
VPP Demonstrations Release Schedule & Tech Spec - Nov 2019

0.1 Draft October 2019

Pre-production: 3rd Oct 19

Production: 17th Oct 19

Release series: VPP

Important notice

PURPOSE & AUDIENCE

This document describes the technical changes required to participant's systems for the AEMO Release Schedule - System Month Year. The Australian Energy Market Operator (AEMO) provides this information as a service targeting business analysts and IT staff in participant organisations. It provides guidance about the changes to their market systems under the National Gas or Electricity Rules (Rules), as at the date of publication.

HOW TO USE THIS DOCUMENT

- If you have questions about the business aspects of these changes, please see Consultations on AEMO's website.
- The references listed throughout this document are primary resources and take precedence over this document.
- Unless otherwise stated, you can find resources mentioned in this guide on AEMO's website.
- **Text in this format**, indicates a reference to a document on AEMO's website.
- This document is written in plain language for easy reading. Where there is a discrepancy between the Rules and information or a term in this document, the Rules take precedence.
- Glossary Terms are capitalised and have the meanings listed against them in the Glossary.
- *Italicised terms* are defined in the Rules. Any rules terms not in this format still have the same meaning.

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VERSION HISTORY

0.1 Created VPP Tech Spec with information for VPP Demonstration project

DOCUMENTS MADE OBSOLETE

The release of this document changes only the version of VPP Demonstrations Release Schedule & Tech Spec - Nov 2019.

FEEDBACK

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1. Introduction

This release schedule and technical specification describes the projects planned by AEMO from a participant perspective. AEMO provides this information as a service targeting business analysts and IT staff in participant organisations.

1.1 Overview

The aim of the VPP demonstration project is to deliver API capability to facilitate data validation and ingestion for VPP enrolments, FCAS High speed data and VPPs operational data and behind the NMI device data.

The VPP demonstration project aims to:

- Build capabilities to receive periodic and on-request data from VPP trial participants.
- Send out dispatch instructions to VPP trial participants via APIs to facilitate data validation and ingestion for VPP enrolments, FCAS High speed data and VPPs operational data and behind the NMI device data.

Note: All these updates affect market participants who have signed up for the VPP trial only. There are no changes to other market participants.

1.2 Audience

The primary audience is business analysts and IT staff at VPP trial participants.

1.3 Schedule

Scheduled for implementation in:

- Pre-production: 3rd Oct 19
- Production: 17th Oct 19

1.4 Proposed timeline

The dates for the User Group Meetings are tentative. We will provide an invitation one week prior to the meeting.

Milestone	Date	Description
User group meeting: initial	27 September 2018	Market systems user group meeting to discuss items on this Release.

Milestone	Date	Description
Revised Release Schedule	October 2019	Further details of the changes to assist IT staff with their own technical implementation.
Pre-production refresh	2 October 2019 — 3 October 2019	Refresh of the pre-production system with data refreshed from the production system. An outage of up to five days can occur to the pre-production environment during this period. Participant access is not restricted, however, AEMO do not guarantee the pre-production data content or system availability. During the refresh, access to other AEMO systems such as AWEFS, EMMS, OPDMS, and STTM may be intermittently affected.
Pre-production implementation	2 October 2019 - 3 October 2019	AEMO implements components of the Release to pre-production for participant testing. AEMO has full access to the system during this period. Participant access is not restricted; however, the data content or system availability is not guaranteed.
Pre-production available	3 October 2019	Testing period begins for participants.
User group meeting: pre-production review	3 October 2019 - 15 October 2019	Market systems user group meeting to review the implementation of this pre-production release.
Production implementation	16 October 2019 – 17 October 2019	AEMO implements the release to production.
Production systems available	17 October 2019	Production systems available to participants

1.5 Implications

There are no functional changes to participant interfaces.

1.6 Business impact

There are no functional changes to participant interfaces.

1.7 Risks

Medium risk as the updates involve changes to critical reporting infrastructure. The application modules are tested by AEMO's Electricity Market Development Test Team.

1.8 Approval to change

This change notice is for information purposes only. No approval or agreement is required from VPP trial participant change controllers.

2. VPP Demonstrations

2.1 Overview

This section covers the changes and new features developed for the VPP Demonstration project.

2.2 VPP Enrolments

To participate in the VPP demonstrations, an approved Market Participant provides details of their proposed VPP to AEMO for assessment using web API services.

