



# AWEFS/ASEFS Working Group - Forum

20 July 2018

# Welcome and Introduction

Neale Scott

# Our facilitators

*SYDNEY*

*Ross Gillett*



*MELBOURNE*

*Neale Scott*



*ADELAIDE*

*Mike Davidson*



# Agenda

Time	Dur (min)	Item	Presenter and location
2.00 pm - 2.05 pm	5	Welcome and introduction	Neale Scott/Melbourne
2.05 pm - 2.15 pm	10	Self-Forecast Project - Overview	Ross Gillett/Sydney
2.15 pm - 2.35 pm	20	Self-Forecast – Dispatch API	Phil Hayes/Sydney
2.35 pm - 2.55 pm	20	Self-Forecast – Reporting	Phil Hayes/Sydney
2.55 pm - 3.15 pm	20	Self-Forecast – Assessment	Ross Gillett/Sydney
3.15 pm - 3.25 pm	10	Energy Conversion Model changes	Ross Gillett/Sydney
3.25 pm - 3.40 pm	15	Participant Web Portal changes, MTPASA Forecast reporting changes	Ross Gillett/Sydney, Kate Farnsworth/Melbourne
3.40 pm - 3.45 pm	5	AWEFS/ASEFS changes	Ross Gillett/Sydney
3.45 pm - 4.00 pm	15	Other Business and close	Neale Scott/Melbourne

# Forum objectives

- **Inform stakeholders** on design of self-forecast API and associated reporting
- **Invite feedback** on draft procedure for self-forecast assessment and acceptance
- **Inform stakeholders** on proposed changes to Energy Conversion Model
- **Invite feedback** on proposed changes to Participant EMMS Web Portal
- **Inform stakeholders** on recent changes to MTPASA forecasts
- **Inform stakeholders** on recent changes to AWEFS and ASEFS

# Self Forecasting Project Overview

Ross Gillett

# Project in a Nutshell

## CURRENT STATE

AEMO uses ANEMOS forecasting systems (AWEFS/ASEFS) to produce unconstrained intermittent generation forecasts for SS units over Dispatch, 5MPD, Pre-Dispatch

Dispatch forecasts largely based on SCADA provided by participant

AEMO validates the ANEMOS forecast:

- Use ANEMOS forecast if valid; else
- Use Active Power if valid; else
- Use Previous Target

AEMO can manually disable the ANEMOS Dispatch forecast and use Active Power



## FUTURE STATE

As current

As current, PLUS: **Participant can optionally submit their own Dispatch forecast (MP5F)**

AEMO validates **MP5F** & ANEMOS forecast:

- **Use latest valid MP5F with highest priority; else**
- Use ANEMOS forecast if valid; else
- Use Active Power if valid; else
- Use Previous Target

As current, PLUS: **AEMO can manually disable the MP5F and use the ANEMOS Dispatch forecast or Active Power as reqd based on regular comparative assessments**

# Timelines

INDICATIVE ONLY

<b>July 2018</b>	API Design Document	Document release
	Implement API in Pre-production	System implementation
	Draft criteria for Participant Forecast assessment	Document release and invitation to comment
	Draft Participant Data Model design	Document release
<b>August 2018</b>	Implement API in production	System implementation
<b>September 2018</b>	Final Technical Specification with Participant Data Model design	Document release
<b>October 2018</b>	Final criteria for Participant Forecast assessment	Document release
<b>December 2018</b>	Implement Dispatch Integration and Reporting in pre-production	System implementation
<b>January 2019</b>	Implement Dispatch Integration and Reporting in production	System implementation

