

Competition benefits in the Integrated System Plan – Consultation Summary Report

December 2021

Consultation Summary Report
For the Integrated System Plan (ISP)

Important notice

PURPOSE

AEMO publishes the Consultation Summary Report – Competition benefits pursuant to National Electricity Rules (NER) 5.22.8(d). This report includes key information and context for the methodology used in AEMO's ISP.

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VERSION CONTROL

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1. Introduction

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 at least the next 20 years.

AEMO considers that leveraging expertise from across the industry is pivotal to the development of 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.

Clause 5.22.10(c)(1) and (3) of the National Electricity Rules (NER) requires AEMO to consider a range of market benefits as part of preparing an ISP 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.

These classes of benefits are documented in the NER and further discussed in the Australian Energy Regulator's (AER's) Cost benefit analysis guidelines (CBA Guidelines). Competition benefits are one type of market benefit referred to in the NER and CBA Guidelines.

The purpose of this consultation was to engage stakeholders on how competition benefits could be calculated in the ISP, if this class of benefit is deemed to be material to the selection of the ODP and can be calculated with a proportionate level of certainty. AEMO proposed leveraging the competition benefits methodology developed and applied by EY for TransGrid's HumeLink Project Assessment Conclusions Report (PACR), expanded to apply to candidate development paths rather than individual projects.

Consultation process

A single-stage consultation process in accordance with the Forecasting Best Practice Guidelines on both the 2021 Inputs, Assumptions and Scenarios Report (IASR) and ISP Methodology commenced on 15 October 2021, with the release of an Issues paper and Ernst & Young's (EY's) *Draft Competition Benefits Inputs, Assumptions and Methodology*¹.

On 26 October 2021, AEMO hosted a public workshop to provide stakeholders with an opportunity to ask clarifying questions prior to making written submission, and on 28 October 2021, AEMO hosted a consumer advocate verbal feedback session. Written submissions closed on 15 November 2021, with 12 submissions received. AEMO would like to thank all who provided feedback throughout this process.

This document summarises submissions to the consultation and provides AEMO's conclusions.

Next steps

AEMO concludes that its existing position in the ISP Methodology regarding competition benefits is retained, meaning that competition benefits will not be included in the cost benefit analysis in determining the optimal development path in the 2022 ISP. **Accordingly, no amendments have been made to the ISP Methodology or the IASR as a result of this consultation.**

¹ At <https://aemo.com.au/consultations/current-and-closed-consultations/competition-benefits-in-the-isp>.

2. Summary of feedback

2.1 Submissions

AEMO received written feedback from 12 stakeholders during the consultation on EY's *Draft Competition Benefits Inputs Assumptions and Methodology*; these stakeholders are listed in Table 1 and the submissions are available on AEMO's website². AEMO also held a verbal feedback session with consumer advocates, who provided feedback that was considered by AEMO in the same way as all other written submissions.

Submissions covered a range of topics, providing AEMO with a valuable perspective on stakeholders' collective view of competition benefits in the ISP.

Table 1 List of stakeholders who provided written feedback

Australian Energy Council (AEC)	Origin Energy
AGL Energy (AGL)	Powerlink Queensland
Energy Australia (EA)	Public Interest Advocacy Centre (PIAC)
Energy Consumers Australia (ECA)	Shell Energy
Hydro Tasmania	Snowy Hydro
ISP Consumer Panel	Victoria Energy Policy Centre (VEPC)

2.2 Summary of key themes and consultation outcome

AEMO received feedback from stakeholders on several areas from EY's *Draft Competition Benefits Inputs Assumptions and Methodology* ('the proposed methodology') consultation.

In summary, stakeholders found several areas for concern regarding the quantification of competition benefits in the ISP that collectively resulted in a lack of confidence that competition benefits could be routinely calculated in the ISP while managing their inherent uncertainty and computational complexity appropriately.

Alongside this consultation, AEMO has also made an indicative assessment of competition benefits as supplementary analysis for the Draft 2022 ISP, and concluded that competition benefits outcomes are immaterial to final selection of the optimal development path (ODP). Appendix 6 of the 2022 Draft ISP shows the results of this indicative analysis, which incorporates some modifications to the proposed methodology as an outcome of this consultation, noting the level of uncertainty inherent in these calculations remains.

AEMO concludes that its existing position in the *ISP Methodology* regarding competition benefits is retained, meaning that competition benefits will not be routinely calculated in the ISP.

To arrive at the conclusion to not routinely calculate competition benefits in the ISP, AEMO considered stakeholder feedback in detail. Table 2 provides an overview of the themes that emerged from the

² At <https://aemo.com.au/consultations/current-and-closed-consultations/competition-benefits-in-the-isp>.

submissions. The remaining sections of this report provide detailed discussion of feedback received, and AEMO's responses.

