**COST ALLOCATION REVIEW: EXPOSURE DRAFT**
**PROPOSED WHOLESALE ELECTRICITY MARKET (WEM) AMENDING RULES**

**Explanatory Note**

This exposure draft sets out proposed amendments to the WEM Rules to implement the outcomes from the Cost Allocation Review,[1] including:

- Regulation services:

  o Changes are proposed to clauses 9.10.37, 9.10.38, 9.10.39; to the definitions in Chapter 11; and to insert a new Appendix 2D.

  o The proposed changes will implement the 'WEM Deviation Method',[2] which was developed as part of the Cost Allocation Review and is outlined in the Cost Allocation Review Information Paper.

- Contingency Reserve Lower services:

  o Changes are proposed to clauses 7.13.1E and 9.10.32; to the definitions in Chapter 11; and to insert a new Appendix 2E.

  o The proposed changes are to apply a modified runway method to allocate Contingency Reserve Lower costs, as follows:

    ▪ If a Network Contingency sets the Contingency Reserve Lower requirement in a Dispatch Interval, the costs of procuring contingency reserves will be split into two components:

      (1) determine the Load Contingency Reserve Lower cost allocation as:

        o the Runway Share: apply the runway method to allocate Contingency Reserve Lower costs to loads > 120 MW;

        o the Threshold Share: apply the existing allocation method (pro-rata based on energy consumption) to allocate Contingency Reserve Lower costs to loads ≤ 120 MW; and

      (2) determine the Network Share as:

        o apply a runway method to allocate the network component of Contingency Reserve Lower costs to Loads > 120 MW.

    ▪ If a load contingency sets the Contingency Reserve Lower requirement in a Dispatch interval, then only step (1) will apply.

- Contingency Reserve Raise services:

  o Changes are proposed to Appendix 2A.

  o The proposed changes will allow separate dispatchable electricity producing units within a Facility to be assigned separate Facility Risk Values for the purposes of allocating Contingency Reserve Raise costs under the runway method if the units are independently dispatchable and have separate network connections.

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[1]   Background on the Cost Allocation Review can be found on the Cost Allocation Review page of Energy Policy WA website at https://www.wa.gov.au/government/document-collections/cost-allocation-review.

[2]   Information on the WEM Deviation Method can be found in section 4 of the Cost Allocation Review Information Paper at https://www.wa.gov.au/system/files/2023-06/cost_allocation_review-information-paper-final.pdf.

The intent is to concurrently commence the WEM Amending Rules to implement the outcomes of the Cost Allocation Review and the WEM Amending Rules to implement five-minute settlement.

This exposure draft is based on the Consolidated Companion Version of the WEM Rules[3] and incorporates the draft WEM Amending Rules to implement five-minute settlement.[4]

Energy Policy WA is seeking stakeholder feedback on this exposure draft by **5:00 PM on 27 November 2023**. Feedback can be sent to energymarkets@dmirs.wa.gov.au.

Following completion of this consultation, Energy Policy WA will compile a single set of WEM Amending Rules that incorporates the five-minute settlement rules and this Exposure Draft. Energy Policy WA will provide the resulting WEM Amending Rules to the Minister for Energy for his approval. The resulting amendments are proposed to commence at the start of the first Trading Week on or after 1 October 2025.

Mark-up Colour guide:

| Text in black | Rules that are in force |
|---|---|
| Text in green | Amending Rules that have been made and will commence on a specified date |
| Text in blue | The Consolidated Companion Version of the WEM Rules (i.e., the WEM Amending Rules that have been made and are expected to commence on New WEM Commencement Day). |
| Text in red – underlined and strikethrough | New amendments proposed. |

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[3]    The Consolidated Companion Version of the WEM Rules is available at https://www.wa.gov.au/system/files/2023-07/wemrules-companion-version-prepared_as22july2023.pdf.

[4]    The Five-Minute Settlement Exposure Draft was published on 17 July 2023 and is available at https://www.wa.gov.au/system/files/2023-07/five-minute_settlement_project-wem_amending_rulese_exposure_draft.pdf.

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## 7.13.    Settlement and Monitoring Data

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7.13.1E.    AEMO must prepare and publish on the WEM Website the following data for a Trading Day by noon on the first Business Day following the day on which the Trading Day ends:

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   (g)    for each Dispatch Interval of the Trading Day:

      i.    all Facility Risks for that Dispatch Interval; and

      ii.    for each Network Contingency which is a Credible Contingency Event that is taken into account when setting the Contingency Reserve Raise or Contingency Reserve Lower requirements under clause 7.2.4 in that Dispatch Interval:

         1.    the Network Risk associated with that Network Contingency; and

         2.    the Registered Facilities whose Facility Risks are included in the Network Risk associated with that Network Contingency; and

   …

…

## 9.10. Settlement Calculations – Essential System Services

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9.10.32. The Contingency Reserve Lower amount recoverable from Market Participant p for ~~Trading~~ Dispatch Interval ~~t~~ DI is:

~~CL_Recoverable(p,t) = CL_Payable(t) × ConsumptionShare(p,t)~~

CL_Recoverable(p,DI)=CL_Payable(DI)×ParticiantCLShare(p,DI)

where:

(a) CL_Payable(DI~~t~~) is the total cost of procuring Contingency Reserve Lower in Dispatch ~~Trading~~ Interval DI ~~t~~ as calculated in accordance with clause 9.10.11; and

~~(b) ConsumptionShare(p,t) is the Consumption Share for Market Participant p for Trading Interval t as calculated in accordance with clause 9.5.6.~~

(b) ParticipantCLShare(p,DI) is Market Participant p's share of the total cost of procuring Contingency Reserve Lower in Dispatch Interval DI as calculated in accordance with section 7.3 of Appendix 2E.

