Distribution demand forecast assessment

Review of Jemena's 2026-31 regulatory proposal

Australian Energy Regulator

July 2025 – Final report

Table of contents

1. Executive summary

We've assessed the reasonableness of Jemena's 2026-2031 demand forecasts and provided recommendations for improvements.

Our scope

Baringa Partners (Baringa) was engaged by the Australian Energy Regulator (AER) to review the methodologies and assumptions driving the Victorian distribution network services providers' (DNSPs') demand forecasts for the 2026-2031 distribution determinations to help inform their assessment of capital and operating expenditure (capex and opex) forecasts. Our scope of work focuses on two key elements:

Demand methodology review

- The approach each DNSP has taken to derive their forecasts for maximum demand, minimum demand, customer number and energy consumption. This includes reviewing their approach to technology-induced demand like EVs and block loads such as data centres.

Demand input assumptions review

- Reviewing the source, recency, and adjustments to key input assumptions such as consumer energy resources (CER) uptake and profiles.

Our approach

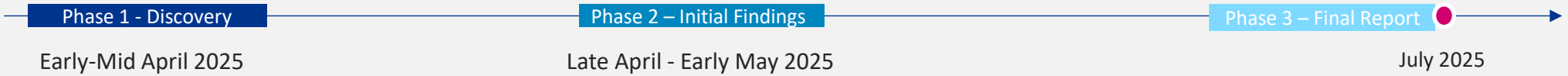
We undertook a 3-phase approach to assessing the demand forecasts:

1. **Discovery**
   - We developed an overarching understanding of the DNSPs' demand inputs, assumptions and methodologies gained via reviewing the proposals, workshops with each DNSP and an initial set of information requests.
2. **Initial Findings**
   - Using our assessment process and the information gathered in Phase 1 plus further information requests, we identified areas of potential concern that required further assessment, clarification or validation.
3. **Final Report**
   - Following a further set of information requests based on the findings in Phase 2, we've landed on the findings set out in the report.

Assessment process

1. Identify key methodology elements and input assumptions
2. Materiality & reasonableness assessment
3. Aggregate element findings and determine level of concern
4. Directional assessment of forecasts
5. Key recommended changes

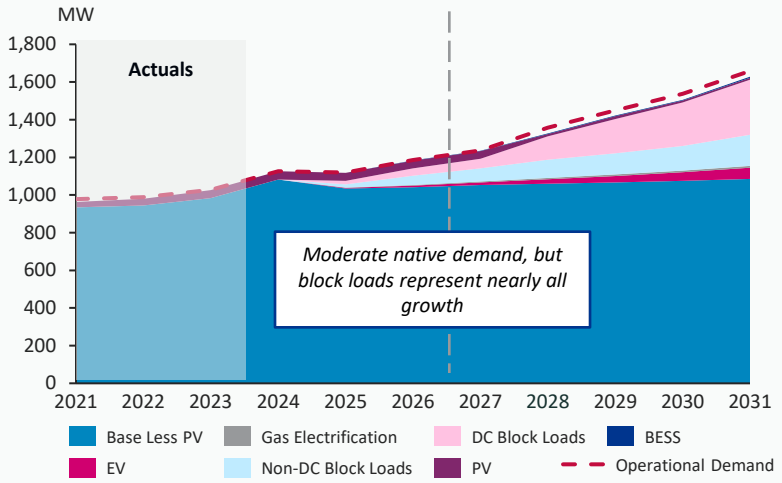
Key timeline



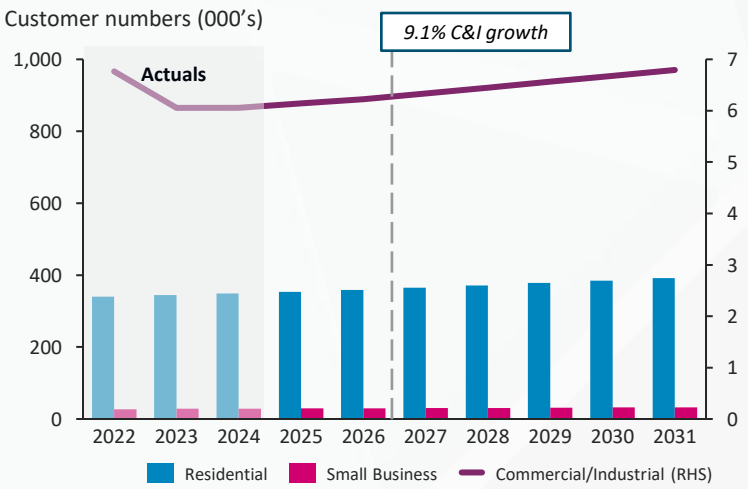
 |

Jemena is forecasting high overall maximum demand growth at an annual rate of 5.9% compounding from 2024.

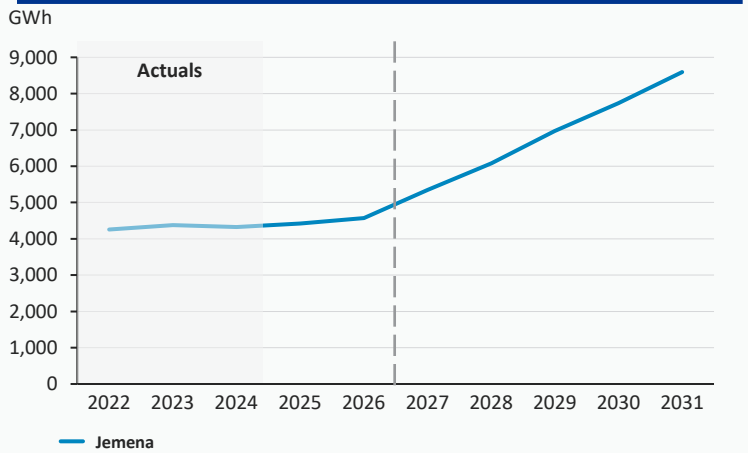
Maximum demand[1]



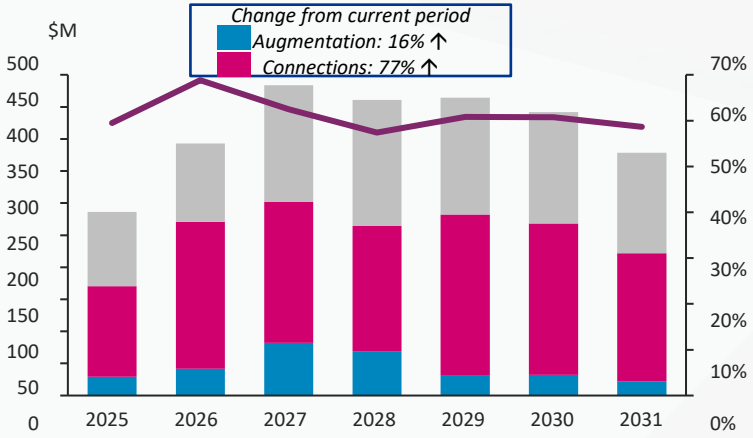
Customer numbers



Energy consumption



Forecast demand-related expenditure[2]



Summary of methodology

Maximum/minimum demand:

- The approach taken by Jemena is relatively complex. Jemena uses a consultant to produce their system-level maximum demand forecasts and Jemena then blends these with their own bottom-up spatial forecasts.
- Jemena separately produces these bottom-up forecasts by using 'local knowledge' (known growth at the spatial-level). Jemena then scales their bottom-up forecast to reconcile with their consultant's system-level forecasts.
- In this way, the outputs are a product of both the consultant's model and Jemena's processes.

Energy consumption:

- Jemena's consultant provides energy consumption forecasts by customer type (residential, small business, large business) at the network level, largely consistent with their approach for max demand.

Customer numbers:

- Customer numbers per segment are grown using the Victorian Government population and household projections. Customer numbers for residential and non-residential grow at same rate in the Forecast RIN templates for the forecast period.

Notes: (1) This is the summer peaking maximum demand forecast POE50, system-level, coincident; (2) Highlights augmentation and gross connections capex growth as primarily demand driven expenditure, though we acknowledge that not all augmentation is demand driven; (3) We have not produced minimum demand forecast charts for assessment.

Jemena's approach to spatial disaggregation, block loads and overall transparency are key issues. No clear energy consumption forecast methodology has been provided.

Key output	Assessment	Level of concern	Impact
Maximum demand	• We have significant concerns with Jemena's forecast of maximum demand, and consider the impact of this is that the forecast is likely to be overstated. • Overall transparency has been a key issue with the information provided by Jemena. The original documentation was brief and lacked sufficient explanation. After further requests, clarity on their inputs and assumptions was improved. • Jemena engaged a consultant for its system-level demand forecast, however Jemena prepares its own spatial-level forecast. The lack of clarity around the reconciliation process, which involves scaling the internal spatial-level forecast to reconcile with the external system-level forecast, raises a concern in the absence of further information. • Jemena does not model CER uptake at the spatial-level, which would result in a more even distribution of demand. • The approach toward native demand is not well documented and uses algorithms that require further data and justification to be validated. • The significant investment of data centres is a new phenomenon and we recognise the challenges in trying to forecast uptake of this new major technology for 5+ years. However, Jemena's approach to forecasting block loads and DCs lacks strong reasoning particularly with the likelihood of the connection proceeding, making it difficult to reproduce. The approach to spatial allocation of block loads is subjective and difficult to reproduce. For instance, only some block loads included in spatial forecasts, but not the others (one 'in-flight' data centre is included). While ample opportunity has been provided, it is possible that further information could allay some of these concerns.	Significant concern	↗
Minimum demand		Significant concern	↗
Customer numbers	• Residential and business customer numbers in the RIN grow with the population growth rate (but growth rate for business numbers is stated to be aligned with gross state product forecasts).	Some concern	-
Energy consumption	• Similar to our assessment on maximum demand, significant growth in consumption is driven by data centres and block loads, and we consider Jemena's approach to be too subjective. While ample opportunity has been provided, it is possible that further information could allay some of the concerns.	Moderate concern	↗

Key:

Level of concern	
Scale	**Rating**
	No or limited concern
	Some concern
	Moderate concern
	Significant concern

Impact on forecast				
Highly Overstated	Overstated	Neutral	Understated	**Highly** Understated
↑	↗	-	↘	↓

Footnote: Expenditure forecast impacts on minimum demand are in reverse. I.e. An overstated maximum demand leads to higher demand-driven augex while an understated minimum demand suggests higher expenditure on CER enablement programs.

Areas of concerns include transparency, approaches to native demand, spatial disaggregation, block load treatment and post-modelling adjustments.

