MLF methodology review 2020

Workshop 3 – 26 June 2020

Agenda

No	TIME	AGENDA ITEM	PRESENTER
1	1:00pm – 1:20pm	Welcome and introduction • Recap from previous workshops • Outstanding actions	Chris Muffett
2	1:20pm – 3:00pm	Issue discussion • Supply demand balance • Intra-regional static loss factors • Inter-regional loss factor equations • Publication • Scenario sensitivity study	Daniel Flynn & Samira Horoufi
3	3:00pm	Closing summary	Chris Muffett

Welcome and introduction

Chris Muffett

Recap from previous workshop

- Purpose of the review is to consider improvements to the Forward Looking Loss Factor (FLLF) methodology
  - Review will be conducted throughout 2020, with the aim to publish a final determination in November 2020
  - Changes to incorporated into the MLF determination for 2021-22
- Workshop 1 on 5 June – about 35 organisations represented
  - 4 actions identified
  - Slides and meeting notes are available on website
- Workshop 2 on 18 June – about 30 organisations represented
  - 6 actions identified
  - Slides and meeting notes distributed by email, and will be uploaded to website shortly

Outstanding actions

#	Action
1	AEMO to provide feedback on the release of additional confidential information
2	AEMO to arrange a separate session with interested stakeholders on voltage control.
3	AEMO to clarify arrangements for connection points close to interconnectors.
4	AEMO to consider if inter-regional equations are fit for purpose as part of considering looped regions.
5	AEMO to investigate on an appropriate method to model hydro generation output as their output differs from the reference year.
6	AEMO to investigate the modelling of intra-year interconnector capacity upgrades in relation to timing, eg. QNI
7	AEMO to analyse the degree of variation between more recent meter data obtained just after preliminary settlement period versus older data. This will facilitate in deciding the possibility of using more recent meter data.
8	AEMO will investigate and provide the pros and cons of each of the 3 methods proposed to incorporate DC interconnectors that are not in parallel to an AC interconnector.
9	AEMO to clarify the approach on network ratings currently modelled
10	AEMO to discuss the modelling of system strength and other network limits.

Issue discussion

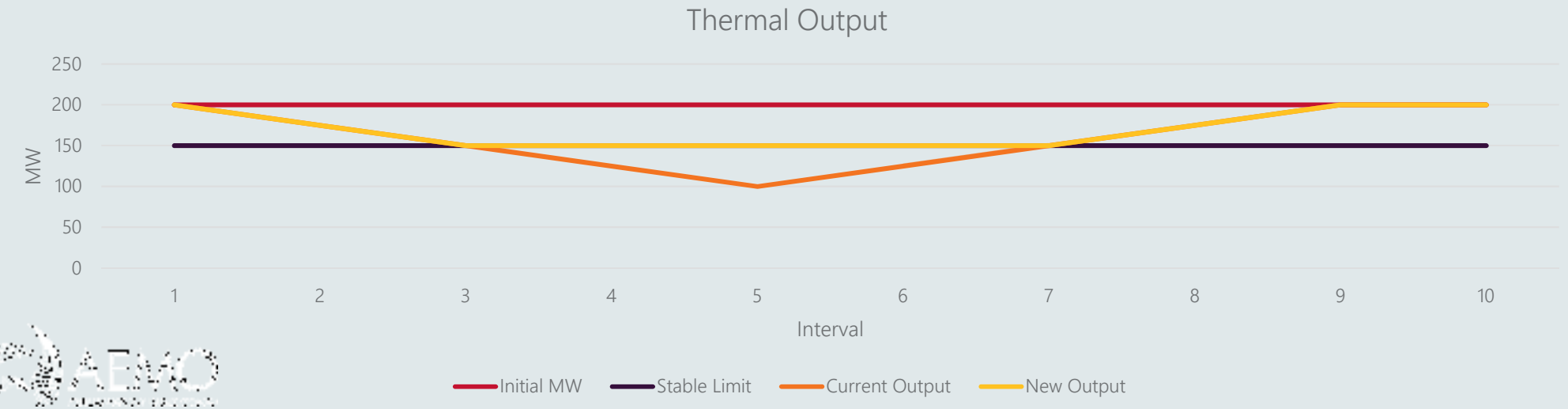
Daniel Flynn & Samira Horoufi

Methodology review:
5.5 Supply Demand Balance

Re-Cap: Stable operation of thermal plant

As covered in workshop 2 thermal plant has physical limits on the range within which they can be dispatched once operational and above their minimum generation level, the current MLF methodology does not consider this limitation.

