EMMS Technical Specification – 5MS - Dispatch and Operations

v6.00 November 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 are listed in the Rules Terms section.
- References to time are Australian Eastern Standard Time (AEST).

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Distribution

Available to the public.

Document Identification

Prepared by: AEMO Technology

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Version History

v6.00 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.

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

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
6.00	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.
5.04	Participants can commence their system builds but small changes may still occur while participants are testing in the staging environment and providing feedback
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

Version	Status
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.

Changes are detailed below.

1.3   Changes in this version

1. Removal of Mandatory Restrictions from the API schema plus field removals. This is in line with AEMC consultation ERC0289, effective 17 September 2020.

2. Date changes to reflect 1 October 2021 and not 1 July 2021 under 4.2.1 and 5.1.

3. Changes to the API section to reflect the APIs details and bidding scenarios are available in the **Guide to API Energy and FCAS Bids and Offers** and the **API Portal**, see page 22.

4. The Staging environment is available for Bidding APIs, see page 23.

5. Added Deflate as an API compression option.

6. Information about Data Model subscriptions on page 10.

7. Added a link in References to **5MS Bidding Transition Plan FAQ's**

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

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
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 - Gzip and Deflate compression for APIs
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
Not supported	Does not support Deflate compressed payload API submission.

Status	In progress
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 Data Model v5.00 details, see **EMMS Technical Specification – 5MS – Data Model v5.00**.

2.4.1   Data model subscriptions

AEMO regularly receives Participant calls for Data Model (DM) assistance where Participants have maintained concurrent subscriptions to both the Current and Legacy versions of DM files. AEMO does not recommend maintaining both subscriptions because it can cause participants Data Interchange (DI) environments to discard the Current file version as in favour of the Legacy file version.

To assist the integrity of participants DI environments, AEMO does a daily check of Participant ID subscriptions. If AEMO finds concurrent subscriptions it unsubscribes the Participant ID from the Legacy file if the subscription is maintained for the following periods in the following environments:

- Pre-production: 14 calendar days
- Production: 5 calendar days (future change)

Email notifications

A future change implements the following email notifications 3 days prior to unsubscription:

- Pre-production: 3 calendar days
- Production: 3 calendar days including an email notification at the time AEMO unsubscribes the Legacy file.

For help with the Data Model and Data Interchange, see,

https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/data-nem/nemweb-help

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 22. Participant IP addresses for the staging environment require whitelisting by AEMO. For help, see page 22

