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# **WEM DER Technical Specification - February 2021**

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**1.0 February 2021**

Pre-production: 23-Nov-2020

Production: 10-Feb-2021

Release series: DERR-WEM

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# Important Notice

## PURPOSE & AUDIENCE

This document describes the technical changes required to participant's systems for the AEMO Release Schedule - System Month Year (Release). 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 Wholesale Electricity Market 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](#) is a link to related information.
- **Text in this format**, indicates a reference to a document on [AEMO's website](#).
- **Text in this format** is an action to perform in the MSATS Web Portal.
- 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**.

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## DOCUMENT IDENTIFICATION

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## VERSION HISTORY

1.0 Includes feedback from the team & confirmed dates..

## DOCUMENTS MADE OBSOLETE

The release of this document changes only the version of WEM DER Technical Specification - February 2021.

## SUPPORT HUB

To contact AEMO's Support Hub use [Contact Us](#) on AEMO's website or Phone: 1300 AEMO 00 (1300 236 600) and follow the prompts.

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# 1. Introduction

The WEM DER Register project is a part of the Distributed Energy Resources (DER) program and includes changes related to participants' IT systems. This technical specification describes the interfaces AEMO are creating to enable Western Power to access the system and provide information to the DER Register via APIs.

## 1.1 Audience

AEMO provides this information as a service targeting business analysts and IT staff in participant organisations.

1. The primary audience is Western Power.
2. The secondary audience is AEMO Operations, Forecasting and Technology teams.

## 1.2 Rule and procedure changes

Type	Details
Rule 3.24.8	Under Wholesale Electricity Market Rules (WEM Rules), which commenced on 1 July 2020, AEMO is required to develop, maintain, and publish guidelines that requires Western Power to provide DER generation information to AEMO.
DER Register Information Procedure (WEM)	This DER Register Information Procedure (Procedure) is made in accordance with AEMO's functions under clause 2.1A.2(h) of the Wholesale Electricity Market Rules (WEM Rules). For more information, see <a href="#">DER Register Information Procedure (WEM)</a> .

## 1.3 Need to know

This technical specification assumes a working knowledge of the DER Register. For more information, see [Distributed Energy Resource Register](#).

## 1.4 Schedule

Scheduled for implementation in:

- Pre-production: 23-Nov-2020
- Production: 10-Feb-2021

## 1.5 Approval to change

There is no approval or agreement to change required from participant change controllers for this Release.

## 2. DER Register

### 2.1 Overview

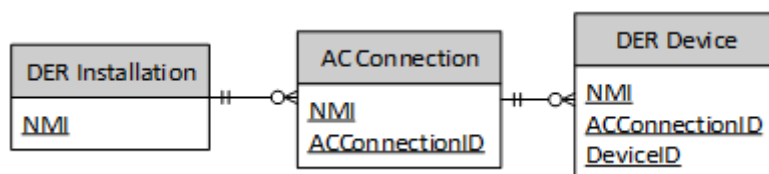
The Distributed Energy Resources (DER) Register project aims to create, maintain, and update a DER register. As specified by the National Electricity Rule 3.7E, the DER register is required to contain standing data on:

- DER generation information, containing information on small generating units submitted by Western Power (WP).
- Demand Side Participation (DSP) information, containing existing information collected on active loads, embedded generation, and energy storage submitted by WP.

The DER register information is integrated into AEMO load forecasts and power system modelling, as well as being accessible to WP and the public, via a report on the AEMO website.

### 2.2 DER Register model

The DER Register model consists of a three-level database structure which aligns to device installation characteristics. A DER Installation is uniquely identified by the NMI and has one or more AC Connections which has one or more Devices attached.



### 2.3 DER Register APIs

As part of the DERR implementation, AEMO has introduced these APIs to create, maintain and update the DER Register. Where possible AEMO API naming standards have been adopted.

API Name	Method	Description
install	POST	Submit a single DER record. The return response includes AC Connection ID, DER Device ID with the current status and exceptions, if any. This API is used for creating, updating, and handling exceptions for a DER Record.
getLatestInstalls	POST	Retrieve latest version of a single or multiple DER records (as per parameters supplied, up to a maximum of 2,000 records)

API Name	Method	Description
getInstall	POST	Retrieve full history/versions of a single DER Record (current and up to 4 previous versions).
nmi-details	POST	Create a single NMI record. This API creates NMI details.
nmi-details/<nmi>	PUT	Update a single NMI record. This API updates the NMI details.
nmi-details/<nmi>	GET	Retrieve a single NMI record. This API updates the NMI details.
requestAccessToken	POST	Return an access token, access token expiry time in seconds, ID token, refresh token and refresh token expiry time in seconds after a successful authentication.

# 3. DER Register APIs

This chapter provides a high-level overview of the DER Register APIs that you can use to build your applications to submit and access DER data.

## 3.1 Accessing APIs

AEMO's DER APIs are exposed through the internet via an API Gateway. The API details along with the OpenAPI Specification files are available via the AEMO's API Portal.

## 3.2 Authentication and authorisation

API connections use mTLS certificates to secure the transport layer with encrypted communication and secure interactions between participants' and AEMO's systems.

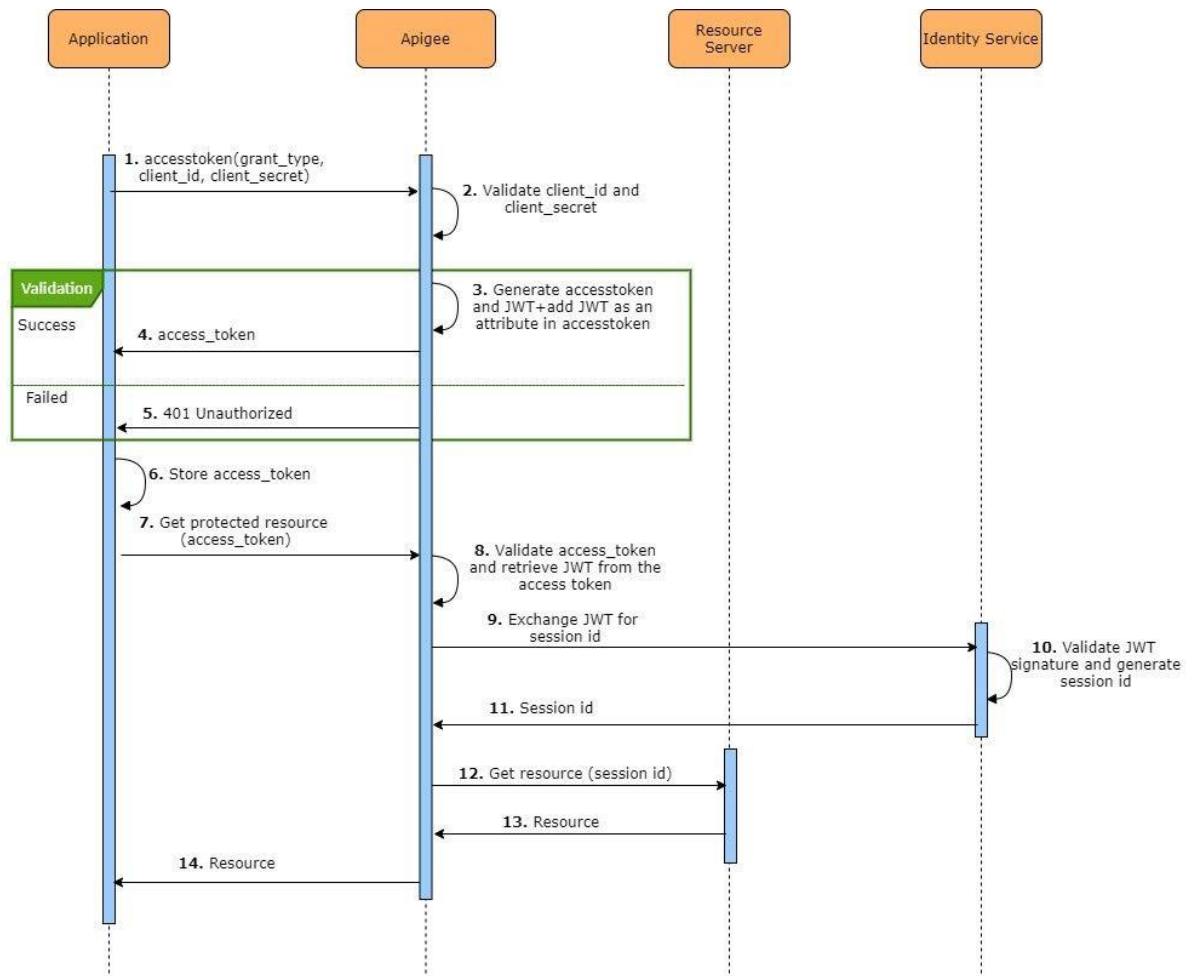
- AEMO issues mTLS certificates to participants on request.
- WP connects to the AEMO DER APIs using a TLS connection. Authentication for WP is via one-way SSL.

API calls for WP are authorised using Oauth2 Pattern for trusted application.

### 3.2.1 Authentication sequence

The logical flow of a typical session is as shown in this diagram.





### 3.2.2 Sequence steps

Sequence	Step	Description
1	Request Access Token	The application invokes an API call on Apigee with grant type, Client Id and Client Secret. Client Id and Secret are passed in the Basic Authentication header.
2	Validation	Apigee validates Client Id and Client Secret.
3	Generate Access Token	If the validation in step 2 was successful Apigee generates access token and a JWT. Apigee then adds the JWT as a custom attribute in the Access Token.
4	Return Access Token	Apigee returns Access Token to the application as part of the response payload to the API request
5	Validation failed	If the validation in step 2 failed Apigee returns 401 Unauthorized error
6	Store access token	Access Token is stored by the application for later use when requesting resources.

Sequence	Step	Description
7	Application requests Protected Resource from AEMO	The application requests access to a protected resource. The application calls the Apigee API Proxy passing the Access token in an Authorization Header. Apigee validates the token and allows or denies access.
8	Validate Access Token	Apigee API Gateway validates Access Token and retrieves JWT from the Access Token which is stored as a custom attribute in the token
9	Exchange JWT for Session Id	If the Access Token is valid the JWT is exchanged for an AEMO Identity Service Session Token used by the Resource server for Authorization
10	Validate JWT	The Identity service validates the JWT signature using the signing public key. After successful validation a Session Id is generated by the service.
11	Session ID Returned	Generated Session Id is returned to Apigee
12	Access Target API	The Protected Resource is accessed, passing the Session Id.
13	Return Data to Gateway	Data is returned to the Gateway in response to the original request.
14	Return Data to Application	Data is returned to the application in response to the original request.