…

9.10.37. Market Participant p's share of the total cost of Regulation payable for ~~Trading Interval t~~ Dispatch Interval DI is:

~~Regulation_Share(p,t)=$\dfrac{RegulationContributingQuantity(p,t)}{RegulationContributingQuantity(t)}$~~

$$\text{Regulation\_Share(p,DI)}=\sum_{f\in p} \text{Contribution\_Factor(f,DI)} + \text{RL\_Contribuiton\_Factor(p,D)}$$

where:

~~(a) RegulationContributingQuantity(p,t) is the quantity calculated in accordance with clause 9.10.38; and~~

~~(b) RegulationContributingQuantity(t) is the quantity calculated in accordance with clause 9.10.39.~~

(a) Contribution_Factor(f,DI) is the share of the total cost of Regulation services payable for Dispatch Interval DI for Regulation Entities f other than Residual Load, calculated in accordance with section 2.3 of Appendix 2D;

(b) f∈p is the set of all Regulation Entities f registered to Market Participant p, other than the Residual Load; and

(c) RL_Contribution_Factor(p,DI) is the share of the total cost of Regulation services payable for Dispatch Interval DI for all loads in the Residual Load that are allocated to Market Participant p, calculated in accordance with section 2.4 of Appendix 2D.

9.10.38. [Blank] ~~Market Participant p's Regulation contributing quantity in Trading Interval t is:~~

~~RegulationContributingQuantity(p,t)~~

~~= $\sum_{SSF\in p}$ |MeteredSchedule(SSF,t)| + $\sum_{NSF\in p}$ |MeteredSchedule(NSF,t)|~~

$$+ \sum_{NDL \in p} |MeteredSchedule(NDL,t)|$$

where:

(a) MeteredSchedule(SSF,t) is the Metered Schedule of Semi-Scheduled Facility, SSF, in Trading Interval t;

(b) SSF∈p denotes all Semi-Scheduled Facilities, SSF, registered to Market Participant p;

(c) MeteredSchedule(NSF,t) is the Metered Schedule of Non–Scheduled Facility, NSF, in Trading Interval t;

(d) NSF∈p denotes all Non-Scheduled Facilities, NSF, registered to Market Participant p;

(e) MeteredSchedule(NDL,t) is the Metered Schedule of Non-Dispatchable Load, NDL, in Dispatch Interval t; and

(f) NDL∈p denotes all Non-Dispatchable Loads, NDL, associated with Market Participant p (including Synergy's Notional Wholesale Meter where Synergy is Market Participant p).

9.10.39. [Blank] The Regulation contributing quantity in Dispatch Interval t is:

$$RegulationContributingQuantity(t) = \sum_{p \in P} RegulationContributingQuantity(p,t)$$

where:

(a) RegulationContributingQuantity(p,t) is Market Participant p's Regulation contributing quantity in Trading Interval t calculated in accordance with clause 9.10.38; and

(b) p∈P denotes all Market Participants.

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## 11.    Glossary

> **Explanatory Note**
>
> The following definitions will be inserted into Chapter 11 in alphabetical order.

**Adjusted Dispatch Target**: means the Dispatch Target for a Scheduled Facility or Semi-Scheduled Facility providing ESS, adjusted for any Regulation services provided by the Facility and any frequency response provided by the Facility in the Dispatch Interval under clause A12.6.1.10 of Appendix 12.

**CL_Threshold**: means the threshold above which the runway method is applied to allocate Contingency Reserve Lower costs, as specified in Appendix 2E.

**Contribution Factor**: means the Regulation services cost recovery factor for a Regulation Entity for a Dispatch Interval, calculated in accordance with section 2.4 of Appendix 2D.

**Deviation**: means the difference between the 4-second SCADA data for a Regulation Entity (for injection or withdrawal) and the Reference Trajectory for the Regulation Entity.

**Facility Risk**: means:

(a)       for a Facility, the sum of energy and Regulation Raise cleared from the relevant Facility in that Dispatch Interval; and

(b)       for the purposes of Appendix 2E, for Scheduled Facilities, Semi-Scheduled Facilities and Non-Dispatchable Loads, the sum of energy consumed in a Dispatch Interval.

**Final Reference Value**: means the end point for a Regulation Entity's Reference Trajectory, and is a Regulation Entity's actual, forecast or metered injection or withdrawal at the end of a Dispatch Interval, depending on the type of Regulation Entity, as defined in section 2.1(d) of Appendix 2D.

**Implied Forecast Quantity**: means the calculated metering quantity for the Residual Load at the end of a Dispatch Interval, as calculated under section 2.1(j) of Appendix 2D.

**Implied Metered Quantity**: means calculated metered quantity for the Residual Load at the start of a Dispatch Interval, as calculated under section 2.1(i) of Appendix 2D.

**Initial Reference Value**: means the starting point for a Regulation Entity's Reference Trajectory and is a metered quantity for a Regulation Entity or the implied MW metered quantity for Residual Loads, at the start of the Dispatch Interval.

**Injection Forecast**: means the end of Dispatch Interval forecasts for Semi-Scheduled Facilities that do not provide ESS and Non-Scheduled Facilities for the purposes of allocating Regulation services costs under Appendix 2D.

**Network Risk**: means, for a Network Contingency in a Dispatch Interval, the sum in MW of the Facility Risks for any Registered Facilities less the forecast consumption of any relevant Loads that are connected to the part of the Network affected by that Network Contingency, and that would lose the ability to Inject or Withdraw from the Network as a result of that Network Contingency.