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.
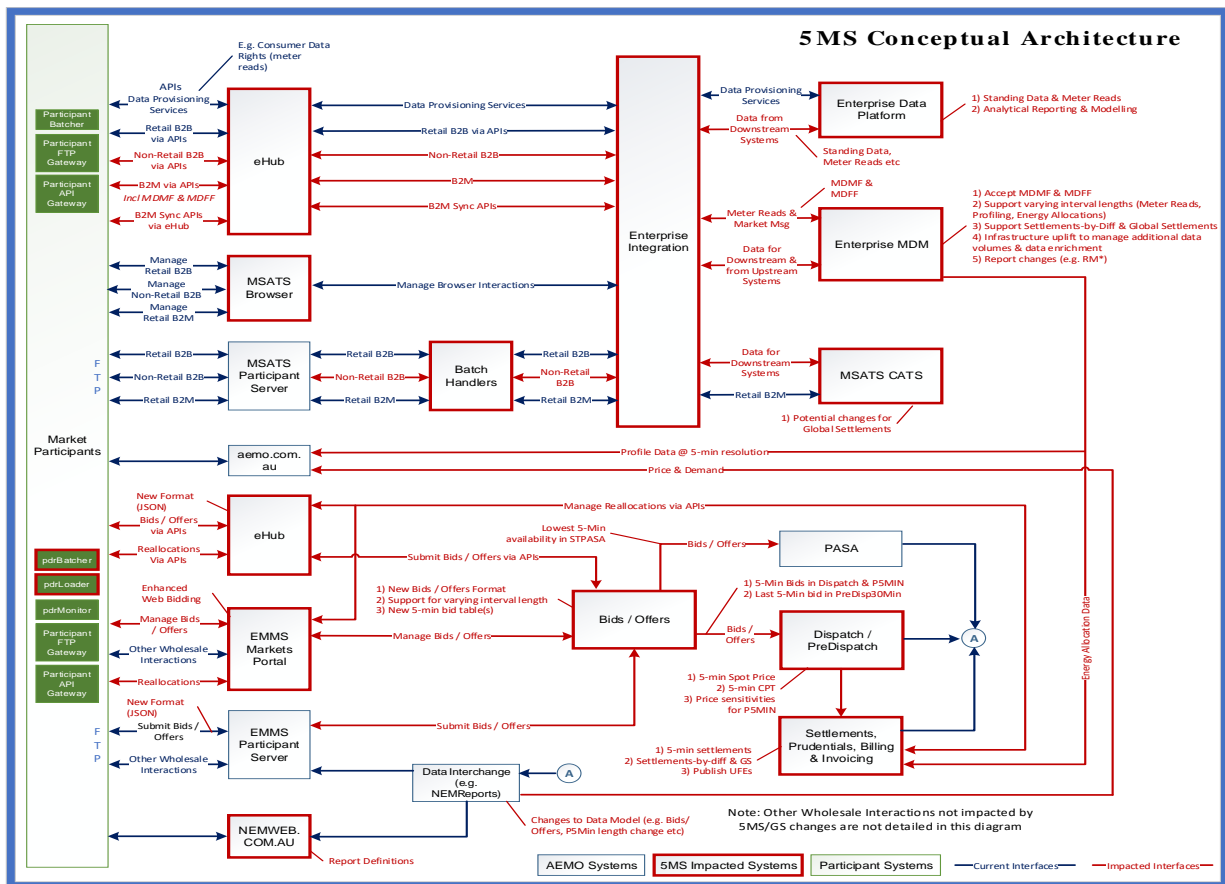
4 Dispatch and Bidding

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 **Draft EMMS Technical Specification - 5MS - Data Model v5.00.**

- 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.

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 October 2021.

- Participants choosing to continue to use FTP as their primary bidding protocol must shift to the new format by 1 October 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 22.**

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 21.**

4.3 Throttling limit

For details, see **FTP throttling limit** in **Draft EMMS Technical Specification - 5MS - Data Model v5.00**.

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 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.

4.6 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).

4.7 Short-term and pre-dispatch PASA

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

4.8 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.

4.9 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.

4.10 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.

4.11 Negative residue management

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

4.12 EMMS data model

For the EMMS data model changes, see **Draft EMMS Technical Specification - 5MS - Data Model v5.00**.

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 October 2021.

5.1.1 5-minute bids

Item	Value/Steps
Format	Zip file format The zip must contain a single .json file
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.

Item	Value/Steps
Filename validation	The filename must match the formats allowed above PID must match the FTP participant folder
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
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

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.

For help using the web interface, see Guide to Energy and FCAS Web Bids.

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 42.

