# Regional Benefit Directions Procedures

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| **Prepared by:** | AEMO Operations |
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## Approved for distribution and use by:

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| **Approved by:** | ~~Ken Harper~~Michael Gatt |
| **Title:** | ~~Group~~ Executive General Manager – Operationsnal ~~Support~~ |
| **Date:** | ~~19~~ 05 / 0541~~2~~ / 25~~3~~ |

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Australian Energy Market Operator Ltd ABN 94 072 010 327

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# Current version release details

| Version | Effective date | Summary of changes |
|---|---|---|
| 1.1 | 05~~X~~ /-054 -/ 2025 | Minor and administrative changes to reflect National Electricity Amendment (Integrating energy storage systems into the NEM) Rule 2021 No.13 and other minor updates and clarifications |
| 1.0 | 19/12/2023 | Final report. |

# 1. Introduction

## 1.1. Purpose and scope

These *Regional Benefit Directions Procedures* (Procedures) are made under the National Electricity Rules (NER) 3.15.8(b2) and have effect only for the purposes set out in those rRules. The ~~National Electricity Rules~~NER and the National Electricity Law prevail over this document to the extent of any inconsistency.

These Procedures describe the process and principles *AEMO* will follow after issuing a *direction* to determine the relative benefit each *region* receives from the issu~~anc~~e of that *direction*, which is referred to in these Procedures as a regional benefit factor (**RBF**). RBFs form part of the calculation *AEMO* must perform to determine the allocation of *compensation recovery amounts* following the issue of a direction[1].

The value of the RBF affects the amount ~~*Market Customers, Market Generators* and/or *Market Small Generation Aggregators*~~*Cost Recovery Market Participants*[2] in a *region* may have to contribute to the cost of the direction. Other factors that affect the allocation of cost to these ~~*Registered* ~~*Cost Recovery Market* *Participants* include the size of the total *compensation recovery amount* (CR~~A~~I) and the *energy* consumed or generated over the period of the *direction*.

## 1.2. Definitions and interpretation

### 1.2.1. Glossary

Terms defined in the National Electricity Law and the NER have the same meanings in these Procedures unless otherwise specified in this clause.

Terms defined in the NER are intended to be identified in these Procedures by italicising them, but failure to italicise a defined term does not affect its meaning.

In addition, the words, phrases and abbreviations in the table below have the meanings set out opposite them when used in these Procedures.

| Term | Definition |
|---|---|
| CR~~A~~ | *Compensation recovery amount* |
| CRMP | *Cost Recovery Market Participant* |
| LOR | Lack of reserve |
| NER | National Electricity Rules |
| RBF | Regional Benefit Factor being the relative benefit each *region* received from the issu~~anc~~e of a direction |

[1] In the rare case where the *compensation recovery amount* determined in accordance with 3.15.8(a) and 3.15.8(g) is negative, *AEMO* will pay thes ~~*Market Customers, Market Generators* or *Market Small Generation Aggregators*~~*Cost Recovery Market Participant* as a result of the direction.

[2] A person who is registered by *AEMO* under Chapter 2 of the NER as a *Generator*, *Integrated Resource Provider* or *Customer*.

### 1.2.2. Interpretation

These Procedures are subject to the principles of interpretation set out in Schedule 2 of the National Electricity Law.

# 2. Application of the Procedures

The Procedures are relevant to the following services provided under *directions*~~*directions types*~~:

- *Energy* ~~directions – *direction s*~~ where~~by~~ directed participants are required to provide energy. ~~*In energy directions, e*~~*Energy* could be:
  - provided by a unit following targets to maintain power system reliability;
  - provided incidentally as a result of providing another service, such as system security[3] or *market ancillary services* ~~frequency control ancillary services (FCAS)~~[4];

  ~~The cost of an *energy* direction is recovered from *Market Customers.*~~
- *Other compensable services* ~~directions – *directions*~~ where~~by~~ directed participants are directed to provide a service that is not:
  - *energy*;
  - *market ancillary services*; or
  - a direct substitute for *energy* or a *market ancillary service*.~~; or~~

  ~~providing *energy* or *market ancillary services* incidental to the provision of that service[5].~~

The cost~~s~~ of ~~an *other compensable services*~~~~both types of *direction*~~*directions* for the provision of these services mentioned above ~~is~~ are recovered from ~~*Market Customers, Market Generators and Market Small Generation Aggregators*~~*Cost Recovery Market Participants*.

The Procedures are not relevant to *market ancillary services* provided under *direction* ~~directions~~[6]. Costs associated with these directions are recovered in line with normal process of recovering the costs of *market ancillary service*~~s~~, as per NER 3.15.6A.

The Procedures do not apply for directions to *Market Suspension Compensation Claimants* during ~~*M*~~*market* ~~*S*~~*suspension* ~~*P*~~*pricing* ~~*S*~~*schedule periods*. Conversely, the Procedures will be relevant during ~~*M*~~*market* ~~*S*~~*suspension* ~~*P*~~*pricing* ~~*S*~~*schedule periods* if a *direction* is made to a participant that is not a *Market Suspension Compensation Claimant*, such as a *Scheduled Load*

[3] Services where *energy* is provided incidentally to the service include inertia, voltage control and system strength.

[4] A direction for *market ancillary services* ~~FCAS~~ may also result in the provision of *energy* in order to comply with the ~~FCAS~~ *market ancillary services* direction. Both of these services require compensation as per NER 3.15.7(a). ~~A direction for the provision of FCAS is a *market ancillary services direction*, so t~~The calculation of RBF in these Procedures does not apply to *market ancillary services* directions. However, compensation for the provision of *energy* is an *energy direction*, so the calculation of RBF in these Procedures is relevant to the *energy* component of the direction.

[5] ~~Services where *energy* is provided incidentally to the service include inertia, voltage control and system strength.~~

[6] As per footnote ~~3~~2, the Procedures apply if there is an energy component to a *market ancillary services* ~~n FCAS~~ direction.

or a *Market Network Service Provider*. Refer to NER 3.15.8A for more information on the regional benefit for *market suspension* compensation recovery.

