



Department of  
**Energy and Economic  
Diversification**

# Draft Methodology, Inputs, Scenarios and Assumptions (MISA)

For the Future Energy System Outlook 2027

October 2026

Energy Policy WA

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## Glossary

| Term                                                                 | Explanatory Note                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AEMO (Australian Energy Market Operator)</b>                      | AEMO manages the electricity system and market in Western Australia and plays an important role in the gas market.                                                                                                                                                                                                                                                           |
| <b>‘agent’</b>                                                       | An ‘agent’ in the context of demand forecasting represents a modelling construct that mimics a particular type of consumer. Each ‘agent’ responds to changing inputs and economic signals such as changes in technology or policy.                                                                                                                                           |
| <b>Coordinated DER</b>                                               | The integrated management and operation of distributed energy resources, including solar PV, battery storage, electric vehicles and controllable loads, to deliver benefits to customers and support functions such as peak demand management and power system operation.                                                                                                    |
| <b>Coordinator of Energy (Coordinator)</b>                           | The Coordinator of Energy (Coordinator) is a statutory role that leads Energy Policy WA, a division of DEED. The Coordinator is responsible for the ongoing evolution of the energy market, including several market reviews.                                                                                                                                                |
| <b>DASLLE (Demand Assessment of SWIS Large Load Electrification)</b> | A DEED model used to estimate additional electricity demand associated with the electrification of large industrial loads. It uses facility-level energy and industry information, including NGER data, to develop sector-specific electrification assumptions and translate potential fuel switching into additional electricity demand.                                    |
| <b>DEED (Department of Energy and Economic Diversification)</b>      | DEED is responsible for the State’s transformation to a renewable energy future, trade and investment attraction, activation of industrial land, industry development and advanced manufacturing, leveraging our innovation and science capability, and economic diversification. The Coordinator and Energy Policy WA are a part of DEED and leading delivery of FESO 2027. |
| <b>Distributed energy resources (DER)</b>                            | Small-scale technologies that can use, generate or store electricity as part of the local distribution system, including distributed PV, distributed battery storage, controllable loads and electric vehicles.                                                                                                                                                              |
| <b>Distribution System Operator (DSO)</b>                            | The DSO is responsible for managing the distribution of electricity to end users and the integration of distributed energy resources into the distribution network.                                                                                                                                                                                                          |
| <b>Electricity System and Market Rules (ESM Rules)</b>               | The Wholesale Electricity Market (WEM) is governed by the Electricity System and Market Rules (ESM Rules). These ESM Rules detail the roles and functions of the AEMO and other governance bodies and guide the operation of the market including the trading and dispatch of energy, the Reserve Capacity Mechanism (RCM) and settlement.                                   |

| Term                                           | Explanatory Note                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Future Energy System Outlook 2027</b>       | <p>FESO 2027 is the publication that will fulfil the requirements for a Whole of System Plan under the ESM Rules and is required to be completed by 30 September 2027.</p> <p>The purpose of the FESO is to plan for the efficient development of the SWIS power system to meet the needs of SWIS consumers over at least the next 20 years. The FESO will help guide the transition to a secure, reliable, least-cost and lower-emissions power system by identifying the least-cost electricity supply mix for the SWIS, ensuring the continued integration of renewable generation and identifying opportunities for emerging technologies.</p> |
| <b>Large loads</b>                             | <p>Large loads include facilities connected to the distribution network at high voltage; facilities connected to the distribution network at low voltage with an average daily consumption greater than 10 MWh and transmission-connected loads. The total number of existing large loads now sits at around 630 connections and represents around half of energy consumed on the SWIS in 2025.</p>                                                                                                                                                                                                                                                |
| <b>Peak Reserve Capacity Target (Peak RCT)</b> | <p>AEMO's estimate of the amount of dependable generation, storage and demand-side capacity required in the SWIS to meet the Planning Criterion for a Capacity Year.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>PLEXOS</b>                                  | <p>Developed by Energy Exemplar, PLEXOS is energy system simulation and optimisation software used for electricity and gas market modelling and long-term system planning. In the FESO, PLEXOS is used for long-term resource planning to identify potential generation, storage and transmission development under each scenario. PLEXOS is already widely used in Western Australia, including by AEMO for the WEM ESOO, WA GSOO and MT PASA, by the ERA for market monitoring, and by Western Power for its Transmission System Plan.</p>                                                                                                       |
| <b>PowerFactory</b>                            | <p>Developed by DlgSILENT GmbH, PowerFactory is power system modelling and simulation software used by Western Power and AEMO for network and operational analysis. In the FESO, PowerFactory is used for planning-level analysis of material transmission constraints and system strength. Relevant findings, including constraint equations, are used to test and refine the wider FESO modelling.</p>                                                                                                                                                                                                                                           |
| <b>Reserve Capacity Mechanism (RCM)</b>        | <p>A market mechanism administered by AEMO to ensure there is sufficient electrical generation capacity within the WEM.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Reserve Capacity Target (RCT)</b>           | <p>AEMO's estimate of the amount of generation, storage and demand-side capacity required in the SWIS to meet the Planning Criterion for a Capacity Year.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>South West Interconnected System (SWIS)</b> | <p>The South West Interconnected System (SWIS) is the State's main electricity system serving more than 1.1 million customers.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

| Term                                                               | Explanatory Note                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SWIS Demand Assessment 2023</b>                                 | The SWIS Demand Assessment (SWISDA) collated industry data to understand the potential change in electricity demand over 20 years, considering the requirements of existing industrial users on the SWIS and potential growth in new industries like hydrogen and critical minerals.                                                                                                                                                                                                                                                                                                                                                   |
| <b>The SWIS Transmission Planning Update 2024</b>                  | This SWIS Transmission Planning Update outlined a series of proposed new network investments for the SWIS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>The South West Interconnected System Transmission Plan 2025</b> | <p>The South West Interconnected System Transmission Plan sets out the State Government's vision for Western Power's transmission network, along with the investment needed to deliver on that vision.</p> <p>The FESO 2027 will consider this plan and build on it with the latest available information.</p>                                                                                                                                                                                                                                                                                                                         |
| <b>Transmission System Plan (TSP)</b>                              | <p>The TSP is published by Western Power annually, in conjunction with a Network Opportunities Map.</p> <p>It outlines the challenges and opportunities of the transmission network over the next ten years and identifies potential opportunities for network and non-network solutions to address identified challenges.</p>                                                                                                                                                                                                                                                                                                         |
| <b>uSIM</b>                                                        | Developed by Energeia, uSim is an agent-based forecasting tool used to model how different types of customers may change their electricity use and technology choices over time. In the FESO, uSim is used to model customer behaviour and the uptake and operation of technologies including rooftop solar, batteries, electric vehicles, energy efficiency and coordinated DER. It produces detailed demand and DER/VPP profiles by location and time for use in the wider modelling. uSim has also been used in electricity forecasting work for organisations including the AEMC, Transgrid and the Victorian and NSW governments. |
| <b>Virtual Power Plant (VPP)</b>                                   | An aggregation or grouping of DER that is actively controlled and coordinated via a software and communications platform by an operator. VPPs can coordinate customer energy resources to deliver benefits to participating customers and provide services to other parties, such as the wholesale market or network.                                                                                                                                                                                                                                                                                                                  |
| <b>V2G (Vehicle to Grid)</b>                                       | V2G is an emerging technology that enables an electric vehicle battery to export electricity to a home, business or the grid.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Wholesale Electricity Market (WEM)</b>                          | The market that supplies electricity to the South West Interconnected System (SWIS).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Whole of System Plan (WOSP) 2020</b>                            | The inaugural Whole of System Plan was released in 2020 as part of the Energy Transformation Strategy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Whole of System Plan (WOSP) 2027</b>                            | Whole of System Plan is the statutory term used in the ESM Rules. The 2027 iteration is referred to as the Future Energy System Outlook (FESO) 2027.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## Abbreviations

| Term               | Definition                                                            |
|--------------------|-----------------------------------------------------------------------|
| <b>AEMO</b>        | Australian Energy Market Operator                                     |
| <b>BTM</b>         | Behind the meter                                                      |
| <b>Coordinator</b> | Coordinator of Energy                                                 |
| <b>DASLLE</b>      | Demand Assessment of SWIS Large Load Electrification                  |
| <b>DEED</b>        | Department of Energy and Economic Diversification                     |
| <b>DER</b>         | Distributed energy resources                                          |
| <b>EPWA</b>        | Energy Policy Western Australia (the Energy Policy group within DEED) |
| <b>ESM Rules</b>   | Electricity System and Market Rules                                   |
| <b>ESS</b>         | Essential System Services                                             |
| <b>EV</b>          | Electric vehicle                                                      |
| <b>FESO</b>        | Future Energy System Outlook                                          |
| <b>ISP</b>         | Integrated System Plan (for the National Electricity Market)          |
| <b>LT</b>          | Long term (as in PLEXOS LT model)                                     |
| <b>MISA</b>        | Methodology, Inputs, Scenarios, and Assumptions publication           |
| <b>PV</b>          | Photovoltaic                                                          |
| <b>RCM</b>         | Reserve Capacity Mechanism                                            |
| <b>SEO</b>         | State Electricity Objective                                           |
| <b>ST</b>          | Short term (as in PLEXOS ST model)                                    |
| <b>SWIS</b>        | South West Interconnected System                                      |
| <b>SWISDA</b>      | South West Interconnected System Demand Assessment                    |
| <b>TSP</b>         | Transmission System Plan                                              |
| <b>VPP</b>         | Virtual power plant                                                   |
| <b>WA GSOO</b>     | Western Australian Gas Statement of Opportunities                     |
| <b>WEM</b>         | Wholesale Electricity Market                                          |

| Term            | Definition                                                          |
|-----------------|---------------------------------------------------------------------|
| <b>WEM ESOO</b> | Wholesale Electricity Market Electricity Statement of Opportunities |
| <b>WOSP</b>     | Whole of System Plan                                                |

# The MISA at a glance



## 1 Three plausible futures

**1 Central**

**Steady transition**

Current policies and expected growth continue broadly as planned.

Underlying consumption by 2050 **83.5 TWh**

**2 Rapid Change**

**Faster transition**

Stronger growth, faster electrification and higher technology uptake.

Underlying consumption by 2050 **116.8 TWh**

**3 Constrained**

**Slower transition**

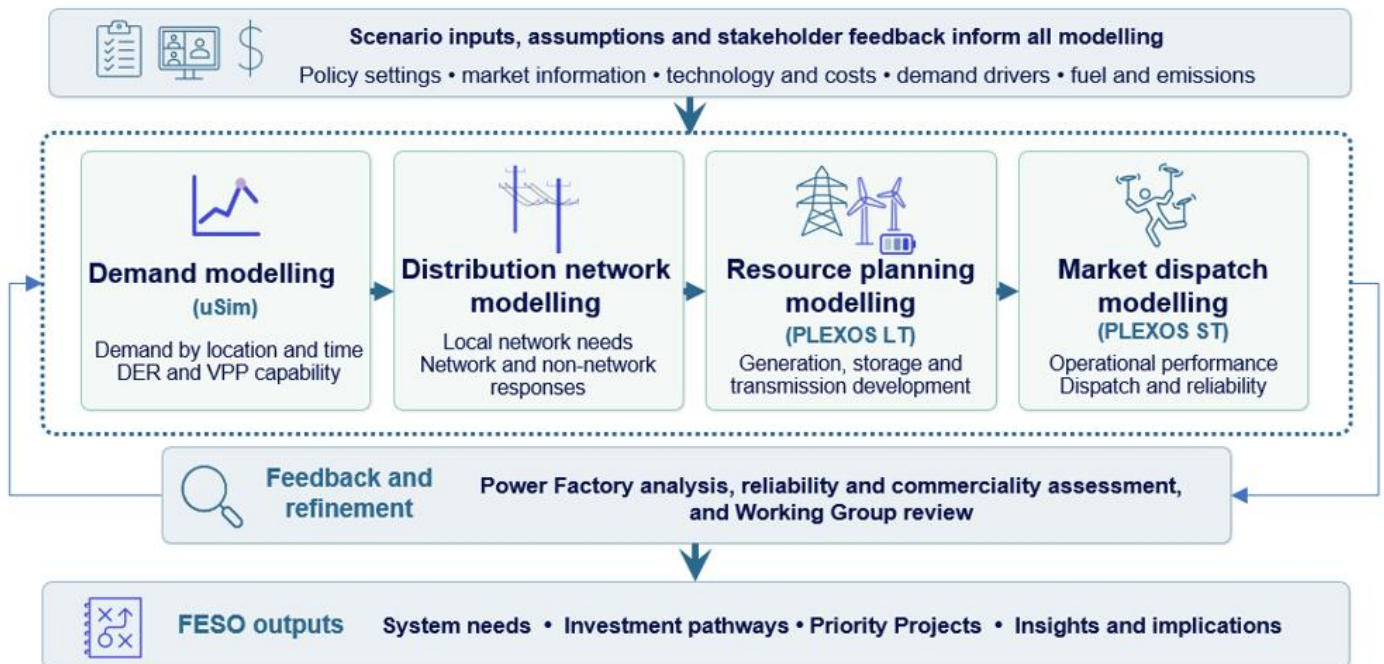
Slower growth and electrification, with greater delivery constraints.

