EMMS Technical Specification – 5MS - Dispatch and Operations

v5.00 May 2020

Important Notice

PURPOSE & AUDIENCE

This document describes the technical changes required to participant's systems for the 5MS Dispatch and Operations (Project). 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 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 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 Markets Portal.
- This document is written in plain language for easy reading. Where there is a discrepancy between the NER, Auction Rules, or procedures and information or a term in this document, the Rules and procedures take precedence.
- Glossary Terms are capitalised and have the meanings listed against them in the Glossary.
- Rules terms defined in the NER or SRA Auction Rules are listed in the Rules Terms section.
- References to time are Australian Eastern Standard Time (AEST).

PRIVACY AND LEGAL NOTICES

The material in this publication may be used in accordance with the privacy and legal notices on AEMO's website.

TRADEMARK NOTICES

Microsoft, Windows, and SQL Server are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Oracle and Java are registered trademarks of Oracle and/or its affiliates.

UNIX is a registered trademark of The Open Group in the US and other countries.

© 2015 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

DISTRIBUTION

Available to the public.

DOCUMENT IDENTIFICATION

Prepared by: AEMO Technology

Last update: Wednesday, 13 May 2020 4:30 PM

VERSION HISTORY

5.00 See Changes in this version on page 7.

DOCUMENTS MADE OBSOLETE

The release of this document changes only the version of EMMS Technical Specification – 5MS - Dispatch and Operations.

SUPPORT HUB

 AEMO's Support Hub   Phone: 1300 AEMO 00 (1300 236 600) and follow the prompts.

FEEDBACK

Your feedback is important and helps us improve our services and products. To suggest improvements, please contact AEMO's Support Hub.

Contents

1 Introduction

The 5MS Dispatch and Operations Release- Dispatch (Release) includes changes related to participants' IT systems. This 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   Status

This technical specification presents the system design at the time of publication. It may change as participants provide feedback and test in the staging environment. Please send feedback to 5ms@aemo.com.au.

Participants can discuss the changes in this version in the upcoming Systems Working Group (SWG) meeting.

For SWG meeting dates, see the 5MS Calendar: https://aemo.com.au/initiatives/major-programs/nem-five-minute-settlement-program-and-global-settlement.

Version	Status
5.00	Participants can commence their system builds but small changes may still occur while participants are testing in the staging environment and providing feedback
4.00	Participants can commence their system builds but small changes may still occur while participants are testing in the staging environment and providing feedback
3.00	Participants can commence their system builds but changes may still occur while participants are testing in the staging environment and providing feedback
2.05	Participants can commence their system builds but changes are still imminent due to participant feedback
2.00	Participants can commence their system builds but changes are still imminent due to participant feedback
1.02	For review only
1.00	For review only
0.05	For review only

1.2   Version numbers

Incremental version numbers such as 1.01, 2.01 and so on mean there is a small change to the technical specification.

Major version numbers such as 1.00, 2.00 means there are substantial changes to the technical specification. Participants must carefully review these changes.

> **AEMO releases new versions of this document as the technical requirements are streamlined.**

Changes are detailed below.

1.3   Changes in this version

1. Information about changes to the Electricity Data Model is removed from this technical specification to the **EMMS Technical Specification - 5MS - Data Model v5.00**. This is a document dedicated to the Electricity Data Model changes for 5MS.

2. Added more information about the on page 54 and linked Throttling limit on page 15 to this section.

3. Add information about API Partial match parameters on page 49.

4. Added a further information in Energy, FCAS, and MNSP biddingon page 14:

    - If participants do not include a referenceId with their Bid Submission, it is populated with the transactionId.

    - Participants receive 30-minute NEMReports for 30-minute Bids and 5-minute NEMReports for 5-minute Bids.

    - During the transition period when AEMO accept 30- and 5-Minute bids, if participants submit a Bid in the 5-minute Bid format, AEMO recommends participants continue to submit bids in the 5-minute Bid format, not returning to the 30-minute Bid format.
    If participants revert to the 30-minute Bid format, it will be hard to establish the latest Bid.

    - The recommendation, therefore, is that once they start submitting 5min bids, they need to operate in a 5min world, with 5min bidding and reports.

    - For participants using the web bidding interface, once they submit a 5-minute web Bid, they must continue to use the 5-minute web bidding interface and not revert to the 30-minute web bidding interface.

1.3.1 APIs

API	Change	Reason
All	Added API Bidding scenarios on page 49	To assist participants to understand the parameters to include when retrieving bids and Submissions
All	Added Glossary definitions for Bid/Offer, Bid, and Submission on page 59.	Clarity
getBids	The following search parameters are removed: fromOfferTimeStamp toOfferTimeStamp referenceId transactionId	Simplify
getBid	The following search parameters are removed: - referenceId - transactionId	Simplify
getSubmissions	The following search parameters are removed: - method	Simplify
	toOfferTimeStamp defaults to Trading Date + 90 days	Improvement
prices Array items/price	An array of 10 prices e.g. [-3.50, 0.00, 4.01, 5.01, ... 5011.01]	Replaces this incorrect example: e.g. [0.00, 0.00, 0.50, 20.00....] Prices must increase monotonically

1.4 Audience

The primary audience is business analysts and IT staff in participant companies.

A secondary audience is Participant Administrators providing rights to their Participant User to access AEMO's systems.

1.5 Project List

The EMMS Technical Specification – 5MS - Dispatch and Operations includes the following projects:

- Dispatch and Bidding
- FTP Interfaces

- EMMS Markets Portal
- APIs
- Electricity Data Model v5.00

1.6   Approval to change

There is no approval or agreement to change required from participant change controllers for this Release as it is part of the AEMC's Five-Minute Settlement rule change.

Amendments to the Rules regarding 5-minute settlements are published on the AEMC website: **National Electricity Amendment (Five-minute settlement rule) 2017** https://www.aemc.gov.au/rule-changes/five-minute-settlement.

1.7   Related rules and procedures

Item	Location
MNSP Convexity Rule	AEMC website > NER Clause 3.8.6A (e)
Introduction to Market Rules	AEMC website > NER Chapter 3
Market Floor Price	AEMC website > NER 3.9.6
Operating Procedure: Mandatory Restriction Offers	AEMO website > Security and Reliability > Power System Operating Procedures
Rebidding and Technical Parameters Guideline	https://www.aer.gov.au/wholesale-markets/market-guidelines-reviews/rebidding-and-technical-parameters-guideline-amendments-for-5-minute-settlement-2019

2 Milestones

2.1   Revised technical specification

Published as required with further details of the changes to assist IT staff with their own technical implementation.

2.2   Systems working group (SWG)

For details about the SWG, see https://aemo.com.au/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/5ms-systems-working-group-swg

For SWG meeting dates, see the 5MS Calendar: https://aemo.com.au/initiatives/major-programs/nem-five-minute-settlement-program-and-global-settlement.

2.3   5MS staging environment

For Data Model releases, see the **EMMS Technical Specification - 5MS - Data Model v5.00**.

Status	In progress
Details	https://portal.5ms.staging.test.marketnet.net.au/ AEMO implements components of the Release in stages. Participant access is not restricted; however, the data content or system availability is not guaranteed. For more details, see https://aemo.com.au/Electricity/National-Electricity-Market-NEM/Five-Minute-Settlement/Systems-Workstream/Staging-Environment
Supports from 29 Nov 2019	- Submit 5-minute Bids via web, API, and FTP. - Case Loader data for PASA, Dispatch, 5-minute Pre-dispatch, 30-minute Pre-dispatch
Supports from 15 May 2020	- 5-Minute Price Functionality (Rolling Sum Price (RSP) and Trading Price (TP)) - Administrative Price Cap Manager (calculated on the 288 intervals over the last 7 days) - NEM Reports relating to 5-Minute Pricing
Doesn't support	Does not support compressed payload Bid submissions through API.
References	**Format and Validation for Energy, FCAS, and MNSP Bids and Offers** **Draft Guide to Energy and FCAS Web Bids**

2.4   Data model v5.00 scripts and pdrConfig release

For details, see **EMMS Technical Specification – 5MS – Data Model v5.00**.

2.5   APIs and JSON schemas

Status	Details
Available for use in the staging environment over the Internet gateway only. The work to submit APIs via MarketNet is still in progress. We will advise when participants can test APIs in the staging environment over MarketNet.	For API e-Hub access details, see page 23. Participant IP addresses for the staging environment require whitelisting by AEMO. For help, see page 23

2.6   Pre-production refresh

Status	Details
Friday 15 May 2020 9:00 am – 28 May 2020 10:00 am	This is an **MSATS** CATS and MDM pre-production refresh only. The **MSATS** pre-production environment is unavailable for the duration of the refresh. EMMS, NOS, OPDMS, and User Rights Management (URM) systems are not affected. User accounts, passwords, and privileges remain the same.

2.7   Pre-production implementation

Status	Details
1 week before the pre-production release	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.

2.8   Pre-production release

Status	Details
For details, see the Program Timeline on AEMO's website.	Pre-production systems available to participants. The Readiness Working Group (RWG) provides these dates as they are confirmed. https://portal.preprod.nemnet.net.au

2.9   Production implementation

Status	Details
1 week before the production release	AEMO implements components of the Release to production.

2.10 Production release

Status	Details
For details, see Program Timeline on AEMO's website.	Production systems available to participants. The Readiness Working Group (RWG), provides these dates as they are confirmed. https://portal.prod.nemnet.net.au

3 5MS Architecture

3.1 Architecture overview

The following diagram provides a high-level overview of AEMO's 5-minute settlement system architecture, including AEMO's Retail and Wholesale systems.
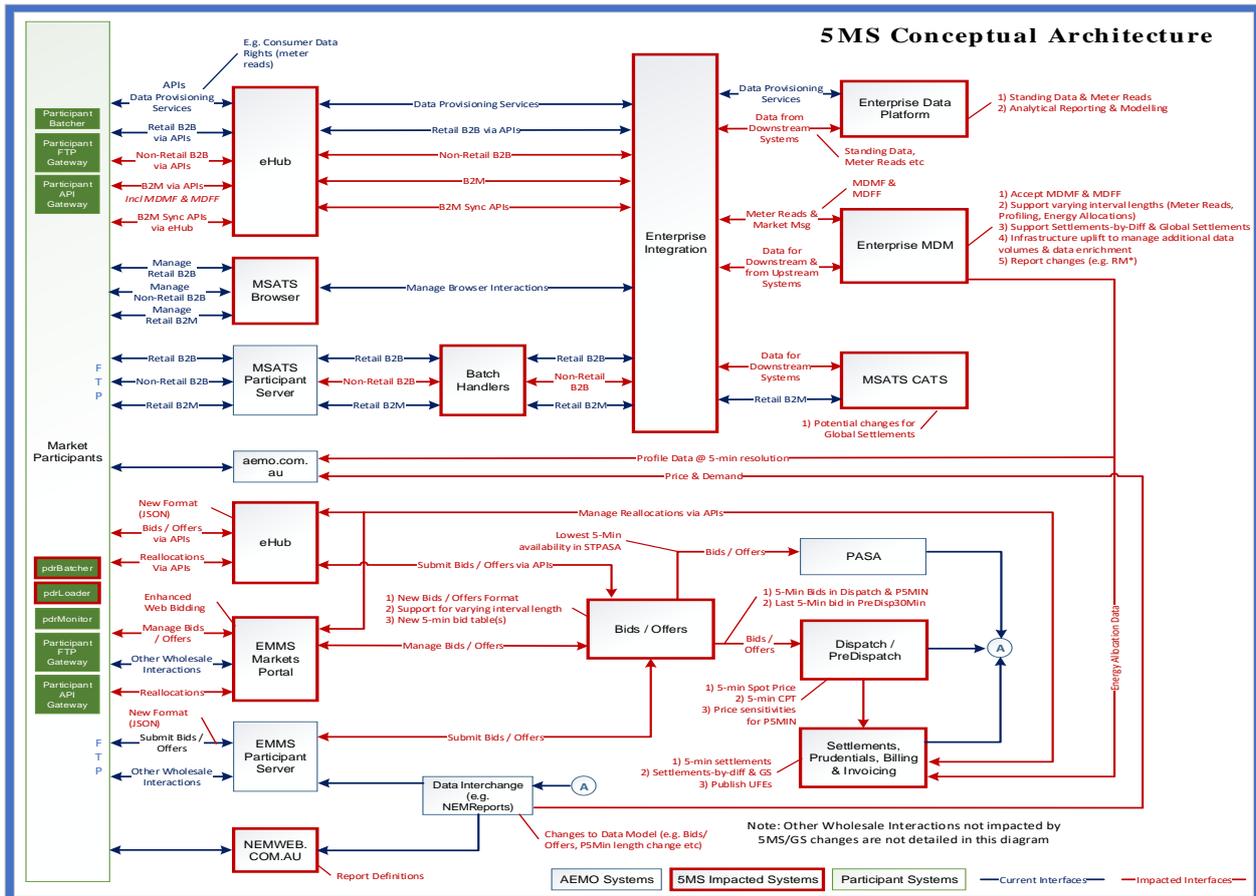
4 Dispatch and Bidding

4.1 Overview

This section covers the 5MS changes to bidding and AEMO's real-time operational systems.