**Reference Trajectory**: means the notional dispatch trajectory for a Regulation Entity that is determined every 4 seconds based on a linear trajectory from the start and end of a 5-minute Dispatch Interval, as defined in sections 2.1(c) and (d) of Appendix 2D.

**Regulation Entity** means the following Facilities and Loads for the purposes of allocating Regulation services:

(a)       Scheduled Facilities;

(b)       Semi-Scheduled Facilities;

(c)     Non-Scheduled Facilities;

(e)     Non-Dispatchable Loads with SCADA metering; and

(f)     Residual Loads.

**Residual Load**: means the implied demand for Non-Dispatchable Loads without SCADA metering, calculated by subtracting all Regulation Entities' withdrawal SCADA data from all Regulation Entities' injection SCADA data every 4 seconds.

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## Appendix 2A: Runway share calculation method

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1.4     If a Facility meets the requirements of section 2.5 of this Appendix and has been confirmed by AEMO under section 2.7(a) of this Appendix, then each electricity producing unit in an Energy Producing System to which section 2.1(c) of this Appendix 2A applies is treated as a separate Facility for the purposes of allocating Contingency Reserve Raise costs under this Appendix 2A.

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2.5.    Subject to AEMO's assessment and determination in accordance with section 2.7(a) of this Appendix, one or more electricity producing units in an Energy Producing System that is part of a Facility may be treated separately for the purposes of allocating Contingency Reserve Raise costs under Appendix 2A, provided that the units meet the following criteria:

   (a)     each electricity producing unit (or set of units) could be dispatched separately from the other units if they were separately Registered; and

   (b)     each electricity producing unit (or set of units) has a separate network connection from the other units.

2.6.    A Market Participant that wants the separate electricity producing unit (or set of units) within an Energy Producing System to be treated separately for the purposes of Appendix 2A must:

   (a)     apply to AEMO and must provide AEMO with any information that AEMO requires to assess the application, in accordance with the WEM Procedure published in accordance with section 2.8 of this Appendix;

   (b)     as soon as practicable, provide AEMO with updated information that has the potential to impact on:

      i.     whether the energy producing unit (or set of units) continue to meet the criteria in section 2.5 of this Appendix and/or the requirements in the WEM Procedure published in accordance with section 2.8 of this Appendix; and/or

      ii.     the Facility Risk of any of the electricity producing units (or set of units).

2.7.    AEMO must assess any application received under section 2.6(a) or any updated information provided under section 2.6(b) and determine:

   (a)     whether the energy producing unit (or set of units) within an Energy Producing System can be treated, or continue to be treated, separately for the purposes of Appendix 2A, based on:

      i.     the criteria in section 2.5 of Appendix 2A and the requirements in the WEM Procedure published in accordance with section 2.8 of this Appendix; and

      ii.     the information provided under section 2.6 of this Appendix;

   (b)     the Facility Risk for each electricity producing unit (or set of units), as determined under section 2.8 of this Appendix.

2.8.    AEMO must publish a WEM Procedure specifying:

   (a)     the process to be followed by a Market Participant to make an application and/or provide updated information, as required by section 2.6 of this Appendix;

(b)    the method AEMO will use to determine whether one or more electricity producing units in an Energy Producing System can be treated separately for the purposes of Appendix 2A, including:

   i.    that the electricity producing unit(s) meet the criteria in section 2.5 of this Appendix and any additional requirements specified in the WEM Procedure;

   ii.    what is the largest contingency associated with the Energy Producing System and its network connections;

   iii.    that it is possible to measure the Facility Risk for one or more of the energy producing units (a subset of the Energy Producing System) and to treat the energy producing units separately for the purposes of this Appendix; and

(c)    how AEMO will determine the Facility Risk of any of the separate electricity producing units (or set of units).

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## Appendix 2D: Calculation of Regulation Shares for Regulation Cost Recovery

**Explanatory Note**

Appendix 2D sets out the steps for AEMO to follow to determine Regulation_Share(f,DI), which is the share of Regulation services costs allocated to each Regulation Entity f in each Distribution Interval DI. Appendix 2D uses the WEM Deviation Method and calculates 5-minute Contribution Factors for each Regulation Entity injecting or withdrawing in the WEM.

Contribution Factors are calculated for Regulation Entities based on variations in the injection or withdrawal of the Regulation Entity.

Contribution Factors are determined for each Regulation Entity based on the deviation of their generation or load from a Reference Trajectory (i.e., a linear trajectory from the start to the end of a 5-minute Dispatch Interval) using 4-second SCADA data. The Reference Trajectory varies according to the type of Regulation Entity.

Residual Loads are Non-Dispatchable Loads that do not have SCADA metering. Residual Load represents most the loads in the WEM. Since Residual Load does not have SCADA metering, 4-second injection data (i.e., net generation due to behind the meter generation exceeding load) and withdrawal data (net load) is calculated based on the difference between injections and withdrawals using SCADA data.

A Contribution Factor is calculated for Residual Load in the same way as for specific Regulation Entities and is then attributed to Market Customers serving the Residual Load in proportion to their metered energy consumption.

## 1.    Interpretation

1.1.    If anything is to be determined, calculated or done in this Appendix, then except if otherwise stated, AEMO will determine, calculate or do that thing.