Underlying consumption by 2050 **51.9 TWh**

From about 23 TWh in 2026, electricity use grows strongly in every scenario, while rooftop PV, batteries, EVs and other customer technologies become a much bigger part of the power system.



## 2 One connected modelling framework



## 3 Built on current evidence and planning

|               |                                                      |
|---------------|------------------------------------------------------|
| <b>AEMO</b>   | WEM ESOO and WA GSOO                                 |
| <b>WP</b>     | Transmission System Plan                             |
| <b>DEED</b>   | SWIS Transmission Plan 2025 and policy settings      |
| <b>Market</b> | Projects, costs, technology and delivery information |



## 4 Have your say



Help test the proposed assumptions and methodology:

[EPWA-info@deed.wa.gov.au](mailto:EPWA-info@deed.wa.gov.au)

# 1. Executive summary

## 1.1. What is the draft MISA?

Western Australia's electricity system will change significantly over the coming decades. The Future Energy System Outlook 2027 (FESO 2027) will bring together the best available planning information, modelling and industry insight to develop a long-term view of how the South West Interconnected System (SWIS) could evolve through to 2050. It will examine how electricity demand, generation, storage, networks and system operation could change, and help government, industry and investors understand what may be needed, when and where those needs may arise, and the opportunities, risks and trade-offs associated with different futures.

This draft Methodology, Inputs, Scenarios and Assumptions (MISA) explains how DEED, Western Power, AEMO and specialist advisers will undertake that analysis. It sets out the modelling framework, the three scenarios being tested, the principal assumptions and data sources, and the methods used to turn those inputs into FESO results.

The MISA provides the analytical foundation for the FESO. Publishing it now gives stakeholders an opportunity to test and strengthen that foundation before the modelling is finalised. Detailed numerical inputs, sources and scenario settings are provided in the accompanying Inputs and Assumptions Workbook, with more detailed technical methodology provided in the supporting appendices.

## 1.2. Building from an established foundation

The MISA does not start from a blank sheet of paper. It builds on the substantial body of electricity system planning already undertaken by AEMO, Western Power, government and industry. In particular:

- the near-term Central demand outlook is broadly aligned with AEMO's WEM Electricity Statement of Opportunities Expected demand outlook;

- Western Power's established demand forecasting and network planning methods provide the basis for important parts of the demand and network analysis;

- existing generation, storage, transmission development and known project pipelines provide the starting point for the resource planning analysis; and

- market, industry and government information gained through stakeholder engagement is used to develop assumptions about future demand, technology, fuel, costs and infrastructure development.

The FESO builds on established forecasts, planning information and proven modelling tools, then connects and extends that work to provide a whole-of-system view through to 2050.

The FESO extends these established planning methodologies out to 2050 and brings them together within a single whole-of-system modelling framework.

The analysis uses established specialist modelling tools. uSim is used to model customer demand and technology uptake, PLEXOS is used for long-term resource planning and market dispatch analysis, and PowerFactory provides planning-level power system validation. These tools are supported by specialist reliability, commerciality and network analysis.

The methodology has been developed and reviewed through the FESO Working Group, which brings together DEED, AEMO and Western Power with specialist modelling and subject matter expertise.

### 1.3. Testing three plausible futures

The FESO examines three scenarios: **Central**, **Rapid Change** and **Constrained**. They are not predictions, nor are they simply high, medium and low demand cases. They test different plausible combinations of economic growth, industrial development, electrification, customer technology uptake, infrastructure delivery and other factors that could shape the SWIS.

**Central** tests a steady transition broadly consistent with current policies, established plans and expected growth.

**Rapid Change** tests stronger growth, faster electrification and technology uptake, and faster infrastructure development.

**Constrained** tests slower growth and electrification alongside greater constraints on the delivery of new infrastructure.

The scenarios have been developed through analysis and stakeholder engagement. Feedback received to date has generally supported them as a reasonable range of plausible futures while helping refine individual assumptions and identify areas requiring further testing. Sensitivities and case studies will supplement the three scenarios where particular assumptions or uncertainties warrant closer examination.

### 1.4. How the modelling works

The FESO uses a connected suite of models rather than relying on a single model or forecast. Four core components examine:

1. **Demand**, including large industrial loads, households and businesses, DER, batteries and electric vehicles.
2. **Distribution networks**, including where local constraints may emerge and the potential role of network and non-network solutions.

**3. Resource planning**, to identify the generation, storage and transmission development that may be required under each scenario.

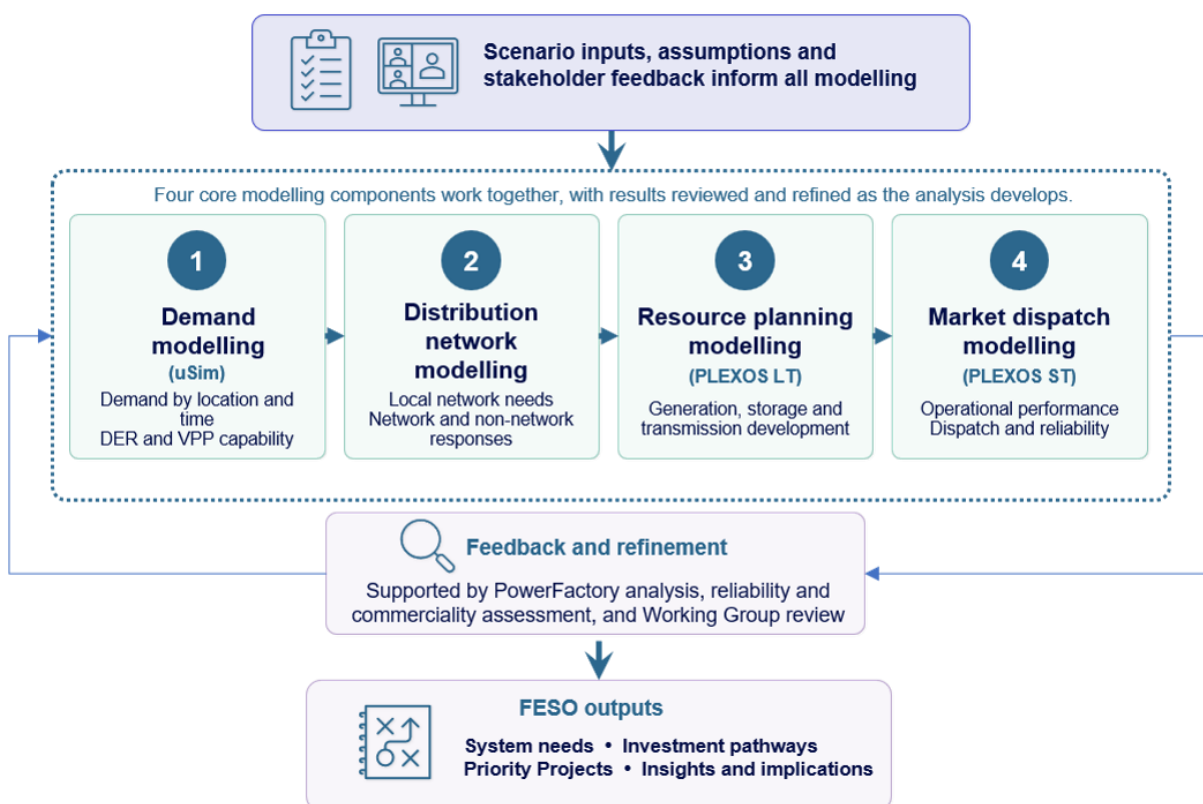
**4. Market dispatch**, to test how that future system could operate in practice.

These are supported by reliability, commerciality and power system analysis.

The modelling is deliberately iterative. Results are checked across the different workstreams rather than accepted at face value. Where dispatch, reliability, network or technical analysis identifies a material problem, assumptions or constraints can be reviewed and the relevant models re-run.

Model outputs are tested, challenged and refined across the different workstreams before they are used to inform FESO conclusions.

**Figure 1.1 Overview of modelling framework**



## 1.5. What the FESO modelling will produce

The FESO modelling is designed to turn the scenarios and assumptions into practical insights about what the SWIS may need, where and when those needs may arise, and what they could mean for future planning and investment. The FESO is expected to provide insight into:

how electricity demand, DER and customer technology uptake may change across the SWIS;

the generation and storage capacity that may be required, including its broad location and timing;

where transmission and distribution development or non-network solutions may be needed;

potential reliability, system security and operational challenges;

which investment needs remain important across multiple different plausible futures, and which depend on particular assumptions; and

commercial, cost or delivery issues that may affect whether a required investment proceeds.

The FESO may also inform the identification of Priority Projects under the ESM Rules. Identifying infrastructure through the FESO does not itself approve or commit that investment. Relevant technical, commercial, regulatory and approval processes would still apply before a project could be delivered.

**The aim is to produce a FESO that gives government, industry and investors a clear evidence base for future planning and decision-making.** The scenarios, assumptions and methodology provide the analytical foundation, while the modelling will identify future system needs, investment choices, risks and trade-offs across a range of plausible futures.

The FESO will provide an evidence base for future system planning and investment decisions by identifying potential needs, timing and priorities.

It does not itself approve or commit a project, which would still progress through the relevant technical, commercial, regulatory and approval processes before delivery.

## 1.6. Where to find the detail and how to provide feedback

This executive summary provides the high-level picture. Further detail on the scenarios, modelling inputs and assumptions is provided throughout the main body of this draft MISA, with supporting technical information in the appendices. A comparative summary of the principal assumptions for the three scenarios is provided in Appendix I, while the detailed numerical inputs, settings and sources used in the modelling are provided in the accompanying Inputs and Assumptions Workbook.

This draft MISA is being published so stakeholders can review and test the proposed approach before the modelling is finalised. DEED particularly welcomes feedback where an important input or dependency may have been overlooked, an assumption does not appear reasonable, better information is available, or a particular uncertainty warrants further testing through a sensitivity or case study. Feedback received will be considered as the modelling is finalised and the final MISA is prepared.

Submissions can be emailed to [EPWA-info@deed.wa.gov.au](mailto:EPWA-info@deed.wa.gov.au) by Friday 23 October 2026.

**Table 1.1: Timelines for engagement**

| Event                                                                       | Date                 | Information                    |
|-----------------------------------------------------------------------------|----------------------|--------------------------------|
| <b>Webinar: Introduction to FESO 2027</b>                                   | 15 July 2026         | <a href="#">[Add web link]</a> |
| <b>Webinar: Draft MISA (Methodology, Inputs, Scenarios and Assumptions)</b> | 15 October 2026      |                                |
| <b>Public consultation period: Draft MISA</b>                               | 9 to 23 October 2026 |                                |
| <b>Flagship event: Draft FESO 2027</b>                                      | Q2 2027              |                                |
| <b>Public consultation period: Draft FESO 2027</b>                          | Q2 2027              |                                |
| <b>Flagship event: Launch of FESO 2027</b>                                  | Q3 2027              |                                |

## 2. Background and context

### 2.1. Structure of this Draft MISA document

This Methodology, Inputs, Scenarios and Assumptions report (the MISA) explains the foundations on which the Future Energy System Outlook (FESO) 2027 will be built. The MISA is designed to be read at different levels of detail. The main report provides a clear, high-level explanation of the scenarios, modelling approach, inputs and assumptions used to develop the FESO.

More detailed methodologies, evidence, data and technical information are provided in the appendices and supporting material. These documents should be read together where a fuller understanding of the analysis is required.

The document is structured as follows:

**MISA at a glance** provides a one-page overview of the purpose of the MISA, the scenarios being examined and how the analysis fits together.

The **Executive summary** outlines the proposed scenarios, modelling approach, sensitivities and principal assumptions.

**Section 2: Background and context** explains the purpose and scope of FESO 2027 and the MISA, including the governance and assurance arrangements.

**Section 3: Modelling framework** explains the overall modelling process, how the different stages fit together and how information flows from the scenarios through to the FESO outputs. It provides the big picture without going into the detailed methodology used in each model.

**Section 4: Scenarios** describes the Central, Rapid Change and Constrained scenarios, including their narratives, key drivers and principal differences. It also explains the proposed use of sensitivities and case studies to examine particular uncertainties in greater detail.

**Section 5: Methodology** explains how each part of the analysis will be undertaken, including the methods, inputs and assumptions used to assess demand, networks, generation, storage, system operation, reliability and commercial outcomes. It identifies the sources of key assumptions, how they differ between scenarios, and where they align with or depart from existing planning work.

## 2.2. FESO 2027 overview and roles

The FESO 2027 is being developed by DEED in collaboration with Western Power, AEMO and specialist advisers. The work brings together demand forecasting, network analysis, resource planning, market modelling and power system analysis to develop a consistent view of how the SWIS could evolve to 2050.

The FESO provides a long-term view of how the SWIS could develop, what investment may be needed, and where future needs, opportunities and constraints may emerge.

Development of the MISA therefore depends on input from several organisations and modelling workstreams. Table 2.1 summarises the principal roles in developing the MISA and FESO.