4.2 Energy, FCAS, and MNSP bidding

- The number of Bid intervals increases from 48 to 288. AEMO creates new data structures to receive, use, and store 5-minute bids and offers.

- AEMO introduces a new Bid Submission format (JSON), replacing the current txt format.

- The bidding Submission receipt format changes from csv to a new JSON format.

- AEMO introduces new web APIs to support Bid Submission and associated functionality. Participants can access the APIs over the internet and MarketNet.

- In the current csv format, optional fields are left blank to indicate no value.
  In the JSON format, to indicate no value for optional fields, the entire attribute must be removed.

- The Rebid explanation changes from a single Reason field to five fields. For more details, see **.**

- The EMMS Market Portal web bidding interfaces change to support the new bidding format, leverage the new APIs, and provide improved functionality.

- If participants do not include a referenceId with their Bid Submission, it is populated with the transactionId.

- Participants receive 30-minute NEMReports for 30-minute Bids and 5-minute NEMReports for 5-minute Bids.

- During the transition period when AEMO accept 30- and 5-Minute bids, if participants submit a Bid in the 5-minute Bid format, AEMO recommends participants continue to submit bids in the 5-minute Bid format, not returning to the 30-minute Bid format.
  If participants revert to the 30-minute Bid format, it will be hard to establish the latest Bid.

- For participants using the web bidding interface, once they submit a 5-minute web Bid, they must continue to use the 5-minute web bidding interface and not revert to the 30-minute web bidding interface.

4.2.1 Submitting bids using FTP

- Participants can submit 5-minute bids via FTP; the structure of these Submissions is in a new JSON format.

- The new 5-minute bidding JSON format is available from 1 April 2021. The current 30-minute bidding txt format for Submissions is no longer supported from 1 July 2021.

- Participants choosing to continue to use FTP as their primary bidding protocol must shift to the new format by 1 July 2021.

> **The same JSON bidding format is supported via FTP, API, and web upload.**

For more detail, see **Section 5 - FTP Interfaces** on page 18.

4.2.2 Submitting bids using APIs

- New web-based APIs are introduced to allow bids to be submitted and Bid information to be retrieved from AEMO.

- These APIs are provided by AEMO's e-Hub using AEMO's current API standards.

> **For more details, see** Section 7 - APIs, on page 23.

4.2.3 Submitting bids using web bidding and web upload

The existing web bidding interfaces change to support 5-minute bids and the functionality is enhanced to better support:

- Small or low-frequency participants using the Markets Portal as their primary bidding interface.

- Large or high-frequency participants using the web bidding interface as part of their business continuity planning processes when their primary systems are unavailable.

> **For more details, see** Section 6 - EMMS Markets Portal, on page 22.

4.3 Throttling limit

For details, see on page 54.

4.4 Dispatch

- The effective bids and offers provided for the 5-minute trading period are used in the Dispatch process.

- Fixed load requires a value of one or more to enforce a fixed load Constraint. To indicate no fixed load, omit the attribute.

- 30-minute bids submitted during transition are copied to 5-minute resolution, on receipt, by duplicating the Bid for each 5-minute interval in the 30-minute interval.

4.5 Mandatory restrictions

- The Mandatory Restrictions schedule remains produced at 30-minute resolution.

- With the bidding intervals changing to 5 minutes, Mandatory Restriction capacities are supplied at 5-minute resolution.

- The Mandatory Restriction capacity must be the same for each 5-minute period in a 30-minute interval.

- For a Mandatory Restriction Bid, participants must provide a Mandatory Restriction Price Scaling Factor and all 288 periods must have a Mandatory Restriction capacity.

4.6 30-minute pre-dispatch

- The last 5-minute Bid in a 30-minute interval is used as the bidding input, i.e. the bids for periods 6, 12, 18, 24, ... to 288.

The inclusion of FSIP remains under discussion.

4.7 5-minute pre-dispatch (P5)

- The effective bids and offers provided for the 5-minute Trading Intervals are used.

- P5 runs every 5 minutes covering at least one hour (12 x 5-minute intervals).

4.8 Short-term and pre-dispatch PASA

- The 5-minute Bid with the lowest availability in a 30-minute period is used as inputs.

4.9 Trading data

- TradingPrice RRP values continue rounding to two decimal places.

- Trading price changes from a 30-minute to 5-minute price from Trading Interval 1.

- Data Model tables TRADINGPRICE and TRADINGINTERCONNECT data changes from 30-minute periods to 5-minute periods.

- Data Model tables TRADINGLOAD, TRADINGREGIONSUM stop being populated.

- A new AVERAGEPRICE30 Data Model table is introduced to provide the 30-minute average spot price mirroring the pre-5MS TRADINGPRICE data.

4.10 Administered pricing

- Energy prices are capped or floored based on a 5-minute Spot Price (not the 30-minute price).

- The rolling-sum price calculation for Energy is now determined for 5-minute Spot Prices instead of 30-minute prices. The Cumulative Price Threshold (CPT) is correspondingly increased to approximately six times the current value.

- The Ancillary Services rolling-price sum is compared to the new CPT with no multiplier (it was previously compared to 6-times the CPT).

- The format for automatically generated market notices is changed to reflect the rules and calculation changes.

4.11 Market suspension pricing

- When suspension pricing applies, AEMO applies the determined 30-minute suspension price as the associated 5-minute Spot Price.

- The price schedules remain calculated for the 30-minute intervals over the 28 days.

- The 30-minute price is the price used for each of the respective 5-minute periods.

4.12 Negative residue management

There are no changes required to Negative Residue management or the data model.

4.13 EMMS data model

For the EMMS data model changes, see , on page **54**

5 FTP Interfaces

The following FTP servers are available over MarketNet, no direct internet access is available:

Environment	Address
5MS Staging	ftp://146.178.211.26
Pre-production	ftp://146.178.211.25
Production	ftp://146.178.211.63

For more information, see Connecting to AEMO's IT systems.

5.1 Submitting bids via FTP

- 5-minute bids and offers are submitted as files in the new JSON format via FTP.

- 30-minute bids and offers are supported until 1 July 2021.

5.1.1 5-minute bids

Item	Value/Steps
Format	Zip file format The zip must contain a single .json file The required JSON format is defined in **Section 13.2 - Indicating no** value for optional fields In the JSON format, to indicate no value for optional fields, the entire attribute must be removed. Bid submission, on page 61.
Upload folder	/Export/Bids
Valid filenames	<PID>_<*BID*>_<YYYYMMDD|YYYYMMDDhhmmss>.zip Examples: PART1_BID_20180101.zip PART1_FCASBID_20180101231145.zip PART2_BIDFCAS_20180701231145.zip **Invalid** **Do not** include OFFER in the filename. It may be processed as a 30-minute Bid during the transition period.
Filename validation	The filename must match the formats allowed above PID must match the FTP participant folder

Item	Value/Steps
Upload process	1. Upload with a .tmp file extension 2. Rename to .zip once upload is complete

5.1.2 30-minute bids

Item	Value/Steps
Format	Txt or zip file format A zip file must contain one .txt file If more than one file is provided, only the first file in the zip is processed The txt file format is defined in the Guide to Energy, FCAS, and MNSP Bid Format and Validation.
Upload folder	/Export/Bids
Valid filenames	<PID>_<*OFFER*>_<YYYYMMDD|YYYYMMDDhhmmss>_<version>.[txt|zip] Examples: PART1_OFFER_20180101_001.txt PART1_FCASOFFER_20180101231145_999.zip PART2_OFFERFCAS_20180701231145_023.zip **Invalid:** Do not include BIDS in the filename, otherwise it is processed as a 5-minute Bid and rejected as invalid
Filename validation	The filename must match the formats allowed above PID must match the FTP participant folder Version must match the version in the Submission document
Upload process	1. Upload with a .tmp extension 2. Rename to .zip or .txt once upload is complete

5.2   Receiving bid acknowledgements via FTP

An acknowledgement is returned via FTP.

The Submission acknowledgement changes from the current csv format to a JSON format.

Item	Value/Steps
Format	zip file format Contains a single .json file The acknowledgement JSON format is defined in **Section 13.2 – Indicating no** value for optional fields In the JSON format, to indicate no value for optional fields, the entire attribute must be removed. Bid submission, on page 61.
Download Folder	\Import\Acknowledgements
Valid Filenames	Accepted Submission: <bid_file>_ACK.zip Rejected Submission: <bid_file>_CPT.zip
Download Process	Retrieve then delete the acknowledgment file

30-minute bids remain supported in csv format.

Item	Value/Steps
Format	csv file format For more details about the csv format, see Guide to AEMO's CSV Data Format Standard.
Download Folder	\Import\Acknowledgements
Valid Filenames	Accepted Submission: <bid_file>_ACK.csv Rejected Submission: <bid_file>_CPT.csv
Download Process	Retrieve then delete the acknowledgment file

5.3 Bid processing order

Bids are processed in the order they are received from a participant. It is up to the participant to ensure the correct Submission order and the correct effective Bid results in AEMO's systems.

6 EMMS Markets Portal

6.1 Energy and FCAS bids

The Energy and FCAS Bids interface supporting 5-minute Bids for Energy and FCAS Bids and Offers is in the staging environment:

https://portal.5ms.staging.test.marketnet.net.au/#/menu

Participants use the same login details they use for the pre-production environment for their initial login.

6.2 Bidding web upload

The Energy and FCAS Bids interface supports uploading of JSON schema files (not csv) for Energy, FCAS, and MNSP Bids and Offers.

For help, with the format, see Appendix 1 – Bidding JSON Format on page 61.

