Department of Energy and Economic Diversification

GOVERNMENT OF WESTERN AUSTRALIA

Future Energy System Outlook (FESO) 2027

Methodology, Inputs, Scenarios and Assumptions (MISA)

19 October 2026

Department of
Energy and Economic
Diversification

GOVERNMENT OF
WESTERN AUSTRALIA

Acknowledgement of Country

The Government of Western Australia acknowledges the traditional custodians throughout Western Australia and their continuing connection to the land, waters and community.

We pay our respects to all members of the Aboriginal and Torres Strait Islander communities and their cultures, and to Elders past and present.

Agenda

Time	Item	Speaker
11:00am	**Welcome and Acknowledgement of Country** **Presenter introductions**	Jai Thomas, Coordinator of Energy, Department of Energy and Economic Development (DEED)
11:05am – 12:00pm	**Introduction and context – FESO & MISA**	Jai Thomas, Coordinator of Energy, DEED
	Modelling framework **Zonal network model**	Julius Susanto, Director, Ampere Labs Luke Petersen, Strategy Consultant, Western Power
	Stakeholder feedback and draft scenarios	Jay Williams, A/Director, DEED
	Methodology • **Demand** • **Renewable generation** • **Distribution planning** • **Expansion model** • **Dispatch model** • **Gas supply and demand** • **Emissions outcomes**	 Luke Petersen, Strategy Consultant, Western Power Luke Petersen, Strategy Consultant, Western Power Luke Petersen, Strategy Consultant, Western Power Simon Arthur, Director, Endgame Analytics Simon Arthur, Director, Endgame Analytics Toby Price, Manager, AEMO Jay Williams, A/Director, DEED
	Next steps	Jay Williams, A/Director, DEED
12:00pm – 12:30pm	**Q&A Panel**	Jai Thomas, Coordinator of Energy, DEED Wenona Hadingham, Executive Director, DEED Jay WilliamsA/Director, DEED Luke Petersen, Strategy Consultant, Western Power Simon Arthur, Director, Endgame Analytics Julius Susanto, Director, Ampere Labs Toby Price, Manager, AEMO

FESO 2027 is a scenario-based study of the SWIS out to 2050

- The Future Energy System Outlook (FESO) 2027 examines three plausible ways in which the SWIS could develop to 2050: Central, Rapid Change and Constrained
- The FESO will identify potential implications for generation, storage, networks, system security and reliability
- To provide an evidence base for government, market bodies, industry and investors
- The FESO will align with and build upon the SWIS Tx Plan, AEMO's ESOO and GSOO, as well as Western Power's TSP



Future Energy System Outlook (FESO)
Methodology, Inputs, Scenarios and Assumptions (MISA)



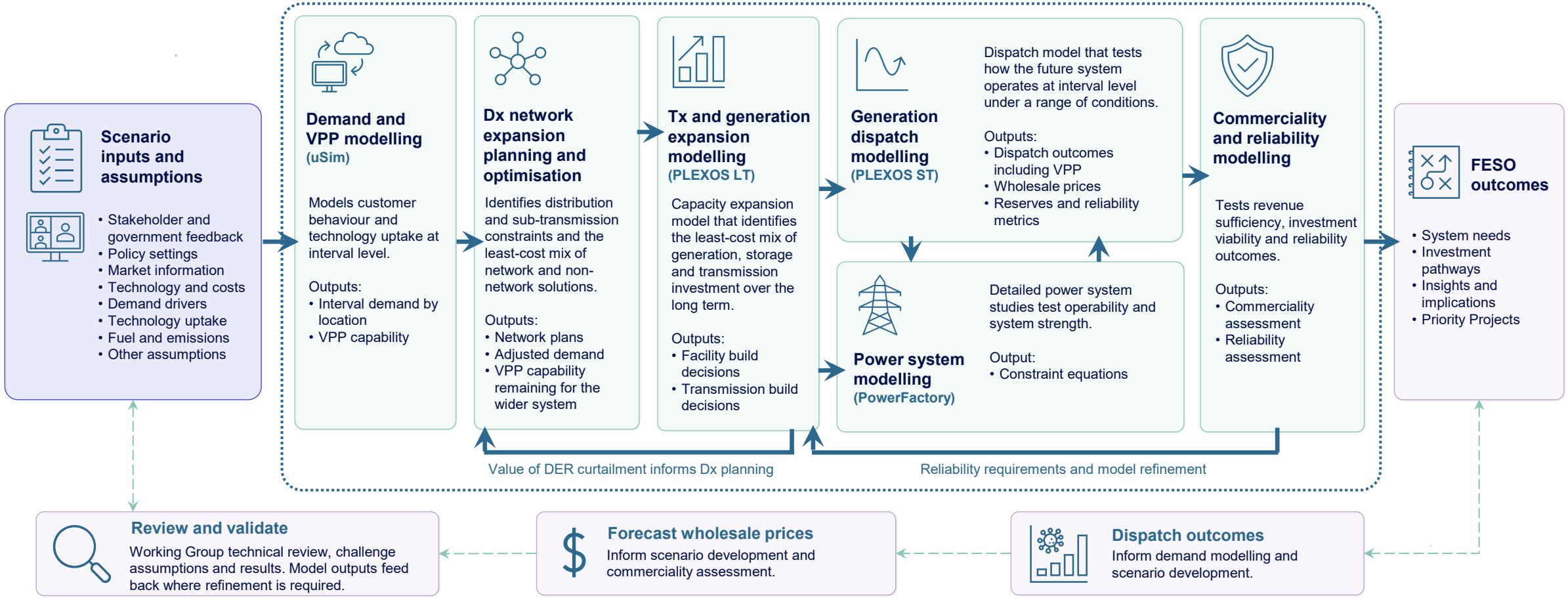
Draft MISA

- Sets out how the FESO analysis will be undertaken
- Publishes detailed inputs and assumptions that underpin the modelling methods outlined
- Feedback is sought to inform the final inputs and assumptions before modelling begins

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.



KEY

Inputs and assumptions | Modelling and analysis | Outputs and governance | Primary information flow | Feedback and iteration | Modelling activities