## 2.    Calculate Contribution Factors

2.1.    The 4-second Deviation value for Regulation Entity f is calculated as:

Deviation(f,s) = SCADA_Quantity(f,s) – Trajectory_Quantity(f,s)

where:

(a)    SCADA_Quantity(f,s) is the MW quantity that Regulation Entity f injected or withdrew for each four second period s within a Dispatch Interval, as recorded by the SCADA system operated by AEMO or the relevant Network Operator (as applicable);

(b)    Trajectory_Quantity(f,s) is the MW quantity that Regulation Entity f would have injected or withdrawn in each four second period s within the Dispatch Interval if the Regulation Entity had injected or withdrawn in accordance with its Reference Trajectory;

(c)    the Reference Trajectory for Regulation Entity f is a straight line between the Regulation Entity's Initial Reference Value and its Final Reference Value for the Dispatch Interval;

(d)    a Regulation Entity's Initial Reference Value and Final Reference Value are based on the type of Regulation Entity, as follows:

| Regulation Entity type | Initial Reference Value | Final Reference Value |
|---|---|---|
| i. Scheduled Facilities<br>ii. Semi-Scheduled Facilities providing ESS | The Facility's MW quantity at the start of the Dispatch Interval. | The Facility's Adjusted Dispatch Target at the end of the Dispatch Interval. |
| iii. Semi-Scheduled Facilities not providing ESS<br>iv. Non-Scheduled Facilities | The Facility's MW quantity at the start of the Dispatch Interval. | The Facility's Injection Forecast at the end of the Dispatch Interval. |
| v. Non-Dispatchable Loads with SCADA | The Load's MW quantity at the start of the Dispatch Interval. | The Load's MW quantity at the end of the Dispatch Interval. |
| vi. Residual Load | The Implied Metering Quantity at the start of the Dispatch Interval. | The Implied Forecast Quantity at the end of the Dispatch Interval. |

(e)     a Facility's or Load's MW quantities at the start or end of a Dispatch Interval is as recorded by the SCADA system operated by AEMO or the relevant Network Operator (as applicable);

(f)     the Adjusted Dispatch Target for Scheduled Facilities and Semi-Scheduled Facilities providing ESS is the Dispatch Target for the Facility adjusted for:

i.      any Regulation Raise services cleared for the Facility for the Dispatch Interval;

ii.     any Regulation Lower services cleared for the Facility for the Dispatch Interval;

iii.    any frequency response provided by the Facility in the Dispatch Interval under section A12.6.1.10 of Appendix 12;

iv.     any directions provided by AEMO;

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**Explanatory Note**

The 4-second Deviation value for Scheduled Facilities and Semi-Scheduled Facilities providing ESS should be reduced or set to zero to reflect the contribution that these Facilities make in providing Regulation services, primary response or in responding to AEMO directions. AEMO must develop a WEM Procedure to indicate the triggers for when and how it will reduce the Deviations for these Facilities. For example, this could include (amongst other things):

- if a Facility provides Regulation services in a 4-second period, then its Deviation is set to zero in that period; and

- if a Facility provided primary frequency response and frequency is outside the Normal Operating Band, then the Deviation for the Facility is set to zero.

(g)    Scheduled Facilities and Semi-Scheduled Facilities providing ESS may not be able to minimise the 4-second Deviation values when they provide Regulation services, frequency response or are subject to AEMO directions; in which case AEMO may reduce or set the Deviation value to zero for that 4-second period;

   i.    AEMO must develop a WEM Procedure to indicate when and how it will adjust Dispatch Targets for Scheduled Facilities or Semi-Scheduled Facilities providing ESS in a Dispatch Period;

(h)    the Injection Forecast for Semi-Scheduled Facilities not providing ESS and Non-Scheduled Facilities are determined under section 3 of this Appendix;

(i)    the Implied Metering Quantity for Residual Loads (RL) at the start of a Dispatch Interval is calculated as:

$$\text{Implied\_Metering\_Quantity(RL,s)} = \sum_{f \in IF} \text{Injection(f,s)} - \sum_{f \in L} \text{Withdrawal(f,s)}$$

where:

   i.    Injection(f,s) is the MW metered quantity that Regulation Entity f injected for the four second period s at the start of the Dispatch Interval, recorded by the SCADA system operated by AEMO or the relevant Network Operator (as applicable);

   ii.   f∈IF denotes all Regulation Entities f that injected in the four second period s;

   iii.  Withdrawal(f,s) is the MW metered quantity that Regulation Entity f withdrew for the four second period s at the start of the Dispatch Interval, as recorded by the SCADA system operated by AEMO or the relevant Network Operator (as applicable);

   iv.   f∈L denotes all Regulation Entities for which AEMO's SCADA system recorded withdrawals in the four second period s;

(j)    the Implied Forecast Quantity for Residual Loads (RL) at the end of a Dispatch Interval is calculated as:

$$\text{Implied\_Forecast\_Quantity(RL,s)} = \sum_{f \in IF} \text{Injection(f,s)} - \sum_{f \in NL} \text{Withdrawal(f,s)}$$

where:

   i.    Injection(f,s) is the MW metered quantity that Regulation Entity f injected in the four second period s at the end of the Dispatch Interval, and is:

      1.    the Dispatch Target for Scheduled Facilities or Semi-Scheduled Facility providing ESS;

      2.    the Injection Forecast for a Semi-Scheduled Facility not providing ESS or a Non-Scheduled Facility;

   ii.   f∈IF denotes all Regulation Entities f that injected in the four second period s;

   iii.  Withdrawal(f,s) is the MW quantity that a Regulation Entity with SCADA metering f withdrew for the four second period s at the end of the Dispatch Interval, as recorded by the SCADA system operated by AEMO or the relevant Network Operator (as applicable); and

         iv.      f∈NL denotes all Regulation Entities with SCADA metering withdrawing power.

