METHODOLOGY FOR CALCULATING FORWARD LOOKING TRANSMISSION LOSS FACTORS

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Contents

Version Release History

VERSION	DATE	BY	CHANGES
5.0	18 September 2014	SP&C	Updates to Methodology to include changes resulting from the Draft Determination of the 2014 Rules Consultation.
4.0	29 June 2011	ESOPP	Updates to methodology for calculating dual marginal loss factors for a transmission network connection point.
3.0	1 April 2010	ESOPP	Methodology for Calculating Forward-Looking Loss Factors: Final Methodology updated to include changes resulting from the more recent Rules Consultation completed on 27 February 2009.
2.0	12 August 2003	Planning	Methodology for Calculating Forward-Looking Loss Factors: Final Methodology updated.
1.0	7 May 2003	Planning	Methodology for Calculating Forward-Looking Loss Factors: Final Methodology developed after extensive consultation was conducted during 2002 and 2003.

1 Purpose

This document specifies how AEMO calculates Forward Looking Loss Factors (FLLF), also known as Marginal Loss Factors (MLF). The National Electricity Rules (NER) require AEMO to calculate and publish MLFs annually.

2 Backgound

The NER requires AEMO to annually calculate intra-regional loss factors and inter regional loss factor equations, and publish the results by April 1. The NER requires AEMO to calculate and publish a single, volume weighted average, intra-regional MLF for each connection point[2].

In a power system electrical losses are function the load, networks and generation mix which is constantly changing. Also, a feature of electrical losses is that they increase quadratically to the electrical power transmitted (Losses $\propto$ Current^2). These variables mean that a single MLF for each connection point is necessarily an approximation.

2.1 Electrical Losses

Electrical transmission losses are a transport cost that needs to be priced and factored into electrical energy prices. MLFs s are factors that represent electrical losses (caused by the transport of electricity) between a connection point and a regional reference node (RRN). The factors are used to adjust electricity spot prices (set at the RRN) to reflect electrical losses between the RNN and a connection point.

2.2 Marginal Losses

The National Electricity Market (NEM) uses marginal costs as the basis for setting electricity prices in line with the economic principle of marginal pricing. There are three components to a marginal price in the NEM: energy, losses and congestion.

The marginal spot price for electrical energy is determined, or is set, by the incremental cost of additional generation (or demand reduction) for each spot market interval. Consistent with this, the marginal loss is the incremental increase in total losses for each incremental additional unit of electricity. The MLF of a connection point represents the marginal losses to deliver electricity to that connection point from the RRN.

3 Regulatory Requirements

Clause 3.6 of the NER requires AEMO to calculate the MLFs and inter-regional loss factor equations by 1 April each year to apply for the next financial year.
Clauses 3.6.1, 3.6.2 and 3.6.2(A) specify the requirements for calculating the MLFs and inter-regional loss factor equations, and the data used in the calculation.

The Rules require AEMO to calculate and publish a single, volume weighted average, intra-regional MLF for each connection point. The Rules also require AEMO to calculate and publish dual MLFs for connection points where one MLF does not satisfactorily represent transmission network losses for active energy generation and consumption.

[2] The Rules also require AEMO to calculate and publish dual MLFs for connection points where one MLF does not satisfactorily represent transmission network losses for active energy generation and consumption.

4 Principles used by the Methodology

The following principles were used to establish this Methodology.

- Calculate factors that are forwarding looking
- Use a full year's data (rather than a representative sample); and
- Use minimal extrapolation of historical data
- Use best approximation to Full Nodal Pricing as a guide to comparing alternative approaches
- Calculate loss factors based on marginal losses (or the derivative of losses with respect to demand) at each connection point

5 Forward-looking Loss Factor Methodology

This section sets out the Forward-Looking Loss Factor (FLLF) methodology AEMO uses to calculate MLFs. An overview of this methodology is illustrated below. The data requirements for the methodology are listed in Appendix B.