- When generation growth significantly exceeds any potential increase in demand, some thermal generators may be set to levels by the MLF engine below their stable operation limit
- An option being considered is to split the capacity into two levels of 'firmness', to limit the engines capability to manage the output of these units below their identified stable operational levels
- Need to consider the source of data for stable operational levels, and would be applied only as necessary



Methodology review:
5.5 Supply Demand Balance

Re-Cap: Minimal Extrapolation Theory

As covered in workshop 2 the current minimal extrapolation theory is limited in nature.

- Simple process for increasing generation
- Extremely simple process for decreasing generation

While this may have been appropriate historically, it is too simplistic to be a reasonable depiction of reality given the current technology mix within the NEM.

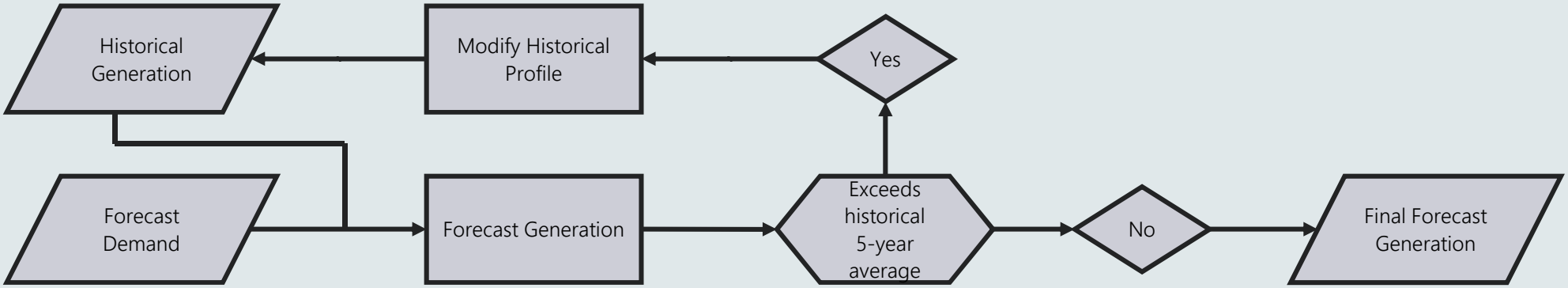
Any solution may be difficult to implement for the 2021-22 FY, as it will either require an entirely new engine for MLF calculations or the creation a separate engine to handle the balancing of supply and demand. It is however an issue the AEMO is actively investigating and any feedback is appreciated.

Methodology review:
5.5 Supply Demand Balance

Issue: Extrapolation Capping

In scenarios where demand is set to exceed any increase in generation capacity (demand exceeds generation) for the target year, the extrapolated generation is subject to a capping process.

The high level capping process is shown in the flowchart below,



While this change was incorporated to manage the impact of large generators exiting the market, it is potentially problematic in relation to the outcome not being an accurate reflection of the actual outcome which is likely to involve additional generators return to service or operational generators operate on a more frequent basis.

Methodology review:
5.5 Supply Demand Balance

Key Considerations: Extrapolation Capping

Requirement: Methodology change

1. Instate process for revising state of generators in lieu or addition to capping process

    - Define process for revising the volume of generation classified as unavailable and/or offline to available and/or online allowing them to provide additional generation than was available/online in reference year (after backfilling and MTPASA adjustments).

        - Pros: Likely to be a more reasonable approximation of actual response to exit of large generator from the market
        - Cons: Significant volume of work, may require an increase in assumptions

2. Retain existing capping requirement

    - Maintain capping process as is.

