Centre for Energy and Environmental Markets

Second Working Paper on the proposed Optional Firm Access model for the Australian National Electricity Market

by

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About CEEM and this discussion paper

The UNSW Centre for Energy and Environmental Markets (CEEM) undertakes interdisciplinary research in the design, analysis and performance monitoring of energy and environmental markets and their associated policy frameworks. CEEM brings together UNSW researchers from the Australian School of Business, the Faculty of Engineering, the Institute of Environmental Studies, and the Faculty of Arts and Social Sciences and the Faculty of Law, working alongside a growing number of international partners. Its research areas include the design of spot, ancillary and forward electricity markets, market-based environmental regulation, the integration of stochastic renewable energy technologies into the electricity network, and the broader policy context in which all these markets operate.

The Australian Energy Market Commission (AEMC) is currently developing an Optional Firm Access (OFA) proposal for transmission within the Australian National Electricity Market (NEM). CEEM welcomes the opportunity to contribute to this important and potentially far-reaching process through this discussion paper.

This paper draws on a range of work by researchers associated with the Centre on facilitating renewable energy integration within the NEM, being undertaken through projects that are funded by partners including CSIRO and the Australian Renewable Energy Agency. It also draws upon more general work exploring the challenges and opportunities for a future low-carbon Australian electricity industry. Relevant papers and presentations, and more details of the Centre can be found at the CEEM website – www.ceem.unsw.edu.au.

This is an area of ongoing work for CEEM and we are actively seeking feedback and comments on this discussion paper, and on related work. The corresponding author for this paper is:

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Executive Summary

This working paper deals primarily with the Optional Firm Access (OFA) model proposed for implementation in the Australian National Electricity Market (NEM) by the Australian Energy Market Commission (AEMC). It builds upon the analysis in an earlier CEEM working paper on OFA [1], and should be read in conjunction with that paper. This analysis is based upon the more recent proposals in the First Interim Report on Optional Firm Access, Design and Testing, published by the Australian Energy Market Commission (AEMC) in July 2014 [2].

We consider the proposed arrangements within the context of key NEM objectives including protecting the longer term interests of consumers. It is argued that providing competitive neutrality between different electricity generation technologies and between existing and possible new industry participants plays a key role in facilitating socially beneficial outcomes from competitive market arrangements.

TRANSITIONAL ACCESS ARRANGEMENTS

What transitional access arrangements are in the best interests of consumers?

The overarching objective guiding the OFA design process is to determine what approach is in the long-term interests of consumers. The following aspects were identified as important considerations that may have been overlooked or not yet adequately explored, regarding the influence of transitional access arrangements upon consumers:

1. Minimizing wealth transfer

The AEMC proposes to give some amount of free transitional access to existing generators. Allocating any amount of access to generators for free constitutes a wealth transfer from consumers to generators. Consumers have paid (and continue to pay) for the existing network through TUOS charges. If no access were granted for free, generators would need to purchase firm access, and the revenues from that auction process could be used to reduce TUOS charges for consumers. Therefore, it is in the best interests of consumers to keep the amount of freely allocated access to the minimum possible.

The AEMC proposes two reasons why free access should be allocated to existing generators:

1. to provide a learning period for participants to adjust to a significant regulatory change in the market
2. Minimising perceptions of regulatory risk, to minimise the cost of capital for new entrant generation, thereby decreasing the cost of the future power system for consumers.

On the basis of the first reason, free access should only be provided for a very brief period. Two to three years of free access would appear sufficient to allow all market participants to adapt to the new regulatory processes. The amount of free access could be rapidly reduced beyond that point, ensuring that generators must pay for access and returning those firm access settlements to consumers, to minimise the wealth transfer.

On the basis of the second reason, the allocation of free access should be the minimum required to maintain a low cost of capital for new entrants, and it should be allocated in a manner that best achieves this goal. Allocating free access representative of current access levels to all existing generators may not be the optimal strategy. Since most new entrants are likely to be peakers or renewable technologies, it is most important to consider the perceptions of financiers towards investment in specifically those technologies. Protecting older, emissions intensive assets may be of little importance to those financing decisions, and may even be detrimental if it were perceived as reinforcing a government intention to maintain the status quo in preference to supporting the entry of new technologies. Given the potentially large wealth transfer being considered, it appears important to conduct analysis to develop a more nuanced understanding of the impact of transitional allocation approaches upon financiers' decision making processes.

2. Avoiding the Reverse Merit Order Effect

Making new entrants face the cost of firm access while existing generators receive firm access for free creates a competitive disadvantage for new entrants. This could give rise to the Reverse Merit Order Effect, which would operate as follows:

1. Fixed costs for new entrants are increased (due to the cost of procuring firm access), while the fixed costs of existing generators remain the same.
2. Wholesale prices will then need to rise to higher levels before investment in new entrants will occur
3. Consumers will be paying higher wholesale prices for an extended duration. These higher wholesale payments will not be offset by reductions in TUOS charges, since most existing generators will not be paying for firm access.

The Reverse Merit Order Effect creates a secondary wealth transfer from consumers to generators, through the impact of OFA on wholesale prices, and specifically related to a transitional access allocation that creates a competitive disadvantage for new entrants. We believe that this wealth transfer is in addition to that described in the previous section (related to explicit gifting of network access to generators). Creating a secondary wealth transfer from consumers to generators does not appear to be in the best interests of consumers.

The Reverse Merit Order Effect can be avoided if the competitive disadvantage for new entrants is removed. If new entrants and existing generators are exposed to the same increase in fixed costs (whether all access is given to all for free, all access is paid for equally by all, or somewhere in between), then the degree to which wholesale prices must rise to support new entry will be matched by increasing payments for fixed access by all generators, to offset TUOS charges. A worked example to illustrate this effect is outlined in section 1.3.

3. Avoiding delayed investment and delayed exit

Creating a competitive disadvantage for new entrants also appears likely to affect investment, independent of locational signals. For example:

1. The cost of obtaining firm access increases the fixed costs of new entrants, while the fixed costs of existing generators remain unchanged.
2. Wholesale prices will need to rise to higher levels to support new entry, so investment in new generation is likely to be delayed (all else being equal).
3. Wholesale prices low enough to cause retirement will remain unchanged. Since wholesale prices will need to rise before new entrants can enter the market, it could be expected that retirement of existing generation will also be delayed (all else being equal).

Thus, creating a competitive disadvantage for new entrants could delay new entry decisions, and delay exit decisions. It could be argued that this reduces the competitiveness of the market, which would not typically be in the best interests of consumers. Since these effects are likely to be complex and difficult to predict, it would appear prudent to conduct further analysis to better understand how various transitional access allocation approaches could influence investment and exit decisions, and how those differences might impact consumers.

4. Designing an OFA transition that is robust to various climate policies

Although Australia's carbon pricing mechanism has recently been repealed, it is reasonable to expect that a similar mechanism to price carbon could be introduced again in future. Carbon pricing mechanisms are widely agreed to be an efficient mechanism for climate mitigation.

Creating a competitive disadvantage for new entrants has the potential to skew the effects of a mechanism such as carbon pricing on the electricity sector. By increasing the fixed costs of new entrant low emissions technologies, while leaving the fixed costs of emissions intensive existing generators unchanged, a relatively higher carbon price will be required to support a transition to lower carbon technologies. This could skew the effect of the carbon price on the electricity sector, relative to other economic sectors. All else being equal, the electricity sector would undertake relatively less mitigation than would be economically efficient, with other sectors undertaking relatively more mitigation. Preventing the efficient operation of a carbon pricing mechanism would not appear to be in the best interests of consumers, since it could increase the cost of climate mitigation.

Alternative transitional access arrangements

In CEEM's previous working paper, we suggested an alternative transitional access approach that would give free transitional access to new entrants, equivalent to the free transitional access held by existing generators at that time. This removes the issues related to competitive disadvantage for new entrants, reducing the potential for negative impacts on consumers, such as the Reverse Merit Order Effect, delay in entry and exit decisions, and inefficient climate mitigation.

The AEMC raised a number of concerns with this proposal. Firstly it was suggested that it would dilute locational signals for new entrants. While this is true during the transitional period, modelling thus far has indicated that the benefits of locational signals are not realised until further into the future. In the near term, these signals are of limited benefit since network investment is not required for some time. By the time these signals become important, transitional access could be scaled back to zero for all generators. Thus, although the AEMC has raised a genuine concern, this needs to be weighed against the potentially serious concerns about the negative implications of competitive disadvantage for new entrants on consumers. If the dilution of locational signals in the near term is relatively unimportant in influencing outcomes for consumers, it may be better to avoid problems related to competitive disadvantage.

The second concern raised by the AEMC was that this proposal could lead to uncertainty for generators about their transitional access holding over time, affecting their contracting behaviour and diluting their financial certainty.

Contracting behaviour and financial certainty are certainly likely to be dependent upon the *total* amount of firm access that any generator holds. However, this is not necessarily dependent upon the amount of *free transitional* access that a generator holds. Regardless of the amount of free transitional access that a generator is allocated, they should be encouraged to hold the amount of access that is economically optimal, to support the level of contracting and financial certainty they are willing to pay for. Thus, if secondary trading mechanisms are available, they should move towards holding the same amount of firm access, regardless of how much free access they were allocated, and this should support the same degree of contracting and financial certainty.

There is likely to be a significant delay from the point where a new entrant is announced, and the time when the generator is commissioned and begins operation in the market. This should allow plenty of time (several years, at a minimum) for any generator to procure any additional access that they would require to return to their economically optimal level when that new entrant begins operation. Therefore, uncertainty about the amount of *free* access does not appear to significantly influence certainty about the *total* level of firm access held at any point in time, if that access is being valued and traded properly in secondary markets. If there is any increase in uncertainty related to imperfect operation of secondary markets, this could be minimal, and from the perspective of consumers, it could be far more important to avoid issues related to competitive disadvantage for new entrants.

Suggested further analysis

Based upon the analysis outlined in this working paper, we make a number of suggestions for the progression of the OFA design process:

- ***TNSP study to quantify access prices*** - It would be of great benefit to commission at least one transmission network service provider (TNSP) to calculate indicative access prices for their network, based upon the Long-Run Incremental Cost (LRIC) approach outlined by the AEMC. This would aid analysis (by providing an indication of the scale of the access charges that could apply), and would also allow a useful trial of the proposed methodology for calculating access charges (which is likely to be challenging).

- ***Modelling study to quantify pricing effects and investment changes*** - Different transitional approaches appear to have the potential to affect wholesale market prices, and investment patterns in different ways. The dynamics are difficult to predict. Given that effects such as the Reverse Merit Order Effect and delayed investment and exit decisions could have significant implications for consumers, it would appear prudent to commission a detailed modelling study that attempts to capture and quantify these effects, particularly taking account of any issues related to competitive disadvantages for new entrants.
- ***Study to quantify cost of capital effects*** - A potentially large wealth transfer from consumers to existing generators is being contemplated through the proposed transitional access arrangements. Given that the only reason for this wealth transfer[1] is to prevent an increase in the cost of capital for new entrants, it would appear prudent to commission a study to quantify the likely impacts on the cost of capital for anticipated new entrant types (peaking and renewable), if different transitional arrangements are implemented. The aim of this study should be to determine the best way to minimise the cost of capital for new entrants, while minimising the wealth transfer from consumers to generators.