7 APIs

7.1 API access

AEMO's bidding APIs are accessible via MarketNet and the Internet.
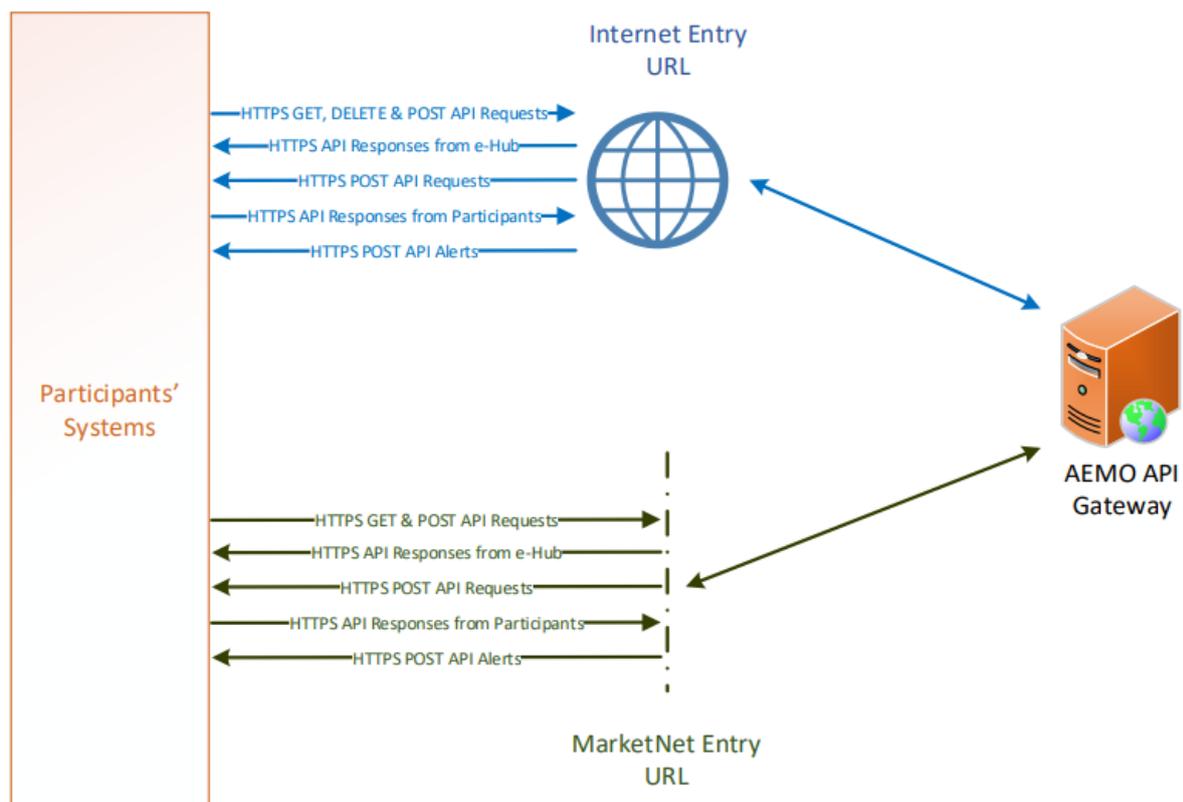
7.2 API whitelisting

The **staging** environment (only) requires AEMO to whitelist your public IP address. To have your IP whitelisted, log a call with the Support Hub who will ask you to provide the following details:

1. Participant ID(s)
2. Inbound Public IP address or a range of IPs
3. SSL Certificate Signing Request (CSR)
4. The APIs you want to access
5. For help obtaining SSL certificates, see **Guide to AEMO's APIs**.
6. For help with Participant User access and required URM entities, see User rights access on page 25.

7.3   API e-Hub addresses

API documentation, 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.

Environment	Internet Address	MarketNet Address
5MS Staging gateway	https://partner.api.5msstaging.aemo.com.au/	**Unavailable until further notice** https://apis.5msstaging.marketnet.net.au:9319/
5MS Staging API portal	https://staging.apiportal.aemo.com.au/	TBA
Pre-production gateway	https://apis.preprod.aemo.com.au	https://apis.preprod.marketnet.net.au
Production gateway	https://apis.prod.aemo.com.au	https://apis.prod.marketnet.net.au

7.4   API authentication and authorisation

> **For details about obtaining a certificate, see Guide to AEMO's e-Hub APIs.**

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 and creating new Participant Users, see **Guide to User Rights Management (URM)**.

7.5 API format

API URLs are in the following format:

```
https://<host>/<business_name>/<business_function>/<APIversion>/<resource>?querystring parameters
```

For example:

```
https://apis.prod.aemo.com.au:9319/NEMWholesale/bidding/v1/getBids
```

Table 1 – API Definition

Parameter	Description
<protocol>	HTTPS
<host>	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. GeneratorRecall
<APIversion>	The version for this API i.e. v1, v2, v3 etc...
<verb><resource>	Entities of a Business Function e.g. /getBids
?querystring parameters	Query string parameters for GET method

7.6 API naming

The 5MS APIs follow a verb and noun naming convention, enabling a clear understanding of their action.

> **API account passwords are reset every 90 days.**

7.7 User rights access

The user rights access used in the bidding APIs, and Bidding web screens use a new URM entity:

- EMMS – Offers and Submissions – Energy FCAS MNSP Bids

Replacing the existing entities:

- EMMS – Offers and Submissions – Energy FCAS Offers – Enter Offer – bid prices, band availabilities

- EMMS – Offers and Submissions – Energy FCAS Offers – Enter Offer – modify physical plant

- EMMS – Offers and Submissions – Energy FCAS Offers – View Data

The steps to set up URM rights for API access are:

> If required, the Participant Administrator (PA) creates a new Participant User in MSATS.

> The PA assigns the URM entity to the Participant User.

> **To avoid impacting participants AEMO migrates the existing rights from the current entities to the new entity.**

> **For help with user rights access, see Guide to User Rights Management.**

7.8   Response codes

Table 2 – HTTP response codes

Data Condition	Value	Examples/Remarks
Successful response	200	200 OK
HTTP Technical Failure	Appropriate HTTP Response Code	HTTP response code of 400 Note: The e-Hub sends the exception details in the response payload

Invalid Credentials	401	401 Unauthorized. The e-Hub also sends the following payload
		{
		　"Exception": "Unauthorized:Invalid UserName or Password"
		}

No Username / Password details in HTTP request	401	401 Unauthorized
		{
		　"Exception": "Unauthorized:Invalid UserName or Password"
		}

Invalid resource used in the API URI	404	404 Not Found Note: The e-Hub sends the exception details in the response payload as illustrated in Section 4.3.3.2
Invalid Method used for calling the API URI (e.g. GET instead of POST)	405	405 Method Not Allowed Note: The e-Hub sends the exception details in the response payload as illustrated in Section 4.3.3.2

Data Condition	Value	Examples/Remarks
Business validation error	422	422 Unprocessable Entity The request was well formed but the submitted content failed business validation rules.
Application Unavailable (down)	500	500 Application Unavailable Note: The e-Hub sends the exception details in the response payload as illustrated in Section 4.3.3.2
Exceeds throttling Limits	503	Service invocation for API was rejected based on policy violation

7.8.1 HTTP response code 404, 405, 500

The e-Hub 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> 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 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
   }
  ]
}
```

7.9   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 on page 29.

7.10 Request and response headers

7.10.1 Standard HTTP request header attributes

Parameter	Value(s)	Description
Content-Type	application/json	Content format. **mandatory.**
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. **mandatory.**
X-market	NEM	The market the request is for. **mandatory.**
Authorization	Example only: Basic QFhQVC0wMDAwMzoyZWRRmOGJhYS0wY2I0LTQwZjjctOTIyMS0yODUxNmM4N2MxNjQ=	Base64 encoding of the URM username and password, concatenated with a colon. **mandatory.**

7.10.2 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

7.11 Bidding APIs

This section describes the proposed bidding APIs to support Energy, FCAS, and MNSP bids.

API Name	Support Methods	Entity Description	Required URM Entity and Right
submitBids	POST	Submit Energy, FCAS and/or MNSP bids	EMMS – Offers and Submissions – Energy FCAS MNSP Bids **Create**
getBids	GET	Returns a list of bids based on search criteria	EMMS – Offers and Submissions – Energy FCAS MNSP Bids **Read**
getBid	GET	Retrieve the details for a specific Bid, this including the Submission details	EMMS – Offers and Submissions – Energy FCAS MNSP Bids **Read**
getSubmission	GET	Retrieve Submission meta data and validation status	EMMS – Offers and Submissions – Energy FCAS MNSP Bids **Read**
getSubmissions	GET	Returns a list of Submissions based on search criteria	EMMS – Offers and Submissions – Energy FCAS MNSP Bids **Read**

7.11.1 POST API response compression

Bidding 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.**

Parameter	Value(s)
Accept-Encoding	Should be at least one of: gzip compress deflate **If not provided no compression is assumed.**

7.11.2 GET API response compression

AEMOs Bidding 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.**

7.11.3 Throttling

AEMO implements throttling on API calls.

A 503 HTTP response code is returned if throttling is exceeded.

AEMO reviews these values during industry testing and market trials.

API Call	Limit
submitBids	1 call per second per participantid The participantid is identified from the X-initiatingParticipantID request header parameter. This restriction is due to an existing legacy limit in the bidding tables in the data model. The bidding tables rely on the field OfferDate in the primary key, which is a date/time field that supports precision only to the second. Participants should be aware of the consequence of this limit. For example, Participants submitting multiple JSON requests for the same participantid through the API interface at the same time may have some rejected. Participants systems need to manage this throttling limit.

API Call	Limit
getBid getBids getSubmission getSubmissions	1 call per second per participantid

7.11.4 POST submitBids

Submit one or more Energy, FCAS, or MNSP Bid/Offers.

If you submit a Bid with multiple units and multiple Trading Days in a single request, and one of them has an error, the whole Submission is rejected.

Request

Item	Value
URL Path	/NEMWholesale/bidding/v1/submitBids
Method	POST
Header	*Standard request header attributes, be sure to include:* Authorization: Basic .... Content-Encoding: Should be one of [gzip, deflate, compress] Accept-Encoding: Should be one or more of [gzip, deflate, compress]

Body	JSON *(quotes removed for simplicity)*
	As per Section 13.2 – Indicating no value for optional fields
	In the JSON format, to indicate no value for optional fields, the entire attribute must be removed.
	Bid submission, on page 61.
	<pre>{
	  submissionTimeStamp: [date/time],
	  referenceId: [string],
	  comments: [string],
	  authorisedBy: [string],
	  energyBids: [array],
	  fcasBids: [array],
	  mnspBids: [array]
	}</pre>

Response for valid submission

Item	Value
Response Code	200
Header	*Standard response header attributes:* Content-Type: application/json Content-Encoding: As requested [gzip, compress, deflate]
Body	POST
Header	*Standard request header attributes, be sure to include:* Authorization: Basic .... Content-Encoding: Should be one of [gzip, deflate, compress] Accept-Encoding: Should be one or more of [gzip, deflate, compress]
Body	JSON *(quotes removed for simplicity)* As per Section 13.2 – Indicating no value for optional fields In the JSON format, to indicate no value for optional fields, the entire attribute must be removed. Bid submission, on page 61.

Response for a submission that failed validation

Item	Value
Response Code	422
Header	*Standard response header attributes:* Content-Type: application/json Content-Encoding: As requested [gzip, compress, deflate]

Item	Value
Body	JSON – as per Section 13.2 – Indicating no value for optional fields
	In the JSON format, to indicate no value for optional fields, the entire attribute must be removed.
	Bid submission, on page 61.

```
{
  transactionId: [string],
  data: {
    referenceId: [string],
    offerTimeStamp: [date/time],
    submissionTimeStamp: [string],
    comments: [string],
    status: [string],
    filename: [string],
    method: [string],
    authorisedBy: [string],
  },
  warnings: [
    {
      code: [string],
      title: [string],
      detail: [string],
      source: [string]
    }
  ],
  errors: [
    {
      code: [string],
      title: [string],
      detail: [string],
      source: [string]
    }
  ]
}
```

Example request

```
POST /NEMWholesale/bidding/v1/submitBids HTTP/1.1

Content-Type: application/json
Accept: application/json
Accept-Encoding: gzip
Content-Length: nnn
Content-Encoding: gzip
Authorization: Basic dGVzdG1hbnVhbSpOZK1tY28wMw==
X-market: NEM
X-initiatingParticipantID: ACMECORP
{
  "submissionTimeStamp": "2021-07-01T01:00:11+10:00",
  "referenceId": "123",
  "comments": "My first bid",
  "authorisedBy": "Max",
  "energyBids": […],
  "fcasBids": […]
}
```

Example response for valid bid

```
HTTP/1.1 200 OK
Content-Type: application/json
Content-Length: nnn
Content-Encoding: gzip
{
  "transactionId": "10ad7d61-27fb-4446-98fe-f4cd3622c8f4",
  "data": {
    "referenceId": "123",
    "offerTimeStamp": "2021-07-01T01:03:11+10:00",
    "submissionTimeStamp": "2021-07-01T01:00:11+10:00",
    "comments": "My first bid",
    "status": "VALID",
    "filename": "<AEMO constructed>",
    "method": "API",
    "authorisedBy": "Max",
  }
}
```

Example response for invalid bid