# 3. Relevance of the RBF when calculating *compensation recovery amounts* ~~payable~~

The RBF determined by *AEMO* following the issue of a *direction*[7] is an important component in the calculations *AEMO* must perform under the NER for the cost recovery of directions compensation. This section describes the formulas ~~currently~~ prescribed by clauses 3.15.8(b) and ~~NER~~ 3.15.8(g) of the NER for the calculation of cost recovery amounts, to highlight the influence that an RBF has on the amounts payable (or receivable) by a given ~~*Market Customer, Market Generator* and/or *Market Small Generation Aggregator*~~*Cost Recovery Market Participant*.

For *energy* ~~directions~~, NER 3.15.8(b) states that *AEMO* must, in accordance with the *intervention settlement timetable*, calculate a figure for each ~~*Market Customer*~~*Cost Recovery Market Participant* in each *region* by applying the following formula:

$$CRP\text{~~MCP~~} = \frac{E}{\sum E} \times \frac{\boldsymbol{RB}}{\sum \boldsymbol{RB}} \times CR$$

where:

- CRP is the amount payable or receivable by a *Cost Recovery Market Participant*;
- E is the sum of the *Cost Recovery Market Participant's adjusted consumed energy* amounts at its *market connection points* in the *region*, in respect of the relevant *intervention price trading intervals* excluding *adjusted consumed energy* of *scheduled loads* or *scheduled bidirectional units*, in respect of which the *Cost Recovery Market Participant* submitted a *dispatch bid* for the relevant *intervention price trading interval* in that *region*; and
- RB is the regional benefit, which is the same as the RBF in these procedures.
- CR is the *compensation recovery amount*.

For *other compensable service*~~s directions~~, NER 3.15.8(g) states that any compensation payable by *AEMO* under clause 3.12.2 and 3.15.7 not recovered under clauses 3.15.8(b) and 3.15.8(e) must be recovered from ~~*Market Customers, Market Generators* and *Market Small Generation Aggregators*~~*Cost Recovery Market Participants*. *AEMO* must, in accordance with *the intervention settlement timetable*, calculate a figure for each ~~*Market Customer, Market Generator* and *Market Small Generation Aggregator*~~*Cost Recovery Market Participant* in each *region* applying the following formula:

$$CRP\text{~~MCP~~} = \frac{TSOEGE\text{~~ + TSGE~~} - TCE}{RATSOEGE\text{~~ + RATSG~~} - RATCE} \times \frac{\boldsymbol{RB}}{\sum \boldsymbol{RB}} \times CRA \times -1$$

[7] See NER 3.15.8(b1))

where:

CRP (in $) = the amount payable or receivable by a *Cost Recovery Market Participant*;

TSOE (in MWh) = the sum, for all *connection points* of the *Cost Recovery Market Participant* located in the *region*, of the *adjusted sent out energy* in all relevant *intervention price trading intervals*;

TCE (in MWh) = the sum, for all *connection points* of the *Cost Recovery Market Participant* located in the *region*, of the *adjusted consumed energy* amounts in all relevant *intervention price trading intervals*;

RATSOE (in MWh) = the sum, for all *connection points* located in the *region* of all *Cost Recovery Market Participants*, of the *adjusted sent out energy* amounts in all relevant *intervention price trading intervals*;

RATCE (in MWh) = the sum, for all *connection points* located in the *region* of all *Cost Recovery Market Participants*, of the *adjusted consumed energy* amounts in all relevant *intervention price trading intervals*;

RB (number) = the regional benefit, which is the same as the RBF in these procedures; and

CRA = the *compensation recovery amount*.

~~In both of the equations above, **RB** is the RBF determined by AEMO in accordance with these Procedures.~~ For the full explanation of the ~~more detail of the~~ variables used in the formulas above, refer to NER 3.15.8(b) and NER 3.15.8(g). Section 6 provides some case studies which describe the calculations of amounts payable in different scenarios.

# 4. Rules required considerations

When determining the relevant benefit each *region* receives from the issu~~anc~~e of a *direction*, *AEMO* must take into account, where applicable to the reason the *direction* was given:

- The *load* at risk if the *direction* was not issued or the extent of improvement in available *energy* reserve in the *region;*
- The capability to control *voltage* in the *region;*
- The capability to control *power system frequency* within the *region;* and
- Any other relevant matters.

# 5. Principles for determining the RBF

*AEMO* will apply the following principles when determining the RBF for each *region* for the provision ~~an~~ of *energy* or *other compensable service*s provided under *direction* ~~direction~~. These principles are expected to hold true despite possible future changes to the structure of the NEM. Figure 1 illustrates the process followed by *AEMO* to determine the RBF following the issu~~anc~~e of a direction, applying the principles detailed in this section.

### Principle 1

For each *direction*, a RBF must be determined for each *region* and this must sum across all *regions* to a value of 1. The RBF for each *region* must be a value between 0 (no benefit) and 1 (the whole benefit).

### Principle 2

The question to be answered is, "who stands to benefit most from the issu~~anc~~e of the direction?" In general, if a *region* doesn't gain any benefit from the *direction*, then the RBF for that *region* should be zero.

### Principle 3

The RBF is not determined by the physical location of the ~~*d*~~*Directed* ~~*p*~~*Participant*, and is independent of whether intervention pricing applies or not[8].

### Principle 4

If a *direction* is issued to address a problem confined to a single *region*, such as system strength, voltage control or to address an intra-regional constraint, the RBF of the affected *region* should be assigned a value of 1, and the RBFs for all other *regions* should be zero. This also applies if a *direction* is issued to address a problem in a *region* after it has been electrically disconnected from the NEM, since the *direction* only addresses a problem in the islanded region.

