energy market consulting associates

Optional Firm Access

Review of Prototype Firm Access Pricing Model

Report to

Australian Energy Market Commission (AEMC)

from

Energy Market Consulting associates (EMCa)

October 2014

www.emca.com.au

Energy Market Consulting associates
605/657 Pacific Highway,
(PO Box 542)
St Leonards, NSW 2065
Australia

Phone: **02 9966 5310**
Web: **www.emca.com.au**

Contents

1. Introduction

1.1 AEMC's review of optional firm access

1.1.1 Review of Optional Firm Access (OFA)

In February 2014, the Standing Council on Energy and Resources (SCER) directed the AEMC to develop, test and assess the optional firm access model that was proposed as part of the AEMC's Transmission Frameworks Review.

The purpose of the review is to inform the SCER on whether there are long term benefits associated with implementing the developed optional firm access framework and, if such benefits are identified, develop the optimal approach to implementation of the framework.[1]

SCER has requested the AEMC[2] to:

- Confirm or modify the design of the optional firm access model as a result of testing and evaluation;
- Engage with industry participants and governments to build understanding of the model and the potential impacts of its implementation; and
- Recommend whether to implement the optional firm access model, and if so, how it could be implemented.

[1] SCER letter to AEMC Chairman 28 February 2014 paragraph 5

[2] SCER letter to AEMC Chairman 28 February 2014 Attachment 1 Overall Objectives

The AEMC's work program will assist government and industry participants to better understand the potential costs, benefits and risks of implementing optional firm access.[3]

The guiding principles cite Table 10.1 (Attachment 1) in the Transmission Frameworks Review final report. "This is the starting point for the AEMC design of the optional firm access model. The AEMC has taken the view that the Terms of Reference does not allow the fundamental redesign of optional firm access model."[4] Some movement away from core elements of Table 10.1 is permitted where further analysis and testing reveals improvements can be made.[5]

1.1.2 Optional firm access pricing model

As part of the concept of OFA, it is proposed that TNSPs will be required to provide a 'firm access 'product' and to price that product on the basis of a pricing model. AEMC have developed a prototype firm access pricing (PFAP) model that implements the logic of a Long-run Incremental Cost (LRIC) pricing method as specified in the Transmission Frameworks Review in 2013. The model is developed in a consistent manner with the core and recommended elements of Table 10.1 of the Review. The model is intended to assist both stakeholders' and the Commission's understanding of:

- How such a model may be implemented in practice;
- Potential prices that may emerge through use of a firm access pricing model; and
- The sensitivity of access prices to different assumptions and inputs.

The Commission also intends that the prototype, and its inputs and outputs, will feed into the Commission's assessment of the costs and benefits of implementing optional firm access.

1.2 What AEMC has asked of us

The Commission has sought an independent assessment of the appropriateness of the prototype pricing model. The assessment is required to consider such matters as:

- The input assumptions, including the cost assumptions that are made:

[3] SCER letter to AEMC Chairman 28 February 2014 Attachment 1 Overall Objectives

4 FIR OFA Design and Testing 24 July 2014 page 3 para 4

5 FIR Overview Report OFA D&T page 11 para 4

- The resulting expansion plans, which the model predicts; and
- The output prices (which are a function of both the inputs and the resulting expansion plans).

Our report is not intended to be read as providing conclusions as to whether the model is ‘fit for purpose’ for deployment against the overarching objectives of Optional Firm Access design. AEMC has well-documented that the model is a prototype only at this stage, that its purpose is to allow the concepts of pricing for firm access to be explored and that there are aspects of the model that are acknowledged as being stylised representations of real situations.

We were asked to undertake this assessment as a limited scope review focusing on priority aspects of the mode and our review is not a comprehensive review of all aspects of the model; in particular, we have not reviewed certain of the more technical aspects of the model, such as the representation of load flows except at a ‘conceptual’ level. We have also not tested the model calculations or model programming, except to the extent that the runs we have undertaken have provided us with a sense check of its workings. The model inputs are considered to be ‘test inputs’ only and we have not verified their accuracy except, again, as a ‘sense check’.