FACILITATING SIGNIFICANT NETWORK EXPANSION

Analysis of the earlier Scale Efficient Network Extensions (SENE) rule change process reveals that some issues identified with the process for assessing significant new augmentations to the network could be addressed by the OFA proposal. This may add a new type of benefit from implementing the OFA proposal, which could be quantified and added into the cost/benefit assessment when considering the implementation of OFA. Enabling SENE-type augmentations could be very important for achieving an efficient transition to low carbon electricity over the coming decades.

SETTLEMENT ARRANGEMENTS

Generators at risk of being undercut in the market (e.g., due to new entrant renewables) are likely to face increased incentives to create congestion, because the purchase of firm access provides an additional hedge against not being dispatched, provided there are binding constraints. Alternatively, low-cost generators (e.g., renewables) will need to withhold capacity to alleviate constraints, or risk losing revenue; if multiple participants are required to coordinate, this is likely to lead to uneconomic outcomes. Further analysis is required to determine the impacts of this disorderly bidding.

Next Steps

We look forward to discussing these issues and proposed alternatives further with the AEMC and other potential stakeholders.

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[1] Aside from a brief learning period.

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Introduction

The Optional Firm Access (OFA) model, as proposed by the Australian Energy Market Commission (AEMC) represents potentially the most significant change to the operation of the National Electricity Market (NEM) since its establishment more than a decade ago. The NEM itself is currently facing a range of growing challenges. Key amongst these is the evident need to greatly reduce electricity sector emissions over the next three decades if Australia is to appropriately contribute to global climate change mitigation.

In this discussion paper, the Centre for Energy and Environmental Markets (CEEM) aims to provide some preliminary analysis of the OFA proposal, highlighting areas that may need further consideration, and providing alternative suggestions that may assist in the more detailed AEMC design work progressing at present. This analysis is based upon the proposals provided in the First Interim Report on Optional Firm Access, Design and Testing published in July 2014 [2]. It builds upon the analysis discussed in an earlier CEEM report [1], and should be read in conjunction with that report, and the AEMC's First Interim Report.

This working paper deals primarily with the transitional access arrangements, relating to the phased implementation of OFA. Analysis on the facilitation of scale efficient network extensions through OFA implementation is also presented, as well as some analysis on settlement arrangements under OFA.

We consider these arrangements within the context of key NEM objectives including protecting the longer term interests of consumers. We argue that providing competitive neutrality between different electricity generation technologies and between existing and possible new industry participants has a key role in facilitating socially beneficial outcomes from competitive market arrangements. Transmission and distribution network access, operation and investment poses particular challenges in this regard due to its inherent natural monopoly characteristics. From the start of micro-economic restructuring of the NEM, the principle of open access and common carriage for networks has been seen as key to supporting dynamic efficiency (including investment, exit and longer-term market transition) [4]. Growing challenges with congestion management and the potential inequity of not charging generators for their use of the Transmission system (TUOS) are both valid reasons for revisiting current arrangements but, if inappropriately implemented, the proposed changes may actually work against the primary objective of serving the long term interests of consumers via effective and efficient competition.

1 Transitional access arrangements

What is in the best interests of consumers?

The overarching objective which must guide the AEMC's design approach is the National Electricity Objective (the NEO), which states:

"The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity with respect to-

a) price, quality, safety, reliability and security of supply of electricity; and
b) the reliability, safety and security of the national electricity system."

CEEM identifies a number of issues that may have been overlooked or not adequately explored thus far in the design process, relating to determining transitional access arrangements that are in the best interests of consumers. These are discussed in the sections below.

1.1 Minimising wealth transfer

Gifting free access constitutes a wealth transfer

The proposed transitional access arrangements create the potential for a wealth transfer from consumers to generators. The existing network has been paid for entirely by consumers (through TUoS charges). Free allocation of firm access to this network to generators therefore constitutes a wealth transfer from consumers to generators. Transitional access has significant value[2]; for example, a generator that is considering retirement could sell any freely allocated transitional access, making a windfall gain.

If all access to the network were auctioned (with no free allocation of firm access), then the revenues from the auction could be used to offset TUoS charges to consumers. However, if all firm access to the network is allocated to generators for free, consumers will continue to pay the full cost of the network, since TUoS charges will not be offset. Consumers will then be in the position of continuing to pay the capital repayments and ongoing operations and maintenance of a network, to which generators have explicit access rights which they can fully monetise. In the worst case, with demand falling and shifting generation patterns, that network capacity may no longer be required, and consumers would need to pay for its

[2] Some have argued that the network has no value to consumers if there is no generation connected to it, so this effect should not be thought of as a wealth transfer from consumers to generators. However, if firm access to the network has value to generators, then it can be argued to have value to consumers (who could sell it to generators and realise that value). Thus, if the proposal is to create firm access rights and give them to generators for free, rather than to give those access rights to consumers and ask generators to purchase them, we argue that this can appropriately be framed as a wealth transfer.

ongoing maintenance or repair so that access standards for generators holding those rights can be maintained[3].

Why give free access?

The AEMC identifies two reasons for giving free access to incumbents.

Firstly, it is argued that the transitional arrangements should allow for a learning period. It would appear that this justifies transitional access only for a very short period (2-3 years), sufficient for market participants to fully incorporate the new processes under OFA. Three years would also be sufficient to cover the period of most pre-negotiated contracts.

Secondly, it is argued that the transitional arrangements should minimise perceptions of regulatory risk, to prevent inflation in the cost of capital. When generation developers made the decision to invest, they did take into account a reasonable expectation of having some access to the network for free. This assumed level of access could be considered to be an implicit subsidy for generators, paid for by consumers. Creating tradable firm access rights makes this subsidy explicit, and allows generators to monetise and realise that subsidy in new ways. In general, making subsidies explicit is in the interests of consumers, since it increases transparency.

Since there was an implicit subsidy at the time of investment for existing generators, if no free transitional access were allocated to generators this could create the perception of regulatory risk in the NEM. This could increase the cost of financing for future investments in the NEM, increasing costs for consumers. Many new entrants are likely to be renewable generators, which are highly capital intensive. This makes the cost of capital a particularly important factor in driving overall costs for renewable technologies, and makes it particularly important to carefully manage perceptions of regulatory risk through this transition.

Therefore, even though the gifting of free transitional access to existing generators does constitute a wealth transfer from consumers to generators, some amount of free access may be in the best interests of consumers, to minimise the cost of capital for future investments. However, the amount of free access allocated should be the minimum that is required to maintain the cost of capital for future investments at low levels, and the benefits of this should be weighed against the magnitude of the wealth transfer being considered. With quantification, it may eventuate that the wealth transfer is so large, and the impacts on the cost of capital so small, that no transitional access can be justified on this basis.

The AEMC has proposed that the amount of free access should be based upon the implicit access levels that existing generators currently receive[4], since this should

[3] The AEMC has acknowledged this potential for inefficient network investment [2, p. 109].

[4] Given the rapid transformation of the electricity sector at present, it is worth noting that there is a significant difference between the historical access that incumbents have enjoyed in the past, and the access that they have a reasonable expectation of continuing to enjoy in future. With the transition to new technologies, and demand falling, access in future may be significantly diminished in some cases below historical levels. It could be argued that this forward projection of access is a better indicator of

eliminate any perceptions of regulatory risk. This proposal may not be optimal from the perspective of consumers for two reasons:

1. Rent seeking behaviour and information asymmetry

The calculation of implicit levels of access currently received by each generator will be challenging. Any central authority tasked with negotiating levels of transitional access with individual generators is likely to face significant information asymmetry, and active rent seeking behaviour. This is likely to lead to an over allocation of free access to existing generators. This will create a windfall gain for existing generators, at a cost to consumers. Furthermore, large market participants are likely to have an advantage, with smaller market participants potentially being disadvantaged.

We note the proposal by Houston Kemp which suggests that each power station would nominate a proposed remaining asset life, to be objectively assessed by an independent agency (e.g., the Australian Energy Market Operator). Under this approach, the assessment would be principally focussed on ensuring that the remaining asset life for each power station is consistent with other power stations within the NEM. This proposal appears fraught with potential for windfall gains for incumbent generators, and the encouragement of rent seeking behaviour. It is also important to note that AEMO's current projections of future generation in publications such as the National Transmission Network Development Plan (NTNDP) are highly conservative on the issue of retirements, and are not likely to form a rigorous foundation for assessing realistic economic life remaining for these assets. Section 1.5 provides further discussion on the likely transition of the electricity sector over the coming decades, which is inconsistent with the view published in the NTNDP. Basing transitional access allocations on assessments such as the modelling used to create the NTNDP is likely to result in over allocation, and windfall gains for incumbents.

2. Impacts on renewables and peakers are likely to be nuanced

Financiers' perceptions of regulatory risk are likely to be nuanced. Given that the market is at the cusp of a technology transition, financiers are taking into account a wide range of factors in determining the risk associated with investment in different technologies, in different markets. Given that most new entrants are likely to be either renewable or peaking generation, the most important consideration is the impact on the financing costs of those technologies.

Bloomberg New Energy Finance recently conducted a study that involved questioning financiers about perceptions of risk and the corresponding cost of capital for a wide range of technologies, including conventional coal-fired generation, gas-fired generation and wind generation [5]. They found that the cost of capital for coal-fired generation is already so high that this technology is not economically competitive with wind generation. This result highlights the importance of recognising the many factors influencing financiers' decisions. In particular, the risks associated with different technologies are assessed differently, and are changing over time to reflect recognition of the technology transition in progress.

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the access that incumbents should be awarded (rather than historical levels of access), if indeed a measure of this nature is to be used as an indicator at all.

Investment in renewable generation remains dependent upon government policy support, through the subsidies created by the Renewable Energy Target and other schemes. Therefore, to minimise perceptions of regulatory risk for renewable technologies, the government needs to signal a strong intention to support the transition to low carbon, and support investment in these technologies. Protecting the interests of existing emissions intensive assets may have little effect upon the financing costs of new renewable generation, and may even create a perception that the government prioritises continued operation of those existing assets (rather than a transition to new low carbon technologies). This could mean that giving substantial free access to emissions intensive incumbents, while exacerbating barriers to entry through competitive disadvantage could actually raise the cost of capital for new entrant renewables, *increasing* costs to consumers.

Of course, some existing generators are renewable. Protecting those recent renewable investments from windfall losses is likely to be extremely important to minimise the cost of capital for new renewable investments. Rather than providing free access to all existing generators, an alternative allocation method could be to provide an amount of free access only to generation types anticipated to be likely to be new entrants (such as renewables and peaking generation). The treatment of older, emissions intensive assets may be of little importance to the financing decisions of new entrants. Therefore, gifting valuable free access to those generators may constitute an unnecessary wealth transfer from consumers[5].