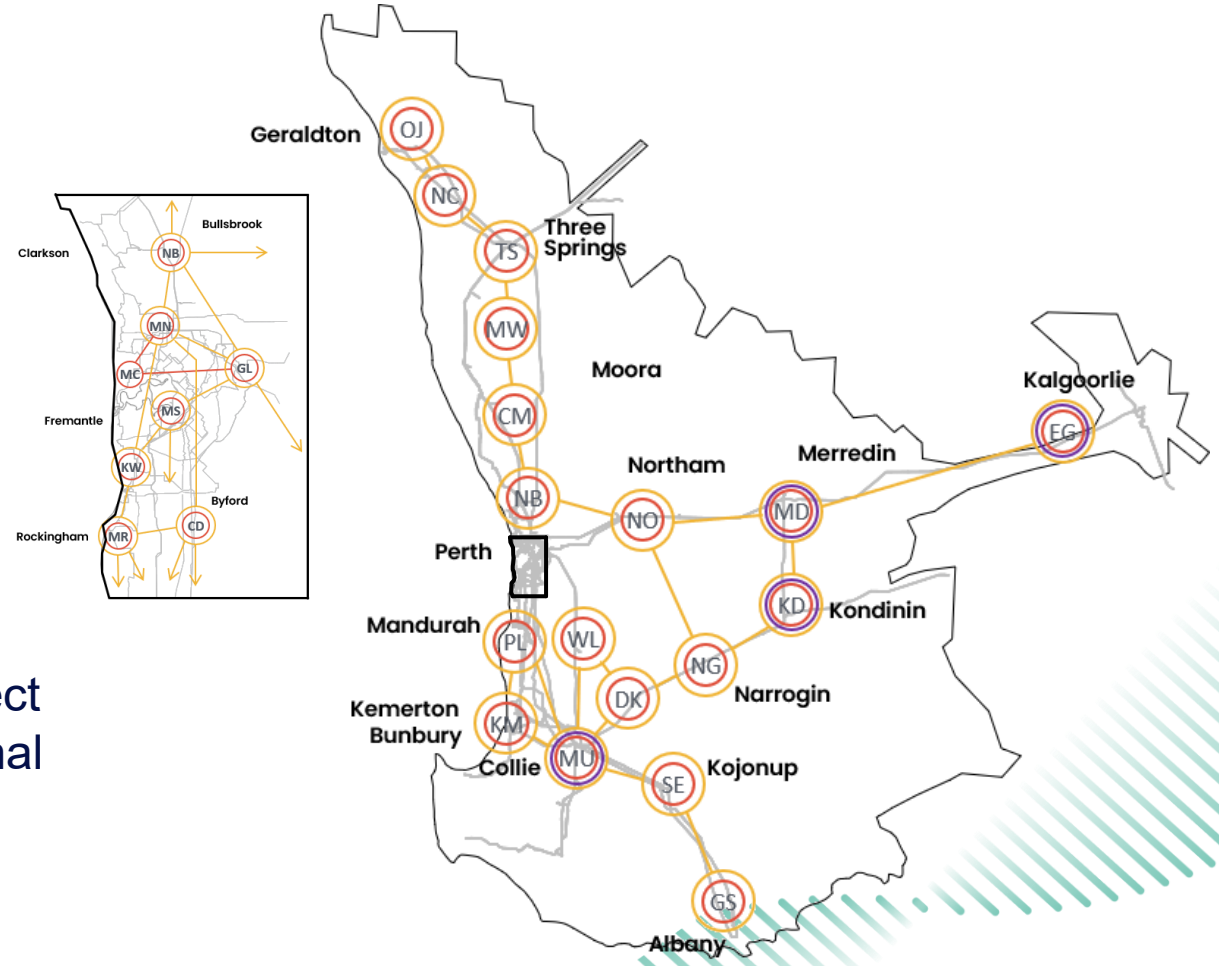
LT Long-term | **ST** Short-term dispatch model | **Dx**

VPP Virtual Power Plant | **DER** Distributed Energy Resources | **Tx** Transmission

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.

Zonal network model

- Builds on the transmission network architecture that underpins the SWIS Transmission Plan; allows for expansion of the SWIS footprint
- Increased network detail from previous system studies – 80+ nodes across 25 zones
- Numerous candidate network augmentations (CEL projects) to support generation connection, network transfer and load connection
- Reference generation candidates located in each zone with CEL dependencies
- Generation connection cost estimates based on project proximity to candidate terminals – network and terminal construction costs based on CEL Phase 1
- Demand & VPP resources aggregated to zones for resource planning



Stakeholder feedback

Engagement activities following publication of the *Approach to Determining Scenarios for the Future Energy System Outlook 2027* in July 2026 include:

- 9 written submissions
- 50+ meetings with existing industry and new proponents who may develop a large load
- 60+ participants via Industry and Stakeholder Reference Group, Government Reference Group, Mid West Forum, and Industry Assumptions Forum

Thank you for the comments and submissions already received

Further stakeholder feedback will be crucial to finalise inputs and assumptions

There is still time to provide your thoughts, we have extended the deadline to 30 October to accept formal feedback and submissions on draft MISA content

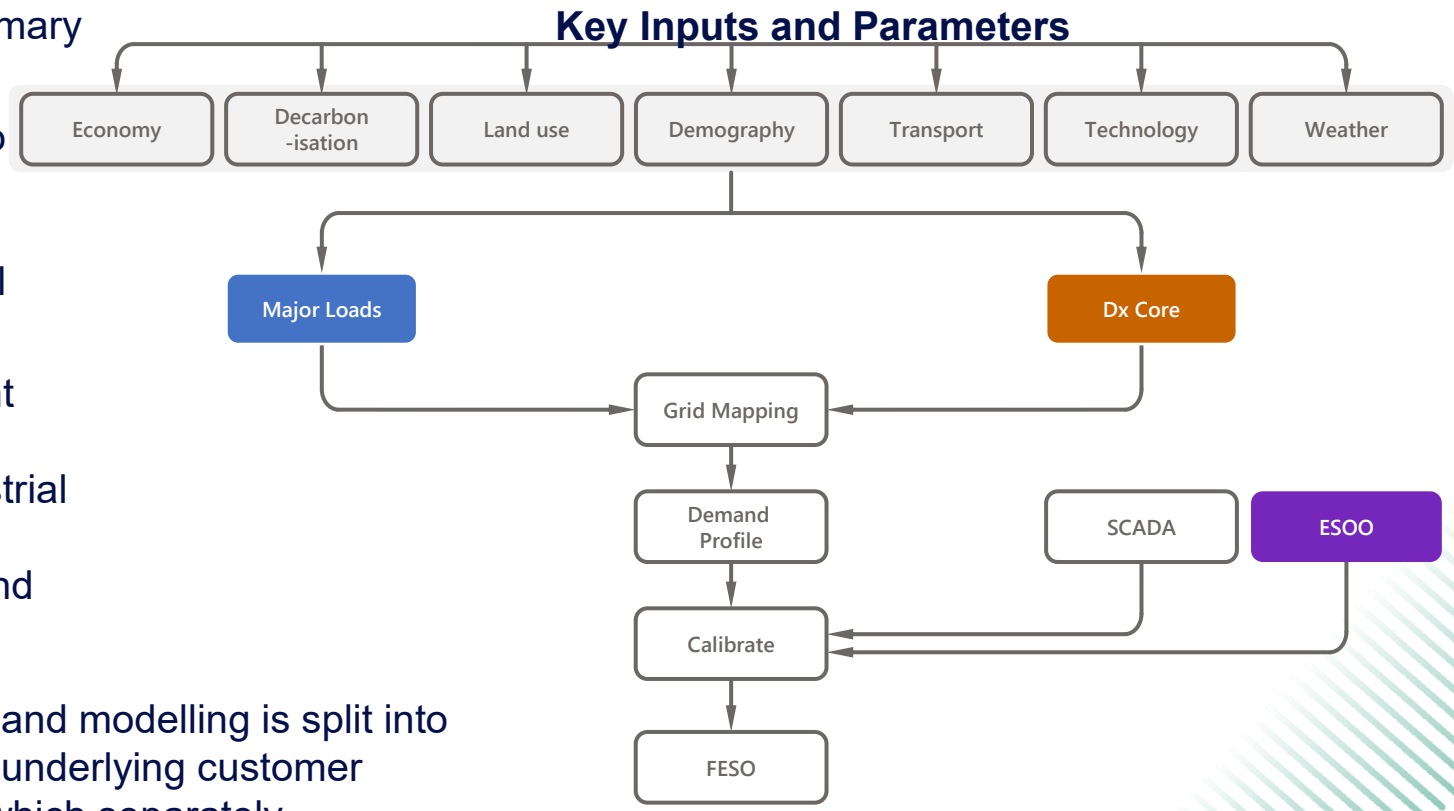
Draft scenarios

The draft MISA documentation outlines three scenarios with the following parameters:

Central	Rapid Change	Constrained
Expected economic growth (WA)	Higher economic growth (WA)	Slower economic growth (WA)
Expected population growth (WA)	Higher population growth (WA)	Slower population growth (WA)
Net Zero by 2050	Net Zero by 2050	Delayed Net Zero by 2050
Electrification progresses steadily	Electrification in the SWIS occurs more rapidly	Electrification in the SWIS occurs slowly
Gradual growth of nascent industries & emergence of some new industries	Growth of nascent industries & emergence of some new industries	Development of new industries stagnates
DER uptake continues; coordinated DER opportunities grow	DER uptake continues at greater scale; coordinated DER opportunities grow	DER uptake plateaus; coordinated DER not taken up at scale
Prices rise over time, with some gas demand reduction and some additional supply	Prices rise for a period and gas demand falls	Prices rise for a period and supply shortfalls are addressed but demand remains higher

FESO 2027 demand modelling design

- FESO 2027 scenarios are developed around the primary drivers of future SWIS demand
- Several inputs are held constant across scenarios to provide a basis for comparison, including resource availability, existing network and committed network augmentations, facility retirements and key technical assumptions
- Other parameters vary by scenario to reflect different plausible futures, ranging from constrained to rapid change pathways, including economic growth, industrial electrification, new industry uptake, DER adoption, coordinated DER participation, industrial flexibility and supply chain constraints



- With the scenario narratives established, SWIS demand modelling is split into two streams: Distribution (Dx) Core, which captures underlying customer demand and DER evolution; and Major Load (ML), which separately represents existing and future large industrial customers
- The Dx Core and Major Loads forecasts are then combined to produce the demand traces used in FESO modelling

Demand and DER outlook by 2050

Central

Underlying consumption	83.5 TWh
Operational consumption	45.9 TWh
Aggregate zonal peak demand	10.8 GW
Rooftop PV	19.6 GW
BTM battery	5.0 GW 10.1 GWh
Electric vehicles	1.78 million

Rapid Change

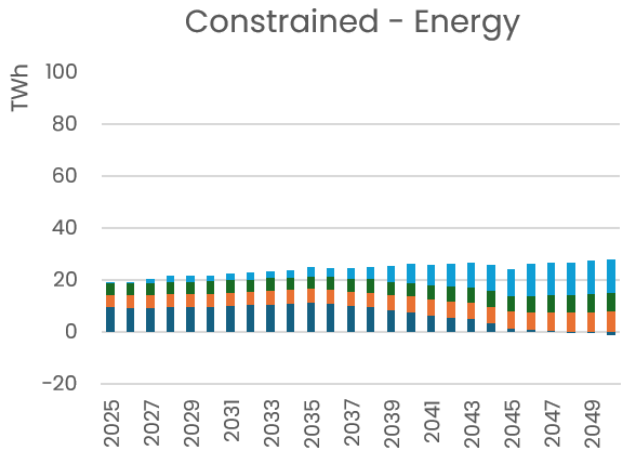
Underlying consumption	116.8 TWh
Operational consumption	64.6 TWh
Aggregate zonal peak demand	14.9 GW
Rooftop PV	27.4 GW
BTM battery	7.0 GW 14.0 GWh
Electric vehicles	2.13 million

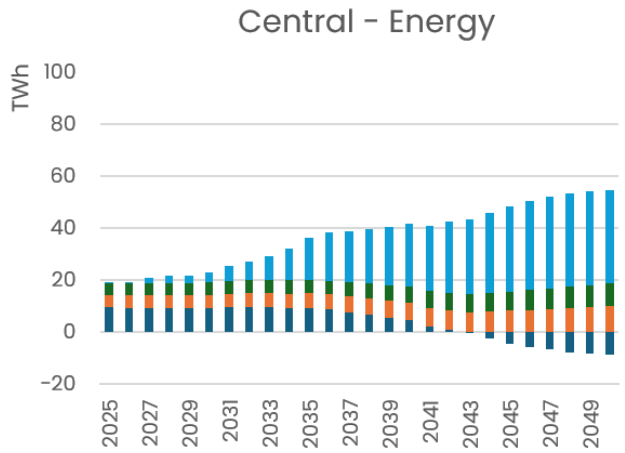
Constrained

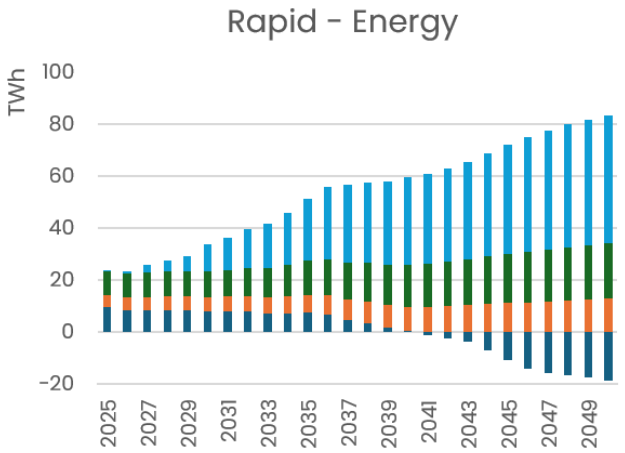
Underlying consumption	51.9 TWh
Operational consumption	26.9 TWh
Aggregate zonal peak demand	7.1 GW
Rooftop PV	13.0 GW
BTM battery	3.3 GW 6.6 GWh
Electric vehicles	1.32 million