We have been asked to suggest improvements to the model which could be made in order to improve the accuracy of outputs and also the useability of the model.

1.3 Assessment Approach

1.3.1 Assessment process

Our review commenced on 22nd September. We were provided with the PFAP model and associated documentation and we met with AEMC staff and the model designer (by teleconference) in order to clarify our understanding of certain aspects of the model. We then inspected the model inputs and workings and we proceeded to develop a series of test scripts in order to test model outputs under a range of scenarios. We reviewed the outputs of the model from these test runs and we have drawn on these in providing our observations on the model.

We completed our review on 26th September and have completed the documentation of our findings in the current report.

1.3.2 Reference sources and the basis for our assessment

Our primary sources of reference for the functional design and operation of the model are:

- Technical report – optional Firm Access – Transmission Frameworks review (AEMC, April 2013), in particular section 5 which describes the 'firm access standard', which defines the service that TNSPs are required to provide and section 6 in which there is a "design blueprint' for access pricing;
- To the (limited) extent that it bears on interpretation or modification of these matters, the First Interim Report – Optional Firm Access Design and testing (AEMC, July 2014);
- The Pricing Prototype Program User Guide, which is undated, and was provided to us by AEMC.

We also drew on a report to AEMC 'Critical Assessment of Transmission Investment Decision-making Frameworks in the national Electricity market', by FTI Consulting (April 2013).

1.3.3 Fundamental questions for our review

We assessed the **PFAP** model qualitatively against the AEMC's fundamental design of the optional firm access pricing model. We have considered the model's calculations of LRIC by grouping our areas of inquiry in order to answer the following two questions:

a) Do the model assumptions and stylised configuration provide a reasonable representation of the network flows and constraints across the meshed network?

b) Does the predicted expansion plan that results from the identified constraints provide a reasonable representation of the necessary augmentations and reasonably represent the incremental cost as a LRIC price to a party seeking firm access of a particular amount, for a particular period at a particular node.

We extracted key aspects of the 'blueprint' functional design, grouped according to the two areas of inquiry above. We have summarised the way in which the model appears to implement each of these aspects of the functional design and, for each aspect, we provide a commentary. Our commentaries focus first and foremost on whether we consider that the model implements the functional design; in addition, from our testing, we have in some cases also formed a view on the validity of certain stylised aspects of the model against its design objectives, and which might guide consideration of potential improvements to the model.

2. Findings and observations

2.1 Flows and Constraints

2.1.1 Question for our inquiry

In this aspect of the review, we considered the following question:

> *Do the model assumptions and stylised configuration provide a reasonable representation of the network flows and constraints across the meshed network?*

2.1.2 Summary of relevant model workings

For these aspects of the relevant functionality, the model operates broadly as follows:

- A baseline set of firm access requirements at every generation node is entered into the model. These baseline assumed requirements are escalated into the future using 'zone growth' assumptions;
- Flows based on the assumed baseline firm access requirements are modelled from each generation node to the Regional Reference Node (RRN), for each year into the future;
- Security assumptions are incorporated on the basis that the firm access planning standard is for a simple N-1 planning standard for each relevant network element between generation nodes and the RRN;

- The model undertakes a contingency analysis in which network elements[6] are withdrawn on the basis of single-contingency events and the post contingent flows are calculated;
- The model then identifies network thermal constraints that would arise from such post-contingent flows, against the rated thermal capacity of each network element, and when those constraints will arise;
- New firm access 'requirements' are then added in the model, the flows are recalculated and the adjusted constraints on each network element, and their timing, are then identified as above.

While this represents the workings of the model in a scenario where sufficient generator require firm access, the model has been set up to handle the scenario where insufficient generators require firm access and the TNSP is nevertheless required to provide access at the required level of security to meet its obligation to loads. The model assumes an N-1 security requirement to loads. In order to meet this requirement, the model adds 'Reliability Access' (RA) as/if required to meet TNSPs' assumed load-related security requirements and determines constraints and consequent augmentation requirements) in the same manner as is described above for Firm Access.