The enrolment process will be used to assess changes to existing VPP configurations in relation to NMI enrolments and VPP capacity. VPP trial participants can provide additional load NMI to be added to the VPP portfolio using APIs.

2.3 FCAS Assessment

Contingency FCAS providers submit DUID and Device Response data using web API services.

AEMO also monitors high and low speed data submitted by Contingency FCAS providers.

2.4 VPP Operational Data

VPP trial participants provide their operational data using web API services. This data is provided at the aggregated at DUID level.

2.5 Telemetry Data

VPP trial participants provide telemetry data (Behind NMI or meter BTM data) using web API services (Dates to be confirmed). This data is provided at the Device level.

2.6 Market Direct Subscriptions

VPP trial participants can set up email subscriptions for VPP notifications.

3. APIs

3.1 API access

AEMO's VPP APIs are accessible via the APIGEE Gateway

API details, including Swagger files, are available via AEMO's API Portal. For more information about e-Hub APIs, see [Guide to AEMO's e-Hub APIs](#).

Table 1 – API Gateway Addresses

Environment	APIGEE Address (API endpoints)
Pre-production	Registrations https://preprod.api.aemo.com.au/NEMWholesale/DER/vpp/registration/v1/ FCAS https://preprod.api.aemo.com.au/NEMWholesale/DER/fcas/assessment/v1/ Ops Data https://preprod.api.aemo.com.au/NEMWholesale/DER/vpp/opsdata/v1/
Production	Registrations https://api.aemo.com.au/NEMWholesale/DER/vpp/registration/v1/ FCAS https://api.aemo.com.au/NEMWholesale/DER/fcas/assessment/v1/ Ops Data https://api.aemo.com.au/NEMWholesale/DER/vpp/opsdata/v1/

More information is available in [Guide to AEMO's eHub APIs](#).

3.2 API authentication and authorisation

API connections use SSL certificates to secure the transport layer ensuring encrypted communication and secure interactions between participant and AEMO's systems. AEMO issues the SSL certificates to participants on request.

API calls are authorised by Basic HTTP authentication using a username and password assigned by the company's Participant Administrator.

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

3.3 API format

API URLs are in the following format:

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

For example:

```
https://api.aemo.com.au/NEMWholesale/DER/vpp/registration/v1/submitNMIDevices
```

Table 2 – API Definition

Parameter	Description
<protocol>	HTTPS
<host server>	Names the server hosting the service or an external proxy Internet web service host: apis.prod.aemo.com.au:9319 MarketNet web service host: apis.prod.marketnet.net.au:9319
<business_name>	A business area such as NEMRetail or NEMWholesale
<business_function>	API Name – The AEMO system providing the services e.g. DER
<APIversion>	The version for this API i.e. v1, v2, v3 etc...
<verb> <resource>	Entities of a Business Function e.g. /submitNMIdevices
?querystring parameters	Query string parameters for GET method

3.4 API naming

The VPP APIs follow a verb and noun naming convention, enabling a clear understanding of their action.

3.5 User rights access

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.

3.6 Response codes

Table 3 – 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	ParticipantID in the payload does not match to ParticipantID in the URM (against the user name 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

The APIGEE gateway sends an appropriate HTTP response code and description when any of the technical validations fail. In such instances, the e-Hub also sends additional information about the validation failure in the exception payload.

For more information, see **Error Responses (APIGEE Gateway)**.

3.7 Payload compression

AEMO APIs support HTTP protocol compression controlled by the HTTP request header attributes, allowing compression before sending and responding.

For details, see Content-Encoding and Accept-Encoding parameter in Request and response headers below.

3.8 Request and response headers

Standard HTTP request header attributes

Parameter	Value(s)	Description
Content-Type	application/json	Content format. This is mandatory.
Content-Length	nnn	Content length of file. The value is populated when the request is sent.
Content-Encoding	gzip compress deflate	Specifies any compression applied to the request body.
Accept	application/json	Details the expected content type of the response
Accept-Encoding	gzip compress deflate	Specifies the encoding supported for the response
X-initiatingParticipantID	<PID>	The participant ID who the request is from. This is mandatory.
X-market	NEMWholesale	The market the request is for. This is mandatory.