Table 2 Key themes from submissions to the *Competition benefits in the ISP* consultation

Theme	Description	Submitters	In this report
Consideration of competition benefits	The appropriateness of quantifying competition benefits in the 2022 ISP, particularly given the associated complexity and uncertainty in doing so.	AEC, EA, ECA, Hydro Tasmania, ISP Consumer Panel, PIAC, Powerlink, Shell Energy, Snowy Hydro, VEPC	Section 3
Identification of strategic players	The appropriateness of limiting the strategic participation in the game theoretic model to coal-fired generators.	AEC, AGL, Hydro Tasmania, ISP Consumer Panel, Origin, Powerlink, Shell Energy	Section 4
Considerations for strategic bidding	The appropriateness of bidding strategies for selected strategic players.	AEC, EA, Hydro Tasmania, ISP Consumer Panel, Powerlink, Shell Energy	Section 5
Selection of 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 associated with the candidate development path (CDP).	ISP Consumer Panel, Shell Energy	Section 6
Competition benefits due to demand elasticity	The appropriateness of including this type of competition benefits given that the calculation carries significant uncertainty and high computational burden and is influenced by the selection of generation development plans noted above.	EA, ECA, Hydro Tasmania, ISP Consumer Panel, Origin, Powerlink, Shell Energy	Section 7
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.	EA, ECA, ISP Consumer Panel, Shell Energy, Snowy Hydro	Section 8

3. Consideration of competition benefits

Clause 5.22.10(c) (1) and (3) of the NER requires that AEMO consider competition benefits in the ISP unless:

- 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.

Previously, 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 contemplated for the ISP. AEMO ran this consultation to explore how competition benefits could be calculated in these circumstances. AEMO sought EY's support to develop the proposed methodology to ensure general alignment with the methodology applied in recent RIT-T analysis, namely the HumLink Project Assessment Conclusion Report (PACR)³.

3.1 Issue summary and submissions

Stakeholders gave their perspective on the complexity, uncertainty and the general appropriateness of quantifying competition benefits in the ISP.

Complexity and uncertainty regarding future outcomes

The complexity of calculating competition benefits, and the required assumptions and/or simplifications made to manage this complexity, was of concern to several stakeholders. The VEPC stated that market modelling, including stochastic and game-theoretic elements, are computationally feasible, however model specification (being the way the market is assumed to operate in the future) is a key issue. Similarly, the PIAC and Shell Energy noted that the competition benefits calculation is heavily dependent on input assumptions.

Generally, uncertainty was a key element of concern to stakeholders (ISP Consumer Panel, AEC, Shell Energy and others), in relation to both appropriate selection of inputs and uncertainty around the materiality of benefits. The VEPC stated that:

³ At <https://www.transgrid.com.au/projects-innovation/humelink>.

“while competition benefits are easy to conceptualise they can not be estimated with any reasonable level of confidence. Likewise any conjecture that a transmission augmentation will provide competition benefits by stimulating competition is not in any way provable.”

The ISP Consumer Panel stated that the assessment of competition benefits carries too much uncertainty to warrant inclusion in the benefits assessment in the ISP.

The AEC recommended caution with the estimation and incorporation of competition benefits, and that AEMO should possibly adjust results downwards to reflect uncertainty surrounding the estimates. EA supported the caution in AEMO’s consultation paper and its approach to be conservative in choice of methodology and inputs. In contrast, Hydro Tasmania expressed concern around understating competition benefits to the detriment of some ISP projects.

EA and the AEC supported the exclusion of dynamic competition benefits, with the AEC acknowledging that any inclusion of dynamic benefits would further increase complexity.

Appropriateness

Several stakeholders, including the AEC, AGL, and ISP Consumer Panel, did not regard competition benefits as appropriate for quantification in the 2022 ISP.

The ECA, ISP Consumer Panel, EA, PIAC and Shell Energy expressed concern about the change in approach regarding competition benefits being introduced at a later stage of the 2022 ISP process, given the Draft 2022 ISP is due to be published in December 2021, and questioned whether the process has been sufficiently exhaustive and enabled meaningful engagement.

In contrast, Snowy Hydro stated that detailed modelling cannot be determined without competition benefits and the ISP would not achieve the ODP if they were not considered. Hydro Tasmania stated its view that strengthening of interconnection between National Electricity Market (NEM) regions offers an opportunity to deliver significant competition benefits for consumers in the NEM.

Shell Energy requested an assurance that competition benefits would be included in cases where they could be material, where materiality could be either positive or negative. If scenarios where there was a materially negative competition benefit were excluded this would create an asymmetry, to the detriment of consumers.

VEPC suggest an alternative evidence-based process for transmission proponents to follow in order to qualify a transmission augmentation as increasing competition. EA recommended AEMO consider additional means to refine its traditional net benefits calculations before having to resort to competition benefits. Powerlink suggested that AEMO should instead focus on other ISP aspects such as testing the robustness of the ODP to future changes in the energy system.

3.2 AEMO’s assessment and conclusion

Complexity and uncertainty regarding future outcomes

AEMO accepts and agrees with stakeholder feedback that the complexity of calculating competition benefits and computational intensity could be overcome through containing the scope and applicability within the ISP framework; whilst acknowledging that the heavy influence of selected modelling input assumptions remains as an outstanding accuracy concern.

AEMO accepts that stakeholders are concerned that significant uncertainty surrounds the quantification of competition benefits, and that this uncertainty decreases confidence in calculating competition benefits with an appropriate level of accuracy. AEMO’s approach to evaluating the uncertainty surrounding competition benefits in this consultation is two-fold:

- To consider the appropriateness of including each class of competition benefits (being competition cost savings and competition benefits due to demand elasticity) separately for its corresponding level of uncertainty regarding future outcomes; and

- To consider whether adopting conservative input assumptions, such that competition benefits are at lower risk of being overstated, is an appropriate means for managing such uncertainty.

AEMO accepts and agrees with stakeholder views that dynamic competition benefits should not be quantified within the ISP, and that only static benefits should be considered for potential inclusion throughout this consultation.