7 APIs

7.1 API access

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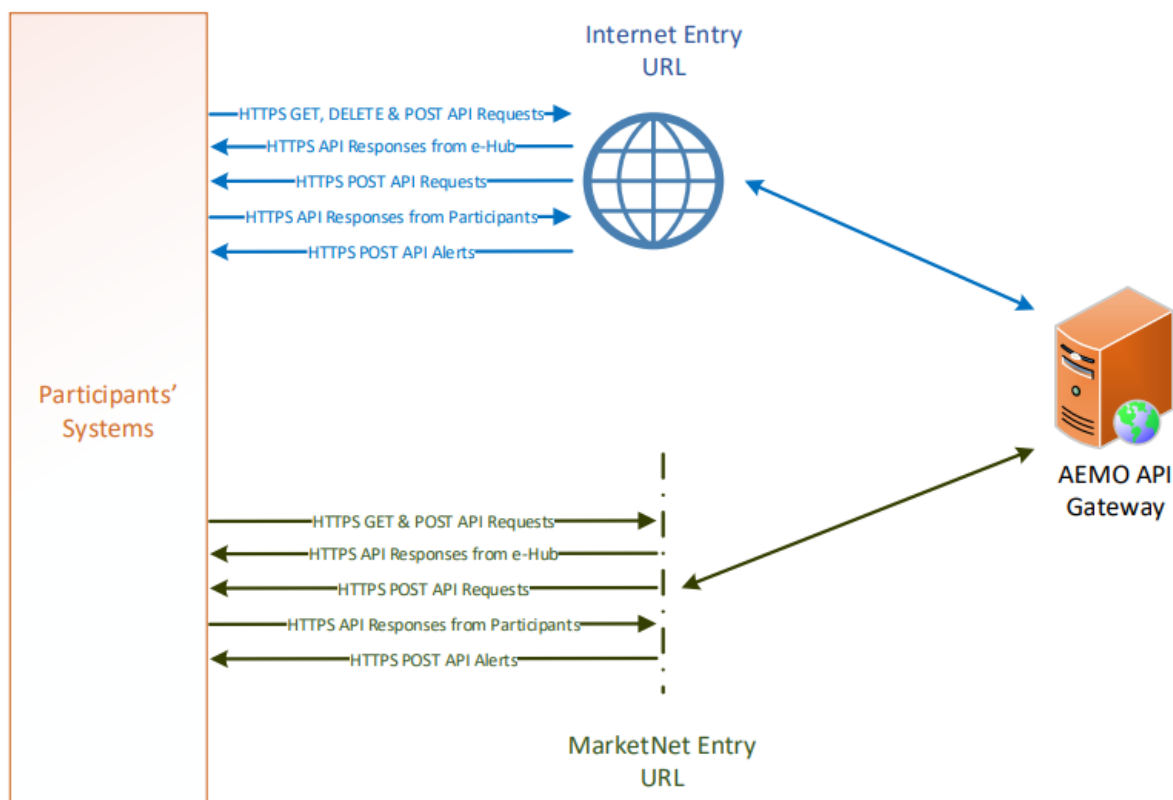
7.2 API whitelisting

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 in AEMO's API Portal.

For more information about e-Hub APIs, see Guide to AEMO's e-Hub APIs.

For more information about connection details, see Connecting to AEMO's Electricity IT Systems.

Environment	Internet Address	MarketNet Address
5MS Staging gateway	https://api.5msstaging.aemo.com.au:9319/NEMWholesale/bidding/v1/	https://apis.5msstaging.marketnet.net.au:9319/NEMWholesale/bidding/v1/
Pre-production API portal	https://dev.preprod.aemo.com.au/	n/a
Production API portal	https://dev.prod.aemo.com.au/	n/a
Pre-production gateway	https://apis.preprod.aemo.com.au:9319/NEMWholesale/bidding/v1/	https://apis.preprod.marketnet.net.au:9319/NEMWholesale/bidding/v1/
Production gateway	https://apis.prod.aemo.com.au:9319/NEMWholesale/bidding/v1/	https://apis.prod.marketnet.net.au:9319/NEMWholesale/bidding/v1/

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>/<reso
urce>?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:

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

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

The PA assigns the URM entity to the Participant User.

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
Business validation error	422	422 Unprocessable Entity The request was well formed but the submitted content failed business validation rules.

Data Condition	Value	Examples/Remarks
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. If not provided no compression is assumed.

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

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 Deflate	Specifies any compression applied to the request body If not provided no compression is assumed
Accept	application/json	Details the expected content type of the response
Accept-Encoding	Gzip 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.**

Parameter	Value(s)	Description
Authorization	Example only: Basic QFhQVC0wMDAwMzoyZWRmmOG JhYS0wY2I0LTQwZj ctOTIyMS0yODUxNmM4N2MxNj Q=	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 Deflate	Specifies any compression applied to the response body If not provided no compression is assumed

7.11 Bidding APIs

The following APIs support Energy, FCAS, and MNSP bids. For complete API details, see Guide to API Energy and FCAS Bids and Offers.

For API documentation, including Swagger files, see the API Portal.

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**

API Name	Support Methods	Entity Description	Required URM Entity and Right
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 - Deflate If not provided no compression is assumed
Accept-Encoding	Should be at least one of: - Gzip - 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 - 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	Method	Limit
submitBids	POST	To control overall traffic for POST requests, for each participant ID, AEMO allows 1 request per second 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
getBid getBids getSubmission getSubmissions	GET	To control overall traffic for GET requests, AEMO allows a rate of 1000 requests per minute (approximatelly 16 request per sec)

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

For bidding scenario details, see **Guide to API Energy and FCAS Bids and Offers**.