2.1.3 Our findings and observations on flow and constraint modelling

General findings on flow and constraint modelling

The model appears to implement a stylised representation of a load flow which identifies constraints in the manner contemplated in the functional design.

We have tested the model across a range of firm access flow baseline requirements and while we have not undertaken technical assessments to confirm the validity of the model's identification of specific constraints, it appears to identify network constraints broadly as would be expected. For example, increasing firm access requirements at a node brings forward specific augmentations that appear to be related to flows from that node.

Baseline transmission development plan

We found that the model is sensitive to the baseline transmission development plan. The functional design recommends the model forecasts

[6] The model considers two network elements: lines, and transformers

being based on the NTNDP or other information provided by NTP (6.2.3).[7] Medium-term forecasts of flow growth should be based on NTNDP forecasts of end-user demand and firm generation.[8]

The model as currently developed is reliant on it producing its own expansion plan, both for the baseline and for the modelled firm access requirement. There would seem to be merit in ensuring forecast model data is reasonably comparable with current augmentation plans of the relevant TNSPs, using common input assumptions (in terms of demand growth, a NEM generation expansion baseline and committed augmentation etc).

Baseline flow data

We find that the baseline input data currently in the prototype model involves a particular set of firm access requirements that we understand to have been obtained from modelling (for transitional access) the simultaneous dispatches of all generators in the NEM at system peak.[9] This data is then escalated forward using growth factors which differ between zones, but using fixed allocations to nodes within those zones.

A present limitation of the prototype model is the end-user data set does not include the major transmission-connected loads. Therefore there is a significant mismatch between demand and supply, and which we understand is handled within the model by balancing at the RRN. We understand that it is AEMC intention that these loads would be included at the correct nodes if this model was to be implemented.

We consider it likely that the simplified representation of future flow increases (arising from growing baseline generation requirements) in its current configuration may prove to be materially different from the flows that will occur under actual generation developments which, unlike the constant annual growth that is currently assumed in the model, are likely to be lumpy. Although our testing is limited, we do find that the baseline generator firm access requirements and their assumed pattern of growth do materially affect LRIC pricing. More specific generation development scenarios should replace and complement the current 'scaling' of firm access by forecasting within a zone the location and timing of known or expected generation development.

While we found that end-user loads (and load growth) have relatively little effect on LRIC pricing, we expect that the absence of very large loads at

---

[7] TFR Final Report 11 April 2013 page 131 Table 10.1 recommended elements

[8] TFR Final Report 11 April 2013 5.2.2 Medium term and long term forecasting page 63; and TFR Technical Report OFA 11 April 2013 6.2.3 page 52

[9] FIR OFA Design and Testing July 2014 page 144

single-node locations could materially affect the model's identification of constraints, and therefore LRIC pricing.

Identification of constraints

As per the specification, the model considers only thermal constraints in a DC approximation load-flow. While this is consistent with the specification, we consider it likely that actual constraints will frequently bind (as they do currently in the NEM) on other factors. We understand that AEMC is considering how stability constraints may be included. While modelling of constraints other than thermal constraints would increase the complexity of the model, assessment of the materiality of this element of the stylised design and consideration of practical ways to incorporate such functionality would be warranted, particularly given the reliance in the foundation papers on LRIC pricing for the firm access product as a market signal for transmission expansion, and proposed removal of the market benefit test from RIT-T assessments.

Security assumptions

The assessment of 'spare capacity' in the model necessarily requires the application of security assumptions that (on the generation side of the RRN) are intended to mimic the proposed "firm access standard". The model assumes an N-1 security standard.

Security requirements for TNSPs tend to be moving towards allowing probabilistic standards. This would certainly be more difficult to model, however if the model is to be based on a traditional N-1 deterministic standard, it would need to be established that this provides a reasonable approximation. It is likely that deterministic standards in the model will be biased towards over-estimating the cost of providing a given level of security, as they foreclose lower cost options that may be available.

