AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Consultation Paper – Draft Competition Benefits Inputs, Assumptions and Methodology

October 2021

Consultation Paper

For Integrated System Plan (ISP)

Important notice

PURPOSE

AEMO publishes the Consultation Paper – Draft Competition Benefits Inputs, Assumptions and Methodology pursuant to section 5.22.8(d) of the National Electricity Rules (NER). This Consultation Paper includes key information and context for the methodology proposed to be used by AEMO to quantify competition benefits as part of the ISP process.

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VERSION CONTROL

Version	Release date	Changes
1.0	15/10/2021	Initial release

Executive summary

Notice of consultation

The *Integrated System Plan* (ISP) is a whole-of-system plan that provides an integrated roadmap for the efficient development of the National Electricity Market (NEM) over the next 20 years.

Leveraging expertise from across the industry is pivotal in developing a robust plan that supports the long-term interests of energy consumers. AEMO is committed to facilitating a stakeholder engagement process that ensures a collaborative approach to developing the 2022 ISP.

When developing an ISP, the National Electricity Rules (NER) require AEMO to develop, consult on and publish the ISP Methodology and *Inputs, Assumptions and Scenarios Report* (IASR) in accordance with the Australian Energy Regulator's (AER's) *Forecasting Best Practice Guidelines*[1] ('FBP Guidelines').

AEMO has completed this process for the 2022 ISP:

- The 2021 IASR was published in July 2021.
- The ISP Methodology was released in August 2021.

The purpose of this Consultation Paper is to commence a single-stage consultation process in accordance with the FBP Guidelines on both the IASR and ISP Methodology, specifically in relation to competition benefits. The IASR and ISP Methodology otherwise remain unchanged.

Competition benefits and the ISP

Section 5.22.10(c)(1) of the NER requires AEMO to consider a range of market benefits as part of preparing an ISP. These classes of benefits are documented in the NER and further discussed in the AER's *Cost benefit analysis guidelines* ('CBA Guidelines'). Competition benefits are one type of market benefit referred to in the NER and CBA Guidelines.

In the ISP Methodology, AEMO concluded that it will not by default include competition benefits in its CBA analysis. However, AEMO noted that competition benefits could be included by transmission network service providers (TNSPs) as part of subsequent Regulatory Investment test for Transmission (RIT-T) analysis on any actionable projects.

AEMO's decision to not routinely calculate competition benefits as part of the ISP Methodology was driven by the significant complexity and uncertainty associated with modelling these benefits. This complexity and input uncertainty is compounded when considering benefits of multiple projects that collectively form a candidate development path (CDP), rather than individual elements that meet an identified system need. AEMO therefore concluded that the estimated cost of undertaking the analysis to quantify the market benefit is likely to be disproportionate, given the level of uncertainty regarding future outcomes.

It is, however, foreseeable that some CDPs may be more likely to provide material competition benefits than others. By limiting the calculation of competition benefits to these CDPs, and making some simplifying assumptions, the analytical complexity could be reduced so that the materiality and volume of competition benefits can be considered in the ISP.

[1] AER. Guidelines to make the integrated system plan actionable, at https://www.aer.gov.au/system/files/AER%20-%20Forecasting%20best%20practice%20guidelines%20-%2025%20August%202020.pdf.

With assistance from Ernst & Young (EY), AEMO has therefore developed a simplified methodology for calculating competition benefits for CDPs within an ISP that could be applied when this class of benefit may materially impact the outcomes of the optimal development path (ODP).

The proposed ISP competition benefit methodology, along with associated inputs and assumptions, is the subject of this consultation.

Competition benefit modelling methodology

The Draft Competition Benefits Inputs, Assumptions and Methodology Report developed by EY outlines the methodology, inputs and assumptions AEMO proposes using to calculate competition benefits for a CDP if it considers this class of benefit could be material to the ODP. It also outlines the inputs and assumptions AEMO proposes using in the 2022 Draft ISP to calculate competition benefits.

The Draft Competition Benefits Inputs, Assumptions and Methodology Report is available at https://aemo.com.au/consultations/current-and-closed-consultations/competition-benefits-in-the-ISP.

Section 2 of this Consultation Paper draws stakeholder's attention to the areas of the proposed methodology prepared by EY to calculate competition benefits that AEMO considers to be of highest importance for consultation, as they could have a material impact on any assessment of competition benefits:

- **Strategic bidding and finding the Nash Equilibrium** – the appropriateness of limiting the strategic participation in the game theoretic model to coal-fired generators.
- **Selection of the generation development plans –** the appropriateness of keeping the generation and storage investment fixed as per the 'no network development' counterfactual case when determining the level of competition and hence competition benefits with and without the CDP.
- **Competition benefits due to a demand response –** the appropriateness of including this type of competition benefits given that the calculation of this carries significant uncertainty and high computational burden and is influenced by the selection of generation development plans noted above.
- **Applicability to the ISP framework** – the appropriateness of the proposed rationalisations to make the calculation of competition benefits in an ISP tractable, including selecting the circumstances where the calculation of competition benefits could materially affect the outcome of the CDP assessment, and choosing the time horizon and scenarios to model in these circumstances.

Section 3 highlights the proposed inputs and assumptions for calculating competition benefits.

The methodology broadly follows the approach EY applied to calculate competition benefits for HumeLink in TransGrid's PACR, but aims to be generic enough to be adapted to CDPs that, in AEMO's view, may provide material competition benefits.

Invitation for written submissions

All stakeholders are invited to provide a written submission to the questions outlined in this Consultation Paper, and on any other matter related to the methodologies, inputs and assumptions for calculating competition benefits relevant to the ISP process. Submissions need not address every question posed and are not limited to the specific consultation questions noted in this Paper, but should be limited to aspects related to competition benefits.

Submissions should be sent via email to ISP@aemo.com.au and are required to be submitted by Sunday 14 November 2021. All submissions should be provided in PDF format. Please identify any parts of your submission that you wish to remain confidential and explain why.

AEMO requests that, where possible, submissions should provide evidence and information to support any views or claims that are put forward and suggest alternate implementable approaches if there is disagreement on the approach proposed.

Next steps

The single-stage consultation process begins upon the release of this Consultation Paper. The next steps in the consultation process are summarised below.

Step	Date
ISP stakeholder workshop to provide stakeholders opportunity to ask questions of clarification	26 October 2021
Consumer workshop to allow consumers to provide verbal submissions as an alternative to written submissions	28 October 2021
Written submissions to this Consultation Paper are due	14 November 2021
Publication of the updated ISP Methodology and IASR	10 December 2021

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1. Introduction

1.1 Background

Section 5.22.10(c)(1) of the National Electricity Rules (NER) requires AEMO to consider a range of market benefits as part of preparing an *Integrated System Plan* (ISP). These classes of benefits – which are documented in the NER and further discussed in the Australian Energy Regulator's (AER's) *Cost benefit analysis guidelines* ('CBA Guidelines') – include:

- Benefits related to the development and operational costs of generation and storage assets.
- Costs associated with demand reduction.
- Changes in network losses.
- Additional option value.
- Changes in ancillary service costs.
- **Competition benefits.**

Section 5.22.10(c)(3) of the NER requires that AEMO treats all the above classes of market benefits as material unless it can provide reasons why:

- A particular class of market benefit is likely not to materially affect the outcome of the assessment of the development path; or
- The estimated cost of undertaking the analysis to quantify the market benefit is likely to be disproportionate given the level of uncertainty regarding future outcomes.