### Principle 5

If a *direction* is issued to address a problem that affects multiple regions[9], the RBFs for each affected *region* should equal the proportion that is the sum of operational demand[10] for the affected *region* divided by the sum of the operational demand from all affected regions across the direction event, unless a *region* is not benefitting from the *direction*, such as through a constrained interconnector[11]. Where a *region* is not benefitting from the *direction*, operational demand in that trading interval will be excluded from the RBF calculation. For examples of this calculation, see Section 6.

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[8] Intervention pricing impacts the *compensation recovery amount* for directions, as ~~*Affected Participants, Market Customers, and Ancillary Service Providers*~~*Cost Recovery Market Participants* are entitled to compensation when intervention pricing applies. However, intervention pricing does not influence the calculation of the RBF.

[9] *AEMO* currently foresees that only reliability directions have the potential to benefit multiple regions. Under such circumstances, operational demand across the affected regions is expected to be high. *AEMO* will continue to review whether system security directions have the potential to benefit multiple regions and adapt the Procedures accordingly if this becomes the case.

[10] For further details on operational demand, see https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Dispatch/Policy_and_Process/Demand-terms-in-EMMS-Data-Model.pdf.

[11] If an interconnector is constrained, it may prevent a region or regions on one side of the interconnector from benefitting from the direction. One example of this could be for a reliability direction, since a constrained interconnector may not allow additional power to flow from the directed region across an interconnector.