Demand

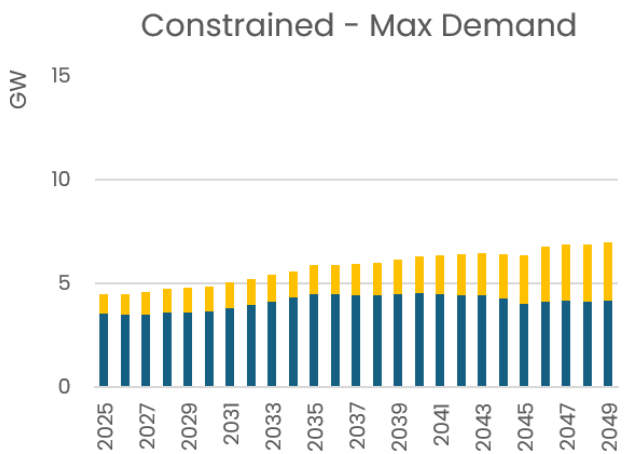
ML - Future
ML - Tx
ML - Dx
Dx Core

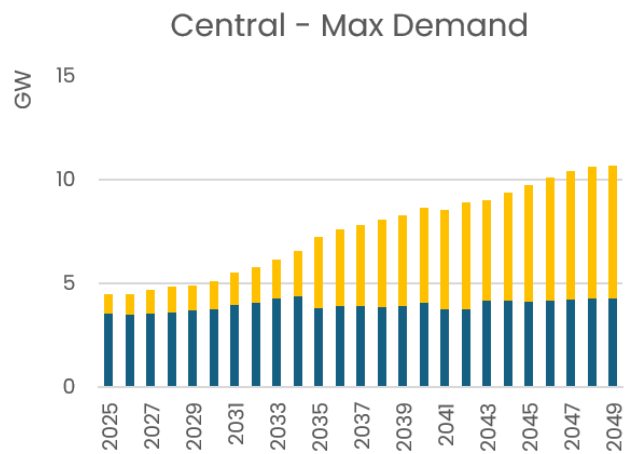


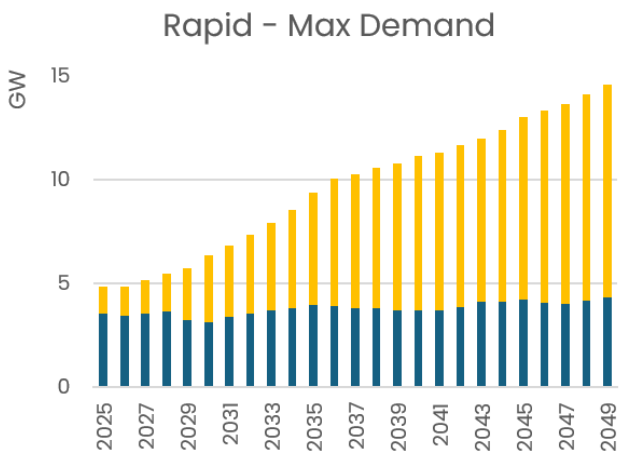




ML – Tx | Dx
Dx Core

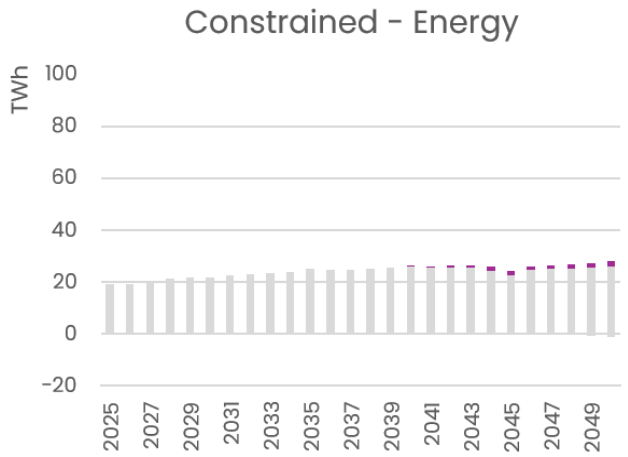


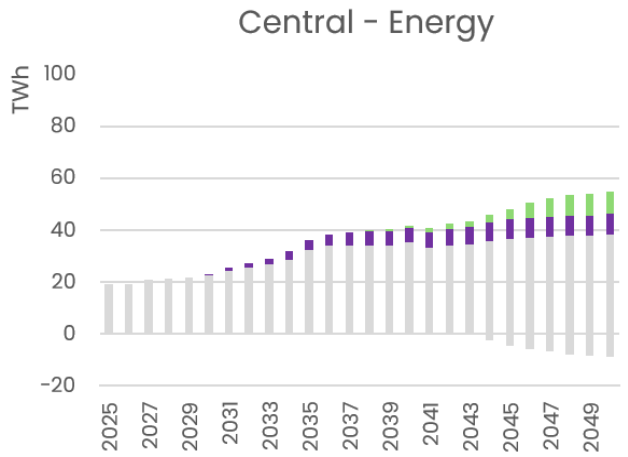


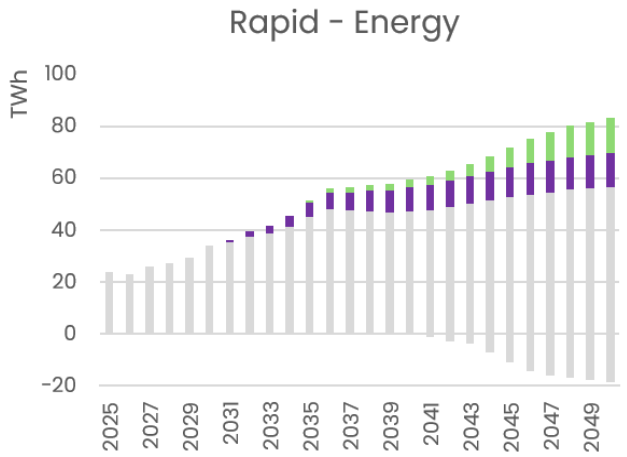


Demand – Alumina decarbonisation and Data centres

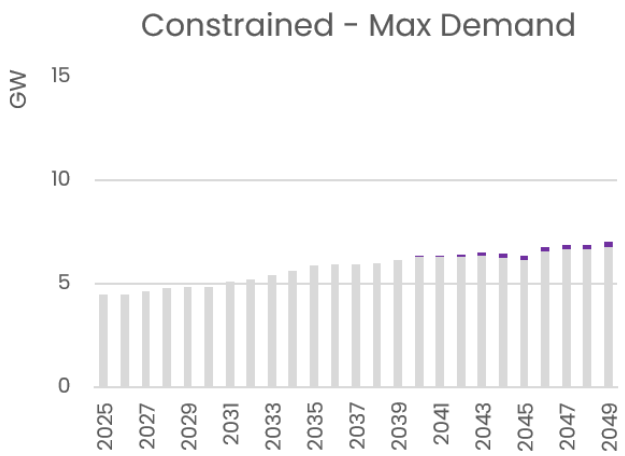
Agent Data Centre
Alumina EAF

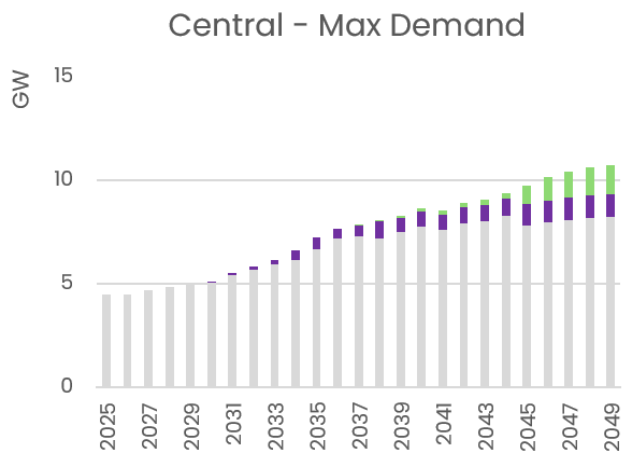


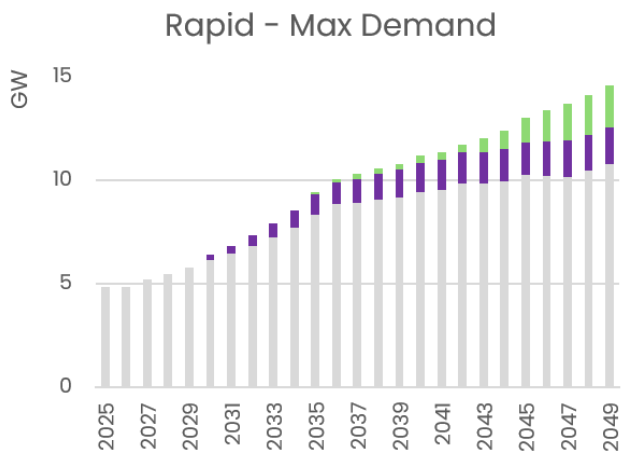




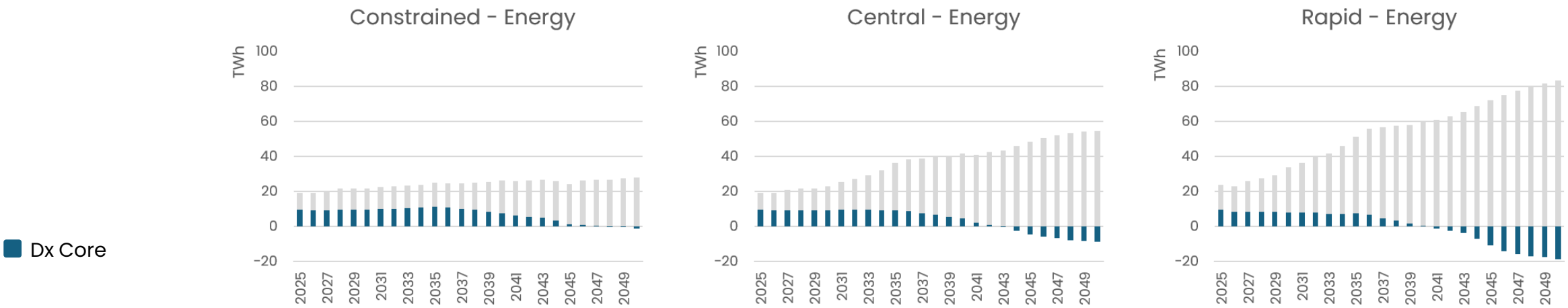
Agent Data Centre
Alumina EAF







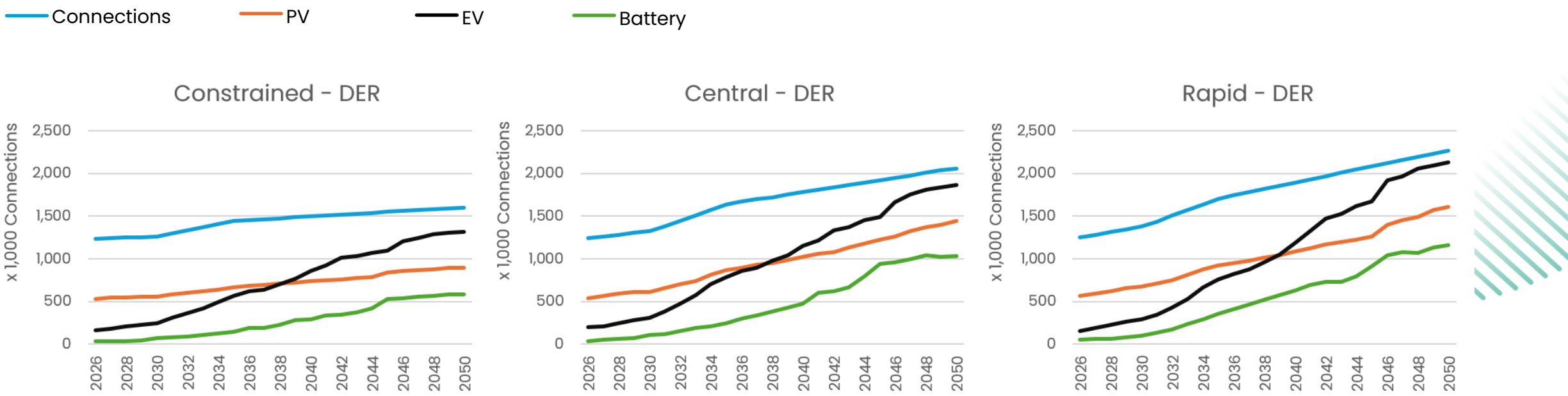
Demand – Distribution core