**Table 2.1: Who is doing what in the MISA and FESO**

| Organisation or group                | Role in developing the MISA and FESO                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Energy Policy WA (DEED)</b>       | Leads development of the MISA, coordinates the overall work program and consultation, and brings the different modelling methods, inputs and assumptions together into the published document.                                                                                                                                                                                                     |
| <b>Western Power</b>                 | Develops key demand, network, generation and DER inputs and contributes the associated modelling methods, data and assumptions.                                                                                                                                                                                                                                                                    |
| <b>AEMO</b>                          | Provides electricity market and power system expertise, relevant forecasts and data, and advice on supply, reliability, system security and market operation assumptions.                                                                                                                                                                                                                          |
| <b>Specialist modelling advisers</b> | Undertake or support modelling, analyse outcomes and document methodologies, inputs and assumptions used.                                                                                                                                                                                                                                                                                          |
| <b>FESO Working Group</b>            | Comprises representatives from DEED, AEMO and Western Power, supported by specialist modelling and subject matter advisers. Reviews the proposed methodology and assumptions, resolves issues between the different modelling workstreams and checks that the overall approach is consistent and fit for purpose.                                                                                  |
| <b>Steering Committee</b>            | <ul style="list-style-type: none"> <li>Jai Thomas, Coordinator of Energy, EPWA, DEED, Chair</li> <li>Noel Ryan, Assistant Coordinator, EPWA, DEED</li> <li>Mathew Greene, Utilities, Transactions and Climate Director, Department of Treasury and Finance</li> <li>Kirsten Rose, Chief Executive Officer, AEMO</li> <li>Ben Bristow, Executive Manager Asset Management, Western Power</li> </ul> |
| <b>Stakeholders</b>                  | Provide relevant information and feedback to help identify gaps, test important assumptions and improve the final MISA.                                                                                                                                                                                                                                                                            |

## 2.3. Purpose and scope of the MISA

The purpose of the FESO 2027 is to provide a transparent view of how the SWIS could develop over the coming decades. It is intended to help government, industry, investors and consumers understand emerging needs, trade-offs, opportunities and constraints. The FESO 2027 will fulfil the requirements for a Whole of System Plan under clause 4.5A.5 of the ESM Rules.

The MISA supports that purpose by documenting the analytical foundations of the FESO. It covers:

- the modelling framework;
- scenario narratives and scenario-specific settings;
- demand, supply, network, fuel, emissions and market assumptions;
- treatment of resource availability, reliability and system security; and
- the approach to assessing commercial outcomes.

Stakeholder feedback will help strengthen the modelling before it is finalised. The final MISA will document the methods, inputs and assumptions used to develop the FESO.

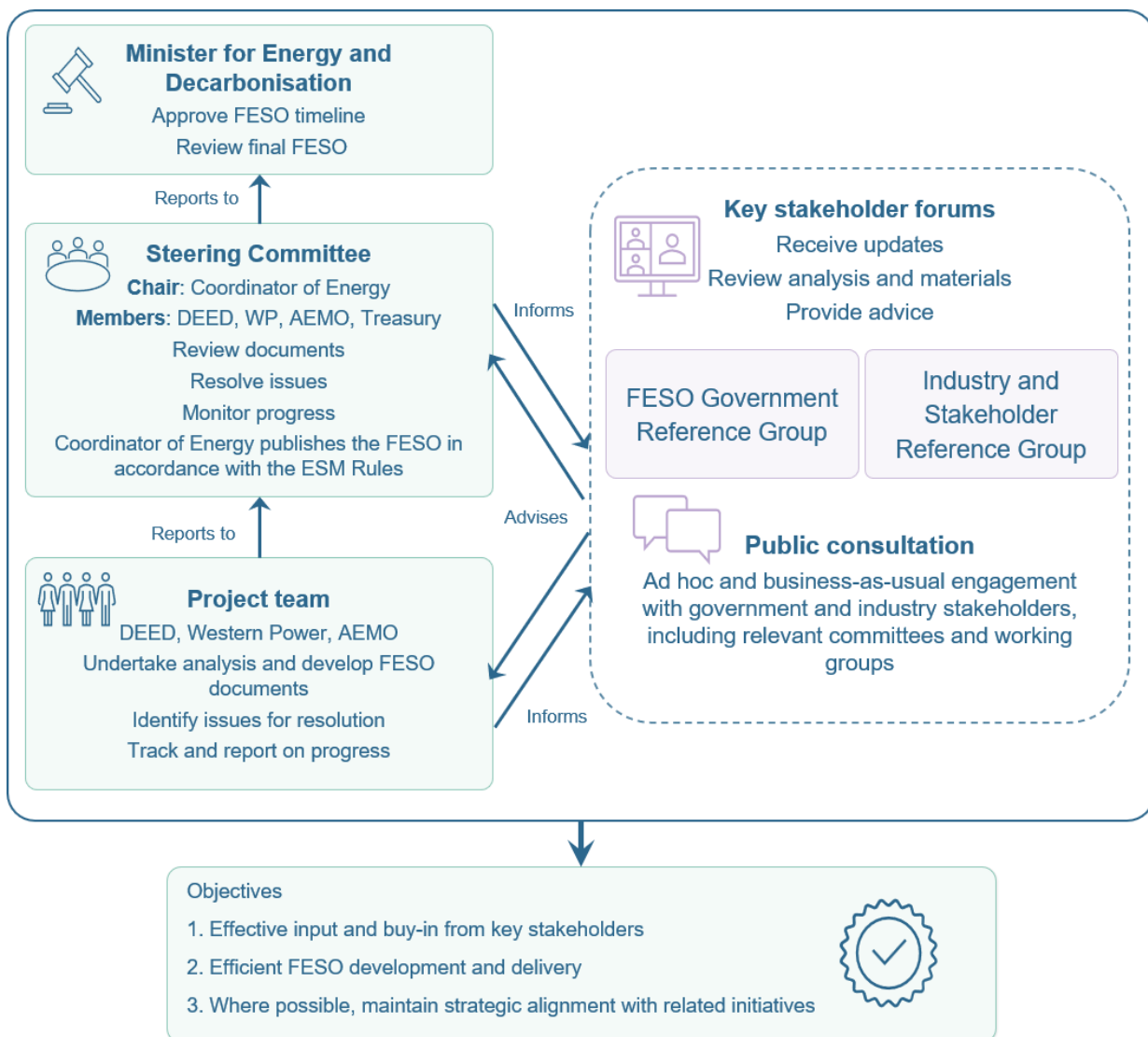
The purpose of this draft MISA is to set out the proposed modelling inputs, assumptions, scenarios and sensitivities that will underpin the FESO modelling. It builds on the work and stakeholder engagement undertaken to date and gives stakeholders an opportunity to identify material gaps, inconsistencies or issues before the modelling is finalised.

Assumptions are a work in progress and will be refined through stakeholder feedback ahead of the Final MISA. In addition, there may be changes to assumptions during the modelling phase including where there are material changes in external factors.

## 2.4. Governance and assurance

The FESO 2027 is prepared by the Coordinator of Energy, with input and support from Western Power, AEMO and specialist advisers, consistent with the requirements of the ESM Rules. DEED leads the development of the FESO and coordinates the overall work program.

The FESO Steering Committee provides strategic oversight and considers significant matters requiring direction or escalation. The FESO Working Group brings together the organisations responsible for the modelling and technical inputs. It reviews the methodology, assumptions and results, considers dependencies between workstreams and resolves technical issues as the analysis progresses.

**Figure 2.1: MISA governance and assurance framework**

The FESO builds on the substantial body of planning and analysis already undertaken across the SWIS. This includes AEMO's WEM Electricity Statement of Opportunities and WA Gas Statement of Opportunities, the South West Interconnected System Transmission Plan 2025, Western Power's Transmission System Plan, and other relevant government, market and network studies and forecasts. Together, these provide an established foundation for developing a view of how the SWIS could evolve through to 2050.

The MISA will be refined as the modelling progresses, drawing on new information, modelling results and stakeholder feedback. The final MISA will document the methodology, inputs and assumptions used to develop the FESO. If a material change arises after publication, an update or addendum may be issued where appropriate.

## 3. Modelling framework

### 3.1. Models overview

The FESO will use a connected suite of models and analyses to examine how the SWIS could develop under each scenario. Different models are used to assess electricity demand and distributed energy resources (DER), distribution network requirements, long-term generation, storage and transmission development, system operation, network constraints, reliability and commercial outcomes.

The modelling is iterative rather than a simple linear sequence. Outputs from one part of the analysis become inputs to another, and some models operate in parallel. Results are also fed back through the process where they identify a constraint, inconsistency or need to revisit an assumption.

This allows the modelling to be refined as the different parts of the future electricity system are tested against one another. The FESO Working Group oversees this process and considers where further modelling or refinement is required.

Figure 3.1 summarises the principal models, analyses and information flows used to develop the FESO. The following sections explain the purpose of the main modelling components and the insights they are expected to provide.

Section 5 provides further detail on the methods, inputs and assumptions used within each component.

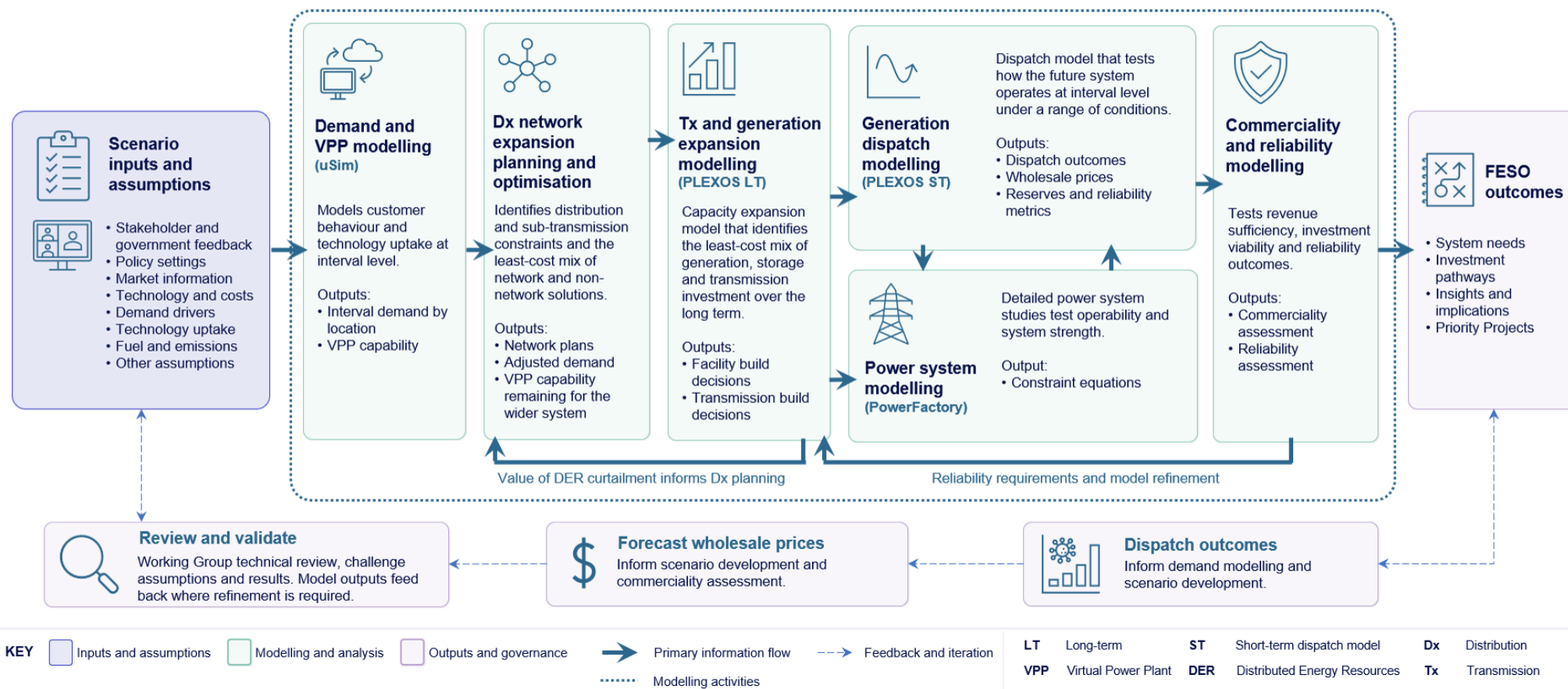
The modelling helps identify where future system needs may emerge. Any resulting project would still progress through the relevant planning and approval processes.

Figure 3.1: Overview of modelling approach

# FESO 2027 modelling framework

How our models and analyses work together

FESO 2027 uses a suite of models and analyses that work together. Information flows between them to test assumptions, refine results and identify development options for a secure and reliable power system.



Note: Arrows show the main flow of information and feedback between models and analyses. The process is iterative, with results feeding back to test and refine assumptions and scenarios.

Further information on the modelling tools used in the FESO is provided in the glossary.

## 3.2. Core modelling components

The FESO modelling framework is organised around four core modelling components. Each answers a different planning question and provides information used by other parts of the analysis. These components are supported by additional reliability, power system and commerciality analysis, as shown in Figure 3.1.

Table 3.1 summarises the four core modelling components, the role each plays in the FESO and the main outputs it produces. It is intended to show how the modelling framework fits together rather than explain the detailed methodology.