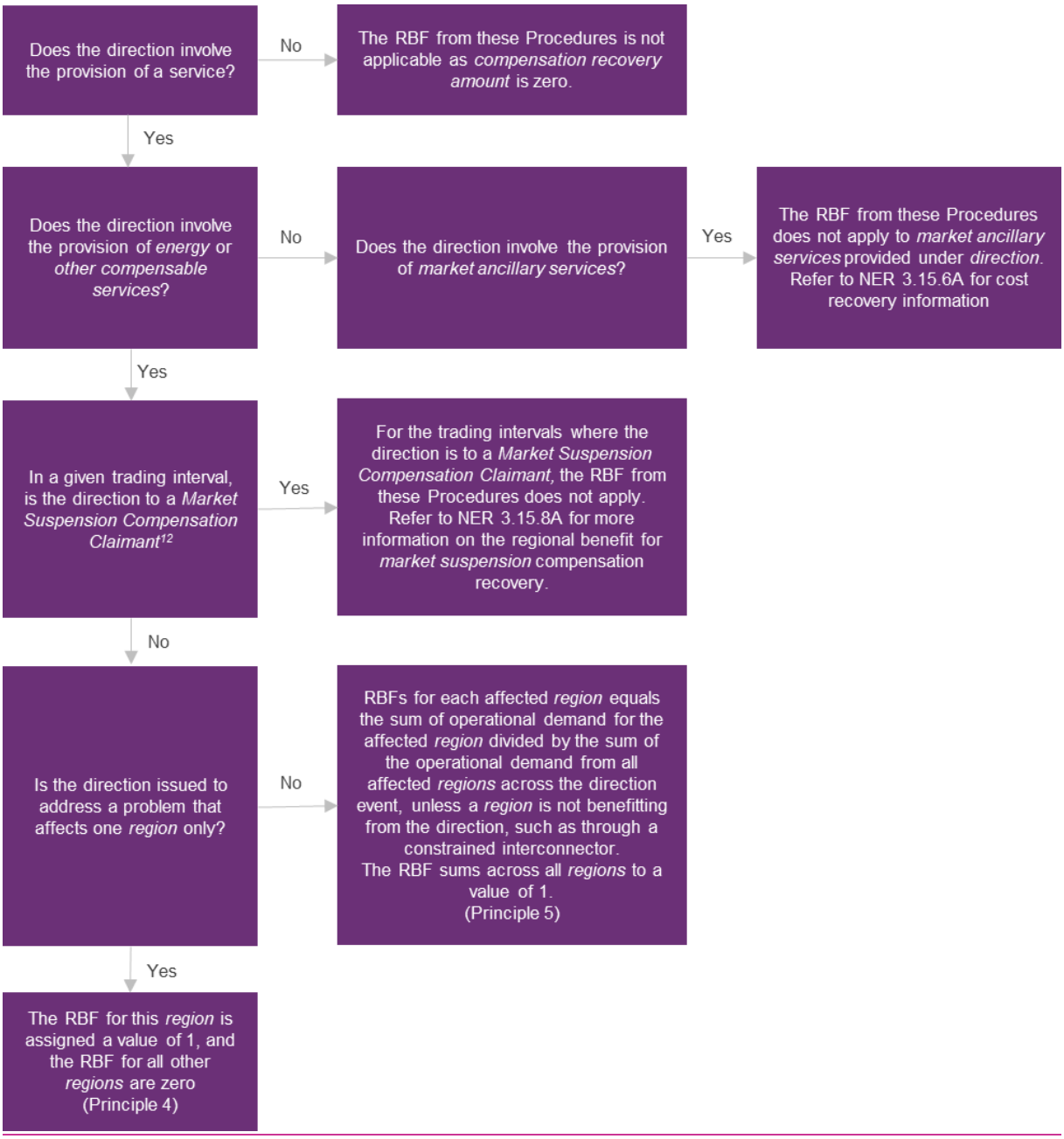
**Principle 6**

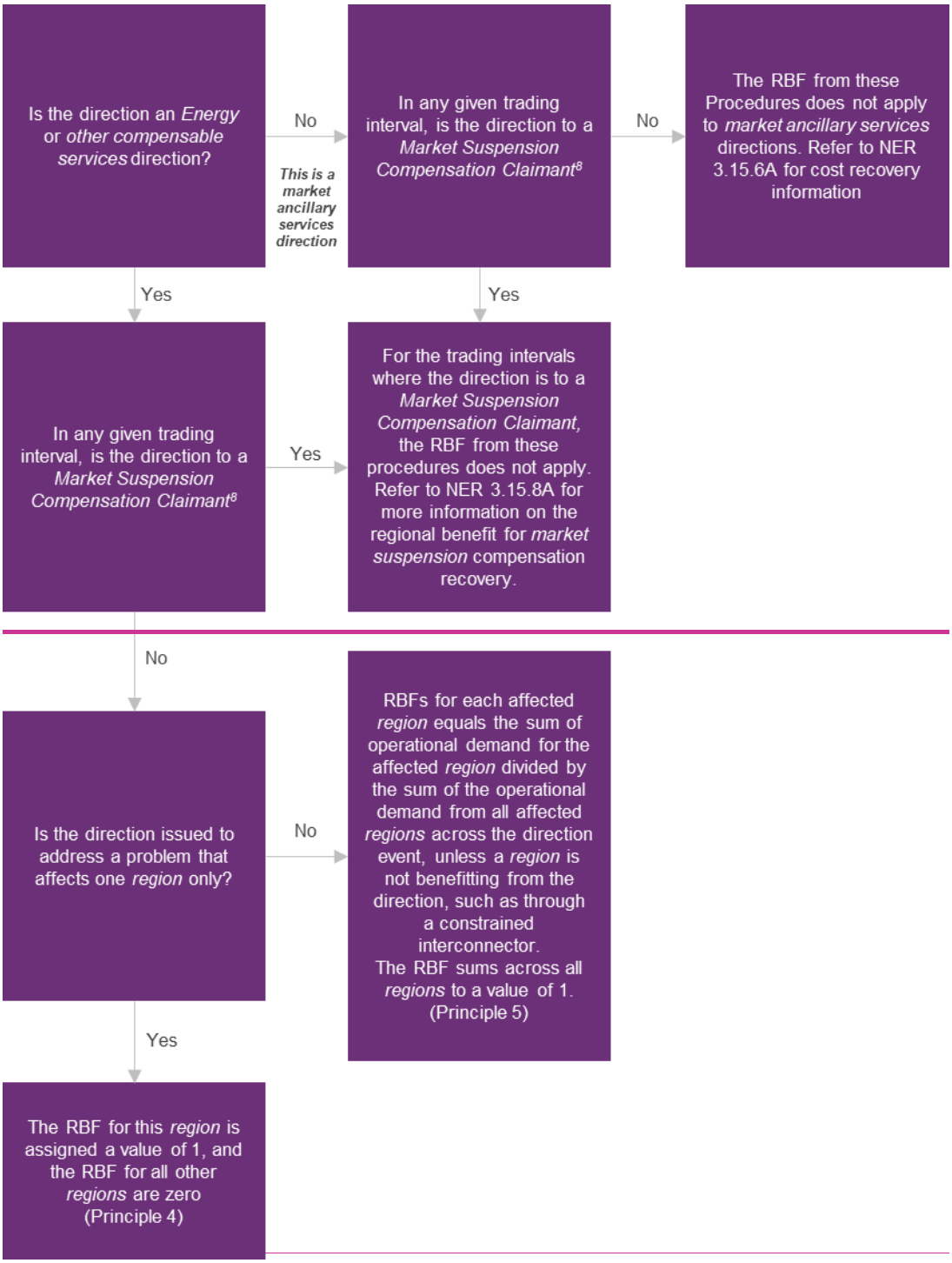
The RBF is not determined by *energy* or *market ancillary services* provided incidental[12] to a *direction* to provide a service.

[12] If, for example, a *direction* for system security enables the provision of additional renewable *energy generation*, the RBF is not determined by this additional *energy*, as it was provided incidental to the system security *direction*.

**Figure 1 Process used to determine the RBF following issu~~anc~~e of a *direction***

[13] A direction to a *Market Suspension Compensation Claimant* can only occur during a *market suspension pricing schedule period* within a *market suspension*. *Market Suspension Compensation Claimants* can include *Scheduled Generators*, *Scheduled Integrated Resource Providers*, *Demand Response Service Providers*, or *Ancillary Service Providers* with *ancillary service* ~~*generating*~~ *units* which are also *scheduled* ~~*generating units*~~*resources*.


Does the direction involve the provision of a service?
No
The RBF from these Procedures is not applicable as compensation recovery amount is zero.
Yes
Does the direction involve the provision of energy or other compensable services?
No
Does the direction involve the provision of market ancillary services?
Yes
The RBF from these Procedures does not apply to market ancillary services provided under direction. Refer to NER 3.15.6A for cost recovery information
Yes
In a given trading interval, is the direction to a Market Suspension Compensation Claimant[12]
Yes
For the trading intervals where the direction is to a Market Suspension Compensation Claimant, the RBF from these Procedures does not apply. Refer to NER 3.15.8A for more information on the regional benefit for market suspension compensation recovery.
No
Is the direction issued to address a problem that affects one region only?
No
RBFs for each affected region equals the sum of operational demand for the affected region divided by the sum of the operational demand from all affected regions across the direction event, unless a region is not benefitting from the direction, such as through a constrained interconnector. The RBF sums across all regions to a value of 1. (Principle 5)
Yes
The RBF for this region is assigned a value of 1, and the RBF for all other regions are zero (Principle 4)


Is the direction an *Energy* or *other compensable services* direction?
No
*This is a market ancillary services direction*
In any given trading interval, is the direction to a *Market Suspension Compensation Claimant*[8]
No
The RBF from these Procedures does not apply to *market ancillary services* directions. Refer to NER 3.15.6A for cost recovery information
Yes
Yes
In any given trading interval, is the direction to a *Market Suspension Compensation Claimant*[8]
Yes
For the trading intervals where the direction is to a *Market Suspension Compensation Claimant*, the RBF from these procedures does not apply. Refer to NER 3.15.8A for more information on the regional benefit for *market suspension* compensation recovery.
No
Is the direction issued to address a problem that affects one *region* only?
No
RBFs for each affected *region* equals the sum of operational demand for the affected *region* divided by the sum of the operational demand from all affected *regions* across the direction event, unless a *region* is not benefitting from the direction, such as through a constrained interconnector.
The RBF sums across all *regions* to a value of 1. (Principle 5)
Yes
The RBF for this *region* is assigned a value of 1, and the RBF for all other *regions* are zero (Principle 4)

# 6. Case studies

This section explores examples of *energy* or *other compensable service*s provided under *directions*, detailing the methodology and calculation of the RBF for each example *direction* and *region*. These case studies are provided by way of example to demonstrate how the concepts in the Procedures should be applied and do not encompass all potential ~~types of~~ *directions*. Sections 2, 3, 4 and 5 should be applied when determining the RBF for a *direction* regardless of whether the *direction* aligns with a case study.

