

# 2015 PLANNING STUDIES: RESPONSE TO NTNDP CONSULTATION

Published: **November 2015**





## CONTENTS

1.	INTRODUCTION	3
2.	CHANGES TO INPUT ASSUMPTIONS	3
3.	STAKEHOLDER FEEDBACK AND AEMO RESPONSE	4



## 1. INTRODUCTION

This document provides AEMO's responses to stakeholder submissions for the 2015 Planning Studies Consultation.<sup>1</sup>

In line with clause 5.20.2 (c) (1) of the National Electricity Rules (NER), the National Transmission Network Development Plan (NTNDP) must consider "efficient development of the national transmission grid". In considering this, AEMO's long-term model has maximised efficiency in generation and transmission investment and dispatch by assuming least-cost modelling.

The Consultation for the 2015 National Transmission Network Development Plan (NTNDP) accorded with clause 5.20.1 of the NER. It included the relevant scenarios and sensitivities to consider, inputs and approach, and material issues involved in preparing the 2015 NTNDP. In particular, AEMO consulted on initiatives to improve the methodology for modelling renewable generation and plant retirements. Consultation topics included:

- Using the required least-cost model, how can AEMO best model renewable generation expansion, considering the Large-scale Renewable Energy Target (LRET)?
- Should AEMO consider using a profitability model for long-term generation expansion?
- What timeframe would you suggest for applying the profitability model?
- Should any other material issues or topics be considered for the NTNDP?
- Are there additional sensitivities that can be considered in AEMO's assumptions for the 2015 NTNDP studies?

The Planning Studies Consultation, which closed on 27 March 2015, received one formal submission from TransGrid. AEMO also collected feedback from informal discussions with renewable energy proponents on costs/availability of wind, large-scale photovoltaics and biomass generation.

AEMO's response to the 2015 Planning Studies Consultation comprises of:

- Updated input data files and assumption documents based on changes identified in section 2, available on AEMO's website 'Planning Assumptions'<sup>2</sup>.
- Clarifications and responses to specific technical questions.

## 2. CHANGES TO INPUT ASSUMPTIONS

The 2015 NTNDP has used input assumptions broadly aligned with those published as part of the 2015 Planning Studies Consultation. Some changes have been made throughout the year to include more up-to-date data, incorporate feedback from informal discussions with renewable energy proponents, and reflect the revised LRET.

In particular, since publication of the 2015 Planning Studies Consultation, the following changes to NTNDP scenarios have occurred. They include:

- Using the 2015 National Electricity Forecast Report (NEFR)<sup>3</sup> forecasts with modifications based on the 2015 NEFR emerging technologies supplementary paper<sup>4</sup>.

<sup>1</sup> AEMO. Available: <http://www.aemo.com.au/Consultations/National-Electricity-Market/~media/Files/Electricity/Consultations/2015/2015%20Planning%20Studies%20Consultation.ashx>

<sup>2</sup> AEMO. Available: <http://www.aemo.com.au/Electricity/Planning/Related-Information/Planning-Assumptions>

<sup>3</sup> AEMO. Available: <http://www.aemo.com.au/Electricity/Planning/Forecasting/~media/Files/Electricity/Planning/Reports/NEFR/2015/Detailed%20summary%20of%202015%20electricity%20forecasts.ashx>

<sup>4</sup> AEMO. Available: <http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report/NEFR-Supplementary-Information>



- Using amending legislation to implement the reduced renewable energy target of 33,000 GWh. GreenPower scheme<sup>5</sup> and ACT 90% renewable target<sup>6</sup> were also applied to adjust the LRET target.
- Natural gas fuel cost projections, reviewed by Core Energy.
- Large-scale solar capital cost assumptions based on Bloomberg New Energy Finance are used in sensitivity modelling.
- Extended lead times for new renewable generation. Publically announced wind farms are allowed to be built as early as 1 July 2017, but more generic new generation projects have three year lead times.
- Biomass is limited at 250 MW in total to reflect fuel limitations.

The Planning Assumptions website<sup>7</sup> is updated to provide transparency in NTNDP inputs, including:

- 2015 PLEXOS long-term planning model and traces.
- 2015 demand trace development.
- Modelling data.
- National Electricity Forecast Report.
- 2014 Fuel and Technology Cost Review.
- Natural gas fuel cost projections.
- Large-scale solar capital cost assumptions used in sensitivity modelling.

### 3. STAKEHOLDER FEEDBACK AND AEMO RESPONSE

AEMO received one formal submission from TransGrid. The issues raised by TransGrid, and AEMO's responses, are summarised below.

#### Issue 1

TransGrid welcomes AEMO's high level assessment of the impact of generation and inter-regional power transfers. However, it considers that the assessment of new transmission connections or asset condition driven needs within the regional networks is unlikely to add any incremental economic value to market participants.

#### AEMO's Response

AEMO considers it important to model and assess the adequacy of the transmission network more broadly, rather than focusing only on inter-connectors, to gain insights into future network limitations under various scenarios.

As a result, the NTNDP's network modelling includes the entire interconnected transmission network, although it does not exhaustively consider its adequacy to meet localised demand.