### 3.2.3 Registering for the AEMO API Portal

Before you can use the AEMO DER APIs to submit and receive data to/from the DER Register, you must register to use the API Portal (for both the pre-production and production environments).

To register, follow these steps:

1. Access the API Portal:

Environment	Internet Address
Pre-production API Portal	<a href="https://dev.preprod.aemo.com.au/">https://dev.preprod.aemo.com.au/</a> You need to register and sign in to access the DER APIs in this portal.
Production API Portal	<a href="https://dev.aemo.com.au/">https://dev.aemo.com.au/</a> You need to register and sign in to access the DER APIs in this portal.

2. Click the Sign In/Register button.
3. On the Register on the Portal screen, click the Create an Account option.
4. Enter the mandatory fields – First name, Last name, Email, Organisation, Password.
5. Agree to the terms and click Create Account.
6. You will receive a verification email with a unique link. Click on the link to verify your account.

You must verify your account within 10 minutes of signing up by clicking the link in the email.

AEMO receives an email to approve your request. You cannot sign into the API Portal until AEMO approves your registration.

Once your registration is approved, you will receive an email from AEMO. You can then log in using your registered email and password details.

### 3.2.4 Creating an app for DER APIs

Once you have registered to use the API Portal, you can create an app to use the DER APIs.

Before you begin, make sure you have registered to use the APIs.

To create an app:

1. On the API Portal, click your login ID to view the dropdown menu.
2. Click Apps.  
If this is your first time using the API Portal, there will be no apps registered for your profile and the Get Started page displays.  
If you have used the API Portal before, you should see the apps you previously registered for your account.
3. Click the New App button.
4. On the New App page, enter the App Name and a description.  
TIP: We recommend using a combination of your organisation name and DER to identify your app. For example, XYZ – DER.
5. From the list of APIs, toggle the AEMO-DER\_Registration\_API-for-External-Apps.
6. To create your app, click Create. An email is sent to AEMO for approval.
7. Once AEMO approves the app, you can view the app details. The API keys are automatically generated, and the status is now Active.

### 3.3 API format

API URLs are in the following format:

```
<protocol>://<domain>/<market>/<version>/<product-name>/<resources>...
```

For example:

```
https://partner.api.aemo.com.au/wem/v1/der-register/install
```

Parameter	Description
<protocol>	HTTPS
<domain>	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
<market>	
<version>	
<product-name>	API Name - The AEMO system providing the services e.g. der-register
<verb><resource>	Entities of a business function. For example, /der-register
?querystringparameters	Query string parameters for GET method.

### 3.4 API addresses

API details including the Swagger files, are available via AEMO's API Portal. For more information, see **Guide to AEMO's e-Hub APIs**.

Environment	Internet Address
Pre-production	<a href="https://dev.preprod.aemo.com.au">https://dev.preprod.aemo.com.au</a> You need to register and sign in to access the DERR APIs in this portal.
Production	<a href="https://dev.aemo.com.au">https://dev.aemo.com.au</a>

### 3.5 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.

### 3.6 Request headers

Standard HTTP request header attributes:

Parameter	Value(s)	Description
Content-Type	application/json	(Mandatory) Content format.
Content-Length	Length of the request body in bytes.	(Mandatory)
Content-Encoding	gzip	(Optional) Specifies any compression applied to the request body.
Accept	application/json	Details the expected content type of the response
Accept-Encoding	gzip	(Optional) Specifies the encoding supported for the response
X-initiatingParticipantID	EHUB	(Mandatory) The participant ID who the request is from.
X-market	WEM	(Mandatory) The market the request is for.
Authorization	Bearer RjzIzEQwf0dezbaAtdiCQWZdAN cJ Note: This is an example only.	(Mandatory) This is the access token received from the OAuth API.

### 3.7 Response headers

Standard HTTP response header attributes:

Parameter	Value(s)	Description
Content-Type	application/json	(Optional) Content format.
Content-Length	Length of the request body in bytes.	(Optional)
Content-Encoding	gzip	Specifies any compression applied to the request body.

### 3.8 Response codes

Data Condition	Value	Examples/Remarks
Successful response	200	200 OK

Data Condition	Value	Examples/Remarks
Created	201	201 Created
HTTP Technical Failure	400	400 Failed Bad post data.
Invalid Credentials	401	401 Unauthorized. <pre>{   "Exception": "Unauthorized:Invalid UserName or Password" }</pre>
No Username / Password details in HTTP request	401	401 Unauthorized <pre>{   "Exception": "Unauthorized:Invalid UserName or Password" }</pre>
Length required	411	411 Length Required <pre>{   "fault": {     "faultstring": "Content- Length is missing",     "detail": {       "errorcode": "messaging.adaptors. http.flow.LengthRequired"     }   } }</pre>
Unsupported media type	415	415 Unsupported Media Type
Business validation error	422	422 Failed The request was well formed but the submitted content failed business validation rules.
Application Unavailable (down)	500	500 Application Unavailable

### 3.8.1 Examples: HTTP response codes

The API Gateway sends an appropriate HTTP response code and description when any of the technical validations fail. In such instances, additional information about the validation failure is included in the <exception payload> as shown below.

**Response code 405 example**

```

HTTP/1.1 405 Method Not Allowed
Content-Length: nnn
Date: Mon, 01 May 2017 18:00:00 GMT
Connection: close
Content-Type: application/json
{
  "transactionId": "<GUID>",
  "data": {
  },
  "errors": [
    {
      "code": 405,
      "title": "Not Found",
      "detail": "Input request HTTP method is <Invalid Method passed>
        but operation <Resource Name>
        accepts only: [<Valid Method>]",
      "source": null
    }
  ]
}

```

**Response code 404 example**

```

HTTP/1.1 404 Resource Not Found
Content-Length: nnn
Date: Mon, 01 May 2017 18:00:00 GMT
Connection: close
Content-Type: application/json
{ "transactionId": "<GUID>",
  "data": {
  },
  "errors": [
    {
      "code": 404,
      "title": "Not Found",
      "detail": "Resources for the endpoint URI not found.
        Endpoint URI: <Resource>",
      "source": null
    }
  ]
}

```

**Response code 415 example**

```

HTTP/1.1 415 Unsupported Media Type
Content-Length: nnn
Date: Mon, 01 May 2017 18:00:00 GMT
Content-Type: application/invalidContent
{
  "transactionId": "<GUID>",
  "data": {},
  "errors": [
    {
      "code": 415,
      "title": "InvalidContentType",
      "detail": "Content Type 'application/invalidContent' is invalid. Only
        'application/json' content type is supported.",
      "source": null
    }
  ]
}

```

**Response code 500 example**

```

HTTP/1.1 500 <As per the validation failure>
Content-Length: nnn
Date: Mon, 01 May 2017 18:00:00 GMT
Connection: close
{
  "transactionId": "<GUID>", "data": {
  },
  "errors": [
  {
    "code": 500,
    "title": "<As per the validation failure>",
    "detail": "<As per the validation failure>",
    "source": null
  }
  ]
}

```

**3.9 POST API response compression**

DER Register 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.

**3.10 GET API response compression**

DER Register GET APIs 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.

**3.11 Throttling**

AEMO implements throttling on API calls. Throttling is set at 1200 requests per minute for WP.



# 4. WEM DER Register APIs

The WEM DER APIs can be split into two groups:

- WEM NMI APIs – allows you to add, update, and retrieve NMI details.
- WEM DER APIs – allows you to create, update, and retrieve DER records

## 4.1 WEM NMI APIs

### 4.1.1 Create NMI details

The nmi-details API allows you to create a new NMI record.

API	der-register/nmi-details
Method	POST
URL	https://partner.api.dev.aemo.com.au/wem/v1/der-register/nmi-details

#### Request payload

```
{
  "nmi": "string",
  "substation": "string",
  "postCode": "string",
  "tni": "string",
  "status": "string"
}
```

#### Successful response

```
{
  "transactionId": "<GUID>",
  "data": {}
}
```

#### Validation error response

```
{
  "transactionId": "<GUID>",
  "errors": [
    {
      "code": "<Error code>",
      "title": "<Error title>",
      "detail": "<Details of business validation error>",
      "source": ""
    }
  ]
}
```

### 4.1.2 Update NMI details

The nmi-details/<nmi> API allows you to update a NMI record.

API	der-register/nmi-details/<nmi>
Method	PUT
URL	https://partner.api.dev.aemo.com.au/wem/v1/der-register/nmi-details/<nmi>

#### Request payload

```
{
  "nmi": "string",
  "substation": "string",
  "postCode": "string",
  "tni": "string",
  "status": "string"
}
```

#### Successful response

```
{
  "transactionId": "<GUID>",
  "data": {}
}
```

#### Validation error response

```
{
  "transactionId": "<GUID>",
  "data": {},
  "errors": [
    {
      "code": "<Error code>",
      "title": "<Error title>",
      "detail": "<Details of business validation error>",
      "source": null
    }
  ]
}
```

### 4.1.3 Retrieve NMI details

Returns the current NMI details.

You cannot request previous NMI data versions.