It would also be worth examining in more detail the consequences of not gifting free access to any market participant. It is possible that any impacts on the cost of capital may be minimal, and remain small in comparison to the wealth transfer from consumers to generators as a result of giving free access. It would appear sensible to quantify any potential impacts on the cost of capital from not giving free access, and comparing that against the payments that consumers would forego for firm access, to offset TUoS charges.

These are complex issues, and it is difficult to predict what the outcomes of various transitional access methodologies might be. However, given that the potential wealth transfer from consumers to generators could be very large, it would appear that it warrants further analysis. The AEMC could consider commissioning a study to explore the impacts of various transitional access regimes on the financing costs of renewables and peaking generation. The methodology for this study could perhaps be informed by the Bloomberg New Energy Finance analysis on financing costs [5]. Section 1.7 provides some further suggestions on the nature of this analysis.

Summary

Even though the gifting of free transitional access to existing generators does constitute a potentially large wealth transfer from consumers to generators, some

[5] Coal-fired power stations may also need to seek capital for refinancing. However, elevation in the cost of capital for incumbents may not be problematic for consumers, if those incumbents cannot pass those costs through in the wholesale market. Effects on retirement and possible bankruptcy may need to be considered, but the impact of the OFA transition on the cost of capital may be minimal compared with the other regulatory risk challenges facing these generators (such as the risk of climate mitigation policies, for example).

amount of free access is probably justified, to minimise perceptions of regulatory risk, and therefore the cost of capital for future investments. The amount of free access allocated should be the minimum that is required to maintain the cost of capital for future investments at low levels. These future investments are likely to be in renewable or peaking generation. **Therefore, it is in the best interests of consumers to give as little free access as possible to generators, and allocate that free access in a manner that best manages perceptions of regulatory risk to ensure a low cost of capital specifically for peaking and renewable generation.**

1.2 Barriers to Entry

Definitions for barriers to entry vary in the literature. Authors in the American Economic Review sought to review these definitions, and proposed the following definition as optimal [6]:

> *"An economic barrier to entry is a cost that must be incurred by a new entrant and that incumbents do not or have not had to incur"*

By this definition, the proposed transitional arrangements for the implementation of OFA would certainly constitute a barrier to entry. Under these arrangements, incumbents will be given free access, while new entrants must pay for that access. This creates a competitive disadvantage for new entrants, and a barrier to entry. This then has the potential to reduce the competitiveness of the market.

Airline analogy

Consider an analogy with the airline industry. Consider a hypothetical example where taxpayer dollars have been used to construct an airline terminal in a city. All airlines are given equal access to this terminal initially, while consumers continue to pay for the maintenance and capital repayments for that terminal. At some later date, it is decided that a fee should be charged to airlines that use the terminal, to gain access to the gates. However, an incumbent airline that has been using the terminal until this point should not be charged for use of the terminal, since they had a reasonable expectation of continuing to have access for free, and had invested under that assumption. Meanwhile, any new entrants that want to use the terminal must pay for access to the terminal. They can either purchase access from the incumbent airline, or can pay to construct a new terminal if desired.

These arrangements would clearly create a competitive disadvantage for new entrants, which may be sufficient to inhibit them from entering the market if they cannot compete with the incumbent due to the increased costs that they face from access charges. This could then "lock out" those new entrants from the market, reducing competitiveness. This would not appear to be in the best interests of consumers, who would be deprived of access to potentially lower cost or superior services from a competitive market.

It would also not appear to be relevant whether the new entrants are operating a different technology, with a different fuel, and face a different cost basis to begin with. This example clearly illustrates that these arrangements elevate barriers to entry by exacerbating any difference in the cost basis, and it is difficult to see how this is in the best interests of consumers.

It would appear appropriate for the AEMC to conduct much more analysis to examine these effects in detail, if it is proposed that a transitional approach that creates a competitive disadvantage is to be implemented.

1.3 The Reverse Merit Order Effect

The barriers to entry outlined in the previous section could have very real and negative consequences for consumers. For example, the AEMC has claimed that [2, p. 111]:

> *"New entry should occur where investors have a reasonable expectation over time of making a risk adjusted rate of return sufficient to support an investment case. The allocation of transitional access to existing generators is not likely to affect this."*

However, it can be argued that the free allocation of firm access under OFA to existing generators, but not to new entrants over the same time period, has the potential to create a "Reverse Merit Order Effect". This would constitute a wealth transfer from consumers to existing generators, via inflated wholesale prices.

The Merit Order Effect has received much attention. This effect relates to the entry of significant quantities of renewable generation (subsidised by the Renewable Energy Target and other support schemes), which lowers wholesale pool prices. The reduction in wholesale pool prices has been found to be sufficiently large that from the perspective of consumers it more than offsets the cost of investment in that generation (through Large-scale Generation Certificates) [7]. This effect is made possible because the Large-scale Renewable Energy Target subsidy is applied only to new entrant generators, while the resulting reduction in wholesale prices applies to *all* energy sales. Thus, the Merit Order Effect describes a wealth transfer from existing generators to consumers via depressed wholesale prices.

The free allocation of firm access under OFA to existing generators, but not to new entrants over the same time period, has the potential to create a "Reverse Merit Order Effect". It would constitute a wealth transfer from consumers to existing generators, via inflated wholesale prices. This wealth transfer would be in addition to that described in the previous section (which relates to the allocation of free access to any generator, existing or new). While the wealth transfer described in the previous section has some justification, this additional wealth transfer due to the Reverse Merit Order Effect has no identified benefit, and therefore appears to be to the detriment of consumers.

This effect arises from the pricing impact of creating a competitive disadvantage for new entrants. It would proceed as follows:

1. Access pricing increases the fixed costs of new entrants, but does not affect the fixed costs of existing generators (which receive firm access for free[6]).
2. Wholesale electricity prices would need to rise to a higher level to support investment in a new entrant, than they would have otherwise. Retirement decisions of existing generators remain unchanged (since their fixed costs remain unchanged), or could be delayed by the rise in wholesale electricity prices.
3. Consumers must pay higher wholesale electricity prices to all generators. Only one generator (the new entrant) required the higher prices to be economically viable, while all existing generators in the system enjoy higher prices, without increased costs (since they are not paying for firm access). This constitutes a secondary wealth transfer from consumers to existing generators.

In the case where all generators (including existing generators) must purchase firm access, the revenues from the auction would presumably be returned to consumers in the form of reduced TUoS charges. Assuming this process is executed efficiently, this could offset the increase in wholesale electricity prices for consumers. However, if existing generators have been allocated firm access for free, there is no auction revenue to reduce TUoS charges. In this case, consumers would need to pay higher electricity prices, without the corresponding reduction in TUoS.

Illustrative example

A simple example helps to illustrate this effect. Assume the following:

- A market with a demand for 200TWh of energy per year.
- A new entrant will supply 1 TWh pa when it enters.
- A new entrant needs to achieve a long run marginal cost (LRMC) of $90/MWh to enter the market (not including firm access costs).
- The cost of firm access will increase the LRMC of a new entrant by $10/MWh.
- The cost of firm access, if applied to existing generators, would also increase their LRMC by $10/MWh.

The implications of these assumptions are outlined in Table 1 under three circumstances:

1. No one pays for firm access (both existing generators and new entrants are given firm access for free).
2. Only new entrants pay for firm access. Existing generators are given their firm access requirements for free[7].
3. New entrants and existing generators all pay the same price for firm access (no free allocation of access).

[6] Under the proposed model existing generators might not receive their entire firm access requirement for free, but these arguments still hold if they are receiving a partial free allocation while new entrants do not.

[7] It is acknowledged that this is not the AEMC's proposal, since transitional access would likely only apply for a proportion of existing generator requirements, for a limited duration of time. However, these simple assumptions serve the purpose for this illustrative example.

If new entrants are allocated firm access for free, they will enter when prices reach an average of $90/MWh (and can be sustained at that level upon entry). In this case, consumers' payments for electricity will be $18b per annum[8].

If new entrants need to pay for firm access, wholesale prices will need to rise further before the new entrant will enter the market. In this example, they will need to rise to $100/MWh (and be sustained at that level upon entry). The new entrant will pay $10m pa for firm access, and this amount will be returned to consumers in the form of reduced TUoS payments, as illustrated in Figure 1.

If only the new entrant pays for firm access, the total wholesale payments by consumers will be $20b, offset by $10m in firm access payments by new entrants. Thus, total payments by consumers will be $19.99b per annum.

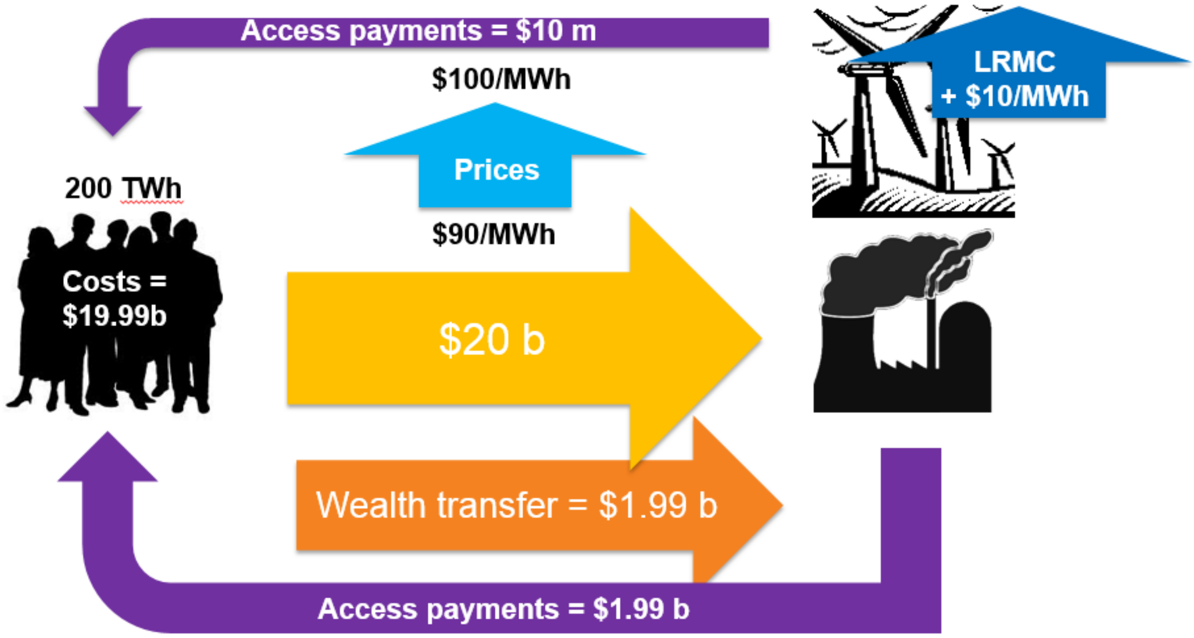
In the case where both new entrants and existing generators pay for firm access, the existing generators will pay an additional $1990m for firm access, further offsetting the wholesale costs to consumers, back to the original payments of $18b pa.

