must be a "LOAD" NMI. • For a NMI to be classified as a Load, ▪ NMI Classification = "SMALL" or "LARGE" or "WHOLESALE" (no NSP2 assigned [Participant Role]) ▪ NMI AGGFLAG = Y	Y	Y
NMI Uniqueness	Uniqueness of each NMI associated to the VPP must be checked • A NMI can be associated with only one Market Customer PID (but can be associated with a Market Customer and a MASP) • A NMI can be associated with multiple MASP PIDs	Y	N

GET – getNMIDevices

Item	Value
Resource	/getNMIDevices
Method	GET
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/vpp/registration/v1
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/vpp/registration/v1
Query parameter	"vppId": "string ", "duid": " string",
Request parameter	None
Request payload	None
Response	200 - Success 429 - This response is provided when the throttling limits are reached 500 - Internal Server Error

Response Payload

```
{
  transactionId: string,
  data [
    {
      vppId string,
      duid string,
      nmi string,
      dnsp string,
      nemRegion string,
      deleteindicator boolean, --NMI delete indicator
      postalCode string,
      statusIndicator string, -- NMI status (NMI validation
pass = Accept and fail = REJECT)
      devices [
        {
         deviceSerialId string,
         deviceModelVersion string,
         deviceControlBoxModelVersion string,
         deviceManufacturer string,
         deviceType string,
         acEquipmentType string,
         inverterManufacturer string,
         inverterModelVersion string,
         inverterSerialNumber string,
         maxR6 number,
         maxR60 number,
         maxR5 number,
         maxL6 number,
         maxL60 number,
         maxL5 number,
         deviceSize number,
         uom string,
         deleteIndicator boolean, --Device delete indicator
         maxL6ApprovalDate string,
         maxL60ApprovalDate string,
         maxL5ApprovalDate string,
         maxR6ApprovalDate string,
         maxR60ApprovalDate string,
         maxR5ApprovalDate string,
        }],
      createdDate string,
      creatorId string,
      updatedDate string,
      updatedId string,
      version number
    }]
}
```

Response example


```
{
  "transactionId": "string",
  "data": [
    {
      "vppId": "VSVAT13",
      "duid": "ASNACTEW1",
      "nmi": 7001001086,
      "dnsp": "ACTEWNGY",
      "nemRegion": "ACT",
      "deleteindicator": false,
      "postalCode": 2601,
      "statusIndicator": "ACCEPT",
      "devices": [
        {
          "deviceSerialId": "DeviceTest1-1A",
          "deviceModelVersion": "SolarEdge RESU10H",
          "deviceControlBoxModelVersion": "SE5000 Reposit",
          "deviceManufacturer": "LG Chem",
          "deviceType": 1,
          "acEquipmentType": "ACEQUIPTYPE",
          "inverterManufacturer": "string",
          "inverterModelVersion": "string",
          "inverterSerialNumber": "string",
          "maxR6": 4,
          "maxR60": 9,
          "maxR5": 9,
          "maxL6": 9,
          "maxL60": 9,
          "maxL5": 9,
          "deviceSize": 1.16,
          "uom": "kW"
          "deleteIndicator": false
          "maxL6ApprovalDate": 2020-01-31T00:00:00+10:00
          "maxL60ApprovalDate": 2020-01-31T00:00:00+10:00
          "maxL5ApprovalDate": 2020-01-31T00:00:00+10:00
          "maxR6ApprovalDate": 2020-01-31T00:00:00+10:00
          "maxR60ApprovalDate": 2020-01-31T00:00:00+10:00
          "maxR5ApprovalDate": 2020-01-31T00:00:00+10:00
        }
      ],
      "createdDate": "2019-05-02 11:14:30:05",
      "creatorId": "string",
      "updatedDate": "2019-05-02 11:14:30:05",
      "updatedId": "string"
      "version": "number"

    }
  ]
}
```

getNMIDevices – Attributes

Attribute	Data Type	Description	Comments/Validations
vppId	String	Contains VPP ID	
duid	String	Contains DUID	
nmi	String	Contains NMI without checksum	
dnsp	String	Contains the DNSP of the NMI	
nemRegion	String	Contains the NEM Region of the NMI	
postalCode	String	Contains the Post Code of the NMI	
statusIndicator	String	Contains the NMI status	If, NMI validation pass = Accept, else NMI Validation fail = REJECT
deviceSerialId	String	The Device Serial ID as provided by the VPP. This is the serial number of the Device. For a battery this will be the Serial Number of the actual battery unit.	Alpha-numeric Non-Case sensitive Could contain "-" (dash).
deviceType	String	Contains the primary technology used in the DER device. Some examples of Device type are Solar PV, Storage. P.S. For Battery, device type will be Storage	
deviceManufacturer	String	Contains the name of the device manufacturer	
deviceModelVersion	String	Contains the Model and version (where available) number of the device.	
deviceControlBoxModeVersion	String	Contains the Model and version (where available) of the device control box	

acEquipmentType	String	Contains AC Equipment Type in use. This refers to AC grid connection source of a DER installation. This will indicate whether the DER device is connected via an inverter or Other equipment type. Allowed values are "Inverter, Other"	
inverterManufacturer	String	Contains the Inverter manufacturer.	**Provided**, if AC Equipment type is Inverter
inverterModelVersion	String	Contains the Model and version (where available) of the Inverter.	**Provided**, if AC Equipment type is Inverter
inverterSerialNumber	String	Contains the Serial number of the Inverter.	**Provided**, if AC Equipment type is Inverter
maxR6	Number	Contains maximum fast raise capability in kw i.e. max R6 in kW	
maxR60	Number	Contains maximum slow raise capability in kw i.e. max R60 in kW	
maxR5	Number	Contain maximum delayed raise capability in kw i.e. max R5 in kW	
maxL6	Number	Contains maximum fast lower capability in kw i.e. max L6 in kW	
maxL60	Number	Contains maximum slow lower capability in kw i.e. max L60 in kW	
maxL5	Number	Contains maximum delayed lower capability in kw i.e. max L5 in kW	

deviceSize	Number	Contains maximum output in kWh that is listed in the product specification by the manufacturer. For a better, this refers to the capacity of individual battery unit.	
uom	String	Contain Unit of Measure for Raise and/or Lower FCAS to be provided by DUID	
maxL6ApprovalDate	String	Data NMI approved for enrolment in VPP Demonstration for Lower 6 Sec service	
maxL60ApprovalDate	String	Data NMI approved for enrolment in VPP Demonstration for Lower 60 Sec service	
maxL5ApprovalDate	String	Data NMI approved for enrolment in VPP Demonstration for Lower 5 min service	
maxR6ApprovalDate	String	Data NMI approved for enrolment in VPP Demonstration for Raise 6 Sec service	
maxR60ApprovalDate	String	Data NMI approved for enrolment in VPP Demonstration for Raise 60 Sec service	
maxR6ApprovalDate	String	Data NMI approved for enrolment in VPP Demonstration for Raise 5 min service	
createdDate	String	Date record created	
creatorId	String	VPP User ID (user credentials used to Authn/Authz)	
updatedDate	String	Date record last udpated	

updatedId	String	User ID of VPP (user credentials used to Authn/Authz)	
Version	Number		