	Key theme	Jemena
1	**Model architecture** Integration of internal and external methodologies	Combined - Jemena's consultant model at system-level only.
2	**Transparency** Clarity on model assumptions and methodologies	Third party algorithms difficult to validate. Rationale for application of consultant methodology to Jemena is unclear. The description of data choices is obscured.
3	**AEMO scenarios use** Adoption of latest inputs and assumptions across coherent scenario	Current and coherent set of AEMO scenarios used.
4	**Native demand** Approach to demographic and economic driven demand growth	Native demand approach (first and second logistic functions) not well documented. Population growth not differentiated at spatial level.
5	**CER spatial disaggregation** Approach to distributing technology-driven growth at the ZSS/Feeder level	CER uptake not allocated at spatial level.
6	**Block load treatment** Approach to large, known load connections	Scoring system based on likelihood.
7	**Data centres (DC)** Approach to DC connections	Scoring system based on likelihood.
8	**Gas electrification** Approach to the transition away from gas	Victoria's Gas Substitution Roadmap (no new connections from Jan 2024).
9	**Post-modelling** Manual adjustment to forecast after the core modelling process	Some block loads appear to be incorporated post-modelling. Adjustments also made at the capex level.

Key: *Area of concern*

Our further assessment on locational demand and data centre forecasts reveal that Jemena is likely overstating demand and the related expenditure.

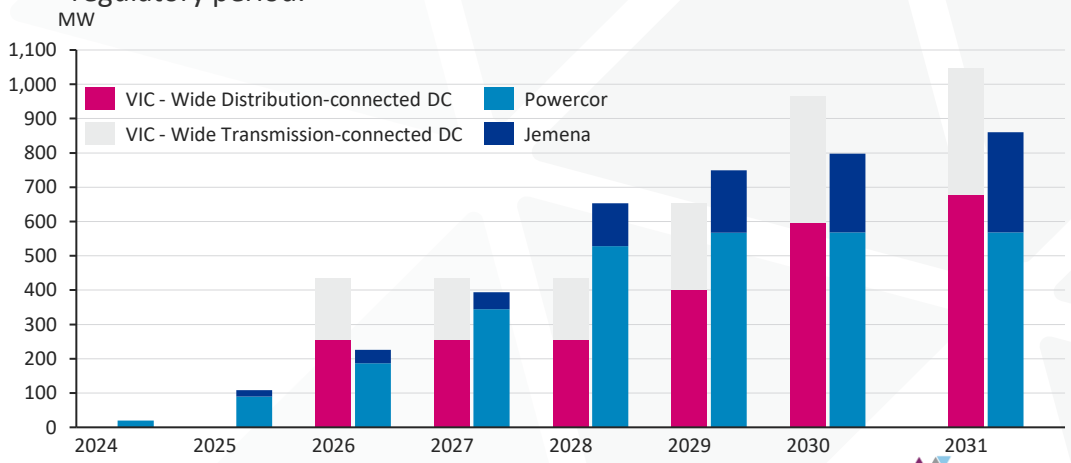
In addition to assessing Jemena's overall demand methodology, we have also selected and assessed the locational demand forecasts for a material demand-driven augex business case.

Northern Growth Corridor Business Case

- The business case investment is driven by very high block loads on several feeders. However our assessment highlights that Jemena's demand forecast appears to have calculation errors. For 11 of the 49 feeders for which Jemena has provided demand component breakdown, the sum of the individual components of demand (native, block load, EV, PV, ESS, electrification) do not sum to the total demand. This is the case for 5 of the 6 feeders forecast to have unserved energy in the business case.
- Further, Jemena has provided the list of block loads at each feeder. It is difficult to determine the certainty of all block load and its uptake profile given the data provided, however a significant portion of the loads have already been connected and are assumed to take up load over time. For example, customers with connection dates as old as 2020 are still assumed to be taking up new load in the forecast, without evidence that there is spare capacity on these connections.
- Our main concern with Jemena's approach to their business case is the difficulty to validate. We would recommend Jemena to clearly tie the forecast to latest information in business case. The method is not clear and not strongly linked to the inputs.

Assessment of data centre forecast

- Our view is that Jemena is proposing an optimistic and high estimate of their incoming DC pipeline and their appropriate network connection requirements.
- Jemena considers *all* block load connection requests (including DCs), irrespective of how advanced the connection process is, via a probability-weighted method, with those probability assumptions not sufficiently justified.
- Further supporting this assessment is that Baringa has developed a preliminary view on a potential pipeline for DC demand growth in Victoria, as of June 2025. **This bottom-up estimate is based on public information and limited market testing**. Our analysis indicates that the total DNSP DC demand forecast is broadly similar to our forecast for **the entirety of Victoria** which includes both transmission and distribution connections, whereas their forecast is distribution only. We note that timing for these large customers is subjective and based on the best available information, but we also recognise there is a high degree of similarity between the distribution level forecasts for the first years of the regulatory period.



*SA2 are areas comparable to postcodes

 |

We recommend that Jemena provide clearer justification of its block loads and spatial forecasts in its Revised Proposal.

Key recommendations

1

Provide clearer transparency on methodology

Jemena has engaged a consultant to undertake its system-level demand forecast. Throughout the RFI process they have provided a large volume of documentation, however we consider it is important that the AER requires from the DNSP clear understanding and documentation of the methodological approach and key assumptions. Greater transparency should be provided in the Revised Proposal because there are still several areas of uncertainty.

2

Improve quality assurance processes and calculations

Our assessment of the Northern Growth Corridor business case revealed unexplained calculation errors and potential double counting. The worked example provided could not be replicated based on the provided information and it is likely that there are other factors being applied or incomplete information throughout Jemena's demand modelling. We recommend an independent assurance process be applied.

3

Provide more justification for block loads and data centres

For the first half of the regulatory period, major projects should be well known and progressed and therefore Jemena's likelihood framework is reasonable. However, in the later years of the regulatory period, there is lower certainty, and so we consider more justification is required to include them in the demand forecast. Alternatively, excluding these block loads and instead adopting a contingent project approach may be more suitable and we note that this regulatory mechanism is appropriate for this type of investment (high materiality but also high uncertainty)

4

Reconsider approach to spatial disaggregation

Jemena's bottom-up spatial level forecast do not appear to be reconciled appropriately against their consultant's top-down system level forecast. We consider it would be better practice to include more modelled, population-driven connection growth at the spatial level (i.e. EV, PV, and population-driven growth). Jemena's overall approach is not ideal and therefore we would recommend more detailed demand drivers to be modelled at the spatial level rather than top-down.

2. Regulatory context and our approach

Note: This section is identical across all reports.

DNSPs' expenditure forecasts must reflect a realistic expectation of demand. Demand forecasts impact capex, opex and tariff calculations.

AER expenditure criteria

1. The efficient costs of achieving the capex and opex objectives
2. The costs that a prudent operator would require to achieve the capex and opex objectives
3. A realistic expectation of the **demand forecast**, cost inputs, and other relevant inputs required to achieve the capex and opex objectives

Spatial maximum demand

Drives demand driven augex

- Spatial level maximum demand forecasts input into the calculation of unserved energy at the asset level which drives the net benefit calculation to support augmentation.
- These forecasts are used to identify emerging network limitations and risks that need to be addressed by either network or non-network solutions.
- **Spatial demand forecasts are therefore used as an input to determine the timing and scope of capital expenditure, primarily augmentation capex.**

Minimum demand

Drives CER integration capex and opex

- Minimum demand forecasts help in planning and managing the integration of CER into the network. Minimum demand forecasts highlight challenges regarding power system security and network operating limits particularly during periods of high solar generation.
- The AER may assess the impact of how minimum demand forecasts affect distribution networks as a result of CER uptake and operation. These forecasts will be required to support any CER integration business cases or related expenditure uplift from DNSPs.

Customer numbers

Drives connections capex and opex output growth changes

- Provides data for network planning and expenditure for new connections.
- For assessing connections and customer driven works expenditure, the AER requires information on both forecast customer volumes and costs for several standardised categories of works.
- In addition to driving new connections capex, customer number forecasts are also an input into the opex output growth trend under the AER's base-step-trend approach to forecasting opex.

Energy consumption

Drives tariff calculations

Also impacts opex forecast

- DNSPs forecast energy consumption (GWh) feeds into tariff setting so that tariff rates are set in a manner that reflects the DNSP's revenue cap for that year. Any differences in actual and forecast volume delivered will have a *perceived* impact on consumers. If DNSPs over-forecast consumption in their revenue proposal, this would result in lower *expected* network tariffs. Though the difference in actual and forecast consumption is adjusted for at the annual tariff setting stage.
- Consumption forecasts also feed into opex forecasts.

Source: National Electricity Rules (NER), clauses 6.5.6 (c) and 6.5.7 (c).

Baringa has been engaged to review the Victorian DNSPs' demand forecasts for the 2026-2031 regulatory control period, with a focus on maximum demand.

Baringa's scope focuses on two key elements for demand forecasts

Demand methodology: The approach that DNSPs have taken to demand forecasts, such as how they have incorporated technology-induced demand like EVs, or considered block loads.

Demand assumptions: Inputs, assumptions and drivers of demand forecasts such as the impact of consumer energy resources, energy efficiency, blocks loads and more.

- We are performing a bottom-up qualitative review of the methodologies, inputs and assumptions for Victorian DNSPs' demand forecasts.
- We are considering the reasonableness of the approaches taken by the DNSPs in order to inform the AER's Draft Determinations.
- Our primary focus is on reviewing the methodologies and input assumptions informing maximum demand forecasts, however, we have also considered minimum demand, customer number and energy consumption forecasts.

Baringa's scope excludes forecasts and reviewing expenditure

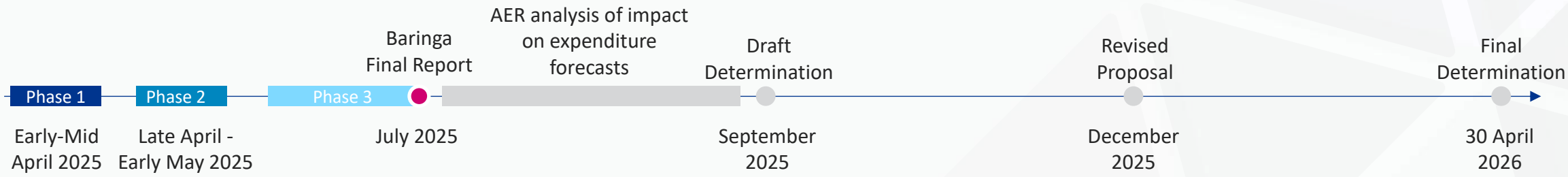
Alternative demand forecasts: Baringa is not performing modelling to prepare alternative forecasts for demand, consumption and customer numbers, as we do not have the ability to directly re-run the DNSPs' back-end models.

Expenditure review: Baringa is not undertaking a review of the expenditure forecasts.