Table 1 – Illustrative Example of the Reverse Merit Order Effect

	No one pays for firm access (allocated for free to new entrants and existing generators equally)	**Only new entrants pay for firm access** (allocated for free to existing generators only)	**All generators pay for firm access** (no free allocation)
Total energy sales	200 TWh	200 TWh	200 TWh
New entrant generation	1 TWh	1 TWh	1 TWh
Existing generation	199 TWh	199 TWh	199 TWh
Change in new entrant LRMC due to additional firm access cost	$0 /MWh	$10 /MWh	$10 /MWh
Change in existing generator LRMC due to additional firm access cost	$0 /MWh	$0 /MWh	$10 /MWh
Pool price for new entrant to enter	$90 /MWh	$100 /MWh	$100 /MWh
Consumers payments in wholesale market	$18 b	$20 b	$20 b
OFA payments by new entrant	$0 m	$10 m	$10 m
OFA payments by existing generators	$0 m	$0 m	$1990 m
Total firm access payments by generators	$0 m	$10 m	$2000 m
Reduction in TUoS	$0 b	$0.01 b	$2 b
Consumer payments (total)	**$18 b**	**$19.99 b**	**$18 b**

[8] Assuming TUOS charges do not rise with the new entrant, i.e., that no network upgrades are required to provide firm access. If network upgrades are required to provide firm access for the new entrants, this would be an additional cost in all scenarios considered. In the scenarios considered here, this cost, as well as any efficiencies arising out of generators choosing not to purchase firm access (i.e., the benefits of the OFA framework), are small compared to the costs of the reverse merit order effect.

Figure 1 – Illustrative example of the Reverse Merit Order Effect



This illustrates the "Reverse Merit Order Effect", showing how creating a competitive disadvantage for new entrants can create a wealth transfer from consumers to existing generators. If existing generators and new entrants are exposed to the same costs (high or low), consumer payments remain at $18 b. However, if only new entrants pay for firm access, consumer payments rise to $19.99b, with the difference of $1.99b being a wealth transfer from consumers to existing generators, and a windfall gain for those existing generators.

Please note that this example is acknowledged to be highly simplistic, and does not take into account the many subtleties of the real market, and the many subtleties of the manner in which OFA is proposed to be implemented. It is intended to be illustrative of the concept only. It highlights the need for further much more detailed modelling to explore these effects so that they can be taken into account in the OFA design.

Some may argue that in the current oversupplied wholesale market, it is implausible that wholesale prices will reach the new-entry level (and so incorporate OFA prices) in the medium term, and therefore this does not provide a compelling argument for faster sculpting. However, as discussed in section 1.5, it could also be argued that it is implausible to expect that the electricity market will remain stagnant over the coming decades while OFA is implemented. This transition period will extend from the point where OFA is implemented (perhaps from 2022) for as long as free access is granted to generators (perhaps for 20-30 years, if present modelling studies of economic life is used as a measure). This overlaps with the period over which the low carbon transition must occur, if Australia is to meet the emissions reductions targets recommended by the Australian Government Climate Change Authority [8] (for example). Therefore, policies of some description are likely to be implemented to cause a transition to low carbon energy. There is great uncertainty about how this may be implemented; it may come in the form of a re-implementation of the carbon price, an expanded and extended RET, or some other mechanism that causes new entry of low emissions technologies, and retirement of emissions intensive technologies.

In considering such long term market reform, it would appear wise for the AEMC to remain unbiased by short term political cycles (such as the current political attitudes towards carbon pricing), and seek understanding of longer term trends that are likely to occur. Given that a transition to low carbon is very likely over the coming decades, designing an OFA transition that is robust to policy changes of this nature would appear sensible. This means that barriers to new entrants need to be taken very seriously, and it needs to be considered plausible that the low carbon transition will occur. This includes considering it plausible that a sufficient carbon price may be applied to cause wholesale prices to rise to the level necessary to support new entrants (i.e., $90-$100/MWh).

Summary

Making new entrants face the cost of firm access while existing generators receive firm access for free creates a competitive disadvantage for new entrants. This is not in the interests of consumers, since it **gives rise to the Reverse Merit Order Effect, which creates a wealth transfer from consumers to generators**. This is in addition to the wealth transfer discussed in the previous section, related to explicit gifting of valuable network access to generators.

This analysis suggests that it would be wise for the AEMC to commission a detailed modelling study to understand these pricing effects, and explore the implications of different transitional access arrangements on wholesale prices, and on consumers. This analysis indicates that it is **important not to create a competitive disadvantage for new entrants, by creating costs for new entrants that are not equally faced by incumbents.** The alternative transitional access proposal outlined in Section 1.6 (and in CEEM's earlier working paper) avoids this issue.

1.4 Delayed investment and delayed exit

Creating a competitive disadvantage for new entrants is likely to delay investment, and delay exit. To illustrate this effect, consider the situation where free access is given to existing generators, but not given in equal amounts to new entrants. In this case:

- The fixed costs of new entrants will be increased. This will mean that wholesale prices will need to be higher before investment in new entrants occurs, so investment in new entrants will be delayed.
- Meanwhile, the fixed costs of existing generators will remain unchanged (or much less affected than those of new entrants), since they do not face the cost of firm access. Since wholesale prices will rise higher before new entrants enter the market, this effect will delay the exit of existing generators (assuming they exit the market on an economic basis).

- Thus, with new entry being delayed, and exit being delayed, the competitiveness of the market appears to be adversely affected, compared with the current market.

This example illustrates that the transitional access arrangements can affect investment decisions in ways other than via locational signals.

The impacts of OFA on investment signals are less clear in the case where partial transitional access is allocated equally to existing generators and new entrants (or in the case where no transitional access is allocated for free). In this case:

1. The fixed costs of new entrants are increased, and wholesale prices will need to increase further before new investment occurs.
2. The fixed costs of existing generators will also increase, such that a relatively higher wholesale price will be required to prevent exit (compared with the current market). This increase in fixed costs may be sufficient to cause retirement or mothballing of plant, in which case it could accelerate the increase in wholesale costs to the point where new entry is supported. Alternatively, the increase in fixed costs may not be sufficient to cause exit of any existing generator, in which case wholesale prices could be expected to remain unaffected, and the profitability of existing generators would be reduced.

These dynamics are likely to be complex and difficult to predict. However, it appears clear that the transitional access arrangements can affect investment patterns in ways beyond locational signals, and may affect the relative competitiveness of different technology types in ways that may not be in the best interests of consumers.

In a general sense, creating a competitive disadvantage for new entrants by adding a new cost to new entrants, while not applying the same cost to existing generators is not in the interests of consumers. This will make it relatively more difficult for new entrants to enter, reducing the competitiveness of the market. Generally, it is in consumers' best interests to enhance competitiveness, ensuring supply of electricity at the lowest possible cost.

Summary

The transitional access arrangements for OFA are likely to influence the investment decisions of new entrants, and the exit decisions of existing generators. These effects are likely to be complex and difficult to predict, but it appears clear that creating a competitive disadvantage for new entrants by giving free access to existing generators and not new entrants will slow the transition of the electricity sector. The entry of new entrants will be delayed, and the exit of existing generators is also likely to be delayed. The impacts of this delay upon consumers need to be carefully examined and understood.

1.5 Designing an OFA transition that is robust to various climate policies

The AEMC correctly identifies that it is not their role to promote the transition of the power system to low emissions technologies; this goal should be articulated at a Government level, and developed into policy mechanisms at that level.

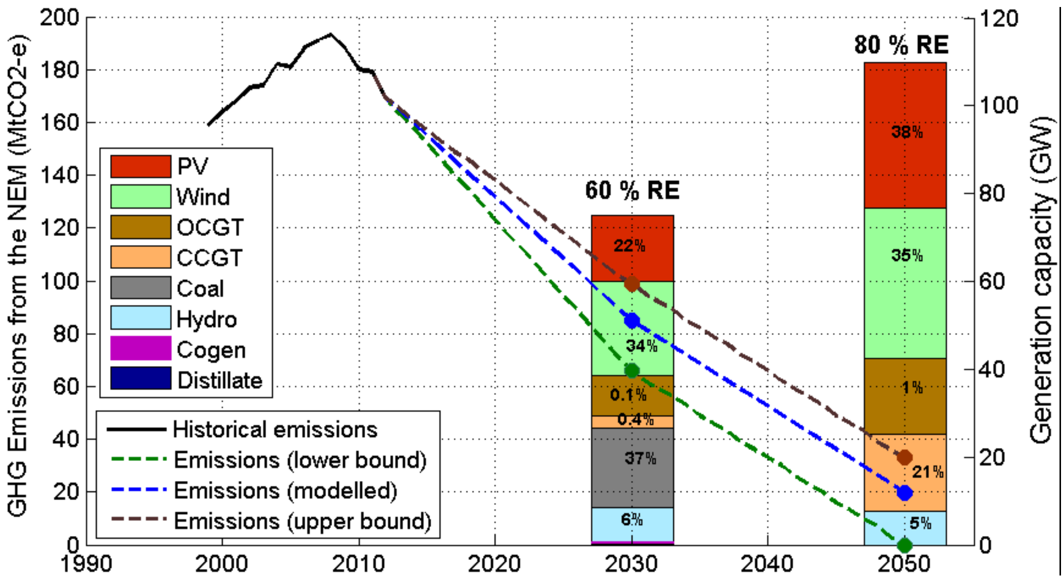
However, in considering a large market reform (such as the introduction of OFA) it is surely important for the AEMC to ensure that the manner in which this policy reform is implemented will be robust to any anticipated policy mechanisms that are likely to be implemented in the coming decades. Thus, it is important for the AEMC to ensure that the transitional mechanisms for implementing OFA will coherently operate in a market where low carbon transition policies have been implemented. Given the very large uncertainty over the nature of those policy mechanisms at present, it would appear wise to make the OFA transitional approach robust to a wide range of possible mechanisms.

The OFA transition will overlap with the low carbon transition

It is important to recognise that the OFA transition is likely to overlap significantly with the period of transition to low carbon technologies. For example, Figure 2 illustrates the historical GHG emissions levels from the NEM, with a range of trajectories for the future based upon the recommendations by the Australian Government Climate Change Authority [8]. The CCA recommends a GHG budget for the period to 2050, such that higher emissions earlier would necessitate lower emissions later. For 2030, the CCA recommended range of 40-60% reductions from 2000 levels by 2030 is illustrated. For 2050, the upper bound is provided by the legislated 80% reduction target from 2000 levels, and the lower range is the zero emissions level indicated by many of the CCA recommended trajectories.

Based upon detailed modelling by UNSW [9], the lowest cost generating portfolios for 2030 and 2050 (including the assumed probability of a carbon price) are illustrated in Figure 2. These portfolios which minimise cost and cost risk also achieve the required emissions reduction ranges. The emissions associated with these portfolios are indicated by the blue dotted line in Figure 2. This modelling indicates that to meet the recommended emissions trajectories at lowest cost, the NEM would need to achieve around 60% renewable energy by 2030. If OFA is proposed to begin implementation in 2022, and transitional access is gifted for periods of decades, it is clear that OFA transition and the clean energy transition are likely to significantly overlap. This makes it essential to consider the OFA transition in this context, and to ensure that the transition to OFA is robust to policies designed to create changes of this nature.