        - Pros: Established process
        - Cons: May not accurately represent response to exit of large generator from the market

Methodology review:
5.5 Supply-demand balance

Issue: Parallel AC/DC Interconnectors

The current MLF process prescribes that where an AC interconnector is parallel to a DC interconnector that the DC interconnector flows are designated by the flow on the AC counterpart and the ratio of the capacities.

In reality, DC interconnectors do not operate in this manner and as a result the current process can result in sub-optimal outcomes.

Key Considerations: Parallel AC/DC Interconnectors

Requirement: Methodology change

1. Utilise ratios based on historical flows rather than capacities

    - Obtain ratios based on flows during reference year
    - Split ratios into seasonal ratios to better reflect reality
    - Consider allowing reverse flows

Season	TOD	Direction	Ratio
Summer	Peak	Reverse	
		Forward	
	Off Peak	Reverse	
		Forward	
Winter	Peak	Reverse	
		Forward	
	Off Peak	Reverse	
		Forward	

Methodology review:
5.5 Supply Demand Balance

Issue: Intra – regional constraints

Increasingly, we are seeing high impact intra-regional constraints in areas within the NEM with large levels of new generation under system normal conditions (no outages).

These constraints,

- May restrict the output of impacted generators
- If not identified and modelled in initial MLF study, potentially lead to unrealistic MLF outcomes for both directly impacted and nearby generators

Currently, the methodology contains no reference to the treatment of intra-regional constraints under system normal conditions.

A current example of a system normal high impact intra-regional constraint,

- Line 63 – Voltage Collapse Limit (N^^N_NIL_2)
  - Expected to impact the output of generation within the south west of NSW as projects come online
  - The constraint is applied under system normal conditions (no network outage)

Methodology review:
5.5 Supply Demand Balance

Key Considerations: Intra – regional constraints

Requirement: Methodology change and guideline update

The AEMO has incorporated system normal intra-regional constraints into recent MLF studies (2019-20 and 2020-21) such as the line 63 voltage collapse limit mentioned in the previous slide. However there is no requirement, or coverage of the process utilised within the current methodology.

1. Implement clause into methodology to cover the treatment of non-thermal system normal intra-regional constraints

- Define how system normal intra-regional constraints are identified for inclusion in MLF studies
- Define how system normal intra-regional constraints are presented in final report
- Publish information on process/es for implementing non-thermal system normal intra-regional constraints

Methodology review:
5.6 Intra-regional Static Loss Factors

Issue: MLFs in close proximity to borders and ICs

Loads and generators in remote, electrically weak sections of the network in close proximity to interconnectors can have large year on year variations to MLFs as a result of significant changes in interconnector flows.

If a generator or load is located in close proximity to an interconnector that,

- Has increased exports (including decreased imports)
  - There will be an increase in flows from the RRN
  - There will be downward pressure on MLFs
- Has increased imports (including decreased exports)
  - There will be an increase in flows to the RRN
  - There will be upward pressure on MLFs

The significant year on year volatility and the resultant financial uncertainty that this results in has been identified as a material concern for both loads and generators.

Methodology review:
5.6 Intra-regional Static Loss Factors

Key Considerations: MLFs in close proximity to borders and ICs

Requirement: Methodology Change / Rule Change

The AEMO has not identified any potential resolutions to this issue that are viable within the current framework, however is open to stakeholder commentary on the issue.

If stakeholders have suggestions, proposals or comments they may submit these at a later date via the formal consultation process or through direct contact with the System Commercial team at the following email address,

MLF_feedback@aemo.com.au

Methodology review:
5.6 Intra-regional Static Loss Factors

Issue: AC load flow

The current MLF calculation engines utilise AC power flow to ascertain the base case for each half hour of the financial year, then utilises an AC sensitivity matrix (aka Newton-Raphson jacobian matrix) to calculate the MLFs for each half hour.

In relation to power flow the MLF methodology,

- Defines the process for managing active power
- Does not define (in detail) the process for managing reactive power, which is handled by the MLF engine

While utilisation of an AC load flow in itself is not problematic, there is alternative options which are utilised in other markets around the world.

