Shell ENERGY

1 March 2021

Ms Nicola Falcon
General Manager Forecasting
Australian Energy Market Operator
PO Box 2008
Melbourne, Victoria, 3001

Dear Ms Falcon

RE: AEMO Integrated System Plan Methodology Consultation

Shell Energy Australia Pty Ltd (Shell Energy) welcomes the opportunity to respond to the Australian Energy Market Operators (AEMO) Integrated System Plan (ISP) Methodology Consultation Issues Paper (the Paper).

About Shell Energy in Australia

Shell Energy is Australia's largest dedicated supplier of business electricity. We deliver business energy solutions and innovation across a portfolio of gas, electricity, environmental products and energy productivity for commercial and industrial customers. The second largest electricity provider to commercial and industrial businesses in Australia[1], we offer integrated solutions and market-leading[2] customer satisfaction, built on industry expertise and personalised relationships. We also operate 662 megawatts of gas-fired peaking power stations in Western Australia and Queensland, supporting the transition to renewables, and are currently developing the 120 megawatt Gangarri solar energy development in Queensland. Shell Energy Australia Pty Ltd and its subsidiaries trade as Shell Energy.

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General Comments

Shell Energy acknowledges and supports the ongoing work by AEMO to attempt to improve inputs and methodologies to be used in the 2022 ISP. We are generally supportive of most of the improvements as outlined in the Paper, however in some areas we believe the Methodology when published would be improved by the inclusion of additional detail to add clarity. We provide comment on the specifics of the Paper in the following areas of our submission.

[1] By load, based on Shell Energy analysis of publicly available data

[2] Utility Market Intelligence (UMI) survey of large commercial and industrial electricity customers of major electricity retailers, including ERM Power (now known as Shell Energy) by independent research company NTF Group in 2011-2020.

Section 2 – Modelling methodology

Shell Energy considers that whilst section 2.2.1 provides an overview of the capacity outlook model, we believe the Methodology would benefit from a more detailed description of how the model operates to achieve its stated objectives.

Section 2.2.2 indicates an overview of the approaches which could be used to load block approximations of time-sequential data but then fails to provide details describing which approach is used in each of the capacity models and the reasons for its selection. Similarly, the approach to rounding from linearised build decisions in subsequent modelling processes for all types of generation technologies fails to describe how a final decision regarding the selection of generation build is derived and the decision framework for this final selection process.

The section also indicates that AEMO in some cases applies "*operational limits*" to the modelling which in our view would invariably impact resource selection. AEMO cites "*This could include for example applying minimum capacity factors on CCGT generators*". In our view this fails to adequately consider the flexibility of modern design where CCGT are capable of operating in open cycle as well as closed cycle mode as well as the ability to operate in synchronous condenser mode. The Paper is less clear regarding where AEMO includes operational choices in its modelling and we believe the Methodology should include a detailed list of all AEMO's choices.

Shell Energy Australia supports the inclusion of the "Anticipated" category for resource developments in the Methodology. We recommend this category of capacity resource also be included in the ESOO reliability assessment for years 3 to 10. With regards to the assessment of government funding in the commitment assessment criteria we support the second option;

> *"that the Finance commitment status is assessed as "in progress" if any form of government-awarded funding is announced, but would only be categorised as Anticipated, and therefore included in all ISP modelling (including counterfactuals), if also progressing towards satisfying two other criteria."*[3]

With regards to "anticipated transmission projects" we note that AEMO is proposing to base their selection on AEMO's assessment that the project is "*highly likely to proceed*", however the Paper includes no details of an assessment framework to be adopted by AEMO in this regard. We recommend that the Methodology contain details of an assessment framework to be used by AEMO in determining that an anticipated transmission project is "*highly likely to proceed*".

Shell Energy Australia is supportive of AEMO's proposal to initially use a static value equal to the largest generator in each of the regions for the maintenance of sufficient reserve resources. We understand that these static values would then be adjusted, (either increased or decreased), such that the forecast of unserved energy from the capacity adequacy modelling does not exceed the 0.002% reliability standard.

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[3] AEMO ISP Methodology Issues Paper pp 14

We also understand that the capacity adequacy model would allow the forecast level of unserved energy to increase towards the reliability standard as opposed to being maintained close to zero. We recommend this point be clarified in the Methodology.

We also note that AEMO proposes that the model be altered to a sub-regional model which would allow the model to better capture what are currently intra-regional network constraints which connect distinct electrical sub-regions of the National Electricity Market (NEM). We support this change, however, we request that AEMO provide further details in the Methodology how this change would interact with the capacity reserve level modelling and forecast unserved energy. Would this also be calculated at the sub-regional level?. If modelling is to be based on a sub-regional model, then output data from the modelling must be supplied on a sub-regional basis. We consider this more granular data would supply significant locational signal benefits to existing and intending participants.