Parameter	Value(s)	Description
Authorization	Basic QFhQVC0wMDAwMzoyZWRmOGJhYS 0wY2I0LTQwZj ctOTIyMS0yODUxNmM4N2MxNjQ=	Base64 encoding of the URM username and password, concatenated with a colon. This is mandatory.
	Note: This is an example only.	

3.8.1 Standard HTTP response header attributes

Parameter	Value(s)	Description
Content-Type	application/json	The API responses are in JSON.
Content-Encoding	gzip compress deflate	Specifies any compression applied to the response body.

3.9 List of VPP APIs

This section describes the VPP APIs available for public consumption. For detailed API specifications, refer to Guide to AEMO VPP Demonstration APIs.

API Name	Support Methods	Entity Description
NMIDevice		
submitNMIDevices	POST	Submits NMIs and attached DER devices under VPP control associated with the DUID.
removeNMIDevices	POST	Remove NMI and device details.
getNMIDevices	GET	Retrieve a list of valid NMIs and DER Devices data associated with a specific DUID under a VPP.
removeDevices	POST	Submit a list of devices that needs to be disassociated from an NMI.
submitFreqInjTestData	POST	Submit Frequency Injection Test Data for Contingency FCAS Load Configuration Assessment for devices.
FCAS		
submitDuidResponse	POST	Submit DUID response data.
submitDeviceResponse	POST	Submit Device response data.
Operational Data		
submitStandingData	POST	Participant submits standing data.
submitActualPerfData	POST	Participant submits actual performance data.
submitOpsForecast	POST	Participant submits operational forecast for 5 mins.
submitAvailForecast5Min	POST	Participant submits available forecast for 5 mins interval.
submitAvailForecast30Min	POST	Participant submits available forecast for 30 mins interval.

3.10 API specification

For more details, refer to Guide to AEMO VPP Demonstration APIs.

3.11 POST API response compression

VPP POST APIs **should** have a compressed payload.

Parameter	Value(s)
Content-Type	Must be: application/json
Content-Encoding	Should be at least one of: gzip compress deflate If not provided no compression is assumed.
Accept-Encoding	Should be at least one of: gzip compress deflate If not provided no compression is assumed.

3.12 GET API response compression

AEMOs VPP GET APIs always provide a compressed successful response.

Parameter	Value(s)
Content-Type	application/json
Content-Encoding	Depends on the Accept-Encoding in the request. It should be one of: gzip compress deflate If not provided no compression is assumed.

3.13 Throttling

AEMO implements throttling on API calls.

A 429 HTTP response Code is returned if throttling is exceeded.

These values will be reviewed during Industry Testing and Market Trials.

4. Subscriptions

4.1 Overview

This section describes how VPP trial participants can set up subscriptions for VPP notifications.

4.2 Setting up subscriptions

For more information, refer to the Market Direct Notifications – QRG.

5. Glossary

Term	Description
AEMO	Australian Energy Market Operator Limited
API	Application programming interface
Contingency Services	Means one or all (1) the fast raise service; (2) the fast lower service; (3) the slow raise service; (4) the slow lower service; (5) the delayed raise service; and (6) the delayed lower service
DER	Distributed Energy Resources
DUID	Identifier for a dispatchable unit (generation or load).
EDP	Enterprise Data Platform
Energy	The unit must be a generator for the service type: 'energy'. Loads cannot bid for mandatory restrictions capacity
ESS	Energy Storage Solution
FCAS Verification Tool (FCASVT)	Excel based used and designed by SPC to assess and verify the performance of MASP in delivery of contingency services
Frequency control ancillary service (FCAS)	Frequency control ancillary service, means those ancillary services concerned with balancing, over short intervals (shorter than the dispatch interval), the power supplied by generating units and the power consumed by loads. Procured as market ancillary service
Frequency Dead-Band	The range of Local Frequency through which a Variable Controller will not operate
Frequency Deviation Setting(s)	Setting or settings allocated to the Ancillary Service Facility by AEMO within the range.
Frequency Disturbance	An occasion when the frequency of the power system moves outside the normal operating frequency band
Frequency Disturbance Time	Time at which Local Frequency falls or rises outside the normal operating frequency band during a Frequency Disturbance, referenced to Australian Eastern Standard Time
Frequency Ramp Rate	Means 0.125 hertz (Hz) per second for regions other than Tasmania or 0.4 Hz per second for the Tasmanian region

