PRE-DISPATCH

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1. INTRODUCTION

1.1. Purpose and scope

(a) This Pre-Dispatch procedure is a *power system operating procedure* under clause 4.10.1 of the National Electricity Rules (NER).

(b) If there is any inconsistency between this procedure and the NER, the NER will prevail to the extent of that inconsistency.

(c) This Pre-Dispatch procedure describes the NEM *pre-dispatch* process in terms of the inputs to the process and the outputs provided by the process. It does not attempt to describe in detail the functional design of the *pre-dispatch* process.

1.2. Definitions and interpretation

(a) In this document, a word or phrase in italics has the meaning given to that term in the NER.

(b) In this document, capitalised words or phrases or acronyms have the meaning set out in the table below.

(c) Unless the context otherwise requires, this document will be interpreted in accordance with Schedule 2 of the *National Electricity Law*.

Table 1 Glossary

Term	Definition
AEMO	Australian Energy Market Operator Limited
ASEFS	Australian Solar Energy Forecasting System
AWEFS	Australian Wind Energy Forecasting System
EMMS	Electricity Market Management System
FCAS	Frequency Control Ancillary Service
NEM	*National Electricity Market*
NER	National Electricity Rules
NSP	*Network Service Provider*
UIGF	Unconstrained Intermittent Generation Forecast

1.3. Related Policies and Procedures

Table 2 Related policies and procedures

Policies and Procedure	Title
SO_OP_3709	Generic Constraints Due to Network Limitations
SO_OP_3710	Load Forecasting

2. PRE-DISPATCH OVERVIEW

Pre-dispatch has two major purposes:

- To provide *Market Participants* with sufficient unit loading, unit *ancillary service* response and pricing information to allow them to make informed business decisions.
- To provide AEMO with sufficient information to allow it to fulfil its duties in accordance with the Rules, in relation to system reliability and security.

This information is calculated in pre-dispatch and published to the market in the form of *trading interval* and *30-minute period* schedules of forecast unit loading, forecast unit *ancillary service* response and forecast regional prices.

Error! Reference source not found. below illustrates the *pre-dispatch* process in context of the inputs and outputs. The major inputs to the *pre-dispatch* process can be divided into two categories,

- Participant Inputs
    - Registration data
    - Energy & FCAS *Dispatch offers/bids*
- AEMO Inputs
    - Demand forecast
    - *Ancillary service* requirements
    - *Network Constraints*
    - Wind generation forecasts from AWEFS
    - Solar generation forecast from ASEFS

The major outputs of the pre-dispatch process are split into two categories

- Aggregate data
    - *Pre-dispatch* solution data
    - Regional data
    - Network data
- Unit specific data
    - Unit energy dispatch data
    - Unit *ancillary service* dispatch data

Each of these inputs and outputs is detailed in the sections below.