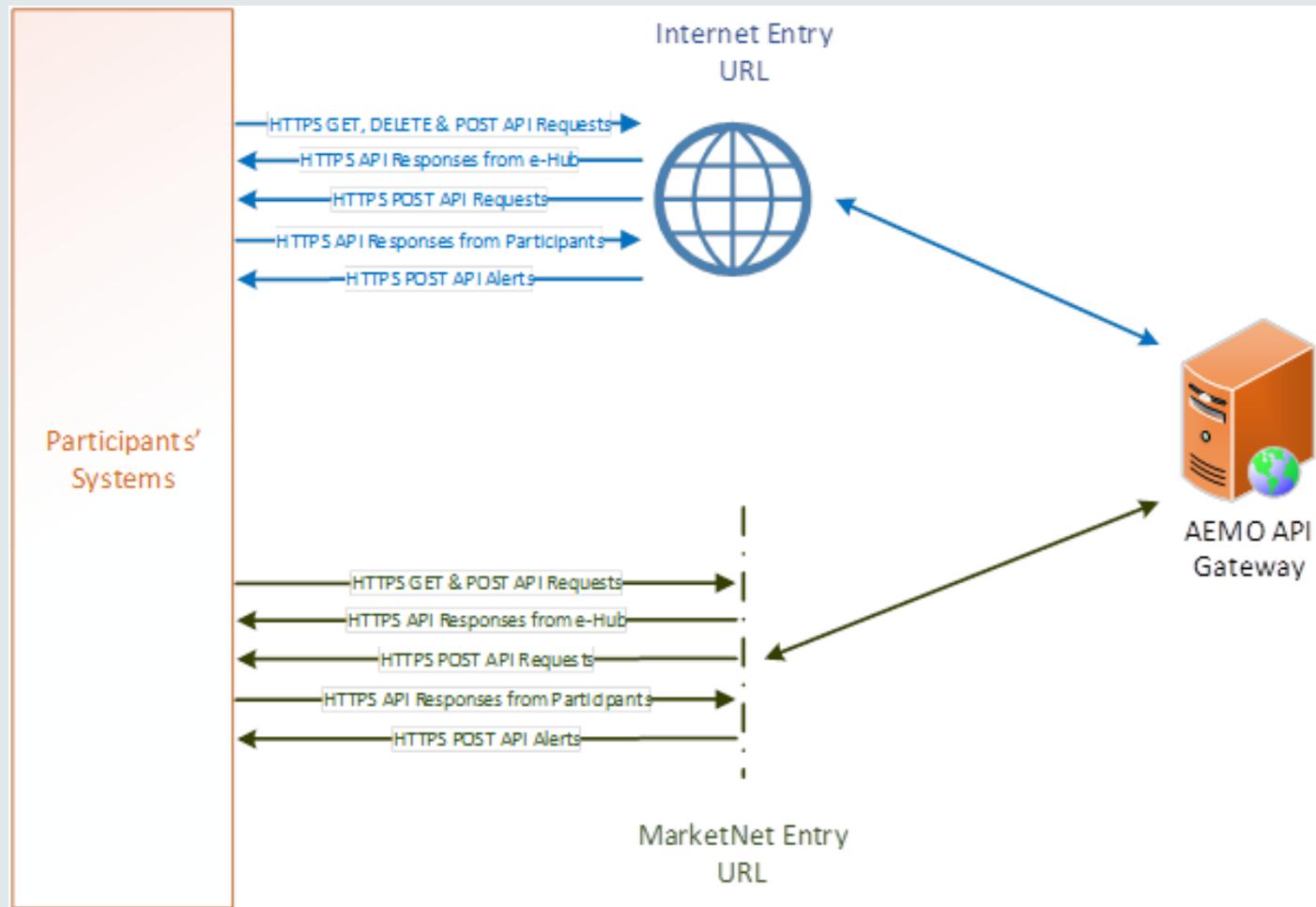
<https://www.aemo.com.au/Stakeholder-Consultation/Industry-forums-and-working-groups/Other-meetings/Market-Participant-5-Minute-Self-Forecast>

# Self-Forecast – Dispatch API

Phil Hayes

# Data Submission - Connection

- Submission only via API exposed on AEMO's API gateway
- Connection via Internet or MarketNet over HTTPS



# Data Submission - Authentication

- The following will be required to connect to the API gateway:
  - A white-listed IP address from which the connection is established. This is a security requirement for both Internet and MarketNet based access.
  - A certificate that is issued by AEMO which permits access to the API gateway at the network level.
  - A set of access credentials which can be created within the User Rights Management module of the MSATS retail system by a Participant Administrator. The user account will need to be granted the relevant permissions to access the Forecast Submission API
- The Dispatch forecast submission API is a restful web service endpoint which accepts data in a JSON format. Access credentials are provided within custom HTTP header fields.
- There is no requirement for an API gateway at the participant end or any particular technology required to consume the 5 minute forecast API service.