Calculate indicative extrapolated generation data

- Obtain previous year's MLF study case
- Develop approximate connection point load forecast
- Restore demand/supply balance by applying minimal extrapolation to generators
- Publish indicative extrapolated generation data

Develop network representation

- Consult with TNSPs to identify committed augmentations
- Take a load flow snapshot of the network from the EMS
- Include all registered connection points, committed augmentations and transmission networks not represented in the EMS
- Modify the load flow to be representative of a system normal configuration with a high demand

Forecast connection point loads

- Obtain list of connection point loads
- If required, provide TNSPs with historical connection point load data
- AEMO or TNSPs produce connection point load forecasts for each region
- AEMO performs due diligence on connection point load forecasts

Determine MNSP flow and new generating unit profiles

- Existing MNSP flow set to historical values and if required, adjust to account for clause 5.5.6. New MNSP flows set to zero
- Estimate the dispatch of new generating units, based on similar or existing units or via consultation with proponents

Calculate loss factors and publish results

- Determine the sent out capacities of exising generators from the ESOO and EMS
- Determine the Interconnector limits
- Restore demand/supply balance by applying minimal extrapolation to generators
- Calculate loss factors for each connection point and RRN for each trading interval
- Calculate volume-weighted intra-regional loss factors
- Determine inter-regional loss factor equations
- Publish intra-regional loss factors and inter-regional loss factor regions by 1 April

5.1 Network representation

5.1.1 Identify Future Augmentations

AEMO consults with the TNSPs to develop a list of committed transmission augmentations that are to be commissioned during the financial year for which the loss factors are to apply.

TNSPs confirm that the transmission augmentations have satisfied the commitment criterion in the current AEMO Electricity Statement of Opportunities (ESOO).

TNSPs supply AEMO with sufficient network data for the augmentation to be represented in the network model.

5.1.2 Prepare the Base Case Load Flow File

AEMO takes a single snapshot of the NEM transmission network from the AEMO Energy Management System (EMS). AEMO then modifies the snapshot to:

- include all known connection points (existing and planned);
- represent anticipated system normal operation;
- include all committed network augmentations; and
- have a voltage profile that is representative of high load conditions.

The network model will contain all registered connection points.

5.2 Connection point load data

The forecast load at a connection point is to be based on historical data from the previous financial year, and will be produced by either AEMO or the TNSP.

5.2.1 Provision of historical load data to TNSPs

AEMO provides to TNSPs, when requested, relevant historical connection point load data for the previous financial year by 15 October each year. This data may be used by the TNSP to develop connection point load forecasts for the MLF study year.

5.2.2 Forecasting connection point load

AEMO or the TNSP produces connection point load forecasts for each load connection point in its jurisdiction by 15 January each year. These forecasts are:

- based on historical connection point data (retaining the same weekends and public holidays);
- consistent with the latest annual regional load forecasts prepared by AEMO or the TNSP;
- based on 50% probability of exceedence and medium economic growth conditions, as described in the ESOO;
- to include any known new loads;
- to include existing and committed generation that is embedded in the distribution network; and
- an estimate of the real and reactive power at each connection point for each trading interval.

5.2.3 AEMO due diligence

If the TNSP provides the connection point forecasts, AEMO reviews the data supplied by the TNSPs and ensures that the:

- the aggregated connection point load annual energies (accounting for estimated transmission losses) match the current AEMO ESOO;
- the aggregated maximum demand matches the current AEMO ESOO (accounting for estimated transmission losses and generator auxiliaries); and
- the differences between the historical and forecast data for selected connection points are acceptable.

AEMO and TNSPs consult to resolve any apparent discrepancies in the connection point data.

5.3 Flows in Controllable Network Elements

Controllable network elements comprise of both MNSPs and controllable regulated network elements.

5.3.1 Controllable Network Elements with historical flow data

AEMO assumes that the flows in controllable MNSP network elements are unchanged from the historical flows. If flows in controllable MNSP network elements are likely to change in response to modified generation profiles in accordance with section 5.5.6 or 5.9, then AEMO adjusts historical flows on controllable MNSP network elements to reflect the change in generation profiles.