Figure 2 - GHG emissions trajectories for the Australian NEM in the proportions of national targets recommended for Australia by the Climate Change Authority, with lowest cost portfolios that meet the targets in 2030 and 2050. Percentages indicate the % of energy supplied by each technology.



Interaction with climate policies

Creating a competitive disadvantage for new entrants by giving free access to existing generators, but not to new entrants may interfere with the operation of climate policies, interrupting and skewing price signals in the electricity sector, compared with other economic sectors. This is not likely to be in the interests of consumers, since it is may increase the total cost of climate mitigation (all else being equal).

Interaction with the Renewable Energy Target (RET)

It is unclear whether the present RET scheme will operate in parallel with the OFA transition. If OFA transition doesn't begin until 2022, and the RET is not expanded and extended, there may be little interaction between the two schemes. However, in the absence of a re-implementation of a carbon price, an expansion and extension of the RET is likely to be considered as a "second best" politically palatable policy to achieve emissions reductions in the electricity sector over the longer term. Therefore, a robust OFA transition approach should be able to operate in parallel with the RET scheme, anticipating that it could be extended.

By increasing the fixed costs of new entrants, OFA is likely to increase the Large-scale Generation Certificate (LGC) price necessary to support the entry of renewable generation under the RET. Previous analysis suggests that the shortfall charge in the RET may not be sufficient in the absence of a carbon price [10]; the introduction of OFA will likely exacerbate this insufficiency. This means that the LGC shortfall charge will probably need to increase in order for the RET targets to be met, if OFA is implemented before the end of the RET scheme.

If the LGC shortfall charge is increased sufficiently, then the introduction of OFA may have limited impact upon the operation of the RET scheme, regardless of the transitional arrangements applied.

Nearing the end of the RET scheme, further renewable development is likely to be delayed if a competitive disadvantage for new entrants is introduced through the transitional access arrangements (as described in section 1.4).

Interaction with carbon pricing

Although Australia's carbon pricing mechanism has recently been repealed, it is reasonable to expect that a similar scheme to price carbon could be introduced in future. Pricing carbon is widely agreed to be an optimal policy mechanism for achieving efficient climate mitigation, as evidenced by the introduction of such schemes in many countries and regions around the world [11].

Carbon pricing ideally allows efficient mitigation of greenhouse emissions by providing an equivalent price signal in different economic sectors, allowing market participants across widely differing sectors to make investment decisions taking that cost into account. The electricity sector is an important sector for climate mitigation in Australia, given that it accounts for more than a third of national greenhouse emissions, and also is likely to have many of the most accessible and commercially available opportunities for carbon abatement.

If the introduction of OFA creates a competitive disadvantage for new entrants by increasing their costs relative to existing generators, this has the potential to skew the impact of the carbon pricing signal in the electricity sector. The carbon price will need to reach higher levels to achieve mitigation in the electricity sector. This will mean that other economic sectors will be undertaking relatively larger amounts of climate mitigation than may be economically efficient, while the electricity sector makes a relatively smaller contribution to national mitigation activities. This would not appear to be in the best interests of consumers, since it would likely increase the total cost of climate mitigation across the economy.

Summary

Creating a competitive disadvantage for new entrants may have the potential to skew the effects of a mechanism such as carbon pricing on the electricity sector. Diluting the intended action of this mechanism would not appear to be in the best interests of consumers.

1.6 Alternative Transitional Access Proposals

As outlined in CEEM's previous working paper on OFA, there are a number of alternatives that could be considered for the transitional process. Three possibilities are outlined here.

1.6.1 Alternative model 1 – No free access

Under this proposal, no free access would be given to any market participant (with the possible exception of a brief learning period of perhaps 2-3 years). Firm access could be auctioned progressively over time.

Under this approach it would be important to manage the initial auction of the network, particularly in relation to contract lengths. If the existing network were auctioned over a very brief period with long contract lengths, new entrants could be effectively locked out of the auction process (since they are not present to participate over that brief time period). Therefore, it may be worth considering an initial auction with short term access only, particularly relating to the existing network. If the TNSP does not need to undertake a significant augmentation to support the sale of firm access, short term access may be an appropriate way of avoiding lock out effects for new entrants.

We note the AEMC's objections that this approach will "delay or dilute" the benefits that OFA is intended to provide. We argue that the detrimental effects of delaying or diluting the onset of full OFA may be minimal compared with the detrimental impacts upon consumers from creating competitive disadvantage effects, or raising barriers to entry[9]. Quantification of these effects would appear wise to allow a better comparison of the merits and disadvantages of each transitional approach.

1.6.2 Alternative model 2 – Scaled access for new entrants

An alternative transitional access proposal was outlined in CEEM's previous working paper [1], and is summarised again here. Under this approach, the amount of access allocated for free to each generator would be ramped downwards gradually over time. Access would continue to decrease until it reaches zero at some future date, as illustrated in Figure 3. This would be the same date for all market participants, minimising rent seeking behaviour. If a generator retires before that date, they would be allowed to sell their remaining transitional access (reducing over time), thus removing barriers to exit.

Most significantly, under this approach, ***any new entrant during the transition period would also be allocated transitional access***, on an equal footing with incumbents. Incumbents at the relevant network locations would have their transitional access scaled back accordingly, so that the total access allocated at that location reflects the proportion of transitional access available to all market participants at that time.

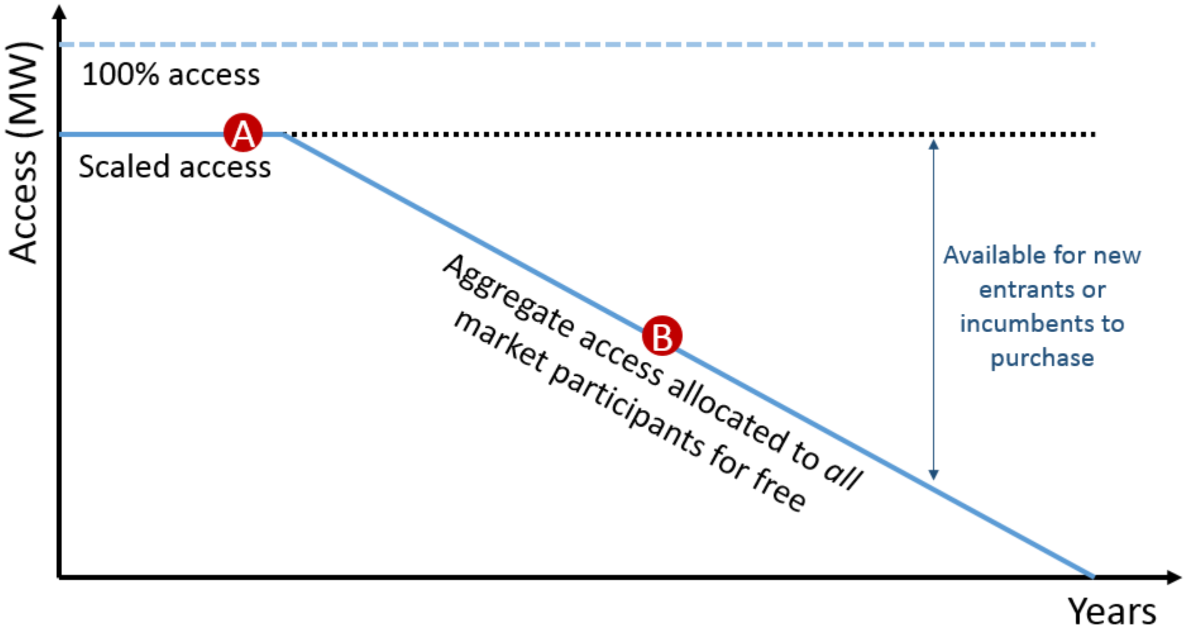
For example, if a new entrant enters the market at time A (shown in Figure 3), the proportion of scaled access available to every market participant at the relevant location would be scaled downwards (in a manner analogous to the original scaling process), such that the new entrant receives the same amount of firm access as if they had been present in the market from the beginning.

Similarly, if a new entrant enters the market at time B (shown in Figure 3), they would be allocated the same proportion of free transitional access as all other market participants at that location at that time, and all incumbents at that location would have their access scaled downwards so that the total allocation of transitional access remains at ~50% of the total existing access for the network (in this example).

New entrants and incumbents alike would be able to purchase further access beyond the freely allocated amount if desired. This will be gradually made available to the market over time as the allocation of transitional access decreases.

[9] For example, refer to the comments below in section 1.6.3 on locational signals.

Figure 3 – Alternative Transition Process – Scaled access for new entrants



Over the long term, this approach approximates the level of network access that incumbents could have expected when they invested. Access is provided for free initially, but new entrants can erode this access, as they would in the present system. It could be argued that this approach actually still provides greater certainty of network access over time for incumbents compared with the present system, since the sharing of network access upon the entry of a new entrant will be calculated in a more predictable fashion, rather than based upon the nuances of very small differences in constraint equation coefficients.

This approach removes the Reverse Merit Order Effect issue

This approach removes the competitive disadvantage for new entrants, and therefore minimises the potential for the Reverse Merit Order Effect. It therefore protects consumers from excessive wealth transfers to generators. It also reduces the potential for delaying investment and exit decisions, and inhibiting and skewing the operation of climate policy.

1.6.3 Addressing the AEMC concerns with alternative proposal 2

In the First Interim Report, the AEMC stated that they do not support this proposal for the following reasons [2, p. 114]:

1. *"It would dilute the locational signals for new entrant generators that the optional firm access model is intended to provide."*
2. *"It could lead to significant uncertainty for generators about their transitional access holding over time, affecting their contracting behaviour and therefore diluting the financial certainty that the optional firm access is intended to promote."*

Locational signals

The dilution of locational signals would apply over the period during which transitional access is being provided to new entrants. For this reason, it is proposed that this period should be relatively short. It should only be as long as is required to allow adequate learning, prevent market shock, and account for perceptions of regulatory risk as discussed in section 1.1.

Modelling commissioned by the AEMC, conducted by ROAM Consulting has indicated that the modelled benefits of OFA in terms of locational signals to drive generation investment are minimal in the near term. Most network investment was found to occur later in the study period, meaning that locational signals were relatively less important in the early years. This could mean that any dilution of locational signals would be relatively unimportant.

Furthermore, locational signals would still exist to the extent that new entrants would only have a proportion of transitional access provided. If they wanted full access, they would still need to purchase some amount, providing exposure to locational price signals. These price signals would increase in strength over time, as the proportion of transitional access granted reduces. New entrants are also exposed to significant locational signals even in the present market, related to marginal loss factors, regional pricing signals, and avoidance of congestion. These could be expected to remain important in driving locational decisions, avoiding completely uninformed generation investment during the short transition period.

Although the AEMC has raised a genuine concern with this proposal, this needs to be weighed against the potentially serious concerns about the negative implications of competitive disadvantage for new entrants on consumers. It would appear prudent to quantify the potential scale of these effects to determine which mechanism is likely to produce the best outcomes for consumers. It may be that a minimal dilution of relatively unimportant locational signals during a short period is better for consumers if it avoids potentially serious issues related to competitive disadvantages for new entrants.