Section 5 provides further detail on how each component is modelled, including the key inputs, assumptions and methods. More detailed technical information is provided in the supporting appendices.

**Table 3.1: Summary of core modelling components**

| Modelling component                   | What it does                                                                                                | Key features                                                                                                                                                  | Main outputs                                                                                                                 |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>Demand modelling</b>               | Forecasts how much electricity may be used, where and when, under each scenario.                            | Produces 30-minute demand traces by location. Combines large loads with household and business demand, including rooftop solar, batteries, EVs and other DER. | Electricity consumption, peak and minimum demand, locational demand profiles, DER uptake and VPP capability.                 |
| <b>Distribution network modelling</b> | Tests how changing demand and DER may affect the distribution and sub-transmission network.                 | Maps demand and DER to the network, identifies emerging constraints and considers network and non-network responses.                                          | Indicative network requirements, timing of constraints and remaining VPP capability available to the wider system.           |
| <b>Resource planning modelling</b>    | Identifies the generation, storage and transmission development that may be needed over the outlook period. | Uses PLEXOS to test investment options against demand, network, fuel, emissions, reliability and other scenario requirements.                                 | Generation and storage capacity, possible transmission development, reserve capacity requirements and modelled system costs. |
| <b>Market dispatch modelling</b>      | Tests how the future system identified through the resource planning modelling could operate in practice.   | Simulates generation, storage and network operation in greater detail, including challenging operating conditions and relevant constraints.                   | Dispatch and market outcomes, network flows, reliability results and inputs to the commerciality assessment.                 |

These modelling components are connected rather than sequential. Section 3.3 explains how the different models and analyses are brought together and refined.

### 3.3. Bringing the modelling together

The FESO modelling is iterative. Results from one part of the analysis are used to test and refine other parts of the modelling, rather than each model being run once and treated as final.

For example, detailed network or dispatch analysis may identify a constraint or reliability problem that requires an earlier assumption, network limit or investment choice to be revisited. The resource planning modelling also provides information on the value of DER curtailment to inform distribution network planning, while dispatch and reliability results may identify issues that require earlier assumptions, constraints or investment choices to be revisited. These feedback loops are shown in Figure 3.1.

This MISA sets the analytical foundation. The draft and final FESO will bring the results together, explain what they mean and identify the implications for the future development of the SWIS.

Where a material issue is identified, the relevant assumptions or modelling inputs will be reviewed and the affected models rerun. The FESO Working Group will oversee this process, test the results and consider whether further modelling or refinement is required. The aim is to develop a consistent and credible view of how the electricity system could develop under each scenario.

The results will then be compared across the three scenarios, together with relevant sensitivities and case studies. This will help identify which system needs and investments appear across a range of plausible futures, which depend on particular assumptions or conditions, and where further investigation, monitoring or earlier action may be warranted.

## 4. Scenarios

### 4.1. Overview of scenarios

The FESO examines three plausible ways in which the SWIS could develop to 2050: **Central**, **Rapid Change** and **Constrained**. Each combines different assumptions about economic and population growth, industrial development, electrification, customer behaviour, technology uptake and the pace at which new infrastructure can be delivered.

The scenarios are not simply high, medium and low demand cases. They are designed to test different planning questions about how the SWIS may need to develop.

**Table 4.1: What each scenario is testing**

| Scenario            | What it represents                                                                                               | What it is testing                                                                                                                       |
|---------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Central</b>      | A steady transition in which current policies, established plans and expected growth broadly continue.           | What generation, storage and network development may be needed if the energy transition develops broadly as currently expected?          |
| <b>Rapid Change</b> | Stronger growth, faster electrification and technology uptake, and fewer constraints on infrastructure delivery. | What additional generation, storage and network development may be needed if electricity demand and technology uptake grow more quickly? |
| <b>Constrained</b>  | Slower growth and electrification, with greater constraints on the delivery of new infrastructure.               | What does the SWIS need if demand growth is lower, new industry develops more slowly and new energy infrastructure is harder to deliver? |

The scenarios were first set out in the *Approach to Determining Scenarios* and have since been refined through further analysis, stakeholder engagement and development of the detailed modelling inputs. Central remains broadly aligned with AEMO's WEM ESOO Expected demand outlook for at least the first five years, providing consistency between the two planning processes while allowing the FESO scenarios to diverge over the longer term.

#### 4.1.1. What the draft demand modelling is showing

The demand modelling has started to show what the differences between the three scenarios could mean in practice. Figure 4.1 and Table 4.2 summarises some of the headline demand outcomes emerging so far.

As the figure shows, the scenarios produce different combinations of electricity use, grid demand and customer technology uptake. These are draft demand modelling outcomes rather than final FESO results and may be refined as the modelling progresses. They provide a useful early indication of how the three scenarios begin to diverge over time.

Figure 4.1: What the early demand modelling is showing

## Draft 2050 demand outlook

The three scenarios produce different combinations of electricity use, grid demand and customer technology uptake.

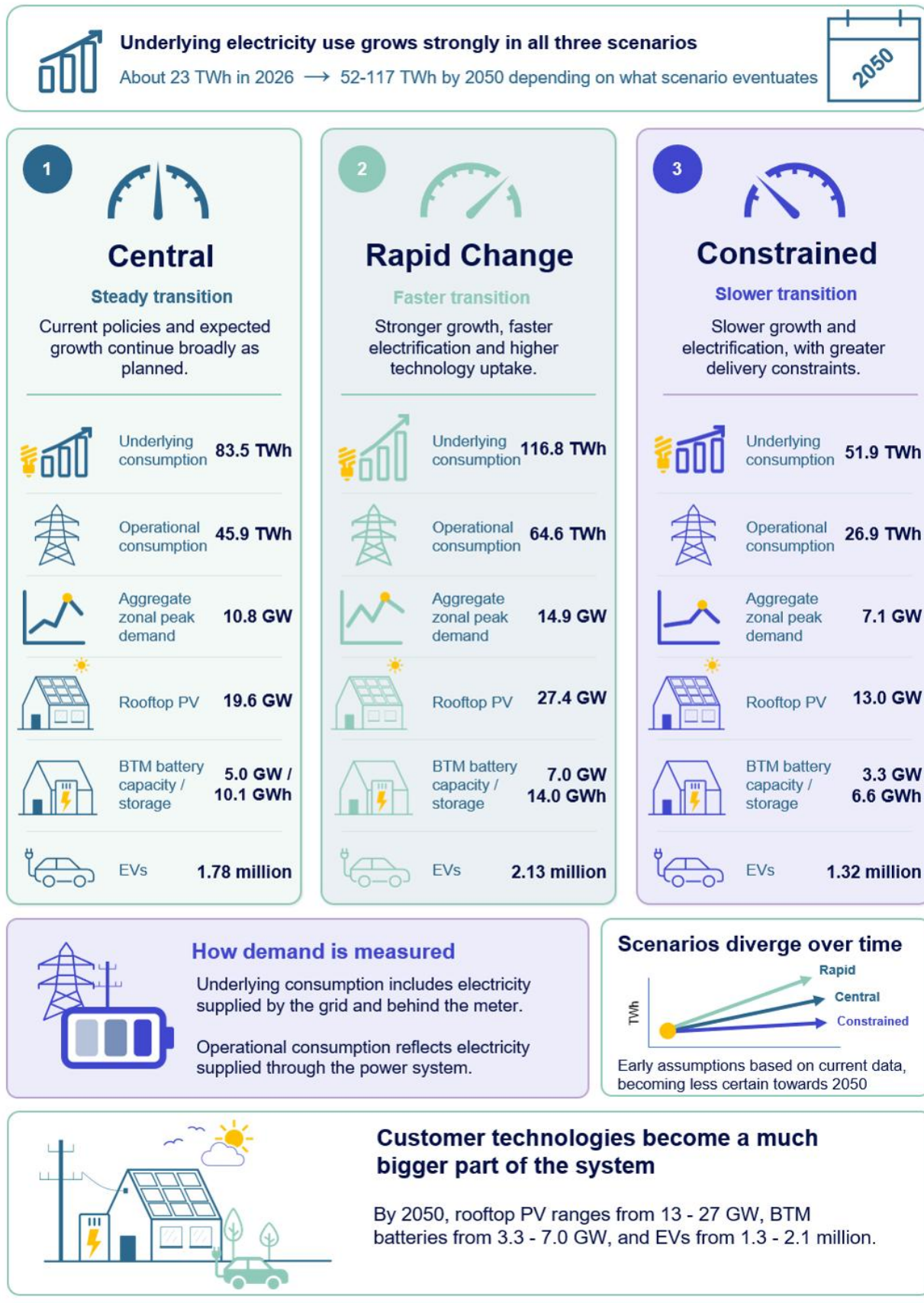


**Table 4.2: 2050 demand outlook by scenario**

| Measure                            | Central      | Rapid Change | Constrained  |
|------------------------------------|--------------|--------------|--------------|
| <b>Underlying consumption</b>      | 83.5 TWh     | 116.8 TWh    | 51.9 TWh     |
| <b>Operational consumption</b>     | 45.9 TWh     | 64.6 TWh     | 26.9 TWh     |
| <b>Aggregate zonal peak demand</b> | 10.8 GW      | 14.9 GW      | 7.1 GW       |
| <b>Rooftop PV</b>                  | 19.6 GW      | 27.4 GW      | 13.0 GW      |
| <b>BTM battery capacity</b>        | 5.0 GW       | 7.0 GW       | 3.3 GW       |
| <b>BTM battery storage</b>         | 10.1 GWh     | 14.0 GWh     | 6.6 GWh      |
| <b>EVs</b>                         | 1.78 million | 2.13 million | 1.32 million |

The initial scenarios have been tested with stakeholders through webinars, targeted meetings and written feedback. Feedback has generally supported them as a reasonable range of plausible futures for the SWIS, while helping refine individual assumptions and identify issues for further testing. Appendix H summarises stakeholder engagement and feedback received to date, including some suggestions for additional consideration.

Appendix I provides a comparative summary of the principal inputs and assumptions for the three scenarios. Detailed numerical settings and sources are provided in the Inputs and Assumptions Workbook.

## 4.2. Sensitivities and case studies

The three scenarios are intended to cover a broad range of plausible futures, but they cannot test every uncertainty. Sensitivities and case studies will be used to look more closely at assumptions or issues that could materially change the results.

- A **sensitivity** changes one assumption or variable, or a small group of related assumptions, to show how much difference the change makes.
- A **case study** looks more closely at a particular issue, technology or location.

This approach helps show which findings are relatively robust and which are more dependent on particular assumptions. It also provides a way to test the impact and implications of issues raised through stakeholder feedback or emerging from the modelling itself.

The final set will depend on stakeholder feedback, available data and what the early modelling shows. Current candidates are summarised in the following table.

**Table 4.3: Potential sensitivity analyses and case studies**

| Potential sensitivities | Potential case studies |
|-------------------------|------------------------|
|-------------------------|------------------------|

- |                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Size and timing of large industrial loads</li><li>• Delays to major network, generation or storage infrastructure</li><li>• Industrial demand flexibility</li><li>• Coordinated DER and VPP participation</li><li>• Vehicle-to-grid uptake</li><li>• Gas availability and fuel costs</li><li>• Technology costs and performance</li></ul> | <ul style="list-style-type: none"><li>• Location of large loads and the extent of co-located generation (with likely focus on the Mid West)</li><li>• Reliability during periods of high demand, low renewable generation or other challenging operating conditions</li><li>• Location-specific issues where more detailed analysis would be useful</li></ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

These sensitivities and case studies allow the FESO to test specific issues, without adding every possibility to the core scenarios.

## 5. Methodology

While section 3 explains the overall modelling framework and how the different workstreams fit together, this section provides further detail on the methods used within each workstream.

The methodology is iterative. Results from one part of the analysis are used to inform and test other parts of the modelling. The models and assumptions may therefore be refined and re-run until the results provide a credible and internally consistent representation of each scenario.

This section describes the principal methods and the role of the most important assumptions. The numerical values, sources and scenario-specific settings used in the modelling will be outlined in the Inputs and Assumptions Workbook published alongside this MISA document.

### 5.1. Demand modelling methodology

Demand modelling forecasts how much electricity may be used, where it may be used and when. It produces 30-minute demand profiles across the modelling horizon for each of the Central, Rapid Change and Constrained scenarios. These profiles provide a common input to the distribution network, resource planning and other FESO modelling.

The demand outlook combines two broad components:

**large loads**, including existing major electricity users, electrification of existing industrial processes and potential new industries; and

**distribution core demand**, covering households and other customers that are modelled through Western Power's uSim demand forecasting model.

These components are modelled separately because they behave differently. Distribution core demand comprises a much larger number of individual customers whose electricity use is affected by population growth, technology uptake, customer behaviour and other factors.

The detailed demand forecasting methodology is provided in Appendix A. The numerical inputs and scenario-specific assumptions are provided in the Inputs and Assumptions Workbook. The following sections provide an overview of the two primary demand modelling components.

#### Why large loads matter

Large loads are relatively few in number but account for around half of electricity consumption on the SWIS. Changes to a small number of large industrial facilities can therefore materially affect both total electricity demand and where that demand appears on the network.