In addition the AEMO has observed that locally some planning studies and some MLF related consultants utilise decoupled load flow (ignoring reactive power) to calculate MLFs (aka DC Load Flow MLFs).

Decoupled load flows provide less precise MLFs (ignores reactive power flows) however the process is significantly more simple to replicate without a requirement for a complex load flow engine to obtain results.

Methodology review:
5.6 Intra-regional Static Loss Factors

Key Considerations: AC load flow

Requirement: Methodology change / Engine change

1. Move to a DC load flow model for calculation of MLFs

   - Can be expressed as a simple set of instructions and equations
   - Would allow for external stakeholders to more closely replicate the AEMO results
   - Would allow for external stakeholders to more confidently perform MLF studies of their own
   - Would require less resourcing allowing staff to work on additional high priority issues
   - Increased viability for incorporating solutions for complex problems such as looped regions and intra-regional constraints.
   - Would bring the MLF process into closer alignment with NEMDE

As the intention of this review is to identify changes that can be implemented for the 2021-22 MLFs, a change of engine is not anticipated to result from this review.

However the AEMO is working on investigating alternative engine options including DC load flow and AC load flow alternatives to TPrice (current MLF engine).

Methodology review:
5.7 Inter-regional loss factor equations

Issue: Looped regions

With the potential options for EnergyConnect, it is likely that the NEM will have its first AC loop between regions (VIC-NSW-SA). Currently, all AC interconnectors within the NEM are radial.

It is expected that the introduction of looped regions will be problematic for both the current MLF engine and the current inter-regional loss factor theory.

Key Considerations: Looped regions

A team within the AEMO is currently working on potential issues that may arise from the introduction of looped regions, and the impact on the current inter-regional loss factor equations.

If you have any comments, suggestions or proposals relating to the impact of looped regions please contact the System Commercial team at the following email address,

MLF_feedback@aemo.com.au

Methodology review:
5.8 Publication

Issue: Transparency of MLFs

Concerns around transparency of MLFs, in particular large year on year step changes and difficulty replicating results externally. Previously, the first indication of MLFs for a target year was in the draft report which is published a month prior to the final MLFs.

This resulted in stakeholders having a very short window to consider the potential impact prior to the final results being published, and a short time between initial draft publication and implementation.

Key Considerations: Transparency of MLFs

Requirement: Publication Change

The AEMO is intending to publish additional reports on annual basis to provide additional information on MLFs including the following publications,

1. Scenario Sensitivity Study
    - Contains results for several different studies where consideration has been made for various generation and load outcomes
2. Preliminary Report
    - Initial indication of MLFs to apply for following financial year

Methodology review:
5.8 Publication

Scenario Sensitivity Study - Scenarios

The scenario sensitivity study intends to assess the sensitivity of MLFs to a variety of scenarios.

The scenario sensitivity study results are not intended to be indicative of future MLFs, however may indicate not only the sensitivity of MLFs in certain areas but also the impact of certain scenarios.

The scenarios being considered for the 2020 scenario sensitivity study are,

Scenario #	Description
Scenario 1	Base Generation
Scenario 2	Expected Generation
Scenario 3	High Generation Growth
Scenario 4	Expected Demand
Scenario 5	Expected Demand and Generation

Methodology review:
5.8 Publication

Scenario Sensitivity Study – Input Data

The scenario sensitivity study will utilise the 2020-21 MLF base study as a foundation. For each scenario, certain inputs into the study will be revised to reflect the conditions of the scenario.

The scenarios, and their associated inputs can be seen in the table below. Note that other than generation and load no other adjustments are anticipated (network model may be altered to incorporate the addition of new generation).