```
HTTP/1.1 422 Unprocessable Entity
Content-Type: application/json
Content-Length: nnn
Content-Encoding: gzip
{
  "transactionId": "10ad7d61-27fb-4446-98fe-f4cd3622c8f4",
  "data": {
    "referenceId": "123",
    "offerTimeStamp": "2021-07-01T01:03:11+10:00",
    "submissionTimeStamp": "2021-07-01T01:00:11+10:00",
    "comments": "My first bid",
    "status": "CORRUPT",
    "filename": "<AEMO constructed>",
    "method": "API",
    "authorisedBy": "Max",
    },
  "errors": [
    {
      "code": "NEM-Bidding-Price-ExceedsMPC",
      "title": "Price Exceeds MPC",
      "detail": "Prices must not exceed the market price cap of $13,500",
      "source": "$.energyBids[?(@.duid = 'UNIT1' && @.tradingDate='2021-04-
21')].energyPeriods[100].price"
    }
  ]
}
```

7.11.5 GET getBids

Retrieve one or more Energy, FCAS, or MNSP Bid/Offers (not including interval data).

Request

Item	Value
URL Path	/NEMWholesale/bidding/v1/getBids
Method	GET
Header	Standard request header attributes, be sure to include: 1. Authorization: Basic .... 2. Content-Encoding: gzip

Item	Value			
Optional parameters	Name	Description	Default	
	fromTradingDate	From Trading Day (inclusive)	Current Trading Day	
	toTradingDate	To Trading Day (inclusive)	fromtradingday + 7 days	
	duid	Comma separated list of dispatchable unit (DUID) or MNSP InterconnectorId	All DUIDs/interconnectorIds	
	service	Comma separated list of services: ENERGY, MNSP, RAISE60SEC, LOWER60SEC etc...	All services	
	includeSuperseded	If set to true includes all versions of bids Otherwise the current effective bids are returned	False	
Response	Header	Standard response header attributes: Content-Type: application/json Content-Encoding: gzip		
	Response Code	200		
	Body	JSON (quotes removed for simplicity)		

```
{
  transactionId: [string], --unique for this API request
  data: {
    bids: [
        {
            referenceId: [string],
            transactionId: [string], --unique for the original
submission
            offerTimeStamp: [date/time],
            tradingDate: [string],
            duid: [string],
            service: [string],
            entryType: [string],
            rebidExplanation: [object],
        },
        …
    ]
  },
  "errors": [],
  "warnings": []
}
```

Example request

```
GET /NEMWholesale/bidding/v1/getBids? HTTP/1.1

Accept: application/json
Accept-Encoding: gzip
Authorization: Basic dGVzdG1hbnVhbSpOZK1tY28wMw==
X-market: NEM
X-initiatingParticipantID: ACMECORP
```

Example response

```
HTTP/1.1 200 OK
Content-Type: application/json
Content-Length: nnn
Content-Encoding: gzip
{
  "transactionId": "4585bb2e-328a-4726-960f-b6ac15d8dc08",
  "data": {
    "bids": [
      {
        "referenceId": "#1234",
        "transactionId": "4abab6ec-6aa7-4f75-bc3f-9060d83dda83",
        "duid": "UNIT1",
        "tradingDate": "2021-04-25",
        "offerTimestamp ": "2021-04-24T15:03:16",
        "service": "ENERGY"
        "entryType": "REBID",
        "rebidExplanation": {
          "reason": "Unit trip",
          "eventTime": "13:10:22"
        },
      },
      {
        "referenceId": "#1235"
        "transactionId": "4abab6ec-6aa7-4f75-bc3f-9060d83dda83",
        "duid": "UNIT2",
        "tradingDate": "2021-04-25",
        "offerTimestamp ": "2021-04-24T15:03:16",
        "service": "ENERGY"
        "offerDateTime": "2021-04-24T15:03:16",
        "entryType": "DAILY",
        "rebidExplanation": {}
      }
    ]
  },
  "errors":[],
  "warnings":[]
}
```

Example usage

URL	Result
getBids	See getBids scenarios on page 50

7.11.6 GET getBid

Returns all details for a specific Bid/Offer, including interval, day, and Submission information.

Request

Item	Value		
URL Path	/NEMWholesale/bidding/v1/getBid		
Method	GET		
Header	Standard request header attributes, be sure to include: Authorization: Basic .... Content-Encoding: gzip		
Mandatory parameters	**Name**	**Description**	**Default**
	tradingDate	The Trading Day the Bid is for	All parameters are compulsory
	duid	The unit or MNSP interconnectorId	
	OfferTimeStamp	date/time	

Successful response

Item	Value
Response Code	200
Header	Standard response header attributes: Content-Type: application/json Content-Encoding: ...
Body	JSON (quotes removed for simplicity) Only one of energyBid, fcasBid or mnspBid is returned

```
{
  transactionId: [string], --unique for this API request
  data: {
      participantId: [string],
      offerTimeStamp: [date/time],
      transactionId: [string], --unique for the original submission
      referenceId: [string],
      filename: [string],
      status: [string],
      submissionTimeStamp: [string],
      comments: [string],
      authorisedBy: [string],
      method: [string],
      energyBid: [object] – only one of these is returned
      fcasBid: [object] – only one of these is returned
      mnspBid: [object] – only one of these is returned
  },
  "errors": [],
  "warnings": []
}
```

Example request

```
GET /NEMWholesale/bidding/v1/getBid?duid=UNIT1&service=ENERGY HTTP/1.1

Accept: application/json
Accept-Encoding: gzip
Authorization: Basic dGVzdG1hbnVhbSpOZK1tY28wMw==
X-market: NEM
X-initiatingParticipantID: ACMECORP
```

Example response

```
HTTP/1.1 200 OK
Content-Type: application/json
Content-Length: nnn
Content-Encoding: gzip
{
  "transactionId": "4abab6ec-6aa7-4f75-bc3f-9060d83dda83",
  "data": {
    "participantId": "ACMECORP",
    "offerTimeStamp": "2021-04-24T15:03:16",
    "transactionId": "4585bb2e-328a-4726-960f-b6ac15d8dc08",
    "referenceId": "#12345",
    "comments": "Daily offer",
    "filename": "ACMECORP_BID_19991211132538651.API",
    "authorisedBy": "Max",
    "Status": "VALID",
    "method": "API",
    "energyBid": {
      "entryType": "DAILY",
      "duid": "UNIT1",
      "tradingDate": "2021-04-25",
      "fastStartProfile": {},
      "rebidExplanation": {},
      "prices": [-
1000.00,0.00,100.00,200.00,500.00,1000.00,5000.00,10000.00,11000.00,120
00.00],
      "energyPeriods": [
        {
          "periodId": 1,
          "rampUpRate": 3,
          "rampDownRate": 3,
          "pasaAvail": 100,
          "maxAvail": 100,
          "bandAvail": [0,0,0,50,50,0,0,0,0,0]
        },
        {
          "PeriodId": 2,
          "rampUpRate": 3,
          "rampDownRate": 3,
          "pasaAvail": 100,
          "maxAvail": 100,
          "bandAvail": [0,0,0,50,50,0,0,0,0,0]
        }
        ...
      ]
```

```
      }
},
"errors":[],
"warnings":[]
}
```

Example usage

There are no scenarios for this submission because all fields are mandatory.

7.11.7 GET getSubmissions

Retrieve a list of previous Submissions where the requesting participantId is the submitting participantId.

Request

Item	Value
URL Path	/NEMWholesale/bidding/v1/getSubmissions
Method	GET

Item	Value		
Optional parameters	Name	Description	Default
	fromTradingDate	Date of the Trading Day to query from (inclusive)	Optional
	toTradingDate	Date of the Trading Day to query from (inclusive)	Optional
	transactionId	Filter based on a partial match to the transactionId	Optional
	fromOfferTimeStamp	Date/time of the offerTimeStamp to query from (inclusive)	Start of current day
	toOfferTimeStamp	Date/time of the offerTimeStamp to query until (inclusive)	fromoffertimestamp + 90 days
	referenceId	Filter based on a partial match to referenceId	Optional
	method	Filter based on the type of Submission: web, API, FTP, REG REG is only visible after registration setup, in the new participant's initial Bid	Optional
	comments	Filter based on a partial match to comments	Optional

Successful response

Item	Value
Response Code	200
Header	*Standard response header attributes:* Content-Type: application/json Content-Encoding: As requested [gzip, compress, deflate]
Body	JSON *(quotes removed for simplicity)*

```
{
 transactionId: [string], --unique for this API request
 data: {
    submissions: [
        {
            participantId [String]
            transactionId: [string], --unique for the original submission
            referenceId: [string],
            offerTimeStamp: [date/time],
            submissionTimeStamp: [string],
            comments: [string],
            status: [string],
            filename: [string],
            method: [string],
            authorisedBy: [string]
        },
        …
    ]
 },
 "errors": [],
 "warnings": []
}
```

Example request

```
GET /NEMWholesale/bidding/v1/getSubmissions HTTP/1.1

Accept: application/json
Accept-Encoding: gzip
Authorization: Basic dGVzdG1hbnVhbSpOZK1tY28wMw==
X-market: NEM
X-initiatingParticipantID: ACMECORP
```

Example response

```
HTTP/1.1 200 OK
Content-Type: application/json
Content-Length: nnn
Content-Encoding: gzip
{
  "transactionId": "76e454bb-ee36-40a5-9b55-709abef50fbe",
  "data": {
    "submissions": [
      {
        "participantId": "ACMECORP",
        "offerTimeStamp": "2021-04-25T12:11:54",
        "transactionId": "6a337759-81dd-49c0-ae88-3c3046ce653d",
        "referenceId": "#1234",
        "submissionTimeStamp": "2021-04-25T04:06:46",
        "comments": "Test",
        "filename": "ACMECORP_BID_20210418121155117.API",
        "authorisedBy": "Max",
        "status": "VALID",
        "method": "API"
      },
      {
        "participantId": "ACMECORP",
        "offerTimeStamp": "2021-04-26T12:11:54",
        "transactionId": "6a337759-81dd-49c0-ae88-3c3046ce653e",
        "referenceId": "#12345",
        "submissionTimeStamp": "2021-04-25T04:06:46",
        "comments": "Test",
        "filename": "ACMECORP_BID_20210426121155117.API",
        "authorisedBy": "Max",
        "status": "VALID",
        "method": "API"
      },
    ]
  },
"errors":[],
"warnings":[]
}
```

Example usage

URL	Result
getSubmissions	See getSubmissions getSubmissions scenarios on page 51

7.11.8 GET getSubmission

Retrieve a previous Submission where the requesting participantId is the submitting participantId.

Request

Item	Value		
URL Path	/NEMWholesale/bidding/v1/getSubmission		
Method	GET		
Optional parameters	Name	Description	Default
	referenceId	Exact match on referenceId	Optional
	transactionId	Exact match on transactionId	Optional
	Provide either a referenceId or a transactionId.		

Successful Response

Item	Value
Response Code	200
Header	*Standard response header attributes:* Content-Type: application/json Content-Encoding: ...

Item	Value

Body	JSON *(quotes removed for simplicity)*
	
	``
	{
	  transactionId: [string], --unique for this API request
	  data: {
	
	    participantId [String]
	    transactionId: [string], --unique for the original submission
	    referenceId: [string],
	    offerTimeStamp: [date/time],
	    submissionTimeStamp: [string],
	    comments: [string],
	    status: [string],
	    filename: [string],
	    method: [string],
	    authorisedBy: [string],
	    energyBids: [array], -- period details not included
	    fcasBids: [array], -- period details not included
	    mnspBids: [array] – period details not included
	  },
	"errors":[],
	"warnings":[]
	}
	``

Example submission

```
GET /NEMWholesale/bidding/v1/getSubmission?referenceId=123 HTTP/1.1

Accept: application/json
Accept-Encoding: gzip
Authorization: Basic dGVzdG1hbnVhbSpOZK1tY28wMw==
X-market: NEM
X-initiatingParticipantID: ACMECORP
```

Example response