### 5.1.1. Large loads

For the FESO, large loads include transmission-connected loads, high-voltage distribution-connected loads, and low-voltage distribution-connected loads with average daily consumption greater than 10 MWh. Large loads are modelled individually or by relevant industry group to reflect their size, location and operating characteristics. The modelling considers three broad sources of future demand change:

- growth or contraction in existing industries;
- electrification of existing industrial processes; and
- development of new energy-intensive industries.

Existing large loads use historical 30-minute demand profiles as a starting point. These are adjusted to reflect expected changes in industrial activity, productivity and energy efficiency, and other known changes in operations.

Industrial electrification is modelled using DEED's Demand Assessment of SWIS Large Load Electrification (DASLLE) model. DASLLE uses facility-level National Greenhouse and Energy Reporting Scheme data and other industry information to identify non-electric energy uses that could plausibly transition to electricity. Energy use is assessed by sector, fuel type and end use, with assumptions about technology uptake and efficiency used to convert potential fuel switching into additional electricity demand. Industry and stakeholder engagement is used to test and refine the resulting electrification assumptions.

Potential new large loads are identified using the best available information on projects that may connect to or increase their use of the SWIS. This includes Western Power connection information, AEMO planning and demand information, State Government policy direction, and direct engagement with major electricity users and project proponents. The maturity, timing, location and likely scale of these developments are considered when determining how they are represented under each scenario.

Data centres have been incorporated into the FESO scenarios, with assumptions reflecting different levels of potential growth to 2050. Given the significant uncertainty regarding future data centre development, feedback on these assumptions is sought through the stakeholder consultation period.

New loads will not generally have an operating history. Where this is the case, a 30-minute demand profile is developed using comparable existing loads or relevant industry operating characteristics, adjusted to reflect the expected operation of the proposed facility.

These components are combined to produce scenario-specific large load demand profiles by location and time for use in the wider FESO modelling. The detailed large load and DASLLE methodologies are provided in Appendix A, with the numerical assumptions and scenario settings provided in the Inputs and Assumptions Workbook.

### 5.1.2. Distribution core and uSim

Distribution core demand is modelled using uSim, an agent-based long-term demand forecasting model developed by Energeia and used by Western Power for system and network planning. In uSim, an ‘agent’ represents a type of electricity customer. The model simulates how the electricity use and technology choices of different customer types change over time in response to factors such as population growth, technology costs, tariffs, customer characteristics and State Government policy.

For each customer type, uSim develops a 30-minute demand profile and models the main components of electricity use, including:

- rooftop solar PV;
- battery storage;
- electric vehicle charging;
- water and space heating;
- cooling and other appliances; and
- other forms of household or business electrification.

This allows the demand forecast to capture both how much electricity customers use and when they use, generate or store it. It also allows emerging technologies and changing customer behaviour to be represented even where there is limited historical data.

Different assumptions are applied under the Central, Rapid Change and Constrained scenarios to reflect differences in population and economic growth, electrification, energy efficiency, technology uptake and customer behaviour. The detailed settings for each scenario are provided in the Inputs and Assumptions Workbook and further detail on the distribution core modelling is included in Appendix A part 1.

#### What does faster electrification mean in practice?

The scenarios differ in the assumed pace of electrification and customer technology uptake. Under the current draft modelling, for example, EV uptake by 2050 ranges from around **1.3 million vehicles in Constrained to 2.1 million in Rapid Change**, while rooftop PV ranges from around **13 GW to 27 GW**.

### 5.1.3. Location of future demand

The location of future demand is important because electricity demand will not grow evenly across the SWIS. The FESO accounts for this by using Western Power’s established spatial modelling approach to locate existing and future customer demand across the network.

Distribution core customers are mapped into small geographic areas known as energy cells. These can then be mapped through the electricity network to feeders, substations

and transmission zones. Population forecasts, land-use planning information and other spatial data are used to identify where future residential and business growth is expected to occur and to reflect that growth in the demand forecast.

Large loads are located separately using the known or expected location of each facility. This includes information on existing industrial sites, strategic industrial areas and proposed developments, supported by available connection, government and industry information.

This spatial approach means the same underlying demand forecast can be represented at the level of detail needed by each part of the FESO modelling. Distribution network modelling uses more detailed feeder and substation demand because local network constraints depend on precisely where electricity is used or exported. The resource planning model uses demand aggregated to transmission zones because its purpose is to assess long-term generation, storage and transmission requirements across the wider SWIS. Using a common spatial demand outlook across the different models helps ensure that local network planning and broader system planning are based on a consistent view of where future electricity demand is expected to emerge.

#### **5.1.4. Benchmarking and calibration**

The FESO demand forecasts are benchmarked against established electricity demand outlooks, particularly AEMO's WEM ESOO. The Central scenario is intended to remain broadly aligned with the WEM ESOO Expected demand outlook in the near term, providing a common and well-established starting point for the FESO analysis. The FESO then extends that outlook to 2050 and adds the greater spatial and 30-minute detail needed for the wider modelling.

The underlying uSim modelling is also calibrated against observed electricity demand. Base-year results are compared with customer meter data and feeder SCADA data, with the model adjusted where necessary to ensure it provides a reasonable representation of actual demand and customer behaviour.

Together, these checks help ensure the FESO demand outlook is grounded in both observed system conditions and established planning forecasts. The modelling then builds on that foundation to provide the additional information needed by the FESO, including annual electricity consumption, peak and minimum demand, 30-minute demand profiles by location, and projections of rooftop solar, batteries and electric vehicles.

These outputs provide a consistent demand basis for the distribution network and resource planning modelling. Where later modelling identifies a material inconsistency or unexpected result, the relevant demand assumptions can be reviewed and refined.

The FESO demand modelling builds on Western Power's established long-term demand forecasting methodology, including the approach used for its Transmission System Plan. Further background is provided in [Appendix D of Western Power's Transmission System](#)

[Plan 2025](#). The methodology has been extended for the FESO to reflect its scenarios, longer modelling horizon and wider system planning requirements.

## 5.2. Distribution network modelling methodology

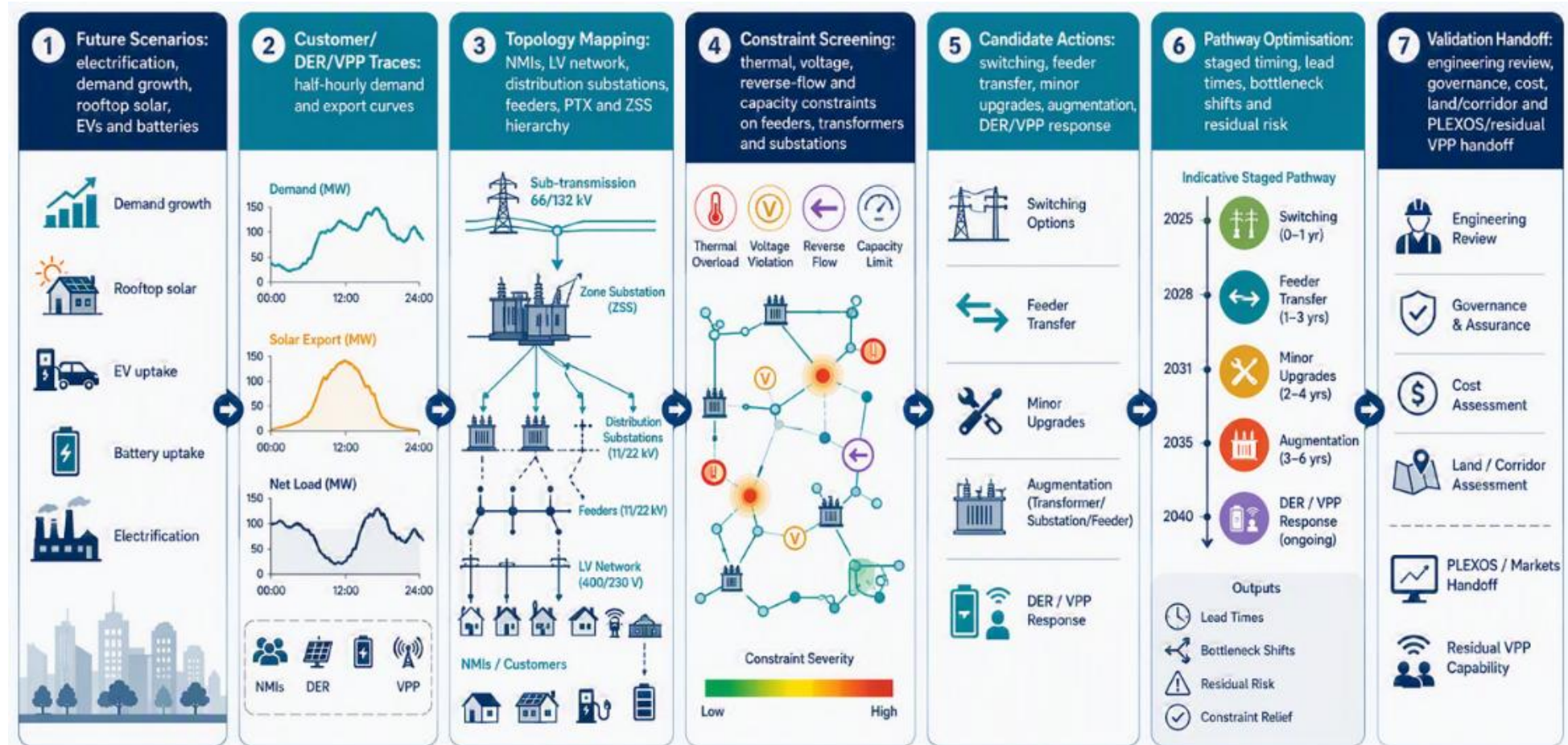
Distribution network modelling assesses how changes in demand, electrification and customer energy resources may affect Western Power's distribution and sub-transmission network under each FESO scenario. It identifies where network constraints may emerge and considers the network and non-network responses that may be needed.

The distribution network analysis is undertaken separately from the long-term resource planning model. Distribution network investment is not co-optimised with generation, storage and transmission investment in PLEXOS. Instead, the distribution modelling identifies local network requirements and determines how much flexible customer capacity may remain available to the wider electricity system.

The proposed distribution network modelling process is outlined below in seven stages.

- 1. Apply the FESO scenario inputs.** Apply the demand growth, electrification, rooftop solar, electric vehicle, battery and other relevant assumptions for the Central, Rapid Change or Constrained scenario.
- 2. Develop customer, DER and VPP traces.** Develop 30-minute demand, export and net-load profiles for customers and DER. uSim is used to estimate DER uptake and potential VPP capability by customer type and location.
- 3. Map demand and DER to the network.** Allocate customer demand and DER profiles through the relevant network hierarchy, including feeders, transformers and zone substations, at the level of detail required for the analysis.
- 4. Identify emerging network constraints.** Assess future demand and electricity flows against relevant network limits to identify issues such as thermal overloads, voltage constraints, reverse flows and capacity limitations.
- 5. Develop possible responses.** Where a constraint is identified, consider credible network and non-network responses. These may include switching or feeder transfers, minor upgrades, augmentation of feeders, transformers or substations, and the use of flexible demand or coordinated DER.
- 6. Develop an indicative network development pathway.** Sequence the responses that may be required, taking account of when constraints emerge, the relief provided by each response, delivery lead times and any relevant dependencies or practical constraints.
- 7. Review and hand off the results.** Review the proposed pathway against relevant engineering, cost, delivery and planning considerations. The resulting network requirements, demand adjustments and available VPP capability are then provided to the wider FESO modelling.

Figure 5.1: Distribution modelling methodology



### 5.2.1. Treatment of DER, VPPs and non-network responses

The modelling distinguishes between the total potential capacity of customer batteries and other DER and the amount that can realistically be relied on by the network or wider electricity system. The normal operation of rooftop solar, batteries, electric vehicles and other customer technologies is already reflected in the demand forecasts. Where these resources can be coordinated through a VPP, the distribution modelling considers whether that capability is available in the right location, at the right time and can be delivered through the local network.

Where a local network constraint emerges, the modelling considers both network and non-network responses. A non-network response may use flexible demand, batteries or other coordinated customer resources to reduce or shift electricity flows and avoid or defer network investment. It is treated as a credible option only where sufficient capability can reasonably be expected to be available when and where it is needed.

The FESO modelling avoids double counting flexible DER. Where VPP capability is needed to manage a local network constraint, only the remaining capability is available to the wider power system.

Where part of the available VPP capability is required to manage a local network constraint, that capability is allowed for first. Any remaining capability can then be made available to the wider electricity system, subject to customer availability and network limits.

### 5.2.2. Vehicle-to-grid

Vehicle-to-grid (V2G) is treated as a potential form of coordinated DER. The modelling does not assume that all EV battery capacity will be available to the electricity system. Only the proportion that can reasonably be expected to participate and be available when required is reflected in the wider FESO modelling.

The assumed timing and level of V2G participation varies between scenarios:

**Rapid Change** assumes earlier and greater uptake, emerging from around 2035 and increasing to a maximum of around 10% of the available EV storage resource.

**Central** assumes a slower emergence from around 2040, increasing to around 5%.

V2G is not assumed to emerge under the **Constrained** scenario.

The detailed V2G participation assumptions and resulting available storage capacity for each scenario are provided in the Inputs and Assumptions Workbook.