We consider that demand data sets for each of the sub-regions should be based on the same historical load traces as that used for the regional model and should be constructed from connection point data to maintain the historical demand diversity observed between the sub-regions. For each region, the sum of the sub-regional demands in any modelling interval for each individual trace year must not exceed the regional demand following AEMO's demand scaling process.

If sub-regional modelling is introduced, then network losses should be calculated based on the modelled sub-regions and adjusted when required to reflect the addition of new transmission elements interconnecting these sub-regions.

Shell Energy notes AEMO's proposed methodology for the contribution of variable output renewable energy (VRE) generators to meeting seasonal peak demand. It is unclear to us why an additional adjustment for VRE generation output is required instead of using the matching historical traces for regional, (or subregional) system demand and actual, (or in the case of new VRE generators), calculated VRE output. We would like to better understand why the proposed additional adjustment is required.

In considering the methodology proposed by AEMO, we support the use of the VRE generator output during the top 10% of seasonal half-hourly demand outcomes as reasonable, but are concerned that the use of the 85th percentile level of output during these periods where VRE output may already be impacted by prevailing weather conditions, could result in an overly conservative estimate. We understand in this case the use of the 85th percentile would mean that in only 15% of periods would VRE output have been higher. It is also unclear from the Paper if "seasonal" applies to the four traditional weather seasons, or only to winter and summer periods. We recommend that the Methodology provide clarity regarding this. We recommend that AEMO provide more detailed data and analysis to AEMO Forecasting reference Group in this area for discussion before determining the approach to be adopted in the Draft ISP Methodology.

Shell Energy conditionally support the proposed methodology for the contribution of short duration (less than X hours of storage capacity at full output) energy storage systems (ESS).

However, we consider that the Methodology must set out the framework by which AEMO will calculate the key input assumption of "duration of peak demand events". Would this be calculated on a seasonal or monthly basis recognising how the shape of demand use changes across a year and what would be the threshold of percentage of demand used to calculate the "duration of peak demand events"? Would it be a percentage of daily, weekly, monthly or seasonal maximum demand. Would it be based on an average outcome or X percentile of observed outcomes? We recommend that AEMO provide more detailed data and analysis to AEMO Forecasting reference Group in this area for discussion before determining the approach to be adopted in the Draft ISP Methodology.

AEMO has proposed to restrict new entrant technologies on a sub-regional basis based on defined criteria. Shell Energy is supportive of such an outcome provided there is clarity and agreement around the framework in the Methodology for this process. We do however have concerns around the proposal to exclude gas powered generation from a sub-region or locational area due to lack of gas delivery infrastructure. This could lead to inefficient investment in transmission or other technology where provision of gas infrastructure to that location could be provided at lower cost.

We note that the current gas supply model,

"does not presently contain cost-related information in sufficient detail to form a reliable view on pipeline and production augmentation based on cost-efficiency alone. It therefore does not co-optimise pipeline expansion from a number of options like the capacity outlook model does"

we question how the model can therefore adequately assess the trade-off between gas and electricity infrastructure. We believe the framework should be based on an optimised cost approach.

We support AEMO's proposal to apply a range of different transfer limits to the transmission networks connecting sub-regions or key zones in the critical network flow paths. We recommend that AEMO use monthly or seasonal day and night limits in the model. In addition, for summer months we recommend that AEMO apply both a 10% POE as well as a typical summer temperature value similar to how different thermal generator output limits are applied to different periods in the modelling. Again, this should be clearly detailed in the Methodology.

AEMO proposes to implement a yet to be fully defined independent process to populate the sub-regions with hydrogen production, storage and transportation facilities to meet the energy export superpower scenario as opposed to outcomes derived from the modelling process. By necessity, as set out by AEMO in the Paper, this will contain a significant number of simplifications of inputs to and within the modelling process. We are concerned that with the evolution of hydrogen production, storage and transportation only in its infancy, that any framework adopted could in effect become a self-fulfilling prophecy resulting in sub-optimal investment decisions in the ISP given the early preliminary assumptions planned to be adopted.

This of course could be mitigated by the allocation of a very low or zero percent probability allocation in the cost benefit analysis for the energy export superpower scenario.

We urge caution in the language used in the 2022 ISP in describing the selection of locations for hydrogen production, storage and transportation facilities pending further developments and increased clarity in this area. We consider it is currently premature to consider the implementation of renewable energy zone (REZ's) and transmission infrastructure as other than an early preliminary view in the 2022 ISP for hydrogen production, storage and transportation infrastructure.