With respect to competition benefits, the ISP Methodology[2] noted that:

- Quantification of competition benefits is a challenging task even when considering a single investment. Including competition benefits throughout the consideration of all alternative development paths on a whole-of-system plan would not be possible in the time available to prepare the ISP, nor would the benefits be expected to be material relative to project costs; and
- AEMO does not by default include competition benefits in the CBA analysis, but they could be included by transmission network service providers (TNSPs) as part of subsequent Regulatory Investment test for Transmission (RIT-T) analysis on any actionable projects.

Concurrently with AEMO developing the ISP Methodology, TransGrid has been progressing the RIT-T for the HumeLink project. In its Project Assessment Draft Report (PADR), TransGrid concluded that it did not expect competition benefits to be material in terms of identifying the preferred option for this RIT-T. However, through additional testing of expected competition benefits undertaken following the PADR, TransGrid identified that competition benefits did constitute a material class of benefits for the HumeLink project and therefore the net market benefit. As a result, TransGrid did include competition benefits in its RIT-T for HumeLink using an approach outlined in its Project Assessment Conclusion Report (PACR)[3].

[2] At https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp/isp-methodology.

[3] TransGrid, HumeLink PACR, p. 15, at https://www.aemo.com.au/-/media/files/stakeholderconsultation/consultations/nsp_consultations/2021/transgrid-pacr-humelink.pdf?la=en.

1.2 Purpose of this Consultation Paper

Given that HumeLink was identified as an actionable ISP project in the 2020 ISP and TransGrid has subsequently identified material competition benefits through its RIT-T process, AEMO considers it necessary to develop and consult on a targeted methodology for calculation of competition benefits that balances computational complexity with the NER requirement to consider all classes of market benefits unless not likely to impact the outcome of the optimal development path (ODP).

Ernst & Young (EY) has helped AEMO prepare a Draft Competition Benefits Inputs, Assumptions and Methodology Report that could be applied to a candidate development path (CDP) in the ISP.

The methodology generally follows the approach EY applied to calculate competition benefits for HumeLink in TransGrid's PACR, but is adapted to be incorporated in the ISP Methodology, and is intended to be applied when competition benefits may be material for a CDP.

AEMO is now undertaking a single-stage consultation process in accordance with the AER's Forecasting Best Practice Guidelines ('FBP Guidelines') to seek stakeholders' views on the Draft Competition Benefits Inputs, Assumptions and Methodology Report and issues outlined in this Consultation Paper, given that these will supplement the existing *Inputs, Assumptions and Scenarios Report* (IASR) and ISP Methodology.

The key points of consultation, as outlined in this Consultation Paper, relate to:

- Aspects of the proposed methodology to be applied to calculate competition benefits that are most likely to have a material impact on outcomes (Section 2 of this Consultation Paper); and
- The proposed simplified set of inputs and assumptions underpinning the methodology that are most uncertain (Section 3 of this Consultation Paper).

Collectively, the inputs, assumptions and methodology for calculating competition benefits within the ISP framework must consider resource intensiveness as it relates to the estimated cost of undertaking the analysis, and whether this is disproportionate given the level of uncertainty in competition benefits outcomes.

Specific points of consultation have been identified throughout the Consultation Paper, but stakeholders are encouraged to provide feedback on any aspect of the proposed Draft Competition Benefits Inputs, Assumptions and Methodology Report relevant to calculating competition benefits.

The Draft Competition Benefits Inputs, Assumptions and Methodology Report is available at https://aemo.com.au/consultations/current-and-closed-consultations/competition-benefits-in-the-ISP.

1.3 Related documents

Table 1 below outlines related documents relevant to the development of the Draft Competition Benefits Inputs, Assumptions and Methodology Report. Stakeholders are invited to refer to these documents for further background and context.

Table 1 Related documents

Methodology/procedure	Description	Location
ISP Methodology, AEMO 2021	The ISP Methodology provides an overview of the modelling methodologies applied to develop the 2022 ISP.	https://aemo.com.au/-/media/files/major-publications/isp/2021/2021-isp-methodology.pdf?la=en
CBA Guidelines, AER 2020	The CBA Guidelines set out the classes of market benefits that are relevant and can be considered in the ISP	https://www.aer.gov.au/system/files/AER%20-%20Cost%20benefit%20analysis%20guidelines%20-%2025%20August%202020.pdf

Methodology/procedure	Description	Location
2021 IASR, AEMO 2021	The IASR includes the scenarios, inputs and assumptions used in AEMO's 2021-22 forecasting and planning activities, including the 2022 ISP.	https://aemo.com.au/-/media/files/major-publications/isp/2021/2021-inputs-assumptions-and-scenarios-report.pdf?la=en
Application guidelines, regulatory investment test for transmission, AER 2020	The application guidelines provide guidance for the operation and application of the RIT-T for RIT–T projects that are not actionable ISP projects.	https://www.aer.gov.au/system/files/AER%20-%20Regulatory%20investment%20test%20for%20transmission%20application%20guidelines%20-%2025%20August%202020.pdf
Evaluating interconnection competition benefits, Frontier Economics 2004	The evaluating interconnection competition benefits report tests whether a workable method for estimating competition benefits can be developed in the context of the regulatory investment test. The report developed by Frontier Economics forms the basis of the approach applied when developing the competition benefits methodology.	https://www.aer.gov.au/system/files/Frontier%20Economics%20report%20-%20evaluating%20interconnection%20competition%20benefits%20-%20September%202004.pdf
Decision of the review of the Regulatory Test for Network Augmentations, AER 2004	The document describes the 'Biggar approach' to determining competition benefits	https://www.aer.gov.au/system/files/Review%20of%20the%20regulatory%20test%20final%20decision%20-%2011%20August%202004.pdf
HumeLink PACR, TransGrid 2021	The PACR represents the final stage in the RIT-T consultative process conducted to identify options for reinforcing the New South Wales Southern Shared Network to increase transfer capacity to demand centres.	https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nsp_consultations/2021/transgrid-pacr-humelink.pdf
Modelling of Liddell Power Station Closure, Frontier Economics 2019	The report defines the generators and portfolios with some degree of market power considered in the Draft Competition Benefits Inputs, Assumptions and Methodology Report.	https://www.energy.gov.au/sites/default/files/Frontier%20Economics%20Modelling%20of%20Liddell%20Power%20Station%20Closure.pdf

2. Competition benefits modelling methodology

2.1 Competition benefits approach

For the purposes of developing the ISP, the AER's CBA Guidelines state that valuing competition benefits entails modelling the likely impact of a candidate development path on the bidding behaviour of generators (and other market participants) who may have a degree of market power relative to the counterfactual development path[4].

Not all changes in bidding behaviour count as competition benefits. Where changes in bidding behaviour result in lower cost generation displacing higher cost generation, this may be counted as a competition benefit. Where changes in bidding behaviour do not affect the generation that is dispatched, this may not be counted as a competition benefit[5].

Importantly, competition benefits are not an estimate of wealth transfer between producers and consumers but instead reflect the difference between the overall economic surpluses (sum of producer and consumer surpluses) that result from changed bidding behaviour compared to the base case.

There are two generally accepted approaches for quantifying the component of market benefits attributable to competition benefits[6],[7] the Biggar approach and the Frontier approach. EY's Competition Benefits Inputs, Assumptions and Methodology Report, proposed to be adopted by AEMO for its ISP, applies the Frontier approach in the competition benefits modelling and provides its reasoning for selection of the Frontier approach.