In this limited scope review, we have not directly assessed the way in which security is modelled. From the user guide, it would appear that a once-only security assessment is undertaken in the base year, by applying contingency events to every element and capturing the resulting 'security flows'. It would appear that this is then used to prepare a security adjustment matrix covering each flow element, and which is then applied in subsequent years, for the baseline run and for the adjusted run.

From the user guide, it is not clear to us whether the security factors are in fact proportionate factors or fixed quantities. It is also not clear that it covers contingency events on all elements (i.e. lines and transformers) or just on lines (which are described in the user guide).

While our review on this aspect is not definitive, we consider it likely that the representation of security is material to the objective of providing a reasonable assessment of LRIC and that the current representation of this aspect would warrant more detailed review.

Reliability access

Reliability access provides for what is in effect a ‘firm access product’, but without the need for generators to pay for it. It is recognised in the functional documentation that TNSPs need to meet this requirement as well as meeting firm access requirements.

Under an extreme run in which we modelled zero firm access, we found that the model provided reliability access that in aggregate almost exactly matched demand. In this respect, it appears that the modelling is correct. However the means by which the model provides reliability access appears to involve scaling in proportion to the assumed zone growth for generation capacity to meet the (present and future) aggregate load. This seems to be a most unlikely way in which reliability access would be delivered. This is illustrated by the current situation, in which no generators do have firm access; TNSPs are not required to provide for N-1 supply to loads under such a dispatch pattern; rather, it is assumed that peak generators can and will be dispatched as required and that any generators can be dispatched out of merit to maintain supply.

We consider that the modelling of reliability access is likely to be biased towards overstating the prudent and efficient cost for TNSPs to maintain supply to loads at the required reliability level. Further work would be required to establish if this bias is material.

Inter-regional effects

The PFAP model exists as a number of independent regional models. While we understand that the proposed optional firm access is an intra-regional concept, we understand that there are instances in the NEM where flow conditions in one region can constrain generation in another.[10] We understand that it is the AEMC intention that the 5 regional models are integrated at which time the issue should be addressed. We have not further considered the materiality of this matter.

Network topology and flow determination

We have not investigated the model’s representation of the topology of the network or its calculation of flows through each network element; however the following observations are intended to assist with any future review.

[10] We note that this is different effect from the question of modelling of constraints on the interconnectors themselves, and which is not required under the proposed optional firm access model.

We understand that the model's representation of lines is in fact a representation of circuits. This is appropriate for load flow and constraint determination purposes, however we comment further in the next section on the implications of this for its costing of augmentations.

It is not clear to us how multiple-bay substations may have been represented as 'transformers', which appear to be the only network elements other than 'lines'. Multiple bay substations also have a physical capacity limit which, if exceeded, will require duplication at a material cost. The inclusion of other network elements may add complexity but would contribute significant value to improving LRIC calculation. The implications of the model's representation of these aspects for the assessment of security / contingencies, should be considered. As with circuits, this aspect of the modelling is also material to the costing of augmentations.

We have not in the current review examined the concepts and modelling of flows and constraints themselves. We have briefly reviewed user guide material and note that this involves assessment based on admittances, distribution factors, meshedness and duplication factors. We commend this aspect of the model for review.

2.1.4 Limitations and scope for further review

The main aspects of the model that we have not reviewed at this stage, or for which the current review has been limited, are:

- Representation of network topology and flow calculations, including admittance, distribution factors, meshedness and duplication factors;
- The representation of constraints as thermal constraints only;
- The representation of security assumptions through "security factors" applied to flows; and
- Inter-regional effects.

Other flow and constraint modelling issues for further review arise from the matters that we have noted in section 2.1.3.