- Distribution core consumption trends toward distribution supplied energy across all scenarios
- Potential constraints applied to rooftop PV (e.g. curtailment) are not shown – these are determined in downstream modelling
- Distribution core is the primary driver for peak demand events in 2025
- Major Loads become a more dominant contributor to peak demand

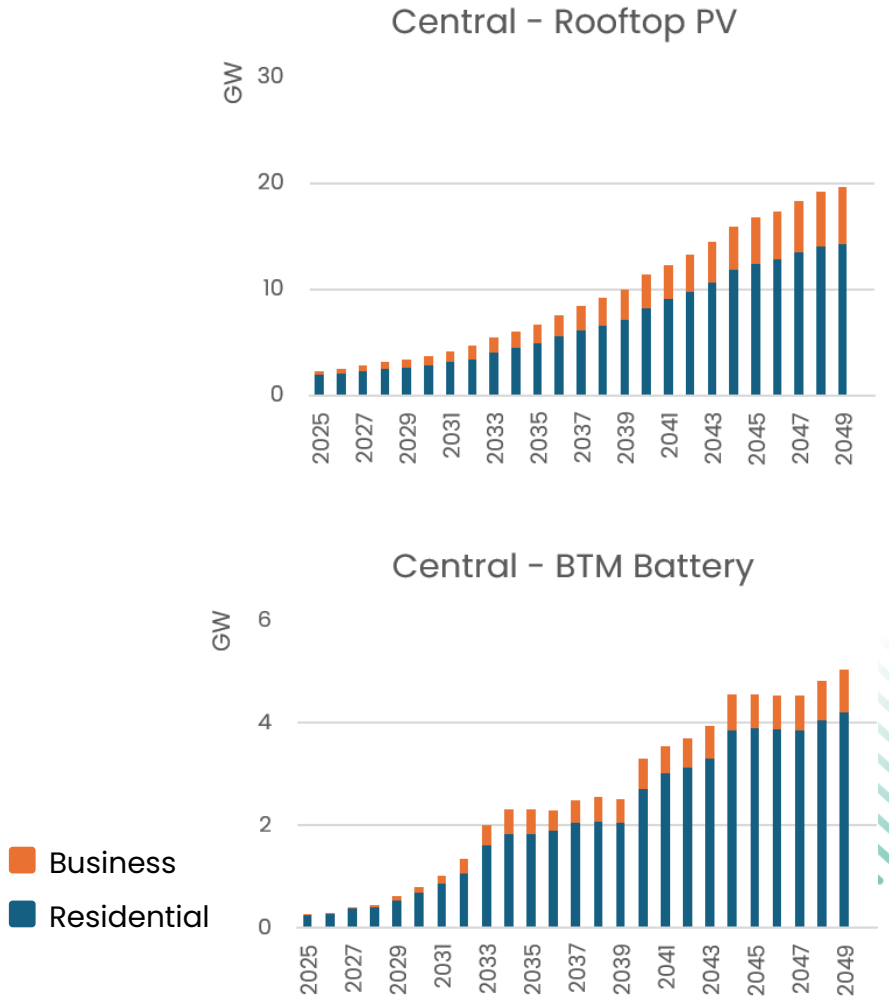
Demand – DER uptake

- New connections are a key factor in DER growth rates – graphs show count of customer connection with DER of the type indicated
- EV includes PHEV and BEV count – vehicle count per household is near two
- Some DER starting values differ from WEM ESOO 2026 – alignment review has identified definition variances and data source snapshot timing drivers