Frontier approach

The Frontier approach for defining competition benefits is to measure the additional benefits that an augmentation, or in the context of the ISP a CDP, might accrue if the assumption of competitive bidding is relaxed[8]. These benefits are over and above traditional market benefits and are expected to flow from taking into account likely bidding behaviour.

Therefore, the Frontier approach involves finding the difference between the change in overall economic surplus resulting from the chosen CDP:

- Assuming bidding reflected the degree of market power both with and without the CDP; and

[4] At https://www.aer.gov.au/system/files/AER%20-%20Cost%20benefit%20analysis%20guidelines%20-%2025%20August%202020.pdf.

[5] At https://www.aer.gov.au/system/files/AER%20-%20Cost%20benefit%20analysis%20guidelines%20-%2025%20August%202020.pdf.

[6] These approaches are outlined in the AER's Application guidelines - Regulatory investment test for transmission and the Australian Competition and Consumer Commission's (ACCC's) 2004 Review of the Regulatory Test – Decision. The Frontier approach is at https://www.aer.gov.au/system/files/Frontier%20Economics%20report%20-%20evaluating%20interconnection%20competition%20benefits%20-%20September%202004.pdf . The Biggar approach is at https://www.aer.gov.au/system/files/Review%20of%20the%20regulatory%20test%20final%20decision%20-%2011%20August%202004.pdf.

[7] The Frontier and Biggar approaches are set out in both the 2020 RIT-T Guidelines and the CBA Guidelines. The 2020 RIT-T Guidelines apply to RIT-T projects that are not actionable ISP projects, while the 2020 CBA Guidelines apply to AEMO in preparing the ISP, and TNSPs in applying the RIT-T to actionable ISP projects. 2020 CBA Guidelines are at https://www.aer.gov.au/system/files/AER%20-%20Cost%20benefit%20analysis%20guidelines%20-%2025%20August%202020.pdf. 2020 RIT-T Guidelines are at https://www.aer.gov.au/system/files/AER%20-%20Regulatory%20investment%20test%20for%20transmission%20application%20guidelines%20-%2025%20August%202020.pdf.

[8] At https://www.aer.gov.au/system/files/Frontier%20Economics%20report%20-%20evaluating%20interconnection%20competition%20benefits%20-%20September%202004.pdf.

- Assuming fully competitive bidding (that is, short-run marginal cost (SRMC) bidding) both with and without the CDP.

The Frontier approach identifies two analysis types for competition benefits, being static benefits and dynamic benefits:

- "Static benefits" are concerned with making more efficient use of existing inputs and are based on the changes to the dispatch and pricing of existing plant.
- "Dynamic benefits" consider the changes in investment patterns driven by strategic behaviour, and capture the increased competition in the market due to avoiding generators (or proponents) with a degree of market power investing in new capacity earlier than an independent investor, to entrench its market position. This is commonly called 'pre-emptive new entry'.

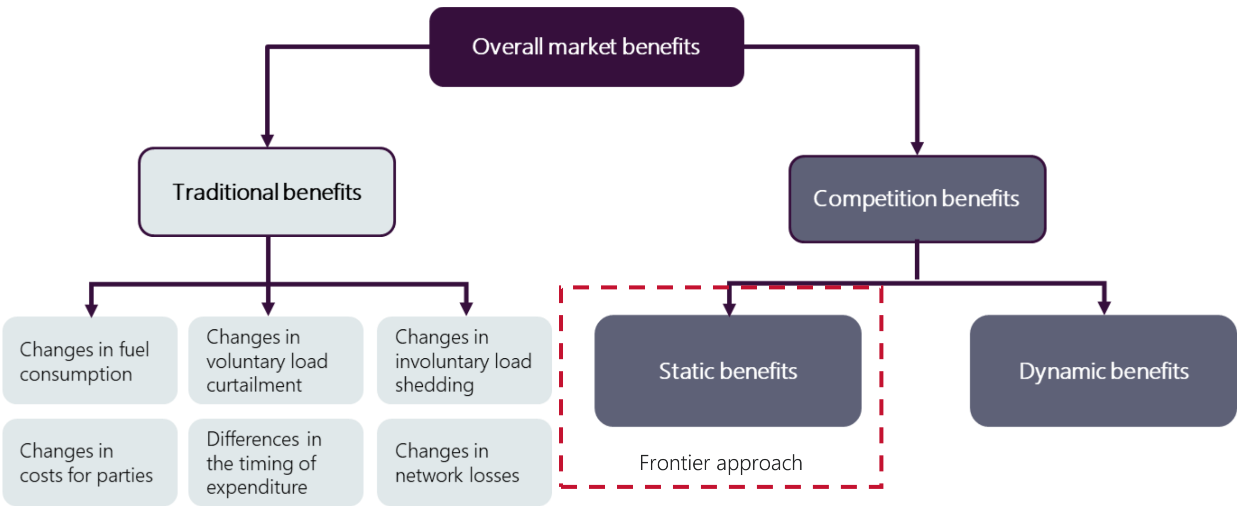
The Frontier approach focuses on modelling the static benefits to remove the need for the complexity of calculating the dynamic competition benefits unless there is a sufficient justification for undertaking further complex analysis beyond that of the static competitive analysis. The Frontier approach states that if the static competition benefits are not significant, it is likely that the dynamic competition benefits will also be small, and therefore the benefits of undertaking further modelling to assess them will not be worthwhile.

In developing the EY methodology, consideration was given to whether static or dynamic competition benefits should be calculated. It was concluded that static competition benefits only should be calculated, because:

- Capital investment dynamic benefits are already calculated in the methodology used to assess traditional benefits, including the optimised development of new generation to replace aging generation on a market basis.
- The incremental utility of calculating dynamic competition benefits relative to the computational complexity is considered limited.
- Capturing capital investment dynamic benefits through traditional benefits analysis and adopting a static competition benefits approach results in the most conservative estimate of competition benefits.

AEMO also considers that any additional capital deferral benefits associated with changes in bidding behaviour due to increasing competition in the market and reducing pre-emptive new entry is likely to be minimal relative to the other classes of market benefit, and the cost of undertaking the analysis to quantify the market benefit is likely to be disproportionate given the level of uncertainty regarding future outcomes. This uncertainty extends to future ownership structures for new infrastructure, contract positions, and even future market design, that may all influence the strategic behaviour and investment patterns of market participants.

Figure 1 Frontier approach to competition benefits



EY has further broken static competition benefits down into competition cost savings and competition benefits due to a demand response. Competition benefits from demand response are discussed in further detail in Section 2.2.3 of this Consultation Paper.

The Draft Competition Benefits Inputs, Assumptions and Methodology Report has more detail about the competition benefits calculation.

Matters for consultation

- Do you agree that AEMO should consider competition benefits as part of the ISP?
- In your view are competition benefits material (and sufficiently certain)?
- Do you agree with adopting the Frontier approach to quantify competition benefits, as detailed in EY's Draft Competition Benefits Inputs, Assumptions and Methodology Report?
- Is there another modelling approach that AEMO could practically consider? If yes, what would be the perceived computational complexity associated with this approach?
- Do you agree that only static competition benefits should be considered?