## 6.1. South Australia system security *direction*

### 6.1.1. Direction details

This case study explores a situation where the *synchronous* ~~*generating*~~ *production units* expected to be online in South Australia are inadequate to maintain a *secure operating state*[14]. In this case, a direction to a *synchronous* ~~*generating*~~ *production unit*, such as a gas-fired generator, is required to ensure the power system remains in a *secure operating state*. A *direction* could, for example, require an offline synchronous generator to synchronise and follow dispatch targets, or require an online synchronous generator to remain online and follow dispatch targets.

This type of *direction* often arises when gas-fired generators in South Australia de-commit from the market, either by bidding generation unavailable or at high prices, because pre-dispatch *energy* prices are too low to warrant keeping the generator online or bringing it online.

### 6.1.2. RBF calculation

The RBF for this *direction* is 1 for South Australia and zero for all other regions. Key considerations for this calculation are as follows:

- The *direction* was given for the purpose of providing ~~system security~~ voltage control in South Australia.
- Principle 2 - only participants in South Australia stand to benefit from the *direction*, since the system security issue this *direction* aims to solve is local to South Australia.
- Principle 3 – although the directed plant is located in South Australia, this does not affect the RBF calculation~~.~~ The RBF calculation is independent of whether intervention pricing applies or not ~~Intervention pricing does not apply for South Australian system security *directions*[15] and this does not affect the RBF calculation~~.

[14] On 25 November 2021, *AEMO* updated its system strength limit advice to reduce the minimum number of gas generation units required to ensure power system security from the equivalent of four large units to two under most operating conditions. Since the updated advice, in most circumstances only two gas generation units have been required to be online for system security purposes. ElectraNet and *AEMO* continue to assess technical requirements and update operating procedures, for updates refer to: https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/system-operations/congestion-information-resource/related-resources/operation-of-davenport-and-robertstown-synchronous-condensers.

~~[15] See https://www.aemc.gov.au/sites/default/files/2021-11/Final%20Determination%20-%20ERC0284.pdf.~~

- Applying Figure 1, the following process for determining the RBF is followed:
  - This **is** an ~~E~~energy direction involving the provision of *energy*, while the direction was to provide voltage control, the response from the generator is to synchronise and provide energy (therefore ~~as the *direction* was to provide system security from a gas generating unit, resulting in~~ energy is being provided incidentally).
  - The *direction* **is not** to a *Market Suspension Compensation Claimant* **for anyll trading intervals**.
  - The *direction* **is** issued to address a problem that affects one *region* only, which is South Australia in this case.
  - Principle 4 – the RBF for South Australia is 1, and the RBF for all other regions is zero.

### 6.1.3. Calculation of amounts payable

This section illustrates the hypothetical split of compensation cost recovery for the system security *direction* to a South Australian gas generator. It shows how the calculation of RBF affects cost recovery from ~~*Market Customers*~~*Cost Recovery Market Participants*. The following assumptions are made to calculate the amounts payable:

- There are three ~~*Market Customers*~~*Cost Recovery Market Participants* in South Australia with the following *adjusted* ~~*gross*~~ *consumed energy* amounts over the course of the *direction*[16]:
  - $E_{CRMPM\sout{C}1} = -3{,}000\ MWh$
  - $E_{CRMPM\sout{C}2} = -4{,}500\ MWh$
  - $E_{CRMPM\sout{C}3} = -5{,}000\ MWh$
- The CR~~A~~ for the *direction*, which essentially describes the total amount to be recovered, is $10,000.

Section 6.1.2 states the RBF for this direction is 1 for South Australia and zero for all other regions. Therefore, the amount payable[17] by each ~~*Market Customer*~~*Cost Recovery Market Participant* outside South Australia is zero, regardless of how large their *adjusted* ~~*gross*~~ *consumed energy* over the course of the *direction* was. Consistent with Principle 2, *Cost Recovery Market Participants* ~~*Market Customers*~~ which didn't receive any benefit from the *direction* do not pay for the *direction*. Using the above assumptions, the amounts payable for the three *Cost Recovery Market Participants* ~~*Market Customers*~~ in South Australia are calculated using NER 3.15.8(b)[18] as follows:

$$\sout{MCP}CRP = \frac{E}{\sum E} \times \frac{RB}{\sum RB} \times CR\sout{A}$$

$$CRP\sout{MCP}_{CRMPM\sout{C}1} = \frac{-3{,}000\ MWh}{(-3{,}000\ MWh - 4{,}500\ MWh - 5000\ MWh)} \times \frac{1}{1} \times \$10{,}000 = \$2{,}400$$

[16] Negative energy values represent energy consumed.

[17] Or receivable, which would be a negative value.