```
HTTP/1.1 200 OK
Content-Type: application/json
Content-Length: nnn
Content-Encoding: gzip
{
  "transactionId": "76e454bb-ee36-40a5-9b55-709abef50fbe",
  "data": {
    "participantId": "ACMECORP",
    "offerTimeStamp": "2021-04-25T12:11:54",
    "transactionId": "6a337759-81dd-49c0-ae88-3c3046ce653d",
    "referenceId": "#1234",
    "submissionTimeStamp": "2021-04-25T04:06:46",
    "comments": "Test",
    "filename": "ACMECORP_BID_20210418121155117.API",
    "authorisedBy": "Max",
    "status": "VALID",
    "method": "API",
    "energyBids": [
      {
        "entryType": "DAILY",
        "duid": "UNIT1",
        "tradingDate": "2021-04-25",
        "fastStartProfile": {},
        "rebidExplanation": {},
        "prices": [-
1000.00,0.00,100.00,200.00,500.00,1000.00,5000.00,10000.00,11000.00,120
00.00],
      }
    ]
  }
"errors": [],
"warnings": []
}
```

Example usage

URL	Result
getSubmission	See getSubmission scenarios on page 53
getSubmission?referenceid=123	Returns the Submission matching the specified referenceId
getSubmission?transactionid=abc	Returns the Submission matching the specified transactionid

7.12 Bid processing order

Bids are processed in the order they are received from a participant. It is up to the participant to ensure the correct Submission order, and to ensure the correct effective Bid results in AEMO's systems.

7.13 Partial match parameters

AEMO offers partial filtering for the following parameters:

1. transactionId
2. referenceId
3. comments

The partial match can be anywhere in the full string and must be string literal, for example, no wildcards or regular expressions.

7.13.1 Case sensitive parameter

- transactionId
- referenceId

7.13.2 case insensitive parameter

- comments

7.14 Bidding scenarios

7.14.1 GetBids

Returns a metadata list of specific Bid/offers based on the following optional parameters.

Only includes duid and Trading Day details. Period details not included.

Mandatory

There are no mandatory parameters.

Optional

1. fromTradingDate (default =current Trading Date)
2. toTradingDate (default =Trading Date + 7 days)
3. duid (or interconnectorId)
4. service
5. includeSuperseded (default = FALSE)

Returns

See getBids Example response on page 39

Function

A seven day range returns; if you require a greater range, you must call the API more than once.

getBids scenarios

Paramater used	Outcome	Explanation
None	The current Bid/Offer for each Service Type for each owned duid / InterconnectorId between the current tradingDate and the current tradingDate + 7 days	You can use the return values to find the full bid detail or getSubmission to find the full Submission detail
includeSuperseded	All Bids/Offers for each Service for each Partipant ID owned duid / InterconnectorId submitted for the Trading Dates between the current Trading Date and the current Trading Date + 7 days	Returns all Bid/Offers, not only current Bids/Offers

7.14.2 GetBid

Retrieve the details for a specific Bid/Offer, including the Submission details.

Mandatory

1. duid + service or duid (InterconnectorId)
2. tradingDate
3. offerTimeStamp

Optional

There are no optional parameters.

Returns

See Example response on page 41.

Function

If the parameters match, the specific Bid/Offer details return. Otherwise an error returns.

getBid scenarios

There are no scenarios for this submission because all fields are mandatory.

7.14.3 getSubmissions

Returns a list of Submissions where the requesting participantId is the submitting participantId.

Mandatory

There are no mandatory parameters.

Optional

> **All Submission searches must match the submitting Participant ID, so only Submissions by the requesting Participant ID return.**

1. fromTradingDate (no default)
2. toTradingDate (no default)
3. transactionId
4. fromOfferTimeStamp (current TradingDate)
5. toOfferTimeStamp (TradingDate + 90 days)
6. referenceId
7. comments

Returns

See Example response on page 45.

Function

For performance reasons the fromOfferTimeStamp and toOfferTimeStamp range is restricted to a configurable range. AEMO adjusts this value based on observed system performance. The initial range is 90 days.

The parameters referenceId and comments are declared as **partial match** parameters because the query is range bound by the primary key fields ParticipantId and OfferTimeStamp.

getSubmissions scenarios

Paramater used	Outcome	Explanation
None	All Submissions from NOW until 90 days to NOW, made by the requesting participantId	The default toOfferTimeStamp is the current time The default fromOfferTimeStamp is the current time until 90 days

Paramater used	Outcome	Explanation
fromOfferTimeStamp toOfferTimeStamp	All Submissions from the given fromOfferTimeStamp until the given toOfferTimeStamp, made by the requesting participantId	For this scenario you must provide the fromOfferTimeStamp and the toOfferTimeStamp The range must not exceed 90 days
transactionId fromOfferTimeStamp toOfferTimeStamp	All Submissions from the given fromOfferTimeStamp until the given toOfferTimeStamp exactly matching the given transactionId, made by the requesting participantId	This example also applies for referenceId, transactionId, and comments because all are partial match variables
fromTradingDate	All submissions from the default fromOfferTimeStamp to the default toOfferTimeStamp with Bids/Offers for Trading Dates equal to or greater than the given fromTradingDate, made by the requesting participantId	This is not a definitive list of all Bids/Offers for the given Trading Date range because there is a restriction with the OfferTimeStamp range.

7.14.4 GetSubmission

Retrieve a previous Submission's metadata and validation status, where the requesting participantId is the submitting participantId. Period details not included

Mandatory

1. At least one of referenceId or transactionId.

Optional

1. referenceId
2. transactionId

Returns

See Example response on page 48.

Function

You must provide at least one optional parameter otherwise no results return.

getSubmission scenarios

Param values	Outcome	Explanation / Comment
None	No results	You must provide at least one optional value
referenceId	The Submission matching the given referenceId	If the Submission for the given data has no data then a null result returns
transactionId	The Submission matching the given transactionId	If the Submission for the given data has no data then a null result returns
referenceId transactionId	The Submission that matches the given referenceId and the given transactionId	If the Submission for the given data has no data then a null result returns

8 Electricity Data Model v5.00

Information about the v5.00 Data Model changes is now in the **EMMS Technical Specification - 5MS - Data Model v5.00**.

9 Implementation

9.1 Transition

The 5MS Readiness Workstream and Cutover forums communicate transition.

9.2 Implications

To maintain systems in line with AEMO's market systems, participants need to:

- Review and assess the impact on their market systems with respect to the changes implemented as part of this Release.

- Change their systems prior to the implementation of this Release.

- Schedule staff and resources to upgrade their market systems for the production implementation of this Release.

9.3 Risks

- Risks are tracked in the **5MS Program Consultative Forum (PCF)**.

10   References

5MS Factsheet: Provides an overview of what 5 Minute Settlement (5MS) is, and how AEMO is going about implementing the change (https://www.aemo.com.au/-/media/Files/Electricity/NEM/5MS/Program-Information/2018/5MS-factsheet.pdf)

5MS High Level Design: Provides information about the potential design of AEMO processes and systems to support the proposed introduction of five-minute settlement' (https://www.aemc.gov.au/sites/default/files/content/b862be5a-4460-4b72-a90b-8f73117f301c/5MS-HLD-Final-4-Sep.pdf)

5MS Staging Environment: Provides details about the staging environment and how to access it: https://aemo.com.au/Electricity/National-Electricity-Market-NEM/Five-Minute-Settlement/Systems-Workstream/Staging-Environment

Concise Guide to Data Interchange: Assists participants to understand AEMO's Data Interchange software, describing how to set up a standard Data Interchange environment to replicate data between AEMO's wholesale energy market systems and participants' local DBMS conforming to the electricity or gas Data Models.

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.

EMMS Technical Specification - 5MS - Data Model v5.00: Information about the changes to the Elctricity Data Model for 5MS.

Guide to AEMO CSV Data Format Standard: Describes the csv data format standard used within flat files to and from AEMO's systems. Its primary function is to provide sufficient information to allow participants to understand the CSV data format used for exchanging data with AEMO.

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.

National Electricity Rules ("The Rules"): Provides details on the national electricity rules that govern all system and process/procedural changes.

NER Amendement – 5MS: Explains the amendments to the Rules regarding 5 minute settlements. See 'National Electricity Amendment (Five-minute settlement rule) 2017' (https://www.aemc.gov.au/rule-changes/five-minute-settlement).

Rebidding and Technical Parameters Guideline outlines the detail required in a Rebid reason submitted to AEMO. The process for requesting additional information to verify the rebid reasons and several related areas associated with the bidding and rebidding of technical parameters.

Release Schedules and Technical Specifications: https://aemo.com.au/Electricity/IT-Systems/IT-change

11 Rules terms

You can find the following terms defined in the National Electricity Rules (NER):
https://www.aemc.gov.au/regulation/energy-rules/national-electricity-rules/current

Term
AEMO
AEMO Markets Portal
Ancillary Services
Bid File
Cancelled Units
Constraint
Cumulative Price Threshold
Dispatch Interval
Energy Constraints
Interconnector
Inter-regional
Intra-regional
Mandatory Restriction
Market Ancillary Services
Market Participants
NEM
NMI

Term
Offer File
Offer Period
Offers
Offered Units
PASA
Pre-dispatch
Rebid
Registered Participant
Semi-scheduled Generating Units
Settlements Residue
Short-term
Spot Price
Trading Day
Trading Interval
Units
Unit Category

12 Glossary

Term	Explanation
30-min period	New term to replace 'trading interval', where the period needs to remain as 30 minutes
5MS	Five-Minute Settlement Program
AEST	Australian Eastern Standard Time
Bid	A Bid/Offer for a specific Trading Day, DUIDs/LinkID, and Service Type
Bid/Offer	The term Bid relates to the following Dispatch Bids: 1. Energy (Scheduled Loads) The term Offer relates to the following Dispatch Offers: 1. Energy (Generation Dispatch Offer) 2. Frequency Control Ancillary Service (FCAS) 3. Market Network Service Provider (MNSP - Network Dispatch Offer)
Data Model	The definition of the interface to participants of data published by AEMO for gas or electricity. A database conforming to the Data Model can contain a local copy of all current participant-specific data recorded in the main database. The Data Model includes database tables, indexes, and primary keys
DUID	Dispatch unit ID or Interconnector ID
EDM	Electricity Data Model
EMMS	Electricity Market Management System; software, hardware, network and related processes to implement the wholesale energy market
FCAS	Frequency Control Ancillary Services
Fixed Load	Optional MW, not greater than the max. availability
FTP	File transfer protocol
GS	Global Settlement
JSON	Java Standard Object Notation. An agreed format for text files and data exchange. This is now used by AEMO to receive Bids and Offers and provide responses
LinkID	Identifies the MNSP interconnector link in AEMO's systems. A property in the MNSPBidLink object in the JSON bidding schema
MNSP	Market Network Service Provider
MSATS	Market Settlement and Transfer Solution for retail electricity

Term	Explanation
MW	Megawatt
NER	National Electricity Rules
Participant ID	Registered participant identifier; A company can have more than one Participant ID
PCF	5MS Program Consultative Forum
PID	Participant ID
Project	5MS Dispatch and Operations
RWG	Readiness working group
Service Types	Energy, FCAS, or MNSP
SSL	Secure Sockets Layer. A standard security technology for establishing an encrypted link between a web server and a browser
Submission	A Bid/Offer submission can have: 1. Multiple Trading Days 2. Multiple DUIDs/LinkIDs 3. All Service Types in the same Submission
SWG	Systems Working Group

13 Appendix 1 – Bidding JSON Format

This information is replaced with a new version of the **Participant Input Interface Energy – MNSP – FCAS Bid File Submission** document.

13.1 Design

The new format is designed to be compatible in structure with the existing txt file format Submission. For example:

- Support bids and offers to be provided for multiple trading days and DUIDs.

- Support provision of Energy, FCAS and MNSP bids/offers in the same Submission.

Under the JSON format, the different types of bids, Energy, FCAS and MNSP, are proposed to have separate defined formats.

The main design change from the txt format is:

- Fields that are not required for a Bid type, or are optional, do not need to be provided in the Submission.

AEMO believes the proposed JSON format:

- Makes the process of building Bid/Offer systems less costly and easier to test for new participants/vendors, enabling leveraging of modern technologies that natively support JSON.

- Makes validation in AEMO's and participants' systems easier to implement and support; the formats would allow schema validation based on Bid type.

- Better supports future changes to bidding (such as better support for batteries) which may only impact one or more of the Bid types and could be done with conditionally mandatory fields, reducing the impact on AEMO's and participants' systems.

- Makes the technical specification clearer and easier to understand, avoiding format misunderstandings.

13.2 Indicating no value for optional fields

In the JSON format, to indicate no value for optional fields, the entire attribute must be removed.

13.3 Bid submission

Every Submission must supply the following Submission level information. The respective bids are then provided in the energyBids, fcasBids, mnspBids arrays.

This supports multiple bids to be provided, which may be for different trading days, DUIDs and FCAS services.