2.2 Key issues for consultation

AEMO considers there are four key issues for consultation that could have a material impact on any assessment of competition benefits:

- **Strategic bidding and finding the Nash Equilibrium** – the appropriateness of limiting the strategic participation in the game theoretic model to coal-fired generators.
- **Selection of the generation development plans –** the appropriateness of keeping the generation and storage investment fixed as per the 'no network development' counterfactual case when determining the level of competition and hence competition benefits with and without the CDP.
- **Competition benefits due to a demand response –** the appropriateness of including this type of competition benefits given that the calculation of this carries significant uncertainty and high computational burden and is influenced by the selection of generation development plans noted above.
- **Applicability to the ISP framework** – the appropriateness of the proposed rationalisations to make the calculation of competition benefits in an ISP tractable, including selecting the circumstances where the calculation of competition benefits could materially affect the outcome of the CDP assessment, and choosing the time horizon and scenarios to model in these circumstances.

These four issues are discussed further below.

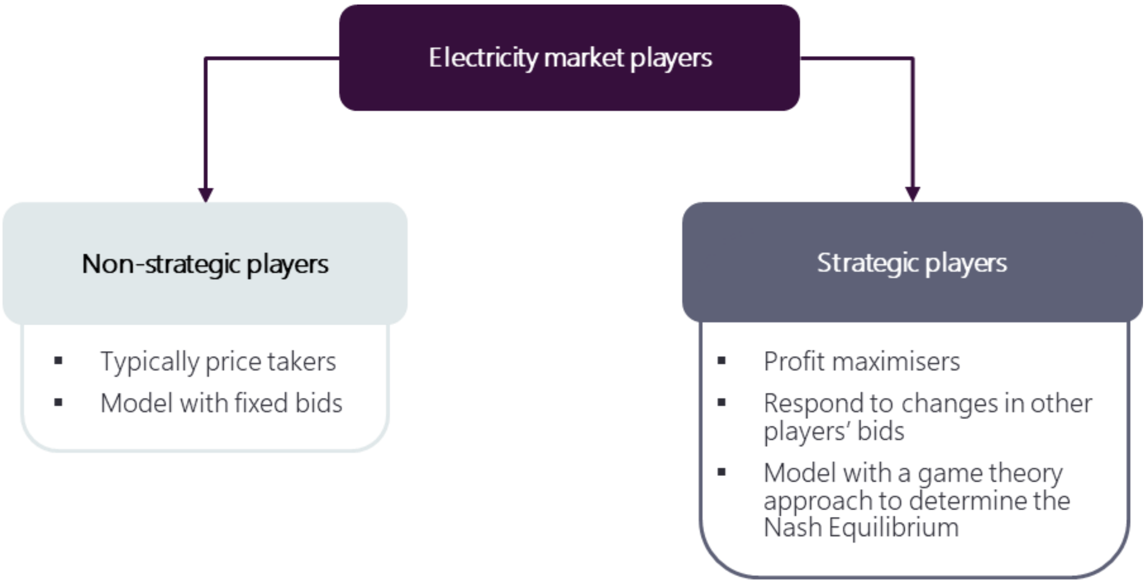
2.2.1 Strategic bidding and Nash Equilibrium

One requirement for calculating competition cost savings is a robust approach to determining strategic bidding. The AER suggests it should be based on a credible theory as to how participants are likely to behave in the market over the modelling period, while taking into account the interaction of participants in their bidding behaviour[9].

In a modelled representation of the electricity market, electricity market players can be classified as non-strategic and strategic players. While non-strategic players are typically price takers and can be modelled with fixed bids, strategic players are those players that respond to changes in other players' bids to maximise their profit.

[9] At https://www.aer.gov.au/system/files/AER%20-%20Regulatory%20investment%20test%20for%20transmission%20application%20guidelines%20-%2025%20August%202020.pdf.

Figure 2 Strategic and non-strategic players



The number of potential combinations of bids for strategic players in the electricity market is vast. It is not possible, nor useful, to attempt to try and guess the 'right' combination of bids from the millions of possible combinations[10]. There are several reasons for this:

- It is likely that mostly larger generators and portfolios will attempt to influence market prices by changing their bids or withholding some level of capacity in order to increase their profit.
- Generators which can influence constraints, particularly constraints which impact interconnector flows, are likely to have some market power.
- Strategic bidding depends on other factors, such as the available capacity in the market in any period.
- The contract levels of generators capture their impact on marginal bidding decisions. However, the contracts and their prices are not expected to change the optimal bidding sets when assessing the optimal bidding strategies from a combination of bidding sets[11].
- Even for a small number of strategies and for a small number of strategic players, the number of strategic bidding permutations required to simulate to find the Nash Equilibrium is high. As a result, the estimated cost of undertaking the analysis will increase exponentially with the number of combinations. For example, the HumeLink competition benefit assessment[12] only considered four strategic players – three of them having three candidate withholding strategies, and the last having two candidate strategies – and it still required 3x3x3x2=54 permutations of the full model to be simulated to find the Nash Equilibrium.

Game theory provides a systematic process for selecting the optimal strategy in the context of strategic players. While there is a range of game theory models, the game theory model used to calculate competition benefits derives a Nash Equilibrium which identifies an equilibrium point from which no participant has an incentive to depart because they return back to that point through competition. The Nash Equilibrium identifies a set of bids that participants in the electricity market would choose if acting rationally under a

[10] At https://www.aer.gov.au/system/files/Frontier%20Economics%20report%20-%20evaluating%20interconnection%20competition%20benefits%20-%20September%202004.pdf.

[11] At https://www.energy.gov.au/sites/default/files/Frontier%20Economics%20Modelling%20of%20Liddell%20Power%20Station%20Closure.pdf.

[12] At https://www.aemo.com.au/-/media/files/stakeholder_consultation/consultations/nsp_consultations/2021/transgrid-pacr-humelink.pdf.

given set of market conditions[13]. An equilibrium outcome is found when the best response of all players coincides[14]; that is, all strategic players maximise their profit from all the combinations of bids.

A range of bids can be used for a game theory approach, including capacity bids, price bids, or a combination of both[15]. Note that strategic players can be portfolios, which have a single generator or multiple generators in one or more regions in the NEM. EY's approach focuses on selecting the largest generation portfolios in each region to be strategic players, and applies strategic bidding to only the largest generators in each portfolio (predominantly coal-fired generators).

Hydro generators can also play strategically in the market. Modelling hydro generators (including pumped hydro generators) strategically is complex, as their energy-constrained dispatch depends on several factors such as storage capacity, inflow and availability. The Frontier approach in 2004 modelled hydro generators and storages as non-strategic, and this approach was also adopted by EY for the HumeLink PACR. In Frontier's view, this assumption tends to provide a conservative view of competition benefits[16], although AEMO notes that this may depend on ownership structures and concentration of market power in any particular circumstance. There could be situations where network augmentation increases the ability for hydro generators to exert market power, particularly if the game theoretic approach is modelled at a portfolio level rather than a power station level.

For the purpose of calculating competition benefits for the ISP, AEMO proposes to follow the strategic bidding approach adopted by EY in the Draft Competition Benefits Inputs, Assumptions and Methodology Report. It attempts to rationalise the number of strategic players and bidding strategies so that the modelling task is tractable, while remaining focused on the changes in bidding behaviour likely to have the most impact.

Matters for consultation

- Do you agree that rationalising strategic participation to focus on the largest generation portfolios in each region (predominantly coal-fired generators), as adopted in EY's methodology, is appropriate? If not, what alternative ways could the strategic participants in the game theoretic model be rationalised?
- Do you agree that modelling hydro generators and storages as non-strategic players will result in a conservative estimate of competition benefits in the NEM? If not, why not, and how else could the game be implemented for energy-constrained units?