### 5.2.3. Outputs and model interfaces

The principal outputs of the distribution modelling include:

- the location, type and timing of emerging distribution and sub-transmission constraints;
- potential network and non-network responses;
- the indicative sequence and timing of those responses;
- relevant delivery lead times and dependencies; and
- the VPP capability remaining available to the wider electricity system.

These outputs provide inputs to the long-term resource planning and other FESO modelling. They help ensure that assumptions about future demand and flexible customer resources reflect the practical limits of the distribution network.

The process is iterative. Results from the resource planning, dispatch and PowerFactory analysis may identify a constraint or inconsistency that requires a distribution assumption, network limit or proposed response to be revisited. Relevant models can then be updated and rerun.

## 5.3. Synthetic weather year methodology

Weather affects both how much electricity is used and how much electricity can be produced by wind and solar generation. The FESO uses a synthetic weather year as the weather basis for the demand and renewable energy traces used across the modelling, rather than using an historical weather series.

A synthetic weather year is not a prediction of the weather in a future year. Rather it is a constructed sequence of plausible weather conditions designed to represent the types of conditions the SWIS may need to operate through. This includes both typical periods that present no difficulty to the power system as well as combinations that can test the system (and are therefore important for system planning), such as periods of high or low demand and prolonged low renewable generation.

The synthetic weather year is developed using observed weather and operating data. Demand, wind and solar conditions are kept aligned in time so that the modelling tests credible combinations of weather-driven demand and renewable generation rather than treating them independently. The same weather basis is used across the scenarios, allowing differences in modelling results to reflect the scenario assumptions rather than different assumed weather.

The resulting half-hourly demand, wind and solar traces are used across the FESO modelling at the level of detail required by each model. This provides a consistent basis for

testing whether the generation, storage and network development identified through the modelling could operate reliably across a credible range of weather conditions.

The common synthetic weather year is used for the core FESO modelling. The subsequent reliability assessment tests the resulting system against a broader range of weather conditions and facility outages, as described in section 5.5.2.

The detailed methodology used to develop the synthetic weather year and the associated demand and renewable resource traces is provided in Appendix C.

## **5.4. Resource planning modelling methodology**

The resource planning modelling covers capacity years 2027 to 2050. For each scenario, the long-term PLEXOS model tests alternative combinations and timing of generation, storage and transmission investment against the demand, network, reliability, policy and other requirements applied in the modelling. This section explains how the SWIS is represented, the investment options available to the model, the requirements and constraints applied, and how the resulting development pathway is tested and refined.

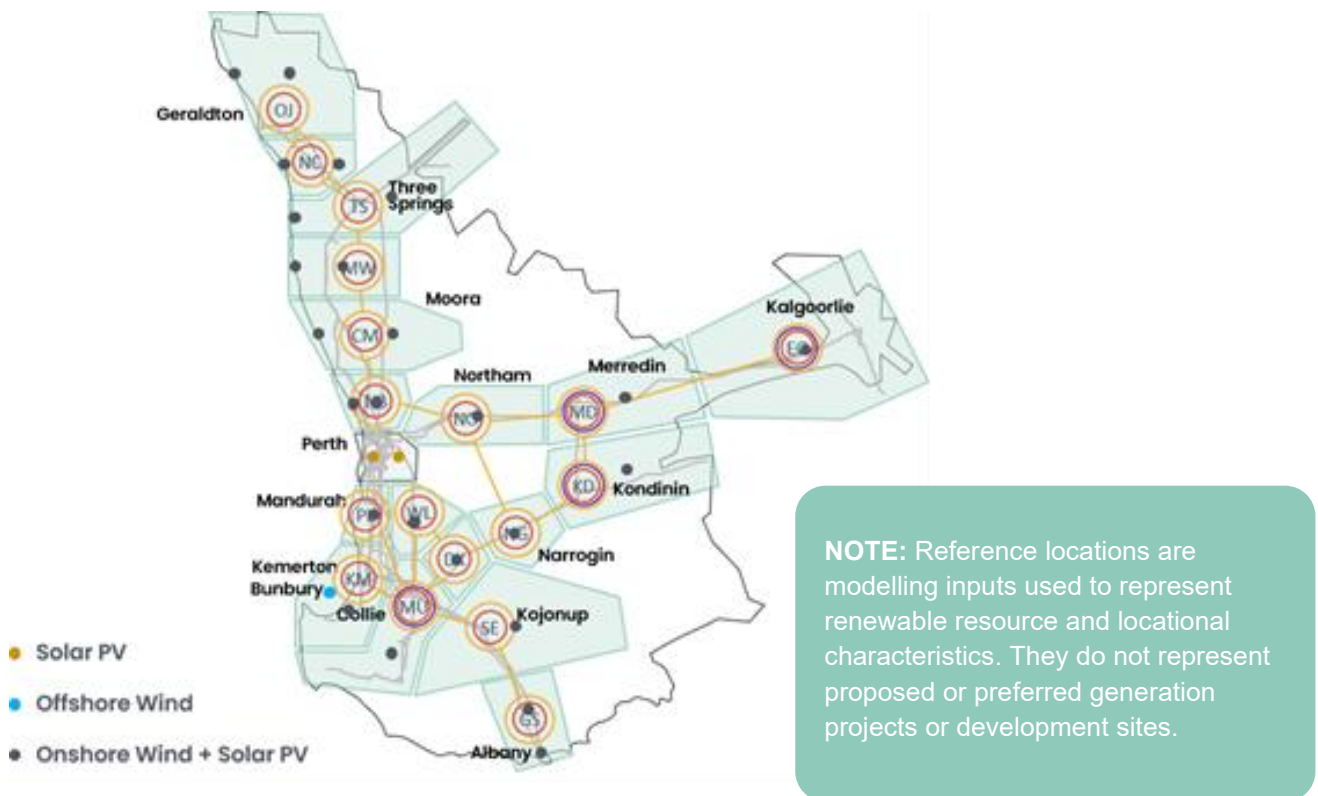
### **5.4.1. Representation of the SWIS**

The long-term model represents the SWIS using geographic zones. Electricity demand, existing generation and storage, and future investment options are allocated to the relevant zone. The model includes limits on how much electricity can be transferred between zones.

The zonal structure and transfer limits are informed by Western Power's network planning information and technical analysis. This gives the model enough spatial detail to identify where generation, storage or transmission development may be needed, without attempting to reproduce every transmission line, substation and local network constraint across the SWIS.

Where a material network constraint is not adequately captured by the zonal representation, information from Western Power's network and power system analysis is used to refine the relevant transfer limit, constraint or investment option. This allows the long-term model to maintain a reasonable run time over the full 2027 to 2050 horizon while still reflecting the network limits that matter for investment decisions.

Candidate generation and storage options are also assigned to zones. Reference locations are used to reflect differences in renewable resource quality, network access and other locational factors that affect where future development could reasonably occur. These reference locations are modelling inputs only and do not represent proposed or preferred development sites.

**Figure 5.2: Indicative reference locations for candidate renewable generation**

### 5.4.2. Model inputs and investment options

The long-term PLEXOS model needs a realistic starting point for the existing power system and a credible set of options for how it could develop. It therefore brings together information on existing and planned generation and storage, facility retirements, future generation and storage options, transmission capability and development, fuel availability, policy requirements, reliability requirements and costs.

These inputs define what infrastructure is already available, what is expected to change, what new investment the model can choose and the practical limits within which those choices can be made. This prevents the model from selecting theoretically low-cost outcomes that could not realistically be delivered.

Table 5.1 summarises the main information and investment options represented in the model. The detailed values, sources and scenario-specific settings are provided in the Inputs and Assumptions Workbook.

**Table 5.1: Information and investment options considered by the long-term model**

| Input                              | How it is represented in the model                                                                                                         |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Demand and renewable traces</b> | Operational demand, peak demand and wind and utility-scale solar traces derived from the common synthetic weather year. The final temporal |

|                                                            |                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                            | representation used in the long-term model will be confirmed as the methodology is finalised.                                                                                                                                                                                                                            |
| <b>Existing facilities and projects assumed to proceed</b> | Existing generation and storage facilities and new projects assumed to proceed are represented using their expected capacity, location, costs and operating characteristics. Near-term assumptions draw on AEMO WEM ESOO project information, Western Power connection information and other available project evidence. |
| <b>Facility retirements</b>                                | Announced State-owned and private coal retirement dates are applied.                                                                                                                                                                                                                                                     |
| <b>Candidate generation and storage</b>                    | Reference generation and storage options are available for the model to select where additional capacity is required. Options are assigned by zone and include technology, cost, performance, renewable resource, development limits and earliest availability.                                                          |
| <b>Facility outages and maintenance</b>                    | Full and partial forced outage rates and planned maintenance assumptions reduce the amount of generation capacity available to the model.                                                                                                                                                                                |
| <b>Fuel costs and gas supply constraints</b>               | Fuel price assumptions and material gas availability and deliverability constraints applied to gas-powered generation, including relevant pipeline flow and linepack constraints.                                                                                                                                        |
| <b>Transmission network and constraints</b>                | Western Power provides the network transfer limits used to represent how much electricity can move between modelling zones. Material limits are reflected through transmission constraints in the model.                                                                                                                 |
| <b>Transmission development</b>                            | Phase 1 projects identified in the <i>South West Interconnected System Transmission Plan</i> are assumed to proceed. Future transmission augmentation options are also represented where the model can select them. Relevant lead times and sequencing dependencies are reflected.                                       |
| <b>Policy settings</b>                                     | Applicable State and Commonwealth policy requirements are represented. Central and Rapid Change include annual SWIS emissions budgets that decline over the modelling period. The Constrained scenario does not apply a SWIS emissions budget. The emissions methodology is described in section 5.8.                    |
| <b>Reserve Capacity Mechanism</b>                          | The modelling reflects the Reserve Capacity Target and relevant assumptions for capacity credits and storage duration requirements.                                                                                                                                                                                      |
| <b>Financial settings</b>                                  | Discount rates and other financial assumptions allow investment and operating costs incurred at different times to be compared consistently                                                                                                                                                                              |

Together, these inputs give the model a practical view of the system it starts with, and the development choices available over time. The model can therefore compare generation, storage and transmission investment on a consistent basis while respecting the network, resource, delivery, reliability and policy constraints that affect what can realistically be built and operated.

### 5.4.3. New entrant generation and storage

A key part of the resource planning modelling is defining the generation and storage options that are realistically available over the modelling horizon. The level of certainty about those options changes over time, so the model represents them differently:

**In the early years** of the forecast horizon, the modelling for each scenario will reflect a plausible development pipeline. Existing facilities and projects assumed to proceed are represented directly using their expected capacity, location and operating characteristics. Information from AEMO's WEM ESOO, Western Power connection processes, government and industry sources is also used to identify other developments that could realistically become available and when.

**In later years**, it becomes increasingly uncertain which specific projects or developers will proceed. The model therefore uses representative future generation and storage options based on credible assumptions about available technologies, costs, performance, location and renewable resource quality.

These representative options, referred to as reference generation and storage options, allow the model to test the types of investment that could realistically be developed without assuming that a particular future project or developer will proceed.

Reference options are assigned to modelling zones and include assumptions about technology, cost, performance, renewable resource quality, earliest availability and the amount that could reasonably be developed. Development limits reflect relevant network capability, renewable resources, land-use considerations, dependent transmission development, industry and connection interest, and practical delivery constraints.

Representative wind and solar locations are used to capture material differences in renewable resource quality and network access. These are modelling inputs used to test where future development could occur. They do not represent proposed or preferred projects or development sites.

PLEXOS then compares different combinations and timing of generation, storage and transmission investment. It selects from the available options to identify the lowest-cost development pathway that can meet forecast demand while satisfying the physical, network, reliability, policy and other requirements applied in the relevant scenario.

**Lowest cost does not mean least infrastructure.** The model minimises total system cost, so additional investment can be worthwhile where it reduces costs elsewhere or improves reliability.

The model considers costs across the full outlook period, including capital, operating and maintenance, fuel and the economic cost of electricity demand that cannot be supplied (i.e. unserved energy). Future costs are converted to present values so that investments occurring at different times can be compared consistently.

The resulting development pathway is then tested through the dispatch, reliability and other FESO analysis and refined where that testing identifies a material issue.

Further detail on the approach to selecting candidate technologies and new entrant generation and storage is detailed in Appendix D.

#### 5.4.4. Requirements the model must meet

PLEXOS does not simply select the cheapest individual investments. The development pathway must also meet the physical, network, reliability, policy and other requirements represented in the model. These requirements ensure that the lowest-cost result is also capable of meeting demand and operating within the practical limits assumed for the relevant scenario.

The main requirements include:

- energy balance, so supply meets demand in each modelled interval;
- facility limits, including maximum capacity, storage duration and efficiency, ramp rates, minimum stable generation, maintenance and outage-adjusted availability;
- network limits on electricity transfers between zones;
- applicable gas availability and deliverability constraints;
- scenario-specific emissions constraints and other applicable policy requirements;
- fixed retirement dates and limits on how much generation and storage capacity can be built by technology, zone and year, reflecting relevant resource, network, land use and project delivery constraints;
- the Reserve Capacity Target; and
- selected high-level system-security requirements.