Term	Description
Frequency Recovery	The first change in Local Frequency from above 50.15 Hz to below 50.1 Hz, or below 49.85 Hz to above 49.9 Hz, to occur after a Frequency Disturbance
Initial Value	The Generation Amount or Load Amount just prior to the Frequency Disturbance Time of a Frequency Disturbance
MW	Mega-watt.
NEM	National Electricity Market
NER	National Electricity Rules. https://www.aemc.gov.au/regulation/energy-rules/national-electricity-rules/current
NMI	National Meter Identifier
OPF	Operational Forecasting team within AEMO Operations
Participant	A registered organisation participating in the NEM
RMC	Registration Management Client
SP	Service Provider (could be different to meter data providers), these will provide the telemetry data i.e. behind the NMI data from Batteries.
SPC	System Performance and Commercial team within AEMO Operations
VPP	Virtual Power Plants

6. Error Responses (APIGEE Gateway)

This section provides information on the error responses (along with codes) provided by the APIGEE Gateway.

6.1 Invalid submission with missing mandatory headers

Item	Value
Response Code	400
Header	Standard response header attributes: Content-Type: application/json
Body	<pre>{ "transactionID": "c46df3bd-fe0f-4b83-862e-1bdf09cbf60", "data": {}, "errors": [{ "code": 400, "title": "Missing mandatory HTTP header parameter", "detail": "Missing required headers", "source": null }] }</pre>

6.2 Invalid submission No BASIC Auth information in HTTP Request Header

Item	Value
Response Code	401
Header	Standard response header attributes: Content-Type: application/json

Item	Value
Body	<pre>{ "transactionID": "941e3d84-e749-4812-9799- a7ac73dd8043", "data": {}, "errors": [{ "code": 401, "title": "Unauthorized", "detail": "Invalid UserName or Password", "source": null }] }</pre>

6.3 JSON payload attack

Item	Value
Response Code	403
Header	Standard response header attributes: Content-Type: application/json
Body	<pre>{ "transactionID": "8e5adb0b-25f3-44f0-b788- ef46307eaca8", "data": {}, "errors": [{ "code": 403, "title": "Forbidden", "detail": "Insufficient privileges", "source": null }] }</pre>

6.4 Invalid resource request

Item	Value
Response Code	404

Item	Value
Header	Standard response header attributes: Content-Type: application/json
Body	<pre> { "transactionID": "7436ac63-3d5a-4512-ac0a-3dc523aacb8e", "data": {}, "errors": [{ "code": 404, "title": "Not found", "detail": "ID not found", "source": null }] } </pre>

6.5 Invalid method call

Item	Value
Response Code	405
Header	Standard response header attributes: Content-Type: application/json
Body	<pre> { "transactionID": "720eca97-9133-4ec3-8997-8a815ecdff41", "data": {}, "errors": [{ "code": 405, "title": "Method Not Allowed", "detail": "Input request HTTP method is POST, but operation accepts only GET", "source": null }] } </pre>

6.6 When throttling limits have exceeded

Item	Value
Response Code	429
Header	Standard response header attributes: Content-Type: application/json
Body	<pre>{ "transactionID": "720eca97-9133-4ec3-8997-8a815ecdff41", "data": {}, "errors": [{ "code": 429, "title": "Too Many Requests", "detail": "Number of inbound requests exceeded the throttling limits; try after sometime", "source": null }] }</pre>

6.7 When the application has returned an error

Item	Value
Response Code	500
Header	Standard response header attributes: Content-Type: application/json
Body	<pre>{ "transactionID": "720eca97-9133-4ec3-8997-8a815ecdff41", "data": {}, "errors": [{ "code": 500, "title": "Internal Server Error", "detail": "Internal Server Error", "source": null }] }</pre>

6.8 When the API Gateway cannot reach the target server

Item	Value
Response Code	502
Header	Standard response header attributes: Content-Type: application/json
Body	<pre>{ "transactionID": "720eca97-9133-4ec3-8997-8a815ecdff41", "data": {}, "errors": [{ "code": 502, "title": "Bad Gateway", "detail": "Bad Gateway", "source": null }] }</pre>

6.9 When the Application does not respond

Item	Value
Response Code	503
Header	Standard response header attributes: Content-Type: application/json
Body	<pre>{ "transactionID": "720eca97-9133-4ec3-8997-8a815ecdff41", "data": {}, "errors": [{ "code": 503, "title": "Service Unavailable", "detail": "Service Unavailable", "source": null }] }</pre>