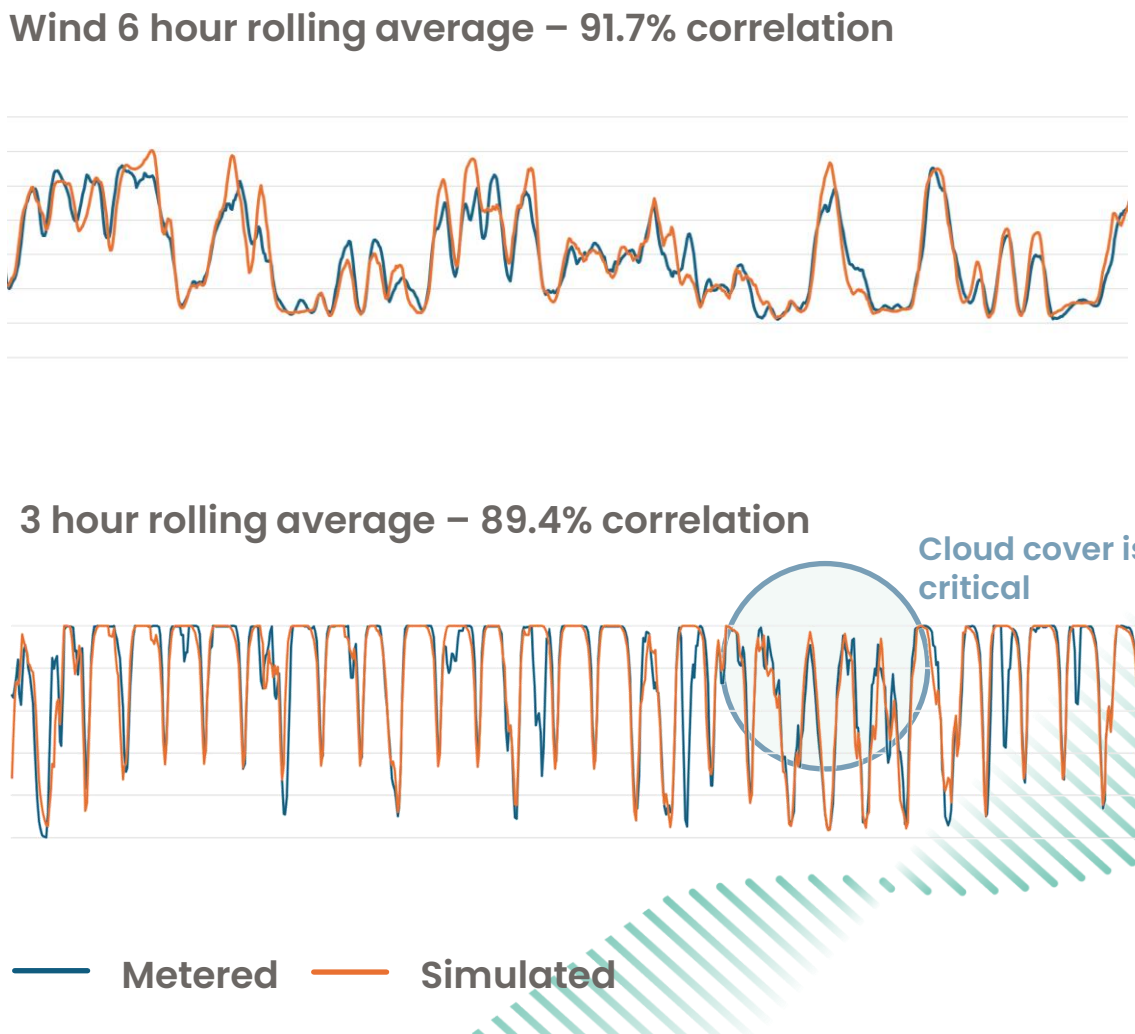
Demand – VPP and DER capacity

- The capacity of DER across the SWIS is projected to increase substantially for all scenarios, business growth is relatively high but remains lower than residential
- NO_VPP = Not Operated VPP, the DER uptake occurs but DER recruited to a VPP is Not Operated. DER that is not recruited to a VPP is operated based on normal customer goals e.g. retail bill minimisation
- DER uptake is influenced by the availability of a VPP product that provides an additional financial incentive to buy DER
- VPP recruitment rates vary by scenario
- The portion of DER recruited into VPP is made available to downstream distribution, sub-transmission, transmission and system investment optimisation



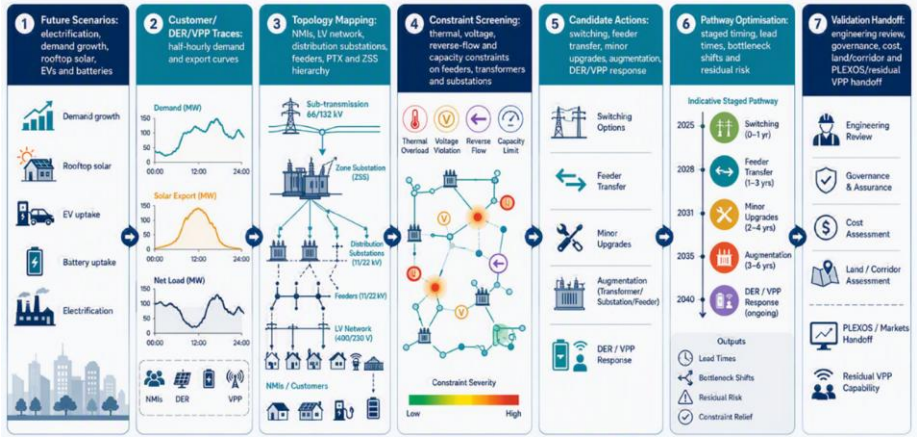
Renewable generation

- Solar and wind generator forecasting based on BoM inputs (Himawari and BARRA2). Model output is calibrated to metered generators – correlation for wind and solar is good although solar lacks meter inputs
- Wind model assumes 150m turbine hub height. Using BARRA input annual capacity factors > 70% and monthly capacity factors > 90% after calibration. BARRA2 extrapolation from 100m to 125m performs well
- Solar model can address tracking but is not applied as default. Panel efficiency static at 25%. Industry input sought on these modelling factors



Distribution planning

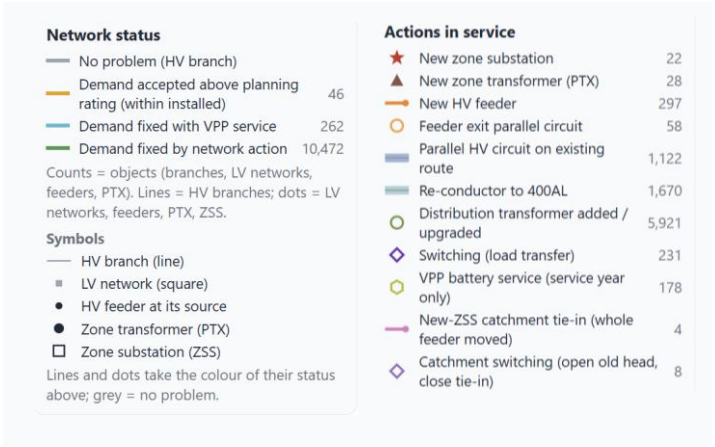
- Distribution & Sub-Transmission (DXST) planning utilises the same 30 minute time series demand and DER inputs applied across FESO
- The modelling has high spatial detail reflecting residential and business development policies
- Thermal and voltage constraints are modelled at 30 minute intervals across LV networks and feeders
- Strategic solutions are developed to address constraints – solutions can span feeders / substations and cover load transfer, network upgrade, substation capacity expansion and new substation development
- VPP solutions are tested taking into account 30 minute resource availability – post VPP demand and residual resource are output for PLEXOS resource planning