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 Bidding Transition Plan FAQ's: Provides transition and bidding FAQs.

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

API Portal: Swagger Files (OAS) and API documentation.

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.

Connecting to AEMO's Electricity IT Systems: Explains the IT interfaces available for electricitiy participants and how to connect to them.

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.

Format and Validation for Energy, FCAS, and MNSP Bids and Offers: Describes the interface to submit file-based energy, FCAS, and MNSP dispatch bids and offers.

Guide to Energy and FCAS Web Bids: Describes the interface to submit web-based Bids and Offers.

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 API Energy and FCAS Bids and Offers: Provides details of the APIs for Energy and FCAS Bids and Offers.

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
Constraint
Cumulative Price Threshold
Dispatch Interval
Energy Constraints
Interconnector
Inter-regional
Intra-regional
Market Ancillary Services
Market Participants
NEM

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

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

Term	Explanation
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
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

Term	Explanation
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

For details about the JSON Format, see Format and Validation for Energy, FCAS, and MNSP Bids and Offers.

For API documentation, including Swagger files, see the API Portal.

14 Appendix 3 - Version History

14.1 5.05

1. Removal of the Mandatory Restrictions from the Schema plus field removals, this is in line with AEMC consultation ERC0289, effective form 17th September 2020.

2. Date changes to reflect 1st of October 2021 and not 1st July 2021 under 4.2.1 and 5.1.Fix broken links.

14.2 5.04

1. Supported API compression is limited to gzip in the staging environment.

2. Further clarification about API throttling for POST and GET requests, see on page 32.

14.3 V 5.00

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 the Throttling limit on page 15 to this section.

3. Added information about API Partial match parameters on page 33.

4. Added further information in Energy, FCAS, and MNSP bidding on 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.

14.3.1 APIs

API	Change	Reason
All	Added API Bidding scenarios on page 33	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 39.	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

API	Change	Reason
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

14.4 v 4.00

1. Added information 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. 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.

4. Updated the Fixed Load definition in the Glossary on page 39.

5. Updated the JSON bidding schema in Appendix 1 – Bidding JSON Formaton page 42 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.

14.4.1 Data model changes

Package	Table	Change	Reason
	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

Package	Table	Change	Reason
	BIDOFFERFILETRK	The OfferDate data type changes from TIMESTAMP to TIMESTAMP(3)	
	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)	
	REGIONAPCINTERVALS TRADINGPRICE TRADINGINTERCONNECT	Change to PERIODID comment only: Period number where 1 represents the trading interval ending at 00:05 AEST	5MS change

14.4.2 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

API	Change	Reason
getSubmissions successful response	Added: }, "errors":[], "warnings":[] }	Change in functionality
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

14.5 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.

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 9 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 22.

7. Added information about having your public participant IP address whitelisted by AEMO on page 22.

8. Added the correct API portal address for staging: https://staging.apiportal.aemo.com.au/ on page 23

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

14.5.1 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

14.6 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.

14.6.1 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. APIs additions.

14.6.2 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.

14.7 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 8.

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 21.

5. Added the API gateway addresses for MarketNet and internet, and the e-Hub portal address, see APIs on page 22.

6. Information about increased data volumes in the Bids tables, see Electricity Data Model v5.00 on page 34.

7. Further detail for Data Model discontinued reports.

8. A link to information about the 5MS staging environment, see References on page 36.

9. RampUpRate in JSON Bidding schema changed to RampRateUp, see Appendix 1 – Bidding JSON Format on page 42.

10. Changes to Data Model tables.

11. Changes to Data Model tables.

12. RampDownRate in JSON Bidding schema changed to RampRateDown, see Appendix 1 – Bidding JSON Format on page 42.

14.7.1 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

Package	Table	Field	Change
	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

14.8 v 1.02

The referenceId field in the JSON schema is changed from mandatory to optional.

14.9 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

14.10 v 0.05

First draft published to participants.

15 Index