API	der-register/nmi-details/<nmi>
Method	GET
URL	https://partner.api.dev.aemo.com.au/wem/v1/der-register/nmi-details/<nmi>

#### Request payload

None

#### Successful response

```
{
  "transactionId": "<GUID>",
  "data": {
    "nmi": "string",
    "substation": "string",
    "postCode": "string",
    "tni": "string",
    "status": "string",
    "recordCreationDate": "string:date-time",
    "recordUpdateDate": "string:date-time"
  }
}
```

#### Validation error response

```
{
  "transactionId": "<GUID>",
  "errors": [
    {
      "code": "<Error code>",
      "title": "<Error title>",
      "detail": "<Details of business validation error>",
      "source": ""
    }
  ]
}
```

## 4.2 WEM DERR APIs

### 4.2.1 Submit a DER installation record

Western Power can submit a single DER record data at any stage of the process. You can also use this API to

- Submit DER installation record
- Update an existing DER record
- Resolve exceptions

API	der-register/install
Method	POST
URL	https://partner.api.dev.aemo.com.au/v1/der-register/install

### Request payload

```
{
  "data":
  {
    "nmi": "string",
    "jobNumber": "string",
    "approvedCapacity": "number",
    "availablePhasesCount": "number",
    "installedPhasesCount": "number",
    "islandableInstallation": "string",
    "centralProtectionControl": "string",
    "exportLimitkva": "number",
    "underFrequencyProtection": "number",
    "underFrequencyProtectionDelay": "number",
    "overFrequencyProtection": "number",
    "overFrequencyProtectionDelay": "number",
    "underVoltageProtection": "number",
    "underVoltageProtectionDelay": "number",
    "overVoltageProtection": "number",
    "overVoltageProtectionDelay": "number",
    "sustainedOverVoltage": "number",
    "sustainedOverVoltageDelay": "number",
    "frequencyRateOfChange": "number",
    "voltageVectorShift": "number",
    "interTripScheme": "string",
    "neutralVoltageDisplacement": "number",
    "installerId": "string",
    "submitMode": "string",
    "comments": "string",
    "acConnections":
    [
      {

```

```

"connectionId": "number",
"nspConnectionId": "string",
"commissioningDate": "string",
"equipmentType": "string",
"count": "number",
"statusCode": "string",
"frequencyRateOfChange": "number",
"voltageVectorShift": "number",
"interTripScheme": "string",
"neutralVoltageDisplacement": "number",
"details":
{
  "dredInverterInteraction": "string",
  "serialNumbers": ["string"],
  "manufacturerName": "string",
  "modelName": "string",
  "inverterSeries": "string",
  "inverterStandard": "string",
  "inverterDeviceCapacity": "number",
  "sustainOpOvervoltLimit": "number",
  "stopAtOverFreq": "number",
  "stopAtUnderFreq": "number",
  "invVoltWattRespMode": "string",
  "invWattRespV1": "number",
  "invWattRespV2": "number",
  "invWattRespV3": "number",
  "invWattRespV4": "number",
  "invWattRespPAtV1": "number",
  "invWattRespPAtV2": "number",
  "invWattRespPAtV3": "number",
  "invWattRespPAtV4": "number",
  "invVoltVarRespMode": "string",
  "invVarRespV1": "number",
  "invVarRespV2": "number",
  "invVarRespV3": "number",
  "invVarRespV4": "number",
  "invVarRespQAtV1": "number",
  "invVarRespQAtV2": "number",
  "invVarRespQAtV3": "number",
  "invVarRespQAtV4": "number",
  "invReactivePowerMode": "string",
  "invFixReactivePower": "number",
  "fixPowerFactorMode": "string",
  "fixPowerFactor": "number",
  "fixPowerFactorQuad": "string",
  "powerRespMode": "string",
  "referencePointP1": "number",
  "referencePointP2": "number",
  "powerFactorAtP1": "number",
  "powerFactorQuadAtP1": "string",
  "powerFactorAtP2": "number",
  "powerFactorQuadAtP2": "string",
  "powerRateLimitMode": "string",
  "powerRampRate": "number",
  "reactivePowerRegulation": "string",
  "voltageSetPoint": "number",

```

```

        "voltageSetPointUnit": "string",
        "deadband": "number",
        "droop": "number",
        "baseForDroop": "number",
        "reactivePowerSourceLimit": "number",
        "reactivePowerSinkLimit": "number",
        "reactiveFixPowerFactor": "number",
        "reactiveFixPowerFactorQuad": "string",
        "generatorRampRate": "number",
        "powerRampGradient": "number",
        "frequencySensitiveMode": "string",
        "frequencyDeadband": "number",
        "frequencyDroop": "number"
    },
    "devices":
    [
        {
            "deviceId": "number",
            "nspDeviceId": "string",
            "type": "string",
            "subType": "string",
            "count": "number",
            "status": "string",
            "details":
            {
                "manufacturerName": "string",
                "modelName": "string",
                "nominalRatedCapacity": "number",
                "nominalStorageCapacity": "number"
            },
            "required": ["type", "status"]
        }
    ],
    "required": ["equipmentType", "devices", "statusCode"]
}
],
"exceptions":
[
    {
        "exceptionId": "number",
        "nspAcknowledged": "string"
    }
],
"required": ["nmi", "jobNumber", "approvedCapacity",
"availablePhasesCount", "installedPhasesCount", "islandableInstallation",
"centralProtectionControl", "acConnections"]
}
}

```

## Successful response

```

{
  "transactionId": "<GUID>",
  "data":
  {
    "nmi": "string",
    "jobNumber": "string",
    "recordUpdateDate": "string",
    "approvedCapacity": "number",
    "availablePhasesCount": "number",
    "installedPhasesCount": "number",
    "islandableInstallation": "string",
    "centralProtectionControl": "string",
    "exportLimitkva": "number",
    "underFrequencyProtection": "number",
    "underFrequencyProtectionDelay": "number",
    "overFrequencyProtection": "number",
    "overFrequencyProtectionDelay": "number",
    "underVoltageProtection": "number",
    "underVoltageProtectionDelay": "number",
    "overVoltageProtection": "number",
    "overVoltageProtectionDelay": "number",
    "sustainedOverVoltage": "number",
    "sustainedOverVoltageDelay": "number",
    "frequencyRateOfChange": "number",
    "voltageVectorShift": "number",
    "interTripScheme": "string",
    "neutralVoltageDisplacement": "number",
    "installerId": "string",
    "submitterId": "string",
    "submitterClass": "string",
    "submitMode": "string",
    "comments": "string",
    "acConnections":
    [
      {
        "connectionId": "number",
        "nspConnectionId": "string",
        "recordCreationDate": "string",
        "recordConfirmedDate": "string",
        "recordEndDate": "string",
        "commissioningDate": "string",
        "installationStage": "string",
        "equipmentType": "string",
        "cecConnectionId": "string",
        "count": "number",
        "statusCode": "string",
        "frequencyRateOfChange": "number",
        "voltageVectorShift": "number",
        "interTripScheme": "string",
        "neutralVoltageDisplacement": "number",
        "details":
        {
          "dredInverterInteraction": "string",
          "serialNumbers": ["string"],

```

```

"manufacturerOther": "boolean",
"manufacturerName": "string",
"modelOther": "boolean",
"modelName": "string",
"inverterSeriesOther": "boolean",
"inverterSeries": "string",
"inverterStandard": "string",
"inverterDeviceCapacity": "number",
"sustainOpOvervoltLimit": "number",
"stopAtOverFreq": "number",
"stopAtUnderFreq": "number",
"invVoltWattRespMode": "string",
"invWattRespV1": "number",
"invWattRespV2": "number",
"invWattRespV3": "number",
"invWattRespV4": "number",
"invWattRespPAtV1": "number",
"invWattRespPAtV2": "number",
"invWattRespPAtV3": "number",
"invWattRespPAtV4": "number",
"invVoltVarRespMode": "string",
"invVarRespV1": "number",
"invVarRespV2": "number",
"invVarRespV3": "number",
"invVarRespV4": "number",
"invVarRespQAtV1": "number",
"invVarRespQAtV2": "number",
"invVarRespQAtV3": "number",
"invVarRespQAtV4": "number",
"invReactivePowerMode": "string",
"invFixReactivePower": "number",
"fixPowerFactorMode": "string",
"fixPowerFactor": "number",
"fixPowerFactorQuad": "string",
"powerRespMode": "string",
"referencePointP1": "number",
"referencePointP2": "number",
"powerFactorAtP1": "number",
"powerFactorQuadAtP1": "string",
"powerFactorAtP2": "number",
"powerFactorQuadAtP2": "string",
"powerRateLimitMode": "string",
"powerRampRate": "number",
"reactivePowerRegulation": "string",
"voltageSetPoint": "number",
"voltageSetPointUnit": "string",
"deadband": "number",
"droop": "number",
"baseForDroop": "number",
"reactivePowerSourceLimit": "number",
"reactivePowerSinkLimit": "number",
"reactiveFixPowerFactor": "number",
"reactiveFixPowerFactorQuad": "string",
"generatorRampRate": "number",
"powerRampGradient": "number",
"frequencySensitiveMode": "string",

```



```

        "frequencyDeadband": "number",
        "frequencyDroop": "number"
    },
    "devices":
    [
        {
            "deviceId": "number",
            "nspDeviceId": "string",
            "recordCreationDate": "string",
            "recordCommissioningDate": "string",
            "recordConfirmedDate": "string",
            "recordEndDate": "string",
            "cecDeviceId": "string",
            "type": "string",
            "subType": "string",
            "count": "number",
            "status": "string",
            "installationStage": "string",
            "details":
            {
                "typeOther": "boolean",
                "subTypeOther": "boolean",
                "manufacturerOther": "boolean",
                "manufacturerName": "string",
                "modelOther": "boolean",
                "modelName": "string",
                "nominalRatedCapacity": "number",
                "nominalStorageCapacity": "number"
            }
        }
    ]
},
"exceptions":
[
    {
        "exceptionId": "number",
        "code": "number",
        "name": "string",
        "affectedAttributes": ["string"],
        "details": "string",
        "status": "string",
        "deviceId": "number",
        "connectionId": "number",
        "nspAcknowledged": "string"
    }
]
}
}

```

## Validation error response

```
{
  "transactionId": "<GUID>",
  "errors": [
    {
      "code": "<Error code>",
      "title": "<Error title>",
      "detail": "<Details of business validation error>",
      "source": ""
    }
  ]
}
```

## 4.2.2 Retrieve the latest DER record

The `getLatestInstalls` API allows you to get a single or multiple DER records along with their details based on the supplied filters. It uses an AND connector and returned data contains all the data for the specified NMI.

- The returned data is the latest version stored in DER Register
- A maximum of 2000 records can be returned.

You can pass multiple NMIs.

