Department of
Energy and Economic Diversification

GOVERNMENT OF WESTERN AUSTRALIA

Future Energy System Outlook 2027

Methodology, Inputs, Scenarios and Assumptions

Webinar Questions & Answers

1. Purpose

This document:

- sets out the questions which the Department of Energy and Economic Diversification (DEED) received from participants during the Future Energy System Outlook (FESO) 2027 webinar on the draft Methodology, Inputs, Scenarios and Assumptions (MISA);
- does not include the identity of the participant who submitted the question
- is current as at 9 November 2026.

2. Questions and Answers

Questions posed during the public briefing by DEED on **19 October 2026**:

1. Does the modelling test earlier generator retirements alongside higher demand?

The FESO focuses on system outcomes rather than individual facilities and aligns with the expected retirement dates published as part the AEMO 2026 WEM Electricity Statement of Opportunities (ESOO). This forms a common baseline for retirements to compare outcomes across FESO scenarios.

Combining earlier retirements with higher demand would likely bring forward capacity shortfalls already identified in the AEMO 2026 WEM ESOO or result in significant additional capacity needing to be built on a less plausible timeline. There is already considerable demand variance across the three scenarios. Further testing of higher demand or different retirement dates may be considered through case studies or sensitivities.

2. Will FESO be updated more frequently than every five years?

The immediate focus is completing the current FESO by September 2027. Future planning exercises may occur more frequently than every five years.

3. How does the modelling account for grid curtailment risk and its impact on renewable investment decisions?

The expansion model includes a detailed network representation that represents physical network constraints. These constraints will influence future transmission augmentation and new entrant generation technology, scale, and location. Network constraints will also be present in dispatch modelling which will be used to assess commerciality of new entrants alongside system reliability. Where needed dispatch modelling outcomes will inform additional expansion modelling if significant curtailment and subsequent commercial risks emerge.

4. **Will FESO assess whether alternative locations, staged loads, behind-the-meter generation, storage or demand flexibility defer network investment, and explain how the associated costs and benefits are reflected in the results?**

Yes, to an extent. While the model will not optimise for a particular quantum of additional flexible load the benefits of this resource can be established in expansion modelling as it applies to limiting additional capacity and/or deferring network investment. The working group will consider escalating assumed DSP as industrial demand grows, particularly in the Rapid Change and Central scenarios. Behind the meter flexibility through storage is being explored through the assumption that thermal storage allows alumina decarbonisation loads to reduce peak consumption. However, once again this is not a quantum of resource that the model will optimise for.

Large load uncertainty is a key feature of the FESO framework and yet can materially impact the need for network investment. The location of such loads is intended to be explored through a case study. Several large loads are already assumed to enter in a staggered fashion, a sensitivity to establish any impact on costs and benefits would be possible.

5. **The modelling appears to track the wholesale price of energy but not the "delivered " cost stack. Is the forecast demand from Large Industrial Loads varied as the delivered cost of energy increases? Are the major load demand assumptions iteratively adjusted based on price?**

FESO is a system-wide least cost modelling exercise. Results will include assessment of the full electricity cost stack.

The modelling does not include an economic feedback loop where higher prices reduce demand from Large Industrial Load. The expansion model identifies the least-cost infrastructure needed to meet demand in each scenario.

A case study approach will be used to consider how large loads might locate in different locations in response to cost sensitivities. For example, data centres may prioritise speed of connection over energy cost which may open opportunities for other industry. The scope of the large loads case study is still being refined, and we welcome comments on how it is developed.

6. **Are wind and solar outcomes based on reference years or probabilistic modelling?**

- **Does the modelling touch on 'renewable droughts'?**
- **Is there consideration of regional correlation to renewable resources?**

- **Is regional demand considered and satisfied before an overall supply/demand/curtailment assessment is completed?**
- **Will IWC/ETAC costs be estimated solely on installed capacity rather than facility type? Eg. a gas-fired generation offers a different reliability outcome than a wind farm and consequently might result in different substation requirements. Another consideration is presumably the line voltage and type.**
- **Will FESO apply the ESOO/GSOO demand profiles?**
- **Any sensitivities around the CEL delivery schedules?**

For expansion modelling FESO will use a single composite weather year (i.e. synthetic-weather year) that captures representative extreme weather events and resource diversity across each network zone. This allows demand and renewable generation availability to be correlated spatially and across each interval. The synthetic weather year approach is not directly equivalent to the ESOO's probability of exceedance (PoE) based approach.