2.2.2 Selecting the generation development plan

AEMO notes that CDPs evaluated in the ISP comprise multiple transmission augmentations. The least-cost generation and storage expansion and retirement plans for a CDP will vary significantly between a CDP and its counterfactual development path (where no transmission is built).

Neither Frontier's approach nor the AER's RIT-T Guidelines are specific when it comes to whether different generation development plans should be considered in the assessment of competition benefits with and without a specific CDP (or even a credible option for a RIT-T).

Following the approach presented in the EY's Draft Competition Benefits Inputs, Assumptions and Methodology Report, the counterfactual capacity expansion plan would be adopted for both CDP and

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13 At https://www.aer.gov.au/system/files/Frontier%20Economics%20report%20-%20evaluating%20interconnection%20competition%20benefits%20-%20September%202004.pdf.

14 At https://www.aer.gov.au/system/files/Frontier%20Economics%20report%20-%20evaluating%20interconnection%20competition%20benefits%20-%20September%202004.pdf.

15 At https://www.energy.gov.au/sites/default/files/Frontier%20Economics%20Modelling%20of%20Liddell%20Power%20Station%20Closure.pdf.

16 At https://www.aer.gov.au/system/files/Frontier%20Economics%20report%20-%20evaluating%20interconnection%20competition%20benefits%20-%20September%202004.pdf.

counterfactual cases for the purpose of calculating competition benefits. EY provides an explanation of this in Section 3.2.2 of the Draft Competition Benefits Inputs, Assumptions and Methodology Report.

AEMO perceives that a disadvantage of following the approach outlined in EY's Draft Competition Benefits Inputs, Assumptions and Methodology Report is that an over-supplied market would be modelled in the CDP case, risking over-estimation of the level of competition and therefore over-stating the competition benefits. This is particularly pertinent in the ISP, where traditional benefits for a CDP comprise heavily of capital deferral benefits. If a CDP or network augmentation delays the need for new generation or storage capacity then such a significant increase in competition would not be observed.

The potential over-statement of competition benefits applies to both classes of static competition benefits:

- Competition cost savings – as competition in the CDP case would be overestimated due to the reduced ability for strategic players to exert market power.
- Competition benefits due to a demand response – as the lower wholesale electricity prices associated with an over-supplied market would result in an over-estimation of the corresponding demand response.

See Appendix A1 for examples that illustrate the variation on competition benefits outcomes due to consideration of different generation development plans.

AEMO therefore seeks stakeholder views on whether, for the purpose of calculating competition benefits in the ISP, it is more appropriate to:

1. Adopt the distinct capacity expansion plans for each of a CDP and its counterfactual development, or
2. Use the counterfactual generation and storage development plan for both the counterfactual and CDP cases.

Matters for consultation

- In estimating the degree of market power between states of the world with and without network developments, should associated differences in generation and storage investment be considered?

2.2.3 Competition benefits due to demand response

Frontier's approach (and EY's) also accounts for benefits that result from a response to lower electricity market prices, causing an increase in the level of aggregate demand, driven by the elasticity of demand to wholesale market price changes, along with the associated increase in supply to meet the higher demand. These are referred to as competition benefits due to demand response[17] and reflect the increase in consumer and producer surpluses[18]. Visually, they are shown as the dark blue area in Figure 3.

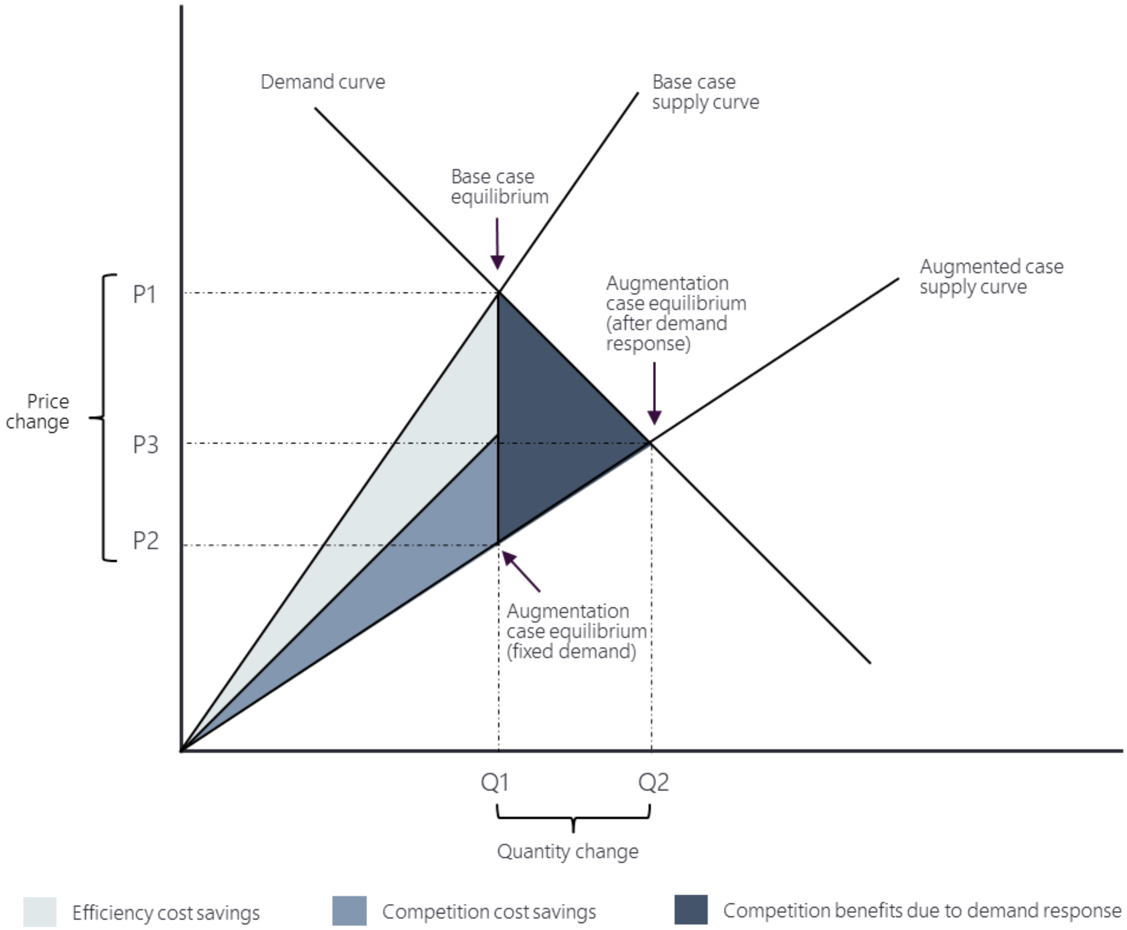
As an example, the modelling for the HumeLink PACR included an assessment of competition benefits from demand response.

To calculate these, following EY's methodology outlined in the Draft Competition Benefits Inputs, Assumptions and Methodology Report, both the augmented case supply and demand curves are required to be constructed. This allows determining the new equilibrium point for the augmentation case with the consideration of elasticity of the demand to wholesale market price.

[17] Note that, within this document, using the original Frontier terminology, 'demand response' refers to changes in underlying demand for electricity to changes in wholesale price. This is different from the more recent use of the term 'demand response' in the context of customer demand or virtual power plants (VPPs) responding to short-term price signals through their retailer or via the Wholesale Demand Response mechanism.

[18] In economics, this increase in producers and consumers surpluses from reducing market inefficiencies is referred to as a reduction in dead weight loss.