Where a controllable regulated network element in parallel with other regulated network elements AEMO uses a scaling factor equal to the ratio of the capabilities of the network elements, with separate ratios for positive and negative flows where the capabilities of the network elements are not symmetrical.

5.3.2 New Controllable Network Elements

AEMO assumes that the flow is not more than 1 MW for each trading interval when there are no historical flow data for a new or recently commissioned controllable network element for the whole previous year.

AEMO treats new regulated controllable network elements in parallel with other regulated network elements in the same manner as existing regulated controllable network elements in parallel with other regulated network elements.

5.4 Estimate new generator output and retired generating units

AEMO estimates the initial dispatch for a new generator from generation patterns of similar generating unit using the following steps.

5.4.1 Obtaining a list of committed new generators

AEMO calculates loss factors based on the list of committed and existing generators published in the current AEMO ESOO and until **15 January** from the AEMO Generation Information Page.

5.4.2 Estimating the dispatch

AEMO assumes the output of new committed generating units to be zero for trading intervals prior to the committed commissioning date[9] reported in the current AEMO ESOO.

9 Within this methodology the commissioning date is defined as the anticipated date of commercial service.

The process for calculating an initial estimate of the output of the committed new generators following their commissioning is:

- identify similar existing generating units in the NEM that use similar technology and fuel type, and are up to 5 years old;
- use data that is up to 10 years old for similar units where no similar existing units are available;
- find the average output of the similar generating units as a percentage of their winter rating from the current AEMO ESOO; and
- determine the output of the new generating units by scaling the average output profile by the nameplate rating of the new unit.

A new generating unit in the second year of operation will generally have an incomplete year of historical data for the previous financial year. In this case AEMO uses the methodology above to estimate the dispatch for the period prior to the historical data being available.

5.4.3 Transmission connected hydro and wind generating units

AEMO consults with the proponent of a new transmission connected hydro or wind generating unit to determine the anticipated generation profile. Where the proponent is unable to provide this profile then AEMO uses a flat generation profile equal to the product of the anticipated utilisation factor and the nameplate rating for new run of river hydro units and wind powered units. For new hydro generators with significant energy storage AEMO consults with the proponent to determine an estimated generation profile.

AEMO uses the mechanism described in Appendix A to ensure the information supplied by the proponent is reliable.

5.4.4 Previously unused technologies and fuel types

For new generators that utilise a new technology or fuel type AEMO adopts the mechanism described in Appendix A to ensure the information supplied by the proponent is reliable.

5.4.5 Retired generating units

The generating units that are retiring in the financial year in which the loss factors apply are identified in the current AEMO ESOO and AEMO Generation Information Page. Retiring plant is represented by setting their forecast MW and MVAr output to zero from the retirement date specified in the SOO and until **15 January** from the Generation Information Page.

AEMO consults with the registered owners of the retiring generating unit if the information in the SOO or Generation Information Page is insufficient to provide an exact retirement date.

5.5 Extrapolating the generation to balance supply and demand

AEMO uses the minimal extrapolation principle to balanace supply and demand. Under the minimal extrapolation approach forecast generation data is based on historical generation data. AEMO uses generation data from the previous financial year as historical generation data. AEMO then adjusts the historical generating unit data to restore the balance of supply and demand. This is subsequent to updating of the network model, scaling of the connection point loads, and including any committed new generating units.

For purposes of this methodology, the availability of a generating unit is used to denote the level to which it can be dispatched. An availability of zero means the generating unit is unavailable for dispatch. A generating unit would be considered available in a period if its declared availability in the equivalent historic period was greater than zero. AEMO obtains the availability status of each generating unit for each trading interval from market data. The availability of a generating unit is a factor that is taken into consideration in the adjustment of the supply / demand balance for those trading periods when it is necessary to increase the level of generation. This is discussed in Section 5.5.2.

5.5.1 Trading intervals of excess generation

There will be an excess of generation for each trading interval where the forecast connection point loads have grown by less than the initial forecast of the output of the new generating units[10]. For these trading intervals the net generation will need to be reduced by scaling the output of all the generators in proportion to their historical output. It is not practicable to consider the minimum dispatch levels of the units.