POST – removeNMIDevices

Item	Value
Resource	/removeNMIDevices
Method	POST
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/vpp/registration/v1
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/vpp/registration/v1
Request Parameter	None

Request payload (Body)	<pre>{
	data* nmiSchema {
	vppId* string
	duid* string
	nmis* [{
	nmi string
	}]
	}
	}</pre>

Request example	<pre>{
	"data": {
	"vppId": "VSNAT1"
	"duid": "VSNAT1V1"
	"nmis": [
	"nmi": 9901002033"
	}]
	}
	}</pre>

Response	200 - Submit Data for VPP Profile - Success 422 - Business validation failure 429 - This response is provided when the throttling limits are reached 500 - Internal Server Error

Example


```
{"transactionID": "b85a35f8-f741-40ac-a701-a8cfebb25669",
"data": {},
"errors": [
{
"code":"429",
"title": "Too Many Requests",
 "detail": "Number of inbound requests exceeded the
throttling limits; try after sometime",
 "source": null
}
]
}
```


removeNMIDevices – Attributes

Attribute	Data Type	Description	Comments/Validations
vppId*	String	Contains VPP ID	
duid*	String	Contains DUID	
nmi	String	Contains NMI without checksum	

POST – removeDevices

Item	Value
Resource	/removeNMIDevices
Method	POST
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/vpp/registration/v1
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/vpp/registration/v1
Request Parameter	None
Request payload (Body)	

```
{
  data: [ deviceRemoveSchema {
            vppId* string
            duid* string
            nmi* string
                devices [{
                      deviceSerialId* string
                      deviceModelVersion* string
                      deviceControlBoxModelVersion* string
                      deviceManufacturer* string
                      deviceType* string
                      acEquipmentType* string
                      maxR6* number,
                      maxR60* number,
                      maxR5* number,
                      maxL6* number,
                      maxL60* number,
                      maxL5* number,
                      deviceSize* number,
                      uom* string
                       }]
          }]
}
```

Request example


```
{
  "data": [
    {
      "vppId": "VSNATE6Powercor",
      "duid": "VSNATE6V1duid6",
      "nmi": 6001002033,
      "devices": [
        {
          "deviceSerialId": "DeviceTest1-1A",
          "deviceModelVersion": "SolarEdge RESU10H",
          "deviceControlBoxModelVersion": "SE5000 Reposit",
          "deviceManufacturer": "LG Chem",
          "deviceType": 1,
          "acEquipmentType": "ACEQUIPTYPE",
          "maxR6": 4,
          "maxR60": 9,
          "maxR5": 9,
          "maxL6": 9,
          "maxL60": 9,
          "maxL5": 9,
          "deviceSize": 1.16,
          "uom": "kW"
        }
      ]
    }
  ]
}
```


Response

200 - Submit Data for VPP Profile - Success

422 - Business validation failure

429 - This response is provided when the throttling limits are reached

500 - Internal Server Error

Example


```
{"transactionID": "b85a35f8-f741-40ac-a701-a8cfebb25669",
"data": {},
"errors": [
{
"code":"429",
"title": "Too Many Requests",
 "detail": "Number of inbound requests exceeded the
throttling limits; try aftersometime",
 "source": null
}
]
}
```

removeDevices – Attributes

Attribute	Data Type	Description	Comments/Validations
vppId*	String	Contains VPP ID	
duid*	String	Contains DUID	
nmi*	String	Contains NMI without checksum	
deviceSerialId*	String	The Device Serial ID as provided by the VPP. This is the serial number of the Device. For a battery this will be the Serial Number of the actual battery unit.	Alpha-numeric Non-Case sensitive Could contain "-" (dash).
deviceType*	String	Contains the primary technology used in the DER device. Some examples of Device type are Solar PV, Storage. P.S. For Battery device type will be Storage	
deviceManufacturer*	String	Contains the name of the device manufacturer	
deviceModelVersion*	String	Contains the Model and version (where available) number of the device.	
deviceControlBoxModeVersion*	String	Contains the Model and version (where available) of the device control box	

acEquipmentType*	String	Contains AC Equipment Type in use. This refers to AC grid connection source of a DER installation. This will indicate whether the DER device is connected via an inverter or Other equipment type. Allowed values are "Inverter, Other"	
maxR6	Number	Contains maximum fast raise capability in kw i.e. max R6 in kW	
maxR60	Number	Contains maximum slow raise capability in kw i.e. max R60 in kW	
maxR5	Number	Contain maximum delayed raise capability in kw i.e. max R5 in kW	
maxL6	Number	Contains maximum fast lower capability in kw i.e. max L6 in kW	
maxL60	Number	Contains maximum slow lower capability in kw i.e. max L60 in kW	
maxL5	Number	Contains maximum delayed lower capability in kw i.e. max L5 in kW	

deviceSize	Number	Contains maximum output in kWh that is listed in the product specification by the manufacturer. For a better, this refers to the capacity of individual battery unit.	
uom	String	Contain Unit of Measure for Raise and/or Lower FCAS to be provided by DUID	

POST – submitFreqInjTestData

Item	Value
Resource	/submitFreqInjTestData
Method	POST
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/vpp/registration/v1
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/vpp/registration/v1
Request Parameter	None
Request payload (Body)	

```
{
data* FITDSchema {
          vppId* string
          duid* string
          fcasMarketType* string
          samplingRate* string
          freqTestDateTime* string
          uom* string
          freqTestData* [ freqTestData {
                              samplineInterval* number
                              frequency* number
                              power* numnber
                              gridPower* number
                              measurementDatetime* string
                              deviceName string
                         }]
          }
}
```

Request example	<pre>{
	  "data": {
	  "vppId": "VSVAT13",
	  "duid": "ASNACTEW1",
	  "fcasMarketType": "R6",
	  "samplingRate": "20ms",
	  "freqTestDateTime": "2019-05-14T23:04:54+10:00",
	  "uom": "kW",
	  "freqTestData": [
	  {
	  "samplineInterval": -4.6,
	  "frequency": 50.00032169,
	  "power": -12.24,
	  "gridPower": 12.24,
	  "measurementDatetime": "2019-05-02 11:14:30:05",
	  "deviceName": "LG"
	  }
	  ]
	  }
	}</pre>