```
{
  "submissionTimeStamp": [string],
  "referenceId": [string],
  "comments": [string],
  "authorisedBy": [string],
  "energyBids": [array],
  "fcasBids": [array],
  "mnspBids": [array]
}
```

The following is used to describe a field's requirement:

- Mandatory (M) – The field must be provided, in respect to its parent element.

- Optional (O) – You may provide the field, if not provided a default is assumed. To indicate no value, you must remove the entire attribute.

- Conditional (C) – The field is normally optional but may be mandatory under certain conditions.

Field	Type	Option	Description
submissionTimeStamp	string	O	Participant provided timestamp for the Submission. Expected in the format: yyyy-mm-ddThh:MM:ss[+10:00] e.g. 2021-04-23T20:20:39 2021-04-23T20:20:39+10:00
referenceId	string(100)	O	A participant provided reference. Must be unique for each Submission.
comment	string(100)	O	A field allow the participant to provide a comment or description for this Submission.
authorisedBy	String(20)	O	Person authorising this Submission. Used for participant's reference but not validated.
energyBids	array	C	Collection of one or more Energy bids. At least one of energyBids/fcasBids/mnspBids must be provided.

25

Field	Type	Option	Description
fcasBids	array	C	Collection of one or more FCAS bids. At least one of energyBids/fcasBids/mnspBids must be provided.
mnspBids	array	C	Collection of one or more MNSP bids. At least one of energyBids/fcasBids/mnspBids must be provided.

The **ParticipantId** is no longer required in the Submission. AEMO determines this in the identity management layer. AEMO then validates authorisation to submit for the respective DUIDs.

13.4 Energy bid

Provided in the EnergyBids element of a Submission. For an example, see Bidding schema on page 72.

Field	Type	Option	Description
energyBid	object	M	Mandatory for energy bids
tradingDate	string	M	Must be a valid date. The effective date for this Bid. Expected in the format: yyyy-mm-dd or yyyy-mm-dd 00:00:00 e.g. 2021-04-23 2021-04-23 00:00:00
duid	string(10)	M	The dispatchable unit for this Bid
prices	Array Items/price	M	An array of 10 prices e.g. [-3.50, 0.00, 4.01, 5.01, ... 5011.01]
price	number	M	Band prices e.g. 0.01, etc
fastStartProfile	object	O	Only valid for fast-start units. If not provided, the unit is treated as slow start, and all values in the data model default to null

Field	Type	Option	Description
dailyEnergyConstraint	integer	O	minimum: 0 maximum: 999999 Maximum Energy available from the constrained plant in MWh/day
rebidExplanation	object	C	Required for rebids, fixed load, and low ramp rates See Rebid explanation on page 68
mrPriceScalingFactor	number	O	Mandatory restrictions offer price scaling factor Not valid for scheduled loads
energyPeriods	array	M	An array of 288 period objects
energyBids	array	M	Items/energyBid
items	object	M	fcasPeriods
periodId	integer	M	The 5-minute interval, starting from the interval starting at 0400 (and ending at 0405) Must be between 1 and 288
maxAvail	integer	M	Maximum MW availability in this period
rampUpRate	integer	M	Rate of Change Up - The maximum rate of increase for the unit in MW/min
rampDownRate	integer	M	Rate of Change Down - The maximum rate of decrease for the unit in MW/min
bandAvail	array	M	An availability for each of the 10 price bands must be provided Min Items: 10 Max Items: 10 e.g. [0, 0, 100, 200, 0, 0, ...]
pasaAvail	integer	M	The unit's capability including any capability potentially available in 24 hours
mrCapacity	integer	O	Required if offering under Mandatory Restrictions. Not valid for scheduled loads

Field	Type	Option	Description
fixedLoad	integer	O	Fixed unit output, in MW. Must be 1 MW or greater. A rebid reason must be provided if this field is populated
fastStartProfile	object	O	Fast-Start Inflexibility Profile
minimumLoad	integer	M	Minimum MW load
t1	integer	M	Time to synchronise, in minutes minimum: 0 maximum: 30
t2	integer	M	Time to reach minimum load, in minutes minimum: 0 maximum: 30
t3	integer	M	Time at minimum load, in minutes minimum: 0 maximum: 59
t4	integer	M	Time to shut down, in minutes minimum: 0 maximum: 59

13.5 FCAS bid

Provided in the fcasBids element of a Submission. For an example, see Bidding schema on page 72.

Field	Type	Option	Description
fcasBid	object	M	Mandatory for FCAS bids
tradingDate	string	M	Must be a valid date. The trading day the Bid is for. Expected in the format: yyyy-mm-dd or yyyy-mm-dd 00:00:00 e.g. 2021-04-23 2021-04-23 00:00:00
duid	string(10)	M	The dispatchable unit the Bid is for

Field	Type	Option	Description
prices	Array Items/price	M	An array of 10 prices e.g. [-3.50, 0.00, 4.01, 5.01, ... 5011.01]
price	number	M	Band prices e.g. 0.01, etc
service	string(10)	M	The FCAS service type, one of: RAISE6SEC, RAISE60SEC, RAISE5MIN, RAISEREG, LOWER6SEC, LOWER60SEC, LOWER5MIN
rebidExplanation	object	C	Required for rebids, fixed load, and low ramp rates See Rebid explanation on page 68
fcasPeriods	array	M	An array of 288 period objects
items	object	M	fcasPeriods
periodId	integer	M	The 5-minute interval, starting from the interval starting at 0400 Must be between 1 and 288
maxAvail	integer	M	Maximum MW availability for this service and period
bandAvail	array	M	An availability for each of the 10 price bands must be provided Min Items: 10 Max Items: 10 e.g. [0, 0, 100, 200, 0, 0, ...]
enablementMin	integer	M	Minimum MW output at which this service can be supplied
lowBreakPoint	integer	M	FCAS low break point, in megawatts.
highBreakPoint	integer	M	FCAS high break point, in megawatts.
enablementMax	integer	M	Maximum MW output at which this service can be supplied

13.6 MNSP bid

Provided in the mnspBids element of a Submission. For an example, see Bidding schema on page 72.

Field	Type	Option	Description
mnspBid	object	M	Mandatory for MNSP bids
interconnectorId	string(10)	M	The name of the registered interconnector.
tradingDate	string	M	Must be a valid date. The trading day the Bid is for. Expected in the format: yyyy-mm-dd or yyyy-mm-dd 00:00:00 e.g. 2021-04-23 2021-04-23 00:00:00
mnspBidImport	mnspBidLink	M	The import Bid for the interconnector
mnspBidExport	mnspBidLink	M	The export Bid for the interconnector
rebidExplanation	object	C	Required for rebids, fixed load, and low ramp rates See Rebid explanation on page 68
mnspBidLink	object	M	
linkId	string(10)	M	Identifies the interconnector link in AEMO's systems. This is case sensitive
prices	Array items/price	M	An array of 10 prices e.g. [-1.00, 0.00, 0.50, 20.00....]
price	number	M	Band prices e.g. 0.01, etc
mrPriceScalingFactor	number	O	Mandatory restrictions offer price scaling factor.
mnspBids	array	M	Items/mnspBid
mnspPeriods	array	M	An array of 288 period objects
items	object	M	mnspPeriods

Field	Type	Option	Description
periodId	integer	M	The 5-minute interval, starting from the interval starting at 0400 Must be between 1 and 288
maxAvail	integer	M	Maximum MW availability for this service and period
rampUpRate	integer	M	Rate of change in MW/min for increasing this link
bandAvail	Array items/avail	M	An availability for each of the 10 price bands must be provided Min Items: 10 Max Items: 10 e.g. [0, 0, 100, 200, 0, 0, ...]
avail	integer	M	The availability (or required level) of energy for each price band, in whole megawatts
pasaAvail	integer	M	The links capability including any capability potentially available in 24 hours
mrCapacity	integer	O	Required if offering under Mandatory Restrictions.
fixedLoad	integer	O	Fixes unit output in MW. Must be 1 MW or greater. A rebid reason must be provided if this field is populated

13.7 Rebid explanation

Field	Type	Option	Description
rebidExplanation	object	C	Required for rebids, fixed load, and low ramp rates
reason	string(500)	M	A brief, verifiable and specific reason for the rebid, fixed load or low ramp rate. Required for rebids.

Field	Type	Option	Description
eventTime	string	C	The time of the event(s) or other occurrence(s) cited/adduced as the reason for the rebid. Required for rebids, not required for fixed load or low ramp rates. Expected in the format: HH:MM:SS e.g. 20:10:00 An invalid value for this field results in AEMO rejecting the Submission
awareTime	string(8)	O	Intended to support the **Rebidding and Technical Parameters Guideline**. The time when the participant became aware of the event(s) / occurrence(s) that prompted the rebid. Not validated by AEMO
decisionTime	string(8)	O	Intended to support the **Rebidding and Technical Parameters Guideline**. The time when the participant made the decision to rebid. Not validated by AEMO
category	string(1)	O	Intended to support the **Rebidding and Technical Parameters Guideline**. A provided rebid category. Not validated by AEMO

13.8 Bid submission response

The following response occurs when:

- A Submission is successfully validated and accepted by AEMO (possibly with warnings)
- A Submission fails validation and is not accepted

```
{
  "transactionId": [string],
  "data": {
    "referenceId": [string],
    "offerTimeStamp": [date/time],
    "submissionTimeStamp": [string],
    "comments": [string],
    "status": [string],
    "filename": [string],
    "method": [string],
    "authorisedBy": [string]
  },
  "errors": [
    {
      "code": [string],
      "title": [string],
      "detail": [string],
      "source": [string]
    },
    ...
  ],
  "warnings": [
    {
      "code": [string],
      "title": [string],
      "detail": [string],
      "source": [string]
    },
    ...
  ]
}
```

Field	Type	Option	Description
transactionId	string(100)	M	A GUID that uniquely identifies this transaction in AEMO's systems
data	object	M	Holds returned data values
referenceId	string(100)	O	The reference id value provided by the participant in the Submission.
offerTimeStamp	date/time	M	The date/time the Submission was processed by AEMO
submissionTimeStamp	string	O	The participant specified timestamp for this Submission format: date-time
comments	string(500)	O	A participant supplied comment for the Submission

Field	Type	Option	Description
status	Boolean	M	Whether the Submission was accepted by AEMO as valid or not. Returns either "VALID" or "CORRUPT"
filename	string(40)	M	The filename of the Submission. AEMO constructs a name for WEB and API Submissions
method	string(3)	M	The method of the Submission, FTP/WEB/API/REG.
authorisedBy	string(20)	O	Participant's provided authoriser
errors	array	C	An array of any validation errors. Mandatory when validation has failed.
code	number(6)	M	A numeric code uniquely identifying the error
title	string(200)	M	A title for the error
detail	string(500)	M	The error details
source	string(200)	M	The source of the error
warnings	array	O	An array of any validation warnings. Warnings do not cause validation to fail, only errors result in a failure.
code	number(6)	M	A numeric code uniquely identifying the warning
title	string(200)	M	A title for the warning
detail	string(500)	M	The warning details
source	string(200)	M	The source of the warning

13.9 Bidding schema

This is the JSON schema for a bidding Submission. Participants may use this to validate their bids before sending them to AEMO's systems. It conforms to the JSON Schema version 7.0.

You can use this reference schema validator this schema: https://www.jsonschemavalidator.net/.