The output of energy limited generators, including pump operation, would not be adjusted.

The initial estimate of the output of the new generators would be scaled in the same manner as the historical output of the existing generators.

5.5.2 Trading intervals with a shortage of generation

There will be a shortage of generation for each trading interval where the connection point loads have grown by more than the initial estimate of the output of the new generating units[11]. For these trading intervals the net generation will be increased using the following priority:

- the spare capacity of non energy limited generating units that are currently running (ON) is dispatched in proportion to the spare capacity of each unit;
- the capacity of the non energy limited generating units that were not running (OFF) but available is dispatched in proportion to the capacity of each unit;
- scheduled pumps are reduced in proportion to their historical load;
- the capacity of the non energy limited generating units that were not running (OFF) and are unavailable is dispatched in proportion to the capacity of each unit;
- the spare capacity of hydro generating units is dispatched in proportion to the spare capacity of each unit; then
- VoLL generators are dispatched at the reference nodes.

The output of transmission connected wind farms would not be adjusted.

The initial estimate of the output of the new generators developed in section 5.4 would be scaled in the same manner as the historical output of the existing generators.

5.5.3 Generator capacities

The historical generation data is usually on a sent out basis, that is, the net output of the generating unit less the station auxiliary load. AEMO will estimate the sent out capacity of each unit for both summer and winter by subtracting an estimate of auxiliary load from the generator terminal capacity in the current SOO. AEMO will need to estimate the auxiliaries from the difference between the SCADA generator terminal output, as obtained from the AEMO EMS, and the settlements value for the same trading interval. In the cases where the auxiliaries are separately measured or negligible then AEMO will not need to correct the historical generation data

The maximum capacity of each of the NEM generators will be set equal to the value specified in the current AEMO ESOO and until **15 January** in the AEMO Generation Information Page. A

[10] Network augmentations also affect the supply/demand balance by altering the network losses.

[11] Network augmentations also affect the supply/demand balance by altering the network losses

separate value should be used for summer and winter, where summer would be defined as 1 December to 31 March.

5.5.3.1 Reductions in capacity

If the capacity of a generating unit is forecast to be reduced for reasons other than for maintenance, the the reduced capacity will be used. If the capacity has been restored from a reduced capacity in the prior year(s), then AEMO in consulation with the registered owner will backfill the historical profile of the generating unit to represent the restored capacity.

5.5.3.2 Reductions in capacity due to maintenance

If the capacity of a generating unit is forecast to be reduced for maintenance reasons, AEMO will ignore the capacity reduction. AEMO will consult with the registered owner to determine if the forecast capacity reduction is maintenance related.

5.5.4 Interconnector limits

The inter-regional transfers will be maintained within the summer and winter interconnector limits specified for the supply/demand balance presented in the current AEMO ESOO for the year in which the loss factors apply.

The generation in different regions may need to be adjusted to keep inter-regional flows within the respective transfer capabilities anticipated for the year in which the loss factors apply. This requirement could arise through the interaction of the interconnector limits with the patterns of load growth and new generation.

AEMO will implement representative interconnector limits for summer and winter, and peak and off peak periods. AEMO will consult with the TNSPs when developing these representative limits. These limits will be consistent with the limits described in the current AEMO ESOO.

5.5.5 Treatment of generators and load that can switch between connection points

A generator or load may be switchable between two (or more) physical connection points. An example is Yallourn unit 1 that can either be connected to the Victorian 500 kV or 220 kV networks. Generally, the load or generator metering data can be separated into the data for each of the physical connection points. Separate loss factors are calculated for the physical connection points and these loss factors are later volume weighted to give a single loss factor for the unit.

Under the principle of minimum extrapolation, AEMO will assume that for the trading intervals where the unit is ON the connection point is unchanged from the state in the historical generator data. Further, when the unit is OFF but is required to be dispatched then AEMO will assume that the connection point state has not changed since the last known state.