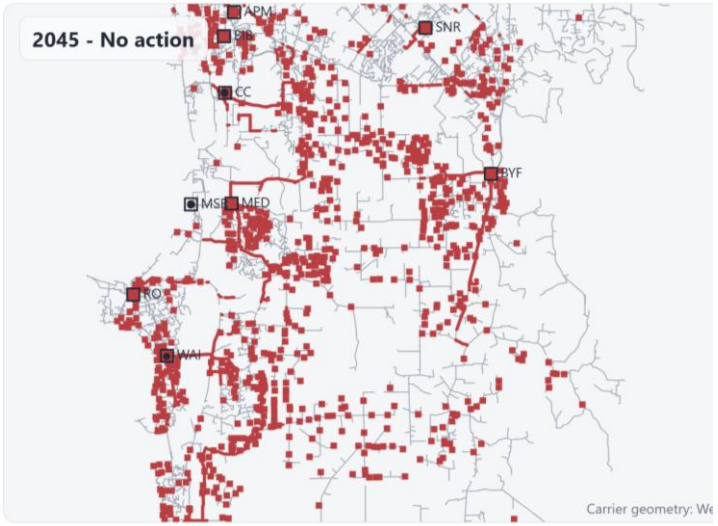


Distribution planning – DXST

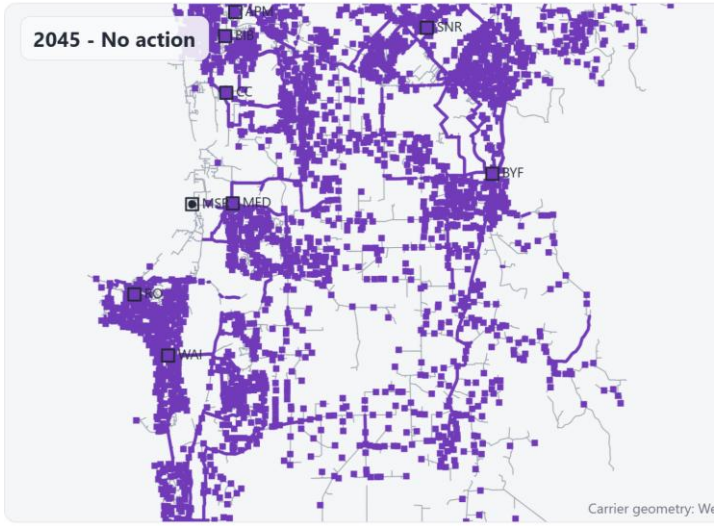
- An example of the DXST modelling output is provided – forward and reverse flow thermal and voltage constraints are determined for LV networks, feeders and sub-stations
- Optimal solutions for a scenario are a blend of capacity expansion and VPP solutions



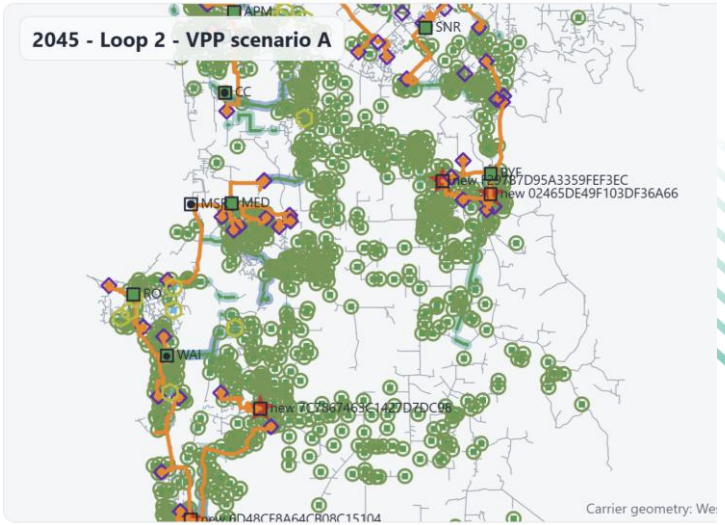
Forward constraints – no action



Reverse constraints – no action



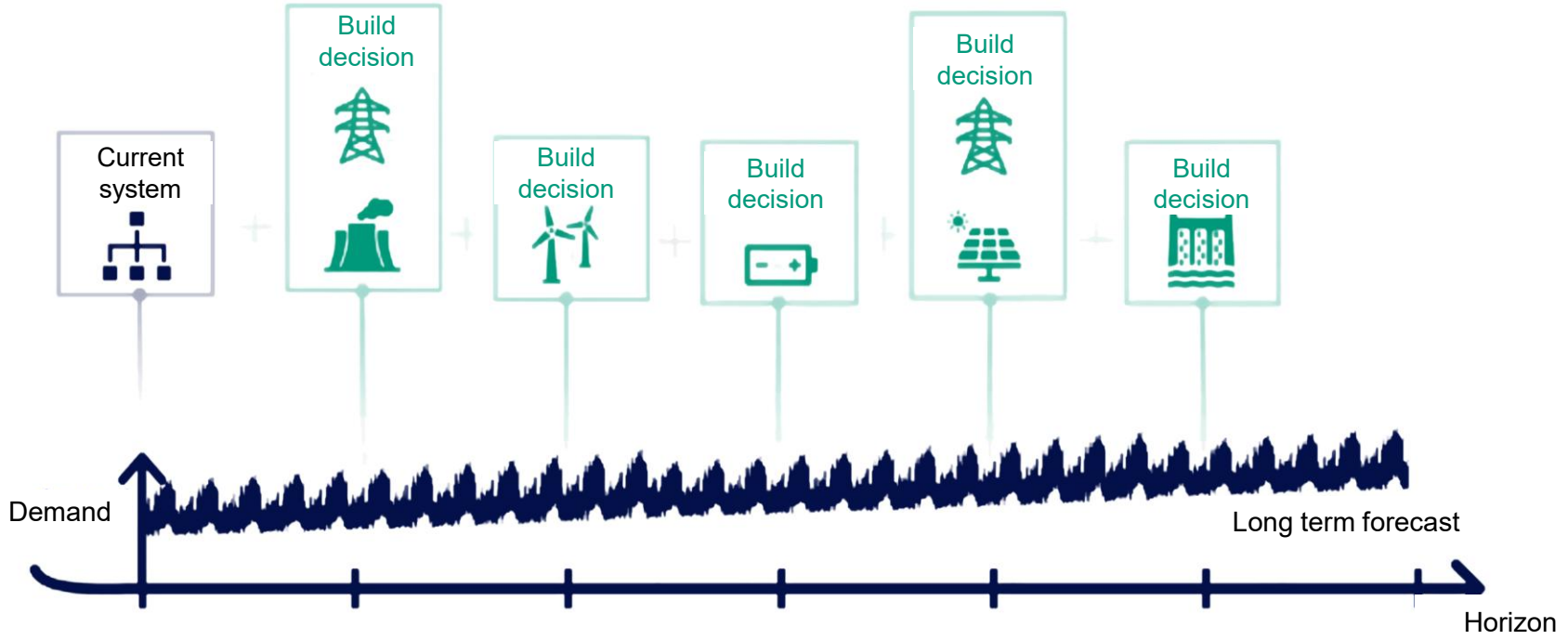
Optimal solution



Expansion model: what to build, where and when

The capacity expansion modelling considers:

- Which technologies to build?
- How much, where and when?