- As we do not have the ability to directly re-run the back-end models used by the DNSPs, this review focuses on a qualitative assessment, rather than preparing alternative forecasts for demand that could be numerically compared against the DNSPs outputs. The exception to this is for data centre load we're we have our own Baringa forecast and have compared that forecast to the DNSPs' as part of our assessment.
- We are focused on the demand forecasts, and in effect their implications for expenditure, rather than reviewing prudency and efficiency of the expenditure forecasts.

We adopted a 3-phase approach to assessing the demand forecasts for each of the Victorian DNSPs. Our findings are outlined in separate reports for each DNSP.

	Key activities	Key outcomes
Phase 1: Discovery	► Undertake documentation review ► Submit first general IRs ► Participate in DNSP on-site sessions ► Submit second targeted IRs	► Broad understanding of the DNSPs inputs, assumptions and methodologies ► View on areas to hone our focus
Phase 2: Initial findings	► Undertake initial evaluation ► Perform initial validations, where feasible ► Draw on our market insights ► Undertake an initial evaluation	► Form an initial view of areas of potential concerns with the approaches taken across the DNSPs ► Identify areas where more clarification or validation is required to make an assessment
Phase 3: Final report	► Submit final clarification IRs ► Perform further validations and refine the evaluation ► Prepare our Draft Reports for AER review and Final Reports for publication	► Greater validation of areas of concerns ► Form a firm view of our concerns with the forecasting approaches taken by the DNSPs, where we have sufficient information



 |

Our assessment approach involves a rigorous five-step process to test the DNSPs' demand methodology and key input assumptions.

1 Identify key methodology elements and input assumptions

Identification of key methodology elements and input assumptions for review.

2 Materiality & reasonableness assessment

Materiality and reasonableness assessment which leads to level of concern assessment of each element.

3 Aggregate element findings and determine level of concern

Grouping of findings to form overall view on level of concern at max demand, min demand, customer number and energy consumption level.

4 Directional assessment of forecasts

Qualitative assessment on directional impact of our concerns on max demand, min demand, customer number and energy consumption.

5 Key recommended changes

Key methodology and input/assumption areas where we recommend the DNSP improves its demand forecast for Dec 2025 Revised Proposal.

Expected materiality of impact on output × **Reasonableness of approach** = **Level of concern**

Scale	Rating
○	Immaterial
◔	Low materiality
◑	Somewhat material
●	Material

Scale	Rating
●	Reasonable
●	Somewhat reasonable
●	Somewhat unreasonable
●	Unreasonable

Scale	Rating
	No or limited concern
	Some concern
	Moderate concern
	Significant concern

Impact of assumption on demand forecasts

Scale	Rating
↑	Highly overstated
↗	Overstated
-	Neutral
↘	Understated
↓	Highly understated

1 **Recommendation** Description

2 **Recommendation** Description

3 **Recommendation** Description

4 **Recommendation** Description

 |

Our assessment of the materiality and reasonableness of each key methodology element and input assumption leads to our level of concern rating.

Level of concern		Reasonableness of approach			
Expected materiality of impact on output	**Scale**	●	●	●	●
Scale	**Rating**	**Reasonable**	**Somewhat reasonable**	**Somewhat unreasonable**	**Unreasonable**
○	**Immaterial**	No or limited concern	No or limited concern	Some concern	Some concern
◔	**Low materiality**	No or limited concern	No or limited concern	Moderate concern	Moderate concern
◑	**Somewhat material**	No or limited concern	Some concern	Moderate concern	Significant concern
●	**Material**	No or limited concern	Some concern	Significant concern	Significant concern

 |

3. Summary of Jemena’s demand proposal

Jemena use a consultant to produce system-level maximum demand forecasts and then blends these with their own bottom-up modelling.

Forecasting methodology

- Jemena uses a consultant. However, Jemena's consultant produces their system-level maximum demand forecasts and Jemena then blends these with their own bottom-up forecasts.
- Jemena separately produces their bottom-up forecast by using 'local knowledge' (known growth at the spatial-level).
- Jemena then scales their bottom-up forecast to reconcile with their consultant's system-level forecasts.
- In this way, the outputs are a product of both the consultant's model and Jemena's processes.
- The approach taken by Jemena is more complicated and the nature of some process steps have raised questions for us.

Transparency of approach

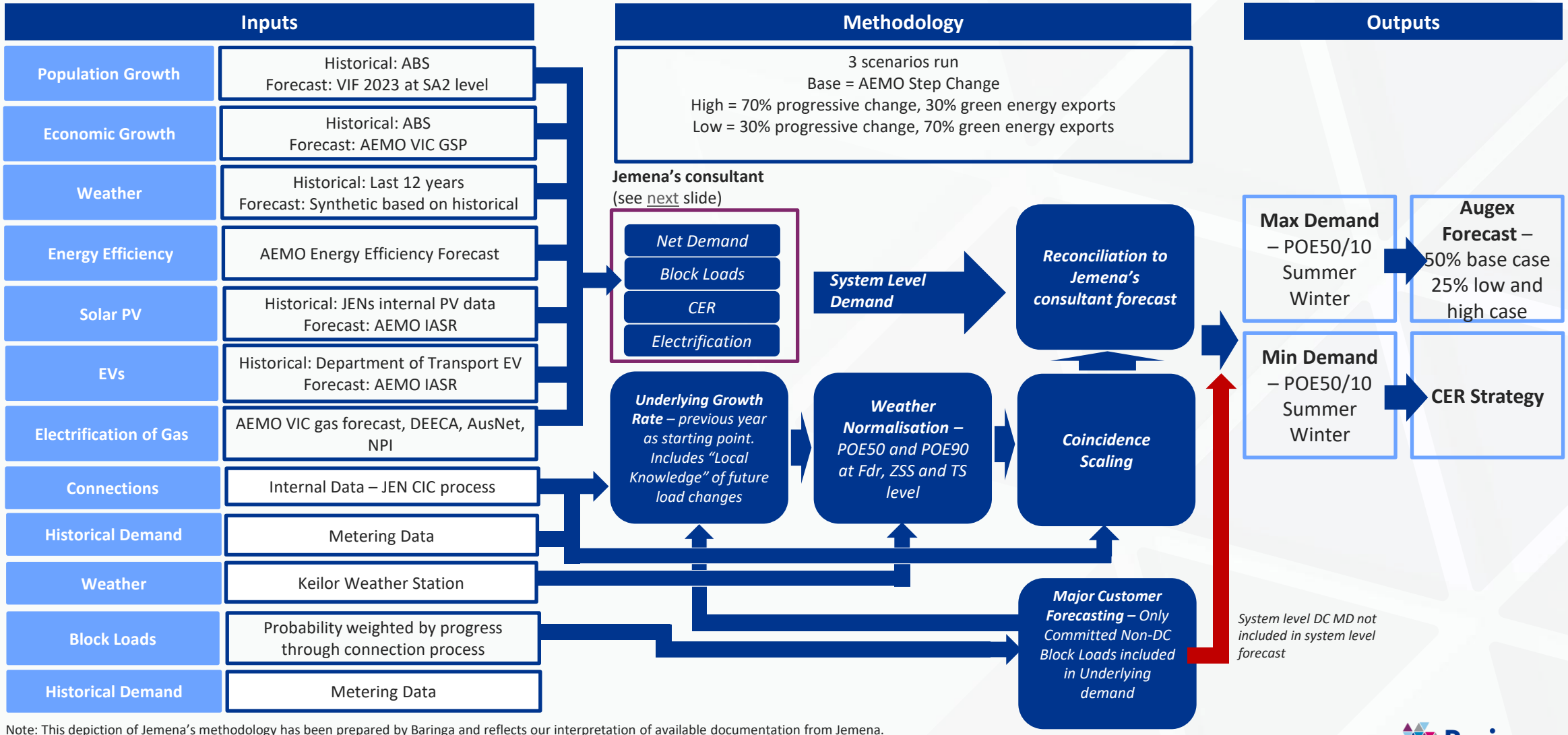
- Jemena have stated their inputs and assumptions clearly and have engaged a consultant. However, their approach includes blending Jemena's consultant's system-level forecasts with Jemena's spatial forecast – the nature of steps within this process has raised some flags for us.
- The rationale for application of Jemena's consultant's methodology to Jemena is unclear. The description of data choices is obscured. Both system-level and spatial-level forecasts rely on Jemena's consultant's modelling.
- The overall use of third-party algorithms has been difficult to validate and therefore is the least transparent.
- Their approach to including block loads (incl. DCs) is based on a probability-weighted approach of potential load.

Relative to the current regulatory period, Jemena is proposing significant increases in demand driven capital expenditure, including 77% growth in connections expenditure.

	2021-2026 period actual/estimate totals		2026-2031 period changes		
	Augmentation	Connections (gross)	Augmentation	Connections	Demand growth
Jemena	$193.6M	$623.3M	16%↑	77%↑	5.9%↑

- The above table outlines Jemena's augmentation and gross connections (i.e. before capital contributions are considered) capex across current period actuals and new regulatory period forecasts. These two expenditure categories are primarily (but not wholly) demand-driven.
- Jemena has proposed significant increases in demand driven capital expenditure. For connections, $1,102.6 million is gross connections expenditure, which is an increase of 77%. The increase in large customers such as data centres is driving the increase. Jemena forecasts net connections expenditure of $275.3 million.
- Total augmentation expenditure is $223.9 million. This is an increase of 16% in comparison to the current regulatory period. Jemena states that this forecast is driven by a significant increase in demand driven augmentation necessitating a need for network upgrades. In Section Five, we have assessed Jemena's local demand forecasts underlying the Northern Growth Corridor Business Case.