# Data Submission - Forecast

- Participants can submit forecasts for next 5 minute dispatch interval only
- Submissions are validated by AEMO before loading into database.
- All valid submissions are retained and published
- Latest a forecast can be submitted to guarantee use in Dispatch is 70 seconds before start of 5 minute dispatch interval to which forecast applies
- Participants can submit updates to forecasts as often as required (throttling limits apply)
- Participants can submit multiple model forecasts for each DUID and allocate each forecast a unique priority
- AEMO will use the highest priority forecast in Dispatch, as long as that forecast has not suppressed by participant or AEMO

# SubmitDispatchForecast API - Request Content - Example

DispatchForecast {

“RunDateTime”: “2017-12-01T22:05:00+10:00”,

“AuthorisedBy”: “Someone”,

“Comments”: “This is a trial dispatch forecast”,

“Forecasts”: [

{

“Duid”: “Duid1”,

“ForecastPriority”: 324,

“Model”: “Model ABC”,

“Suppressed”: false,

“ParticipantTimeStamp”: “2017-12-01T21:58:01+10:00”,

“IntervalForecast”: {

“IntervalDateTime”: “2017-12-01T22:05:00+10:00”,

“ForecastPoe50”: 106.349 }]]}

# Dispatch Forecast Submission Validation

- AEMO applies the following validation rules to Participant submitted forecasts:
  - RunDateTime between gate open and close times
  - ParticipantID should match the participant id associated with the user credentials.
  - Duid must belong to the participant as at RunDateTime
  - Duid must be semi-scheduled & active as at IntervalDateTime
  - Only one ForecastPoe50 provided per (Duid,ForecastPriority) combination
  - ForecastPoe50 between zero and Maximum Capacity
  - Number of (Duid,ForecastPriority) records < configurable max
  - IntervalForecast must be same as RunDateTime
- Where one or more forecasts fail validation, the entire submission is rejected.<sup>14</sup>

# API Information for Participants

- AEMO will be publishing a technical guide covering the use of the Forecast submission API
- The AEMO API portal contains documentation and resources specific to the API implementation. Participants can download a swagger file from the API portal which may be helpful when constructing client applications
- General information around access to eHub API's and technical standards can be downloaded from the AEMO website:

[https://www.aemo.com.au/-/media/Files/Electricity/NEM/IT-Systems-and-Change/2018/Guide\\_to\\_AEMOs\\_e-Hub\\_APIs.pdf](https://www.aemo.com.au/-/media/Files/Electricity/NEM/IT-Systems-and-Change/2018/Guide_to_AEMOs_e-Hub_APIs.pdf)

- The Dispatch forecast submission API is scheduled to be made available in the AEMO Pre-Production environment in July 2018
- Participants can use the Pre-Production environment to develop and test their forecast submission processes

# Self-Forecast – Reporting

Phil Hayes

# Self-Forecast - Reporting

- AEMO will make available data related to self forecasting within standard reporting processes presently used to provide operational data to intermittent generation plant.
- The existing standard for publication of data from Wholesale electricity systems is the Data Interchange platform.
- Data Interchange is only offered over MarketNet, which is a private network to support interactions with AEMO's market systems.
- Data Interchange requires a database and some applications (provided by AEMO) to be hosted and managed by the participant. This will allow the local database to be populated with market data.
- The use of Data Interchange is not mandatory. Information available via DI processes can be sourced directly as CSV files from the AEMO FTP server if participants prefer to design and implement their own reporting solution.