[18] Positive CR~~A~~ values are assumed when using this formula, meaning *AEMO* recovers direction compensation costs from participants. This results in positive CRP~~MCP~~ values, which are amounts participants pay to *AEMO* as part of the direction cost recovery.

$$CRP\sout{MCP}_{CRMP\sout{MC}2} = \frac{-4{,}500\ MWh}{(-3{,}000\ MWh - 4{,}500\ MWh - 5000\ MWh)} \times \frac{1}{1} \times \$10{,}000 = \$3{,}600$$

$$CRP\sout{MCP}_{CRMP\sout{MC}3} = \frac{-5{,}000\ MWh}{(-3{,}000\ MWh - 4{,}500\ MWh - 5000\ MWh)} \times \frac{1}{1} \times \$10{,}000 = \$4{,}000$$

As expected, the Cost Recovery Market Participants ~~Market Customers~~ in SA are liable for the entire amount payable for the direction:

$$CR\sout{A} = CRP\sout{MCP}_{CRMP\sout{MC}1} + CRP\sout{MCP}_{CRMP\sout{MC}2} + CRP\sout{MCP}_{CRMP\sout{MC}3}$$

$$CR\sout{A} = \$2{,}400 + \$3{,}600 + \$4{,}000 = \$10{,}000$$

## 6.2. Queensland and New South Wales reliability *direction* (*energy*)

### 6.2.1. Direction details

This case study explores a situation where the demand in Queensland and New South Wales is approaching energy supply including imports across the interconnector and AEMO is forecasting a lack of reserve (LOR)[19] 2~~0~~ in several hours. In this case, a *direction* is made to a coal-fired generator in Queensland with additional energy availability, to assist in maintaining a reliable operating state[21] in both Queensland and New South Wales, as there are forecast periods with headroom on the interconnectors between the two regions. A *direction* could, for example, require an already online coal-fired generator in Queensland to increase its availability offered to the market and ramp up its output at its maximum capability.

This type of *direction* could occur when demand is high, such as when there is an extreme heatwave, and/or when supply is low, such as when there are generator or transmission outages, economic or technical unavailability, low fuel reserves (such as coal stockpiles and gas line pack) or low fuel supply (such as the sun and wind).

### 6.2.2. RBF calculation

The RBFs determined for this direction are: $RBF_{QLD} = 0.54$, $RBF_{NSW} = 0.46$, $RBF_{VIC} = 0$, $RBF_{TAS} = 0$ and $RBF_{SA} = 0$. Key considerations for this calculation are as follows:

- The *direction* is given for the purpose of maintaining the power system in a reliable operating state in Queensland and New South Wales only. No other regions have reliability concerns. In addition, load is at risk in Queensland and New South Wales if the direction is not issued.
- Principle 2 – only participants in Queensland and New South Wales stand to benefit from the *direction*, since the *direction* is aimed to improve energy reserves in both *regions*.
- Principle 3 – at times when the interconnectors between Queensland and New South Wales are not constrained, the location of the directed generator (in Queensland) will not determine

[19] See https://aemo.com.au/-/media/files/learn/fact-sheets/lor-fact-sheet.pdf?la=en.

[20] ~~See https://aemo.com.au/-/media/files/learn/fact-sheets/lor-fact-sheet.pdf?la=en.~~

[21] A reliable operating state involves meeting demand at all times with available energy supply, including after the largest credible contingency.

the RBF. The RBF calculation is independent of whether intervention pricing applies or not ~~Intervention pricing applies during this direction and this does not impact RBF calculation~~.

- Applying Figure 1, the following process for determining the RBF is followed:
  - This **is** a~~n *Energy* direction~~ involving the provision of *energy*, as *energy* was provided by the generator following targets to ~~the *direction* was to increase the availability and generation of a coal generator to~~ maintain a reliable operating state in Queensland and New South Wales.
  - The *direction* **is not** to a *Market Suspension Compensation Claimant* **for anyll trading intervals**.
  - The *direction* **is** issued to address a problem that affects two regions (Queensland and New South Wales).
  - Principle 5 – RBFs for Queensland and New South Wales equal the sum of operational demand for the relevant *region* divided by the sum of the operational demand from both regions across the *direction* event, unless a *region* is not benefitting from the *direction*, such as through a constrained interconnector. Details of the operational demand in Queensland and New South Wales and interconnector constraints between the regions are shown in Table 1.

**Table 1 Operational demand and interconnector constraints during Queensland and New South Wales reliability direction**

| Trading interval (hrs) | Queensland operational demand (MW) | New South Wales operational demand (MW) | Interconnector flow constrained from Queensland to New South Wales?[22] |
|---|---|---|---|
| 16:30 | 9,800 | 12,900 | No |
| 17:00 | 10,000 | 13,200 | No |
| 17:30 | 10,300 | 13,100 | Yes |

For this *direction* to a Queensland coal generator to address a reliability issue in Queensland and New South Wales, the RBFs are calculated as follows:

$$RBF_{QLD} = \frac{(QLD_{DEMAND1} + QLD_{DEMAND2} + QLD_{DEMAND3})}{(QLD_{DEMAND1} + QLD_{DEMAND2} + QLD_{DEMAND3}) + (NSW_{DEMAND1} + NSW_{DEMAND2} + NSW_{DEMAND3})}$$

$$RBF_{QLD} = \frac{(9{,}800 + 10{,}000 + 10{,}300)}{(9{,}800 + 10{,}000 + 10{,}300) + (12{,}900 + 13{,}200 + 0)} = 0.54$$

[22] Where the directed unit is in Queensland and the interconnector flow is constrained from New South Wales to Queensland (northwards flow), the benefits are split across both regions based on operational demand, because it is generally possible in such a scenario that additional energy in Queensland could improve reserves in New South Wales.

$$RBF_{NSW} = \frac{(NSW_{DEMAND1} + NSW_{DEMAND2} + NSW_{DEMAND3})}{(QLD_{DEMAND1} + QLD_{DEMAND2} + QLD_{DEMAND3}) + (NSW_{DEMAND1} + NSW_{DEMAND2} + NSW_{DEMAND3})}$$

$$RBF_{NSW} = \frac{(12{,}900 + 13{,}200 + 0)}{(9{,}800 + 10{,}000 + 10{,}300) + (12{,}900 + 13{,}200 + 0)} = 0.46$$

### 6.2.3. Calculation of amounts payable

The following assumptions are made to calculate the amounts payable by ~~*Market Customers*~~*Cost Recovery Market Participants*:

- There are five ~~*Market Customers*~~*Cost Recovery Market Participants*, two in Queensland and three in New South Wales, with the following *adjusted* ~~*gross*~~ *consumed energy* amounts over the course of the direction:

$$CRMP\text{~~MC~~}_{QLD1} = -7{,}000\ MWh$$

$$CRMP\text{~~MC~~}_{QLD2} = -6{,}500\ MWh$$

$$CRMP\text{~~MC~~}_{NSW1} = -6{,}750\ MWh$$

$$CRMP\text{~~MC~~}_{NSW2} = -3{,}750\ MWh$$

$$CRMP\text{~~MC~~}_{NSW3} = -6{,}000\ MWh$$

- The CR~~A~~ for the *direction* is $50,000.