2.2.      The Deviation value for all Regulation Entities f is calculated as follows:

$$\text{Deviation}(f,DI) = \sum_{s \in DI} |\text{Deviation}(f,s)|$$

where:

(a)      Deviations(f,s) is calculated in accordance with section 2.1 of this Appendix; and

(b)      s∈DI is the set of all 4-second periods s within Dispatch Interval DI for which metering data is recorded by the SCADA system operated by AEMO or the relevant Network Operator (as applicable).

2.3.      The Contribution Factor for each Regulation Entity f in Dispatch Interval DI is calculated as:

$$\text{Contribution\_Factor}(f,DI) = \frac{\text{Deviation}(f,DI)}{\sum_{f \in F} \text{Deviation}(f,DI)}$$

where:

(a)      Deviation(f,DI) is calculated in section 2.2 of this Appendix; and

(b)      f∈F denotes the set of all Regulation Entities.

2.4.      The Contribution Factor for the Residual Load is allocated to Market Participants p is calculated as follows:

RL_Contribution_Factor(p,DI) =

$$\text{Contribution\_Factor}(RL,DI) \times \frac{\sum_{L \in P} |\text{Metered\_Quantity}(L,DI)|}{\sum_{L \in RL} |\text{Metered\_Quantity}(L,DI)|}$$

where:

(a)      Contribution_Factor(RL,DI) is the Contribution_Factor(f,DI) calculated for Residual Load in accordance with clause 2.3 of this Appendix;

(b)      Metered_Quantity(L,DI) is the metered consumption by loads L in the Residual Load in Dispatch Interval DI;

(b)      L∈P is the set of metering connection points for loads L in the Residual Load that are allocated to Market Participant p; and

(d)      L∈RL is the set of metering connection points for all loads in the Residual Load.

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**Explanatory Note**

In applying the WEM Deviation Method to a Regulation Entity, AEMO must develop Injection Forecasts for Semi-Scheduled Facilities that do not provide ESS and for Non-Scheduled Facilities.

AEMO must develop a method for determining the Injection Forecasts and must use these for the development of AEMO's Dispatch Forecasts unless the relevant participant advises AEMO that it must use the Unconstrained Forecasts submitted by the Market Participant instead.

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### 3. Injection Forecasts

3.1.     AEMO must determine Injection Forecasts for Semi-Scheduled Facilities that do not provide ESS and for Non-Scheduled Facilities for the purposes of the calculations in section 2.1 of this Appendix.

3.2.     AEMO:

(a)     must provide the Injection Forecast for a Facility to the relevant Market Participant at the same time as it issues Dispatch Instructions for the Real-Time Market, in accordance with clauses 7.1.2 and 7.1.3; and

(b)     unless it is notified by the Market Participant in accordance with section 3.3 of this Appendix, AEMO must use the Injection Forecast determined in accordance with section 3.1 of this Appendix to determine the Dispatch Forecast for the Facility.

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**Explanatory Note**

Market Participants may request that AEMO use the Unconstrained Forecasts provided as part of their Real-Time Balancing Submissions for the purposes of the calculations in this Appendix, instead of the Injection Forecasts developed by AEMO.

In accordance with clause 7.2.4A, AEMO may determine and use as an input to the Dispatch Algorithm alternative forecast quantities to the Unconstrained Injection Forecasts and Unconstrained Withdrawal Forecasts provided in a Real-Time Market Submission if AEMO reasonably considers that the alternative forecast quantities are likely to be more accurate.

AEMO must develop a WEM Procedure for developing the Injection Forecasts under section 3.1 of this Appendix.

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3.3.     A Market Participant for a Semi-Scheduled Facility that does not provide ESS or a Non-Scheduled Facility is registered may notify AEMO that it requires AEMO to use the Unconstrained Injection and Withdrawal Forecast that the Market Participant provided in the Real-Time Market Submission for the Facility under clause 7.4.1 instead of the Injection Forecast developed by AEMO under section 3.1 of this Appendix.

3.4     If notified by the relevant Market Participant in accordance with section 3.3 of this Appendix, AEMO must not use the Injection Forecasts developed by the AEMO, unless AEMO has determined alternative forecast quantities in accordance with clause 7.2.4A.

### 4. Contingency Reserve Lower Cost Allocation Procedure

4.1.     AEMO must publish a WEM Procedure specifying:

(a)     how it would adjust Injection Forecasts to account for the provision of primary frequency response by a Semi-Scheduled Facility that does not provide ESS or a Non-Scheduled Facility under section 2.1(f) of this Appendix; and

(b)     the method it uses to develop the Injection Forecasts under section 3 if this Appendix.

## Appendix 2E: Calculation of Contingency Reserve Lower Share

## 1.        Interpretation

1.1.        If anything is to be determined, calculated, or done in accordance with this Appendix, then except if otherwise stated, AEMO will determine, calculate, or do that thing.

1.2.        For the purposes of this Appendix, CL_Threshold = 120 MW.

## 2.        Define CL Entity Sets and Contingencies

2.1.        Determine the CL_Entities(DI) as the set of all:

        (a)        Scheduled Facilities, Semi-Scheduled Facilities and Non-Scheduled Facilities that have a net withdrawal in Dispatch Interval DI;

        (b)        Non-Dispatchable Loads with SCADA metering in Dispatch Interval DI, and;

        (c)        Non-Dispatchable Loads without SCADA metering in Dispatch Interval DI.

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**Explanatory Note**

Electric Storage Resources are picked up as Scheduled Facilities. Hybrid Facilities that include Electric Storage Resources may be either Scheduled Facilities or Semi-Scheduled Facilities.