Uncertainty and contracting behaviour

As discussed in section 1.1, it is important that existing generators are not given more access for free than they would have reasonably expected when they invested (and there may be good arguments why some should receive less than this amount). In the present market, generators are exposed to the risk that a new entrant will site nearby and erode their present level of access. This risk would be appropriately carried over into the allocation of free access, representing the arrangements current market.

Although the level of free access will be eroded by a new entrant, this does not mean that the total amount of firm access held by any generator would need to decrease. At any point, generators can choose to purchase more access if desired, to increase certainty and support contracting to the level that they find economically optimal[10]. There is likely to be a significant notice period between the period a new generation project is announced, and before it is commissioned and begins operation. This allows time for an existing generator to negotiate the purchase of new firm access if required to support contracting to the desired level. Since this proposed transition approach includes regular reductions in the amount of freely allocated access, new firm access will become progressively available for purchase by existing generators and new entrants alike, if desired.

As outlined in section 1.1, the only reason to provide any level of free access to existing generators (beyond an initial learning period) is to minimise perceptions of regulatory risk, and therefore minimise the cost of capital for new entrants. Under this framework, the amount of free access granted to existing generators would be of an equivalent value to the implicit subsidy that they currently receive for transmission access. This has no relation to the degree of firm access that generators will find it economically efficient to hold, to support contracting. Generators will be able to purchase (or sell) access to reach that level, and provide the degree of certainty that they find optimal, regardless of whether that access is allocated for free, or purchased.

Procuring more access due to the entry of a neighbour certainly causes existing generators to incur an additional cost, but it does not change the total amount of access that they should find it optimal to hold. Provided that access is available for purchase in secondary markets, we disagree that this proposal is likely to significantly affect contracting behaviour, or dilute financial certainty.

1.6.4 Alternative proposal 3 – Free access only for renewables and peakers

Another alternative worthy of consideration would be to give free transitional access to incumbent renewables and peaking generators, but not to incumbent coal-fired generators. This may offer a way of gifting a very small amount of transitional access (minimising the wealth transfer from consumers to generators by ensuring that the majority of generators pay for firm access, offsetting TUoS charges), while simultaneously minimising any potential increase in the cost of capital for new entrants.

We acknowledge that this enters into the territory of non-technology neutrality. While this is not necessary prohibited by the National Electricity Objective, it would generally not be recommended. However, in this case it may offer the best outcomes for consumers over the long term, and therefore it would appear that it should be considered. The merits and disadvantages of this approach could be quantified and compared with other approaches through studies as suggested in section 1.7.

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[10] However, we do acknowledge that the price at which an incumbent could purchase further firm access may change over time, which could contribute to greater uncertainty. This may make longer term contracting more difficult, where it is founded upon transitional access, and may devalue transitional access compared with purchased firm access. However, this issue should only arise in cases where generators are contracting more than 2-3 years in advance, which we believe is rare. In our understanding, longer term contracts are typically only signed by new entrant market participants, as a condition of financing. In this case, additional assurances on the ability to retain the given level of firm access may be required.

1.7 Suggested further analysis

Based upon the analysis outlined in this working paper, we make a number of suggestions for the progression of the OFA design process:

TNSP study to quantify access prices

One of the major challenges that prevents meaningful analysis of the impacts of OFA transitional approaches is the absence of any indication of the magnitude of access prices. For example, it is unclear whether access procurement will increase the long run marginal costs (LRMC) of new entrants by \$0.01/MWh or \$30/MWh. Market outcomes will be very different in either case.

It would significantly aid analysis to have an indication of the scale of access charges that are likely to apply. It would be of great benefit to commission at least one transmission network service provider (TNSP) to calculate indicative access prices for their network, based upon the approach outlined by the AEMC.

This would have the additional benefit of highlighting any challenges and issues with the proposed access pricing calculation methodology. The LRIC methodology appears likely to be complex to implement in practice, and this indicative study would highlight any challenges that might be insurmountable, or that need to be refined.

We understand that the AEMC is undertaking a modelling process for this purpose at the moment, and we look forward to analysing and utilising the results of that study.

Modelling study to quantify pricing effects and investment changes

As highlighted in section 1.3 and section 1.4 different transitional approaches appear to have the potential to affect wholesale market prices, and investment patterns in different ways. The dynamics are difficult to predict. Given that effects such as the Reverse Merit Order Effect could have significant implications for consumers, it would appear prudent to commission a detailed modelling study that attempts to capture and quantify these effects, particularly taking account of any issues related to competitive disadvantages for new entrants.

Study to quantify cost of capital effects

A potentially large wealth transfer from consumers to existing generators is being contemplated through the proposed transitional access arrangements. Given that the only reason for this wealth transfer is to prevent an increase in the cost of capital for new entrants, it would appear prudent to commission a study to quantify the likely impacts on the cost of capital, if different transitional arrangements are implemented. The aim of this study should be to determine the best way to minimise the cost of capital for new entrants, while minimising the wealth transfer from consumers to generators. This should involve exploring the impacts of range of options described in this paper, as well as other innovative alternatives.

Transitional access options to consider

This analysis suggests that the following options for transitional access arrangements would be suitable to consider in the above mentioned studies:

1. ***No free access is given to any market participant*** – The aim in examining this option would be to quantify any anticipated impacts on the cost of capital for new entrants, and determine whether the costs passed through to consumers from that effect would outweigh the payments received from all generators for free access (offsetting TUoS charges). The size of those payments would be representative of the wealth transfer from consumers to generators, if that access were given for free. Free access could be allocated for a brief learning period (2-3 years) if desired, and then rapidly scaled back to zero.
2. ***Free access is equally given to incumbents and new entrants*** – this approach would remove any issues related to competitive disadvantage, but would still risk making an unnecessary wealth transfer from consumers to generators if the allocation is larger than required, and may still encourage rent seeking behavior.
3. ***Free access is given only to incumbent renewables and peaking generators*** – Under this approach, the aim would be to minimize perceptions of regulatory risk specifically for anticipated new entrants (renewables and peakers). The influence of not giving free access to any coal-fired incumbent generators on the cost of capital for new entrants could be quantified, and the impacts on consumers determined. This option may offer an alternative that allows for minimal gifting of free access to market participants, limiting the wealth transfer from consumers to generators, while still minimizing any potential increase in the cost of capital for new entrants[11].

2 Facilitating significant network expansion

Studies indicate that significant network expansion will be necessary to achieve an efficient transition to low emissions energy [12, 13, 14]. Many renewable resources are located far from the present transmission grid, and far from load centres. However, under the present regulatory framework it appears that it will be challenging to construct these networks in an efficient manner, if at all. The OFA model could

[11] Impacts on the cost of capital for refinancing of coal-fired assets could also be quantified, but financing arrangements for the debt of existing assets will not impact on their ongoing operation in the NEM or costs to consumers. Although higher financing costs may result in write downs of asset values, these do not change generators' short-run costs, position in the dispatch merit order, or market power, assuming that all participants are acting rationally as profit-maximising entities. Therefore, market prices and hence consumer costs will be unchanged.

An increase in fixed costs from the purchase of firm access could potentially accelerate retirements if it is not balanced by increased revenue or improved contracting positions, but this is separate to the cost of capital issues being considered in this section.

provide an important framework for facilitating these network expansions in an efficient manner. It may be important for this potentially beneficial aspect to be taken into consideration when determining whether to go ahead with implementing the OFA proposal.

2.1 The current framework in Australia

The arrangements for network connections and the construction and funding of network extensions in the NEM are set out in Chapters 5 and 6A of the National Electricity Rules (NER). Essentially, the NEM operates an open access regime whereby network companies are obliged to facilitate connections to the shared network, subject to security and reliability requirements. The market also uses the 'causer pays' principle such that when transmission costs can be attributed to a specific user, that party should be liable for the costs incurred. In the case of connecting a single remote renewable energy project the costs attributable to that generator would typically be unambiguous.

Broadly, there are two options for the transmission connection services available to a new-entrant generator at present [15].

- A transmission investment can be a Prescribed transmission service if it has passed the RIT-T. In this situation the funding is recovered from the customer base of the network utility.
- The network utility can provide either a Negotiated or a Non-regulated transmission service whereby the new transmission asset is funded by the generator.

The AEMC has demonstrated that there are barriers to this type of investment occurring via either of the two options noted above.

Applying the RIT-T to the investment is likely to be problematic, in part due to the difficulties in defining the base case and alternative options that the proposal will be compared against [16]. The allocation of potential benefits such as lower RET certificate prices (as contemplated in [17]), or lower pool prices, owing to subsequent renewable energy connections would also be problematic because market contracts limit the extent to which these benefits can be passed onto customers.

Typically it would not be feasible for a remote renewable generator to fund and build a long transmission line to connect to the shared network. This is due to the high cost of transmission infrastructure, and the specific characteristics of wind and solar projects. This has been addressed in Australian and International studies, including [17] and [18]. Instead, a viable option may be for the transmission costs to be shared if multiple generators were to connect in the same area. If generators are ready to connect simultaneously this can be coordinated. However, if connections are expected over a period of time it may be efficient to initially oversize a transmission asset to cater for the expected future connections.

There are disincentives for a generator, or group of generators, to fund the transmission line because under the current framework those generators would not be able to own the asset, have control over who can connect to it, or have guaranteed access rights to use it [15, 19]. In [15], the AEMC notes that: "The lack of clarity regarding access rights…may provide a disincentive for first mover generators to fund additional capacity". This situation represents a first mover disadvantage and the free rider problem in that non-funding generators could subsequently connect at lesser expense.

Owing to these barriers, transmission-connected wind and solar energy developments to date have typically not been in remote areas.

As the most easily and economically accessible renewable energy resources are utilised, it is expected that more remote resources will be considered. Such resources are currently considered to be 'stranded' as they are not close to existing transmission infrastructure. For example, the wind resource of King Island in the Tasman Strait has been described as being stranded [20], although Hydro Tasmania is currently conducting a feasibility study for a new interconnector that would allow access. Also a study has demonstrated how 2000 MW of wind energy on the Eyre Peninsular in South Australia could be 'unlocked' by a series of transmission investments [21]. Looking further ahead, the viability of geothermal energy is dependent on connecting these very remote locations; projects in the Cooper Basin could require transmission lines of around 1000 km in length [17]. The efficient development of remote projects such as these will likely require shared transmission assets, and therefore shared capital costs, for these resources to be accessed.

2.2 The Scale Efficient Network Extensions Rule Change

The issues discussed above were contemplated in a 2008 market review undertaken by the AEMC. The *Review of the Energy Market Frameworks in light of Climate Change Policies* considered whether existing frameworks would operate efficiency once an emissions trading scheme and an expanded Renewable Energy Target (RET) were implemented [22]. It was anticipated that the RET would cause the establishment of clusters of new renewable generators in certain remote areas. However, the existing frameworks are not well structured to capture the efficiency gains from connecting these generators in clusters when these generators are not connecting at the same time. As well as the first mover disadvantage and free rider problem noted above, there is also no incentive for network utilities to oversize a transmission asset in anticipation of generators connecting the future.