Appropriateness

AEMO acknowledges consensus stakeholder feedback that competition benefits are inappropriate to consider in the ISP, particularly in the 2022 ISP as an amendment to the ISP Methodology.

AEMO is required by clause 5.22.10(c)(3) of the NER to consider competition benefits in the ISP. While AEMO has not previously quantified competition benefits in the ISP, this was based on expectations of low materiality relative to project costs. Given that HumeLink was identified as an actionable ISP project in the 2020 ISP and TransGrid has subsequently identified material competition benefits through its Regulatory Investment Test for Transmission (RIT-T) process, AEMO found it necessary to review its position, seek stakeholder feedback through consultation, and test the materiality of competition benefits by performing indicative calculations using a modified version of EY's proposed methodology.

AEMO notes that transmission augmentations could, in some circumstances, decrease competition rather than increase competition. In this circumstance, negative competition benefits could be included in the assessment of a CDP, effectively reducing the reported benefits of a CDP. Any quantification of competition benefits must allow for such an outcome.

On the suggestion of an alternative evidence-based process for transmission proponents to follow for claiming competition benefits, and other recommended changes to benefits assessments in the ISP, AEMO is not in a position to assess or adopt these suggestions as part of this consultation as they would require more wholesome changes to the ISP Methodology than appropriate to make in a single stage consultation.

4. The identification of strategic players

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 behaviour⁴.

In its consultation paper, AEMO proposed to follow the strategic bidding approach adopted by EY in the *Draft Competition Benefits Inputs, Assumptions and Methodology Report*. 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).

4.1 Issue summary and submissions

Shell Energy and others noted the choice of strategic participants is a critical part of competition benefits modelling.

The transient nature of strategic players

Generally, stakeholders were of the view that the selection of strategic players is problematic, because the portfolios that bid strategically will change over time:

- AEC noted that strategic players are likely to change in the future as the generation technology mix changes and coal-fired generation exit the market.
- Shell Energy and PIAC stated that portfolios may bid strategically at different times, and strategic bidding is not guaranteed to occur at any time, noting that the proposed methodology considers that the nominal strategic players bid strategically all the times during the nominal time periods set out in the report.
- The impacts of market reforms, such as the introduction of five-minute settlement (noted by Origin and PIAC) and the Energy Security Board's Post 2025 Market Design work (noted by PIAC and Powerlink) are not yet fully understood.

Considering other strategic players

Some stakeholders proposed that more portfolios and their generators should be included as strategic players, in addition to the three portfolios AEMO proposed:

- AGL and the ISP Consumer Panel considered that other generation technologies such as hydro generators, gas generators and/or storage units could be included in the selected strategic players, for their ability to bid strategically, and ability to operate flexibly. In contrast, Shell Energy supported AEMO's decision to exclude bidirectional resources and hydro generators from modelling as strategic players given the uncertainty of how resource-limited hydro generators will operate in the future.

⁴ See Appendix A of AER's "Application guidelines: RIT-T", August 2020, available at: <https://www.aer.gov.au/system/files/AER%20-%20Regulatory%20Investment%20test%20for%20transmission%20application%20guidelines%20-%202025%20August%202020.pdf>

- Origin considered that the proposed approach (focused on baseload generation) to modelling bidding behaviour in the NEM was overly simplified.
- Hydro Tasmania noted that two of the strategic bidders selected in the proposed methodology are forecast to have lower market shares than Snowy Hydro and Origin from 2026, and that excluding those portfolios was likely to result in highly conservative modelled estimates of competition benefits.
- Hydro Tasmania recommended that observed behaviour of non-coal generators should be considered in analysis of strategic bidding, particularly in the context of the changing NEM resource mix.
- The ISP Consumer panel stated that HumeLink could increase the market power of certain participants and their ability to bid strategically and that these issues were ignored in the proposed methodology.

Definition and selection criteria

Shell Energy and PIAC raised a concern that the selection criteria for identifying strategic players lacked definition. AGL stated that competition in the NEM has not proven to be ineffective in recent history and a competition benefit should only be considered where significant instances of the exercise of market power can be identified.

The ISP Consumer Panel suggested modelling could be complemented by analysis of opportunities to exercise market power with or without any development path, and that the Pivotal Generators analysis undertaken as part of the Australian Competition and Consumer Commission (ACCC) Retail Electricity Pricing Inquiry could be a complementary 'top down' approach. The ISP Consumer Panel noted that it was likely that this analysis would reveal that market power was more complex than the simplifying assumptions in the proposed methodology.

4.2 AEMO's assessment and conclusion

The transient nature of strategic players

AEMO agrees that the strategic players proposed comprise generation assets that will exit the market at some point within the ISP forecast time horizon (to 2050). This would logically imply that the modelled competition benefits of a CDP would reduce over time as the market share of these strategic players reduces.

AEMO also agrees that existing portfolios may invest in new assets in the future, effectively increasing market share. In the ISP modelling, AEMO is not in a position to make any inference about how many new generation entrants may be a part of an existing portfolio. Similarly AEMO recognises the potential for new strategic players to enter the market, and is unable to make any inference about what these portfolios may be within the ISP. AEMO regards the proposed selection of existing strategic players only, and assuming no expansion of their asset base, as a simplified input assumption and acknowledges stakeholder views that this simplification may give rise to accuracy concerns.