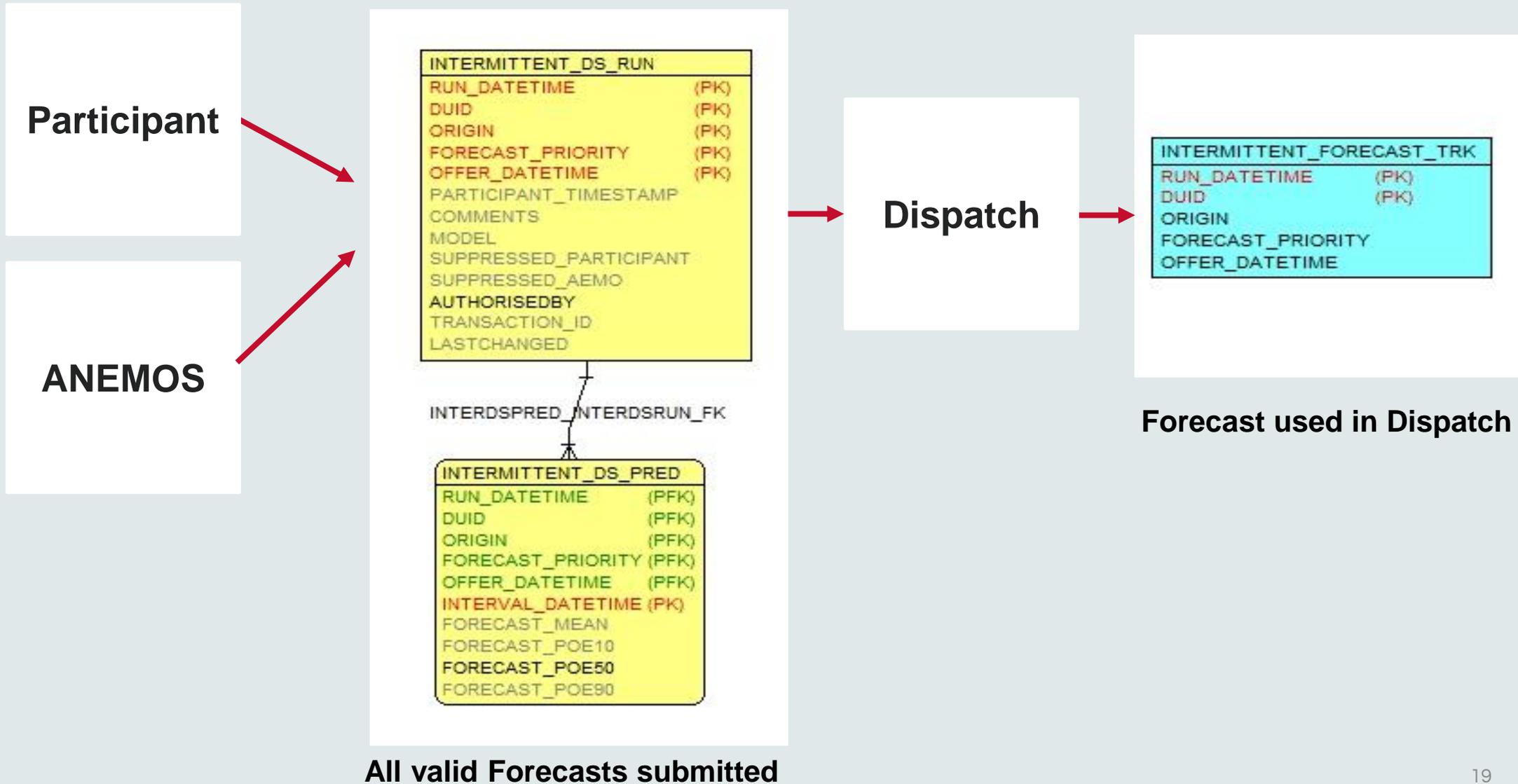
# Self-Forecast - Reporting

- The participant data model (which is the industry standard database structure populated by DI) will be extended with new tables to support the following new data feeds:

Data set	Confidentiality
Intermittent Forecast submitted by Participant and also forecasts generated by AWEFS_ASEFS	Same day private/next day public
Tracking of which intermittent forecast was used in the 5 minute dispatch process	Same day public

- The details of the data model changes will be published in a technical specification document, which will contain all the technical details required to inform participant implementation
- Approval will be sought from participant change managers under standard change management protocols

# Participant Data Model (Working Draft)



# Self-Forecast - Reporting

- The following data elements are considered to potentially be sensitive and are only made available to the participant to whom a forecast applies:

<b>Data field</b>	<b>Description</b>
AuthorisedBy	Contains the authenticated user/account which submitted the forecast. Is stored within AEMO systems as part of the audit trail, but can not be made public as such detail may facilitate a malicious actor to mount a denial of service attack.
Model	Contains a designation of the model construct that was used to generate a particular forecast. The model might reasonably be regarded as Intellectual Property of the participant.
Comments	A free text description that is optionally included in a participant forecast submission. Participants are in control of content, but it could include operating conditions, commentary around model construct/performance, etc.

# Self-Forecast – Assessment

Ross Gillett

# Initial Assessment Process

## Objective

AEMO assesses the relative performance of SF against AWEFS/ASEFS (based on MAE and RMSE measures) to provide reasonable assurance that SF will not provide materially worse inputs to dispatch than current AWEFS/ASEFS forecasts

## Steps

1. Participant submits SF to AEMO production environment for assessment purposes, but AEMO suppresses its use in dispatch
2. Participant advises when AEMO can start to use its SF for assessment purposes
3. AEMO conducts initial assessment, using 12 weeks of SF data from production environment
  - A participant-unsuppressed SF must be received for at least 99% of all intervals before it can be assessed
  - Assessment will not differentiate between different model forecasts

# Initial Assessment Process...contd

4. AEMO provides its initial assessment of SF to participant:
  - If SF passes the initial assessment test:
    - AEMO enables SF for use in dispatch by unsuppressing the SF
    - AEMO automatically reports to participant when it unsuppresses its SF
    - AEMO commences ongoing assessment of SF
  - If SF does not pass the initial assessment test  
OR there are insufficient SF received to perform assessment:
    - Steps 2 to 4 are repeated on a weekly basis