The SENE proposal

To address this, the AEMC recommended that the Ministerial Council on Energy (MCE) submit a Rule change proposal for Scale Efficient Network Extensions (SENEs); the MCE did so in December 2009. The AEMC subsequently published a Consultation Paper [23] that details the key elements of the SENE proposal:

i. the Australian Energy Market Operator (AEMO) would identify possible SENE zones as part of the National Transmission Network Development Plan (NTNDP);
ii. NSPs would identify credible connection asset options for the SENE zones identified by AEMO and undertake preliminary planning, to be reported in their Annual Planning Report (APR);

iii. NSPs would publish a planning report and standard connection offer for each SENE zone, including technical design issues and annual charges payable by generators who connect to that asset based on a forecast generation profile;
iv. AEMO and the Australian Energy Regulator (AER) would have regulatory oversight roles, including a requirement that AEMO reviews the relevant NSP's forecast generation profile and an opportunity for the AER to disallow the project;
v. the connection offer would contain an agreed power transfer capability, including compensation arrangements where a generator is constrained off below its agreed capability;
vi. construction of the SENE would be triggered by agreement on the connection offer by at least one generator;
vii. a charging framework that requires connecting generators would pay for the share of SENEs that they use. Consumers would pay for any revenue requirement not recovered from generators, where fewer generators connect or connect later than was planned for; and
viii. a review of the policy would be undertaken by the AEMC and provided to the MCE after five years to ensure the anticipated benefits are being achieved.

During the course of the *Climate Change Policies* market review, stakeholders provided examples of the potential benefits of SENEs. A Victorian Distribution Network Service Provider (DNSP) identified a circumstance where four generators could be connected over 35 km of line at a saving of $12 million over the alternative where they were each connected individually [16]. Grid Australia gave an illustrative example in which there was a 50% saving on the capital cost to generators from using the SENE approach [24]. The AEMC considered that the potential for scale efficiencies was greater at the transmission level than at for the distribution network [25].

Rule change process

Following the Consultation Paper the AEMC published an Options Paper [15] in which it observed that the initial support for the proposal had, "been tempered by the complex nature of the proposed Rule and the implementation difficulties that it poses". A key concern was that consumers were exposed to the risk of stranded transmission assets.

The Options Paper presented five options. Options 1 and 2 were similar to the original SENE proposal; the key differences were that they both specified that 25% of the SENE must be subscribed to before it could be built, and Option 2 included an economic test for market benefit and excluded regulated compensation. Under Option 3 the first generator would pay their stand-alone cost and a RIT-T would be performed on any additional capacity. The additional capacity would be funded permanently by TNSP customers, while generators connecting in the future would contribute to the initial costs of the first generator to connect. Option 4 also involved a RIT-T on the capacity above the needs of the first generator; however the cost of the incremental capacity would be transferred to generators connecting in the future rather than remaining with the TNSP customer base. In Option 5, a RIT-T was performed on the whole SENE, if it passed then all generators (including the first generator) would pay their proportional cost (i.e. the cost they would pay when the SENE is fully subscribed), as opposed to the stand alone cost specified in Options 3 and 4.

The options were assessed against five criteria:

- generators are able to connect in a timely manner;
- generators face efficient locational signals;
- potential to capture scale economies;
- frameworks are not overly complex; and
- stranded asset risk is appropriately managed.

Analysis by Wright [26] of stakeholder submissions demonstrates the lack of consensus as to which option, if any, was the most suitable. Eight submissions opposed the proposals, 10 were in favour, and a further eight were undecided or neutral. Wright observed that stakeholders who benefit under the current arrangements opposed the proposal, while those in favour included utilities with investments in renewable energy and organisations seeking to encourage the uptake of renewable energy.

Following the Options Paper, the AEMC published the Draft Rule [25]. In the Draft Rule the AEMC proposed a "more preferable Rule" which was different from both the original proposal by the MCE and the five options presented in the Options Paper. Despite stakeholder concern that the new proposal was inadequate and "essentially upholds the status quo", the Draft Rule was maintained in the promulgation of the Final Rule.

The Final Rule is compared with the original proposal in Table 2. The Final Rule specifies that a TNSP is to investigate the potential for a SENE if the investigation is requested and funded by a project proponent. The scope of the study will be established through negotiations between the TNSP and the entity requesting the study; the completed study is to be published on the website of the TNSP. Equipped with this information, developers and other market participants are then able to decide whether or not to fund the SENE. As the pre-existing framework remained unchanged, the party funding the SENE would not be able to own, operate or control the asset, nor influence who may or may not connect to it.

Table 2 Comparison between the Proposed Rule and the Final Rule for Scale Efficient Network Extensions

Key design feature	Proposed Rule	Final Rule
Trigger for considering a SENE	AEMO to identify SENE zones, NSPs to identify credible options for connection to network.	Any entity willing to fund a SENE feasibility study can request the TNSP to undertake the study.
Investment test	Signed connection agreement with at least one generator. Consultation on	Whether or not an entity is willing to fund the SENE and bear the associated risks.

	optimum size of asset.	
Cost allocation and charging methodology	Generators pay for share of the SENE that they use. Consumers pay for any revenue requirement not recovered from generators.	SENE funded by generator, TNSP, government, or other third party. Terms by which SENE funder is reimbursed are subject to negotiation with TNSP.
Access provisions	Connection offer contains an agreed power transfer capacity and compensation provisions if generator is constrained-off below this agreed transfer capacity.	Existing connections framework. Any subsequent generators could negotiate with TNSP for connection; SENE funder no influence in decision.
Regulatory oversight	AEMO to review NSP forecasts, while AER has power to disallow project.	No explicit role. Enforcement of National Electricity Rules by AER.

Reasoning behind decision

The AEMC judged that the Final Rule, by allowing for the identification of potential benefits of a SENE, would allow for generators to make more efficient investment decisions. It overcomes any information asymmetry between TNSPs and other market participants while protecting consumers from the risk of stranded assets. The AEMC's reasoning for why the Final Rule would be more efficient than the options previously considered was threefold:

- It more efficiently allocates the risk of stranded assets by allocating it to those best able to willing to manage the risk, i.e. market participants and investors rather than consumers.
- It maintains a market-based approach rather than requiring non-market facing entities (i.e. AEMO and the AER) to take risks on generator investment decisions.
- It is less complex as it maintains the current arrangements for access and connection.

In analysis by Wright it is deemed unlikely that any SENE will be progressed under the Final Rule. It is demonstrated that the Final Rule does not provide any incentive for generators or TNSPs to construct a SENE; nor does not correct the first mover disadvantage.

In light of this, the decision of the AEMC can be explained by the scope of the National Electricity Objective (NEO). It is notable that this objective does not contain an environmental objective [27]:

> *"To promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to –*
>
> *a. price, quality, safety, reliability and security of supply of electricity; and*
>
> *b. the reliability, safety and security of the national electricity system."*

All rule changes must promote the NEO. As discussed by Wright, during the SENE rule change process the NEO did not allow for the full quantification of potential SENE project benefits. In regards to the RET, the AEMC states:

> *"It is…not our role to ensure the RET is met, but to ensure any behavioural changes as a result of the RET are accommodated in the most efficient way" [15]*
>
> *"It is the governments' role to ensure that environmental policy objectives are met" [25]*

In promoting the NEO, the AEMC sought to ensure that transmission and generation investment would occur in an efficient manner. An inefficient outcome would involve the duplication of assets if multiple generators connected in the same area but did not coordinate their investments. Understandably this would incur unnecessary cost on consumers. The AEMC decided that the Final Rule was enough to avoid this situation. Owing to the AEMC's position on the RET, the decision was not intended to encourage efficient investment, rather to discourage inefficient investment.

2.3 The OFA framework

The OFA framework, if implemented, could remedy the concerns relating to the perceived complexity of the original SENE proposal, specifically the provisions around access and compensation, and around ownership of the connection asset.

The original SENE rule change proposal specified that the connection offer would "contain an agreed power transfer capability, including compensation arrangements where a generator is constrained off below the agreed capability" [23]. This conflicts with the existing open access regime under which TNSP are obliged to facilitate connection, subject to network security and reliability requirements. Even though negotiated firm access is contemplated by clause 5.4A of the Rules, the AEMC has demonstrated that this would be unworkable under the existing arrangements [19].

It was also deemed problematic as to how the arrangements between the TNSP and generators connected to the SENE would be managed if the SENE was to be subsumed into the shared network [15]. This would seemingly be remedied by the implementations of the OFA model. If OFA was implemented across the shared network, there would no longer be a conflict between the regulation of the SENE, and the regulation of the shared network that was envisaged at the time of the SENE rule change consultation. Furthermore, the "triggers" proposed add clarity to the process of a dedicated connection asset becoming part of the shared network.

If a SENE was to be defined as a dedicated connection asset, then the OFA model would give generators the ability to own and operate the asset, and negotiate access by third parties wishing to connect. Combined with the ability for generators to manage congestion through firm assess rights, the recommendations, if implemented, would be more accommodating to SENE projects. By giving generators more control over the factors that influence their investment, they would have more confidence in the SENE project.

While this appears to overcome the free rider problem, it is still necessary for a generator to individually fund an oversized asset, or collaborate with other generators in order to do so. Since generators would likely be in competition with each other there are likely to remain barriers to this occurring.

2.4 Summary

When considering whether to go ahead with implementing the OFA proposal, it may be important to consider the potential for additional benefits in facilitating significant network expansion to support an efficient transition to low emissions energy sources. It may be appropriate to add this potential benefit to the list of assessment criteria considered by the AEMC.

3 Settlement arrangements

The AEMC Technical Report [3] features extensive discussion of the bidding incentives in the NEM, both under the current market rules and under the OFA framework, as well as conditions where generators would be incentivised to purchase firm access.