AEMO agrees that, in reality, strategic players can differ throughout time and that strategic bidding is not guaranteed to occur at any time. AEMO notes that strategic bidding has been confined to certain daytime periods in the proposed methodology, yet acknowledges that this strategic bidding is applied for all days across the 10-year time horizon and is a modelling simplification that may not be realistic. AEMO notes that this strategic bidding will not necessarily result in competition benefits arising at all times, as this will depend on supply and demand conditions at each time period.

AEMO acknowledges that the observed impacts of market reforms would ideally be taken into account in competition benefits assessments.

Considering other strategic players

AEMO regards the selection of strategic players as a critical decision in competition benefits modelling, that carries significant uncertainty. AEMO acknowledges stakeholder feedback that other (non-coal) generation

assets, hydro generators in particular, could be considered as strategic players. AEMO makes the following observations in regards to considering inclusion of other strategic players:

- Resultant changes in competition benefits calculation outcomes: AEMO considers that if more strategic players were added to the assumptions/modelling, this could increase competition benefits rather than decrease them. This is complicated by the possibility of transmission augmentations increasing the ability for portfolios to bid strategically, depending on the nature and location of their generation assets. If this occurs, including these portfolios as strategic players would decrease competition benefits. On balance, it is difficult to speculate whether increasing the number of strategic players would increase or decrease competition benefits.
- Materiality to outcomes: Strategic bidding of coal-fired generation capacity is likely to result in increased dispatch of (predominantly) gas-fired generation capacity. The difference in short run marginal cost (SRMC) between these two generation technologies is relatively large, and could result in material differences in dispatch cost savings associated with network development, with and without consideration of strategic bidding. In this sense, capturing major coal-fired generators as strategic players is most relevant to the approximation of competition cost savings.
- Relevance to competition cost savings: In circumstances where strategic bidding of other generation technologies does not lead to significant differences in the marginal cost of generation (relative to the significant marginal cost difference between coal-fired generation and gas-fired generation), but does lead to differences in wholesale prices, this is less material/relevant to the approximation of competition cost savings. If quantified, such an outcome is more material to the calculation of competition benefits due to demand elasticity (see Section 7).
- Significant uncertainty remains: Selecting a larger number of strategic players would not remove uncertainty surrounding the asset composition of future strategic players, and carries with it a significant increase in the cost associated with undertaking the analysis. Specific to including hydro assets as strategic players are market modelling challenges associated with their inclusion, further increasing the cost associated with undertaking the analysis.

In conclusion, selecting a small number of strategic players (as existing coal-fired generators) is an approach that AEMO considers should generally provide some indication of the materiality of competition benefits, specifically competition cost savings. For its indicative assessment (in Appendix 6 of the Draft 2022 ISP), AEMO has taken this approach. AEMO remains cognisant of the uncertainty and accuracy concerns associated with this approach.

Definition and selection criteria

AEMO concludes that simplifying assumptions are necessary to allow for competition benefits to be computationally feasible, yet acknowledges that making simplifying assumptions carries risk of inaccurate outcomes. For this reason, AEMO agrees that the definition and selection criteria for strategic players must be transparent, and evidenced by available literature and current analysis.

4.3 Additional clarifications

Several stakeholders had further questions/concerns regarding EY's proposed methodology. AEMO has clarified these in Table 3 below for informational purposes.

Table 3 Clarifying additional questions on selection of strategic players

	Issue	AEMO clarification
Regional considerations	AGL stated that the methodology presumes regional geographic markets for competition among coal-fired generators, even though, when coal-fired generators set the price,	AEMO confirms that the the ISP modelling takes into account interconnector constraint behaviour, and that competition between coal-fired generators in different regions will therefore be appropriately represented. The

	Issue	AEMO clarification
	interconnectors are typically not constrained, and that coal-fired generators are generally in the same competitive market.	proposed methodology takes into account that in some regions the competition benefits may be positive and in other regions the competition benefits can be negative. In the case where coal-fired generators in different regions are owned by the same portfolio, AEMO confirms that the chosen profit maximising strategy maximises profit for that portfolio.
With and without augmentation	ISP Consumer Panel questioned whether there was an assumption that generators with market power immediately before the transmission project would have retained the same level of market power for 10 years if the transmission project did not occur.	For its indicative assessment, AEMO held the selection of strategic players constant across both a CDP and its counterfactual. However, the selected profit maximising strategy varies between CDPs and the counterfactual, and between ISP scenarios. This means that the level of market power can change between with and without transmission cases. Additionally, the proposed methodology allowed for changing volumes of dispatch cost savings across the 10 year period, depending on whether strategic bidding results in a change in dispatch.
NSW Government Roadmap	ISP Consumer Panel also noted that the selection of generators was based on a 2019 Frontier Economics report relating to Liddell closure which was completed prior to the NSW Government Roadmap commitment of 12 gigawatts (GW) of renewable generation and 2 GW of firming capacity by 2030.	. AEMO notes the observation from the ISP Consumer Panel and will take it into consideration if competition benefits are calculated in future ISPs.
DER	ECA noted that consumers' own investments in rooftop solar have likely had a significant impact in reducing market power from incumbent parties, and that the proposed methodology was absent any mention of the impact from distributed energy resources (DER) on competition.	DER is inherently considered in all ISP modelling as an offset to demand. In the proposed methodology, time periods were identified where competition benefits are most likely to occur, with these time periods mostly outside of daytime periods (where rooftop and utility-scale solar reduce the potential for competition benefits to arise).

5. Considerations for strategic bidding

In its consultation paper, AEMO proposed leveraging recent competition benefits studies, namely the 2019 Frontier Economics study and TransGrid's HumeLink Project Assessment Conclusions Report (PACR), proposing to adopt the same set of strategic players and respective potential bidding strategies.