API	der-register/getLatestInstalls
Method	POST
URL	https://partner.api.dev.aemo.com.au/v1/der-register/getLatestInstalls

### Request payload

```
{
  "data": {
    "nmis": ["string"],
    "installerId": "string",
    "accessRequested": "boolean",
    "exceptionCodes": ["string"],
    "modifiedDateFrom": "string",
    "modifiedDateTo": "string",
    "submitterClass": "string",
    "acConnection":
    {
      "equipmentType": "string",
      "commissioningDateFrom": "string",
      "commissioningDateTo": "string",
      "status": "string",
      "installationStages": ["string"]
    },
    "device":
    {
      "types": ["string"],
      "status": "string",
      "installationStages": ["string"]
    }
  }
}
```

## Validation error response

```

{
  "transactionId": "<GUID>",
  "data":
  {
    "derRecords":
    [
      {
        "nmi": "string",
        "jobNumber": "string",
        "recordUpdateDate": "string",
        "approvedCapacity": "number",
        "availablePhasesCount": "number",
        "installedPhasesCount": "number",
        "islandableInstallation": "string",
        "centralProtectionControl": "string",
        "exportLimitkva": "number",
        "underFrequencyProtection": "number",
        "underFrequencyProtectionDelay": "number",
        "overFrequencyProtection": "number",
        "overFrequencyProtectionDelay": "number",
        "underVoltageProtection": "number",
        "underVoltageProtectionDelay": "number",
        "overVoltageProtection": "number",
        "overVoltageProtectionDelay": "number",
        "sustainedOverVoltage": "number",
        "sustainedOverVoltageDelay": "number",
        "frequencyRateOfChange": "number",
        "voltageVectorShift": "number",
        "interTripScheme": "string",
        "neutralVoltageDisplacement": "number",
        "installerId": "string",
        "submitterId": "string",
        "submitterClass": "string",
        "comments": "string",
        "acConnections":
        [
          {
            "connectionId": "number",
            "nspConnectionId": "string",
            "recordCreationDate": "string",
            "recordConfirmedDate": "string",
            "recordEndDate": "string",
            "commissioningDate": "string",
            "installationStage": "string",
            "equipmentType": "string",
            "cecConnectionId": "string",
            "count": "number",
            "statusCode": "string",
            "frequencyRateOfChange": "number",
            "voltageVectorShift": "number",
            "interTripScheme": "string",
            "neutralVoltageDisplacement": "number",
            "details":
            {

```

```

"dredInverterInteraction": "string",
"serialNumbers": ["string"],
"manufacturerOther": "boolean",
"manufacturerName": "string",
"modelOther": "boolean",
"modelName": "string",
"inverterSeriesOther": "boolean",
"inverterSeries": "string",
"inverterStandard": "string",
"inverterDeviceCapacity": "number",
"sustainOpOvervoltLimit": "number",
"stopAtOverFreq": "number",
"stopAtUnderFreq": "number",
"invVoltWattRespMode": "string",
"invWattRespV1": "number",
"invWattRespV2": "number",
"invWattRespV3": "number",
"invWattRespV4": "number",
"invWattRespPAtV1": "number",
"invWattRespPAtV2": "number",
"invWattRespPAtV3": "number",
"invWattRespPAtV4": "number",
"invVoltVarRespMode": "string",
"invVarRespV1": "number",
"invVarRespV2": "number",
"invVarRespV3": "number",
"invVarRespV4": "number",
"invVarRespQAtV1": "number",
"invVarRespQAtV2": "number",
"invVarRespQAtV3": "number",
"invVarRespQAtV4": "number",
"invReactivePowerMode": "string",
"invFixReactivePower": "number",
"fixPowerFactorMode": "string",
"fixPowerFactor": "number",
"fixPowerFactorQuad": "string",
"powerRespMode": "string",
"referencePointP1": "number",
"referencePointP2": "number",
"powerFactorAtP1": "number",
"powerFactorQuadAtP1": "string",
"powerFactorAtP2": "number",
"powerFactorQuadAtP2": "string",
"powerRateLimitMode": "string",
"powerRampRate": "number",
"reactivePowerRegulation": "string",
"voltageSetPoint": "number",
"voltageSetPointUnit": "string",
"deadband": "number",
"droop": "number",
"baseForDroop": "number",
"reactivePowerSourceLimit": "number",
"reactivePowerSinkLimit": "number",
"reactiveFixPowerFactor": "number",
"reactiveFixPowerFactorQuad": "string",
"generatorRampRate": "number",

```

```

        "powerRampGradient": "number",
        "frequencySensitiveMode": "string",
        "frequencyDeadband": "number",
        "frequencyDroop": "number"
    },
    "devices":
    [
        {
            "deviceId": "number",
            "nspDeviceId": "string",
            "recordCreationDate": "string",
            "recordCommissioningDate": "string",
            "recordConfirmedDate": "string",
            "recordEndDate": "string",
            "cecDeviceId": "string",
            "type": "string",
            "subType": "string",
            "count": "number",
            "status": "string",
            "installationStage": "string",
            "details":
            {
                "typeOther": "boolean",
                "subTypeOther": "boolean",
                "manufacturerOther": "boolean",
                "manufacturerName": "string",
                "modelOther": "boolean",
                "modelName": "string",
                "nominalRatedCapacity": "number",
                "nominalStorageCapacity": "number"
            }
        }
    ]
},
"exceptions":
[
    {
        "exceptionId": "number",
        "code": "number",
        "name": "string",
        "affectedAttributes": ["string"],
        "details": "string",
        "status": "string",
        "deviceId": "number",
        "connectionId": "number",
        "nspAcknowledged": "string"
    }
]
},
"warnings":
[
    {
        "code": "string",

```

```

        "title": "string",
        "detail": "string",
        "source": "string"
    }
]
}

```

### 4.2.3 Retrieve a DER record

The `getInstall` API allows you to get the historical versions of a single DER record. The response contains the current and up to four previous versions of the record.

The response payload contains AC connections and DER devices regardless of their status.

API	der-register/getInstall
Method	POST
URL	https://partner.api.dev.aemo.com.au/v1/der-register/getInstall

#### Request payload

```

{
  "data":
  {
    "derRecords":
    [
      {
        "nmi": "string",
        "jobNumber": "string",
        "required": ["nmi"]
      }
    ]
  }
}

```

#### Successful response

```

{
  "transactionId": "<GUID>",
  "data":
  {
    "derRecords":
    [
      {
        "nmi": "string",
        "jobNumber": "string",
        "recordUpdateDate": "string",
        "approvedCapacity": "number",
        "availablePhasesCount": "number",
        "installedPhasesCount": "number",

```

```

    "islandableInstallation": "string",
    "centralProtectionControl": "string",
    "exportLimitkva": "number",
    "underFrequencyProtection": "number",
    "underFrequencyProtectionDelay": "number",
    "overFrequencyProtection": "number",
    "overFrequencyProtectionDelay": "number",
    "underVoltageProtection": "number",
    "underVoltageProtectionDelay": "number",
    "overVoltageProtection": "number",
    "overVoltageProtectionDelay": "number",
    "sustainedOverVoltage": "number",
    "sustainedOverVoltageDelay": "number",
    "frequencyRateOfChange": "number",
    "voltageVectorShift": "number",
    "interTripScheme": "string",
    "neutralVoltageDisplacement": "number",
    "installerId": "string",
    "submitterId": "string",
    "submitterClass": "string",
    "submitMode": "string",
    "comments": "string",
    "acConnections":
    [
      {
        "connectionId": "number",
        "nspConnectionId": "string",
        "recordCreationDate": "string",
        "recordUpdateDate": "string",
        "recordConfirmedDate": "string",
        "recordEndDate": "string",
        "commissioningDate": "string",
        "installationStage": "string",
        "equipmentType": "string",
        "cecConnectionId": "string",
        "count": "number",
        "statusCode": "string",
        "frequencyRateOfChange": "number",
        "voltageVectorShift": "number",
        "interTripScheme": "string",
        "neutralVoltageDisplacement": "number",
        "details":
        {
          "dredInverterInteraction": "string",
          "serialNumbers": ["string"],
          "manufacturerOther": "boolean",
          "manufacturerName": "string",
          "modelOther": "boolean",
          "modelName": "string",
          "inverterSeriesOther": "boolean",
          "inverterSeries": "string",
          "inverterStandard": "string",
          "inverterDeviceCapacity": "number",
          "sustainOpOvervoltLimit": "number",
          "stopAtOverFreq": "number",
          "stopAtUnderFreq": "number",

```



```

"invVoltWattRespMode": "string",
"invWattRespV1": "number",
"invWattRespV2": "number",
"invWattRespV3": "number",
"invWattRespV4": "number",
"invWattRespPAtV1": "number",
"invWattRespPAtV2": "number",
"invWattRespPAtV3": "number",
"invWattRespPAtV4": "number",
"invVoltVarRespMode": "string",
"invVarRespV1": "number",
"invVarRespV2": "number",
"invVarRespV3": "number",
"invVarRespV4": "number",
"invVarRespQAtV1": "number",
"invVarRespQAtV2": "number",
"invVarRespQAtV3": "number",
"invVarRespQAtV4": "number",
"invReactivePowerMode": "string",
"invFixReactivePower": "number",
"fixPowerFactorMode": "string",
"fixPowerFactor": "number",
"fixPowerFactorQuad": "string",
"powerRespMode": "string",
"referencePointP1": "number",
"referencePointP2": "number",
"powerFactorAtP1": "number",
"powerFactorQuadAtP1": "string",
"powerFactorAtP2": "number",
"powerFactorQuadAtP2": "string",
"powerRateLimitMode": "string",
"powerRampRate": "number",
"reactivePowerRegulation": "string",
"voltageSetPoint": "number",
"voltageSetPointUnit": "string",
"deadband": "number",
"droop": "number",
"baseForDroop": "number",
"reactivePowerSourceLimit": "number",
"reactivePowerSinkLimit": "number",
"reactiveFixPowerFactor": "number",
"reactiveFixPowerFactorQuad": "string",
"generatorRampRate": "number",
"powerRampGradient": "number",
"frequencySensitiveMode": "string",
"frequencyDeadband": "number",
"frequencyDroop": "number"
},
"devices":
[
{
"deviceId": "number",
"nspDeviceId": "string",
"recordCreationDate": "string",
"recordCommissioningDate": "string",
"recordUpdateDate": "string",

```

```

        "recordConfirmedDate": "string",
        "recordEndDate": "string",
        "cecDeviceId": "string",
        "type": "string",
        "subType": "string",
        "count": "number",
        "status": "string",
        "installationStage": "string",
        "details":
        {
            "typeOther": "boolean",
            "subTypeOther": "boolean",
            "manufacturerOther": "boolean",
            "manufacturerName": "string",
            "modelOther": "boolean",
            "modelName": "string",
            "nominalRatedCapacity": "number",
            "nominalStorageCapacity": "number"
        }
    ]
}
},
"exceptions":
[
    {
        "exceptionId": "number",
        "code": "number",
        "name": "string",
        "affectedAttributes": ["string"],
        "details": "string",
        "status": "string",
        "deviceId": "number",
        "connectionId": "number",
        "nspAcknowledged": "string"
    }
]
}
],
"warnings":
[
    {
        "code": "string",
        "title": "string",
        "detail": "string",
        "source": "string"
    }
]
}

```

#### 4.2.4 Request an access token

The token API authenticates and if successful, returns the access token and its expiry time in seconds.