Section 6.2.2 states that the RBFs for this *direction* are: $RBF_{QLD} = 0.54$, $RBF_{NSW} = 0.46$, $RBF_{VIC} = 0$, $RBF_{TAS} = 0$ and $RBF_{SA} = 0$. Given regions other than Queensland and New South Wales had RBFs of zero, the amounts payable[23] by any ~~*Market Customers*~~*Cost Recovery Market Participants* outside these regions is zero. Using the above assumptions, the amounts payable are calculated in accordance with NER 3.15.8(b) as follows:

$$CRP\text{~~MCP~~} = \frac{E}{\sum E} \times \frac{RB}{\sum RB} \times CR\text{~~A~~}$$

$$CRP\text{~~MCP~~}_{CRMP\text{~~MC~~}QLD1} = \frac{-7{,}000}{-7{,}000 - 6{,}500} \times \frac{0.54}{1} \times \$50{,}000 = \$14{,}000$$

$$CRP\text{~~MCP~~}_{CRMP\text{~~MC~~}QLD2} = \frac{-6{,}500}{-7{,}000 - 6{,}500} \times \frac{0.54}{1} \times \$50{,}000 = \$13{,}000$$

$$CRP\text{~~MCP~~}_{CRMP\text{~~MC~~}NSW1} = \frac{-6{,}750}{-6{,}750 - 3{,}750 - 6{,}000} \times \frac{0.46}{1} \times \$50{,}000 = \$9{,}409$$

$$CRP\text{~~MCP~~}_{CRMP\text{~~MC~~}NSW2} = \frac{-3{,}750}{-6{,}750 - 3{,}750 - 6{,}000} \times \frac{0.46}{1} \times \$50{,}000 = \$5{,}227$$

$$CRP\text{~~MCP~~}_{CRMP\text{~~MC~~}NSW3} = \frac{-6{,}000}{-6{,}750 - 3{,}750 - 6{,}000} \times \frac{0.46}{1} \times \$50{,}000 = \$8{,}364$$

As expected, the *Cost Recovery Market Participants* in Queensland and New South Wales are liable for the entire amount payable for the *direction*:

[23] Or receivable if CRA is a negative value.

$$CR = CRP_{CRMPQLD1} + CRP_{CRMPQLD2} + CRP_{CRMPNSW1} + CRP_{CRMPNSW2} + CRP_{CRMPNSW3}$$

$$CR = \$14{,}000 + \$13{,}000 + \$9{,}409 + \$5{,}227 + \$8{,}364 = \$50{,}000$$

## ~~6.4.~~6.3. Queensland reliability *direction* (*other compensable services*)

### ~~6.4.1.~~6.3.1. Direction details

This case study explores a situation where there is a forecast LOR2 for the evening peak period in Queensland. In this case, a *direction* is made to a pumped hydro unit in Queensland, enabling additional water to be stored at height, which can be released to provide additional reserves when required in the evening. The *direction* is for the pumped hydro unit to make additional capacity available for dispatch and follow dispatch targets.

The *direction* could occur for the same reasons outlined in Section 6.2.1 with a different type of plant (in this case hydro), available to direct.

### ~~6.4.2.~~6.3.2. RBF calculation

The RBF for this *direction* is 1 for Queensland and zero for all other regions. Key considerations for this calculation are as follows:

- The *direction* is given for the purpose of maintaining the power system in a reliable operating state in Queensland. No other regions have reliability concerns. In addition, load is at risk in Queensland if the *direction* is not issued.
- Principle 2 – only participants in Queensland stand to benefit from the *direction*, since the system reliability issue this *direction* aims to solve is local to Queensland.
- Principle 3 – the location of the directed plant in Queensland does not determine the RBF. The RBF calculation is independent of whether intervention pricing applies or not~~Intervention pricing applies during this *direction* and this does not impact RBF calculation~~.
- Applying Figure 1, the following process for determining the RBF is followed:
  - This **is** a *direction* involving the provision of reserve, as the unit made additional capacity available for dispatch and follow dispatch targets. ~~n *Other Compensable Services* direction as the unit acts as a load and consumes energy to meet the direction requirements.~~
  - The *direction* **is not** to a *Market Suspension Compensation Claimant* **for anyll trading intervals**.
  - The *direction* **is** issued to address a problem that affects one *region* only, which is Queensland in this case.
  - Principle 4 – the RBF for Queensland is 1, and the RBF for all other regions is zero.

### ~~6.4.3.~~6.3.3. Calculation of amounts payable

The following assumptions are made to calculate the amounts payable for ~~*Market Customers, Market Generators and Market Small Generation Aggregators*~~*Cost Recovery Market Participants*:

- There are two *Cost Recovery Market Participants* ~~*Market Customers*~~ which consumed energy in Queensland. The energy consumed[24] by each *Cost Recovery Market Participants* ~~*Market Customer*~~ over the course of the *direction* (*adjusted consumed energy*~~customer energy~~) is as follows:
  - $TCE_{CRMP\text{~~MC~~}1(consumer)} = -2{,}000\ MWh$
  - $TCE_{CRMP\text{~~MC~~}2(consumer)} = -4{,}000\ MWh$
- There are three *Cost Recovery Market Participants* which generated energy ~~*Market Generators*~~ in Queensland. The energy generated~~generated~~[25] by each *Cost Recovery Market Participant* ~~Market Generators~~ over the course of the *direction* (*adjusted sent out energy*~~generator energy~~) is as follows:
  - $TSOE\text{~~GE~~}_{CRMP\text{~~MG~~}1(producer)} = 3{,}000\ MWh$
  - $TSOE\text{~~GE~~}_{CRMP\text{~~MG~~}2(producer)} = 1{,}500\ MWh$
  - $TSOE\text{~~GE~~}_{CRMP\text{~~MG~~}3(producer)} = 2{,}500\ MWh$
- ~~There is one *Market Small Generation Aggregator*~~*Integrated Resource Provider* ~~in Queensland. The energy generated over the course of the direction (small generator~~integrated resource system ~~energy) is as follows:~~
  - ~~$TSGE_{MSGA1} = 10\ MWh$~~
- The CRA for the direction, which ~~essentially~~ describes the total amount to be recovered, is $20,000.