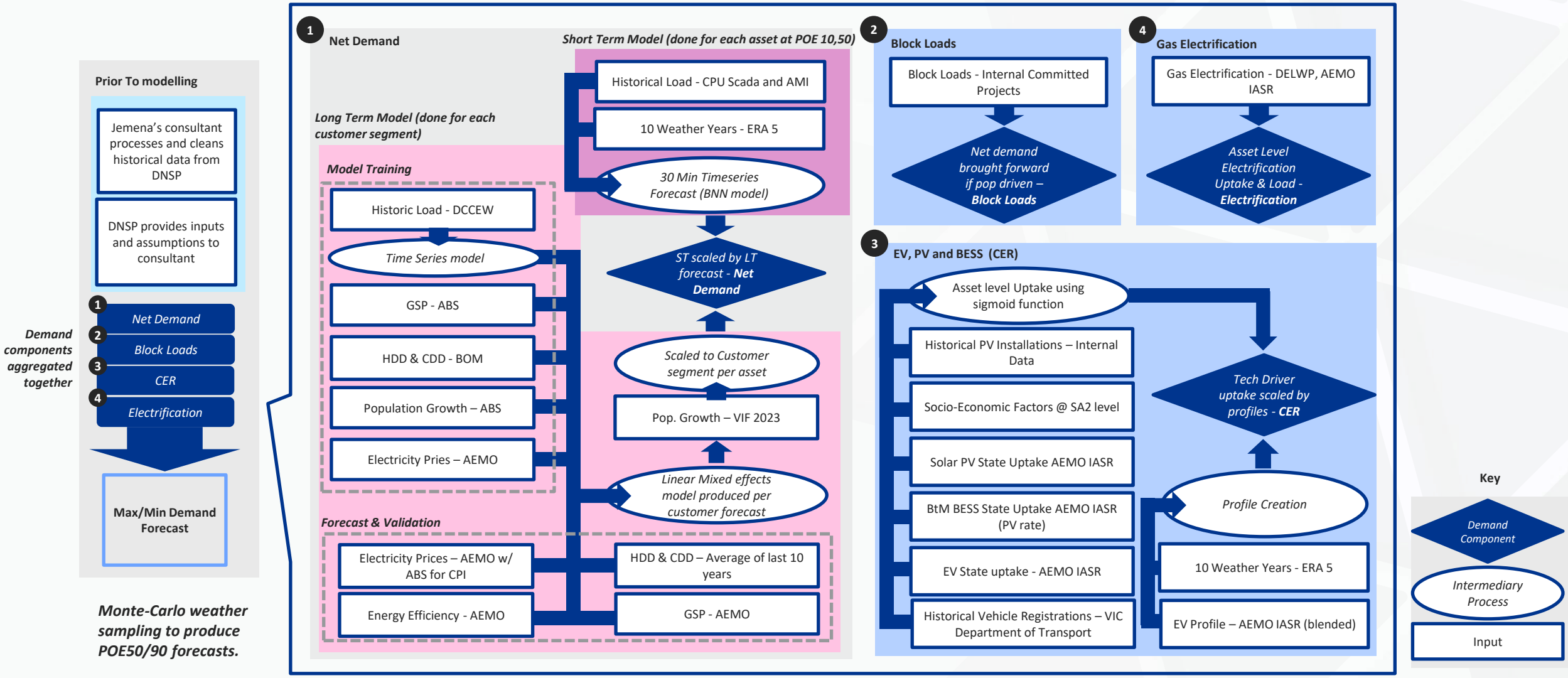
Jemena adopts their consultant's tool to prepare system-level demand forecasts, however these are scaled and reconciled with internal bottom-up forecasts.



Note: This depiction of Jemena's methodology has been prepared by Baringa and reflects our interpretation of available documentation from Jemena.

 |

Jemena's consultant third-party forecasting tool has been deployed for Jemena to produce max/min demand forecasts.

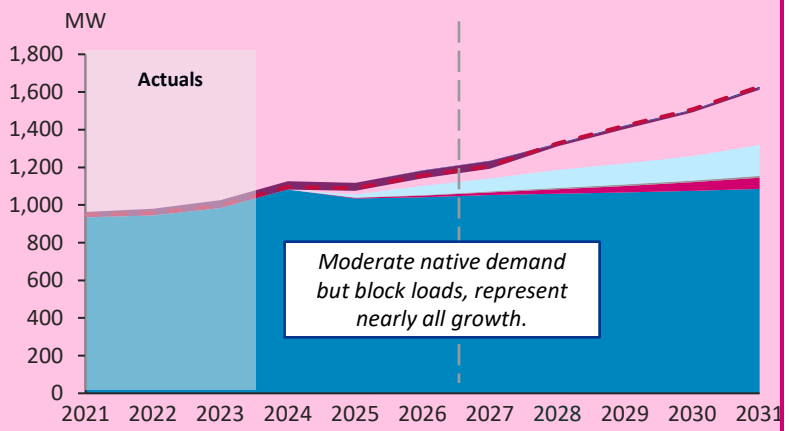


Note: This depiction of Jemena's consultant's methodology has been prepared by Baringa and reflects our interpretation of documentation provided by Jemena's consultant and Jemena.

 |

Jemena forecasts high demand growth compared to the other Victorian DNSPs, driven primarily by data centres and other block loads.

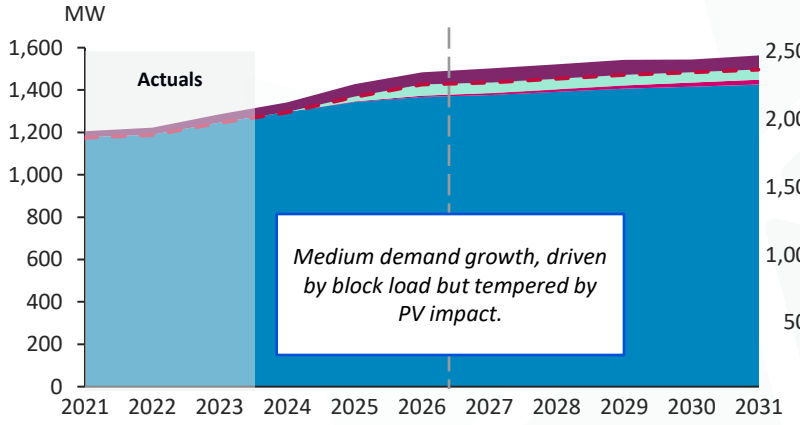
Jemena



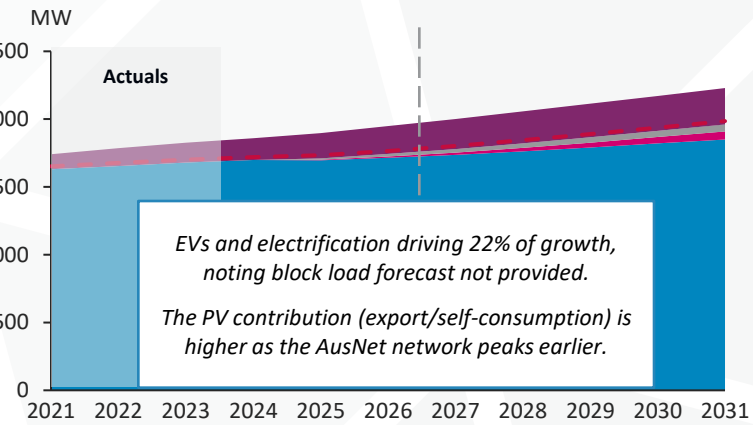
Commentary

- Jemena has high overall demand growth, at approximately 5.9% compounding over 2024-2031.
- The largest drivers are data centres which make up 18% of maximum demand, and are a big proportion of block loads. In aggregate, most of the demand growth is from block loads at 86%.
- EVs and gas electrification only contribute a small portion of growth at 3.7% and 0.6% respectively.
- Notably, native organic demand is expected to drop in 2025 and than remain largely flat over the forecast horizon.

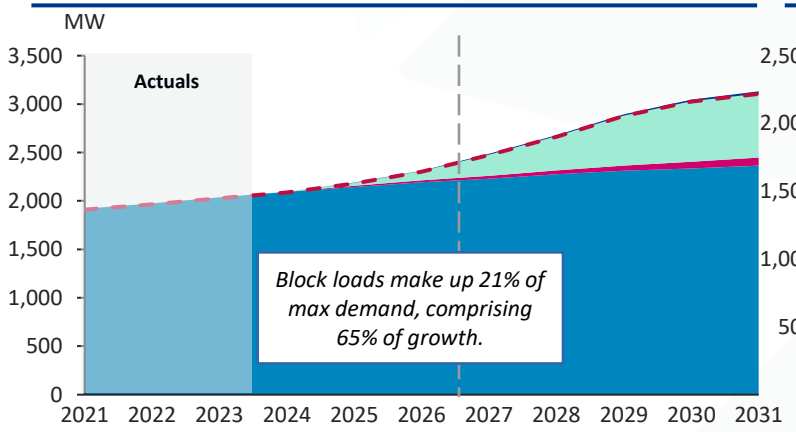
CitiPower



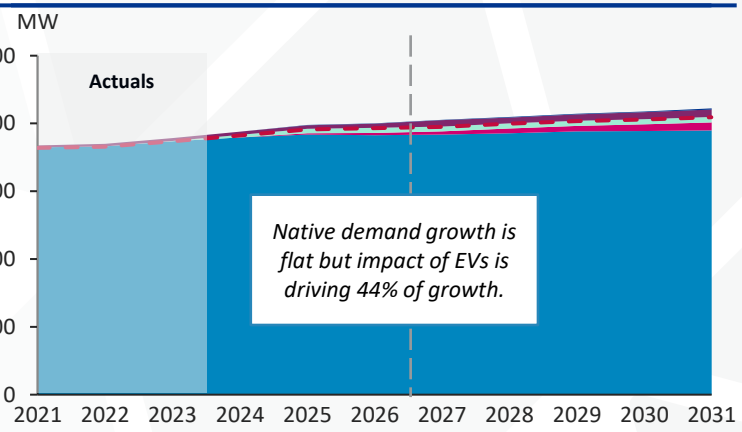
AusNet



Powercor



United Energy



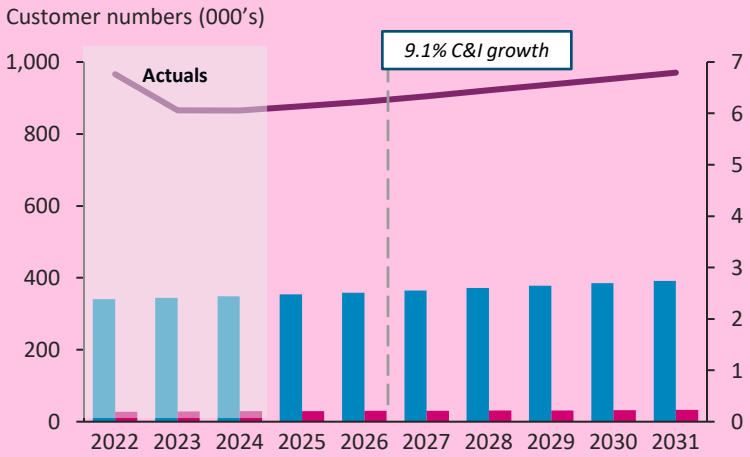
Base Less PV | Gas Electrification | PV | Non-DC Block Loads | Operational Demand
EV | Block Loads (DC and Non-DC) | BESS | DC Block Loads

Source: Data provided by DNSP in IR responses

 |

Jemena forecasts the same uniform growth rate across each of the residential, small business and C&I customer segments.