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2.2.        FacilityRisk(f, DI) is equal to the CL Entity's MWh consumption, multiplied by 12 to convert to MW.

2.3.        FacilityRisk(f, DI) for Non-Dispatchable Loads without SCADA metering is deemed to be < CL_Threshold.

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**Explanatory Note**

Non-Dispatchable Loads without SCADA metering, including the Notional Wholesale Meter, is a combination of non-contestable loads, none of which cause the need for Contingency Reserve Lower services above the CL_Threshold. Only CL_Entities behind a single connection with consumption greater than CL_Threshold are allocated the additional costs of providing Contingency Reserve Lower services. Non-Dispatchable Loads without SCADA metering is not an Applicable CL_Entity for the purposes of applying the runway calculations in section 3 of this Appendix.

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2.4.        Determine the Applicable_CL_Entities(DI) as the members f of CL_Entities(DI) for which FacilityRisk(f,DI) > CL_Threshold.

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**Explanatory Note**

Section 3 calculates the Runway Share for all members of Applicable_CL_Entities(DI) (i.e., with consumption > CL_Threshold) using the runway method. Each Applicable_CL_Entity is ranked in ascending order of their Facility Risk value and allocated a runway share based on that rank.

Section 4 calculates the Threshold Share for CL_Entities with consumption ≤ CL_Threshold, which is pro-rated based on energy consumption.

Section 5 calculates the total allocation of Contingency Reserve Lower costs for each CL_Entity in a Dispatch Interval as the sum of the CL_Entity's Runway Share and Threshold Share in that Dispatch Interval.

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Consider the following example with two CL_Entities above the CL_Threshold:

- Entity A = 250 MW;
- Entity B = 180 MW; and
- Non-Dispatchable Loads totals 1,800 MW in the DI.

The Facility Risk and ranking of the CL_Entities above the CL_Threshold is:

- Entity A has the highest Facility Risk value at 70 MW (= 250 MW – 180 MW), CL_EntityMW(rank=3,DI);
- Entity B has the next highest Facility Risk value at 60 MW (= 180 MW – 120 MW), CL_EntityMW(rank=2,DI); and
- The CL_Threshold of 120 MW is deemed to be CL_EntityMW(rank=1,DI).

The runway shares for the portion of the CL_Entities' loads exceeding the CL_Threshold are calculated as:

- Entity A = (70)/(250*(1+1-1)) + (60)/(250*(2+1-1)) = 28.00%/1 + 24.00/2% = 40.00%.
- Entity B = (60)/(250*(2+1-1)) = 24.00%/2 = 12.00%.
- The total recovery of Contingency Reserve Lower service costs for the portion of loads exceeding the CL_Threshold (i.e., the Total_Runway_Share) is 12.00% + 40.00% = 52.00%.

The threshold shares for the portion of the CL_Entities' loads below the CL_Threshold are calculated pro-rata based on energy consumption.

- Entity A = 120/(1800+120+120) = 5.88%.
- Entity B = 120/(1800+120+120) = 5.88%.
- The Non-Dispatchable Loads = 1800/(1800+120+120) = 88.24%.

The total allocation of Contingency Reserve Lower costs in the Dispatch Interval for each CL_Entity is its runway share plus its threshold share multiplied by 1-Total_Runway_Share.

- Entity A = 40% + [2.82%*(1-52%)] = 42.82%.
- Entity B = 12.00% + [2.82%*(1-52%)] = 14.82%.
- Non-Dispatchable Loads: = 0% + [42.35%*(1-52%)] = 42.35%.

The cost shares add up to 100%:
14.82%+42.82%+42.35% (0.01% rounding error in this example).

## 3. Determine the Runway Share for each Applicable CL_Entity

3.1. Rank the CL_Entities in the set Applicable_CL_Entities(DI) in Dispatch Interval DI in ascending order of the value of FacilityRisk(f,DI) determined in sections 2.2 and 2.3 of this Appendix:

    (a) If two or more CL_Entities in that set have the same FacilityRisk(f,DI) value, AEMO must rank those CL_Entities in ascending alphabetical order of the name of the CL_Entities recorded by AEMO in accordance with clause 2.34B.1.

    (b) CL_Threshold is deemed to be a CL_Entity and is to have lowest FacilityRisk(f,DI) and rank(f, DI) = 1.

    (c) The CL_Entity with the highest FacilityRisk(f,DI) value will have rank(f, DI) = n, where n is the number of CL_Entities in the set Applicable_CL_Entities(DI).

3.2.     Determine runway share of the cost of procuring Contingency Reserve Lower for each CL_Entity f in Applicable_CL_Entities(DI) as follows:

$$RunwayShare(f,DI)= \sum_{i=1}^{Rank(f,DI)} \frac{CL\_EntityMW(i,DI) - CL\_EntityMW(i-1,DI)}{CL\_EntityMW(n,DI)\times(n+1-i)}$$

where:

(a)     CL_EntityMW(1,DI) is the CL_Threshold;

(b)     CL_EntityMW(i,DI) is the FacilityRisk(x,DI) value of CL_Entity x with rank(x,DI) = i in Dispatch Interval DI, where:

    i.     for i=1, CL_EntityMW(0,DI) = 0; and

    ii.     x∈Applicable_CL_Enitities(DI);

(c)     Rank(f,DI) is the rank of Facility f in Dispatch Interval DI as determined in section 3.1 of this Appendix; and

(d)     n is the number of Facilities in the set Applicable_Facilities(DI) in Dispatch Interval DI.