API	der-register/token
Method	POST
URL	https://api.dev.aemo.com.au/oauth/v1/token
Header	Include the following information in the header: Authorization = Basic Base64 encoding of the client ID and the secret, concatenated with a colon.
Query parameter	grant_type = client_credentials

#### Request payload

None

#### Successful response

```
{
  "transactionId": "<GUID>",
  "access_token": "string",
  "expires_in": "number"
}
```

# 5. Appendix: Validation Rules

## 5.1 First validation for DER pre-submission

Business Rules	Impacted Field(s)-	Exception Code
Job number must be unique for an NMI and for the NSP that sent it Job number must not have been submitted before for a different NMI by the same NSP	jobNumber	1000
NMI must exist	nmi	1010
NMI must not be extinct	nmi	1011
NSP must currently hold the LNSP role for this NMI	nmi	1012
Content must be in the correct format	All	1020
All mandatory fields are completed	Mandatory Fields	1021
NMI must have at least one AC Connection linked to it	N/A	1030
Each AC Connection with status of null or Active must have at least one device linked to it	N/A	1031
Each Device must have an AC Connection linked to it	N/A	1032
If there is an existing Confirmed AC Connection or DER Device and status = Active, it must be included in every submission, that is Confirmed AC Connections or DER Devices cannot be removed If Confirmed DER Record is decommissioned, status changes to Decommissioned and must be submitted.	N/A	1040

Business Rules	Impacted Field(s)-	Exception Code
<p>If there is an existing Confirmed AC Connection or DER Device and status = Active, it must be included in every submission, i.e. Conditional DER Records cannot be removed</p> <p>If Conditional DER Record is decommissioned, status changes to Decommissioned and must be submitted</p>	N/A	1041
AC Connection ID must be null or generated previously by AEMO	connectionId	1050
DER Device ID must be null or generated previously by AEMO	deviceId	1051
AC Connection status must be Active or Decommissioned if commissioning date is in the present or in the past	statusCode	1061
Device Status must be Decommissioned if the AC Connection linked to it has status of Decommissioned	Device Status	1063
Number values must be within the permitted range. For more information, see Appendix: API Parameter Details	number fields	1070
Device Type must be Solar, Storage, or Wind if the AC Connection linked to it = Inverter	type	1080
Device Type must be NOT Solar, Storage, or Wind if the AC Connection linked to it = Other	type	1081
The count of submitted Serial numbers for an AC Connection must equal the number of AC Connections	serialNumbers	1090

Business Rules	Impacted Field(s)-	Exception Code
<p>Each ACTIVE AC Connection must have the number of AC Connections equal to or less than total of the number of DER Devices that are linked to it, i.e.</p> <p>number of AC Connections &lt;= SUM {number of Devices 1 + number of Devices 2 ... + number of Devices n}</p> <p>Where n is the number of Devices or group of DER Devices connected to that AC Connection</p> <p>This validation is only applicable if AC equipmentType = Inverter</p>	count	1110
<p>If AC equipmentType = Other, then the number of AC Connections must equal to number of DER Devices linked to it</p>	count	1111

Business Rules	Impacted Field(s)-	Exception Code
One of Protection and Control Modes attributes must be submitted	The following Level 1 (NMI Level) fields: exportLimitkva underFrequencyProtection underFrequencyProtectionDelay overFrequencyProtection overFrequencyProtectionDelay underVoltageProtection underVoltageProtectionDelay overVoltageProtection overVoltageProtectionDelay sustainedOverVoltage sustainedOverVoltageDelay frequencyRateOfChange voltageVectorShift interTripScheme neutralVoltageDisplacement	1120
Reactive power mode MUST be Not Enabled if any of Voltage response modes are Enabled	invReactivePowerMode	1121
Fixed power factor mode MUST be Not Enabled if any of Voltage response modes are Enabled	fixPowerFactorMode	1122
Power factor curve/power response mode MUST be Not Enabled if any of Voltage response modes are Enabled	powerRespMode	1123
If export limit is specified, it must be equal or smaller than approved capacity	exportLimitkva	1130

Business Rules	Impacted Field(s)-	Exception Code
If Voltage set point unit is %, then Voltage set point must NOT be more than 100	voltageSetPoint	1140
If device type equals Solar PV then nominalRatedCapacity must be less than 10 kVA .	nominatedRatedCapacity	1070
The value entered for nominalStorageCapacity must be less than or equal to 1,000 kWh	nominatedStorageCapacity	1070

## 5.2 Second validation for DER pre-submission

Business Rules	Impacted Field(s)-	Exception Code	Comments
Required only if relevant fields are not submitted	Optional Attributes	2023	Fields which are Required when relevant fields are not provided.
If no export limit is specified, approved capacity must be equal or bigger than AC Connection installed Capacity	approvedCapacity	2040	AC Connection Installed capacity is a calculated value. It represents what is the total capacity physically installed at site. Exceptions generated due to this validation rule cannot be acknowledged. All AC Connections and DER Devices that were newly added will be Conditional.



# 6. Appendix: API Parameter Details

## 6.1 Fields in DER installation submission payload.

Field	Type	Permitted values	Description and comments
<b>DER Installation</b>			
<b>nmi</b>	string(10)		Unique identifier for each connection point where DER installation has been installed/approved.
<b>jobNumber</b>	string(30)	Specified by WP.	Unique identifier associated with WP's connection offer/agreement for the approved DER works.
<b>approvedCapacity</b>	number(8,3)	$0 \leq \text{value} \leq 10,000$	Approved small generating unit capacity as agreed with WP in the connection agreement, expressed in kVA. Can be distinct or equal to an export limitation.
<b>availablePhasesCount</b>	number(1)	1, 2, 3	The number of phases available for the installation of DER.
<b>installedPhasesCount</b>	number(1)	1, 2, 3	The number of phases that DER is connected to.
<b>islandableInstallation</b>	string(3)	Yes, No	Identifies small generating units designed with the ability to operate in an islanded mode.
<b>centralProtectionControl</b>	string(3)	Yes, No	For DER installations where WP specify the need for additional forms of protection above those inbuilt in an inverter. Describes the type(s) of central protection to be applied to the DER system.

Field	Type	Permitted values	Description and comments
<b>exportLimitkva</b>	number(8,3)	$0 \leq \text{value} \leq 10,000$ A null value indicates no limit.	Maximum amount of power (kVA) that may be exported from a connection point to the grid, as monitored by a control / relay function.
<b>underFrequencyProtection</b>	number(4,2)	$45 \leq \text{value} \leq 50$	Under frequency protection in Hz. Described in AS4777.1:2016 Table 2.
<b>underFrequencyProtectionDelay</b>	number(4,3)	$0 \leq \text{value} \leq 50$	Under frequency protection delay in seconds.
<b>overFrequencyProtection</b>	number(4,2)	$0 \leq \text{value} \leq 9.999$	Over frequency protection in Hz Described in AS4777.1:2016 Table 2.
<b>overFrequencyProtectionDelay</b>	number(4,3)	$50 \leq \text{value} \leq 55$	Over frequency protection delay in seconds
<b>underVoltageProtection</b>	number(9,3)	$0 \leq \text{value} \leq 999999.999$	Under voltage protection in volts (V)
<b>underVoltageProtectionDelay</b>	number(4,3)	$0 \leq \text{value} \leq 9999.999$	Under voltage protection delay in seconds
<b>overVoltageProtection</b>	number(9,3)	$0 \leq \text{value} \leq 999999.999$	Over voltage protection in volts (V)
<b>overVoltageProtectionDelay</b>	number(4,3)	$0 \leq \text{value} \leq 9999.999$	Over voltage protection delay in seconds
<b>sustainedOverVoltage</b>	number(9,3)	$0 \leq \text{value} \leq 999999.999$	Sustained Over voltage protection in volts (V)
<b>sustainedOverVoltageDelay</b>	number(5,3)	$10 \leq \text{value} \leq 20$	Sustained Over voltage protection delay in seconds.
<b>frequencyRateOfChange</b>	number(4,3)	$0 \leq \text{value} \leq 4$	Rate of change of frequency trip point (Hz/s).

Field	Type	Permitted values	Description and comments
<b>voltageVectorShift</b>	number(4,2)	0 ≤ value ≤ 99.99	Trip angle (Deg.)
<b>interTripScheme</b>	string(100)		Description of the form of inter-trip (e.g. from local substation).
<b>neutralVoltageDisplacement</b>	number(7,3)	0 ≤ value ≤ 9999.999	Trip voltage (V)
<b>installerId</b>	string(50)		Unique identifier for the DER Account-holder accountable for the installation, modification or removal of the small generating unit in accordance with this NMI and Connection Agreement job number. This identifier is the Account-holder's unique qualification number (e.g. electrical tradespersons licence or similar accreditation number).
<b>submitMode</b>	varchar(6)	Null, Submit	This attribute is NOT applicable to WP.
<b>Comments</b>	string(2000)		Comments to help with DER Submission. WP can add notes for the Connection process. These comments for WP internal use only.
<b>connectionId</b>	number(15)	Null, or an existing connectionId that has been previously generated by AEMO's system.	Unique identifier for each AC Connection or Group in a DER installation. This is system-generated by AEMO. It is Null when the record is set up and before there is a connection; when the connection is set up AEMO generates a connectionId and populates the field.
<b>nspConnectionId</b>	string(50)	Must be null if NSP chooses not to use this field	An AC Connection identifier used by WP internally, WP can use this field to link their internal ID with AEMO's generated connectionId.

Field	Type	Permitted values	Description and comments
<b>commissioningDate</b>	string (yyyy-mm-dd)		The date that an AC Connection becomes Active. This date and AC Connection RecordConfirmedDate are needed to monitor / manage obligation on timeframe to complete submission of record. Commissioning date can be in the past, current or the future.
<b>equipmentType</b>	string(20)	Inverter, Other	Indicates whether the DER device is connected via an inverter (and what category of inverter it is) or not (e.g. rotating machine).
<b>count</b>	number(5)	1 <= value <= 999	Number of AC Connections in the group. For the suite of AC Connections to be considered as a group , all AC Connections included must have the same attributes.
<b>statusCode</b>	string(20)	Active, Decommissioned	Code used to indicate the status of the AC Connection. This will be used to identify if an AC Connection is active or decommissioned. This status will also track commissioning and decommissioning date. When a new record is inserted in the database, the installation date/ start date is defined by the user and may be backdated. This status is only applicable on AC Connections. <b>Note:</b> This is not a duplicate of the NMI level status, as inverters may become active without a change of status to the overall system. Active: an AC Connection record that is physically installed and operating. Decommissioned: an AC Connection that used to operate, and it is NOT operating any more.
<b>frequencyRateOfChange</b>	number(4,3)	0 ≤ value ≤ 4	Rate of change of frequency (Hz/s)
<b>voltageVectorShift</b>	number(4,2)	0 ≤ value ≤ 99.99	Trip angle (Deg.)