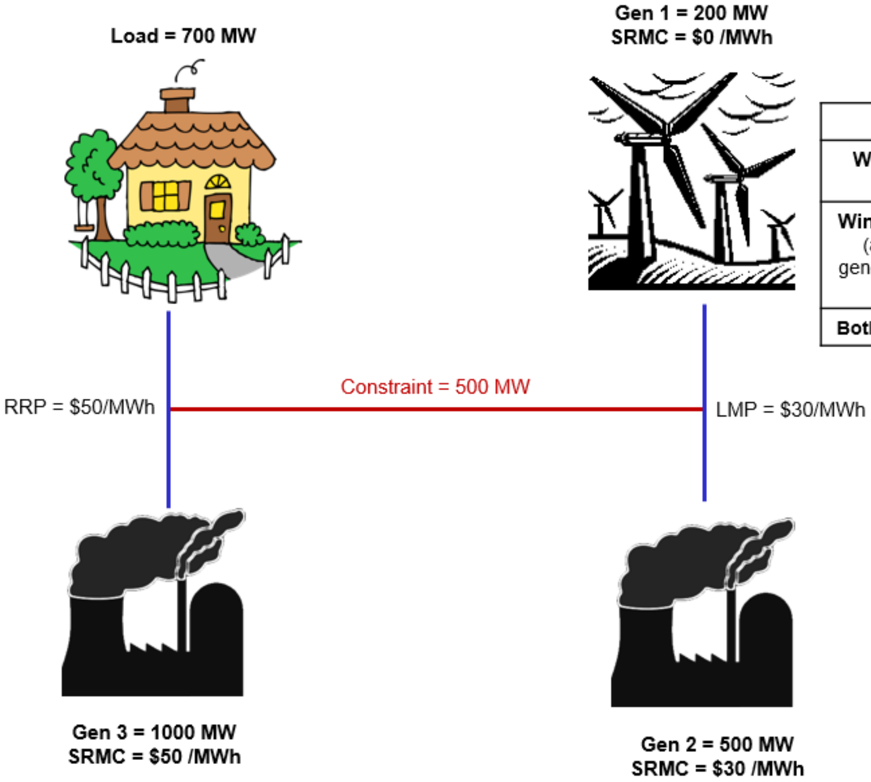
To investigate the implications of the proposed OFA settlement arrangements, CEEM has developed a simple spreadsheet model, based upon the proposed settlement equations in the AEMC Technical Report [3], and applied to a simple test system. In this section a number of issues that appear worthy of further investigation are presented.

3.1 Is firm access valuable to renewable generators?

In response to CEEM's earlier working paper on OFA [1], it was suggested by some stakeholders that renewable generation would not find any value in holding firm access. The basis of this argument was that any generator with very low, zero or negative short run marginal costs (SRMC) is unlikely to be undercut by other generation in the dispatch merit order, and therefore would have the equivalent of "firm" access to the Regional Reference Price (RRP) for free. This would mean that renewable technologies would not obtain any additional value from holding firm access.

CEEM simulated a simple system using a spreadsheet model. In this example, a wind farm with 200 MW available (in this particular period) competes with a thermal generator for access to the RRP via a constrained line. The wind farm is assumed to have a zero SRMC (and to offer its full available capacity at that price), while the thermal generator has an SRMC of $30/MWh (and offers its capacity at that price). The wind farm will be dispatched to 200 MW, and the thermal generator to 300 MW.

Figure 4 – Example of the value of firm access to a renewable generator



	Wind Profit
Wind is 100% Firm	$10,000 /hr
Wind is non-firm (and thermal generator is 100% firm)	$6,000 /hr
Both are non-firm	$8,857 /hr

Settlement outcomes are as follows:

- If the wind farm is fully firm, no compensation is paid. Both generators receive the RRP for the amount that they generate. The wind farm makes a profit of $10,000.
- If the wind farm is non-firm, and Generator 2 is fully firm, the wind farm will pay compensation to the thermal generator. The operation of the wind farm has disrupted the ability of Generator 2 to access the market, so the wind farm must pay compensation, such that Generator 2 is indifferent. This reduces the profitability of the wind farm to $6,000. The wind farm does still make a profit, but the profit is reduced compared to the case where the wind farm held firm access.
- If both generators are non-firm, the access is shared and the wind farm pays a smaller amount of compensation. In this case, the wind farm earns a profit of

$8,857. This is less than the profits the wind farm would have earned if it had full firm access.

This example clearly illustrates that firm access has value, even to generators with a zero SRMC. Profitability during constrained periods will be increased by having firm access.

Of course, the actual amount of firm access that renewable generators may choose to hold remains unclear. Although firm access clearly has value, even for technologies with a zero SRMC, obtaining it will have a cost. Generators will need to weigh the costs against the benefits in deciding how much to purchase.

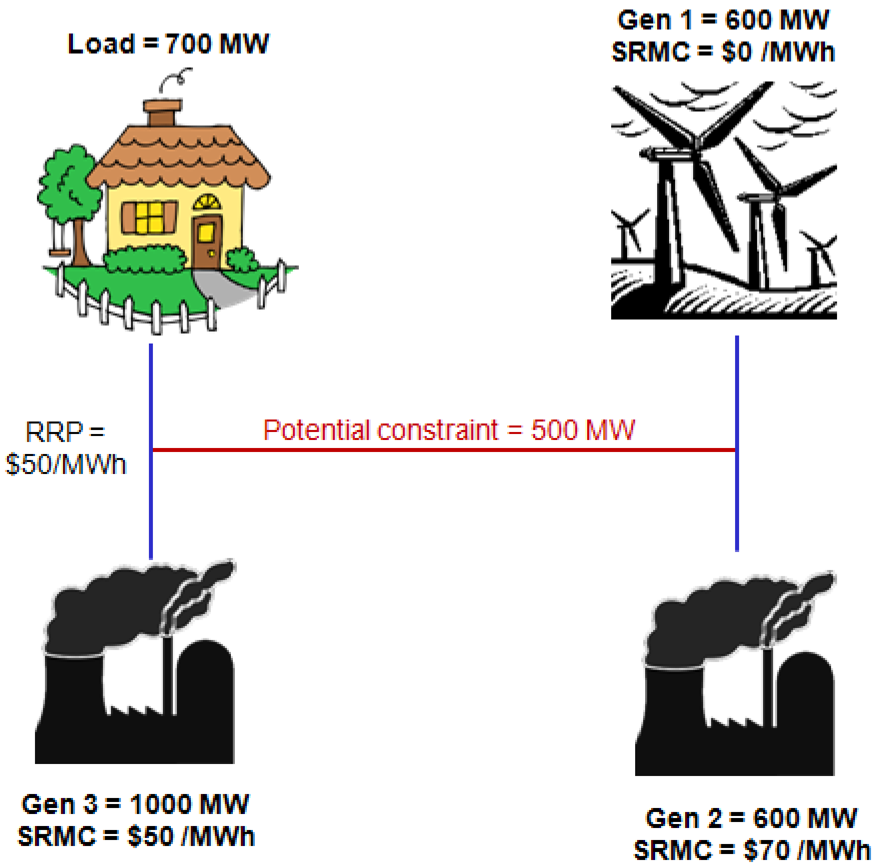
Firm renewable technologies (such as hydro, biomass and geothermal) would presumably find similar benefit in holding firm access to conventional thermal technologies. By contrast, variable renewable technologies such as wind and solar photovoltaics may not be able to obtain as much value from firm access as other technologies, since their availability varies over time. Thus, they may find it optimal to hold firm access for only a proportion of their nameplate capacity.

3.2 Uneconomic bidding strategies

The amount of firm access purchased by a generator only impacts their net margin when the relevant constraints bind. This leads to settlement outcomes and behavioural incentives that are potentially undesirable.

Consider the situation shown in Figure 5 where two generators, a low cost generator (Gen 1, with a short-run marginal cost (SRMC) of $0/MWh) and a high cost generator (Gen 2, with an SRMC of $70/MWh), are on the same side of a potentially constrained (to 500 MW) transmission line to the reference node. In this simple model, a large generator at the reference node sets the regional reference price to $50/MWh. Up to 500 MW of firm access is available for immediate purchase (although additional access could obviously be procured in the future if the constraint was alleviated).

Figure 5 – Example scenario to demonstrate settlement arrangements



The settlement equation for each generator is described by equation (2.1) of the AEMC Technical Report [3]:

$$\text{Generator margin} = (LMP - C) \times G + (RRP - LMP) * A$$

where

LMP = Local marginal price, set by the marginal bidder on the constrained side of the constraint

RRP = Regional Reference Node price, set at the marginal cost of supply at the reference node (in this case, $50/MWh)

and, for each generator:

C = The cost of supply ($/MWh)
G = Dispatched output (MWh)
A = Amount of network access

In practice, this formula is made more complex by the participation of each generator in multiple flowgates and constraints; for the sake of simplicity, we consider generators participating only in a single constrained radial flowgate.

If the line is unconstrained, the local marginal price (LMP) is equal to the reference price. In this case, Generator 1 will be dispatched to its full capacity (600 MW), with a net margin of $30,000/hour. Generator 2 will not be dispatched, provided it bids in merit, nor would it want to be dispatched (as the price it would receive is below its cost).

If, however, the line becomes constrained to 500 MW, there are three possible scenarios.

Scenario 1: Generator 1 is firm

If Generator 1 is firm (for 500 MW), it will receive the RRP for its generation and a net margin of $25,000/hour. Generator 2 will not be dispatched, and will continue to receive a settlement of zero.

This is consistent with the margins that would apply without the OFA framework; therefore, the introduction of the OFA model provides no additional certainty or advantages to Generator 1 in this scenario, compared with the market in the absence of OFA.

Scenario 2: Generator 2 is firm

If the more expensive generator has purchased firm access, the settlement equations will result in Generator 2 receiving a margin of $25,000/hour, while Generator 1 will receive zero. That is, although Generator 2 would not have wanted to be dispatched (and is not), regardless of the transmission constraint, by purchasing firm access they will receive all of Generator 1's potential settlement payments.

Although OFA intrinsically requires lower cost generators to compensate more expensive generators, it appears inappropriate that this should apply when the more expensive generator would not otherwise have been dispatched and neither generator has purchased firm access.

Scenario 3: Neither generator is firm

Section 12.7 of AEMC Technical Report [3] proposes that all non-firm generators will receive pro-rata access based on their availability. In this example, if both generators had an availability of 600 MW, both would receive access of 250 MW, and hence settlements of $12,500/hour.

Again this results in revenue for Generator 2 at the expense of Generator 1, even though Generator 2 was not dispatched and would not have wanted to be dispatched even if they had been able in the absence of the constraint.

In this instance, the implicit access sharing assumed for non-firm generators results in a windfall gain to the higher cost generator at the expense of the lower cost generator. This would appear to place pressure on lower cost generators (e.g., renewables) to purchase firm access even though they would be the preferred economic dispatch by the system.

Uneconomic bidding

The step change in generator revenue depending on whether a constraint binds could lead to a new class of disorderly bidding, where Generator 1 will try to withhold capacity to unbind the constraint[12]. This could lead to suboptimal generator bids and economic outcomes, especially in the case where there are *multiple* lower cost, non-firm generators, who are attempting to ensure that the transmission constraint never binds, which would result in them losing all revenue to the firm generator. Without collusion, this is likely to lead to either too little generation being offered (and hence suboptimal market outcomes), or to the constraint binding, and hence payments to the firm, but not dispatched, generator and a loss of revenue to the low cost generators.

Alternatively, Generator 2 may try to *create* congestion. Although this is unlikely in the above example, real world flowgates in the NEM are rarely simple radial constraints; rather, they depend on the output of many generators and interconnectors, often widely geographically dispersed. Gentailers with large portfolios may be able to cause constraints to bind at favourable times and in favourable locations, therefore improving their portfolio outcomes while increasing the overall system costs.

We suggest that further quantitative analysis of the OFA implementation is required to understand the significance of these impacts and whether the reduction in current strategic bidding strategies (e.g., race to the floor) outweighs potential new inefficiencies that may be introduced.

4 Next Steps

We look forward to discussing these issues further with the AEMC. We also welcome input from other stakeholders and interested parties.

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