Response	200 - Submit Data for VPP Profile - Success 422 - Business validation failure 429 - This response is provided when the throttling limits are reached 500 - Internal Server Error

Example	<pre>{"transactionID": "b85a35f8-f741-40ac-a701-a8cfebb25669",
	"data": {},
	"errors": [
	{
	"code":"429",
	"title": "Too Many Requests",
	"detail": "Number of inbound requests exceeded the throttling limits; try after sometime",
	"source": null
	}
	]
	}</pre>

submitFreqInjTestData – Attributes

Attribute	Data Type	Description	Comments/Validations
vppId*	String	Contains VPP ID	
duid*	String	This field will contain DUID	
deviceName	String	This field will contain device Name	Optional, to be provided only when providing FITD for Device.

fcasMarketType*	String	Contains the FCAS Market Service Type for which the Frequency Injection test data is being provided	
measurementDateTime*	String	Datetime of the measurement (i.e. Power, Grid Power and Frequency).	Data submitted must be in NEM time (in AEST) and in ISO 8601 format.
samplingInterval*	Number	No. of seconds (or milliseconds) before or after the t=0, where t=0 is the time of disturbance	
frequency*	Number	The localised frequency monitored at the local plant/unit level in Hz.	
power*	Number	Contains the Power output observed at the Inverter terminal. This is defined as measurement of the market ancillary service generating unit or market ancillary service load. Min precision 6 decimal places	When submitting data for DUID, power reported in MW. When submitting data for a device power is reported in kW
gridPower*	Number	Contains the Power in kW observed at the Connection point. Min precision 6 decimal place	When submitting data for DUID, gridPower reported in MW. When submitting data for device, gridPower reported in kW
uom*	String	Contains the unit of measure of Power and Grid Power. Power and Grid Power must be provided in same Unit of Measure.	When submitting data for DUID, uom is MW. When submitting data for a device , uom is kW

samplingRate*	String	Specifies the time interval between two consecutive data points (or observations) in seconds or milliseconds.	for e.g. 20ms, 50ms, 1s, 4s

Chapter 6. FCAS APIs

The following section documents and describes the API definition of the FCAS Response Data APIs and each end point. The section below also provides specifics of the API Method, base URLs for pre-production and production environment, request payload and example, response payload and example, response codes and query parameters where applicable. The section also describes data validation implemented in the API.

POST – submitDuidResponse

Item	Value
Resource	/submitDuidResponse
Method	POST
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/fcas/assessment /v1
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/fcas/assessment /v1
Request Parameter	None
Request payload (Body)	{ data* eventDuidResponseSchema { eventDatetime* string vppId* string duid* string measurementUnit* string measurements* [{ measurementMethod string measurementDateTime string frequency number output number samplingRate number }] } }

Request example	{
	"data": {
	"eventDatetime": "2019-05-14T23:04:54+10:00",
	"vppId": "VSVPP1",
	"duid": "VSNAT1V1",
	"measurementUnit": "MW",
	"measurements": [
	{
	"measurementMethod": "Actual",
	"measurementDateTime": "2019-05-14T23:00:05.20+10:00",
	"frequency": 50.014,
	"output": 159.385,
	"samplingRate": "0.20"
	}
	]
	}
	}

Response	200 - Submit Data for VPP Profile - Success 422 - Business validation failure 429 - This response is provided when the throttling limits are reached 500 - Internal Server Error

Example	{"transactionID": "b85a35f8-f741-40ac-a701-a8cfebb25669",
	"data": {},
	"errors": [
	{
	"code":"429",
	"title": "Too Many Requests",
	"detail": "Number of inbound requests exceeded the throttling limits; try after sometime",
	"source": null
	}
	]
	}

submitDuidResponse – Attributes

Attribute	Data Type	Description	Comments/Validations
eventDatetime*	String	This field will contain the date time of the frequency disturbance for which data needs to be provided.	Provided by AEMO in data request email
vppId*	String	Contains VPP ID	

duid*	String	This field will contain DUID	
measurementUnit*	String	This field will contain the unit of measurement	In MW
measurementMethod*	String	This field will contain the method used to measure the values	Actual or Calculated
measurementDateTime*	String	Datetime of the measurement (i.e. Power, Grid Power and Frequency).	Data submitted must be in NEM time (in AEST) and in ISO 8601 format.
frequency*	Number	The localised frequency monitored at the local plant/unit level in Hz.	
output*	Number	This field will contain the Power output observed at the Inverter terminal. This is defined as measurement of the market ancillary service generating unit or market ancillary service load. Min precision 6 decimal places	Reported in MW.
samplingRate*	Number	Specify the time interval between two consecutive data points (or observations) in seconds.	The value must be numeric with maximum two decimal places. The value must be between 0 and 4. For e.g. 1 (i.e. 1 second interval), 0.05 (i.e. 50 millisecond interval)

POST – submitDeviceResponse

Item	Value
Resource	/submitDeviceResponse
Method	POST
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/fcas/assessment /v1
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/fcas/assessment /v1
Request Parameter	None

Request payload (Body)	<pre>{
	  data* eventDeviceResponseSchema{
	  eventDatetime* string
	  vppId* string
	  duid* string
	  measurementUnit* string
	  measurements* [{
	  deviceSerialId string
	  measurementDateTime string
	  frequency number
	  output number
	  samplingRate number
	  }]
	  }
	}</pre>

Request example	<pre>{
	  "data": {
	  "eventDatetime": "2019-05-14T23:04:54+10:00",
	  "vppId": "VSVPP1",
	  "duid": "VSNAT1V1",
	  "measurementUnit": "MW",
	  "measurements": [
	  {
	  "deviceSerialId": "DeviceTest1-1A",
	  "measurementDateTime": "2019-05-
	14T23:00:05.20+10:00",
	  "frequency": 50.014,
	  "output": 159.385,
	  "samplingRate": "0.20"
	  }
	  ]
	  }
	}</pre>

Response	200 - Submit Data for VPP Profile - Success 422 - Business validation failure 429 - This response is provided when the throttling limits are reached 500 - Internal Server Error

Example	{"transactionID": "b85a35f8-f741-40ac-a701-a8cfebb25669",
	"data": {},
	"errors": [
	{
	"code":"429",
	"title": "Too Many Requests",
	"detail": "Number of inbound requests exceeded the throttling limits; try after sometime",
	"source": null
	}
	]
	}

submitDeviceResponse – Attributes

Attribute	Data Type	Description	Comments/Validations
eventDatetime*	String	This field will contain the date time of the frequency disturbance for which data needs to be provided.	Provided by AEMO in data request email
vppId*	String	Contains VPP ID	
duid*	String	This field will contain DUID	
measurementUnit*	String	This field will contain the unit of measurement	In kW
deviceSerialId*	String	The Device Serial ID as provided by the VPP. This is the serial number of the Device. For a battery this will be the Serial Number of the actual battery unit.	Alpha-numeric Non-Case sensitive Could contain "-" (dash).