We note that in considering the impact of hydrogen production facilities for the capacity adequacy modelling, AEMO proposes that the operational flexibility of hydrogen electrolysers would be used to balance supply and demand in real time via consumption reduction at the electrolysers. Given this is the case, we question the need to modify the capacity adequacy model by the inclusion of hydrogen electrolyser capacity. If AEMO is correct in their flexibility assumption, as the total capacity of hydrogen electrolysers grows, this could in effect remove the need for any reserve generation requirement. The same may also apply for transmission network adequacy where it would be reasonably expected that the hydrogen electrolysers operating as a scheduled load would match consumption to AEMO's dispatch instructions which would take into account network congestion outcomes.

Shell Energy is supportive of the proposed amendments in the engineering assessment area. However, we are concerned that currently AEMO only consults with network service providers (NSPs) to ensure rigor in any engineering assessment process. We consider that the ISP would be improved if consultation was extended to equipment manufacturers and, existing and intending participants. Whilst the Paper sets out an AEMO/NSP's engineering assessment focussed framework for the provision of system services, (system strength, inertia, etc), little consideration appears to be given to the self- provision of system services by new asynchronous generations using substitutable services such as grid-forming inverters with integrated capacitors, or other methods. We note that AEMO acknowledges in the Paper that their current methodology is expected to result in a conservative outcome across scenarios. In our view this could result in inefficient investment in system services by NSPs on a regulated asset basis increasing costs unnecessarily to consumers. We recommend that AEMO expand its consultative efforts to achieve the least cost approach for consumers.

We are supportive of the proposed "land use penalty cost"[4] for the development of REZ's. In considering this penalty costs, we consider that this should also include the loss of productive output associated with the conversion of the land from its traditional use to that of hosting VRE generation if that is appropriate. As an example, installation of solar panels on land that was historically used for grain production would lose the potential for future grain production.

[4] AEMO ISP Methodology Issues Paper pp 27

In considering the REZ or other network expansion models, we note the proposed use of the simplified linearised expansion model by AEMO. It is unclear if the model is based on nominal capacity upgrade values or the values that can reasonably be expected following an upgrade between two designated locations. When considering the example of rebuilding a single circuit 220 kV transmission line with a double circuit line,[5] it is unclear if the initial capacity of the existing line is considered when indicating the additional hosting capacity. Similarly, a new 500 kV loop may fail to deliver its nominal rating due to the interaction of the new line with other transmission lines with which it is meshed. In creating the linearised expansion equation, the model should be location specific and based on the actual expected, as opposed to nominal increase in transfer capacity, and should consider the use of line voltages other than that generally used in a region, i.e. the use of 330 kV transmission lines in Victoria.

We support the proposed parameters as outlined in the Paper to be used for building transmission infrastructure in the energy export superpower scenario. However, we again express concerns that for the 2022 ISP the energy export superpower scenario should be clearly identified as an early preliminary assessment only.

In considering the question of modelling of ramping or operational reserves, AEMO questions their ability to accurately model fast start generator start-up times,[6] we note that fast start inflexibility profiles (FSIP) start-up and load-up rate times are routinely provided as part of their bids by fast start generators so this data is readily available. We recommend AEMO use the summation of fast-start capacity represented on a regional basis as an input assumption to their modelling. It should be noted that this fast start capacity is in addition to reserves available for the provision of frequency control ancillary services which could also be used to provide instantaneous ramping capability which is then replaced by fast start capacity.

In addition, given the maintenance in the modelling of adequate reserves to maintain unserved energy below the reliability standard, the proposed flexibility of hydrogen production facilities and the conservative nature of AEMO's assessment process for VRE generation output and demand response, we question the need to even consider ramping or operational reserves in the time sequential modelling. It is unclear to us what benefits the inclusion of what AEMO considers to be a difficult to quantify parameter brings. Its inclusion may again result in the forecast need for additional regulated transmission assets at additional costs to consumers.

Section 3 – Cost benefit analysis methodology

Shell Energy notes that in general when considering non-network options, the previous ISPs have provided little detail of the potential for generator runback or tripping schemes, energy storage, or dynamic reactive support to enhance network transfer capability. We recommend that the Methodology consider how such schemes could be integrated in proposed development paths.

[5] AEMO ISP Methodology Issues Paper pp 29 – Table 3
[6] AEMO ISP Methodology Issues Paper pp 34

Shell Energy notes that the ISP cost benefit analysis (CBA) guideline requires a mandated CBA based on a weighted scenario calculation. Provided this is prepared, AEMO may propose additional CBA frameworks. We are therefore disappointed that the Paper contains no discussion on the framework to determine weightings to be applied to the scenarios.