3.3.     RunwayShare(f,DI) = 0 for:

(a)     the Notional Wholesale Meter; and

(b)     CL_Entities f in Dispatch Interval DI with MeteredQuantity(f,DI) < CL_Threshold; where

    i.     MeteredQuantity(f,DI) = the Meter Schedule for CL_Entity f in a DI, multiplied by 12 to convert to MW.

3.4.     Calculate the TotalRunwayShare(DI) as follows:

$$Total\ Runway\ Share(DI) = \sum_{f\in F} RunwayShare(f,DI)$$

where:

(a)     RunwayShare(f,DI) is determined in sections 3.2 and 3.3 of this Appendix; and

(b)     f∈F denotes all CL_Entities f in the set of Applicable_CL_Entities(DI).

## 4.     Determine the Threshold Share for each CL_Entity

4.1.     Determine the deemed CL_Entity_Quantity(f,DI) for each CL_Entity f in each Dispatch Interval DI as follows:

(a)     If MeteredQuantity(f,DI) ≥ CL_Threshold, then the deemed CL_Entity_Quantity(f,DI) = CL_Threshold;

(b)     If MeteredQuantity(f,DI) < CL_Threshold, then the CL_Entity_Quantity(f,DI) = MeteredQuantity(f,DI);

(c)     the deemed CL_Entity_Quantity(f,DI) for Non-Dispatchable Loads without SCADA metering is the metered consumption for the aggregate of these loads, which includes the Notional Wholesale Meter; and

(d)     MeteredQuantity(f, DI) is equal to the CL_Entity's MWh consumption, multiplied by 12 to convert to MW.

4.2.     Determine the ThresholdShare(f,DI) for each CL_Entity f as follows:

$$\text{ThresholdShare}(f,DI) = \frac{\text{CL\_Entity\_Quantity}(f,DI)}{\sum_{f \in F} \text{CL\_Entity\_Quantity}(f,DI)}$$

where:

(a)     CL_Entity_Quantity(f,DI) is determined in section 4.1 of this Appendix; and

(b)     f∈F denotes the set of CL_Entities(DI) determined in section 2.1 of this Appendix.

## 5.     Determine the Total CL Share for each CL_Entity

5.1.     Determine the total share of Contingency Reserve Lower costs for each CL_Entity f in the set of CL_Entities(DI) as follows:

CL_Entity_Share(f,DI) = RunwayShare(f,DI)
                        + (ThresholdShare(f,DI)*(1 – Total_Runway_Share(DI)))

where:

(a)     RunwayShare(f,DI) is as determined in sections 3.2 and 3.3 of this Appendix;

(b)     TotalRunwayShare(DI) is determined in section 3.4 of this Appendix; and

(b)     ThresholdShare(f,DI) is calculated in accordance with section 4.2 of this Appendix.

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**Explanatory Note**

Section 6 calculates the Network Contingency runway shares for CL_Entities that are Registered Facilities and are deemed to be causers of Network Contingencies. Denote:

- ApplicableNetworkContingencies(DI) are contingencies from whom cost are to be recovered in Dispatch Interval DI; and

- Causer_CL_Entities(nc,DI) is the set of CL_Entities nc that are Registered Facilities and are the causers of each ApplicableNetworkContingency(DI).

Each CL_Entity nc that is a member of Causer_CL_Entities(nc,DI) is ranked in ascending order of their Facility Risk value and is allocated a runway share based on that rank for that Network Contingency. Membership of Causer_CL_Entities(nc,DI) is restricted to CL because behind-the-meter components serving Intermittent Loads are not relevant to network risks, which are set based on the net generation lost if a network trip occurs.

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## 6.     Network Contingency Shares

6.1.     Determine Network_Contingencies(DI) as the set of Network Contingencies that are considered when setting the Contingency Reserve Lower requirement under clause 7.2.4 for Dispatch Interval DI.

6.2.     For each member in Network_Contingencies(DI), nc, calculate NetworkRisk(nc,DI) in Dispatch Interval DI as follows:

(a)     NetworkRisk(nc,DI) equals the Network Risk in Dispatch Interval DI as published by AEMO in clause 7.13.1E(g)(ii)(1), if nc sets the Largest Credible Load Contingency in Dispatch Interval DI; and

(b)     NetworkRisk(nc,DI) = 0 otherwise.

6.3.     Determine Applicable_Network_Contingencies(DI) as the members nc of NetworkContingencies(DI) for which NetworkRisk(nc,DI) > 0MW.

6.4.     Calculate m(DI), as the number of members of Applicable_Network_Contingencies(DI).

6.5.     For each member in Applicable_Network_Contingencies(DI), nc, perform the following steps:

(a)     from the information published under clause 7.13.1E(g)(ii), determine the set of CL_Entities that are Registered Facilities whose Facility Risks are included in the Network Risk associated with Network Contingency nc as Causer_Facilities(nc,DI), where Causer_Facilities(nc,DI) is a subset of the union of Applicable_CL_Entities(DI) as defined in section 2.4 of this Appendix;

(b)     rank the Registered Facilities in Causer_Facilities(nc,DI) in the ascending order of the value of FacilityRisk(f,DI) as determined in section 3.1 of this Appendix:

  i.     if two or more Registered Facilities in CauserFacilities(nc,DI) have the same FacilityRisk(f,DI) value in Dispatch Interval DI, AEMO must rank those Registered Facilities in ascending alphabetical order of the name of the Registered Facility recorded by AEMO in accordance with clause 2.34B.1;

  ii.     the Registered Facility with the lowest FacilityRisk(f,DI) value will have rank(nc,f,DI) = 1;

  iii.     the Registered Facility with the highest FacilityRisk(f,DI) value will have a rank(nc,f,DI) = $n_{nc}$, where $n_{nc}$ is the number of Registered Facilities in the set Causer_Facilities(nc,DI); and