# Initial Assessment test

SF must pass both the MAE and RMSE initial assessment tests before AEMO will enable it for use in dispatch:

$$MAE_{SF} \leq MAE_{AWEFS\_ASEFS}$$

AND

$$RMSE_{SF} \leq RMSE_{AWEFS\_ASEFS}$$

# Initial Assessment test...contd

$$MAE_{SF} = \frac{1}{n} \sum_{i=1}^n \text{Absolute}(SF_i - \text{Actual}_i)$$

$$MAE_{AWEFS\_ASEFS} = \frac{1}{n} \sum_{i=1}^n \text{Absolute}(AWEFS\_ASEFS_i - \text{Actual}_i)$$

$$RMSE_{SF} = \sqrt{\frac{\sum_{i=1}^n (SF_i - \text{Actual}_i)^2}{n}}$$

$$RMSE_{AWEFS\_ASEFS} = \sqrt{\frac{\sum_{i=1}^n (AWEFS\_ASEFS_i - \text{Actual}_i)^2}{n}}$$

# Initial Assessment test...contd

## Explanation of terms

SF = Participant's 5-minute ahead self-forecast for time  $i$ , which is the highest priority forecast with latest Offer\_DateTime (prior to SF gate closure time at  $i-70$  seconds) that is not suppressed

AWEFS\_ASEFS = AWEFS/ASEFS 5-minute ahead MW forecast for time  $i$ , or where no AWEFS/ASEFS forecast, SCADA Initial MW

Actual = IF semi-dispatch cap does not apply at time  $i$ :  
          MAX( 0, SCADA Initial MW )  
ELSE  
          MAX( 0, SCADA Initial MW, SCADA Possible Power )

# Ongoing Assessment Process

- On an ongoing weekly basis, AEMO assesses the relative performance of all SF against AWEFS/ASEFS, based on MAE and RMSE measures
- MAE and RMSE measures same as for the initial assessment, except shorter assessment period:
  - **If SF is not suppressed by AEMO at assessment time**, the assessment is up to four previous consecutive weeks where SF passed the ongoing assessment test
  - **Otherwise**, the assessment is over previous week, to allow measure to reflect recent, potentially large improvements in SF

# Ongoing Assessment Process...contd

## Steps

- If SF does not pass the ongoing assessment test:
  - AEMO will suppress SF (if not already suppressed) until next weekly assessment
  - AEMO automatically reports to participant when it suppresses the SF
- If SF passes the ongoing assessment test:
  - AEMO will unsuppress SF (if not already unsuppressed)
  - AEMO automatically reports to participant when it unsuppresses the SF

# Ongoing Assessment test

SF must pass both the MAE and RMSE ongoing assessment tests to remain enabled for use in dispatch:

$$MAE_{SF} \leq MAE_{AWEFS_{ASEFS}} \times \left[ 1 - \frac{X_{\text{ongoing}}}{100} \right]$$

AND

$$RMSE_{SF} \leq RMSE_{AWEFS_{ASEFS}} \times \left[ 1 - \frac{Y_{\text{ongoing}}}{100} \right]$$

where;

$X_{\text{ongoing}}$  &  $Y_{\text{ongoing}}$  = % improvement of SF over AWEFS\_ASEFS (configurable)  
= 0 % initially (ie same as initial assessment test)  
but this might increase with experience

# Ongoing monitoring for system security

1. AEMO control room may suppress the current intermittent generation forecast (regardless of source) if it is causing, or could cause, a threat to system security:
  - If this is the SF, defaults to using AWEFS\_ASEFS in dispatch
  - If AEMO also suppresses the AWEFS\_ASEFS forecast, defaults to using SCADA in dispatch
  - AEMO automatically reports to participant when it suppresses the SF
  - AEMO control room might not directly contact the participant prior to suppressing its SF
2. AEMO will reassess the SF at the next ongoing weekly assessment:
  - If SF passes the assessment, AEMO will unsuppress the SF
  - AEMO automatically reports to participant when it unsuppresses the SF

# Specific questions on draft Assessment procedure

1. What other validations should AEMO perform on the sample data?
2. What relative performance thresholds for the ongoing MAE/RMSE assessments are reasonable? Should the SF performance be better than the AWEFS\_ASEFS performance, and how much better?
3. Should there be a maximum acceptable MAE/RMSE for the SF performance, even if the SF has a relatively lower MAE/RMSE than AWEFS\_ASEFS?
4. Should we use a probability of exceedance (POE) error measure (in place of the RMSE measure) to indicate forecast accuracy for large ramping events? If so, what POE would be appropriate? The 99% POE error?
5. Are there other performance metrics that would be appropriate? Specifically, what metrics are useful for quantifying ramping events? Should there be a time-of-day specific error measure?