measurementDateTime*	String	Datetime of the measurement (i.e. Power, Grid Power and Frequency).	Data submitted must be in NEM time (in AEST) and in ISO 8601 format.
frequency*	Number	The localised frequency monitored at the local plant/unit level in Hz.	
output*	Number	This field will contain the Power output observed at the Inverter terminal. This is defined as measurement of the market ancillary service generating unit or market ancillary service load. Min precision 6 decimal places	Reported in kW.
samplingRate*	Number	Specify the time interval between two consecutive data points (or observations) in seconds.	The value must be numeric with maximum two decimal places. **The value must be between 0 and 4.** For e.g. 1 (i.e. 1 second interval), 0.05 (i.e. 50 millisecond interval)

Chapter 7. Ops Data APIs

The following section documents and describes the API definition of the VPP Operational data APIs and each end point. The section below also provides specifics of the API Method, base URLs for pre-production and production environment, request payload and example, response payload and example, response codes and query parameters where applicable. The section also describes data validation implemented in the API.

POST – submitStandingData

Item	Value
Resource	/submitStandingData
Method	POST
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/vpp/opsdata/v1
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/vpp/opsdata/v1
Request Parameter	None

Request payload (Body)	{
	data* StandingDataSchema{
	vppId* string
	duid* string
	measurementDateTime* string
	generationCapacity* number
	loadCapacity* number
	totalEnergyStorage* number
	}
	}

Request example	{
	"data": {
	"vppId": "VST002",
	"duid": "DUID201",
	"measurementDateTime": "2019-09-13T02:28:11+10:00",
	"generationCapacity": 10.34,
	"loadCapacity": 10.11,
	"totalEnergyStorage": 20.3
	}
	}

Response	200 - Submit Data for VPP Profile - Success 422 - Business validation failure 429 - This response is provided when the throttling limits are reached 500 - Internal Server Error

Example	{"transactionID": "b85a35f8-f741-40ac-a701-a8cfebb25669",
	"data": {},
	"errors": [
	{
	"code":"429",
	"title": "Too Many Requests",
	"detail": "Number of inbound requests exceeded the throttling limits; try after sometime",
	"source": null
	}
	]
	}

submitStandingData – Attributes

Attribute	Data Type	Description	Comments/Validations
vppId*	String	Contains VPP ID	
duid*	String	This field will contain DUID	
measurementDateTime*	String	Datetime of the measurement (i.e. Power, Grid Power and Frequency).	Data submitted must be in NEM time (in AEST) and in ISO 8601 format. Data must align to Dispatch Interval ending
generationCapacity*	Number	The actual level of total generation that could have been created within the VPP (MW) if the VPP discharged at the maximum rate.	Negative value, nulls or blank values not allowed
loadCapacity*	Number	The actual level of load that could have been created (MW) had the VPP operator elected to charge storage at maximum rate.	Negative value, nulls or blank values not allowed

totalEnergyStorage*	Number	Total Energy Storage in MWh: The Energy stored if all batteries are fully charged. Maximum energy storage capacity	Negative value, nulls or blank values not allowed

submitStandingData – Business Rule Validation

Seq	Business Rule Description	If Validation fails	Reason
1	Check for Null values or Blanks in the data	Reject payload	Null/Blank observed in the data submitted
2	Check for negative (<0) values	Reject payload	Negative values observed in the data submitted

POST – submitActualPerfData

Item	Value
Resource	/submitActualPerfData
Method	POST
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/vpp/opsdata/v1
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/vpp/opsdata/v1
Request Parameter	None
Request payload (Body)	

```
{
      data* ActualPerfData{
                vppId* string
                duid*  string
                measurementDateTime* string
                controlledGeneration* number
                controlledLoad* number
                energyStored* number
    }
}
```

Request example	<pre>{
	  "data": {
	  "vppId": "VST002",
	  "duid": "DUID201",
	  "measurementDateTime": "2019-09-13T02:28+10:00",
	  "controlledGeneration": 10,
	  "controlledLoad": 10.5,
	  "energyStored": 20.653
	  }
	}</pre>

Response	200 - Submit Data for VPP Profile - Success 422 - Business validation failure 429 - This response is provided when the throttling limits are reached 500 - Internal Server Error

Example	<pre>{"transactionID": "b85a35f8-f741-40ac-a701-a8cfebb25669",
	"data": {},
	"errors": [
	{
	"code":"429",
	"title": "Too Many Requests",
	"detail": "Number of inbound requests exceeded the throttling limits; try after sometime",
	"source": null
	}
	]
	}</pre>

submitActualPerfData – Attributes

Attribute	Data Type	Description	Comments/Validations
vppId*	String	Contains VPP ID	
duid*	String	This field will contain DUID	
measurementDateTime*	String	Datetime of the measurement (i.e. Power, Grid Power and Frequency).	Data submitted must be in NEM time (in AEST) and in ISO 8601 format. Data must align to Dispatch Interval ending.
controlledGeneration*	Number	The aggregate VPP generation (in MW) averaged over the interval. A positive value indicates generation (discharging).	Number of intervals check, negative value, nulls or blank values not allowed, Standing data check

controlledLoad*	Number	The aggregate VPP load (in MW) averaged over the interval. A negative value indicates load (charging).	Number of intervals check, negative value, nulls or blank values not allowed, Standing data check
energyStored*	Number	The Energy (MWh) stored in the VPP (Actual State of Charge in MWh)	Number of intervals check, negative value, nulls or blank values not allowed, Standing data check

submitActualPerfData – Business Rule Validation

Seq	Business Rule Description	If Validation fails	Reason
1	Check for Null values or Blanks in the data	Reject payload	Null/Blank observed in the data submitted
2	Check for negative (<0) values	Reject payload	Negative values observed in the data submitted
3	Check against Standing data.	Reject payload	Value greater than standing data

StandingData Check

Actual Performance Data Attribute	Standing Data Attribute - Less than or equal to	WHERE
controlledGeneration	generationCapacity	[measurementDateTime] >= [Standing Data] .[measurementDateTime]
controlledLoad	loadCapacity	[measurementDateTime] >= [Standing Data] .[measurementDateTime]
energyStored	totalEnergyStorage	[measurementDateTime] >= [Standing Data] .[measurementDateTime]

POST – submitOpsForecast

Item	Value
Resource	/submitOpsForecast
Method	POST
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/vpp/opsdata/v1
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/vpp/opsdata/v1
Request Parameter	None