However, the operator of a switchable load or generating unit may consider that in the year the loss factors apply the switching pattern of their unit will differ significantly from the historical switching pattern. If the operator expects that the unit generator switching differs by more than five days in aggregate then the associated TNSP would, in consultation with the operator of the unit, prepare the switching profile that is anticipated for the year in which the loss factors will apply.

5.5.6 Accounting for abnormal conditions affecting NEM generation patterns

Where a Generator believes its historical generation profiles are not an accurate predictor of future generation profiles, it may provide to AEMO by 15 November, an adjusted generation profile. AEMO will then review the adjusted generation profile, and consider whether to use the adjusted generation profile in lieu of the historical generation profile provided:

- Requests for generation profile revision come from the owner or operator of a generating unit or generating system;
- Historical generation profiles must be shown to be obviously not representative of the expected generation profile in the next year;
- Revised generation profiles are independently verifiable and are based on physical circumstances only, such as:
  - drought conditions;
  - low storage levels or rainfall variability for hydroelectric generators;
  - major plant failures resulting in forced outages of greater than four weeks;
  - failure in the supply chain impacting on fuel availability;
- Revised generation profiles are not market-related or arise as a result of the financial positions of Generators; and
- Adjusted generation profiles are not be confidential, as AEMO will publish them along with its reasoning for using an adjusted generation profile as part of the report accompanying the issue of the MLFs.

AEMO may seek an independent review of any adjusted generation profile submitted by a Generator.

If AEMO accepts an adjusted generation profile, then this information will be published on 1 April. The information will be aggregated quarterly on a regional or sub-regional level. AEMO will also historically review how adjusted generation profiles compared with actual generation profiles and publish information summaried as above.

AEMO will calculate and publish indicative extrapolated generation data in October to assist market participants to identify grossly incorrect historical generation data. The calculation will be approximate and will

- only reflect information known at the time
- only include exisiting and major new connection points
- only include an approximate load forecast
- be based on the previous year's network model, and will not include new augmentations

5.6 Calculating the intra-regional static loss factors

AEMO will use TPRICE[12] or an equivalent to calculate loss factors. The TPRICE algorithm can be summarised as:

- a load flow is solved for each trading interval using the supplied generation and load data;
- the marginal loss factors defined with respect to the load flow swing bus (usually Murray power station)[13] are calculated for each connection point and trading interval from the Jacobian matrix;

12 The TPrice application calculates the loss factor for each connection point and regional reference node (RRN) referred to the load flow swing bus defined in the network model. The loss factor of connection point A referred to connection point B is defined as the ratio of their respective loss factors with respect to the swing bus.

13 The selection of swing bus does not directly affect the marginal loss factors with respect to the assigned regional reference node. There is a small effect on the flows in the network flows from changing the swing bus and this has a small indirect affect on the loss factors.

- the marginal loss factors defined with respect to the associated regional reference node (RRN) are calculated for each trading interval as the ratio of the connection point loss factor to the associated RRN loss factor; and
- for each connection point, the marginal loss factors (with respect to the RRN) for each trading interval are volume weighted by connection point MLFs (with respect to the RRN) to give the static MLF.

AEMO may include a number of voltage control buses to improve the stability of the load flow solution. The use of voltage controlled buses would be limited and would mainly be located on the backbone of the main high voltage network.

5.6.1 Calculating dual intra-regional static loss factors for a transmission network connection point

AEMO will calculate dual MLFs for transmission network connection points where a single MLF for the transmission network connection point does not satisfactorily represent transmission network losses for active energy generation and consumption. AEMO will:

(i) Apply two MLFs to all transmission network connection points classified as Pump Storage Schemes; and

(ii) For all other transmission network connection points, apply two MLFs if the net energy balance (NEB) is less than 30%

The NEB threshold test is applied as follows:

Determined the percentage NEB by expressing the net energy at a transmission connection point as a percentage of the total energy generated or consumed at a transmission connection point, whichever is greater.