Field	Type	Permitted values	Description and comments
<b>interTripScheme</b>	string(100)		Description of the form of inter-trip (e.g. from local substation).
<b>neutralVoltageDisplacement</b>	number(7,3)	$0 \leq \text{value} \leq 9999.999$	Trip voltage (V)
<b>dredInverterInteraction</b>	string(3)	Yes, No	Applies if equipmentType = inverter
<b>serialNumbers</b>	string(array)		<p>The serial number of the device(s)</p> <p>If the equipment type = Inverter, the number of Serial Numbers (where entered) required must match the number of AC Connections.</p> <p>For example, if count = 3, then serialNumbers (where entered) must = 3.</p> <p>- For WP APIs, serialNumbers can be NULL..</p> <p>The maximum number of serial numbers permissible is 999.</p>
<b>manufacturerName</b>	string(120)		<p>Applies if equipmentType = inverter</p> <p>The name of the inverter manufacturer</p>
<b>modelName</b>	string(120)		<p>Applies if equipmentType = inverter</p> <p>The model number of the inverter.</p>
<b>inverterSeries</b>	string(50)		<p>Applies if equipmentType = inverter</p> <p>The inverter series.</p>
<b>inverterStandard</b>	string(150)		<p>Applies if equipmentType = inverter</p> <p>What standard/s is the inverter manufactured, tested and installed to?</p> <p>Examples include AS4777.2:2015, IEC 62109-1 and IEC 62019-2.</p>

Field	Type	Permitted values	Description and comments
<b>inverterDeviceCapacity</b>	number(9,3)	$0 \leq \text{value} \leq 1000$	Applies if equipmentType = inverter The rated AC output power that is listed in the product specified by the manufacturer. This value refers to a single device.
<b>sustainOpOvervoltLimit</b>	number(7,3)	$244 \leq \text{value} \leq 258$	Applies if equipmentType = inverter Indicates the sustained operation overvoltage limit, when the average voltage for a 10-minute period exceeds the $V_{\text{nom-max}}$ . This setting is described in AS4777.2:2015, section 7.5.2. The unit is in (V)
<b>stopAtOverFreq</b>	number(4,2)	$51 \leq \text{value} \leq 52$	Applies if equipmentType = inverter Frequency (stop) In Hz. This setting is described in AS4777.2:2015, section 7.5.3.
<b>stopAtUnderFreq</b>	number(4,2)	$47 \leq \text{value} \leq 49$	Applies if equipmentType = inverter Frequency (stop) In Hz. This mode is described in AS4777.2:2015, section 7.5.3.
<b>invVoltWattRespMode</b>	string(15)	Enabled, Not Enabled	Applies if equipmentType = inverter. This mode and below set points are described in AS4777.2:2015, section 6.3.2.2.
<b>invWattRespV1</b>	number(7,3)	$200 \leq \text{value} \leq 300$	Applies if invVoltWattRespMode = Enabled. Unit is in (V) See AS4777.2:2015, section 6.3.2.2.

Field	Type	Permitted values	Description and comments
<b>invWattRespV</b>	number(7,3)	$216 \leq \text{value} \leq 230$	Applies if invVoltWattRespMode = Enabled. Unit is in (V). See AS4777.2:2015, section 6.3.2.2.
<b>invWattRespV3</b>	number(7,3)	$235 \leq \text{value} \leq 255$	Applies if invVoltWattRespMode = Enabled. Unit is in (V). See AS4777.2:2015, section 6.3.2.2.
<b>invWattRespV4</b>	number(7,3)	$245 \leq \text{value} \leq 265$	Applies if invVoltWattRespMode = Enabled. Unit is in (V). See AS4777.2:2015, section 6.3.2.2.
<b>invWattRespPAAtV1</b>	number(6,3)	$0 \leq \text{value} \leq 100$	Applies if invVoltWattRespMode = Enabled. Unit is in (%) See AS4777.2:2015, section 6.3.2.2.
<b>invWattRespPAAtV2</b>	number(6,3)	$0 \leq \text{value} \leq 100$	Applies if invVoltWattRespMode = Enabled. Unit is in (%) See AS4777.2:2015, section 6.3.2.2.
<b>invWattRespPAAtV3</b>	number(6,3)	$0 \leq \text{value} \leq 100$	Applies if invVoltWattRespMode = Enabled. Unit is in (%) See AS4777.2:2015, section 6.3.2.2.
<b>invWattRespPAAtV4</b>	number(6,3)	$0 \leq \text{value} \leq 20$	Applies if invVoltWattRespMode = Enabled. Unit is in (%) See AS4777.2:2015, section 6.3.2.2.

Field	Type	Permitted values	Description and comments
<b>invVoltVarRespMode</b>	string(15)	Enabled, Not Enabled	Applies if equipmentType = inverter. This mode and below set points are described in AS4777.2:2015, section 6.3.2.3.
<b>invVarRespV1</b>	number(7,3)	$200 \leq \text{value} \leq 300$	Applies if invVoltVarRespMode = Enabled. Unit is in (V) See AS4777.2:2015, section 6.3.2.3.
<b>invVarRespV2</b>	number(7,3)	$200 \leq \text{value} \leq 300$	Applies if invVoltVarRespMode = Enabled. Unit is in (V) See AS4777.2:2015, section 6.3.2.3.
<b>invVarRespV3</b>	number(7,3)	$200 \leq \text{value} \leq 300$	Applies if invVoltVarRespMode = Enabled. Unit is in (V) See AS4777.2:2015, section 6.3.2.3.
<b>invVarRespV4</b>	number(7,3)	$200 \leq \text{value} \leq 300$	Applies if invVoltVarRespMode = Enabled. Unit is in (V). See AS4777.2:2015, section 6.3.2.3.
<b>invVarRespQAtV1</b>	number(6,3)	$0 \leq \text{value} \leq 60$	Applies if invVoltVarRespMode = Enabled. Unit is in (%) See AS4777.2:2015, section 6.3.2.3.



Field	Type	Permitted values	Description and comments
<b>invVarRespQAtV2</b>	number(6,3)	$-100 \leq \text{value} \leq 100$	Applies if invVoltVarRespMode = Enabled. Unit is in (%) -ve sign refers to sink See AS4777.2:2015, section 6.3.2.3.
<b>invVarRespQAtV3</b>	number(6,3)	$-100 \leq \text{value} \leq 100$	Applies if invVoltVarRespMode = Enabled. Unit is in (%) -ve sign refers to sink See AS4777.2:2015, section 6.3.2.3.
<b>invVarRespQAtV4</b>	number(6,3)	$-60 \leq \text{value} \leq 0$	Applies if invVoltVarRespMode = Enabled. Unit is in (%) -ve sign refers to sink. See AS4777.2:2015, section 6.3.2.3.
<b>invReactivePowerMode</b>	string(15)	Enabled, Not Enabled	Applies if equipmentType = inverter. Select which power quality response modes are enabled on the inverter. It should equal to Not Enabled, if InvVoltVarRespMode or/and InvVoltWattRespMode = Enabled. This mode and below set points are described in AS4777.2:2015, section 6.3.3.

Field	Type	Permitted values	Description and comments
<b>invFixReactivePower</b>	number(6,3)	$-100 \leq \text{value} \leq 100$	<p>Applies if invReactivePowerMode = Enabled.</p> <p>Reactive Power. Specified in % output of the system.</p> <p>-ve sign refers to sink</p> <p>This mode and below set points are described in AS4777.2:2015, section 6.3.3.</p>
<b>fixPowerFactorMode</b>	string(15)	Enabled, Not Enabled	<p>Applies if equipmentType = inverter.</p> <p>Select which power quality response modes are enabled on the inverter.</p> <p>It should equal to Not Enabled, if InvVoltVarRespMode or/and InvVoltWattRespMode = Enabled.</p>
<b>fixPowerFactor</b>	number(4,3)	$0.8 \leq \text{value} \leq 1$	Applies if fixPowerFactorMode = Enabled
<b>fixPowerFactorQuad</b>	string(10)	Source, Sink	Applies if fixPowerFactorMode = Enabled
<b>powerRespMode</b>	string(15)	Enabled, Not Enabled	<p>Applies if equipmentType = inverter,</p> <p>Select which power quality response modes are enabled on the inverter.</p> <p>It should = Not Enabled, if InvVoltVarRespMode or/and InvVoltWattRespMode = Enabled.</p> <p>This mode and below set points are described in AS4777.2:2015, section 6.3.4.</p>
<b>referencePointP1</b>	number(6,3)	$0 \leq \text{value} \leq 100$	<p>Applies if powerRespMode = Enabled</p> <p>Unit is in (%)</p> <p>These settings are described in AS4777.2:2015, section 6.3.2.1.</p> <p>The curve is described in AS4777.2:2015, section 6.3.4. Needs to be defined by WP and provided to installers.</p>

Field	Type	Permitted values	Description and comments
<b>referencePointP2</b>	number(6,3)	$0 \leq \text{value} \leq 100$	<p>Applies if powerRespMode = Enabled</p> <p>Unit is in (%)</p> <p>These settings are described in AS4777.2:2015, section 6.3.2.1.</p> <p>The curve is described in AS4777.2:2015, section 6.3.4. Needs to be defined by WP and provided to installers.</p>
<b>powerFactorAtP1</b>	number(4,3)	$0.9 \leq \text{value} \leq 1$	<p>Applies if powerRespMode = Enabled</p> <p>These settings are described in AS4777.2:2015, section 6.3.2.1.</p> <p>The curve is described in AS4777.2:2015, section 6.3.4. Needs to be defined by WP and provided to installers.</p>
<b>powerFactorQuadAtP1</b>	string(10)	Source, Sink	<p>Applies if powerRespMode = Enabled</p> <p>These settings are described in AS4777.2:2015, section 6.3.2.1.</p> <p>The curve is described in AS4777.2:2015, section 6.3.4. Needs to be defined by WP and provided to installers.</p>
<b>powerFactorAtP2</b>	number(4,3)	$0.9 \leq \text{value} \leq 1$	<p>Applies if powerRespMode = Enabled</p> <p>These settings are described in AS4777.2:2015, section 6.3.2.1.</p> <p>The curve is described in AS4777.2:2015, section 6.3.4. Needs to be defined by WP and provided to installers.</p>
<b>powerFactorQuadAtP2</b>	string(10)	Source, Sink	<p>Applies if powerRespMode = Enabled</p> <p>These settings are described in AS4777.2:2015, section 6.3.2.1.</p> <p>The curve is described in AS4777.2:2015, section 6.3.4. Needs to be defined by WP and provided to installers.</p>