# Feedback on draft Assessment procedure

- Provide written feedback to AEMO by COB Friday 10 August 2018
- Send to [op.forecasting@aemo.com.au](mailto:op.forecasting@aemo.com.au)
- AEMO is also seeking feedback on some specific questions, these are on the last page of the draft procedure
- When providing feedback on specific question, make reference that question
- AEMO will consider feedback, publish final revised procedure in October 2018

# Energy Conversion Model abridged consultation

Ross Gillett

# ECM changes

AEMO is conducting an abridged consultation on an amendment to the *Energy Conversion Model (ECM) Guidelines*

Consulting on following proposed changes to solar and wind ECMs:

- Cosmetic updates to page layout (i.e. inserting “comments” column)
- Align the formatting of wind and solar ECMs to be consistent
  - Naming of tabs, and information contained in each tab
  - Structure layout, order and placement of farm & cluster level SCADA signals
- Update the definition of solar PV clusters, to more accurately reflect the actual cluster definition process

# ECM changes continued...

- Update the description for a number of fields, to avoid confusion and to make them consistent across AEMO
- Remove fields that are already provided via the registration application form, or are no longer relevant (i.e met-masts)
- Correct “valid range” errors
- Add:
  - An “**AEMO-use only**” tab – AEMO to approve DUID, Cluster ID(s) and Cluster Maximum Capacity
  - **SCADA Possible Power (POSP)** – optional SCADA signal
  - **MP5F** – optional field, for participants to notify AEMO if they intend to provide their own self-forecast
  - **MPF5 Model ID** – one Model ID for each self-forecast provided, along with a description of what type of model is used i.e. Lidar. Model ID is kept confidential by AEMO

# ECM Consultation timeline

- Consultation will commence via email in **August 2018**
- One round of submissions, open for 2 weeks
- The following documents will be uploaded to the ECM abridged consultation webpage, for comments and feedback:
  - Description of proposed changes
  - Draft – Guide to Data Requirements for AWEFS and ASEFS
  - Draft – Amended Solar ECM
  - Draft – Amended Wind ECM
- The final ECM documentation will be released following the submission close date, likely **October 2018**

# EMMS Web Portal – Intermittent Gen changes

Ross Gillett

# Intermittent Generation – View/Enter Availability

- AEMO is proposing to remove the calculated “cluster MW Available” column from portal, as part of January 2019 Portal release
- Column is misleading as:
  - it is based on underlying data that is used for a different purpose
  - it is not directly used by AWEFS/ASEFS (only entered Turbines/Strings Available” is used)