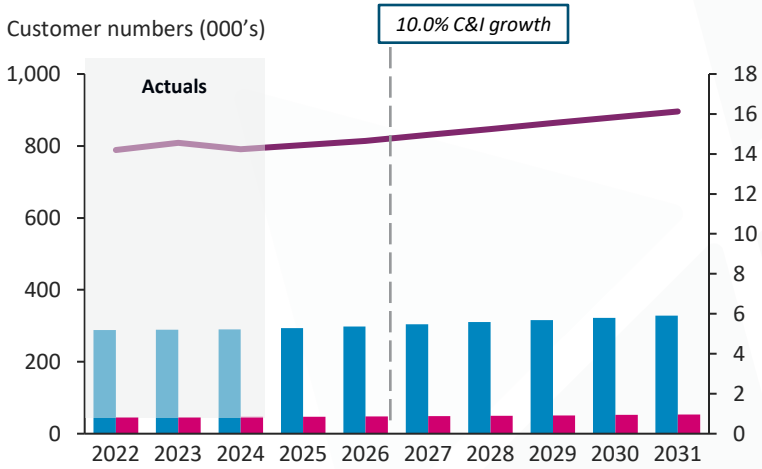
Jemena



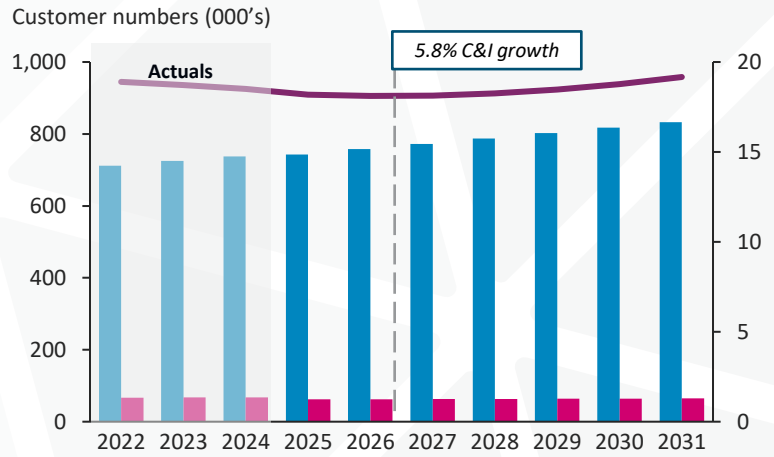
Commentary

- Jemena is forecasting total customer growth over the regulatory period to increase by 9.1% with steady and uniform customer growth across residential, small business and C&I segments.
- This trend is resulting in higher expenditure for connections and customer-driven works in particular.
- Jemena's customer number forecasts in this slide are sourced from their proposal RIN. We acknowledge Jemena has subsequently updated its customer number forecast.

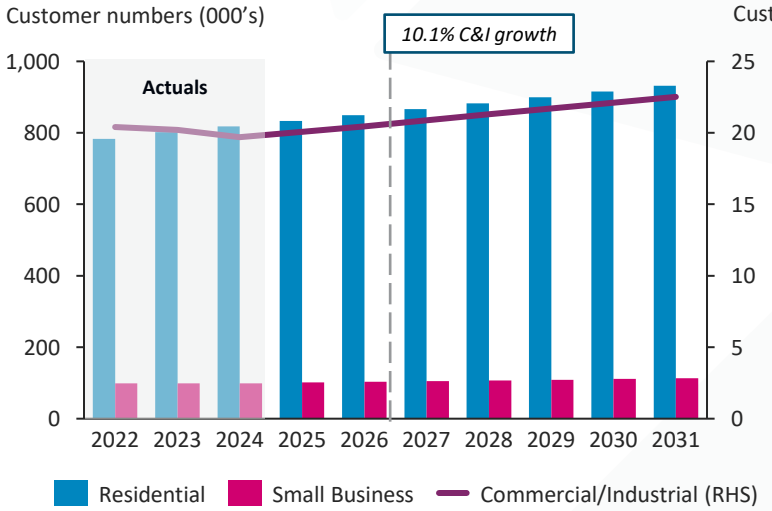
CitiPower



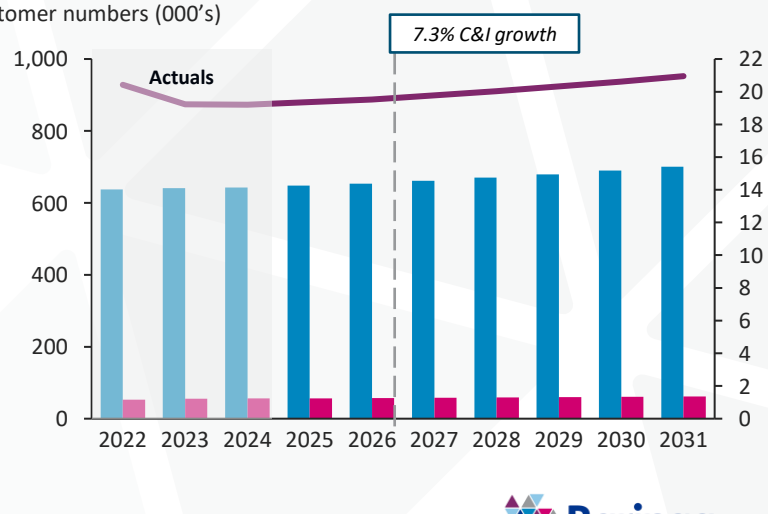
AusNet



Powercor



United Energy



Source: Analysis based on DNSP Reset RIN data

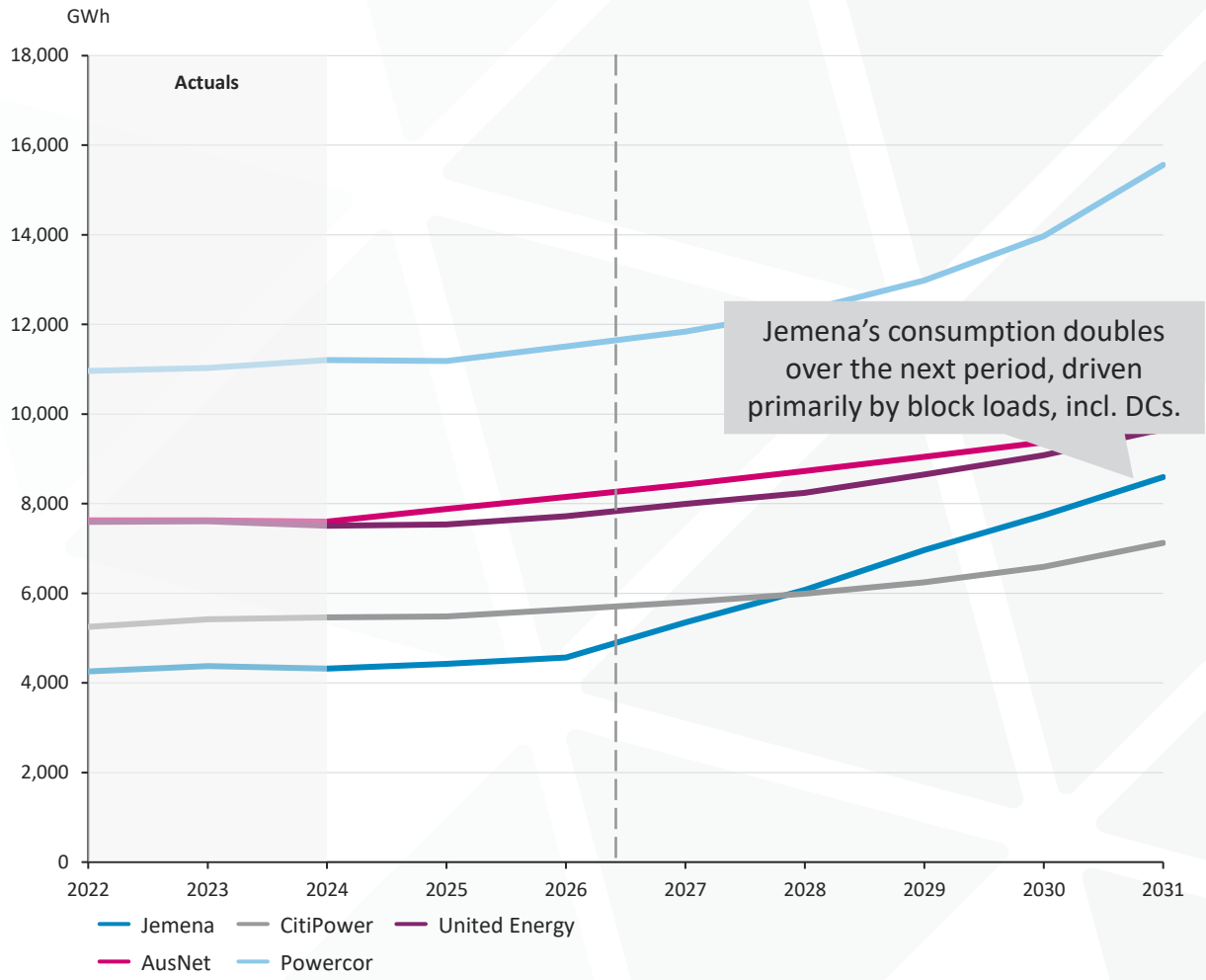
 |

Jemena propose the steepest increases in energy consumption within the next period, driven by block loads including data centres.

Key consumption drivers

- Energy consumption is a measure of all customers' total energy use over time. The chart illustrates the energy consumption for the five Victorian DNSPs for the current and upcoming regulatory periods.
- Forecasting energy consumption is relevant as the consumption volumes for each year act as an input into setting prices for that given year such that the DNSP's expected revenue is equal to the maximum regulated revenue.
- Key changes and drivers include:
  - **AusNet**: Relatively consistent at approximately 7,600 GWh before a moderate increase to over 9,600 GWh by 2031 driven by steady growth across all consumption categories, native demand, CER and gas electrification.
  - **Jemena**: Shows the most significant increase in consumption pinpointed at the start of the period, driven primarily by data centres and ultimately doubling energy throughput to 8,594 GWh by 2031.
  - **CitiPower**: A 31% increase compared to 2024 levels with 7,124 GWh by the end of the period. Driven initially CER and electrification of gas then data centres late in the regulatory period.
  - **Powercor**: Highest level of throughput with a significant rate of change driven largely by data centre uptake in the network. 11,204 GWh in 2024 and projected to reach over 15,562 GWh by 2031, representing a 39% increase.
  - **United Energy**: Similar to AusNet, at approximately 7,500 GWh before a steady increase to over 9,600 GWh by 2031. Driven initially CER and electrification of gas then data centres late in the regulatory period.