Field	Type	Permitted values	Description and comments
<b>powerRateLimitMode</b>	string(15)	Enabled, Not Enabled	Applies if equipmentType = inverter Select which power quality response modes are enabled on the inverter. This mode is described in AS4777.2:2015, section 6.3.5.3.3.
<b>powerRampRate</b>	number(6,3)	As described in AS4777.2:2015, section 6.3.5.1. $5 \leq \text{value} \leq 100$	Applies if powerRateLimitMode = Enabled. Unit is $W_{Gra}$ , The power rate limit range shall be adjustable in the range of 5 - 100 of rated power per minute
<b>reactivePowerRegulation</b>	string(20)	None, Voltage droop, Fixed power factor	Applies if equipmentType = other
<b>voltageSetPoint</b>	number(9,3)	$0 \leq \text{value} \leq 999999.99$	Applies if reactivePowerRegulation = Voltage droop. The voltage set point Units can be in either % or V
<b>voltageSetPointUnit</b>	string(1)	% V	Applies if reactivePowerRegulation = Voltage droop. The unit for VoltageSetPoint
<b>deadband</b>	number(6,3)	$0 \leq \text{value} \leq 100$	Applies if reactivePowerRegulation = Voltage droop. $\pm x\%$
<b>droop</b>	number(5,3)	$0 \leq \text{value} \leq 99.999$	In % Applies if reactivePowerRegulation = Voltage droop.
<b>baseForDroop</b>	number(8,3)	$0 \leq \text{value} \leq 999999.99$	Applies if reactivePowerRegulation = Voltage droop. In kVA

Field	Type	Permitted values	Description and comments
<b>reactivePowerSourceLimit</b>	number(8,3)	$0 \leq \text{value} \leq 999999.99$	Applies if reactivePowerRegulation = Voltage droop. kVAr
<b>reactivePowerSinkLimit</b>	number(8,3)	$0 \leq \text{value} \leq 999999.99$	Applies if reactivePowerRegulation = Voltage droop. kVAr
<b>reactiveFixPowerFactor</b>	number(4,3)	$0 \leq \text{value} \leq 1$	Applies if reactivePowerRegulation = Fixed power factor.
<b>reactiveFixPowerFactorQuad</b>	string(10)	Source, Sink	Applies if reactivePowerRegulation = Fixed power factor.
<b>generatorRampRate</b>	string(15)	Enabled, Not Enabled	Applies if equipmentType = other. A generator may have a ramp rate applied.
<b>powerRampGradient</b>	number(6,3)		Applies if generatorRampRate = Enabled Power ramp rate (%/min)
<b>frequencySensitiveMode</b>	string(15)	Enabled, Not Enabled	Applies if equipmentType = other A generator may operate in a frequency sensitive mode whereby it adjusts output to help support frequency control. A generator may have a ramp rate applied.
<b>frequencyDeadband</b>	number(6,3)	$0 \leq \text{value} \leq 999.99$	Applies if frequencySensitiveMode = Enabled In Hz
<b>frequencyDroop</b>	number(4,2)	$0 \leq \text{value} \leq 99.99$	Applies if frequencySensitiveMode = Enabled In %

Field	Type	Permitted values	Description and comments
<b>devices</b>			
<b>deviceld</b>	number(15)	Null an existing deviceld that has been previously generated by AEMO's system.	Unique identifier for a single DER device or a group of DER devices with the same attributes. AEMO's system will reject submission if deviceld is none of the above. Null shall be used in the event of adding a new record Existing deviceld is required to update an existing record
<b>nspDeviceld</b>	string(50)		A DER Device identifier that is used by WP internally. This is provided to assist participants with linking their internal ID with AEMO's generated deviceld
<b>type</b>	string(50)	<ul style="list-style-type: none"> <li>- Co-/Tri-generation</li> <li>- Fossil</li> <li>- Geothermal</li> <li>- Hydro</li> <li>- Renewable/Biomass/Waste</li> <li>- Solar PV</li> <li>- Storage</li> <li>- Wind</li> <li>- Other</li> </ul>	Used to indicate the primary technology used in the DER device. Other is only applicable in the DER web portal where selecting Other will request the user to specify, and the value entered would be recorded. Note: Using API, it is acceptable to submit a device type that is not in the list. There is no validation applied on this.

Field	Type	Permitted values	Description and comments
<b>subType</b>	string(50)	<p>If Type = Solar PV, the expected value is one of the following:</p> <ul style="list-style-type: none"> <li>- Monocrystalline</li> <li>- Polycrystalline</li> <li>- Crystalline</li> <li>- Thin-film</li> <li>- Concentrating PV</li> <li>- Silicon</li> <li>- Biohybrid</li> <li>- Cadmium telluride</li> <li>- Other</li> </ul> <p>If Type = Storage, the expected value is one of the following:</p> <ul style="list-style-type: none"> <li>- Lithium-ion</li> <li>- Lead acid</li> <li>- Lead carbon</li> <li>- Sodium nickel</li> <li>- Lead crystal</li> <li>- Absorbed glass matt</li> <li>- Vanadium</li> <li>- Aqueous hybrid ion</li> <li>- Tubular gel</li> <li>- Zinc bromide</li> <li>- Electric Vehicle</li> <li>- Other</li> </ul>	<p>Used to indicate the primary technology used in the DER device.</p> <p>This field is also used to record for example the battery chemistry, or the type of PV panel. It is also used to record if a battery is contained in an electric vehicle connected in a vehicle-to-grid arrangement.</p> <p>Other is only applicable in the web portal where selecting Other will request the user to specify, and the value entered would be recorded.</p> <p>Using API, it is acceptable to submit a device sub-type that is not in the list. There is no validation applied on this.</p>
<b>count</b>	number(5)	1 < value <= 999	Number of devices in the group of DER devices.

Field	Type	Permitted values	Description and comments
<b>status</b>	string(20)	Active, Decommissioned	<p>Code used to indicate the status of the DER Device. This will be used to identify if a Device is active or decommissioned.</p> <p>This status will also track commissioning and decommissioning date. When a new record is inserted in the database, the installation date/ start date is defined by the user and may be backdated.</p> <p>This status is only applicable on DER Device. This is not a duplicate of the NMI level status, as Devices may become active without a change of status to the overall system.</p> <p>Active: an DER Device record that is physically installed and operating Decommissioned: an DER Device that used to operate, and it is NOT operating any more.</p>
<b>manufacturerName</b>	string(120)		The name of the device manufacturer
<b>modelName</b>	string(120)		The model number of the device.
<b>nominalRatedCapacity</b>	number(8,3)	$0 \leq \text{value} \leq 10$	Maximum output in kVA that is listed in the product specification by the manufacturer. This refers to the capacity of each unit within the device group.
<b>nominalStorageCapacity</b>	number(9,3)	$0 \leq \text{value} \leq 1,000$	<p>Applies if type = Storage</p> <p>Maximum storage capacity in kWh. This refers to the capacity of each storage module within the device group.</p>



Field	Type	Permitted values	Description and comments
<b>exceptions</b>			
<b>exceptionId</b>	number	Null an existing exceptionId that was previously generated by AEMO	A unique identification for an exception generated when business validation fails This value is integer and System generated. This Id will be generated by AEMO upon a submission that fails business validation If the exceptionId was not generated by AEMO, the system will reject the submission.
<b>nspAcknowledged</b>	string(3)	- Yes - No	Not applicable for WP.

## 6.2 Fields in DER Installation response payloads.

Field	Type	Description and comments
<b>DER Installation</b>		
<b>recordUpdateDate</b>	string(YYYY-MM-DDTHH:mm:ss.sssZ)	The date when DER Record was updated. AEMO will store a history of all versions changes and it can be tracked via this date. A new version is generated every time a new submission or update happens
<b>ACconnections</b>		
<b>recordCreationDate</b>	string(YYYY-MM-DDTHH:mm:ss.sssZ)	The date when AC Connection record was created. System generated and it is the date that the AC Connection gets submitted for the first time

Field	Type	Description and comments
<b>recordConfirmedDate</b>	string(YYYY-MM-DDTHH:mm:ss.sssZ)	The date when AC Connection record becomes Confirmed for the first time System generated. This date in combination with AC Connection commissioning date are needed to monitor / manage obligation on timeframe to complete submission of record
<b>recordEndDate</b>	string(YYYY-MM-DDTHH:mm:ss.sssZ)	The date when AC Connection record ends or becomes decommissioned System generated If DER Record is Conditional or Confirmed and it is decommissioned, this date will capture the decommissioning date
<b>commissioningDate</b>	string(YYYY-MM-DD)	
<b>installationStage</b>	string(11)	
<b>cecConnectionId</b>	string(30)	
<b>manufacturerOther</b>	boolean	This is used to indicate if the Manufacturer is in the CEC accreditation list (match is not case sensitive)
<b>modelOther</b>	boolean	This is used to indicate if a model number is in the CEC accreditation list (match is not case sensitive)
<b>inverterSeriesOther</b>	boolean	This is used to indicate if an inverter series is in the CEC accreditation list (match is not case sensitive)
<b>Devices</b>		
<b>recordCreationDate</b>	string(YYYY-MM-DDTHH:mm:ss.sssZ)	The date when DER Device record was created.