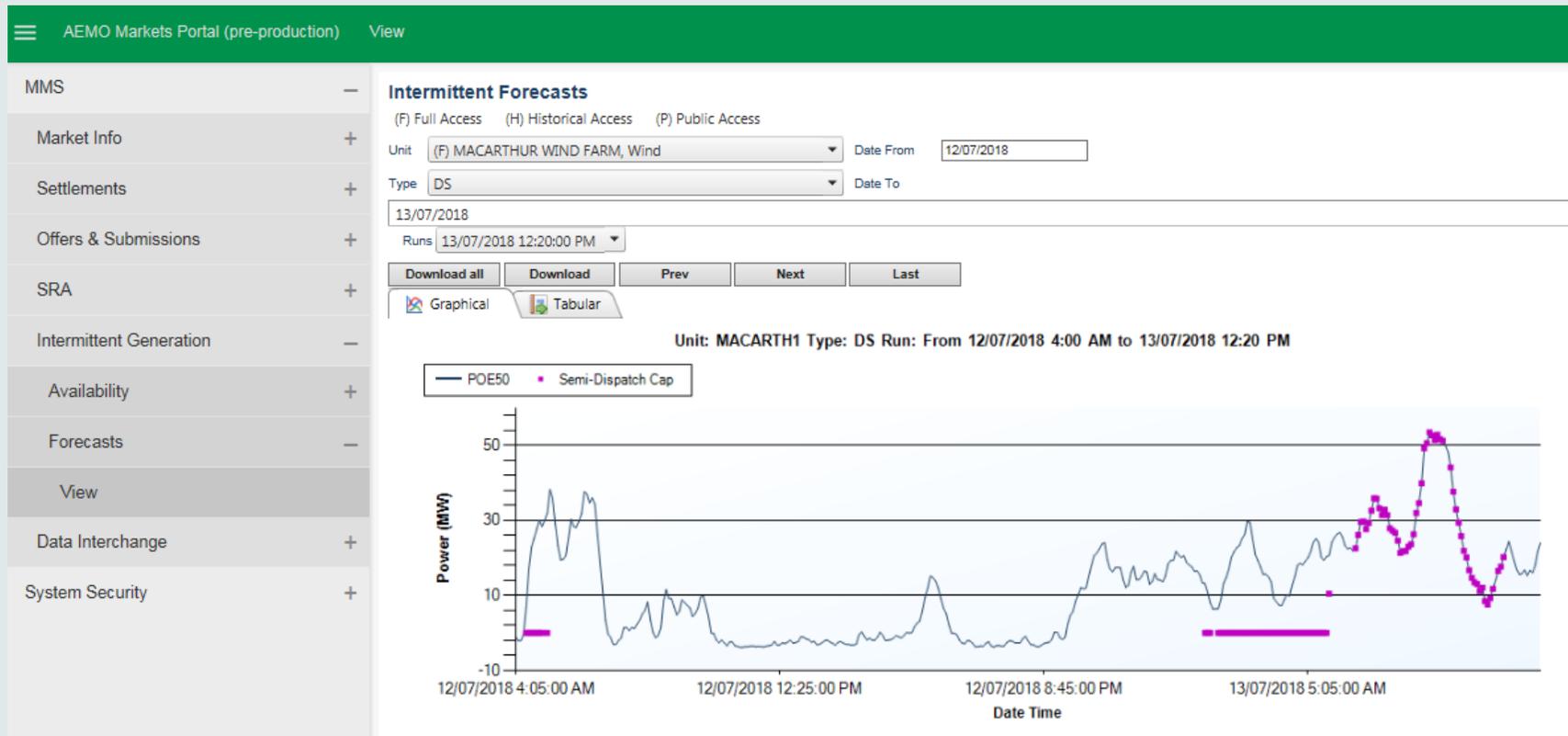
## Create Availability submissions

Unit: BNGSF1, Solar BUNGALA ONE SF	From: 13/07/2018	To: 13/07/2018		
<input type="button" value="Browse..."/>	<input type="button" value="Upload"/>	<input type="button" value="Expand/Collapse"/>	<input type="button" value="Submit"/>	
Trading Interval	Upper MW Limit (reg. max 110 MW) (-1 means no limit)	Cluster: BNGSF1_CL1 (maximum of 54) Strings unavailable	Cluster: BNGSF1_CL1 MW available	Period
Trading date 2018/07/13, Friday, offered on 2018/07/13 12:59:08, Friday				
04:30	37	38	33	1
05:00	37	38	33	2
05:30	37	38	33	3
06:00	37	38	33	4
06:30	37	38	33	5
07:00	37	38	33	6
07:30	37	38	33	7
08:00	37	38	33	8

Remove this column:  
the real “MW Available”  
= 40 MW

# Intermittent Generation – Forecasts – View – DS

- As part of the Self-Forecast project, AEMO will start to use participant forecasts from new DB table, from January 2019
- However, Portal “Intermittent Generation – Forecasts – View – DS” will still point to old ANEMOS DS tables



# Update to “Guide to Intermittent Generation Portal”

- AEMO is reviewing the participant’s [Guide to Intermittent Generation Portal](#), with at least the following changes:
  - Removal of “MW Available” column
  - Replace “Strings” with “Inverters” to align with Solar ECM
  - Clarify the need to submit full Availability offer for the day after reduced Availability offer
- AEMO proposes to update the Guide in August/September 2018, and again in January/February 2019 following implementation of the Self-Forecast project and web portal changes above
- **Are there any general comments about the Guide?**