Figure 3 Calculation of competition benefits from demand response



Supply curve

The supply curve is a representation of the marginal price offered for any level of demand. The slope of the augmented supply curve in each region is estimated. The approach outlined in EY's Draft Competition Benefits Inputs, Assumptions and Methodology Report is to apply a small change in each region's demand, re-simulate, and then calculate the resulting prices in that region and other regions.

In an ISP context, this requires a substantial increase in the modelling effort. As a minimum, it requires an additional five simulations for the entire modelling horizon to estimate the slope of the supply curve for each region for each year. These extra simulations allow a supply curve to be estimated based on the slope between the original augmentation case and the additional simulations (with a change in demand).

A finer representation of the supply curve could be created by modelling additional runs, fitting the supply curve to these extra data points, however the increase in accuracy is unlikely to justify the increase in computation. Even in the simplest case, the increase in computation is significant.

Demand elasticity

Elasticity of demand is the ratio between the change in demand and the change in price[19]. If demand is elastic then (all else being equal) if price reduces demand will increase and vice versa. It is an important factor in the calculation of competition benefits from demand response. As shown in Figure 3, apart from the electricity price differences between the counterfactual and augmentation case, the size of the dark blue area is also influenced by the elasticity of the demand. That is, if demand is highly responsive to price changes, the slope

[19] Oxford Reference, https://www.oxfordreference.com/view/10.1093/oi/authority.20110803095745343, accessed 23 September 2021.

of the demand curve is flatter and thus the competition benefits due to demand response are higher and vice versa.

Uncertainty of estimated competition benefits from demand response

Figure 3 shows the importance of both the difference between the base case and augmented case supply curves as well as the demand elasticity. Both are uncertain.

On the supply side, two things in particular matter:

- **Assumed supply mix** – if, for simplicity, the same generation development plan was assumed for both the counterfactual and augmented case, the latter could (with the addition of the additional network capacity) result in sustained market oversupply compared to what the market would deliver in an equilibrium as per discussion in Section 2.2.2. For a CDP, considering a generation development plan optimised for that case will give the most appropriate augmented supply curve. This could result in higher prices (less supply than if the counterfactual generation development path was assumed) and thus less competition benefits from demand response.
- **Realistic forecast price outcomes for the assumed supply mix** – the bidding strategies selected to provide the Nash Equilibrium (see Section 2.2.1) are sensitive to assumptions around ownership and contracting levels. Ideally, price outcomes align with what could be reasonably expected.

When it comes to the demand elasticity, publicly available literature (see Section 3.2.4 in the Draft Competition Benefits Inputs, Assumptions and Methodology Report) reports a wide range of elasticity of demand values, and by inference this type of static competition benefit carries significant uncertainty.

Price elasticities are generally assessed at retail level, and must be converted to an equivalent response at wholesale price level. If, for example, wholesale prices make up approximately half the retail prices (with the remainder being network tariffs, environmental costs and retail margins), the elasticity should be halved. Additionally, if no increase in network tariffs is assumed in the augmentation case to reflect transmission expansion costs, there is a risk the demand response will be over-estimated.

Matters for consultation

- Do you agree with EY's approach outlined in the Draft Competition Benefits Inputs, Assumptions and Methodology Report for calculating competition benefits due to a demand response?
- In your opinion, is it appropriate to apply this general approach in the ISP?
- In your opinion, is the effort required to calculate competition benefits due to a demand response proportionate, given the level of uncertainty regarding future outcomes?
- Given the computational burden associated with calculating competition benefits due to demand response, under what circumstances should these benefits be considered?

2.2.4 Applicability to the ISP framework

Criteria for deciding when to consider competition benefits

AEMO proposes applying the competition benefits methodology within the ISP framework in cases where competition benefits may be material to selection of the ODP:

- AEMO considers that competition benefits for CDPs are likely to be material where:
  - CDPs deliver an amount of traditional benefits such that consideration of competition benefits may change the ranking of candidate development paths and the final selection of an ODP, and therefore has potential to be material to ISP outcomes. That is, the relativity of traditional benefits between CDPs

- is sufficiently close and yet the suite of network developments materially different, such that considering competition benefits may result in a change to which CDP is selected as the ODP; and
  - CDPs deliver significant fuel cost savings under the competitive bidding approach. Significant fuel cost savings is an indicator that the transmission options that form the development path result in a substantial change in dispatch of thermal fuel generators. Only a material change in the dispatch of those can deliver material competition cost savings.
- Due to the computational complexity and inherent uncertainty, AEMO will not calculate competition benefits if AEMO has reason/s to believe competition benefits are not material to the ODP selection.

Time horizon

In circumstances where AEMO proposes calculating competition benefits according to these criteria, AEMO proposes only considering competition benefits for 10 years starting from the earliest commissioning date for an actionable ISP project in any of the CDPs being assessed, because:

- As in the case study presented in the Draft Inputs, Assumptions and Methodology report, methods used in previous studies to calculate competition benefits have been developed around strategic behaviour of portfolios with larger thermal generators being dominant in the NEM regions where they are located. These are modelled as strategic players, as per Section 3.1. Other types of generation, including variable renewable generation and energy constrained units, whether hydro with storage, pumped hydro, or battery storage, are modelled as non-strategic. As more and more coal plants retire, the market share of strategic players reduces, resulting in reduced ability for strategic behaviour over time, and thus a reduced likelihood of finding material competition benefits[20].
- While strategic bidding can be calculated through game theoretic approaches for any future year, the resulting price outcomes are typically very dependent on input assumptions such as contracting levels/vertical integration and future ownership of generation. Under the proposed methodology the strategic portfolios and their associated bidding strategies are selected to align broadly with historical outcomes. As market conditions change with generator retirements, new builds and transmission augmentation, there is increased uncertainty that the outcomes will be reflective of the future in the longer term.

Competition benefits found over the time horizon and under circumstances outlined above will be considered along with the traditional benefits in AEMO's assessment of CDPs, and could potentially result in a change in ranking of candidate development paths, potentially influencing final selection of the ODP.

Role of ISP scenarios

In the HumeLink case study presented in the Draft Competition Benefits Inputs, Assumptions and Methodology Report, modelling was undertaken for four 2020 ISP scenarios to calculate both traditional benefits and competition benefits in each scenario. The total competition benefit was calculated as the weighted sum of competition benefits across all scenarios where the weighting used to calculate the competition benefit reflected the weighting applied to each scenario in the 2020 ISP. In this modelling, competition benefits varied across ISP scenarios: those that had greater spare capacity showed a decline in the market power and competition benefits relative to ISP scenarios that had limited capacity.

Competition benefits are proposed to be considered in the ISP if this class of market benefit is likely to materially affect the outcome of the assessment of the ODP. In selecting which CDPs to calculate competition benefits for, according to the criteria proposed above, it is plausible that certain ISP scenarios are not material to selection of the ODP. In these scenarios, the effort required to calculate competition benefits for CDPs would not be warranted given the immateriality to selection of ODP.

[20] New methodologies, should they emerge, that take into account strategic behaviour of new supply technologies, in particular storage options and potentially wind, can extend the workable horizon of identifying material competition benefits.

AEMO therefore proposes selecting ISP scenarios in which competition benefits are potentially considered according to the following criteria:

- The likelihood of each scenario, whereby a scenario with higher likelihood is more likely to be material to selection of the ODP and is therefore a higher priority for considering competition benefits; and
- Whether, based on the competition benefits calculated in other scenarios and the relative level of spare capacity, competition benefits are likely to be material under that scenario.