The Paper notes that;

> *"The AER's CBA guidelines require AEMO to rank the CDPs based on the scenario-weighted approach, but allow AEMO to use an alternative approach (such as LWR) and professional judgement to select the ODP.*
>
> *The choice of approach AEMO will use in the ISP is necessarily reliant on the outcomes and risks observed in the market modelling. The approach selected, and AEMO's justifications in doing so, will be documented in the Draft ISP to provide the opportunity for stakeholders to provide feedback. Any deviation from the scenario-weighted approach would clearly explain how the decision balances risks for consumers, and the potential cost associated with selecting the ODP based on the LWR approach compared to the scenario-weighted approach."*[7]

We are concerned that this means that AEMO is intending to wait until publication of the Draft ISP to explain how it has selected the scenario weightings. We consider that the framework for calculating the appropriate scenario weightings should be consulted on now as part of finalising the Methodology. We appreciate that scenario weightings are likely to be difficult to determine and relatively subjective, but this makes it even more important that AEMO explains and consults on the framework it proposes to select those weightings as part of developing the ISP Methodology.

The approach to selecting the optimal development path (ODP) and assigning weightings must in our view also explicitly consider linkages to the Regulated investment test for transmission (RIT-T) process and the extent to which it promotes consistency between the analysis used by AEMO in the ISP and TNSPs in RIT-Ts for actionable ISP projects. While AEMO has considerable flexibility in how it uses scenarios and the weighting applied to select the ODP, Transmission NSPs have significantly less flexibility in resulting RIT-Ts.

The Paper also asks for comments on whether another approach would '*provide a more appropriate, considered framework for assessing benefits and investment risk*'[8]. It is difficult to answer this question given the Paper does not discuss any other alternatives other than the "least worst regrets" approach set out in the Paper that have been considered by AEMO.

We would encourage AEMO to explain whether there are any other alternatives that it has considered and what it views as the advantages and disadvantages of each approach. For example:

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[7] AEMO ISP Methodology Issues Paper pp 42

[8] AEMO ISP Methodology Issues Paper pp 42

- the National Grid approach concluded that single year regret analysis is the best way to evaluate the needs of the national electricity transmission system.
- we would encourage AEMO to consider whether there is a role for more qualitative tools to assess the key risks involved in each development path, e.g. their sensitivity to changes in key inputs, the level of project risk involved or the extent to which they rely on benefits that do not accrue until well into the future.

However, as noted above, such an approach may lead to greater risks of inconsistency between the ISP and resulting RIT-Ts.

Whilst not considered in the Paper, we recommend that the Methodology set out the framework to be used by AEMO for the determination of discount rates to be applied in the CBA. In our view whilst there is a high level of certainty regarding the recovery of costs by NSPs for the provision of new transmissions services, there is a higher level of uncertainty that the market benefits calculated in the modelling will be delivered. As such, we consider that AEMO should apply a discount rate to future benefits aligned closely with the discount rate for future benefits that would be used by a commercial as opposed to regulated entity.

We recognise that any approach will involve subjective judgements. A development path that is seen to be the ODP using a range of assessment methods would provide increased confidence to stakeholders that it is indeed close to the ODP.

Shell Energy notes the proposed take one out at a time (TOOT) approach discussed in the Paper to confirm that each actionable ISP project makes a positive contribution to the net economic benefit in the Central scenario. We are supportive of the TOOT testing approach of actionable ISP projects. We understand that this would determine if the change in market benefits derived from the TOOT test was greater, that the forecast cost of the project to indicate that the actionable ISP project delivered a net market benefit in its own right. What is unclear to us is given the relatively low accuracy of costs, as demonstrated by the large range of cost estimates, for projects as set out in the ISP, what cost forecast would be used to determine that the project delivered a net market benefit? In our view given recent contingency project applications by NSPs the uppermost value should be used initially pending finalisation of more accurate cost estimates.

Another key limitation of the TOOT analysis is that it compares (1) the net market benefits with the actionable project included in the ODP, and (2) the net market benefits with the actionable project removed, but nothing is substituted in its place. This will assess the benefits of the actionable project compared with a 'do nothing' counterfactual. However, it will not assess the benefits compared with a more realistic counterfactual of substituting the project for a lower cost alternative.

The TOOT analysis as currently proposed will not reveal whether there would be higher net market benefits if the ISP actionable project was substituted with a smaller network augmentation including an alternative REZ or non-network alternative. We recommend that AEMO consider if it may be possible to add additional tests to the TOOT analysis to address this limitation.

Please contact Ron Logan 0427 002 956 or ron.logan@shellenergy.com.au if you have any questions with regards to this submission.

Yours sincerely

Libby Hawker
Senior Manager – Regulatory Affairs
03 9214 9324 – libby.hawker@shellenergy.com.au