The impact of weather variability will be assessed in more detail through dispatch modelling. Reliability modelling will consider multiple historical weather years to test how different weather conditions affect renewable generation, demand, and the correlation between resources.

Each zone in expansion modelling will have a wind and solar resource availability trace specific to that location, diversity of resource will be accounted for in this way. Correlation with demand versus resource availability at a zone or system level will be captured in expansion modelling.

The expansion model demand and generation available in each zone and imports or exports capacity to optimise the whole system. A high value on the unserved energy of around $48,300/MWh means the expansion model will optimise to avoid material unserved energy. If necessary, further constraints maybe applied in the expansion model to address a reliability shortfall.

Connection costs will be based on the connection capacity and not changed by technology type. Connection costs are one parameter within the expansion model and the contribution to the system by one or another technology is equally considered by the expansion model.

Delaying CEL delivery is likely to predominantly impact near term outcomes which are not the focus of FESO. Notwithstanding this, across the three scenarios different scale of new entrants will enter in each scenario through to 2032. This will result in insights regarding the impact of delayed new entrant generation, a proxy for delaying new transmission capacity.

7. Aiming for the 'least cost system' is the economically optimal approach, but the risks/impacts of over-investment vs under-investment are asymmetrical. Can you comment on how these asymmetries are being considered to ensure the plans are robust (in addition to being economically sound)?

There is inherent uncertainty in identifying infrastructure that may be required over a 20+ year outlook. Plausible but distinct scenarios can help stress test and understand the circumstances in which further investment is required.

For example, a specific transmission investment might be triggered by load growth of a certain amount. The point at which this demand growth occurs will likely be different across scenarios, but the nature of the investment may be the same. Analysis and review of these outcomes can inform our understanding of the driver for a specific investment: is it consistent across scenarios or is it dependent on a scenario specific assumption.

Consistency across scenarios can provide validation of a least cost or low regret investment. Inconsistency provides an opportunity to identify a specific driver or triggers and inform broader policy objectives and strategic enablers or opportunities.

8. How will the proposed modelling assess the risk of involuntary load shedding and supply interruptions for large industrial consumers at specific connection points, rather than relying solely on system-wide reliability metrics?

Reliability modelling aims to identify and eliminate involuntary load shedding or unserved energy and ensure the system will exceed the Planning Criterion. Assessments will be conducted at a sub-regional level throughout the modelling to determine whether any unserved energy is attributable to generation shortages or transmission constraints.

Holistically, the model with its perfect foresight will search for and seek to solve reliability shortfalls.

9. Given the long-term nature of FESO, do the virtual power plant (VPP) assumption reflect today's predominantly residential VPPs, or does it assume a future where commercial and industrial DER also participate in VPPs alongside residential resources?

While DER uptake is simulated separately for customer groups (e.g. residential, business), DER resources that are subscribed to VPP assumptions do not distinguish between residential, commercial or industrial DER. A VPP case study is being considered to explore alternative participation models, including demand-side management.

10. The Inputs and Assumptions Workbook identifies vehicle-to-grid (V2G) storage as an input to resource and dispatch models. How does that handoff turn available storage energy capacity into interval-level capability after mobility, customer availability, local-network use, power and SOC restrictions?

V2G is represented through broad assumptions about the proportion of EV battery capacity available to the grid. The controllable EV storage resource that is made available will be set for each network zone and time interval at a level that is plausible given influencing factors such as EV connection status, battery SoC, location and VPP participation. More sophisticated behavioural modelling that addresses these factors in detail will not be applied across the FESO scenarios but may be explored via case studies.

11. How are the data centre demand uptake assumptions developed, and how is industry feedback incorporated into the process?

Assumptions are based on existing demand patterns, industry input and scenario-specific forecasts. Data centre demand is an input assumption rather than an outcome of the model. Renewable generation, storage and transmission are planned to meet assumed demand levels.

Current modelling assumes both large and small data centres follow the same 30-minute demand profile observed in the existing smaller data centres connected to the SWIS. However, there is growing feedback that large data centres may have different load characteristics, with less daily variability and a flatter demand profile. In response, future modelling may separate data centre demand into a relatively inflexible baseload component and a flexible component that can be adjusted to minimise impacts on operational peak demand.