5.1 Issue summary and submissions

Powerlink and others acknowledged that there are a multitude of inherent assumptions behind each potential withholding strategy, including the hedging activities of strategic players and a strategic players retail position.

Use of historical information

The AEC and EA reported difficulty in reconciling use of historical analysis. Reasons given included the pace of change in generation patterns and portfolio structures, and that historical data contains periods of fuel and capacity unavailability that is difficult to discern/separate from strategic portfolio behaviour.

EA also noted that the range of portfolio strategy options was quite material and questioned whether historical analysis supports considering all of these options in the modelling. Shell Energy stated it was concerned that large and unrealistic competition benefits could be calculated simply based on the choice of strategic bidding input assumptions, noting that some of the bidding strategy options did not appear likely (in Shell Energy's opinion). Shell Energy recommended that some of these options be discarded as they would create an artificially high estimate of competition benefits. Shell Energy also stated it did not consider that the assumptions represent historically observed behaviour, particularly during the selected time periods.

Hydro Tasmania encouraged AEMO to explore opportunities to strengthen the proposed methodology by focusing on forward market evolution rather than on past market trends. It was considered that the proposed approach risks producing unrealistic results as it does not appropriately consider changing market dynamics.

Finding the Nash Equilibria

EA sought clarification why the Nash Equilibrium was not determined for each hour or year independently across the 10-year period.

Shell Energy also noted that the Nash Equilibrium has not been investigated for each hour independently, or for each year independently. While Shell Energy accepted that a full set of modelling using half-hourly or hourly bids would be prohibitively computationally expensive, other alternatives include the use of monthly or seasonal Nash Equilibria which potentially change based on observable market events, such as the proposed date for commissioning of network assets. Shell Energy felt this would better reflect the broad scope of strategies generators can choose to employ in a fast-changing NEM environment.

5.2 AEMO's assessment and conclusion

Use of historical information

AEMO thanks Shell Energy for the historical bid data that was included in the Shell Energy submission, and the efforts all stakeholders have made in providing detailed submissions that help substantiate positions put forward.

AEMO notes that historical data was used to assess the range of bidding patterns, but the bidding patterns adopted for the future were the result of computing the profit-maximising bidding profiles to be adopted by strategically bidding generators in the modelling.

AEMO considers that use of historical data is a means of inherently capturing underlying dynamics that are reflected within historical bidding behaviour, such as contracting behaviour and portfolio dynamics. AEMO agrees that the transient nature of strategic bidding behaviour and the context surrounding these events is an issue when using historical data to inform strategic bidding options. AEMO acknowledges ultimate adoption of particular strategic bidding patterns for an extended forecast period is a simplification that carries risk of inaccuracy, particularly if the bidding strategies adopted are at the extreme end of an historical range. AEMO acknowledges that an accuracy improvement would be to consider historically observed behaviour during the selected time periods.

AEMO recognises that while strategic players and their range of strategic bidding options are selected based on history, the proposed methodology partly considers future market evolution and implications for competitive outcomes across the NEM, by virtue of AEMO's ISP market models being used to simulate the strategic bidding cases and determine which of the selected strategies maximises future profit for all strategic players.

Finding the Nash Equilibria

AEMO accepts that a more frequent recalculation of the profit maximising strategy, such as the options suggested by Shell Energy, may result in a more accurate representation of changing strategic bidding behaviour in a fast-changing market environment. If competition benefits were to be routinely calculated in the ISP, the materiality of this improvement in accuracy would have to be weighed up against the necessary increase in computational cost.

5.3 Additional clarifications

Several stakeholders had further questions/concerns regarding the proposed methodology. AEMO has clarified these in Table 4 below for informational purposes.

Table 4 Clarifying additional questions on strategic bidding

	Issue	AEMO clarification
Internal consistency	EA noted it would be concerned about the lack of internal consistency if prices post competition modelling were not used as an input into the long-term capacity modelling.	AEMO concludes that competition benefits modelling results are unlikely to change the investment signal such that capacity modelling outcomes would differ, unless competition benefits were extremely material. AEMO has excluded dynamic competition benefits from consideration for reasons provided in EY's <i>Draft Competition Benefits Inputs, Assumptions and Methodology Report</i> .
Market power post augmentation	ISP Consumer Panel was concerned that no generators would exercise market power in the post-augmentation modelling.	AEMO confirms that the proposed methodology would have allowed for strategic players to exercise market power in post-augmentation cases.

	Issue	AEMO clarification
Publication of results	Hydro Tasmania made multiple specific recommendations of modelling results and historical benchmarking results for publication by AEMO.	AEMO notes these recommendations but, based on the the outcomes of this consultation, will not be routinely calculating competition benefits as part of its ISP methodology.
Price threshold	Shell Energy noted that it disagreed with the \$500/MWh threshold for capacity not offered at Short Run Marginal Cost (SRMC) and stated that a \$300/MWh was more appropriate given that is the strike price for most market cap contracts.	<p>AEMO notes the logic for adopting a \$300/MWh price threshold in preference to the proposed \$500/MWh price threshold.</p> <p>AEMO considers that this would not result in a material change to dispatch cost savings calculations, as the dispatch outcomes are unlikely to change materially between either of these price thresholds. AEMO also notes that \$500/MWh is a more conservative assumption relative to an assumed price threshold of Market Price Cap..</p>

6. Selection of generation and storage development plans

6.1 Issue summary and submissions

Following the approach presented in EY's *Draft Competition Benefits Inputs, Assumptions and Methodology Report*, the counterfactual capacity expansion plan would be adopted for both CDP and counterfactual cases for the purpose of calculating competition benefits.