Request payload (Body)	<pre>{
	  data* OpsForecast{
	  vppId* string
	  duid* string
	  fcstStartDateTime* string
	  fcstEndDateTime* string
	  samplingRate*
	  measurements* [{
	  measurementDateTime string
	  fcstControlledGeneration number
	  fcstControlledLoad number
	  fcstEnergyStorage number
	  }]
	  }
	}</pre>

Request example	<pre>{
	  "data": {
	  "vppId": "VST002",
	  "duid": "DUID201",
	  "fcstStartDateTime": "2019-09-13T02:28:11+10:00",
	  "fcstEndDateTime": "2019-09-13T02:28:11+10:00",
	  "samplingRate": "5Min",
	  "measurements": [
	  {
	  "measurementDateTime": "2019-09-13T02:28:11+10:00",
	  "fcstControlledGeneration": 0,
	  "fcstControlledLoad": 10,
	  "fcstEnergyStorage": 0.83
	  }
	  ]
	  }
	}</pre>

Response	200 - Submit Data for VPP Profile - Success 422 - Business validation failure 429 - This response is provided when the throttling limits are reached 500 - Internal Server Error

Example	{"transactionID": "b85a35f8-f741-40ac-a701-a8cfebb25669",
	"data": {},
	"errors": [
	{
	"code":"429",
	"title": "Too Many Requests",
	"detail": "Number of inbound requests exceeded the throttling limits; try after sometime",
	"source": null
	}
	]
	}

submitOpsForecast – Attributes

Attribute	Data Type	Description	Comments/Validations
vppId*	String	Contains VPP ID	
duid*	String	This field will contain DUID	
fcstStartDateTime	String	Forecast period Start datetime associated with the data submission	In NEM time, Dispatch Period ending
fcstEndDateTime	String	Forecast period End datetime associated with the data submission	In NEM time, Dispatch Period ending
samplingRate	String	This field will contain time interval between two consecutive data points (or observations) in mins	5min
measurementDateTime*	String	Datetime of the measurement (i.e. Power, Grid Power and Frequency).	Data submitted must be in NEM time (in AEST) and in ISO 8601 format. Data must align to Dispatch Interval ending.
fcstControlledGeneration*	Number	The forecast of aggregate VPP generation (in MW) averaged over the interval.	Number of intervals check, negative value, nulls or blank values not allowed, Standing data check

fcstControlledLoad*	Number	The forecast of aggregate VPP load (in MW) averaged over the interval.	Number of intervals check, negative value, nulls or blank values not allowed, Standing data check
fcstEnergyStorage*	Number	The forecast energy (MWh) stored in the VPP that could be discharged if required by VPP operator	Number of intervals check, negative value, nulls or blank values not allowed, Standing data check

submitOpsForecast – Business Rule Validation

Seq	Business Rule Description	If Validation fails	Reason
1	Check the number of intervals in the data is 576	Reject payload	Data not provided for full forecast horizon
2	Check for Null values or Blanks in the data	Reject payload	Null/Blank observed in the data submitted
3	Check for negative (<0) values	Reject payload	Negative values observed in the data submitted
4	Check against Standing data	Reject payload	Value greater than standing data

StandingData Check

Actual Performance Data Attribute	Standing Data Attribute - Less than or equal to	WHERE
fcstControlledGeneration	generationCapacity	[measurementDateTime] >= [Standing Data] .[measurementDateTime]
fcstControlledLoad	loadCapacity	[measurementDateTime] >= [Standing Data] .[measurementDateTime]
fcstEnergyStorage	totalEnergyStorage	[measurementDateTime] >= [Standing Data] .[measurementDateTime]

POST – submitAvailForecast5Min

Item	Value
Resource	/submitAvailForecast5Min
Method	POST
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/vpp/opsdata/v1
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/vpp/opsdata/v1
Request Parameter	None

Request payload (Body)	<pre>{
	  data* AvailForecast5Min {
	  vppId* string
	  duid* string
	  fcstStartDateTime* string
	  fcstEndDateTime* string
	  measurements* [{
	  measurementDateTime string
	  fcstGenerationCapacity number
	  fcstLoadCapacity number
	  fcstEnergyStorageCapacity number
	  }]
	  }
	}</pre>

Request example	<pre>{
	  "data": {
	  "vppId": "VST002",
	  "duid": "DUID201",
	  "fcstStartDateTime": "2019-09-13T02:28:11+10:00",
	  "fcstEndDateTime": "2019-09-13T02:28:11+10:00",
	  "measurements": [
	  {
	  "measurementDateTime": "2019-09-13T02:28:11+10:00",
	  "fcstGenerationCapacity": 10.34,
	  "fcstLoadCapacity": 1.514,
	  "fcstEnergyStorageCapacity": 0.12
	  }
	  ]
	  }
	}</pre>

Response	200 - Submit Data for VPP Profile - Success 422 - Business validation failure 429 - This response is provided when the throttling limits are reached 500 - Internal Server Error

Example	{"transactionID": "b85a35f8-f741-40ac-a701-a8cfebb25669", "data": {}, "errors": [{ "code":"429", "title": "Too Many Requests", "detail": "Number of inbound requests exceeded the throttling limits; try after sometime", "source": null }] }

submitAvailForecast5Min – Attributes

Attribute	Data Type	Description	Comments/Validations
vppId*	String	Contains VPP ID	
duid*	String	This field will contain DUID	
fcstStartDateTime	String	Forecast period Start date time associated with the data submission	In NEM time, Dispatch Period ending
fcstEndDateTime	String	Forecast period End date time associated with the data submission	In NEM time, Dispatch Period ending
measurementDateTime*	String	Datetime of the measurement (i.e. Power, Grid Power and Frequency).	Data submitted must be in NEM time (in AEST) and in ISO 8601 format. Data must align to Dispatch Interval ending.
fcstGenerationCapacity*	Number	The level of generation that could be created (MW) if the VPP discharged at the maximum rate	Number of intervals check, negative value, nulls or blank values not allowed, Standing data check
fcstLoadCapacity*	Number	The level of load that could be created (MW) if the VPP operator charges storage at the maximum rate	Number of intervals check, negative value, nulls or blank values not allowed, Standing data check

fcstEnergyStorageCapacity *	Number	Forecast Maximum energy storage capacity in MWh available	Number of intervals check, negative value, nulls or blank values not allowed, Standing data check

submitAvailForecast5Min– Business Rule Validation

Seq	Business Rule Description	If Validation fails	Reason
1	Check the number of intervals in the data is 576	Reject payload	Data not provided for full forecast horizon
2	Check for Null values or Blanks in the data	Reject payload	Null/Blank observed in the data submitted
3	Check for negative (<0) values	Reject payload	Negative values observed in the data submitted
4	Check against Standing data	Reject payload	Value greater than standing data