Section 6.3.2 states the RBF for Queensland is ~~one~~ 1 and the RBF is zero for all other regions. Therefore, the amount payable[26] by each ~~*Market Customer, Market Generator and Market Small Generation Aggregator*~~*Cost Recovery Market Participant* outside Queensland is zero. Using the above assumptions, the amounts payable for the ~~*Market Customers, Market Generators and Market Small Generation Aggregator*~~*Cost Recovery Market Participants* in Queensland are calculated in accordance with NER 3.15.8(g)[27] as follows:

$$CRP\text{~~MCP~~} = \frac{TSOE\text{~~GE + TSGE~~} - TCE}{RATSOE\text{~~GE + RATSG~~} - RATCE} \times \frac{RB}{\sum RB} \times CRA \times -1$$

[24] Energy values used in recovery are gross~~net~~ values ~~(imports-exports)~~(post IESS rule change). This means that consumption and generation are not netted against each other. ~~Most often energy will be positive for the generators and negative for the customers, but the opposite could occur.~~

[25] Same as previous footnote~~See footnote 17~~.

[26] Or receivable if the CRA is a negative value.~~Or receivable which would be a negative value.~~

[27] Positive CRA values are assumed when using this formula, meaning *AEMO* recovers direction compensation costs from participants. This results in negative CRP~~MCP~~ values, which are amounts participants pay to *AEMO* as part of the direction cost recovery.

- The amount payable for each ~~*Market Customer*~~*Cost Recovery Market Participant* in Queensland:

$$CRP\text{~~MCP~~}_{CRMP\text{~~MC~~}1(consumer)} = \frac{\text{~~0 +~~}0 - (-2{,}000)}{(3{,}000 + 1{,}500 + 2{,}500)\text{~~ + 10~~} - (-2{,}000 - 4{,}000)} \times \frac{1}{1} \times 20{,}000 \times -1$$
$$= -\$3{,}0775$$

$$CRP\text{~~MCP~~}_{CRMP\text{~~MC~~}2(consumer)} = \frac{0\text{~~ + 0~~} - (-4{,}000)}{(3{,}000 + 1{,}500 + 2{,}500)\text{~~ + 10~~} - (-2{,}000 - 4{,}000)} \times \frac{1}{1} \times 20{,}000 \times -1$$
$$= -\$6{,}15449$$

~~• The amount payable for each Market Generator in Queensland:~~

$$CRP\text{~~MCP~~}_{CRMP\text{~~MG~~}1(producer)} = \frac{3{,}000\text{~~ + 0~~} - 0}{(3{,}000 + 1{,}500 + 2{,}500)\text{~~ + 10~~} - (-2{,}000 - 4{,}000)} \times \frac{1}{1} \times 20{,}000 \times -1$$
$$= -\$4{,}6152$$

$$CRP\text{~~MCP~~}_{CRMP2(producer)\text{~~MG2~~}} = \frac{1{,}500\text{~~ + 0~~} - 0}{(3{,}000 + 1{,}500 + 2{,}500)\text{~~ + 10~~} - (-2{,}000 - 4{,}000)} \times \frac{1}{1} \times 20{,}000 \times -1$$
$$= -\$2{,}3086$$

$$CRP\text{~~MCP~~}_{CRMP3(producer)\text{~~MG3~~}} = \frac{2{,}500\text{~~ + 0~~} - 0}{(3{,}000 + 1{,}500 + 2{,}500)\text{~~ + 10~~} - (-2{,}000 - 4{,}000)} \times \frac{1}{1} \times 20{,}000 \times -1$$
$$= -\$3{,}8463$$

~~The amount payable for the *Market Small Generation Aggregator* in Queensland:~~

$$\text{~~}CRPMCP_{MSGA1} = \frac{0 + 10 - 0}{(3{,}000 + 1{,}500 + 2{,}500) + 10 - (-2{,}000 - 4{,}000)} \times \frac{1}{1} \times 20{,}000 \times -1 = \$15\text{~~}$$

The aggregate CRP~~MCP~~ recovered from ~~*Market Customers, Market Generators and Market Small Generation Aggregators*~~*Cost Recovery Market Participants* in Queensland make up the entire payable amount for *direction*. Note that the summed CRP is multiplied by negative 1, to return a positive CRA, which is an amount that *AEMO* recovers from participants:

$$CRA = (CRP\text{~~MCP~~}_{CRMP\text{~~MG~~}1(consumer)} + CRP_{CRMP2(consumer)}\text{~~MCP~~}_{\text{~~MG2~~}} + \text{~~MCP~~}_{\text{~~MG1~~}} + CRP_{CRMP1(producer)}\text{~~MCP~~}_{\text{~~MG2~~}} + CRP_{CRMP2(producer)}\text{~~MCP~~}_{\text{~~MG3~~}} + CRP_{CRMP3(producer)}) * -1\text{~~MCP~~}_{\text{~~MSGA1~~}}$$

$$CRA = (-\$3{,}0775 - \$6{,}15449 - \$4{,}6152 - \$2{,}3086 - \$3{,}846) * -1\text{~~3 = $15~~} = \text{~~-~~}\$20{,}000$$