Together, these requirements prevent the model from producing a low-cost result that could not realistically meet the needs of the power system. PLEXOS instead identifies the lowest-cost combination of generation, storage and transmission investment that satisfies the requirements applied to each scenario.

#### 5.4.5. Meeting the reliability requirement

The long-term model must identify enough dependable capacity to keep the power system reliable in each year. The Peak Reserve Capacity Target sets the amount of dependable capacity the model must provide. The target is determined using two tests under the WEM Planning Criterion:

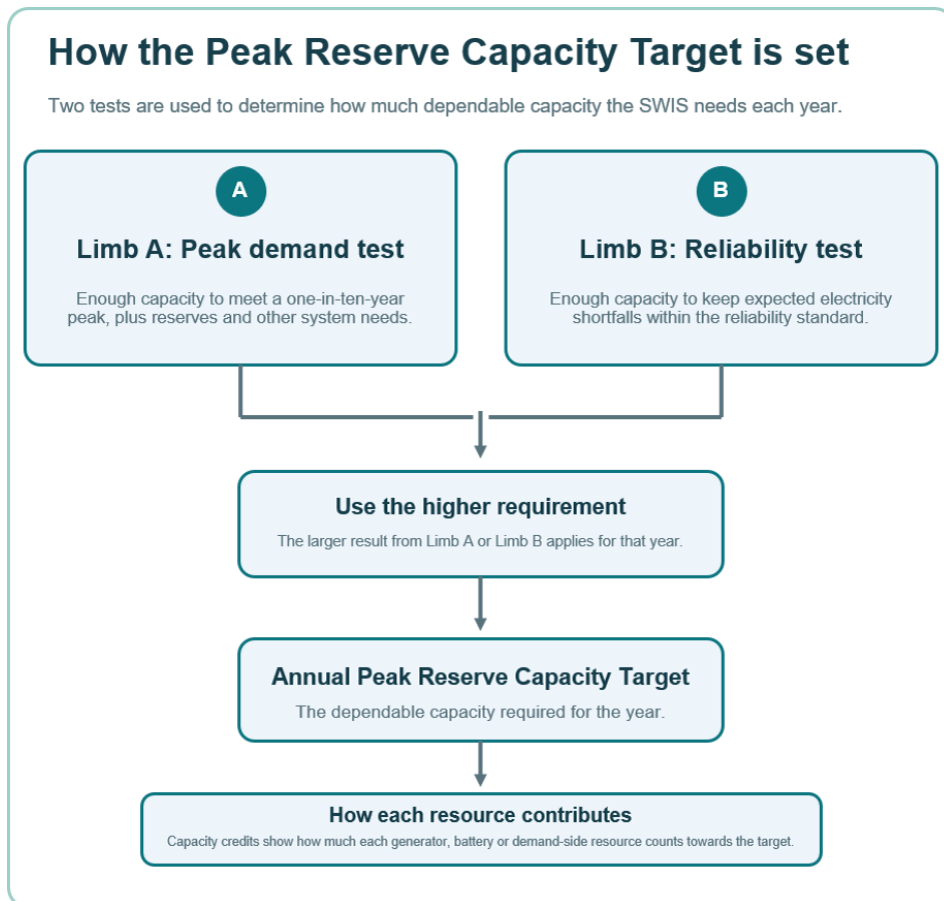
- Limb A assesses how much capacity is needed to meet a one-in-ten-year peak demand forecast, together with a reserve margin and other applicable system requirements.
- Limb B assesses how much capacity is needed to keep expected electricity shortfalls within the reliability standard.

The higher of the two requirements sets the Peak Reserve Capacity Target for that year, ensuring the model provides enough capacity to satisfy both peak-demand and reliability requirements. The current FESO methodology does not assess Limb C because it has not historically been used to determine the Reserve Capacity Target.

Under the proposed approach, the first long-term modelling run will apply Limb A. The more detailed dispatch and reliability modelling will then be used to assess Limb B. If Limb B produces a higher requirement, the target and the proposed investment plan may be updated and the long-term model run again.

Installed capacity is not treated as automatically available when the system needs it. Generation, storage and demand-side resources contribute to the target through capacity credits, which reflect the dependable capacity each resource can provide during periods of system need. Capacity credit assumptions for new resources are set out in the Inputs and Assumptions Workbook.

**Figure 5.3: Setting the Peak Reserve Capacity Target**



#### 5.4.6. How the model considers transmission upgrades

The resource planning modelling identifies where, when and at what scale transmission development may be needed under each scenario. It does this by testing transmission upgrades alongside generation and storage investment, allowing the model to compare different ways of meeting future electricity needs across the SWIS.

Transmission investment is assessed on its contribution to the system as a whole, not simply how heavily an upgrade is used. An upgrade may be worthwhile because it allows lower-cost generation to reach customers, improves reliability during challenging periods or avoids more expensive investment elsewhere. Equally, high utilisation of an existing part of the network does not necessarily mean augmentation is the lowest-cost response.

Phase 1 projects in the SWIS Transmission Plan are assumed to proceed. Further transmission development is tested through the modelling and may differ between scenarios.

The modelling therefore provides an indication of the location, scale and timing of transmission development that may be needed under each scenario. These results provide evidence for future network planning, but do not themselves approve or commit Western Power to a particular project.

FESO results may also inform the identification of Priority Projects under the ESM Rules. Note that identifying a Priority Project in the final FESO would not in itself approve the project. It would still need to go through the relevant regulatory and approval processes before it could be delivered.

#### 5.4.7. How the results are tested and refined

The results from the long-term modelling are not accepted at face value. They are tested through the other FESO modelling and reviewed by the organisations and specialists involved in developing the FESO.

Dispatch, reliability and power system analysis test aspects of the future system that cannot be represented at the same level of detail in the long-term model. These checks can identify operational, reliability or network issues, unrealistic assumptions, or constraints that need to be represented differently.

Where a material issue is identified, the relevant assumptions, network limits or investment options are reviewed and updated. The affected models are then rerun to test whether the issue has been resolved and whether the change has created any material effects elsewhere in the modelling.

Issues can also be identified through Working Group review, specialist technical review or feedback from internal and external stakeholders. The FESO Working Group considers these issues and seeks advice from relevant subject matter experts where required. Matters requiring broader direction or agreement are escalated to the FESO Steering Committee. This iterative process helps ensure the final modelling results are technically credible, internally consistent and robust enough to support the planning conclusions drawn from them.

## 5.5. Market dispatch, reliability, commerciality and pricing

The long-term resource planning modelling identifies a development pathway for each scenario. The next stage tests whether that future system can operate reliably in practice, whether the required generation and storage investment appears commercially viable, and what the resulting system could mean for future electricity costs.

This analysis comprises four connected workstreams:

**market dispatch modelling**, which tests how the modelled generation, storage and transmission system operates from one interval to the next;

**reliability assessment**, which tests whether the system can continue to meet the WEM reliability standard under a wider range of weather, renewable generation and outage conditions;

**commerciality assessment**, which tests whether the generation and storage investment identified as necessary by the wider modelling appears capable of recovering its costs under the modelled market arrangements; and

**pricing and cost assessment**, which brings together the relevant modelling results to examine how the cost of supplying electricity may change over time.

Together, these workstreams provide an important check on the long-term modelling. They test whether the development pathway is operationally credible and reliable, and whether there are commercial or cost issues that could affect whether the required investment is delivered.

The methodology described below reflects the proposed FESO approach. Final implementation details will be settled as the work is commissioned. Any material changes will be reflected in the final MISA. Detailed technical methodology will be provided in Appendix B, with the principal inputs and scenario-specific assumptions in the Inputs and Assumptions Workbook.

### 5.5.1. Market dispatch modelling

Market dispatch modelling takes the generation, storage and transmission development identified through the long-term resource planning model and tests how that future system operates in greater detail.

The generation and storage capacity and transmission development identified by the long-term modelling are treated as fixed inputs. The model then dispatches the available generation and storage to meet 30-minute demand, taking account of generator operating limits and availability, storage charging and state of charge, renewable generation and curtailment, transmission constraints, gas availability and other relevant operating requirements.

Generators are represented using bids based on their short-run marginal costs. This provides a practical representation of how the modelled future generation and storage fleet could be dispatched through the WEM.

The modelling produces generation and storage dispatch, network flows, market price outcomes, unserved energy, emissions and fuel use. These outputs provide the basis for the reliability, commerciality and pricing assessments.

Where dispatch modelling identifies a material operational, reliability or network issue, the relevant assumptions, constraints or investment requirements are reviewed and fed back into the resource planning modelling.

### **5.5.2. Reliability assessment**

The reliability assessment tests whether the development pathway identified through the resource planning modelling can meet the WEM reliability standard across a broader range of operating conditions. Section 5.4.5 explains how Limb A of the WEM Planning Criterion is applied in the long-term resource planning model. The reliability assessment provides the more detailed analysis needed to test Limb B and determine whether additional dependable capacity is required.

A single model run cannot represent every combination of weather, renewable generation and facility availability that the future system may experience. The reliability assessment therefore tests the modelled system using multiple weather years and synthetic outage traces. This allows the analysis to examine challenging conditions such as high demand, prolonged low renewable generation, storage depletion and generator outages.

Where a reliability shortfall is identified, the analysis examines its size, duration, timing, location and cause. Potential responses are then tested, including changes to storage operation, demand-side participation, maintenance timing or network development.

If the shortfall cannot be resolved through changes to system operation, the reliability requirements applied to the resource planning model are strengthened and the model is rerun. The revised development pathway is then tested again through the dispatch and reliability modelling.

The principal outputs include whether the modelled system meets the relevant Planning Criterion, expected unserved energy, and the location and nature of any load shedding or reliability shortfall.

### 5.5.3. Commerciality assessment

Resource planning identifies investment that is worthwhile from the perspective of the electricity system as a whole. That does not necessarily mean an individual project will earn enough market revenue to recover its costs. The commerciality assessment tests that distinction.

For each relevant facility or technology, projected market revenues will be compared with the costs of developing and operating the investment. Revenue may include energy market, Reserve Capacity Mechanism and relevant Essential System Services revenue. Costs include capital recovery, fixed and variable operating costs, fuel costs and other relevant costs represented in the modelling.

An investment can be needed by the power system without being commercially viable for an individual investor. The commerciality assessment tests that distinction.

Where projected revenues are insufficient to recover costs, the assessment will identify the nature and scale of the shortfall. This can help show where the investment identified as necessary by the wider system modelling may not be delivered under existing market arrangements, and where further consideration of market settings, policy or other mechanisms may be warranted.

The assessment will not capture every commercial arrangement available to an individual project. In particular, bilateral contracts, hedging arrangements, renewable energy certificates and network support agreements are not proposed to be modelled. The results should therefore be interpreted as an assessment of commercial viability under the modelled market revenues rather than a complete project finance assessment.

### 5.5.4. Pricing and cost assessment

The pricing and cost assessment examines what the modelled development pathway could mean for the cost of supplying electricity over time. It brings together the relevant modelling inputs and outputs to assess the principal components of electricity supply costs, including energy market costs, Reserve Capacity Mechanism costs, Essential System Services, transmission and distribution network costs, and other relevant market costs.

The FESO will compare how electricity supply costs could change over time across the three scenarios.

This allows the FESO to compare the overall cost of the different development pathways and show how those costs change over time and across different parts of the electricity supply chain.

## 5.6. Network and power system studies

Power system modelling provides a technical check on the generation and transmission development identified through the wider FESO modelling. Its purpose is to test whether the modelled future system is credible at a planning level and to identify any material transmission or system strength issues that need to be reflected elsewhere in the analysis.

The analysis is undertaken using DlgSILENT PowerFactory. It tests representative future system conditions based on the generation, storage, demand and transmission development identified through the FESO modelling. This provides a more detailed check of how the transmission system may perform under those conditions, including whether material transmission constraints or system strength issues emerge.

PowerFactory analysis is also used to develop or refine relevant transmission constraint equations for the wider modelling. Where a material issue is identified, the affected network limit, modelling assumption or infrastructure requirement can be reviewed and the relevant FESO models rerun.

The FESO will not model every transmission or distribution network element or assess the detailed impact of individual future facilities and connections. It will not, for example, determine the precise network consequences of connecting a particular generator at a particular location. Distribution network requirements are considered separately through the methodology described in Section 5.2.

Power system modelling provides a planning-level validation of the FESO results and does not replace the detailed network and connection studies required as individual projects progress.

Detailed connection, protection, stability and project-specific network studies will still be required as individual developments progress. The role of the FESO analysis is to provide sufficient technical testing to identify material issues that could affect the overall development pathway, rather than to replace those later studies.

## 5.7. Fuel costs and constraints

Fuel prices and availability affect both how existing generation operates and the relative value of future investment. The FESO modelling includes assumptions for natural gas, coal and distillate, together with material constraints that may limit the availability of those fuels to electricity generation.

The treatment of natural gas is more detailed because the amount of gas available to gas-powered generation can be affected by gas pipeline transfer capacity, demand from other gas users and the availability of linepack. These constraints can affect how much gas-powered generation can operate at a particular time and therefore influence the generation, storage and transmission investment identified through the modelling.