In the consultation, AEMO sought stakeholder views on whether following this approach could risk over-estimation of the level of competition in the CDP case.

Two options were proposed by AEMO in the consultation paper:

1. AEMO adopts the distinct capacity expansion plans for each of a CDP and its counterfactual development plan; or
2. AEMO uses the counterfactual generation and storage development plan for both the counterfactual and CDP cases (EY's proposed approach)

The ISP Consumer Panel recommended adopting the distinct capacity expansion plans for each of a CDP and its counterfactual development plan (option 1), because:

- The comparison between a CDP and its counterfactual as proposed (per the second option above) could overstate competition benefits; and
- The overbuild of generation (in the case where the counterfactual generation plan is adopted for a CDP) would not be an efficient market outcome and is not a likely outcome (if the market knew the transmission project/s were being built); and
- This approach (option 1) would allow for the competition benefits assessment to be consistent with other benefits assessments in the ISP.

In Shell Energy's view, competition benefits modelling should include the possible outcome that additional transmission capacity leads to early exit of existing capacity or a change in generation development plans, which could lead to a negative competition benefit.

6.2 AEMO's assessment and conclusion

AEMO has taken into consideration the above feedback and concludes that, if competition benefits were to be routinely calculated in the ISP, AEMO would adopt the distinct capacity expansion plans for each of a CDP and its counterfactual development plan (option 1). AEMO took this approach in its indicative assessment for competition benefits.

AEMO considers the main advantage of adopting the distinct capacity expansion plans for each of a CDP and its counterfactual development plan to be an avoidance of risk of overstating competition benefits for the

aforementioned reasons. AEMO concurs that changes to capacity expansion plans as a result of additional transmission capacity (and their subsequent impact on competition) should be accounted for in competition benefits modelling.

In proposing their methodology, EY was of the view that taking option 1's approach adds complexity, particularly given new generation entry and existing generation retirement timings will differ between a CDP and its counterfactual and that this may result in a comparison of dispatch cost savings between cases being less straightforward or potentially unworkable.

However, AEMO needs to determine the generation and storage mix, with and without transmission in various candidate development paths regardless, as part of the ISP methodology. Option 1 therefore results in a comparison that is more intuitive and straightforward in the context of the ISP. The approach to determining the static classes of market benefits with and without competition is exactly the same, except that one assumes strategic bidding and the other assumes SRMC bidding.

AEMO therefore considers that option 1 is most appropriate as it reduces risk of double-counting or of overstating competition cost savings.

AEMO considers there is potential to seek further clarification on the treatment of capacity expansion plans in calculating competition benefits through future enhancement of the AER's CBA Guidelines.

7. Competition benefits due to demand elasticity

7.1 Issue summary and submissions

EY's methodology, outlined in the *Draft Competition Benefits Inputs, Assumptions and Methodology Report*, accounts for benefits that result from a sustained 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.

Stakeholders raised multiple concerns in regards to this type of competition benefit, following themes of materiality, accuracy and appropriateness.

Materiality

Stakeholders questioned the materiality of a consumer response to long-term changes in wholesale prices. The ECA noted that, from their experience, any response from small business and residential consumers would be too small to support inclusion of this type of benefit. In particular, some stakeholders expressed a lack of confidence that an *increase* in demand would result from a *reduction* in wholesale electricity prices:

- **Practical limitations:** Shell Energy stated that a reduction in electricity prices does not often result in an opportunity to expand consumption. Similarly, the ECA stated their expectation that *"most residential and small business consumers will not realise significant benefits from demand response, simply because as renters or with limited disposable income, they do not have the agency or means to purchase additional appliances that enable increased utilitarian consumption"*.
- **Other (non-electricity) factors:** Shell Energy reported that, when commercial and industrial (C&I) or larger small to medium enterprise (SME) consumers consider whether to replace or expand their technology/production assets, electricity price is just one of many factors that vary in importance depending on the consumer. The ECA stated that energy consumption behaviour patterns are complicated and driven by many non-economic factors. The ECA noted that all business consumers – including small business consumers – consider energy investments alongside a suite of other potential business investments that might in one way or another increase revenue or reduce costs. Sustained lower energy prices are only likely to increase consumption if they materially improve the prospects of energy investments compared to other investment opportunities. It is unclear if wholesale price decreases would be sufficient to do so.
- **Lack of evidence:** Shell Energy stated that, while the proposed methodology quotes a number of studies undertaken on electricity markets to calculate the elasticity of demand, these studies are generally associated with reductions in electricity demand due to electricity price increases, as opposed to increases in demand due to lower prices. Shell Energy said it was concerned the assertions set out in the EY report are not supported by factual evidence supporting the proposed outcome, particularly with regards to demand increases for lower wholesale prices. Shell Energy also noted that elasticity of demand is not

necessarily symmetrical. The ECA stated neither AEMO nor EY had provided any evidence or research to support their claim that lower prices would increase demand.