For example:

Energy generated = 10 GWh
Energy consumed = - 3 GWh

Therefore, % NEB threshold is

= (absolute value of the sum of energy generated and energy consumed) / (greater of the absolute value of energy generated or energy consumed)

= (10-3)/10 = 70%

5.7 Determining the inter-regional loss factor equations

5.7.1 Regression procedure

The inter-regional marginal loss factor equations will be determined using linear regression analysis. The procedure is as follows:

- the marginal loss factors for each of the RRNs, defined with respect to the swing bus will be extracted from the output of the TPRICE run used to calculate the intra-regional loss factors.
- for each pair of adjacent RRNs:
- the inter-regional marginal loss factors are calculated for each trading interval as the ratio of marginal loss factors of the associated RRNs; and

- the inter-regional loss factor equations are estimated by regressing the inter-regional marginal loss factors against the associated interconnector flow and selected regional demands.

The regional demands will be included in the inter-regional loss factor equations if they significantly improve the fit of the regression equation.

Where the fit of an inter-regional loss factor regression is poor then AEMO will consider using additional variables in the regression analysis, including:

- the output of specific generating units that affect the inter-regional losses (for example losses on QNI would be affected to some degree by generation at Millmerran); and
- transfers on other interconnectors.

Including these variables would require alterations to the AEMO market systems.

5.7.2 Inter-regional loss factors in the presence of loop flows

At present the regional model of the NEM is linear as the interconnectors between the regions do not form loops. Loop flows may be introduced in the future if additional interconnectors are built between regions that are not currently interconnected or the region model is modified.

If loops are introduced into the NEM regional model then the forward-looking loss factor methodology may need to be revised.

5.7.3 Modelled generator and load data

Where the range of interconnector flows is less than approximately 75 % of the technically available range of the interconnector flows or where the regression fit is considered to be poor then the load and generator data would be scaled power system modelling and in a power simulation tool to produce a set of randomly distributed flows covering the technically available range of the interconnector flows. The regression analysis repeated using the modelled data obtained from these flows.

The modelled generator and load data would not be used for calculating intra-regional loss factors.

5.8 Connection points defined after the loss factors are published

AEMO calculates loss factors for each connection point and loss factor equations for each interconnector and publishes the loss factors by 1 April prior to the financial year for which the loss factors are to apply. It is only possible for AEMO to calculate loss factors for connection points and interconnectors that are known to AEMO.

If a loss factor or a loss factor equation is required after AEMO has calculated and published the loss factors then a separate calculation is required. The proposed procedure for calculating such a connection point is discussed in the following sections.

5.8.1 Network representation

The network representation used to calculate the loss factors for the new connection point should be based on the network used to perform the most recent annual loss factor calculation.

The network representation will be modified to incorporate the new connection point. This may include addition of new or changed transmission elements or modifications to existing connection points.

5.8.2 Determine connection point data

The connection point load and generator data used to calculate the loss factors for the new connection point should be based on the connection point data used to perform the most recent annual loss factor calculation.

If the new connection point is a load then the relevant TNSP will need to supply AEMO with the load data for each trading interval following the commissioning of the connection point. If the new connection point is a generator then AEMO will determine an estimate of the dispatch for the new generator using the procedure in section 5.4.

5.8.3 Methodology

The procedure in section 5.5 will be applied to restore the supply/demand balance by making adjustments to the output of generating units. This would be the same procedure used by AEMO to perform the most recent annual loss factor calculation. The intra-regional loss factor for the new connection point would be calculated using the procedure in section 5.6.

When AEMO calculates the loss factor for a new connection point loss factor values for existing connection points in the vicinity may also be affected. However, when a new connection point is defined after the loss factors have been published then AEMO will not revise the published loss factors for the existing connection points.

5.8.4 Time requirements

Clause 3.6.2(l)(2) requires AEMO to use reasonable endeavours to determine and publish the intra-regional loss factor at least 45 business days prior to the commencement of operation of the established connection point.

For a new load connection point the relevant Code Participant needs to inform AEMO and the relevant TNSP that a new connection point is being established and a loss factor is required. The TNSP will require up to 45 business days to estimate the connection point load data. AEMO will require up to a further 30 business days to calculate and publish the loss factor.