2.2 Augmentation costs and LRIC price calculation

2.2.1 Question for our inquiry

In this aspect of the review, we considered the following question:

Does the predicted expansion plan that results from the identified constraints provide a reasonable representation of the necessary augmentations and reasonably represent the incremental cost as a LRIC price to a party seeking firm access of a particular amount, for a particular period at a particular node?

2.2.2 Summary of relevant model workings

The workings of this aspect of the model can be summarised as follows:

- From the identified network constraints, the model draws on notional network elements to duplicate existing network elements. We understand that these are considered as 'clones' of the relevant network elements that have been constrained (i.e. the same type of asset, with the same rating and operating at the same voltage).

- The model then 'adds' these new network elements when they are progressively required over time. This results in network expansion plan that is in effect a progressive replication of the existing network;

- A baseline network expansion plan is determined in this way, using the baseline firm access requirements, demand forecast and the model's determination of resulting constraints, as described in the previous section. The cost of this expansion plan is calculated as a NPV;

- A new firm access 'requirement' is then added in the model, as described in the previous section and, based on the recalculated flows, an adjusted network expansion plan is determined.

- The LRIC price of adding the requested new firm access requirement is calculated by subtracting the NPV of the baseline expansion plan from the NPV of the adjusted expansion plan, and dividing by the quantity of firm access requested. This provides a specific LRIC price (in $/kW) of providing firm access of a particular amount, at a particular time, for a particular period at a particular node.

2.2.3 Our findings and observations on modelling of augmentation costs and derivation of LRIC prices

General findings on augmentation costs and LRIC calculation

The AEMC's papers represent that a significant advantage of optional firm access is that generators, who best understand the economics of the wholesale electricity market, will be able to make least-cost siting decisions.

This is preferable to the current situation in which TNSPs are in effect required to second-guess generation economics in applying a 'market benefits' test under the current RIT-T requirements. However this outcome will be contributed to if generators are provided with firm access prices that reflect suitably realistic transmission augmentation costs.

While significant advances are made in understanding firm access and its pricing we consider that the PFAP model, as currently configured, does not yet provide LRIC prices that reflect the incremental costs of providing firm access, primarily because of the current weaknesses in its representation of transmission augmentation costs. We elaborate on the main issues that we observe at present. We consider that there are workable solutions to the issues that we identify, however further work would be required to scope appropriate solutions.

Replication of network elements as an augmentation plan

While we recognise the objective of having this model determine a proxy augmentation plan, we consider that the means by which it does this by assuming that elements are progressively replicated, would require some refinement and testing for reasonableness. It is most unlikely that a prudent and efficient network development plan will simply involve replication of existing network elements and we consider it likely that this aspect of the modelling is likely to lead to a network augmentation cost that is far removed from a network expansion plan that is developed using prudent network planning principles.

Moreover we consider it likely that an augmentation plan determined by 'replication' will be biased towards over-estimating the costs of augmentation, because prudent planning will typically identify strategic solutions with lower long-term costs. Examples may be;

- Combining reasonably anticipated future requirements to strategically develop the network by providing a single higher-capacity augmentation rather than replicating existing lower-capacity network elements;

- Establishing new substations and new line routes;

- Adding double-circuit lines (rather than multiple single circuit lines, which we understand to be the model's default).

We also consider that there are scenarios where replication of existing assets is infeasible – for example it is possible in the model to enter an infeasible large firm access request (e.g. 3,000 MW) off an existing 132kV line; the model will then replicate this line many times over in its 'attempt' to provide the necessary capacity.