StandingData Check

Actual Performance Data Attribute	Standing Data Attribute - Less than or equal to	WHERE
fcstGenerationCapacity	generationCapacity	[measurementDateTime] >= [Standing Data] .[measurementDateTime]
fcstLoadCapacity	loadCapacity	[measurementDateTime] >= [Standing Data] .[measurementDateTime]
fcstEnergyStorageCapacity	totalEnergyStorage	[measurementDateTime] >= [Standing Data] .[measurementDateTime]

POST – submitAvailForecast30Min

Item	Value
Resource	/submitAvailForecast30Min
Method	POST
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/vpp/opsdata/v1
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/vpp/opsdata/v1
Request Parameter	None

Request payload (Body)	<pre>{
	  data* AvailForecast30Min {
	  vppId* string
	  duid* string
	  fcstStartDateTime* string
	  fcstEndDateTime* string
	  measurements* [{
	  measurementDateTime string,
	  fcstGenerationCapacity number,
	  fcstLoadCapacity number,
	  fcstEnergyStorageCapacity number
	  }]
	  }
	}</pre>

Request example	<pre>{
	  "data": {
	  "vppId": "VST002",
	  "duid": "DUID201",
	  "fcstStartDateTime": "2019-09-13T02:28:11+10:00",
	  "fcstEndDateTime": "2019-09-13T02:28:11+10:00",
	  "measurements": [
	  {
	  "measurementDateTime": "2019-09-13T02:28:11+10:00",
	  "fcstGenerationCapacity": 10,
	  "fcstLoadCapacity": 0.567,
	  "fcstEnergyStorageCapacity": 20
	  }
	  ]
	  }
	}</pre>

Response	200 - Submit Data for VPP Profile - Success 422 - Business validation failure 429 - This response is provided when the throttling limits are reached 500 - Internal Server Error

Example	{"transactionID": "b85a35f8-f741-40ac-a701-a8cfebb25669", "data": {}, "errors": [{ "code":"429", "title": "Too Many Requests", "detail": "Number of inbound requests exceeded the throttling limits; try after sometime", "source": null }] }

submitAvailForecast30Min – Attributes

Attribute	Data Type	Description	Comments/Validations
vppId*	String	Contains VPP ID	
duid*	String	This field will contain DUID	
fcstStartDateTime	String	Forecast period Start date time associated with the data submission	In NEM time, Dispatch Period ending
fcstEndDateTime	String	Forecast period End date time associated with the data submission	In NEM time, Dispatch Period ending
measurementDateTime*	String	Datetime of the measurement (i.e. Power, Grid Power and Frequency).	Data submitted must be in NEM time (in AEST) and in ISO 8601 format. Data must align to Dispatch Interval ending.
fcstGenerationCapacity*	Number	The level of generation that could be created (MW) if the VPP discharged at the maximum rate	Number of intervals check, negative value, nulls or blank values not allowed, Standing data check
fcstLoadCapacity*	Number	The level of load that could be created (MW) if the VPP operator charges storage at the maximum rate	Number of intervals check, negative value, nulls or blank values not allowed, Standing data check

fcstEnergyStorageCapacity *	Number	Forecast Maximum energy storage capacity in MWh available	Number of intervals check, negative value, nulls or blank values not allowed, Standing data check

submitAvailForecast30Min– Business Rule Validation

Seq	Business Rule Description	If Validation fails	Reason
1	Check the number of intervals in the data is 384	Reject payload	Data not provided for full forecast horizon
2	Check for Null values or Blanks in the data	Reject payload	Null/Blank observed in the data submitted
3	Check for negative (<0) values	Reject payload	Negative values observed in the data submitted
4	Check against Standing data	Reject payload	Value greater than standing data

Standing Data Check

Actual Performance Data Attribute	Standing Data Attribute - Less than or equal to	WHERE
fcstGenerationCapacity	generationCapacity	[measurementDateTime] >= [Standing Data] .[measurementDateTime]
fcstLoadCapacity	loadCapacity	[measurementDateTime] >= [Standing Data] .[measurementDateTime]
fcstEnergyStorageCapacity	totalEnergyStorage	[measurementDateTime] >= [Standing Data] .[measurementDateTime]

Chapter 8. Telemetry APIs

The following section documents and describes the API definition of the Telemetry Data APIs and each end point. The section below also provides specifies of the API Method, base URLs for pre-production and production environment, request payload and example, response payload and example, response codes and query parameters where applicable. The section also describes data validation implemented in the API.

POST – submitTelemetryData

Item	Value
Resource	/submitTelemetryData
Method	POST
Production URL	https://partner.api.aemo.com.au/NEMWholesale/DER/vpp/telemetrydata/v1/
Pre-Production URL	https://partner.api.preprod.aemo.com.au/NEMWholesale/DER/vpp/registration/v1
Request parameter	None

Data Points

		All (AC, DC and Non Battery)		
	No. of data points	**AC Configuration**	**DC Configuration**	**Non Battery Devices**
Timestamp – instantaneous (1 field)	1	Y	Y	Y
Customer gross load – kW & kVAr – max & min & mean (6 fields)	6	Y	Y	Y
Voltage – V – max & min & mean & instantaneous (4 fields)	4	Y	Y	Y
Frequency – Hz – max & min & mean & instantaneous (4 fields)	4	Y	Y	Y
Export power – kW & kVAr – max & min & mean (6 fields)	6	Y	Y	Y
PV inverter power output – kW & kVAr – max & min & mean (6 fields)	6	Y	N	N
Battery inverter power output – kW & kVAr – max & min & mean (6 fields)	6	Y	N	N
Battery state of charge – Wh – mean & instantaneous (2 fields)	2	Y	Y	N
Inverter power output – kW & kVAr – max & min & mean (6 fields)	6	N	Y	N
Battery DC power output – kW – max & min & mean (3 fields)	3	N	Y	N
Device net power output – kW & kVAr – max & min & mean (6 fields)	6	N	N	Y
	Total Data Points	**35**	**32**	**27**

Note:

- Attributes with Installation type 'ALL' are mandatory, all other attributes are optional
- Mandatory attributes can be submitted in payload with a NULL value