Scenario #	Generation	Demand
Scenario 1	20-21 generators and 21-22 registered generators	20-21 input data
Scenario 2	21 -22 Committed and Committed * (Any registered significant generators)	20-21 input data
Scenario 3	Any projects with expected commencement date for 21-22	20-21 input data
Scenario 4	20-21 generators	Demand reduction due to COVID19 (% regional factor excluding large industrial load)
Scenario 5	21 -22 Committed and Committed * (Any registered significant generators)	Demand reduction due to COVID19 (% regional factor excluding large industrial load)

Methodology review:
5.8 Publication

Scenario Sensitivity Study – Results

The AEMO has identified the following options for presenting the results,

- TNI level
  - MLFs will only be published for existing generators and loads
- Subregional level
  - MLFs published will include impact of new and existing generators and loads (aggregated)

Sub-Region	Results				
	Type	Load	Solar Gen	Wind Gen	Other Gen
NQ	GWh				
	Volume weighted MLF				
CQ	GWh				
	Volume weighted MLF				
SWQ	GWh				
	Volume weighted MLF				
SEQ	GWh				
	Volume weighted MLF				

Methodology review:
5.8 Publication

Issue: Intra-year revisions

Under the NER, the AEMO has the ability to revise MLFs intra-year where a material change in capacity at a transmission network connection point has been identified that was not captured in the initial MLF study for the target year.

- There has historically been some confusion and concern when intra-year MLF revisions have occurred.
- While intra-year revisions are allowed for in the rules, there is no coverage in methodology.

Key Considerations: Intra-year revisions

Requirement: Methodology Change / Publication change / Stakeholder engagement process change

1. Improve transparency around intra-year revisions

- Introduce references in methodology relating to intra-year revisions.
- Instate a prescribed timeline for quarterly revisions to the published MLFs to represent any changes that have occurred intra-year.
- Instate a process to ensure that where generators are impacted by an intra-year revision to MLFs they are notified of this change.
- Publishing live reports of MLFs via NEMWeb, which will be accessible at the following link.

http://www.nemweb.com.au/Reports/Current/Marginal_Loss_Factors/

Methodology review:
5.8 Publication

Issue: Energy generation forecast study (Previously referred to as indicative extrapolation study)

On an annual basis, the AEMO publishes indicative extrapolation results. These results allow generators to review their forecast GWh levels for the target year, and for them to provide feedback to the AEMO where they believe there is a material and physical reason the values presented are not appropriate for use.

Currently, the process only includes thermal and hydro generation and no results are published for wind or solar generation.

Key Considerations: Energy generation forecast study (Previously referred to as indicative extrapolation study)

Requirement: Methodology change / Publication Change

1. In addition to the results currently published, publish forecast GWh for both solar and wind generation

    - Add the ability for solar and wind generators to provide feedback on their forecasts
    - Where a material and physical reason is provided that indicates the forecast is not appropriate, change to be considered

2. Continue to publish as per existing methodology

Methodology review:
5.9 Unexpected and unusual system conditions

Issue: Treatment of problematic historical data

COVID-19 has had a material impact on both the magnitude and diurnal profile of demand over the last several months.

- Morning and evening peaks have shifted toward the middle of the day and there has been a material reduction in demand during daytime (overnight impact minimal)
- Reference year data (2019-20) for 2021-22 MLF study will be reflective of lockdown conditions, while sustained reductions in load long term are likely the impact of lockdowns is not expected to be reflective of conditions in the 2021-22 financial year

Key Considerations: Treatment of problematic historical data

Requirement: Methodology Change

Section 5.9 of the methodology allows the AEMO to utilise its own judgement on issues that are not defined within the methodology, in such cases the AEMO must base any judgement on the principles of the NER and section 5 of the methodology.

This clause should be utilised on an infrequent basis, and where it is or may be utilised frequently for a specific issue consideration should be made to incorporate that issue within the methodology reducing reliance on a clause that is subjective in nature.

1. Introduce a clause to the methodology to prescribe a process for managing problematic historical data

- Consider substituting problematic historical data with more suitable historical data
- Consider reducing the scope of the MLF study, to exclude periods with problematic data

Closing summary

Chris Muffett

Next steps

- Upcoming activities:
  - Discussion on voltage control
  - 1-on-1 discussions
  - Potential for a 4th workshop
  - Issues paper
- Information from previous forums and all workshops available at: https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem/market-operations/loss-factors-and-regional-boundaries/review-of-marginal-loss-factor-calculation-processes
- Any feedback or questions should be directed to: mlf_feedback@aemo.com.au

- Thank you all for your participation


AEMO
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