A national policy discussion is underway on minimum requirements for new data centres, including renewable energy obligations, with jurisdictions such as Western Australia potentially introducing additional requirements.

These evolving policy settings will need to be considered in future modelling and FESO development and are likely to change significantly over the next three to six months. Given the uncertainty around future data centre growth and the materiality of a single very large data centre it is intended to examine the impact of such as facility or facilities through a case study.

Stakeholder input on how data centre load profiles may evolve is being sought.

12. Why is commerciality of investment relevant to least cost trajectories in the optimisation model?

Commercial viability is assessed after least-cost optimisation to determine whether proposed assets would be financially viable under current market settings. This testing examines whether projects can earn sufficient revenue to justify investment or whether additional policy support, incentives, or market mechanisms may be needed. For example, while a least-cost pathway may achieve a renewable energy target, commerciality testing may show that some renewable generators cannot recover their costs through existing market revenues alone, highlighting the need for further support to deliver the least-cost plan in practice.

13. How is excess distributed solar generation treated?

The model evaluates multiple solutions, including network augmentation and increased distribution storage uptake. Costs associated with exporting distributed generation through transmission infrastructure are explicitly captured.

The modelling will assess the relative costs of different options. If excess distributed solar generation is exported through the distribution and sub-transmission networks to serve larger loads, the required network upgrades and associated costs will be explicitly captured in the modelling. This allows the model to determine the most cost-effective way to utilise excess generation, whether through storage, network investment, or other solutions.

14. What are the main limitations of the modelling?

The modelling team has tried to minimise compromises to meet project timeframes, but some limitations remain. The main areas identified were:

- Vehicle-to-grid (V2G) modelling is not yet as advanced as desired and remains an area for future improvement.
- Network representation in expansion model has required some simplification to ensure the model can be practically run. As a result, a simplified representation of the network is being developed to balance accuracy with modelling feasibility (while still representing a significantly more sophisticated representation of the SWIS).
- The modelling does not capture economic feedback loops, such as how investment decisions and market responses might alter future outcomes in response to electricity prices for example. Instead, these effects are informed through external assumptions and evidence.

- Gas network representation could be modelled in greater detail, but the proposed approach is considered a significant improvement on previous methods while remaining practical to implement.

15. Why use an annual emissions target instead of a renewable energy generation target?

This approach is intended to explore and inform how the system could change as new capacity enters quickly or slowly and will provide insight on both risks and opportunities. Beyond 2031 the application of an emissions constraint will mean that the renewable energy % will continue to grow over time (noting rising demand in all scenarios).

This approach will allow the FESO to focus on and explore how emerging technologies might shape the SWIS as emissions become substantially reduced. It is expected that this will include insights on the role of emerging technologies that are not yet commercially proven at scale.

16. Could you show an anonymised bridge from gross industrial consumption and embedded generation to net SWIS demand, including onsite-supply failure and the actual limits on backup grid imports?

The operation of BTM generation is not modelled in FESO. The historic behaviour of large loads is represented to the extent possible. The impact of behind the meter energy consumption for heat and the potential for this to represent as future decarbonisation driven demand growth is captured.

17. Behind the meter generation and storage has the potential to support the grid, but only if it is coordinated. Network export tariff is a significant disincentive to provide that support. Is this a future service that is being considered?

Consideration and exploration of specific initiatives may be considered through sensitivities and FESO may provide the evidence base for progressing future initiatives. Note existing structures exist for participation in the WEM through the RCM and Demand Side Programmes.

18. Can you explain the meaning of the black, red circles in the Western Power diagram of the SWIS - Also is the Northam Narrogin new link?

Appendix E, Figure 4 includes a key describing colour coding applied to the network zonal model.

19. Has there been consideration in the generation model for offshore wind in the Bunbury area?

Yes, the intention is to have an offshore wind candidate that reflects Bunbury Offshore Wind Zone that has been declared by the Australian Government in the Indian Ocean off the coast of Bunbury.

20. What energy storage obligation for batteries is assumed over the forecast period (there are 4 sizes in the capex pricing)?

The expansion model will identify the duration of new entrant storage that results in the least cost outcome for the system. While the Peak Electric Storage Resource Obligation Interval (ESROI) is not an explicit driver or constraint on the duration of new entrant storage the commerciality of new entrant storage can be expected to be influenced by ESROI and capacity revenue.