Request payload (Body)

```
{
  data*
      telemetryschema {
         vppId* string,
         duid* string,
         samplingRate* string,
         devices: [
        {
          deviceSerialId* string,
          nmi* string,
          measurementDateTime* string,
          batteryConfig* string,
          samplingRate* string,
          minPspecLoad* number,
          maxPspecLoad* number,
          meanPspecLoad* number,
          minQspecLoad* number,
          maxQspecLoad* number,
          meanQspecLoad* number,
          minV* number,
          maxV* number,
          meanV* number,
          instV* number,
          maxFrequency* number,
          minFrequency* number,
          meanFrequency* number,
          instFrequency* number,
          minExportP* number,
          maxExportP* number,
          meanExportP* number,
          minExportQ* number,
          maxExportQ* number,
          meanExportQ* number,
          meanBatterySoc number,
          instBatterySoc number,
          minSmartInverterP number,
          maxSmartInverterP number,
          meanSmartInverterP number,
          minSmartInverterQ number,
          maxSmartInverterQ number,
          meanSmartInverterQ number,
          minBatteryP number,
          maxBatteryP number,
          meanBatteryP number,
          minSolarInverterP number,
          maxSolarInverterP number,
          meanSolarInverterP number,
          minSolarInverterQ number,
          maxSolarInverterQ number,
          meanSolarInverterQ number,
          minBatteryInverterP number,
          maxBatteryInverterP number,
          meanBatteryInverterP number,
          minBatteryInverterQ number,
```

```
            maxBatteryInverterQ number,
            meanBatteryInverterQ number,
            minDeviceNetP number,
            meanDeviceNetP number,
            maxDeviceNetP number,
            minDeviceNetQ number,
            meanDeviceNetQ number,
            maxDeviceNetQ number
            ]
          }
        ]
      }
  ]
}
```

Request example


```
{
  "data": {
    "vppId": "VSNATE1",
    "duid": "TEST1 duid 1",
    "samplingRate": "5m",
    "devices": [
      {
        "deviceSerialId": "12345678",
        "nmi": "123456789A",
        "measurementDateTime": "2020-01-31T14:29:55.105+10:00",
        "batteryConfig": "AC",
        "minPspecLoad": 0,
        "maxPspecLoad": 0,
        "meanPspecLoad": 0,
        "minQspecLoad": 0,
        "maxQspecLoad": 0,
        "meanQspecLoad": 0,
        "minV": 0,
        "maxV": 0,
        "meanV": 0,
        "instV": 0,
        "maxFrequency": 0,
        "minFrequency": 0,
        "meanFrequency": 0,
        "instFrequency": 0,
        "minExportP": 0,
        "maxExportP": 0,
        "meanExportP": 0,
        "minExportQ": 0,
        "maxExportQ": 0,
        "meanExportQ": 0,
        "meanBatterySoc": 0,
        "instBatterySoc": 0,
        "minSmartInverterP": 0,
        "maxSmartInverterP": 0,
        "meanSmartInverterP": 0,
        "minSmartInverterQ": 0,
        "maxSmartInverterQ": 0,
        "meanSmartInverterQ": 0,
        "minBatteryP": 0,
        "maxBatteryP": 0,
        "meanBatteryP": 0,
        "minSolarInverterP": 0,
        "maxSolarInverterP": 0,
        "meanSolarInverterP": 0,
        "minSolarInverterQ": 0,
        "maxSolarInverterQ": 0,
        "meanSolarInverterQ": 0,
        "minBatteryInverterP": 0,
        "maxBatteryInverterP": 0,
        "meanBatteryInverterP": 0,
        "minBatteryInverterQ": 0,
        "maxBatteryInverterQ": 0,
        "meanBatteryInverterQ": 0,
```

```
            "minDeviceNetP": 0,
            "meanDeviceNetP": 0,
            "maxDeviceNetP": 0,
            "minDeviceNetQ": 0,
            "meanDeviceNetQ": 0,
            "maxDeviceNetQ": 0
          ]
        }
      ]
    }
}
```


Successful response	200 – Submit Data for VPP Profile – Success
Error responses	422 - Business validation failure 429 - This response is provided when the throttling limits are reached 500 - Internal Server Error

Example


```
{
  "transactionId": "string",
  "data": {},
  "errors": {
    "code": 0,
    "title": "string",
    "details": "string",
    "source": "string"
  }
}
```


submitTelemetryData – validation check

Seq	Business Rule Description	If Validation fails	Reason
1	NMI & Device pair check. The API service checks the NMI & Device pair in the payload exists in the VPP portfolio.	Reject payload	NMI & Device pair doesn't not exist in the VPP enrolment data. VPP must submit the NMI & Device data prior to submitting Telemetry data for site (NMI & device).
2	API Schema Validation	Reject Payload	All mandatory attributes must be provided. Certain mandatory attributes can be submitted with a "NULL" value (for details see table below).

submitTelemetryData – Attributes

Attribute	Data Type	Mandatory	Nullable?	Description	Installation Type	Comments/ Validations
vppId*	String	Y	N	Contains VPP ID	All	
duid*	String	Y	N	Contains DUID	All	
samplingRate	String	Y	N	Sampling interval in minutes (e.g. 5m)	All	
deviceSerialId	String	Y	N	The Device Serial ID as provided by the VPP. This is the serial number of the Device. For a battery this will be the Serial Number of the actual battery unit.	All	• Alpha-numeric • Non-Case sensitive • Could contain "-" (dash)
nmi	String	Y	N	Contains NMI (without checksum)	Al	10 digit alpha-numeric
measurementDateTime	String	Y	N	Datetime of the measurement or the observation. Data submitted must be in NEM time (in AEST) and in ISO 8601 format. Data must align to Dispatch Interval ending (i.e. must be time interval ending).	All	• All data submitted must be in Market (NEM) time. • yyyy-MM-ddThh:mm+10:00
batteryConfig	String	Y	N	Battery configuration (AC, DC or No Battery)	All	AC, DC, No Battery
minPspecLoad	Number	Y	Y	Minimum: Customer gross load (min; real in kW)	All	If not available, provide as null
maxPspecLoad	Number	Y	Y	Maximum: Customer gross load (max; real in kW)	All	If not available, provide as null

meanPspecLoad	Number	Y	Y	Mean: Customer gross load (mean; real in kW)	All	If not available, provide as null
minQspecLoad	Number	Y	Y	Minimum: Customer gross load (min; reactive in kVAr)	All	If not available, provide as null
maxQspecLoad	Number	Y	Y	Maximum: Customer gross load (max; reactive in kVAr)	All	If not available, provide as null
meanQspecLoad	Number	Y	Y	Mean: Customer gross load (mean; reactive in kVAr)	All	If not available, provide as null
minV	Number	Y	Y	Minimum: Meter voltage, network-side in Volts.	All	If not available, provide as null
maxV	Number	Y	Y	Maximum: Meter voltage, network-side in Volts.	All	If not available, provide as null
meanV	Number	Y	Y	Mean: Meter voltage, network-side in Volts.	All	If not available, provide as null
instV	Number	Y	Y	Instantaneous: Meter voltage, network-side in Volts.	All	If not available, provide as null
maxFrequency	Number	Y	Y	Maximum: Meter frequency (network-side)	All	If not available, provide as null
minFrequency	Number	Y	Y	Minimum: Meter frequency (network-side)	All	If not available, provide as null
meanFrequency	Number	Y	Y	Mean: Meter frequency (network-side)	All	If not available, provide as null
instFrequency	Number	Y	Y	Instantaneous: Meter frequency (network-side)	All	If not available, provide as null
minExportP	Number	Y	Y	Minimum: Meter export Real power in kW (min; real - kW)	All	If not available, provide as null
maxExportP	Number	Y	Y	Maximum: Meter export Real power in kW (min; real - kW)	All	If not available, provide as null