Costing anomalies

We consider that the PFAP model, as provided, does not suitably specify or cost the required augmentations. These are largely limitations of input data and the representation of input costs, for which there are workable solutions. We observe the following issues:

- The assumption that there are only two material network elements – lines and transformers – appears to ignore the significant costs of substation bays. Additional lines will need termination and additional transformers require switchyard bays with associated switchgear, protection systems and the like. These may add a significant multiple to the costs currently represented only by transformers;

- While we have not comprehensively reviewed unit costs assumptions, we observe what appear to be some significant anomalies. Some examples are:

    - $560,000/km for a 400MW 220kV line – we would expect a figure approximately two to three times this amount. Most other line costs also appear anomalous;

    - The same costs/MW are used for all transformers – while this appears to be in a reasonable range, the costs/MW should vary inversely by voltage and within that, by rating;

    - Line costs/km can vary significantly by line length (due to economies of scale) and by topology;

    - The model has a ‘size’ designation of ‘L’, ‘M’, and ‘H’ available for each element type. It is unclear what this designation is intended for, since the lines and transformers all have capacity ratings ascribed to them.

- Some assets seem to have infeasible ratings – for example, 200MW transfer capacity for a 220kV line is less than half what we would expect, and a lumpiness of only 100MW for a 275kV line would seem to be an error.

No replacement or maintenance

All augmentations will require that the TNSP incurs additional operations and maintenance expenditure over their lifecycle. We would expect this to fall within the definition of being a long-run incremental cost; however no allowance appears to have been made.

Augmentations within the model period are unlikely to need replacement within the time horizon of the model. However there are assets that will reach the end of their lives within the model horizon and will require replacement.

We are advised the AEMC is looking at including replacement costs. This represents another time when an economic decision is required as to whether such replacement is warranted. We are aware of situations in the NEM where significant assets to be replaced are in effect dedicated to a single load or generator that may itself be near end of life. The question arises as to whether such generators should face LRIC price signals to confirm their committed requirements.

While this is a functional design issue, and we can envisage functional design responses on this matter, we note that the model as currently configured does not limit firm access to the end of the life of the assets providing the service, and LRIC pricing therefore in effect is for a service in perpetuity.

Implications of the baseline plan

In testing the model, we find that the baseline plan can have a material impact on the LRIC price for a firm access generator. In using the model to produce actual LRIC prices, it will be important to understand those assumptions that most impact LRIC prices, and to take all reasonable steps to ensure that these are as realistic as possible. Of the model sensitivities that we tested, we find that the following baseline assumptions are most material (in broadly descending order):

- The baseline level of firm access and the location of other firm access generators relative to the new request;
- The assumed level of ‘zone growth’ in firm access, and its location relative to the new request;
- Short term demand growth.

This sensitivity is essentially as expected. However it does demonstrate the importance of resolving some ‘application’ issues that have been discussed, including ensuring that the new request is not in effect double-counted by being also inherent in the baseline plan; also to ensure that any plant retirements are accounted for in the baseline (at least to the extent that they are firm) in order to correctly model low LRIC prices where capacity may be freed up as a result.

Possible anomalies in LRIC results

While our testing was not definitive, we found some results that did not fit our expectation, or the expectations of other authors in papers discussing the application of the firm access pricing concept. These include:

- Where we added a short term access request (say 5 years), and this triggers an augmentation requirement within that period, then we would expect there to be a similar LRIC price to a longer-period firm access request. However in the limited scenario tests we undertook, we found a considerably lower LRIC price for this short period;

- We would also expect to find a near-zero LRIC price where we sculpted out a ‘retirement’ and then added a new firm access request of the same size, and which would therefore be using the same capacity (augmentations) as were included in the baseline. However our runs did not find this result;

- We would have expected to see a greater degree of ‘lumpiness’ in LRIC pricing in that (for example) where a ‘baseline’ firm access increment triggers an augmentation, there would be low-cost spare capacity available for subsequent firm access requests. This would be a classic ‘free rider’ issue. However we did not find evidence of this result;

- In the absence of significant firm generation, the TNSP will be required to provide reliability access and we would expect that this same capacity would therefore lead to low-cost ‘spare capacity’ being available to be sold as firm access with minimal incremental cost, and therefore a near-zero LRIC. However we did not find markedly lower LRIC prices except at extreme and unrealistic levels of demand growth and even then they were still around 75% to 90% of the ‘base case’ LRIC (depending on the size of the firm access request).