Matters for consultation

- Is the proposed application appropriate for the ISP, given that modelling competition benefits for all CDPs is not practicable in time available to develop an ISP? If not, what other methodology could be practically applied, and what is the associated computational complexity?
- Do you agree with the proposed circumstances for selecting which CDPs should be tested for competition benefits? If not, what alternative criteria would you recommend?
- Do you agree with the proposed time horizon to calculate competition benefits across?
- Do you agree with the underlying premise that strategic portfolio concentration will reduce over time? If not, how would you propose this is managed within the methodology?
- Do you agree with the proposed approach to select which ISP scenarios competition benefits will be calculated for?

3. Draft inputs and assumptions

3.1 Strategic bidding selection

To ensure the analysis is computationally feasible, only strategic players most likely to be in a position to exercise market power are selected in the game-theoretic model, with all others regarded as non-strategic.

To guide the selection of strategic players, measures of market share or market concentration can be considered, including those reported in the AER's State of the Energy Market[21] report:

- Market share for each company by both capacity and generation.
- The Herfindahl–Hirschman Index (HHI) index by region (an often-used measure for market concentration).
- The Pivotal Supplier Test (PST) by region, indicating how often dispatch of the largest (PST-1) or two largest (PST-2) generators are required to meet market demand within a region, taking into account possible interconnector flows.

The selection of strategic players should also account for expected generator retirements, as well as entry of new generators, within the modelling horizon. This may reduce the number of strategic players, as was seen in the HumeLink case study presented in the Draft Competition Benefits Inputs, Assumptions and Methodology Report.

To calculate the competition benefits in the 2022 Draft ISP, AEMO proposes leveraging recent competition benefits studies, namely the 2019 Frontier Economics study and TransGrid's HumeLink PACR, and use the same set of strategic players (see Table 2). Despite being done in 2019, the Frontier Economics study remains relevant as a starting point, as it concluded that new peaking generation would be profitable due to the strategic bidding of incumbent generators maintaining prices at profitable levels. These new peaking generators, Kurri Kurri and Tallawarra B, have been incorporated in AEMO's 2021 IASR. The timing of Liddell's retirement and of new entry generators in New South Wales are still current information to be used in the Draft 2022 ISP, and no new information has come to light that would render this information out of date.

Generators are assumed to withdraw their respective capacity to a price of $500/MWh – refer the Draft Competition Benefits Inputs, Assumptions and Methodology report.

Table 2 Strategic players and bidding strategies proposed for the 2022 Draft ISP

Portfolio	Generators	Strategy options
AGL NSW	Bayswater	40%, 70%, 80%
AGL VIC	Loy Yang A	80%, 95%
EA NSW	Mt Piper	40%, 75%, 80%
Stanwell QLD	Stanwell, Tarong	40%, 70%, 90%

[21] The most recent is AER, State of the Energy Market 2021, at https://www.aer.gov.au/system/files/State%20of%20the%20energy%20market%20 2021%20-%20Full%20report_1.pdf, accessed 11 October 2021.

Matters for consultation

- Do you agree with EY's proposed selection of strategic players outlined in the Draft Competition Benefits Inputs, Assumptions and Methodology report, and is it reasonable to apply this selection more generically for the ISP?
- Do you agree with EY's assumption that the optimal bidding strategies can be assumed to remain stable over time as the market evolves, as a means of managing computational burden?
- Do you agree that the strategic options percentages (proportion of capacity offered at SRMC) proposed by EY and reported in Table 2 are reasonable?
- Do you agree $500/MWh is an appropriate value to bid in capacity that is not offered at SRMC?

3.2 Time periods

For the 2022 ISP, to help reduce modelling complexity, AEMO proposes applying strategic bidding only for the peak demand periods of 6.00 am to 10.00 am and 6.00 pm to 10.00 pm. These time periods were identified through modelling by EY for the HumeLink PACR as periods where the capability of strategic players to change their bids or withhold their capacity to raise prices is high. EY also applied strategic bidding for all periods in the HumeLink PACR modelling and found the results were not significantly different.

Longer term, with retirements of more thermal generation, flexible plant may have more market power overnight whenever wind generation is low. However, this is unlikely to be material in the 10-year time horizon AEMO is proposing to focus on for competition benefits. If strategic bidding was to be applied to overnight periods, the bidding strategies selected to reach Nash Equilibrium could differ to the selected bidding strategies for peak demand periods. This would increase modelling complexity.

Matters for consultation

- For the purpose of the ISP, do you agree that the majority of competition benefits are likely to occur during the peak demand periods of 6.00 am to 10.00 am and 6.00 pm to 10.00 pm?

3.3 Elasticity of demand to wholesale price

Price elasticity is a key assumption when calculating the competition benefits from demand response. These benefits arise where electricity is offered at a lower price for a sustained period, allowing more consumption at prices no larger than the willingness to pay for electricity (used as a proxy for the marginal utility of using electricity).

The relevant price elasticity to consider is the long-run price elasticity. Price elasticities cannot be directly measured, and estimates are generally considered uncertain[22]. AEMO publishes price elasticities used for its demand forecasting in its IASR each year. Different elasticities may be used depending on sector (residential or business) or consumption type (baseload versus heating/cooling).

For the purpose of calculating competition benefits due to a demand response, AEMO proposes using only a single aggregate number, consistent with the value of -0.05 adopted by EY for the HumeLink PACR.

[22] The price elasticities may also be asymmetric, so a particular price increase may lead to a larger reduction in consumption than the increase in consumption from a similar reduction in price.

Matters for consultation

- Do you agree with the proposed elasticity of demand value of -0.05, and associated justification for this value outlined in the Competition Benefits Inputs, Assumptions and Methodology Report?
- Do you agree with EY's approach of converting a retail price elasticity to an equivalent demand response at the wholesale price level?

4. Other points of consultation

Stakeholders are invited to provide a written submission to the questions outlined in this Consultation Paper, and on any other matter related to the methodologies, inputs, and assumptions for calculating competition benefits relevant to the ISP process.

Submissions need not address every question posed and are not limited to the specific consultation questions noted in this Consultation Paper.

Matters for consultation

- In your view, what are the major points of uncertainty in outcomes of competition benefits modelling?
- Are the proposed inputs, assumptions, and methodology appropriate given your view on the level of uncertainty?

5. Next steps

The single-stage consultation process begins upon the release of this Consultation Paper. The next steps in the consultation process are shown in the table below.

Step	Date
ISP stakeholder workshop to provide stakeholders opportunity to ask questions of clarification	26 October 2021
Consumer workshop to allow consumers to provide verbal submissions as an alternative to written submissions	28 October 2021
Written submissions to this Consultation Paper are due	14 November 2021
Publication of the updated ISP Methodology and IASR	10 December 2021

ISP stakeholder workshop

AEMO will undertake a workshop with ISP stakeholders on 26 October 2021. The purpose of this workshop will be to provide ISP stakeholders with the opportunity to discuss and clarify any aspect of the Draft Competition Benefits Inputs, Assumptions and Methodology Report with AEMO and EY. Should ISP stakeholders wish to formally respond to this Consultation Paper, they should do so by providing written feedback by 14 November 2021.

Consumer workshop

AEMO will also host a Consumer workshop on 28 October 2021. The purpose of the Consumer workshop will be provided consumers and consumer representatives with the opportunity to provide verbal feedback on the Competition Benefits Inputs, Assumptions and Methodology Report. AEMO will document this feedback and it will be treated as formal written feedback to the Consultation Paper similar to other written feedback received by 14 November 2021.