meanExportP	Number	Y	Y	Mean: Meter export Real power in kW (min; real - kW)	All	If not available, provide as null
minExportQ	Number	Y	Y	Minimum: Meter export Reactive power in kVar (min; reactive - kVAr)	All	If not available, provide as null
maxExportQ	Number	Y	Y	Maximum: Meter export Reactive power in kVar (min; reactive - kVAr)	All	If not available, provide as null
meanExportQ	Number	Y	Y	Mean: Meter export Reactive power in kVar (min; reactive - kVAr)	All	If not available, provide as null
meanBatterySoc	Number	Y	Y	Mean: Battery State of Charge (usable)	Any Battery	If not available, provide as null
instBatterySoc	Number	Y	Y	Instantaneous: Mean: Battery State of Charge (usable)	Any Battery	If not available, provide as null
minSmartInverterP	Number	N	Y	Minimum: Smart inverter Real power output (min; real - kW)	DC Config only	
maxSmartInverterP	Number	N	Y	Maximum: Smart inverter Real power output (min; real - kW)	DC Config only	
meanSmartInverterP	Number	N	Y	Mean: Smart inverter Real power output (min; real - kW)	DC Config only	
minSmartInverterQ	Number	N	Y	Minimum: Smart inverter Reactive power output (min; reactive - kVAr)	DC Config only	
maxSmartInverterQ	Number	N	Y	Maximum: Smart inverter Reactive power output (min; reactive - kVAr)	DC Config only	

meanSmartInverterQ	Number	N	Y	Mean: Smart inverter Reactive power output (min; reactive - kVAr)	DC Config only	
minBatteryP	Number	N	Y	Minimum: Battery real power output (min; in kW, Pbatt)	DC Config only	
maxBatteryP	Number	N	Y	Maximum: Battery real power output (min; in kW, Pbatt)	DC Config only	
meanBatteryP	Number	N	Y	Mean: Battery real power output (min; in kW, Pbatt)	DC Config only	
minSolarInverterP	Number	N	Y	Minimum: Solar PV inverter Real power output (min; real in kW, Pinv)	AC Config only	
maxSolarInverterP	Number	N	Y	Maximum: Solar PV inverter Real power output (min; real in kW, Pinv)	AC Config only	
meanSolarInverterP	Number	N	Y	Mean: Solar PV inverter Real power output (min; real in kW, Pinv)	AC Config only	
minSolarInverterQ	Number	N	Y	Minimum: Solar PV inverter Reactive power output (min; reactive in kVAr, Qinv)	AC Config only	
maxSolarInverterQ	Number	N	Y	Maximum: Solar PV inverter Reactive power output (min; reactive in kVAr, Qinv)	AC Config only	
meanSolarInverterQ	Number	N	Y	Mean: Solar PV inverter Reactive power output (min; reactive in kVAr, Qinv)	AC Config only	
minBatteryInverterP	Number	N	Y	Minimum: Battery inverter Real power output (min; real in kW)	AC Config only	

maxBatteryInverterP	Number	N	Y	Maximum: Battery inverter Real power output (min; real in kW)	AC Config only	
meanBatteryInverterP	Number	N	Y	Mean: Battery inverter Real power output (min; real in kW)	AC Config only	
minBatteryInverterQ	Number	N	Y	Minimum: Battery inverter Reactive power output (min; reactive in kVAr)	AC Config only	
maxBatteryInverterQ	Number	N	Y	Maximum: Battery inverter Reactive power output (min; reactive in kVAr)	AC Config only	
meanBatteryInverterQ	Number	N	Y	Mean: Battery inverter Reactive power output (min; reactive in kVAr)	AC Config only	
minDeviceNetP	Number	N	Y	Minimum: Device net power output (kW)	Non-Battery Device	
maxDeviceNetP	Number	N	Y	Maximum: Device net power output (kW)	Non-Battery Device	
meanDeviceNetP	Number	N	Y	Mean: Device net power output (kW)	Non-Battery Device	
minDeviceNetQ	Number	N	Y	Minimum: Device net power output (kVAr)	Non-Battery Device	
maxDeviceNetQ	Number	N	Y	Maximum: Device net power output (kVAr)	Non-Battery Device	

meanDeviceNetQ	Number	N	Y	Mean: Device net power output (kVAr)	Non-Battery Device

Chapter 9. Need Help?

Support Hub

For non-urgent issues, normal coverage is 8:00 AM to 6:00 PM on weekdays, Australian Eastern Standard Time (AEST).

IT assistance is requested through one of the following methods:

- Phone: 1300 AEMO 00 (1300 236 600)
- Contact Us form on AEMO's website

AEMO recommends participants call AEMO's Support Hub for all urgent issues, if you have logged a call in the Customer Portal.

Information to provide

Please provide the following information when requesting IT assistance from AEMO:

- Your name
- Organisation name
- Participant ID
- System or application name
- Environment: production or pre-production
- Problem description
- Screenshots

Related Documents

Data Interchange Framework and Glossary**:** provides important information about upgrading your Data Interchange (DI) environment, explains DI terms, and DI related resources. Please read this guide in conjunction with this technical specification.

Guide to AEMO's e-Hub APIs: Provides details about using AEMO's e-Hub as an interface to communicate information with AEMO. It assists Wholesale electricity and gas participants developing their own APIs.

Guide to Electricity Information Systems: Provides guidance for *Registered Participants* and interested parties about AEMO's participant electricity market systems.

Guide to User Rights Management: Assists participant administrators (PAs) to use the user rights management functions in the MSATS Web Portal.

Retail Electricity Market Glossary and Framework: assist participants of the Retail Electricity Market to understand the overall framework. It also contains a list of terms used in the Retail Electricity Market Procedures and a full list of NEM procedures, guidelines, and documents.

Glossary

Abbreviation	Explanation
AEMO	Australian Energy Market Operator
AEST	Australian Eastern Standard Time
B2B	Business-to-business
B2M	Business-to-market
EMMS	Electricity Market Management System; software, hardware, network and related processes to implement the wholesale energy market
FCAS	frequency control ancillary services
FTP	File transfer protocol
MSATS	Market Settlement and Transfer Solution for retail electricity
NEM	National Electricity Market
NER	National Electricity Rules
NMI	National Metering Identifier for electricity meters
MW	Megawatt