2.2.4 Limitations and scope for further review

In undertaking this review, the following matters were not reviewed or were reviewed only to a limited extent:

- While we are not aware of any issues, we did not review the augmentation NPV calculations. We would expect the model to implement standard calculations in this regard;

- While we noted some input cost anomalies, we have not comprehensively reviewed the model costing assumptions against reasonable and efficient unit costs for a model of this type;

- We have not reviewed the modelled augmentation plan and forecast data against the NTNDP or against specific TNSPs’ published augmentation development plans. It is accepted there would not be a one-to-one mapping between an access request and a transmission expansion project.[11] However, if the medium–term forecasts of flow growth are to be based on NTNDP forecasts of end-user demand and firm generation[12], it is appropriate that key forecast elements of the expansion plan input data have regard to (or at least complement) known network augmentation planning and generation development expectations in the NTNDP or information provided by the NTP.[13] We understand that it is AEMC intention that end-user demand and firm generation data would be reviewed if this model was to be implemented.

Other augmentation cost and LRIC pricing issues for further review arise from the matters that we have noted in section 2.2.3.

[11] FIR OFA Design and Testing 24 July 2014 Page 12

[12] TFR Final Report 11 April 2013 5.2.2 Medium term and long term forecasting page 63; and TFR Technical Report OFA 11 April 2013 6.2.3 page 52

[13] TFR Final Report 11 April 2013 page 131 Table 10.1 recommended elements

3. Conclusions

The model is a stylised prototype

We are cognisant that the PFAP model, as provided to us, is a prototype that is considered to be still in 'draft' form, with inputs that are intended to be representative but not yet useable for deployment. We are also conscious that AEMC's design brief for the model acknowledges that it will produce LRIC prices using stylised representations of the network, its flows, constraints and augmentations.

Some enhancements should be made so that it is more representative of LRIC – starting with more realistic cost inputs

The model advances understanding of firm access and its pricing and is of value in indicating trends and the relative impact of different assumptions. Nevertheless we consider that the model, as provided to us, does not yet provide suitably cost reflective long run incremental costs. The present shortcomings could be relatively easily rectified – for example through modest enhancements to the costing of augmentations, and input of more realistic unit cost assumptions.

Technical assessment of load flow and constraint modelling will improve confidence

Some other aspects of the modelling could be confirmed through specialist technical assessment. The main such aspect would involve assessment of the representation in the model of load flows and capacity constraints, with further focus on the representation of security and reliability access. While we are not aware of issues with these aspects of the model, they are important to the result and would require power system load flow modelling expertise to review.

Improvements to augmentation modelling should be explored

We consider that there are ways in which it should be possible to improve on the augmentation modelling, such that it is less likely to be biased towards over-estimation by assuming inefficient replication of existing elements when lower-cost options may be readily identifiable to an experienced planning engineer. This would require design scoping to determine how such improvements to the model could be made.

Calibration against TNSPs' transmission development plans will improve confidence

We consider that there is merit in comparing the transmission augmentation plan flow growth input assumptions that the model uses, with the NTNDP and regional TNSP planning forecasts. If the medium–term forecasts of flow growth are to be based on NTNDP forecasts of end-user demand and firm generation, it is appropriate that the model is calibrated with current demand forecasts and reasonably likely generation development scenarios and that the model produces a reasonable representation of augmentation plans.

We suggest that these more specific generation development scenarios should replace and complement the current 'scaling' of firm access within zones. Several generation development scenarios should be developed, and a sensitivity test undertaken to determine the sensitivity of LRIC prices to these baseline generation scenarios, before deciding which should be used (or possibly a weighted set of such scenarios). If a firm access request was received from a generator already included in that forecast growth assumption it should be removed from the forecast before processing that request to avoid double counting.

Concluding remarks

We understand that AEMC intends to separately commission a model audit, which we would endorse. With this audit plus consideration of the matters that we have raised, we consider that the model should play a valuable role in helping the commission and stakeholders in assessing the merits of implementing optional firm access.