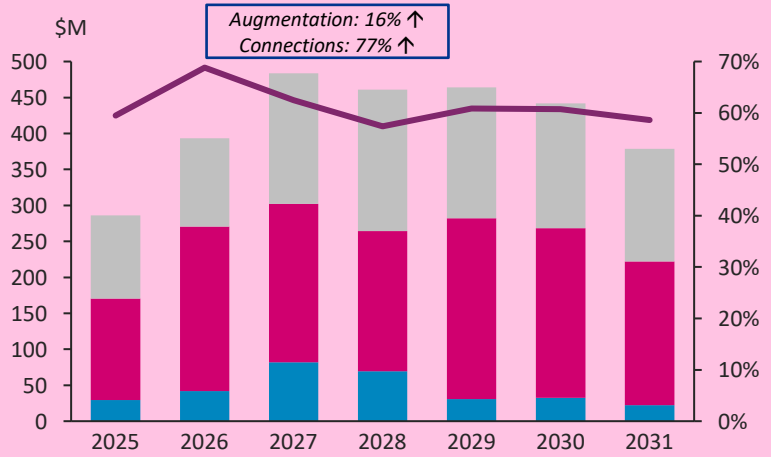
Victorian DNSP energy consumption historical and forecast



Source: Analysis based on DNSP Reset RIN data

Jemena's expenditure uplift is led by a strong increase in gross connections, which are in line with their increased for major customers and data centres.

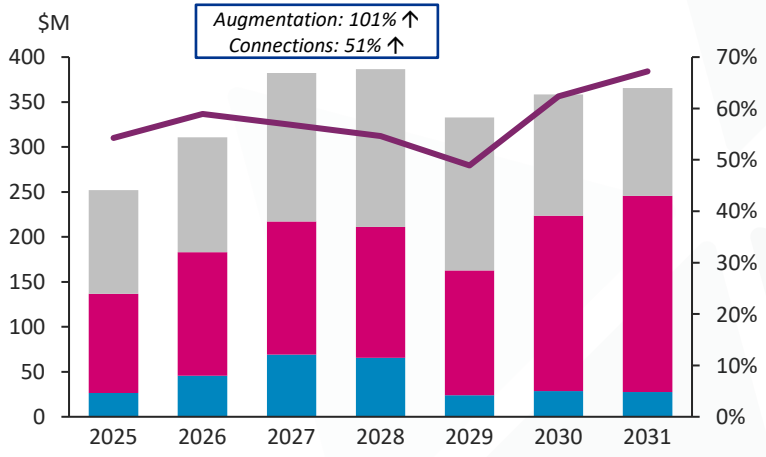
Jemena



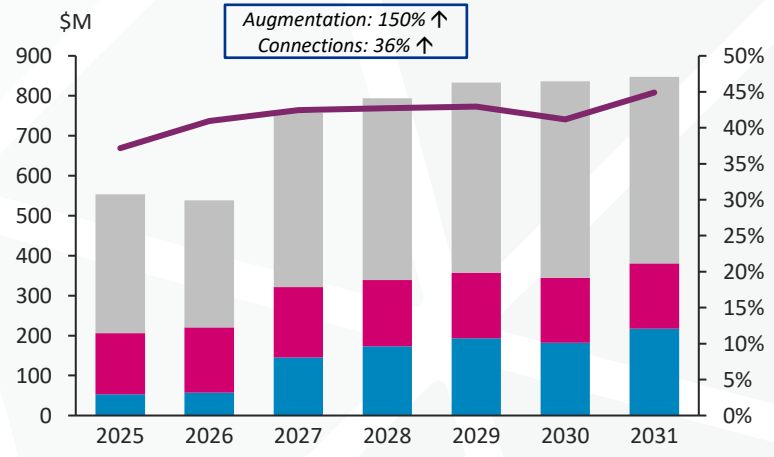
Commentary

- All DNSPs are proposing increases in expenditure, with demand-related capex accounting for approximately 60% of Jemena's total capex.
- Jemena's gross connections proposal is providing a significant contribution to the uplift in expenditure over the next regulatory period. Relative to the other Victorian DNSPs, it has the second highest increase at 77% when compared to expenditure levels in the current period.
- Augmentation expenditure is also increasing at 16% higher, but this is relatively low when compared to the other DNSPs.

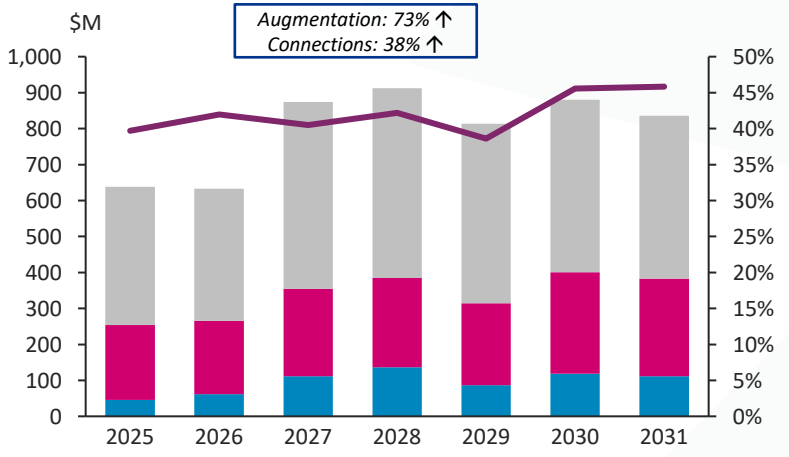
CitiPower



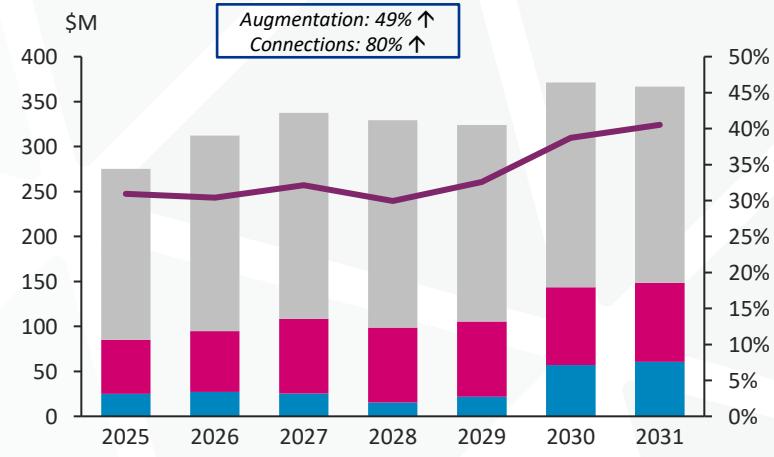
AusNet



Powercor



United Energy



Augmentation capex
Other Capex
Connections capex (Gross)
Proportion of demand-related capex (RHS)

Change from current period

Source: Analysis based on DNSP Reset RIN data

 |

4. Our overall evaluation on key demand methodology and input assumptions

We identified the following as the key input assumptions and methodology processes for review.

Key inputs

Traditional drivers

- Population
- Economic growth
- Customer numbers

Technology-induced drivers

- PV
- Electric vehicles
- BtM batteries
- Gas electrification
- Data Centres
- Other block loads

Key methodological processes

Min/max demand	Customer numbers	Energy consumption
Native Demand Forecasting	Spatial population forecast (Residential)	Native Demand Forecasting
Technological uptake	Gross state product forecast (C&I)	Technological uptake
Spatial disaggregation		Historical data use
Historical data use		Major customers and block loads
Weather normalisation		Scenario use and sensitivities
Major customers and block loads		Validation and testing
Profile Creation		
Scenario use and sensitivities		
Validation, testing and review		

 |

Economic growth assumptions, and how they are applied, are not clear in Jemena's methodology.

Traditional

Key inputs	Output	Materiality × Reasonableness = Concern	Assessment detail – Inputs and assumptions
Population growth	Max/min	No or limited concern	• We consider Jemena has sourced its population growth input assumptions and forecasts from a credible source (Victoria in Future 2023). Jemena have applied their consultant's forecasts to its network to derive residential and non-residential customer forecasts. Jemena's consultant's approach is to capture population growth at the asset level.[1] We consider this a good practice forecasting approach that incorporates a key driver. • Our analysis indicates that Jemena's residential and business customer numbers grow with the population growth rate (however we have some concern regarding the growth rate for business numbers as this is not clearly stated within the methodology).[2]
	Energy	No or limited concern	
	Customers	Some concern	
Economic growth	Max/min	Some concern	• We have some concern with Jemena's assumptions for economic growth because their methodology documents do not refer to a clear primary source and the process for model ingestion. Jemena's consultant is stated as the independent forecaster source for Jemena's underlying organic economic growth, adopting GSP forecasts from AEMO's ISP.[3] However, the methodology has not clearly explained the incorporation of economic growth into native demand. • We consider that it is typical to include economic growth as an input into demand, particularly business demand (for example, it is a key component that AEMO includes as a driver for ESOO) and is a useful differentiator from population driven growth.
	Energy	Some concern	
	Customers	Some concern	
Customer Numbers	Customers	Moderate concern	• See section *Methodological approach – Customer numbers*

Source: (1) JEN – RIN – Support – Jemena's consultant Modelling Guide 20241122 - 20250131 – Confidential, pg. 12; (2) Jemena – IR#027 – Q1; (3) Jemena – IR#027 – Q7

Jemena's inputs and assumptions for CER uptake appear to be generally aligned with AEMO's latest information.

Technology-based

Key inputs	Output	Materiality	×	Reasonableness	=	Concern	Assessment detail – Inputs and assumptions
PV generation and uptake	Max/Min	◑		●		No or limited concern	• We assess Jemena's PV generation and uptake inputs to be broadly reasonable. Jemena relies on *[Redacted]* • As a result, we have no concern with Jemena's assumptions for this element.
	Energy	⬤		●		No or limited concern	
EV charging profiles and uptake	Max/min	◑		●		No or limited concern	• We have no concern regarding Jemena's selection of EV data inputs. Jemena has relied on AEMO's statewide EV uptake forecast (Step Change) – August 2024. [1] This was the latest available at time of initial proposal. • Similar to PV generation and uptake, Jemena's consultant incorporates the EV charging profiles and uptake via a two step process. This is a clear and reasonable approach.
	Energy	◑		●		No or limited concern	
BtM BESS charging profiles and uptake	Max/min	◑		●		Some concern	• We consider that the inputs used for BtM BESS charging profiles and uptakes are somewhat reasonable and could be improved for the max/min demand forecasts. For Jemena's demand forecast, storage uptake is based on analysis of historical installation rates and AEMO's 2024 Forecasting Assumptions Update and Scenarios Report – Inputs and Assumptions Workbook. [1] • We have some concern with assumptions adopted by Jemena's consultant's modelling. *[Redacted]* • We note that the model assumes BtM storage is acting to increase max demand and also reduce minimum demand,[2] whereas we would expect the impact to be reversed. This assumption has not been able to be validated and has raised a minor concern for us. • This approach would have a non-negligible impact on energy consumption forecasting, but given the low materiality our concerns are dampened.
	Energy	○		●		No or limited concern	

Source: (1) JEN – RIN – Support – Jemena's consultant Modelling Guide 20241122 - 20250131 – Confidential; (2) Jemena – IR#027 – Q6.