Fuel price assumptions and material gas availability and deliverability constraints are applied to gas-powered generation, including relevant pipeline flow and linepack constraints. Further detail is provided in section 5.7.216 and Appendix D.

### 5.7.1. Fuel costs

Fuel cost assumptions for each scenario are included in the Inputs and Assumptions Workbook and are provided for gas, coal, distillate, and hydrogen.

**Gas:** gas price assumptions have been informed by historical spot prices, current market information and the scenario narratives.

**Hydrogen:** assumptions are based on the NEM ISP<sup>1</sup> scenarios and have been converted to Capacity Years, with a 25% allowance added for distribution network costs.

**Coal:** coal price assumptions have been informed by historical prices, current market information and the scenario narratives.

**Distillate:** a long-term forecast has been derived from the ACIL Allen fuel price report<sup>2</sup>.

### 5.7.2. Natural gas

Natural gas will continue to play an important role in the electricity system, particularly in supporting reliability during periods of low renewable generation and high demand. Gas-powered generation (GPG), however, can only operate if sufficient gas can be delivered when it is needed.

Most GPG in the SWIS is supplied through the Dampier to Bunbury Natural Gas Pipeline (DBNGP). The amount of gas available to generators depends on the capacity of the relevant pipeline section, gas demand from other users and the amount of gas available through linepack. If sufficient gas cannot be delivered, a generator may need to reduce output or, where available, use distillate as an alternative fuel.

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<sup>1</sup> [AEMO, 2026 Integrated System Plan, June 2026](#)

<sup>2</sup> [ACIL Allen, Gas, liquid fuel, coal and renewable gas projections, Final report, February 2025.](#)

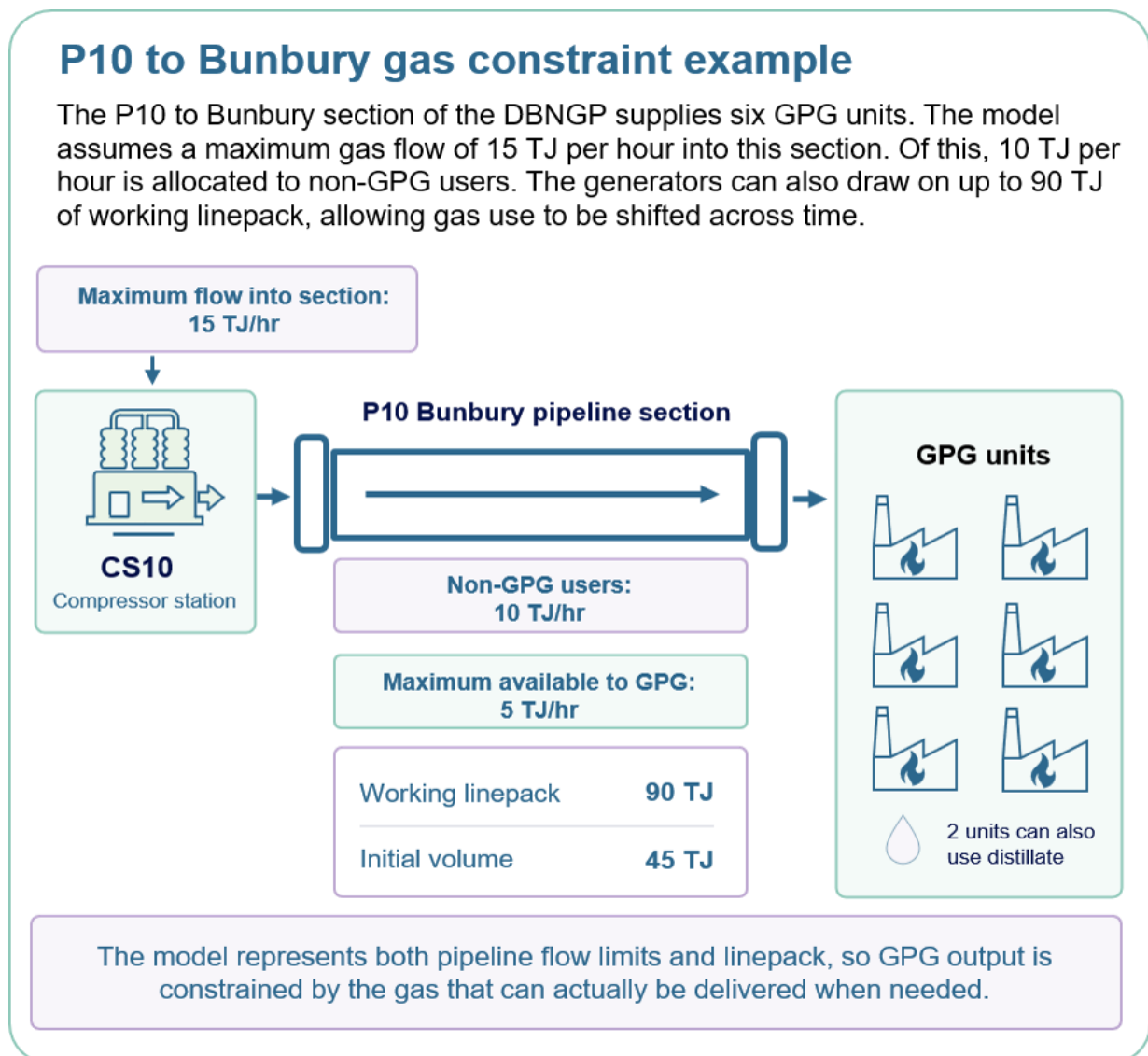
The FESO accounts for these practical limits by representing material gas transport and deliverability constraints in the electricity modelling. Maximum flows are applied to relevant sections of the DBNGP, together with assumptions about non-GPG gas demand and the amount of linepack that can be used. This constrains the amount of GPG available to the electricity model and prevents it from assuming that generators can operate at full output when the gas system cannot support them.

The FESO will model gas deliverability, not upstream gas supply adequacy. Gas availability and prices are inputs to the electricity modelling. The FESO will reflect changes in gas demand caused by industrial electrification assumptions in each scenario. Where industry electrifies and uses less gas, this can increase the amount of gas able to be delivered to electricity generators.

The FESO models whether gas can be delivered to generators when needed. It does not forecast upstream gas production or determine which future gas projects will proceed.

Gas price assumptions vary between scenarios to reflect uncertainty in future market conditions and respond to the scenario narratives. The trajectories are informed by historical prices, current market information and external gas price forecasts. The methodology and basis for the gas supply constraints are described in Appendix D, with the detailed gas price and availability assumptions and sources provided in the Inputs and Assumptions Workbook.

Where gas deliverability becomes a binding constraint, FESO may consider the impact of mitigating options such as linepack, using distillate in dual-fuel generators, changing the dispatch of other generation and storage, or identifying additional generation, storage or transmission investments.

**Figure 5.4: How gas supply constraints are factored in the model**

## 5.8. Net Zero by 2050

Western Australia has a State Government commitment to achieve net zero emissions by 2050. The electricity sector has an important role in supporting that objective, both by reducing emissions from electricity generation and by supplying the additional electricity required as households, businesses and industry electrify.

The FESO represents these effects in two ways.

1. First, the demand modelling captures electricity demand associated with decarbonisation and electrification. Changes in household and business energy use are reflected through the distribution core demand modelling described in section 5.1.2. Electrification of existing industrial processes is reflected through the large load methodology described in section 5.1.1.

2. Second, emissions from electricity generation are represented directly in the resource planning and dispatch modelling. Emissions are calculated from the operation of the modelled generation fleet using the relevant fuel use and emissions assumptions.

The FESO is focused on the SWIS and the generation, storage and network development required to meet future electricity demand under different assumptions and constraints. The scenarios are therefore intended to explore how different combinations of demand growth, infrastructure development and emissions constraints could affect emissions from the power system over time.

### 5.8.1. Net zero in the power system

As coal generation retires and renewable generation increases, the SWIS is expected to require firming capacity to maintain reliability during periods of low renewable generation and high demand. If no emissions constraint is applied and the model is limited to currently available generation and storage technologies, some residual emissions are likely to remain.

The FESO will explore the scale of those residual emissions and how they may be reduced through existing and emerging technologies. The treatment of emissions differs between scenarios:

**Constrained** will not apply an annual emissions constraint.

**Central** and **Rapid Change** will not apply an annual emissions constraint to 2031.

From 2032, **Central** and **Rapid Change** will apply an annual SWIS emissions constraint

Emissions outcomes between 2026 and 2031 will therefore be shaped by demand growth, generation retirements, the timing and scale of new entrant supply, and the operating characteristics of the generation fleet. Given uncertainty around the amount and timing of new supply that may be developed during this period, an explicit emissions constraint is not proposed before 2032.

For Central and Rapid Change, the annual emissions constraint from 2032 will be established as follows:

Modelled emissions in 2031 will provide the starting point for the subsequent emissions trajectory;

The 2032 emissions constraint will be set 15 per cent below the modelled 2031 emissions outcome; and

In each subsequent year, the annual emissions constraint will reduce by a further 15 per cent from the previous year.

The 15 per cent annual reduction has been informed by the CSIRO Multi-sectoral Modelling 2024 Step Change scenario for SWIS electricity emissions. The resulting FESO emissions trajectory is expected to broadly align with the shape of the CSIRO modelling, while recognising that the starting point in 2031 will be determined by the FESO modelling outcomes and assumptions.

State Government emissions targets will not be modelled explicitly as separate constraints in the FESO. However, the modelling will reflect substantial emissions reductions associated with the retirement of State-owned coal generation and the wider transition of the power system. Demand impacts associated with household and business decarbonisation are captured through the distribution core demand methodology, while electrification of existing industry is captured through the large load methodology.

The FESO Working Group is also considering whether available information is sufficient to support a climate impact sensitivity. Some climate-related demand trends, such as increased air-conditioning uptake, are expected to be captured through the agent-based demand forecasting model.

## **5.9. Sensitivities, validation and model assurance**

The three scenarios test coherent combinations of assumptions. Targeted sensitivities and case studies will then test individual uncertainties or locations where additional analysis can improve understanding of the results. The sensitivities will be selected once the core scenario results show which assumptions and system conditions matter most.

Validation and assurance will be applied within each modelling workstream using methods appropriate to that analysis. Proposed checks include:

- backcasting and comparison with other forecasting approaches for the demand modelling;
- comparison of weather and renewable resource traces with historical observations and available measurement data;
- testing reliability outcomes against historical challenging periods, including periods of prolonged low renewable generation;
- expert review of the resource planning, reliability and commerciality modelling through the FESO Working Group and relevant industry and government reference groups; and
- cross-checking results between modelling workstreams to identify inconsistencies or unexpected outcomes.

The formal consultation periods for the draft MISA and draft FESO will provide a further opportunity for stakeholders to test and challenge the methodology, assumptions and

results. The final assurance approach will be refined as the modelling methods and review arrangements are confirmed.

# List of appendices

| Appendix             | Appendix name                                                                  | What it covers                                                                                                                                                                                                                                                                                               |
|----------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A - parts 1, 2 and 3 | <b>Demand methodology</b>                                                      | Demand forecasting methodology, including large loads, population and economic growth, electrification, energy efficiency and DER impacts on demand.                                                                                                                                                         |
| B                    | <b>Resource planning and dispatch methodology, Commerciality, Pricing</b>      | <p>Long-term resource planning and dispatch modelling, including investment logic, build constraints, outages, reserve requirements and chronological dispatch.</p> <p>Methodology for assessing the commercial viability of modelled outcomes, including relevant market and capacity considerations.</p>   |
| C                    | <b>Synthetic weather year and renewable generation forecasting methodology</b> | Synthetic weather year and renewable generation forecasting methodology, including the development of representative weather conditions, treatment of critical demand and renewable generation events, and the methods used to develop wind and solar generation traces and reference generator assumptions. |
| D                    | <b>Supply, fuel, gas and emissions assumptions</b>                             | Existing and future electricity supply, candidate technologies, fuel costs, gas network and GPG assumptions, gas transfer constraints and emissions assumptions.                                                                                                                                             |
| E                    | <b>Network and DER assumptions</b>                                             | Transmission, sub-transmission and distribution network assumptions, network expansion options, DER, VPP and V2G assumptions and interactions between the models.                                                                                                                                            |
| F                    | <b>System security and reliability methodology</b>                             | Reliability criteria and modelling, essential system services, system strength and other relevant system security considerations.                                                                                                                                                                            |
| G                    | <b>Cost estimation (under development)</b>                                     | Summary of the methodology used by Western Power for developing costs for generators and the network.                                                                                                                                                                                                        |
| H                    | <b>Summary of FESO 2027 stakeholder engagement and feedback to date</b>        | Engagement undertaken to date, key stakeholder feedback themes, how those matters are reflected in the MISA and the approach to continuing engagement.                                                                                                                                                       |
| I                    | <b>Comparative scenario inputs and assumptions</b>                             | Provides a consolidated comparison of the principal inputs and assumptions used for the Central, Rapid Change and Constrained scenarios, including the main differences between scenarios and the sources used to develop them.                                                                              |
| J                    | <b>Distribution and Sub-Transmission</b>                                       | Summary of Western Power's distribution and sub-transmission planning methodology.                                                                                                                                                                                                                           |