```json
{
  "type": "object",
  "title": "NEM Energy, FCAS and MNSP bid Submission schema",
  "description": "Data submitted to AEMO as an offer or bid for Energy, FCAS or MNSP",
  "$schema": "http://json-schema.org/draft-07/schema#",
  "$id": "http://nemweb.com.au/schemas/json/bidding_submission.json",
    "definitions": {
        "authorisedBy": {
      "type": "string",
      "description": "Participant's Authoriser",
      "maxLength": 20
        },
    "avail": {
      "type": "integer",
      "description": "The availability (or required level) of energy for each price band, in whole megawatts.",
      "minimum": 0
        },
    "awareTime": {
      "type": "string",
      "description": "Expected to be the time at which the participant became aware of the event causing the need to rebid (24h clock, NEM time) - HH:MM:SS",
      "maxLength": 8
        },
    "bandAvail": {
      "type": "array",
      "description": "The set of 10 band availabilities (see 'Avail').",
      "items": {
        "$ref": "#/definitions/avail"
            },
      "minItems": 10,
      "maxItems": 10
        },
    "category": {
      "type": "string",
      "description": "A Rebid category",
```

```json
          "maxLength": 1
            },
      "comments": {
        "type": "string",
        "description": "Participant's free-form field for information",
        "maxLength": 500
          },
            "dailyEnergyConstraint": {
        "type": "integer",
        "description": "The maximum output this unit can offer in a day, in whole
megawatts.",
        "minimum": 0,
        "maximum": 999999
          },
            "decisionTime": {
        "type": "string",
        "description": "Expected to be the time at which the participant decided to rebid
(24h clock, NEM time) - HH:MM:SS",
        "maxLength": 8
          },
      "duid": {
        "type": "string",
        "description": "Dispatchable Unit identifier as recorded in AEMO's systems, must
be upper-case.",
        "maxLength": 10
          },
            "enablementMax": {
        "type": "integer",
        "description": "Maximimum FCAS enablement limit in megawatts.",
        "minimum": 0
          },
            "enablementMin": {
        "type": "integer",
        "description": "Minimimum FCAS enablement limit in megawatts.",
        "minimum": 0
          },
      "energyBid": {
        "type": "object",
        "properties": {
          "tradingDate": {
            "$ref": "#/definitions/tradingDate"
                },
          "duid": {
            "$ref": "#/definitions/duid"
                },
          "prices": {
```

```json
                    "$ref": "#/definitions/prices"
                },
        "fastStartProfile": {
            "$ref": "#/definitions/fastStartProfile"
                },
                    "dailyEnergyConstraint": {
            "$ref": "#/definitions/dailyEnergyConstraint"
                },
        "rebidExplanation": {
            "$ref": "#/definitions/rebidExplanation"
                },
                    "mrPriceScalingFactor": {
            "$ref": "#/definitions/mrPriceScalingFactor"
                },
        "energyPeriods": {
            "$ref": "#/definitions/energyPeriods"
                }
            },
    "required": [
        "tradingDate",
        "duid",
        "prices",
        "energyPeriods"
            ]
        },
    "energyBids": {
        "type": "array",
        "items": {
            "$ref": "#/definitions/energyBid"
            }
        },
        "energyPeriods": {
        "type": "array",
        "items": {
            "type": "object",
            "properties": {
                "periodId": {
                    "$ref": "#/definitions/periodId"
                    },
                "maxAvail": {
                    "$ref": "#/definitions/maxAvail"
                    },
                "rampUpRate": {
                    "$ref": "#/definitions/rampUpRate"
                    },
                "rampDownRate": {
                    "$ref": "#/definitions/rampDownRate"
```

```json
                        },
            "bandAvail": {
                "$ref": "#/definitions/bandAvail"
                        },
            "pasaAvail": {
                "$ref": "#/definitions/pasaAvail"
                        },
            "mrCapacity": {
                "$ref": "#/definitions/mrCapacity"
                        },
            "fixedLoad": {
                "$ref": "#/definitions/fixedLoad"
                    }
                },
        "required": [
            "periodId",
            "bandAvail",
            "maxAvail",
            "pasaAvail",
            "rampUpRate",
            "rampDownRate"
                ]
            },
        "minItems": 288,
        "maxItems": 288
            },
    "eventTime": {
        "type": "string",
        "format": "time",
        "description": "Time at which the event causing the rebid occurred (24h clock) -
HH:MM:SS"
            },
    "reason": {
        "type": "string",
        "description": "Reason required by the Rules for rebids, inflexibility (fixed load)
and/or low ramp rates. Additional characters are truncated.",
        "maxLength": 500
            },
    "fcasBid": {
        "type": "object",
        "properties": {
            "tradingDate": {
                "$ref": "#/definitions/tradingDate"
                    },
            "duid": {
                "$ref": "#/definitions/duid"
                    },
```

```json
      "prices": {
        "$ref": "#/definitions/prices"
                },
      "service": {
        "$ref": "#/definitions/service"
                },
      "rebidExplanation": {
        "$ref": "#/definitions/rebidExplanation"
                },
      "fcasPeriods": {
        "$ref": "#/definitions/fcasPeriods"
                }
            },
    "required": [
        "tradingDate",
        "duid",
        "prices",
        "service",
        "fcasPeriods"
            ]
        },
  "fcasBids": {
    "type": "array",
    "items": {
        "$ref": "#/definitions/fcasBid"
            }
        },
        "fcasPeriods": {
    "type": "array",
    "items": {
        "type": "object",
        "properties": {
          "periodId": {
            "$ref": "#/definitions/periodId"
                    },
          "maxAvail": {
            "$ref": "#/definitions/maxAvail"
                    },
          "bandAvail": {
            "$ref": "#/definitions/bandAvail"
                    },
          "enablementMin": {
            "$ref": "#/definitions/enablementMin"
                    },
          "lowBreakPoint": {
            "$ref": "#/definitions/lowBreakPoint"
                    },
```

```
        "highBreakPoint": {
          "$ref": "#/definitions/highBreakPoint"
                 },
        "enablementMax": {
          "$ref": "#/definitions/enablementMax"
                 }
               },
      "required": [
        "periodId",
        "bandAvail",
        "maxAvail",
        "enablementMin",
        "lowBreakPoint",
        "highBreakPoint",
        "enablementMax"
               ]
             },
    "minItems": 288,
    "maxItems": 288
       },
  "fixedLoad": {
    "type": "integer",
    "description": "Fixed unit output (MW)",
    "minimum": 1
       },
         "fastStartProfile": {
    "type": "object",
    "description": "Fast-Start Inflexibility Profile",
    "properties": {
      "minimumLoad": {
        "$ref": "#/definitions/minimumLoad"
               },
      "t1": {
        "$ref": "#/definitions/t1"
               },
      "t2": {
        "$ref": "#/definitions/t2"
               },
      "t3": {
        "$ref": "#/definitions/t3"
               },
      "t4": {
        "$ref": "#/definitions/t4"
               }
             },
    "required": [
      "minimumLoad",
```

```json
            "t1",
            "t2",
            "t3",
            "t4"
                ]
        },
        "highBreakPoint": {
        "type": "integer",
        "description": "FCAS high break point, in megawatts.",
        "minimum": 0
        },
        "interconnectorId": {
        "type": "string",
        "description": "Identifies the relevant interconnector in AEMO's systems. This is
case sensitive.",
        "maxLength": 10
        },
        "lowBreakPoint": {
        "type": "integer",
        "description": "FCAS low break point, in megawatts.",
        "minimum": 0
        },
    "linkId": {
        "type": "string",
        "description": "Identifies the interconnector link in AEMO's systems. This is case
sensitive.",
        "maxLength": 10
        },
    "maxAvail": {
        "type": "integer",
        "description": "Maximum availability loading for a period, in whole megawatts.",
        "minimum": 0
        },
        "minimumLoad": {
        "type": "integer",
        "description": "Fast-Start minimum load level for inflexibility profile, in
megawatts.",
        "minimum": 0
        },
    "mnspBid": {
        "type": "object",
        "properties": {
            "interconnectorId": {
                "$ref": "#/definitions/interconnectorId"
                },
            "tradingDate": {
```

```
          "$ref": "#/definitions/tradingDate"
                    },
      "mnspBidImport": {
          "$ref": "#/definitions/mnspBidLink"
                    },
      "mnspBidExport": {
          "$ref": "#/definitions/mnspBidLink"
                    },
      "rebidExplanation": {
          "$ref": "#/definitions/rebidExplanation"
                    }
                },
    "required": [
        "interconnectorId",
        "tradingDate",
        "mnspBidImport",
        "mnspBidExport"
            ]
        },
        "mnspBidLink": {
    "type": "object",
    "properties": {
      "linkId": {
          "$ref": "#/definitions/linkId"
                    },
      "prices": {
          "$ref": "#/definitions/prices"
                    },
                "mrPriceScalingFactor": {
          "$ref": "#/definitions/mrPriceScalingFactor"
                    },
      "mnspPeriods": {
          "$ref": "#/definitions/mnspPeriods"
                    }
                },
    "required": [
        "linkId",
        "prices",
        "mnspPeriods"
            ]
        },
    "mnspBids": {
      "type": "array",
      "items": {
        "$ref": "#/definitions/mnspBid"
            }
        },
```

```
        "mnspPeriods": {
    "type": "array",
    "items": {
        "type": "object",
        "properties": {
            "periodId": {
                "$ref": "#/definitions/periodId"
                },
            "maxAvail": {
                "$ref": "#/definitions/maxAvail"
                },
            "rampUpRate": {
                "$ref": "#/definitions/rampUpRate"
                },
            "bandAvail": {
                "$ref": "#/definitions/bandAvail"
                },
            "pasaAvail": {
                "$ref": "#/definitions/pasaAvail"
                },
            "mrCapacity": {
                "$ref": "#/definitions/mrCapacity"
                },
            "fixedLoad": {
                "$ref": "#/definitions/fixedLoad"
                }
            },
        "required": [
            "periodId",
            "rampUpRate",
            "bandAvail",
            "maxAvail",
            "pasaAvail"
                ]
            },
    "minItems": 288,
    "maxItems": 288
        },
    "mrCapacity": {
        "type": "integer",
        "description": "Only required if offering under mandatory restrictions. (MW)",
        "minimum": 0
        },
            "mrPriceScalingFactor": {
    "type": "number",
    "multipleOf": 0.0001,
```

```json
      "description": "Mandatory restrictions offer price scaling factor.",
      "minimum": 0
        },
    "pasaAvail": {
      "type": "integer",
      "description": "The unit's capability including any capability potentially available
in 24 hours. (MW) - Includes the offered availability.",
      "minimum": 0
        },
    "periodId": {
      "type": "integer",
      "description": "Trading interval identifier",
      "minimum": 1,
      "maximum": 288
        },
    "price": {
      "type": "number",
      "multipleOf": 0.01,
      "description": "Band price"
        },
    "prices": {
      "type": "array",
      "description": "10 price bands must be supplied.",
      "items": {
        "$ref": "#/definitions/price"
            },
      "minItems": 10,
      "maxItems": 10
        },
          "rebidExplanation": {
      "type": "object",
      "description": "Rebid Reason - expanded to 5 fields.",
      "properties": {
        "reason": {
          "$ref": "#/definitions/reason"
                },
        "eventTime": {
          "$ref": "#/definitions/eventTime"
                },
        "awareTime": {
          "$ref": "#/definitions/awareTime"
                },
        "decisionTime": {
          "$ref": "#/definitions/decisionTime"
                },
        "category": {
```

```json
                    "$ref": "#/definitions/category"
                        }
                 },
        "required": [
            "reason"
                ]
            },
            "referenceId": {
        "type": "string",
        "description": "Participant's reference - must be unique.",
        "maxLength": 100
            },
            "rampDownRate": {
        "type": "integer",
        "description": "Maximum rate of decrease in output, in megawatts per minute.",
        "minimum": 0
            },
      "rampUpRate": {
        "type": "integer",
        "description": "Maximum rate of increase in output, in megawatts per minute.",
        "minimum": 0
            },
        "service": {
        "type": "string",
        "description": "FCAS service type",
        "enum": [
            "RAISE6SEC",
            "RAISE60SEC",
            "RAISE5MIN",
            "RAISEREG",
            "LOWER6SEC",
            "LOWER60SEC",
            "LOWER5MIN",
            "LOWERREG"
                ]
            },
            "submissionTimeStamp": {
        "type": "string",
        "format": "date-time",
        "description": "Date and time participant considers this bid as submitted (or
approved this submission)."
            },
        "t1": {
        "type": "integer",
        "description": "Time to synchronise (in minutes)",
        "minimum": 0,
```