We have concerns with Jemena's scoring approach for non-committed block loads which we consider subjective and not reproducible.

Technology-based

Key inputs	Output	Materiality ×	Reasonableness =	Concern	Assessment detail – Inputs and assumptions
Gas electrification residential, commercial and industrial	Max/min	◑	●	No or limited concern	• We assess Jemena's gas electrification inputs to be broadly reasonable. • Jemena/Jemena's consultant has used AEMO's Electrification Of Gas Workbook (Aug 2024) for residential gas electrification and data from the Victorian Government Department of Energy Environment and Climate Action and National Pollutant Inventory for commercial and industrial gas electrification.[1] Jemena's consultant also state that they consider Victoria's Gas Substitution Roadmap, including a new policy made in July 2023 to phase out new residential gas connections from 1 January 2024.[2] • We consider these assumptions reasonable and have no or limited concern with Jemena using these figures as their input sources as they represent quality and up-to-date information.
	Energy	◑	●	No or limited concern	
Data centres	Max/min	●	●	Significant concern	• We consider Jemena's assumption for including data centres within their demand and consumption forecasts has not been clearly justified. In Jemena's methodology,[3] it is stated they consider all current enquiries received for DCs, irrespective of how advanced the connection process is. This contrasts to the other Victorian DNSPs that only consider 'committed and contracted' DCs in their demand forecasts. • We have sought evidence to support the assumption that the likelihood of connection is driven by level of advancement of connection process such as land acquisition, feasibility studies or financial approvals, however Jemena has not been able to provide a comprehensive response. [4] This assumption has an impact on the timing and uptake level. • Overall, we recognise the challenges in trying to forecast uptake of this new major technology for 5+ years, however, Jemena's assumption to forecasting block loads and DCs lacks strong reasoning particularly regarding the likelihood of the connection proceeding, making it difficult to reproduce
	Energy	●	●	Significant concern	
Other block loads	Max/min	●	●	Significant concern	• Related to the assumption used for data centres, Jemena has base, low and high scenarios for their block load forecasts. The final block load maximum demand is based on a weighted average, that is weighted 50% to the 'base' scenario, 25% to the 'low' scenario, and '25%' to the high maximum demand forecast scenario. [5] • The assumption adopted is that the likelihood of connection is driven by level of advancement of connection process, but it is unclear the rationale for adopting a speculative weighted average that contributes to demand, and we would better consider tangible evidence from prospective connections on their progress towards commercial operation. • Overall, we acknowledge the inherent subjectivity in the block load forecasting process adopted by Jemena and consider this can be refined for such a significant demand driver.
	Energy	●	●	Significant concern	

Source: (1) Jemena – IR#014 – Q24; (2) JEN – RIN – Support – Jemena's consultant Modelling Guide 20241122 - 20250131 – Confidential, pg. 3; (3) JEN – RIN – Support – Major Customers – Forecast Methodology – 20250131 – Confidential; (4) Jemena – IR#026 – Q2; (5) Jemena – IR#014 – Q20

Jemena's native demand modelling methodology is difficult to follow and validate.

Key approach	Output	Materiality × Reasonableness = Concern	Assessment detail – Maximum demand
Native Demand Forecasting	Max/Min	Significant concern	• We consider Jemena's approach for native demand forecasting unreasonable and therefore have significant concern. • Jemena forecasts native demand both in their internal bottom-up forecast and Jemena's consultant's top-down forecast. While Jemena states these forecasts are undertaken independently, their internal bottom-up forecast relies on the consultant's modelling for a key input.[1] • Jemena's native demand forecasting approach remains unclear even after multiple information requests. Baringa has particular concerns with the organic growth rate provided by Jemena's consultant being the basis of their bottom-up demand forecast as it lacks clarity and is difficult to validate. • Historical native demand is grown using an 'organic underlying growth rate'. An organic growth rate is assigned to each asset based on native demand growth for each network asset provided by Jemena's consultant. • Adjustments to organic growth rates are also made towards the end of the forecast period to take into account that known load information is limited in the later years. Although the exact process for making these adjustment remains unclear. *[Redacted]* • While logistic functions are generally considered reasonable for population growth, this overall approach is not well documented and difficult to validate.
Technological Uptake	Max/min	Some concern	• We have some concern with Jemena's technological uptake forecast because it is unclear the extent to which the methodology contributes into the system-level demand forecast. • System-level EV, PV, and BtM BESS uptake are provided in Jemena's consultant's top-down model. *[Redacted]* [2] • While this is a reasonable for the system-level, it does not accurately take into account the potential discrepancies in the granular locational detail across different parts of Jemena's network.

Source: (1) Jemena – IR#008 – Q1; (2) Jemena – IR#008 – Q3

Jemena's spatial forecast misses key details such as CER, native growth, and certain block loads.

Key approach	Output	Materiality	×	Reasonableness	=	Concern	Assessment detail – Maximum demand
Spatial disaggregation	Max/min	●		●		Significant concern	• We have significant concern about Jemena's approach to spatial disaggregation as this is not reconciled to their system-level approach.[1] • HV Feeder-level demand only includes known new connections and the 'organic underlying growth rate' which is based on Jemena's consultant's modelling. CER uptake and population growth is only modelled at the system-level. Aggregate diversified feeder demand (including known connections) is then scaled up to match Jemena's consultant's system level demand forecast. • CER uptake is only modelled at the system level. It would be more accurate to look at current levels of CER uptake on a ZSS/Postcode/SA2 level and then grow these out using AEMO's latest uptake rates. *[Redacted]* • However, it is unclear if or how this is actually being applied given Jemena's consultant is only providing the system-level forecast. • Only a subset of new block loads (and 1 upcoming data centre) appear to be included in Jemena's underlying/bottom-up forecast. Notably, uncommitted block loads are only allocated at the system level. It is unclear why some block loads are only being included at a system level. • On the other hand, an aspect of the spatial disaggregation methodology we find reasonable is incorporating planned load transfers between feeders from committed projects. • We consider it would be better practice to include more modelled, population-driven connection growth at the spatial level (i.e. EV, PV, and population-driven growth). Jemena's overall approach is not ideal and therefore would recommend more detailed demand drivers to be modelled at the spatial level.

Source: (1) JEN – RIN – Support – Jemena's consultant Modelling Guide 20241122 - 20250131 – Confidential, pg. 5.

Jemena's approach to historical data use and weather normalisation could be improved.

Key approach	Output	Materiality × Reasonableness = Concern	Assessment detail – Maximum demand
Use of historical data	Max/min	Moderate concern	• Jemena's use of historical data is somewhat unreasonable as it is not transparent and unable to validated. The starting point maximum demand at HV Feeder level uses historical, weather-corrected and transfer-corrected data. In the top-down model, historical demand, weather data, and calendar data feed into the short-term model. Using a Bayesian Neural Network (BNN), this model generates a range of stochastic demand outcomes driven by weather scenarios (based on 12 year historical data). [1] • Usage of a BNN is reasonable for capturing multiple nonlinear relationships. However, the algorithm is complex, not transparent and difficult to validate without clear data. We therefore consider this approach is not easily reproducible as Jemena has not sufficiently described how this is being derived from Jemena's consultant's model.
Weather normalisation	Max/min	Moderate concern	• We have a moderate level of concern with Jemena's weather normalisation approach because it does not sufficiently factor the impact of heating degree days (HDD) and particularly cooling degree days (CDD) in the regression. • The methodology for max demand normalisation states that historical second-order regression determines relationship between temperature and maximum demand. Raw degrees C is not the best driver of demand, as demand does not increase monotonically with temperature (peaking at either high or low temps). We consider it would be preferable to use HDD and CDD in the regression. Regression process describes deleting unwanted points to improve the curve fit. Our analysis shows that weather normalisation is only applied to the summer forecast as Jemena considers the sensitivity is negligible during winter.[2] • We consider this somewhat unreasonable as the low temperature impacts are important for demand forecasting given the trend towards heat electrification.

Source: (1) JEN – RIN – Support – Jemena's consultant Modelling Guide 20241122 - 20250131 – Confidential, pg. 8; (2) Jemena – IR#027 – Q12;

Jemena's approach to including non-committed block loads is difficult to validate.

Key approach	Output	Materiality	× Reasonableness	= Concern	Assessment detail – Maximum demand
Major customers and block loads and data centres	Max/min	●	●	Significant concern	• We have significant concern with Jemena's approach to incorporating major customers into their demand forecasts due to the high level of subjectivity. • Jemena uses a scoring system to determine the timing and uptake level of uncommitted major connections. For example, lower likelihood connections have their initial connection date and full uptake date delayed as well as the scale of uptake derated. It should be noted that even at the maximum likelihood, several "In Flight" projects have a 30% derating to their customer demand forecast, while others have 0% derating. This scoring approach is subjective and would not be reproducible.[1] • Unknown major connections are assumed to connect beyond the horizon of current connections, beyond 2028. For major customers, Jemena expects connections to be similar to what has been observed in the past. For data centres, they expect those connections will reduce over the period as the boom in data centre investment moderates. The data provided is unclear to what degree this impacts the block load forecast.[2] • At the system level, Jemena's consultant's model handles population-driven block loads by removing the overlap with organic population growth. This has the impact of block loads bringing forecast load forward, but not increasing the long-term forecast. • Materiality thresholds could be established based on minimum size (e.g., 1MW) and/or relative to the capacity of the assets (e.g., 5% of the asset capacity) to mitigate the potential overlapping with the trend component. • Jemena's consultant's approach to addressing the potential overlap between blockloads and other components of the modelling for system-level demand may not be sufficient as it is limited to population-driven blockloads, and may also fail to properly account for the impact of other demand drivers such as electricity price increases, demand management and greater energy efficiency that continue to drive down demand from the existing broader customer base. • We are not satisfied with the evidence Jemena has provided to substantiate the commitment levels of the block load scoring system.

Source: (1) JEN – RIN – Support – Major Customers – Forecast Methodology – 20250131, p. 14; (2) Jemena – IR#026 – Q1;

Reconciliation of top-down bottom-up forecast a concern. Jemena's consultant's modelling plays a role in both the bottom-up and the top-down forecast.