- **Retention of energy savings:** Shell Energy stated that responses to higher electricity prices such as plant augmentations to improve productive efficiency or rooftop solar are not removed due to a subsequent fall in electricity prices. Where possible these savings are retained as improved margins or, for households, lower electricity bills, which then allows spending on other items which may not be electricity consumption related.
- **Electrification:** The ECA noted that consumers may benefit from increased electrification, yet the consumer benefits of electrification are already baked into the scenarios AEMO has developed for the ISP. EA and the ECA noted that the interaction between these benefits and any further competition benefits (due to demand elasticity) through electrification is unclear in the methodology.

In contrast, Hydro Tasmania noted that the proposed elasticity demand value (-0.05) was likely to be conservative, given the evidence provided by EY.

Accuracy

Various stakeholders reported concerns regarding the accuracy of the proposed methodology and subjectiveness of the proposed inputs for this calculation:

- **Application of a single elasticity figure:** Origin and the ECA expressed concern around the application of a single number for elasticity of demand across all consumers, given that elasticity of demand to wholesale price can vary. The ECA felt stronger evidence/research was needed for a single figure to be confidently applied.
- **Impact of wholesale price changes on consumption:** EA recommended further exploration of the assumption that discounting the demand elasticity figure by 50% would result in the change in electricity demand (due to a change in wholesale price) being appropriately reflected.
- **Uncertainty of future outcomes:** Powerlink considered that, while the inputs appear reasonable, *"changes associated with storage technologies, distributed energy sources and market design could markedly alter characteristics of demand responses to price in the short to medium outlook"*.

Appropriateness

The ISP Consumer Panel stated that:

- The proposed approach to estimating competition benefits from increased consumption was based on highly simplified and unreliable assumptions regarding demand elasticities, future retail prices, and consumer behaviour, that are not supported by any robust evidence.
- The assumptions proposed were so unreliable that all demand elasticity benefits should be removed from the methodology.

Shell Energy was not convinced that sufficient rigour had been applied to analysis in this area to warrant its inclusion. The ECA was similarly unsupportive of this form of competition benefit being included in the ISP, until and unless further research has been conducted.

In contrast, Hydro Tasmania supported the overall approach to determining the competition benefits due to demand elasticity.

Terminology

The ISP Consumer Panel reported that the use of the term "demand response" is confusing given the term's meaning in the current electricity market.

7.2 AEMO's assessment and conclusion

Materiality

AEMO thanks stakeholders for providing their observations of demand elasticity across consumer segments. AEMO considers this stakeholder feedback alongside various reports referenced in both the IASR and EY's report that do report elasticity of demand. These report a wide range of elasticity figures, and stakeholder feedback would indicate that, in practice, demand elasticity is in the lower end of this range, which is reasonably consistent with conservative value proposed.

AEMO acknowledges that demand elasticity is typically considered in relation to responses to increasing retail prices, which is different to the proposed application here – increasing demand in response to low wholesale prices. In this respect and to AEMO's knowledge, evidence of increasing demand in response to low wholesale electricity prices is smaller. AEMO recognises the possibility that demand elasticity is not symmetrical: a retail price reduction may need to be observed for a number of years before it results in a similar response as a retail price increase would have done to reducing demand. A potential lag in any demand increase will reduce possible benefits.

Within this time horizon, the uncertainty about strategic players (discussed in Section 4), their bidding behaviour (Section 5) and the selection of generation and storage expansion plans (discussed in Section 6) also results in uncertainty around the forecast wholesale price outcomes, noting that changes to market structure (for example, as mentioned in Section 4.1) can also impact prices. As result, AEMO concludes that the proposed methodology cannot be adopted with sufficient confidence for modelling of competition benefits arising from demand elasticity.

Accuracy

AEMO acknowledges concerns around application of a single figure for demand elasticity. However, absent any of the other issues raised, this issue is one that AEMO considers resolved by use of a small (conservative) figure, so as to not risk overstatement of competition benefits due to demand elasticity.

AEMO also acknowledges the potential for demand elasticity to change as the power system evolves and consumer behaviour changes, giving rise to uncertainty regarding any assumed demand elasticity figure.

In considering the concerns around inferring any increases to consumption as a result of wholesale price reductions, AEMO concurs with stakeholders that the proposed 50% discount of demand elasticity introduces a level of simplification and/or potential inaccuracy. AEMO concludes that this issue should be investigated further if and before competition benefits due to demand elasticity are calculated in future ISPs.

Appropriateness

Given the aforementioned matters of materiality and accuracy, AEMO concludes any assumption of competition benefits derived due to increases in demand, as a result of forecast wholesale price reductions, as inappropriate for the ISP. This is because this type of competition benefit, if appropriately calculated, is not likely to materially affect the outcome of the assessment of the development path. AEMO considers there is potential to seek further clarification on the appropriateness of considering this type of competition benefit in future enhancements to the AER's CBA Guidelines.

Further, more effort to quantify, clarify and model this type of benefit would ultimately still contain a significant level of uncertainty regarding future outcomes. In this respect, the cost of quantifying this type of competition benefit is clearly disproportionate given the level of uncertainty regarding future outcomes.

Terminology

AEMO agrees that the use of the term "demand response" is confusing given the term's meaning in the current electricity market, and now refers to these benefits as "competition benefits due to demand elasticity".

8. Applicability to the ISP framework

8.1 Time period

8.1.1 Issue summary and submissions

AEMO has proposed a 10-year calculation period recognising that future uncertainty increases over time.