<sup>5</sup> GreenPower Accredited Renewable Energy. Available: <http://www.greenpower.gov.au/Business-Centre/Quarterly-Reports/>

<sup>6</sup> ACT Government. Available: [http://www.environment.act.gov.au/\\_data/assets/pdf\\_file/0006/581136/AP2\\_Sept12\\_PRINT\\_NO\\_CROPS\\_SML.pdf](http://www.environment.act.gov.au/_data/assets/pdf_file/0006/581136/AP2_Sept12_PRINT_NO_CROPS_SML.pdf)

<sup>7</sup> AEMO. Available: <http://www.aemo.com.au/Electricity/Planning/Related-Information/Planning-Assumptions>



## Issue 2

TransGrid suggests that the least-cost model should use historical bids obtained through back-casting (where simulation results using the bid data closely match those of historical outcomes) as opposed to Short Run Marginal Cost (SRMC) bids. Historical bids will more closely reflect actual market conditions and address difficulties with modelling renewable generation investment signals.

### AEMO’s Response

Under clause 5.20.2 (c) (1) of the Rules, the NTNDP must consider the “efficient development of the national transmission grid”. In considering this development, AEMO’s long- term model has maximised efficiency in generation and transmission investment and dispatch by assuming least-cost modelling.

There are at least three alternative bidding approaches that may be considered in the context of generation expansion planning. In considering the “efficient development of the national transmission grid”, AEMO currently assumes SRMC bidding to determine a least-cost generation and transmission development plan. Alternatives include market-driven approaches, using historical bidding or strategic bidding determined from game-theoretic models such as Nash-Cournot.

All approaches have strengths and weaknesses:

- The Nash-Cournot is computationally intensive, but provides a reasonable representation of generator profitability in the future.
- SRMC yields an efficient development plan, but under-estimates electricity market revenue for renewable generators. This can impact on the level of renewable generation built in the model, given the maximum revenue available from large-scale generation certificates (LGCs).
- Historical bidding is an attractive proposition as it comes with an expectation of reliable, market-driven spot prices, but is not well suited to modelling a long-term horizon, considering significant changes to the operating system, such as growth in distributed generation sources and consolidation of ownership of large-scale generation.

A comparative analysis of the three bidding techniques is provided in the table below.

Performance criteria	SRMC bidding	Historical bidding	Strategic bidding (Nash-Cournot)
Computational time and preparation	Fast: computationally efficient, supporting a wide range of analysis for each scenario.	Slow: long preparation time limits analysis for each scenario.	Slow: Computationally intensive, and requires tuning. Limits analysis for each scenario.
Ability to capture generator profitability	Simulates perfect competition. Outcomes reflect changes in underlying costs over time.	Provides realistic spot prices in short term. Reflects generator's bidding strategy in the past. Does not reflect changes in the market over time.	Provides plausible spot prices and generator profitability over long term. Market changes over time are reflected through dynamic bidding strategies.
Likelihood of driving efficient development	High probability of supporting efficient future transmission development. Results respond predictably to the scenario inputs.	Low probability of supporting efficient future transmission development. Results do not respond predictably to the scenario inputs.	Medium probability of supporting efficient transmission development. Depends on extent of out-of-merit order bidding. Results respond somewhat predictably to the scenario inputs.
Summary	Long term market simulation studies delivering a view of efficient generation/transmission outlook for each scenarios, but underestimates generator profitability.	Preferable when assessing generators' revenue sufficiency in the near future.	Preferable when assessing generators' long term future revenue sufficiency.



Given the strengths and weaknesses of the various approaches, and the requirement to consider an efficient development plan, AEMO has continued using SRMC-based bidding in its long-term modelling for this year's NTNDP. A simple spreadsheet model was developed to verify the reasonableness of renewable generation projections from a revenue perspective. Further developments in this area are expected.

### Issue 3

One factor affecting retirement of existing generating stations is inclusion of retirement cost. This would increase total costs and may delay or even cause retirement not to occur.

#### AEMO's Response

AEMO confirms that the 2015 NTNDP studies (like in 2014) assume retirement cost data as estimated by ACIL Allen.<sup>8</sup>

### Issue 4

TransGrid considers that using the market driven approach is an appropriate mechanism to fine tune the least-cost model over the short and medium term – five to 10 years. Such an approach is arguably a much more realistic reflection of how an investor in new generation assets decides when to invest.

#### AEMO's Response

Under clause 5.20.2 (c) (1) of the Rules, the NTNDP must consider the “efficient development of the national transmission grid”. In considering this development, AEMO's long- term model has maximised efficiency in generation and transmission investment and dispatch by assuming least-cost modelling.

In 2015, outcomes of least-cost modelling were compared against other studies undertaken by AEMO using an iterative strategic bidding approach for investments and retirements. AEMO found that development and withdrawal decisions are broadly similar. Given that the computational burden of the strategic bidding approach is high, and only one submission was received favouring this initiative, AEMO considers it prudent to consult further on the value of fine-tuning the least-cost model.

<sup>8</sup> AEMO. Available: [http://www.aemo.com.au/Electricity/Planning/Related-Information/~/\\_media/Files/Other/planning/2014%20Assumptions/Fuel\\_and\\_Technology\\_Cost\\_Review\\_Data\\_ACIL\\_Allen.ashx](http://www.aemo.com.au/Electricity/Planning/Related-Information/~/_media/Files/Other/planning/2014%20Assumptions/Fuel_and_Technology_Cost_Review_Data_ACIL_Allen.ashx)