(c)     determine for each Registered Facility f, which is a member of CauserFacilities(nc,DI), its runway share of the Network Contingency component (attributable to Network Contingency nc) of procuring Contingency Reserve Lower in Dispatch Interval DI as follows:

$$\text{Network\_Share}(nc,f,DI) = \sum_{i=1}^{Rank(nc,f,DI)} \frac{NetworkMW(nc,i,DI) - NetworkMW(nc,i-1,DI)}{NetworkMW(nc,n_{nc}+1-i)}$$

where:

  i.     NetworkMW(nc,i,DI) is the FacilityRisk(x,DI) value of Registered Facility x with rank(nc,x,DI) = i in Dispatch Interval DI, where:

    1.     for i=1, NetworkMW(nc,0,DI) = 0;

    2.     x∈Causer_Facilities(nc,DI);

  ii.     Rank(nc,f,DI) is the rank of Registered Facility f∈CauserFacilities(nc,DI) as determined in section 6.5(b) of this Appendix; and

  iii.     $n_{nc}$ is the number of Registered Facilities in the set Causer_Facilities(nc,DI).

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**Explanatory Note**

Section 7 divides the cost of Contingency Reserve Lower services into the components attributable to:

- Network Contingencies (Network_Component(DI)); and

- CL_Entity contingencies (CL_Entity_Component(DI)).

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## 7.     Cost Shares

7.1.     Calculate the cost shares associated with:

(a)     the network component of Contingency Reserve Lower costs in Dispatch Interval DI as follows:

$$\text{Network Component(DI)}=\frac{\text{Max}(0,\text{LargestNetworkRisk(DI)}-\text{LargestFacilityRisk(DI)})}{\text{LargestNetworkRisk (DI)}}$$

where:

i.     LargestNetworkRisk(DI) is the Largest Network Risk in Dispatch Interval DI; and

ii.    LargestFacilityRisk(DI) is the FacilityRisk(f,DI) of CL_Entity f in Dispatch Interval DI that has the rank(f,DI) = n; and

(b)     the CL_Entity component of Contingency Reserve Lower costs in Dispatch Interval DI as follows:

$$\text{CL\_Entity Component(DI)}=1-\text{NetworkComponent(DI)}.$$

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**Explanatory Note**

Section 7.2 accounts for multiple Network Contingencies being tied as the Largest Credible Supply Contingency by dividing each causer Registered Facility's network runway share (for a given Network Contingency) by the total number of tied Network Contingencies.

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7.2.     Determine the cost share of procuring the network component of Contingency Reserve Lower costs for each Registered Facility f associated with each Applicable Network Contingency nc in Dispatch Interval DI as follows:

$$\text{Applicable\_Network\_Share(nc,f,DI)}=\frac{1}{\text{m(DI)}}\times\text{Network\_Share(nc,f,DI)}$$

where:

(a)     m(DI) is determined in section 6.4 of this Appendix; and

(b)     Network_Share(nc,f, DI) is determined in section 6.5(c) of this Appendix.

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**Explanatory Note**

Participant cost shares (ParticipantCLShare(p,DI)) are calculated in section 7.3 considering:

• the CL_Entity Component and Network Component ratios calculated in section 7.1 of this Appendix; and

• the CL_Entity runway shares and the network runway shares calculated in sections 5 and 6 of this Appendix.

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7.3.     Determine Market Participant p's total runway share of procuring Contingency Reserve Lower services in Dispatch Interval DI as follows:

$$\text{ParticipantCLShare(p,DI)} = \text{CL\_Entity ComponentShare(p,DI)} + \text{NetworkComponentShare(p,DI)}$$

where:

(a)     $\text{CL\_Entity ComponentShare(p,DI)} = \text{CL\_Entity Component(DI)} \times$

$$\sum_{f\in\text{Applicable\_CL\_Entieies(p,DI)}} \text{CL Entity Share(f, DI)}$$

where:

i.      CL_EntityComponent(DI) is calculated in section 7.1(b) of this Appendix;

ii.      Applicable_CL_Entities(p,DI) is a subset of Applicable_CL_Entities identified in section 2.4 of this Appendix, which are Facilities registered to Market Participant p and electricity consuming units in Applicable_CL_Entities(DI) that have net loads for which Market Participant p is responsible;

iii.      CL_Entity_Share(f,DI) for CL_Entity f in Dispatch Interval DI is calculated in accordance with section 5.1 of this Appendix; and

(b)      NetworkComponentShare(p,DI) is calculated as follows:

$$NetworkComponentShare(p,DI) = NetworkComponent(DI) \times \sum_{nc \in Applicable\_Network\_Contingencies(DI)} \sum_{f \in CauserFacilities(nc,p,DI)} Applicable\_Network\_Share(nc,f,DI)$$

where:

i.      NetworkComponent(DI) is calculated in section 7.1(a) of this Appendix;

ii.      Applicable_Network_Contingencies(DI) is the subset of Network Contingencies determined in section 6.3 of this Appendix;

iii.      Causer_Facilities(nc,p,DI) is a subset of Causer_Facilities(nc,DI) identified in section 6.5(a) of this Appendix that are registered to Market Participant p; and

iv.      Applicable_Network_Share(nc,f,DI) is Registered Facility f's cost share associated with Network Contingency nc in Dispatch Interval DI, as calculated in section 7.2 of this Appendix.