Field	Type	Description and comments
<b>recordCommissioningDate</b>	string(YYYY-MM-DDTHH:mm:ss.sssZ)	<p>The date when DER Device record became active. This will either equal to:</p> <ul style="list-style-type: none"> <li>Commissioning date of the AC Connection linked to it, if they were created on the same date; OTHERWISE</li> <li>The date that the DER Device status becomes Active</li> </ul> <p>recordCommissioningDate can be in the past, or present</p>
<b>recordConfirmedDate</b>	string(YYYY-MM-DDTHH:mm:ss.sssZ)	<p>The date when DER Device record became Confirmed for the first time System generated.</p> <p>This date in combination with Device recordCommissioningDate are needed to monitor / manage obligation on timeframe to complete submission of record.</p>
<b>recordEndDate</b>	string(YYYY-MM-DDTHH:mm:ss.sssZ)	<p>The date when DER Device record ends/decommissioned System generated</p> <p>If DER Record is Conditional or Confirmed and it is decommissioned, this date will capture the decommissioning date</p>
<b>cecDeviceId</b>	string(30)	<p>Unique device identifier to store CEC Device reference data</p> <p>This ID shall be returned if the submitted device is accredited</p>
<b>installationStage</b>	string(11)	<p>Installation stage of the DER Device.</p> <p>This will be used to indicate to the user if the DER Device is initial, conditional, confirmed, or idle.</p> <p>Permitted value to be returned is one of the following:</p> <ul style="list-style-type: none"> <li>- Conditional</li> <li>- Confirmed</li> </ul>

Field	Type	Description and comments
<b>typeOther</b>	boolean	To indicate if the submitted device type is part of the provided list. If the submitted device type is one of the list provided below, the returned value is false If the submitted device type is NOT one of the list provided below, the returned value shall be false
<b>subTypeOther</b>	boolean	To indicate if the submitted device subtype is part of the provided list If the submitted device subType is one of the list provided below, the returned value shall be false If the submitted device subType is NOT one of the list provided below, the returned value shall be true
<b>manufacturerOther</b>	boolean	This is used to indicate if a manufacturer is accredited
<b>modelOther</b>	boolean	This is used to indicate if a model number is accredited
<b>Exceptions</b>		
<b>exceptionId</b>	number	A unique identification for an exception generated when business validation fails This Id is integer value and will be generated by AEMO upon a submission that fails business validation Permitted value of submission is one of the following: an existing exceptionId that was previously generated by AEMO Null If the ExceptionId was not generated by AEMO, the system will reject the submission.
<b>code</b>	number(4)	Code used to indicate the type of exception
<b>name</b>	string(20)	Name of exception

Field	Type	Description and comments
<b>AffectedAttributes</b>	string(300)	Lists the names of fields that were the reason for producing this exception
<b>details</b>	string(200)	Description of the exception
<b>status</b>	string(6)	Status of exception (Open or closed)
<b>deviceId</b>	number(15)	
<b>connectionId</b>	number(15)	
<b>nspAcknowledged</b>	string(3)	Not applicable for WP.

### 6.3 Fields in NMI payloads

Field	Type	Permitted values	Description and comments
<b>nmi</b>	string(10)	8001000000 to 8020999999 or WAAA000000 to WAAAZZZZZZ excluding WAAAW*	Unique identifier for each connection point where DER installation has been installed/approved.
<b>tni</b>	string(20)	Specified by WP	Transmission Node Identifier
<b>status</b>	string(20)	Active, Extinct	Status of the NMI
<b>substation</b>	string(40)	Specified by WP	Name of Zone Substation
<b>postCode</b>	string(4)	6000 to 6999	Postcode where the NMI is located
<b>recordCreationDate</b>	string(YYYY-MM-DDTHH:mm:ss.sssZ)		The date when the NMI was created in the DER Register
<b>recordUpdateDate</b>	string(YYYY-MM-DDTHH:mm:ss.sssZ)		The date when the NMI was updated in the DER Register

# 7. Appendix: Error Codes

## 7.1 WEM NMI error codes

Error code	Error message
1010	Invalid submission: NMI does not exist.
1020	Invalid submission: NMI already exists.
1020	Invalid submission: Mismatch between path parameter NMI and request payload NMI.
1014	Invalid postcode: Not located in Western Australia. Postcode must be between 6000 and 6999

## 7.2 WEM DERR error codes

Error code	Error message
1120	Invalid submission Missing information. At least one field must be completed.
1130	Invalid submission Export limit exceeds approved capacity.
1030	Invalid submission DER installation information missing. Please link an AC Connection to this NMI.
1031	Invalid submission DER installation information missing. Please link a Device to this AC Connection.
1051	Invalid submission Invalid Device identifier.
1063	Invalid submission Device status not aligned to linked AC Connection.
1070	Invalid submission: <payload-field> value must be between <Min-Value> and <Max-Value>.
1080	Invalid submission Device type invalid for AC Connection type.
1081	Invalid submission Device type invalid for AC Connection type.
1065	Invalid submission Device status invalid.
1040	Invalid submission DER Record mismatch to AEMO data.
1041	Invalid submission DER Record mismatch to AEMO data.

Error code	Error message
1061	Invalid submission DER installation already commissioned. Status must be active or decommissioned.
1090	Invalid submission Missing information.
1110	Invalid submission Not enough Devices in DER Record.
1111	Invalid submission Number of Devices and AC Connections must match.
1140	Invalid submission Value is percentage, maximum is 100%.
1121	Invalid submission Cannot enable reactive power AND voltage response modes.
1122	Invalid submission Cannot enable fixed power factor AND voltage response modes.
1123	Invalid submission Cannot enable variable power factor AND voltage response modes.
3000	NMI must exist in DER register database.
3001	Job Number must exist in DER register database.
3002	3002 - Combination of Job Number and NMI must be correct i.e Job number is associated with the submitted NMI in connection agreement submission.
1000	Invalid submission: Job number already in use.
1010	Invalid submission: NMI does not exist in MSATS.
1011	Invalid submission: NMI is Extinct and cannot be used.
1012	Invalid submission: NMI not aligned to NSP NMI allocation



# 8. Rules Terms

You can find the following terms defined in the [National Electricity Rules \(NER\)](#) and the [Settlements Residue Auction Rules](#).

Term
AEMO
AEMO Clearing Account
AEMO Markets Portal
AEMO Website
Allocated Units
APA
Auction
Auction Participant
Auction Rules
Average cancellation price
Average purchase price
Bid File
Cancelled Units
Cancelled volume
Cash Security
Confidential Information

Term
Directional interconnector
Linked Bid
Market Clearing Price
Market Participants
Maximum Units
Notional Interconnector
Offer Database
Offer File
Offer Period
Offer Submission
Offered Units
Offers
Product
Prudential Approved Participant
Prudential Exposure

Term
Region
Regional reference prices
Registered Participant
Relevant Quarter
Settlement residue auction
Settlement residue committee
Settlement residue distribution agreement
SRDA Units
Trading Limit
Trading Margin
Trading Position
Unit Category
Units

# 9. Glossary

Abbreviation/Term	Explanation
AC	Alternating Current
AEMO	Australian Energy Market Operator
AEST	Australian Eastern Standard Time
API	Application Programming Interface. A set of clearly defined methods of communication between various software components.
API Portal	Where you can view available APIs, manage your API Keys, and obtain OAS files.
DER	Distributed Energy Resources
DERR	Distributed Energy Resources Register
DNISP	Distributed Network Service Provides
DSP	Demand Side Participation
EMMS	Electricity Market Management System; software, hardware, network and related processes to implement the wholesale energy market
Endpoint	Where the API request is sent and where the response comes from.
FCAS	frequency control ancillary services
FTP	File transfer protocol; a standard network protocol used for the transfer of computer files between a client and server on a computer network.
GUID	Globally Unique Identifier
Header parameters	Parameters included in the request header.
JSON	JavaScript Object Notation. A lightweight syntax containing objects and arrays, usually used (instead of XML) to return information from a REST API.
Key pair	SSL uses a technique called public-key cryptography, based on the concept of a Key Pair. The Key Pair consists of encrypted Public and Private Key data. It is only possible to decrypt the Public Key with the corresponding Private Key.
MarketNet	AEMO's private network available to participants having a participant ID

Abbreviation/Term	Explanation
Markets Portal	Web portal for access to AEMO's wholesale web-based applications.
method	The allowed operation for a resource, e.g. GET, POST, PUT, DELETE, and so on. These operations determine whether you're reading information, creating new information, updating existing information, or deleting information.
MSATS	Market Settlement and Transfer Solution for retail electricity
MW	Megawatt
NER	National Electricity Rules
NMI	National Metering Identifier for electricity meters
OAS	OpenAPI Specification
OpenAPI specification document	The file, either in YAML or JSON, describing your REST API. Follows the OpenAPI specification format.
parameters	Parameters are options you pass with the endpoint (such as specifying the response format or the amount returned). There are four types of parameters: header parameters, path parameters, query string parameters, and request body parameters. The different types of parameters are often documented in separate groups on the same page. Not all endpoints contain each type of parameter.
Participant API Gateway	The interface implemented by participants where AEMO pushes messages.
Participant File Server	The publishing point from AEMO systems to participant systems. Each participant is allocated an account and access to private and public areas. Participants are responsible for interfacing with the Participant File Server. If uncollected, files are moved to the archive folder after a couple of days. If your Data Interchange environment is configured properly it automatically retrieves the missing files from the archive. Files are kept in the archive for approximately six months. AEMO's production and pre-production environments are independently operated, so each environment has its own IP address for its Participant File Server. For help, see <b>Connection to AEMO's IT Systems</b> .
Participant ID	Registered participant identifier
Participant user ID	The user ID to login to the system.
Participant users	Set up by the company's Participant Administrator
Path parameters	Parameters in the path of the endpoint, before the query string (?). Path parameters are usually set off within curly braces.

Abbreviation/Term	Explanation
Payload	The data sent by a POST request. The Payload section sits after the header.
PID	Participant ID
Pre-production	AEMO's test system available to the participants.
Private key	The secret Private Key is a text file used initially to generate a Certificate Signing Request (CSR), and later to secure and verify connections.
Production	AEMO's live system
Public Key	The Public Key is included as part of your SSL certificate, and works together with your Private Key to make sure your data is encrypted Key (i.e. the certificate) can verify the digital signature is authentic without having to know the secret Private Key.
Query string parameters	Parameters in the query string of the endpoint, after the ?.
Release	WEM DER Technical Specification - February 2021
request	The way information is returned from an API. In a request, the client provides a resource URL with the proper authorization to an API server. The API returns a response with the information requested.
request body parameters	Parameters in the request body. Usually submitted as JSON.
response	The information returned by an API after a request is made. Responses are usually in JSON or XML format.
response example	The response example shows a sample response from the request example; the response schema defines all possible elements in the response. The response example is not comprehensive of all parameter configurations or operations, but it should correspond with the parameters passed in the request example. The response lets developers know if the resource contains the information they want, the format, and how that information is structured and labeled. The description of the response is known as the response schema. The response schema documents the response in a more comprehensive, general way, listing each property that could possibly be returned, what each property contains, the data format of the values, the structure, and other details.
REST	The Representational State Transfer API architecture
SSL	Secure Sockets Layer, cryptographic protocol providing API communication security

Abbreviation/Term	Explanation
Swagger	Refers to the OpenAPI specification.
Swagger file	The OpenAPI Specification (OAS) definition of the API.
TLS	Transport Layer Security, cryptographic protocol providing API communication security.
URM	User Rights Management; see the <b>Guide to User Rights Management</b> on AEMO's website
WEM	Wholesale Electricity Market
WP	Western Power
zip	The file compression format used for exchanging data with AEMO.

# 10. References

You can find the following resources on the AEMO website.

**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

**Wholesale Electricity Market (WEM):** The WEM supplies electricity to the south-west of Western Australia via the South West Interconnected System (SWIS).