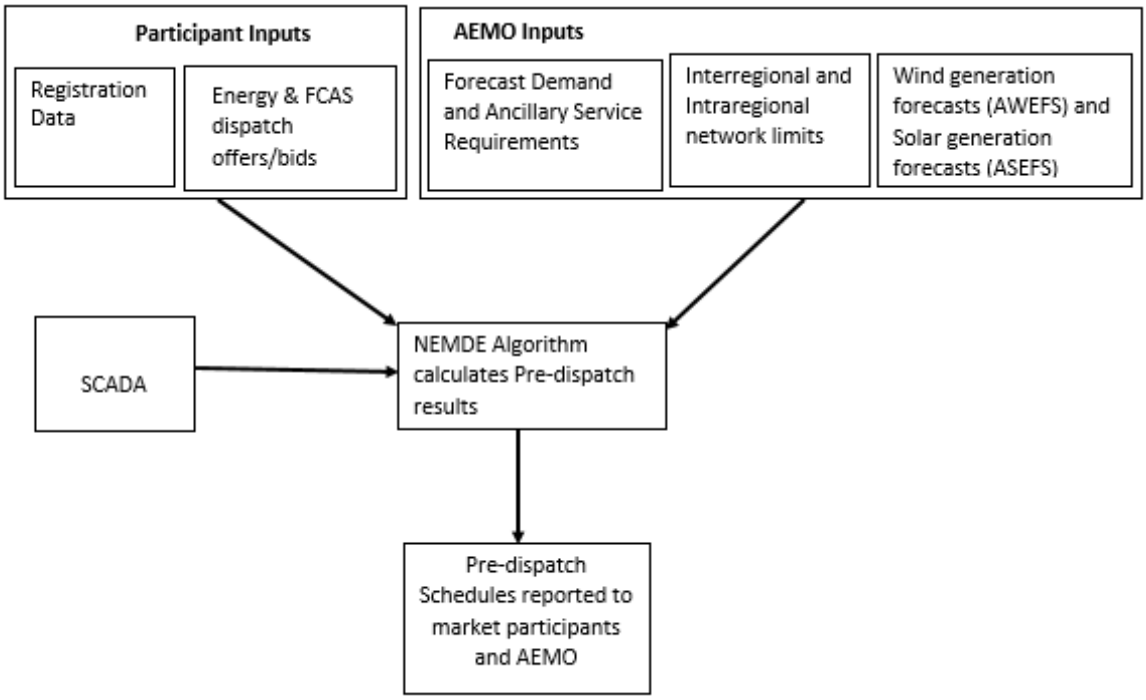

Figure 1 Pre-dispatch process

2.1. Pre-dispatch timing

As indicated in NER 3.8.20 AEMO must prepare and publish a *pre-dispatch* schedule in accordance with the Spot Market Operations Timetable. AEMO runs *pre-dispatch*:

- every five minutes, for each *trading interval* in the next hour; and
- every half hour, on the half hour, for each *30-minute period* up to and including the last *30-minute period* of the last *trading day* for which bid band prices have closed. As changes to bid band prices for the next trading day close at 1230 hours, AEMO will at 1230 hours publish *pre-dispatch* for all *30-minute periods* up to the end of the next trading day.

3. INPUTS

3.1. Participant Inputs

3.1.1. Registration data

Unit registration data is standing data that is initially submitted by the *Market Participant* and subsequently authorised by AEMO as part of the dispatchable unit registration process for participation in energy and *ancillary services* dispatch.

3.1.2. Energy and FCAS dispatch offers/bids

Unit energy *dispatch offer*/bid data is price band and MW loading constraint information relating to a market participant's dispatchable unit(s) or load(s) which is submitted by market participants in accordance with NER 3.8. This data is used by *pre-dispatch* to forecast the MW loading for each dispatchable unit or load at the end of each *trading interval* or *30-minute period* of the *pre-dispatch* period.

FCAS *dispatch offer*/bid data is FCAS quantity, pricing and boundaries of operation information relating to a *market participant's* dispatchable unit(s) or load(s) which is submitted by *market participants* in accordance with NER 3.8. This data is used by *pre-dispatch* to forecast the *dispatch* of each FCAS service for each dispatchable unit or load, which has submitted an FCAS offer/bid, for each *trading interval* or *30-minute period* of the *pre-dispatch* period.

Five-minute *pre-dispatch* uses the *dispatch offers* and *dispatch bids* for each *trading interval* in the forecast period. Half-hourly *pre-dispatch* uses the *dispatch offers* and *dispatch bids* for the last *trading interval* in each *30-minute period*.

3.1.3. Fast-start inflexibility profiles

Fast-start inflexibility profiles are used to define the *dispatch inflexibilities* of plants that can synchronise and reach minimum load in 30 minutes, and can synchronise, reach minimum load and shut down in less than 60 minutes.

Fast-start inflexibility profiles are used in five-minute *pre-dispatch*. Fast-start inflexibility profiles are not used in half-hourly *pre-dispatch*.

3.2. AEMO Inputs

3.2.1. Forecast demand

In accordance with NER 4.9.1 AEMO must produce the most probable (50% probability of exceedance) energy demand for each region for each *30-minute period*. These forecasts are based on half-hourly historical metering records and expected weather patterns.

AEMO will regularly review the accuracy of the *pre-dispatch* demand forecast to ensure if reflects the actual demand trend. For details on load forecasting methodology refer to SO_OP_3710 (Load Forecasting)

The half-hourly demand forecasts are used in half-hourly *pre-dispatch*. Five-minute *pre-dispatch* uses demand forecasts based on recent historical incremental changes in demand for the corresponding *trading interval*.

3.2.2. Ancillary service requirements

In accordance with NER 3.11 AEMO is required to enter the regional FCAS requirements for each FCAS service for each *trading interval*. This is implemented in the form of FCAS type constraints. For details relating to calculation of FCAS requirements refer to Constraint Implementation Guidelines.

3.2.3. Inter-regional and Intra-regional Limits

Each *interconnector* has a defined flow direction, with positive *interconnector* flows out of the defined "From Region" into the "To Region" with the limits on the scheduled flow of energy over an *interconnector* defined for each direction.

Limits on the operation of dispatchable units and *interconnectors* are implemented in the NEMDE algorithm using constraint equations. These constraints may represent "system normal" type limits or may be invoked for planned outages of transmission equipment as advised by the relevant NSPs.

Constraints for planned *outages* may include both energy and FCAS requirements. For a full description on constraints refer to SO_OP_3709 (Generic Constraints Due To Network Limitations).

NSPs or AEMO may also define certain *intra-regional* limits to control flows within a region. AEMO will use constraint equations to impose energy flow limits on intra-connectors.