Updated ISP Methodology and IASR

AEMO will update the ISP Methodology and IASR to reflect the final Competition Benefits Inputs, Assumptions and Methodology Report and publish these together with a consultation summary report by 10 December 2021.

Details on major milestones in the ISP process can be found in the ISP Timetable[23] , and additional information on upcoming events and consultations for the ISP are outlined on AEMO's website[24]. Details on how to get involved in the consultation process are also provided on the website[25].

[23] At https://aemo.com.au/-/media/files/major-publications/isp/2021/2022-isp-timetable.pdf?la=en.

[24] At https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp/opportunities-for-engagement.

[25] At https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp/get-involved.

Appendix A1 – Examples of competition benefit calculations

To illustrate the issue surrounding calculation of competition benefits with and without consideration of changes in generation investment in response to the augmentation, the following three examples draw on example 34 of Appendix A in the AER's RIT-T Guidelines[26]. AEMO is seeking views from stakeholders regarding the appropriate approach to adopt for ISP modelling of competition benefits.

Example 1: no capital deferral benefit associated with augmentation

Assume:

- Load is 200 MW.
- There are three generators capable of serving this load:
  - Coal-fired generation with a SRMC of $10/MWh and 120 MW capacity.
  - Mid-merit gas-fired generation with a SRMC of $50/MWh and 100 MW capacity.
  - Peaking oil-fired generation with a SRMC of $100/MWh and 40 MW capacity.
- The credible option entails developing an interconnector with a capacity of 140 MW to a competitive region that supplies electricity at a constant SRMC of $12/MWh.
- The coal-fired generator behaves strategically; that is, it maximises its short-run profit, given by: Quantity*(Price – SRMC).
- The coal-fired generator, due to technical requirements, has a minimum generation level of 60 MW and must offer its capacity in increments of 10 MW.

All other generators (including the power supplied through the interconnector) behave competitively. That is, they bid their full capacity into the market at SRMC.

In the base case:

- The three generators in the region make the following offers:
  - Coal-fired generation offers 90 MW at $10/MWh.
  - Mid-merit gas-fired generation offers 100 MW at $50/MWh.
  - Peaking oil-fired generation offers 10 MW at $100/MWh.
- The peaking generator sets the market price at $100/MWh.
- Total dispatch costs are 90*$10 + 100*$50 + 10*$100 = $6,900 per hour.

In the state of the world with the credible option:

- The interconnector enables the supply of 140 MW of electricity at $12/MWh.
- The generators in the region make the following offers:
  - Coal-fired generation offers 120 MW at $10/MWh.

[26] At https://www.aer.gov.au/system/files/AER%20-%20Regulatory%20investment%20test%20for%20transmission%20application%20guidelines%20-%2025%20August%202020.pdf

– Mid-merit gas-fired generation offers 100 MW at $50/MWh.

– Peaking oil-fired generation offers 40 MW at $100/MWh.

- The marginal generator in the adjacent region sets the market price through the interconnector at $12/MWh.
- Total dispatch costs are 120*$10 + 80*$12 = $2,160 per hour.

The change in the total dispatch cost between states of the world with and without the credible option, assuming competitive bidding in both states of the world, is:

(120 * $10 + 80 * $50) – (120 * $10 + 80 * $12) = $3,040 per hour.

The change in the total dispatch cost between a state of the world with and without the credible option, assuming strategic bidding in both states of the world, is:

(90 * $10 + 100 * $50 + 10 * $100) – (120 * $10 + 80 * $12) = $4,740 per hour.

The competition benefit is thus: $4,740 – $3,040 = $1,700 per hour.

Example 2: there is capital deferral benefit associated with augmentation and this reduced capital investment is considered when calculating competition benefits of the augmentation (this example aligns with AEMO's proposed approach)

Now consider what would happen if load in the above example was 350 MW and a generator has just retired (leaving the three generators from the example above), causing a supply shortfall of at least 90 MW.

In the base case:

- A new mid-merit gas-fired generator of 100 MW is built to help meet the load and it offers 100 MW at $40/MWh.
- The oil-fired peaking generator still sets the market price at $100/MWh.
- Total dispatch costs are 120[27] * $10 + 100 * $40 + 100 * $50 + 30 * $100 = $13,200 per hour.

In the state of the world with the credible option:

- This new mid-merit gas-fired generator is not needed.
- Total dispatch costs are 100[28] * $10 + 140 * $12 + 100 * $50 + 10 * $100 = $8,680 per hour.

Now the change in the total dispatch cost between states of the world with and without the credible option, assuming competitive bidding in both states of the world, is:

(120 * $10 + 100 * $40 + 100 * $50 + 30 * $100) – (120 * $10 + 140 * $12 + 90 * $50) = $5,820 per hour.

And the change in the total dispatch cost between a state of the world with and without the credible option, assuming strategic bidding in both states of the world is:

(120 * $10 + 100 * $40 + 100 * $50 + 30 * $100) – (100 * $10 + 140 * $12 + 100 * $50 + 10 * $100) = $4,520 per hour.

The competition benefit is thus: $4,520 – $5,820 = -$1,300 per hour.

[27] Withholding capacity is no longer a profit maximising option for this coal generator, as the marginal price is already at $100/MWh.

[28] Withholding 20 MW of capacity is profit maximising, as it results in the marginal price being $100/MWh rather than $50/MWh.

Example 3: there is capital deferral benefit associated with the augmentation, but this reduced capital investment is not considered when calculating competition benefits of the credible option (this example aligns with the approach presented in the Draft Competition Benefits Inputs, Assumptions and Methodology report)

If the capital deferral with the credible option is ignored, then the additional gas-fired generation would be assumed to exist in both states of the world with and without the credible option.

In that case, the change in the total dispatch cost between states of the world with and without the credible option, assuming competitive bidding in both states of the world is:

(120 * $10 + 100 * $40 + 100 * $50 + 30 * $100) – (120 * $10 + 140 * $12 + 90 * $40) = $6,720 per hour.

And the change in the total dispatch cost between a state of the world with and without the credible option, assuming strategic bidding in both states of the world is:

(120 * $10 + 100 * $40 + 100 * $50 + 30 * $100) – (100 * $10 + 140 * $12 + 100 * $40 + 10 * $50) = $6,020 per hour.

The competition benefit is thus: $6,020 – $6,720 = -$700 per hour.

In the last two examples with 350 MW of load, the competition benefits are actually negative regardless of whether the new gas-fired generator is assumed to be available in the state of the world with the credible option, but the magnitude of the value varies considerably depending on approach taken, as does the change in dispatch price. Small negative competition benefits are not uncommon in RIT-T assessments and can be highly sensitive to assumptions around strategic bidding or future ownership structures, which is why, up until now, most RIT-T proponents have concluded that the benefits are not material.

Abbreviations

Term	Definition
ACCC	Australian Competition and Consumer Commission
AER	Australian Energy Regulator
CBA	Cost Benefit Analysis
CPA	Contingent Project Application
CDP	Candidate Development Path
EY	Ernst & Young
FBP	Forecasting Best Practice
IASR	Inputs, Assumptions and Scenarios Report
ISP	Integrated System Plan
MW	Megawatt/s
MWh	Megawatt hour/s
NEM	National Electricity Market
NER	National Electricity Rules
ODP	Optimal Development Path
PACR	Project Assessment Conclusions Report
PADR	Project Assessment Draft Report
RIT-T	Regulatory Investment Test for Transmission
SRMC	Short Run Marginal Cost
TNSP	Transmission Network Service Provider