For a new generator AEMO will require up to 40 business days to calculate and publish the loss factor.

The times in this section are estimates only. AEMO and the TNSPs will use reasonable endeavours to expeditiously perform the necessary calculation but the process relies on the relevant Code Participants supplying the necessary information promptly.

5.9 Unexpected and unusual system conditions

When developing this methodology, AEMO has used its best endeavours to cover all expected operating and system conditions that could arise when producing the load, generator and network dataset that represents the financial year in which the loss factors apply.

However, in practice some unexpected operating or system condition may arise that is not explicitly covered in the methodology. If this arises then AEMO will make a judgement based on the principles listed in the Code and in section 5. All such judgements that AEMO is required to make while developing the loss factors in a given year will be identified in thepublished report listing the loss factors.

Appendix A: Forecasting the Generating Data for New Units Based on Information from the Proponents

This appendix describes the process where proponents of a new generating unit provide to AEMO the information necessary to determine the forecast generating data. The process ensures that proponents provide realistic information to AEMO. The process is:

- Each new generator is assumed to operate continuously at full load from its installation date, subject to AEMO receiving credible advice from the operator of reductions due to:
  - forced outages
  - planned outages
  - an energy limit
  - an intent to operate only when the relevant regional reference node price exceeds a stated value, or
  - generation being determined by factors outside the control of the participant such as the seasonal nature of the fuel source.
- No other grounds shall be accepted, and these restrictions shall be accepted only if AEMO, acting reasonably, accepts them as valid.
- Any specified reductions due to forced outage shall be incorporated as a uniform reduction in availability.
- Any specified reduction due to planned outage will be applied during periods specified by the participant.
- Any specified energy limit shall be applied by distributing generation from the highest price settlement period from the previous financial year to lower-priced periods until the specified energy is exhausted.
- Where an intent to operate only above a specified price is applied then the generation profile will comprise full-load when the corresponding historical price exceeded the specified value, and zero at other times.
- Where an external factor is limiting production, then the generation profile shall be as specified by the generator, provided this is accepted as reasonable by AEMO.

Appendix B: Data Required by AEMO

The following table summarises the data necessary for AEMO to implement the forward-looking loss factor methodology. The table includes a description and the source of each item of data.

Data	Description	Source
Existing Load Connection Points		
Connection point load	MW & MVAr by trading interval	AEMO or relevant TNSP (AEMO will estimate the data if it is not supplied)
New Load Connection Points		
Estimated commissioning date	Date of commercial operation	ESOO, confirmed with proponent
Connection point load	MW & MVAr by trading interval	AEMO or relevant TNSP
Existing generating units		
Generator terminal capacity for summer and winter	Summer and winter MW values	ESOO
Auxiliary requirements for summer and winter	Summer and winter MW values	AEMO estimate with consultation with the registered owner
Historical generation profile	MW by trading interval	AEMO settlements data
Availability status by trading interval	Status by trading interval	AEMO market systems
New generating units		
Estimated commissioning date	Date of commercial operation	ESOO, confirmed with the registered owner
Nameplate rating	MW	ESOO, confirmed with the registered owner
Similar units	List of generating units	AEMO discussions with the registered owner
Generation profile of similar units	MW by trading interval	AEMO settlements data
Existing MNSP		
Historical energy transfer profile	MW by trading interval	AEMO settlements data
New MNSP		
Estimated commissioning date	Date of commercial operation	ESOO, confirmed with proponent
Interconnector Capability		
Capacity in each	MW by trading interval	ESOO, in consultation with the TNSPs

Data	Description	Source
Existing transmission network		
Network data and configuration	Load flow, representative of system normal	AEMO EMS and operating procedures
Transmission network augmentations		
List of network augmentations	List of augmentations	AEMO ESOO, in consultation with the TNSPs
Estimated commissioning date	Date of commercial operation	AEMO ESOO, in consultation with the relevant TNSP
Network element impedances	Network element impedances	Relevant TNSPs