3.2.4. AWEFS and ASEFS Forecasts

The Australian Wind Energy Forecast System (AWEFS) and the Australian Solar Energy Forecast System (ASEFS) provide the unconstrained intermittent generation forecasts (UIGF), or max availability, for semi scheduled wind farms and solar farms respectively. They are also used to calculate the level of non-scheduled wind and solar generation.

3.3. SCADA

The following SCADA data is captured by the NEMDE process from the NEM SCADA database and is applied to the first *trading interval* calculation only, of the current *pre-dispatch* schedule.

- Unit data
    - Initial loading
    - Unit ramp rates
    - AGC status
- Region data
    - Aggregate dispatch error (ADE)
    - Forecast demand change
- Network data
    - Initial *interconnector* flow
    - EMS limits

4. OUTPUTS

Pre-dispatch information is released to the market in two stages:

- Output results calculated from each run of the *Pre-dispatch* process are released after that *Pre-dispatch* run. *Pre-dispatch* data of an aggregate nature (both inputs and outputs) is published to the whole market, with data relating to a specific market participant only published to that participant; and
- All *Pre-dispatch* data (both input and output) is published to the whole market after the end of the trading day to which that data applies.

Details of the different data provided in each category can be found in the AEMO document, Pre-dispatch Process Description, available from the AEMO website.

4.1. Aggregate data

4.1.1. Pre-dispatch solution data

Provides an indication of the status of the *pre-dispatch* solution, whether the solution was successful or not and whether the solution is complete.

4.1.2. Region data

Provides the following information for each region for each *trading interval* or *30-minute period* within the *pre-dispatch* period,

- *Spot prices* or *30-minute prices* for energy and FCAS
- Excess generation price
- *30-minute prices* and excess generation sensitivity prices
- Total demand
- Daily energy requirement
- *Short term capacity reserve* requirement
- Short term capacity requirement
- Energy unconstrained short term capacity
- Energy constrained short term capacity
- Energy constrained short term capacity surplus
- Dispatchable generation
- Dispatchable load
- Deficit/surplus generation
- Net interchange
- FCAS dispatch
- FCAS local dispatch
- FCAS requirements
- FCAS local requirements
- FCAS import
- Aggregate dispatch error (for first interval only)
- Forecast demand change (for first interval only)

4.1.3. Network data

Provides the following information for each *trading interval* or *30-minute period* within the *pre-dispatch* period,

- *Interconnector* flow
- *Interconnector* metered MW flow
- *Interconnector* flow limits
- *Interconnector* flow limit status
- Marginal value
- Violation degree
- *Interconnector* flow losses
- *Interconnector* flow loss factor

- *Intra-regional* network flow limit
- *Intra-regional* network flow limit status

4.2. Unit Specific data

For each dispatchable unit or load the following information is provided for each *trading interval* within the *pre-dispatch* period,

- Total cleared MW
- Initial MW
- Energy market ramp rate
- FCAS raise response (for each service)
- FCAS lower response (for each service)
- AGC status

5. MANAGEMENT OF PRE-DISPATCH

AEMO will review the results of *pre-dispatch* on a regular basis to ensure the accuracy and validity of the results. Accuracy and validity may be affected by a number of issues including.

5.1. Demand forecast accuracy

Half-hourly demand forecast accuracy is highly dependent on weather forecast accuracy and customer behaviour.

AEMO will regularly review the accuracy of regional demand forecasts to ensure they reflect the actual demand trend. If the forecast error for a region is greater than a threshold limit for greater than two *30-minute periods* AEMO may submit a revised forecast for that region.

5.2. AWEFS and ASEFS Forecast accuracy

AWEFS and ASEFS forecast wind and solar generation based on weather information and real time data. Plant availability and down regulation of semi-scheduled generators may affect the accuracy of wind and solar generation forecasts. AEMO will monitor AWEFS and ASEFS forecasts to ensure acceptable levels of accuracy are maintained.

5.3. Constraint formulation

The formulation used for the *pre-dispatch* calculation may differ from the dispatch formulation due to the number of assumptions that may need to be made relating to future system conditions. This may result in *pre-dispatch* giving a dissimilar outcome to dispatch. AEMO has a process in place to improve the *pre-dispatch* formulation of constraints where significant errors are observed.

5.4. Short notice outages

NSPs may submit short notice outages that require AEMO to apply a constraint at any time during the *pre-dispatch* or *dispatch* period. NSPs may also cancel planned outages at short notice. AEMO will invoke/revoke any relevant constraints as soon as is practicable after AEMO receives notification of a new or cancelled outage.

5.5. Unplanned outages

Generating units or network elements may fail at any time. The impact this may have on *pre-dispatch* is related to the size of the generating unit or location of the network element. Again AEMO will invoke any necessary constraints as soon as is practicable after AEMO is aware of the outage.

5.6. Re-bidding

Re-bidding by generators and loads may have a significant impact on the accuracy of *pre-dispatch*. AEMO has no control over the level of re-bidding.