The ISP Consumer Panel commented that the approach proposed by AEMO was an improvement on the approach adopted by TransGrid in the Humelink PACR, which assumes competition benefits will continue for the 20-year modelling period. However, the ISP Consumer Panel considered that a 10-year period is unrealistic and likely to overstate the magnitude of competition benefits, given that market reforms and market entry of new generation is expected to erode market power of existing generators. The ISP Consumer Panel recommended a shorter time horizon of no more than 10 years from the date of the analysis – irrespective of the commissioning date of other projects in question, or five years, not 10 years, post commissioning.

Shell Energy raised doubts that competition benefits modelling would accurately represent actual outcomes over the next 12 months, let alone the proposed 10-year period over which competition benefits are intended to be included.

In contrast, EA noted that AEMO should also be guided by the need for consistency across modelled outcomes: *“Noting EA’s support for a conservative and transparent approach, this consistency may actually dictate calculation of benefits for the full time horizon rather than arbitrarily truncating it to 10 years. To the extent benefits are in proportion to retiring coal plants, their tailing off should be seen in the modelling results in any case.”*

8.1.2 AEMO’s assessment and conclusion

AEMO concludes that, should competition benefits be quantified in the ISP, the selected time period of 10 years (from the first commissioning date of transmission projects) is appropriate, in balance of numerous factors raised through consultation.

In AEMO’s opinion, 10 years strikes a balance between being somewhat consistent with the long time horizon across which traditional market benefits are calculated, and recognising the increased level of uncertainty associated with competition benefits. While competition benefits would be quantified across a 10-year period, in the case where strategic players retire over time, competition benefits should reduce accordingly within that 10-year period.

8.2 Additional clarifications

Several stakeholders had further questions/concerns regarding the proposed methodology. AEMO has clarified these in Table 5 below for informational purposes.

Table 5 Clarifying additional questions on applicability to ISP framework

	Issue	AEMO conclusion
RIT-T implications	Hydro Tasmania, Shell Energy, PIAC and EA questioned the broader interaction with the RIT-T process.	Whether or not AEMO quantifies competition benefits within the ISP does not preclude or require competition benefits to be quantified in the RIT-T. However, AEMO does recognise the potential for inconsistency between the RIT-T assessment and any feedback loop request if the project proponent has identified material competition benefits that are not then able to be confirmed in an ISP feedback loop. The AEMC's Transmission Planning Investment Review is considering how inconsistencies in the process may be addressed.
Scale	The ISP Consumer Panel stated that the EY methodology was developed for a RIT-T and it was not clear whether it would scale effectively to the ISP and CDPs as opposed to individual projects like in a RIT-T.	AEMO considers that the methodology for calculation cost savings could scale effectively to the ISP, however complexity is introduced in reassessing bidding strategies for each candidate development path.
Benefits of interconnection	<p>Snowy Hydro stated that the competition benefits of enabling future connections and risk management benefits of the system should also be assessed (for example, those relating to the Western Victorian renewable energy zone [REZ]). It also stated that the definition of competition benefits should be expanded to include:</p> <ul style="list-style-type: none"> • Enabling future generation connections and competition benefits for the system. • Productive efficiency which arises when increased interconnection causes lower priced generation to displace higher priced generation. • Allocative efficiencies from avoiding or deferring the construction of generation and transmission assets (which may otherwise be developed if prices were higher). 	<p>AEMO considers that the benefits, including risk management benefits, of enabling future generation connections, and of increased interconnection, are appropriately captured in the market benefits assessments within the ISP methodology.</p> <p>The competition benefits of these are the subject of this consultation and bear the uncertainty, complexity and materiality considerations detailed throughout this report. The decision to include or exclude each of static and dynamic competition benefits was also the subject of this consultation.</p>
TOOT analysis	Shell Energy noted that during the 26 October workshop AEMO stated it does not intend to calculate the change in competition benefits as part of the take one out at a time (TOOT) analysis. When eventually the proposed methodology is developed sufficiently via analysis and consultation to be suitable for its inclusion in the benefits analysis, should this class of benefits be shown to be material, Shell Energy would encourage the inclusion of the calculation of changes in competition benefits as part of the TOOT analysis.	AEMO notes the suggestion from Shell Energy and will take it into consideration if competition benefits are calculated in future ISPs.
Discount rate	The ISP Consumer Panel raised the idea that a higher discount rate for competition benefits, such as the 10% ISP sensitivity, would be another way to recognise the benefits are less certain than other benefits. The ISP Consumer Panel noted that, based on AEMO's approach to discount rates in the Final IASR, AEMO may prefer not to apply different discount rates to different classes of benefits.	AEMO concludes that same discount rate should be applied to competition benefits as is applied to other traditional market benefits, aligned with AEMO's existing approach to discount rates. AEMO considers that other measures proposed to manage uncertainty are more appropriate.

Abbreviations

Term	Definition
ACCC	Australian Competition and Consumer Commission
AEC	Australian Energy Council
AER	Australian Energy Regulator
AGL	AGL Energy
CBA	Cost benefit analysis
CDP	Candidate development path
DER	Distributed energy resources
EA	Energy Australia
ECA	Energy Consumers Australia
IASR	<i>Inputs, Assumptions and Scenarios Report</i>
ISP	<i>Integrated System Plan</i>
NEM	National Electricity Market
NER	National Electricity Rules
ODP	Optimal development path
PACR	Project Assessment Conclusions Report
PIAC	Public Interest Advocacy Centre
REZ	Renewable energy zone
RIT-T	Regulatory Investment Test for Transmission
SRMC	Short Run Marginal Cost
TOOT	Take-one-out-at-a-time (analysis)
VEPC	Victoria Energy Policy Centre