Expansion model: what to build, where and when

A least-cost investment pathway for the SWIS

INPUTS

DEMAND

- Demand traces for each zone

SUPPLY

- Wind and solar generation traces
- Existing fleet and announced coal retirements
- Capital and operating costs, learning curves, WACC
- Network augmentation options and costs
- Gas supply constraints

LEAST COST OPTIMISATION

Build & operate to minimise NPV of total system cost over horizon

SUBJECT TO

- Energy balance
- Reserve Capacity Target
- Network transfer limits
- Build limits
- Fuel supply
- Net zero by 2050

OUTPUTS

- Capacity build schedule by technology, zone and year
- Transmission development pathway
- Reserve Capacity level
- High level dispatch outcomes

Together, a least-cost development pathway for each scenario.

24-year horizon to 2050

25 zones across the SWIS

3 scenarios, plus sensitivities and case studies

Dispatch model: testing market and operational outcomes

Half-hourly dispatch of the long-term pathway, testing whether it works and what it costs

INPUTS

- Development pathway fixed from the long-term model
- Half-hourly demand, wind and solar traces
- Detailed plant operating parameters
- Generator bids
- Inter-zonal and intra-zonal network constraints
- More detailed gas supply constraints

LEAST COST DISPATCH

Minimise generation and storage costs in every half-hourly interval over the entire horizon

SUBJECT TO

- Energy balance
- Plant technical limits
- Network constraints
- Storage state of charge
- Fuel availability
- Forced outages

OUTPUTS

- Real-Time Market price outcomes
- Generation dispatch by unit
- Unserved energy
- Emissions
- Fuel offtake

Half-hourly results for every modelled year, in every scenario.

Gas supply and demand

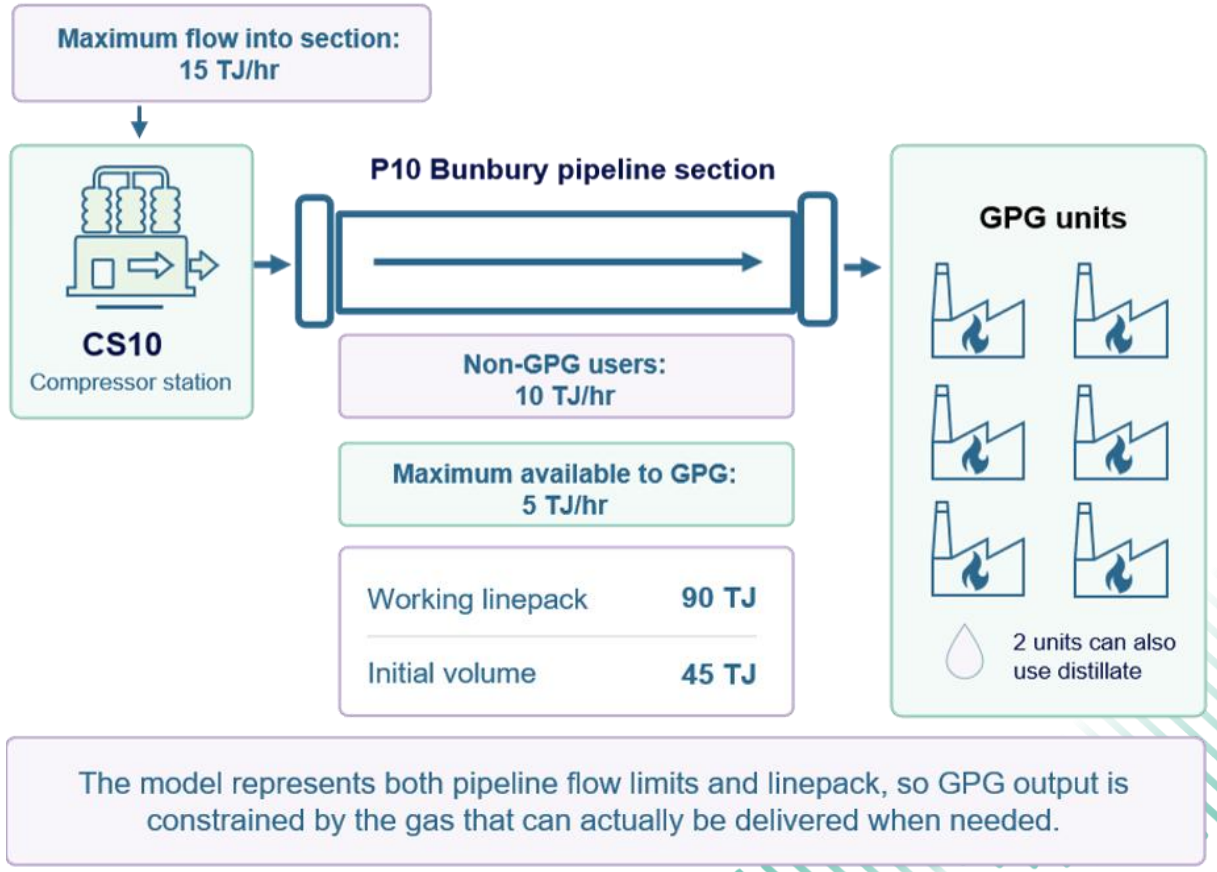
- Gas-powered generation (GPG) is projected to support reliability during low renewable output and high demand periods
- Generator availability depends not only on generation capacity, but on the gas that can be delivered when required

2026 WA GSOO:

- Tests gas deliverability using simplified representations of key infrastructure limits
- Considers impacts of SWIS GPG, non-SWIS GPG and other users demand growth on pipeline utilisation
- Examines whether operational responses such as fuel switching can mitigate risks
- Identifies where more detailed investigation is required

FESO

- Extends the analysis using a more granular representation of the gas network
- Represents pipeline transfer limits, linepack and location-specific deliverability constraints
- Considers how gas infrastructure influences optimal generation, storage and transmission development



Emissions outcomes

- FESO aims to understand the impact of Net zero by 2050 on the power system
- Decarbonisation driven load growth is present in each scenario and responds to the scenario narrative
- Emissions from the electricity generation fleet will be modelled and reported on
    - The Central and Rapid Change will apply an annual emissions constraint from 2032
    - The Constrained scenario will not apply an annual emissions constraint
- A climate impact sensitivity is being considered



Next steps

- Draft MISA documents and further details are available at the EPWA FESO website: Future Energy System Outlook
- Feedback can be submitted by emailing epwa-info@deed.wa.gov.au by 30 October 2026
- Final MISA will be published once all feedback has been considered

We're seeking your feedback

- Inputs and assumptions
- Sensitivities or case studies
- Demand forecasts
- Modelling methodology



9 October 2026

Draft MISA public consultation opens

19 October 2026

Draft MISA Webinar

30 October 2026

Draft MISA consultation closes

Mid November 2026

Final MISA published

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GOVERNMENT OF
WESTERN AUSTRALIA

Q&A

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