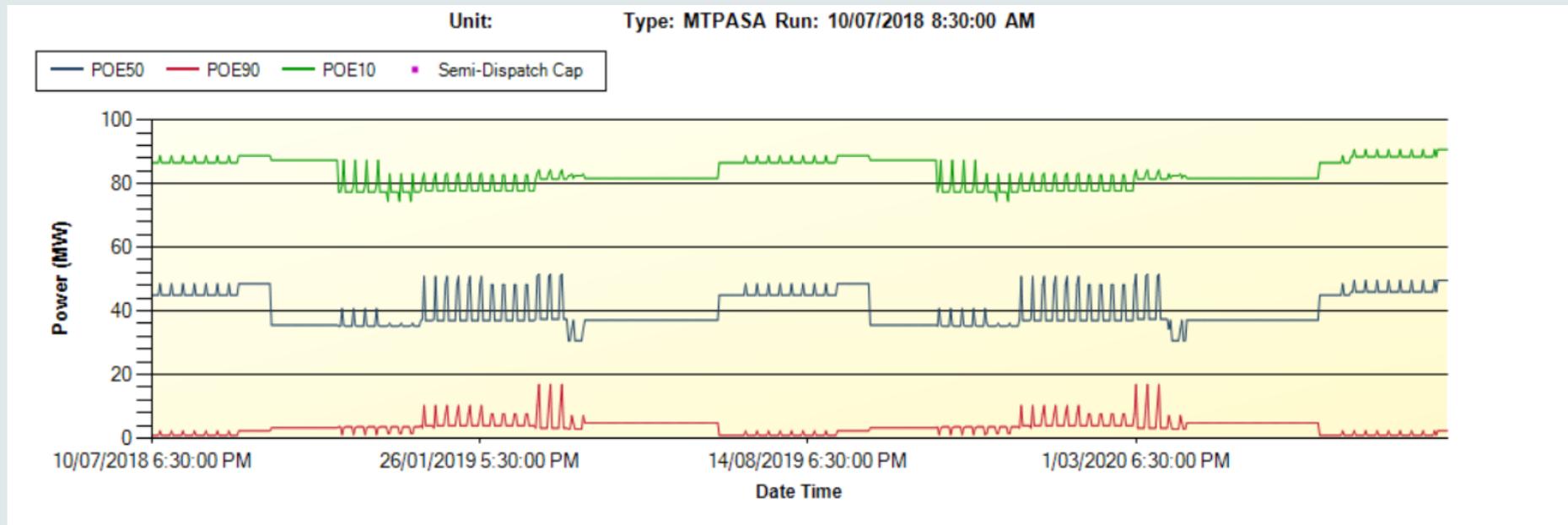


# MTPASA Intermittent Gen Forecasting & Reporting

Kate Farnsworth  
Analyst  
Reliability Forecasting

# MTPASA Intermittent Forecasting

- Currently in the EMMS Web portal (“Intermittent Generation – Forecasts – View – MTPASA”), you may be able to see the following image for your respective generators:



# MTPASA Intermittent Forecasting

- **Since May 2018**, AEMO has moved to a probabilistic model for MTPASA, and no longer using the MTPASA forecasts provided by ANEMOS
- AEMO now determines MTPASA forecasts based on either:
  - **for existing plant:** historical intermittent generation traces (where available) or;
  - **for new committed plant:** reference weather traces using either:
    - a “shadow generator” based on existing intermittent generator of the same technology in close proximity, or
    - meteorological data for the generation site, and assuming a power factor based on similar unit type
- Given the data featured on the previous slide is no longer implemented into MTPASA, ***is this something you still currently use?***

# MTPASA Intermittent Forecasting

- MTPASA forecasts for intermittent generation is now reported in the **MTPASA Region Result** table of the participant data model database:

Field	Data Type	Description
TOTALINTERMITTENTGEN90	Snapshot – half hourly (NEM Max)	The 90% percentile for intermittent generation across all iterations and reference years (MW)
TOTALINTERMITTENTGEN50	Snapshot – half hourly (NEM Max)	The 50% percentile for intermittent generation across all iterations and reference years (MW)
TOTALINTERMITTENTGEN10	Snapshot – half hourly (NEM Max)	The 10% percentile for intermittent generation across all iterations and reference years (MW)

- This data can be found in the PUBLIC\_MTPASA csv file available in the Medium\_Term\_PASA\_Reports directory in the nemweb

# AWEFS and ASEFS changes

Ross Gillett

# Capping at Maximum Capacity

- AWEFS and ASEFS changes implemented on 11 July 2018, to cap all Pre-dispatch, STPASA and MTPASA forecasts at registered Maximum Capacity
- Previously, forecasts only capped at (often higher) Nameplate Rating
- This addresses Rules compliance issue with NER 3.7B(c)(1)

# Other Business and close

Neale Scott

# In Summary

- AEMO to run Intermittent Gen forums 6 monthly, next in Feb 2019
- General feedback or questions: email [op.forecasting@aemo.com.au](mailto:op.forecasting@aemo.com.au)

Thank you for your valued participation !!

- General AWEFS and ASEFS information: [Solar and wind energy forecasting webpage](#)
- Self-forecast project: [Market Participant 5-Minute Self Forecast project webpage](#)