```json
            "maximum": 30
            },
      "t2": {
          "type": "integer",
          "description": "Time to minimum load (in minutes)",
          "minimum": 0,
          "maximum": 30
            },
      "t3": {
          "type": "integer",
          "description": "Time at minimum load (in minutes)",
          "minimum": 0,
          "maximum": 59
            },
      "t4": {
          "type": "integer",
          "description": "Time to shut down (in minutes)",
          "minimum": 0,
          "maximum": 59
              },
                "tradingDate": {
          "type": "string",
          "description": "Target trading day"
              }
    },
     "properties": {
            "submissionTimeStamp": {
          "$ref": "#/definitions/submissionTimeStamp"
            },
            "referenceId": {
          "$ref": "#/definitions/referenceId"
            },
      "comments": {
          "$ref": "#/definitions/comments"
            },
            "authorisedBy": {
          "$ref": "#/definitions/authorisedBy"
            },
      "energyBids": {
          "$ref": "#/definitions/energyBids"
            },
      "fcasBids": {
          "$ref": "#/definitions/fcasBids"
            },
      "mnspBids": {
          "$ref": "#/definitions/mnspBids"
```

```
            }
        }
}
```

14 Appendix 3 - Version History

14.1 v 4.00

1. Added information on page 54 about changes required to the PDR Loader properties file for Oracle databases to accommodate the TIMESTAMP data type.

2. Added information about the change to the Data Model so participants can submit more than one Submission per second on page 54. The changes are for Oracle database users only.

3. Added a list of tables where the data will change from 30-minute to 5-minute in on page 54.

4. Updated the Fixed Load definition in the Glossary on page 59.

5. Updated the JSON bidding schema in Appendix 1 – Bidding JSON Formaton page 61 with syntax highlighting for easy understanding.

6. Added a note about errors in participant Submissions with multiple units and multiple Trading Days in a single request. If there is an error the whole Submission is rejected.

14.1.1 Data model changes

Package	Table	Change	Reason
BIDS	BIDOFFERPERIOD	The OfferDateTime data type changes from TIMESTAMP to TIMESTAMP(3) DUID data type changes from VARCHAR2(10) to VARCHAR2(20) All data types having NUMBER(6) change to NUMBER(8,3) except RAMPUPRATE and RAMPDOWNRATE	To include the time for latest Bid To allow participants to submit more than one Submission per second
	BIDOFFERFILETRK	The OfferDate data type changes from TIMESTAMP to TIMESTAMP(3)	

Package	Table	Change	Reason
	BIDDAYOFFER	The OfferDate data type changes from TIMESTAMP to TIMESTAMP(3)	
	MNSP_BIDOFFERPERIOD	The OfferDateTime data type changes from TIMESTAMP to TIMESTAMP(3) LINKID data type changes from VARCHAR2(10) to VARCHAR2(20) All data types having NUMBER(6) change to NUMBER(8,3) except RAMPUPRATE	
	MNSP_DAYOFFER	The OfferDate data type changes from TIMESTAMP to TIMESTAMP(3)	
	DISPATCHOFFERTRK	The OfferDate data type changes from DATE to TIMESTAMP(3)	To allow participants to submit more than one Submission per second
	PREDISPATCHOFFERTRK	The OfferDate data type changes from DATE to TIMESTAMP(3)	
FORCE_MAJEURE	REGIONAPCINTERVALS	Change to PERIODID comment only: Period number where 1 represents the trading interval ending at 00:05 AEST	
TRADING_DATA	TRADINGPRICE		5MS change
	TRADINGINTERCONNECT		

14.1.2 APIs

API	Change	Reason
getBids	The default changes from fromtradingday + 1 day to fromtradingday + 7 days	error
	In the successful response: 1. Service : [string] is changed to filename: [string] 2. status: [string] is added	error
	The Tooffertimestamp request parameter description changes from Date/Time of the offerTimestamp to query from (exclusive) to: Date/Time of the offerTimestamp to query from (inclusive).	error
getBids example response	Added: }, "errors":[], "warnings":[] }	Change in functionality
getBids example response	"offerDateTime": "2021-04-24T15:03:16" changes to: "OfferTimestamp": "2021-04-24T15:03:16", Added: "service": "ENERGY" "rebidExplanation": {} }, "errors":[], "warnings":[] }	Error & change in functionality
getBid successful response	Added: }, "errors":[], "warnings":[] }	Change in functionality

API	Change	Reason
getBid example response	Added: "filename": "ACMECORP_BID_19991211132538651.API", "Status": "VALID", "fastStartProfile": {}, "rebidExplanation": {}, }, "errors":[], "warnings":[] }	Error & change in functionality
getSubmissions	The default changes from fromoffertimestamp + 1 day to fromoffertimestamp + 7 days	error
	The following fields are added to the getSubmissions request: 1. fromTradingDate 2. toTradingDate 3. transactionId 4. method	error
	participantId [String] is added to the body of the successful response	error
	The Tooffertimestamp request parameter description changes from Date/Time of the offerTimestamp to query from (exclusive) to: Date/Time of the offerTimestamp to query from (inclusive).	error
	The result in the example usage changes from Returns all Submissions having a referenceId containing "bc", submitted between 21-Apr-21 00:00:00 (inclusive) and 25-Apr-21 00:00:00 (exclusive) to: Returns all Submissions having a referenceId containing "bc", submitted between 21-Apr-21 00:00:00 (inclusive) and 25-Apr-21 00:00:00 (inclusive)	error
getSubmissions successful response	Added: }, "errors":[], "warnings":[] }	Change in functionality

API	Change	Reason
getSubmissions example response	Added: }, "errors":[], "warnings":[] }	Change in functionality
getSubmission	participantId [String] is added to the body of the successful response	error
getSubmission successful response	Added: }, "errors":[], "warnings":[] }	
getSubmission example response	Added: "fastStartProfile": {}, "rebidExplanation": {}, }, "errors":[], "warnings":[] }	Error & change in functionality

14.2 v 3.00

1. The majority of changes in this version are for usability of the technical specification with a few minor changes to the Data Model. See on page 8.

2. Added a section indicating the status of this version. For example, whether it is for participant review or stable enough for participants to complete their own systems builds.

3. Added a Milestones section on page 10 with further details about environments, obtaining Data Model scripts and JSON schemas.

4. Added details about changes to each version in this Release series: EMMS521 .

5. Add a link to the Guide to Setting Up a Standard Data Interchange Environment for help setting up a new DI instance.

6. Added information about accessing the staging environment for APIs and APIs unavailable over MarketNet until further notice on page 23.

7. Added information about having your public participant IP address whitelisted by AEMO on page 23.

8. Added the correct API portal address for staging: https://staging.apiportal.aemo.com.au/ on page 24

9. Added information about differences between the display of decimal points in NEM reports and Data Model tables. See on page 54.

14.2.1 Data model changes

Package/Table	Change
MNSP_BIDOFFERPERIOD	Changes to comment only: MNSP_BIDOFFERPERIOD shows availability for 5-minute periods for a specific Bid and LinkID for the given Trading Date and period MNSP_BIDOFFERPERIOD is a child to MNSP_DAYOFFER (and joins to BIDOFFERFILETRK for 5MS Bids)
MNSP_DAYOFFER	Changes to comment only: MNSP_DAYOFFER updates as bids are processed. All bids are available as part of next day market data MNSP_DAYOFFER is the parent table to MNSP_PEROFFER and MNSP_BIDOFFERPERIOD (and joins to BIDOFFERFILETRK for 5MS Bids)
AVERAGEPRICE30	Change to comment for the PERIODID Column: The 30-minute interval period, 1 to 48 from the start of the calendar day

14.3 v 2.05

1. In Energy, FCAS, and MNSP bidding on page 14 the following bullet point changes to add more clarity:

   – In the current csv format, to indicate no value for optional fields, they are left blank.

   – In the JSON format, to indicate no value for optional fields, you must remove the entire attribute.

14.3.1 JSON bidding schema

1. For the Energy and FCAS eventTime field an invalid value results in AEMO rejecting the Submission.

2. eventTime changes to type: string.

3. SubmissionTimestamp changes to type: string.

4. The tradingDate type changes from Date to String.

5. The type: number changes to integer.

6. The FCAS property EnablementMin changes from optional to mandatory.

7. For APIs, added Rebid explanation on page 68.

14.3.2 Data Model changes

Package/Table	Change
AVERAGEPRICE30	The following field name changes from PRICE_STATUS to PRICE_CONFIDENCE The following fields are removed: 1. RUNNO 2. ROP 3. EEP 4. RAISE6SECROP 5. RAISE60SECRRP 6. RAISE60SECROP 7. RAISE5MINRRP 8. RAISE5MINROP 9. RAISEREGRRP 10. RAISEREGROP 11. LOWER6SECRRP 12. LOWER6SECROP 13. LOWER60SECRRP 14. LOWER5MINRRP 15. LOWER60SECROP 16. LOWER5MINROP 17. LOWERREGRRP 18. LOWERREGROP
BidOfferFileTrk BidDayOffer MNSP_DayOffer	OfferDate existing fields change from Date to TimeStamp. The FCAS property
FORCE_MAJEURE	The package is removed because there are no changes.

14.4 v 2.00

1. Removal of the proposed timeline. The Readiness Working Group (RWG) will confirm delivery dates.

2. Added Related rules and procedures on page 9.

3. Addition of the FTP address for the staging environment, see FTP Interfaces on page 18.

4. Addition of the staging environment URL for the Energy and FCAS Bids web interface, see EMMS Markets Portal on page 22.

5. Added the API gateway addresses for MarketNet and internet, and the e-Hub portal address, see APIs on page 23.

6. Information about increased data volumes in the Bids tables, see Electricity Data Model v5.00 on page 54.

7. Further detail for Data Model discontinued reports, see on page 54.

8. A link to information about the 5MS staging environment, see References on page 56.

9. RampUpRate in JSON Bidding schema changed to RampRateUp, see Appendix 1 – Bidding JSON Format on page 61.

10. Changes to on page 54.

11. Changes to on page 54.

12. RampDownRate in JSON Bidding schema changed to RampRateDown, see Appendix 1 – Bidding JSON Format on page 61.

14.4.1 Data Model changes

Package	Table	Field	Change
BIDS	BIDDAYOFFER MNSP_DAYOFFER	REBID_EVENT_TIME	Changes from VARCHAR2(8) to VARCHAR2(20)
		REBID_AWARE_TIME	Changes from VARCHAR2(8) to VARCHAR2(20)
		REBID_DECISION_TIME	Changes from VARCHAR2(8) to VARCHAR2(20)
	BIDOFFERFILETRK	SUBMISSION_DATE	Changed to SUBMISSION_TIMESTAMP
	BIDOFFERPERIOD	OFFERDATE	Changed to OFFERDATETIME
	MNSP_BIDOFFERPERIOD	OFFERDATE	Changed to OFFERDATETIME
DISPATCH	DISPATCHLOAD DISPATCHREGIONSUM	PERIODID	Removed There are no changes to the DISPATCH package for this Release
FORCE_MAJEURE	REGIONAPCINTERVALS	PERIODID	Only the comment changes to reflect the change of trading price from a 30-minute to a 5-minute resolution There are no other changes to the FORCE MAJEURE package

14.5 v 1.02

The referenceId field in the JSON schema is changed from mandatory to optional, see Indicating no value for optional fields

In the JSON format, to indicate no value for optional fields, the entire attribute must be removed.

Bid submission on page 61.

14.6 v 1.00

Additional information about:

1. Mandatory restrictions
2. Trading data
3. Submitting bids via FTP
4. FTP Throttling limit
5. APIs and API Throttling
6. API User rights access
7. Electricity Data Model 5.00

14.7 v 0.05

First draft published to participants.

15 Index