Key approach	Output	Materiality	×	Reasonableness	=	Concern	Assessment detail – Maximum demand
Profile Creation	Max/min	◑		●		Some concern	• We consider the profile creation to be somewhat reasonable overall with a minor concern regarding BESS profiles. • BESS profiles are produced by Jemena's consultant.[1] By default, Jemena's consultant derives battery profiles based on historical data. This generally aligns with the BESS acting to optimize self-consumption (i.e. charging from solar). Output demand shows BESS contributing (rather than reducing) to increasing max demand and reducing min demand, which is counter-intuitive although the impact of this is very small.[2] • EV demand profiles based on AEMO's charging profiles. *[Redacted]*
Scenario use and sensitivities	Max/min	●		●		Some concern	• We have a minor concern with Jemena's use of AEMO inputs and scenarios as there is some discrepancies with their approach. The top-down peak demand forecast incorporates AEMO Step Change, however the EV forecasts use ISP inputs, which are out of date.[3] • Jemena also runs three separate scenarios – Base, High and Low. Base Case uses AEMO Step Change inputs and is the scenario used in the business cases. Data centre demand uses a different methodology with a 50%, 25%, 25% split of Base, High and Low cases, respectively.
Validation of bottom-up forecasts	Max/min	◑		●		Moderate concern	• We consider Jemena's approach to validating their bottom-up forecasts to be somewhat unreasonable, as we have concerns about the independence of their bottom-up and top-down forecasts as Jemena's consultant's modelling plays a key role in both. • Jemena produces the bottom-up forecast, which is scaled to match system level top-down forecast by Jemena's consultant.[4] However, the key input to Jemena's internal bottom-up forecast is provided by their consultant. • In addition, the block loads included at different levels of the networks may not be the same, as each may differ in what have been captured in the trend and other components. However, it is unclear from the information submitted by Jemena about the approaches to block loads at the spatial level vs system-level, and how they reconcile to each other. • Approaches to Monte Carlo simulation seem broadly reasonable as these simulations are a standard approach to simulating future variability based on historical outcomes. However, Jemena's approach has been difficult to validate with the current data and methodology as described.

Source: (1) Jemena – IR#027 – Q6; (2) Jemena – IR#014 – Q13.; (3) Jemena – IR#027 – Q4; (4) Jemena – IR#008 – Q1.

While Jemena engages a consultant to support with demand forecasting, our assessment of their methodology has identified gaps and opportunities for review.

Key approach	Output	Materiality	× Reasonableness	= Concern	Assessment detail – Maximum demand
Review of forecasting approach	Max/min	◑	●	Significant concern	• We have significant concern with Jemena's description of their forecasting review process and consider their approach could be better clarified and improved. • Jemena states they review their methodology on an annual basis, comparing their bottom-up forecast demand to recorded actuals and investigate any discrepancies.[1] It is unclear how discrepancies are addressed or if overall internal forecasting methodology undergoes a review. • Jemena's consultant's methodology describes a bottom-up/spatial-level forecast, but is only used for the top-down/system-level forecasting. • Meanwhile, the consultant methodology provided outlines significant detail on the spatial forecast methodology, however, this is inconsistent with their role of providing a system-level forecast. • On reviewing Jemena's approach to spatial disaggregation for the Northern Growth Corridor Business Case (slides 43-46), we found calculation errors in Jemena's forecast numbers. These errors included demand components by feeder not summing to the feeder's MD and block load contribution to MD exceeding the block loads in the source data.

Source: (1) JEN – RIN – Support – JEN Load Demand Forecast Procedure 2024 – 20250131 – Public, p. 13

Jemena's residential and business customer growth aligned with VIF 2023, but there is some inconsistency when compared to the RIN outputs.

Key approach	Output	Materiality ×	Reasonableness	= Concern	Assessment detail – Customer numbers
Customer Number Forecast (Spatial and GSP)	Customers	◑	●	Some concern	• We consider Jemena's methodology for customer numbers to be broadly reasonable, however, we have difficulty reconciling Jemena's stated methodology with the outputs from that methodology. • Jemena states that it projects their residential customer numbers using the VIF 2023 population and household projections, and projects non-residential customer numbers using Victorian GSP growth rates sourced from AEMO. • However, the customer number forecasts included by Jemena in the RIN grow by a uniform 9.1% over the regulatory period across each of the residential, small business and C&I customer segments. This uniform growth rate is a surprising outcome given the residential and non-residential customer numbers have different drivers. • We understand Jemena's the customer number forecasts in Jemena's proposal RIN are now outdated and different from their current view on customer number forecasts.[1] We recommended Jemena updated their revised proposal RIN with their latest customer number forecasts and ensure those forecasts align with their stated methodology.

Source: (1) Jemena – IR#027 – Q1

Jemena's energy forecasting approach is broadly consistent with the MD approach.

Key approach	Output	Materiality × Reasonableness = Concern	Assessment detail – Energy consumption
Native Demand Forecasting	Energy	Some concern	• Jemena uses a relatively consistent approach between their native demand forecasting and energy consumption, although we do have some concern with the degree of reconciliation between the two outputs. • Jemena's consultant produces the energy load forecast for Jemena.[1] Customer numbers per tariff are grown using a historical relationship between population growth and customer growth. This appears to be a reasonable approach. Similar to the max/min demand forecast, a long-term trend is generated from energy efficiency and GSP forecast. • It is unclear if the long-term approach is reconciled with the max/min demand forecast, however, we note that native demand growth makes up only a small proportion of overall energy growth.
Technological Uptake	Energy	No or limited concern	• For energy consumption, the approach adopted to model the impact of technology uptake is reasonable and we have no concern with Jemena's provided information. • Baringa has validated the gas electrification, PV, EV, and BESS approaches stated in the methodology and are found to be consistent with the max/min demand forecast. [1] • Energy consumption relies on total system consumption, so the spatial data is not as material a driver.
Use of historical data	Energy	No or limited concern	• We consider Jemena's use of historical data reasonable and that their forecasts accurately reflect the stated methodology. This is because existing customer numbers are segmented and calculated by tariff type.[1] The historical customer growth trends used to inform response of customer group (residential, small business, large business) growth to population growth. This approach is reasonable for estimating tariff-specific customer growth. • Historical PV generation and export numbers are used to estimate the % self consumption for PV customers. This approach seems reasonable.

Source: (1) JEN - IR014 - Initial Proposal Q & A Response - Jemena's consultant - JEN Energy Forecast Documentation - 20250508 – Confidential; (2) Jemena – IR#014 – Q14

Jemena's data centre and other block load approach for energy forecasting requires further validation.

Key approach	Output	Materiality × Reasonableness = Concern	Assessment detail – Energy consumption
Major customers and block loads and data centres	Energy	Significant concern	• We consider the major customer approach that Jemena is proposing for block loads to be somewhat unreasonable given the high materiality on the forecast. • Block loads are taken from the 2023 peak demand forecasting. It is unclear why the block loads from the latest peak demand forecast are not being used. Block loads and data centres make up 83% of the total energy consumption growth using their weighted average load uptake rate. This is then explained to be used as an input of the capacity update which are then moderated.[1] • Given the materiality, we would expect to see more evidence justifying the load uptake profiles of major customers and block loads.
Scenario use and sensitivities	Energy	Moderate concern	• We are not satisfied that Jemena's explanation of the use of AEMO scenarios is reasonable. • Their methodology describes alignment with the 2023 max/min demand forecast, and therefore relies on out-of-date AEMO 2023 inputs.[2] • All AEMO inputs should be sourced from the latest update available at the time and linked to the relevant scenario. Using the latest AEMO scenario and forecasting update would demonstrate that Jemena's forecast is based on the most recent input information.
Review of forecasting approach	Energy	Moderate concern	• It's unclear what review or QA processes are performed on the energy consumption forecasts because this has not been clearly outlined in the information provided by Jemena.

Source: (1) Jemena – IR#026 – Q9; (2) JEN - IR014 - Initial Proposal Q & A Response - Jemena's consultant - JEN Energy Forecast Documentation - 20250508 – Confidential

We note the quality and completeness of the information for the following inputs and methodology processes have limited our review.

Key inputs

Traditional drivers

- Population
- Economic growth
- Customer numbers

Technology-induced drivers

- PV
- Electric vehicles
- BtM batteries
- Gas electrification
- Data Centres
- Other block loads

Key methodological processes

Max/min demand	Customer numbers	Energy consumption
Native Demand Forecasting	Spatial population forecast (Residential)	Native demand forecasting
Technological uptake	Gross state product forecast (C&I)	Technological uptake
Spatial disaggregation		Historical data use
Historical data use		Major customers and block loads
Weather normalisation		Scenario use and sensitivities
Major customers and block loads		Validation, testing & review
Profile Creation		
Scenario use and sensitivities		
Validation, testing and review		

Key: *Sufficient* | *Incomplete information*

 |

Jemena should address the below deficiencies in their Revised Proposal which would enable a clear review of their submission.

Input/process	Output	Expected level of detail required
• **BtM batteries**	Demand	• Evidence and example of calculation of BtM storage contribution to peak demand.
• **Data centres and other block loads** • **Validation, testing and review**	Demand Energy	• Evidence from each prospective connections (data centres and other major customers) on their progress towards commercial operation, including but not limited to: • materiality threshold applied • information sources and supporting documents from the requested parties • method for calculating the loads or validating the loads requested • whether the load is included or excluded from load forecasts at zone substation and above due to potential overlapping. • Methodology for identifying overlap with organic population growth • Evidence and breakdown for load uptake profiles • Evidence of reconciliation of block loads at spatial-level vs system-level
• **Native demand forecasting**	Demand Energy	• Calculation of population/GSP driven growth • Evidence and example of manual intervention for adjustments and their scale for the organic growth rate • Additional detail on energy consumption methodology
• **Technological uptake**	Demand	• Explanation of how bottom-up methodology feeds into system-level forecast
• **Historical data use**	Demand	• Calculation and worked example of BNN outputs • Data and example evidence of Monto Carlo simulation to validate historical outcomes

5. Further assessment on selected topics

Assessment of locational demand-driven business case

Background for selected business case

We selected the Northern Growth Corridor Network Development Strategy business case to dive deeper into Jemena's approach to spatial disaggregation of demand. This project was selected as it is a major capex project that is driven by location-specific demand growth.

Northern Growth Corridor	
Location of Project	North Metropolitan Melbourne, Northern Growth Corridor (Greenvale, Craigieburn, Mickleham, Donnybrook, Kalkallo, Mernda, Wollert and Beveridge)
Problem addressed by project	Mitigate forecast unserved energy at various feeders across the Kalkallo, Somerton, Coolaroo, and Broadmeadows substations, driven by high forecast population growth.
Preferred option description	New Zone Substation at Craigieburn and various feeder augmentations
Cost of preferred option	$25m

Source: JEN – RIN – Support – Northern Growth Corridor – Network Development Strategy – 20250131 – Confidential

Notes: Our criteria was to select up to two locational demand-driven business cases above $10m. We also requested data for Jemena's TS-NH(NEI)-NEL-WT-TTS 66 kV loop project. However, we found this project to be smaller than anticipated, driven by demand growth at a single zone substation. As a result, this project has not been assessed.

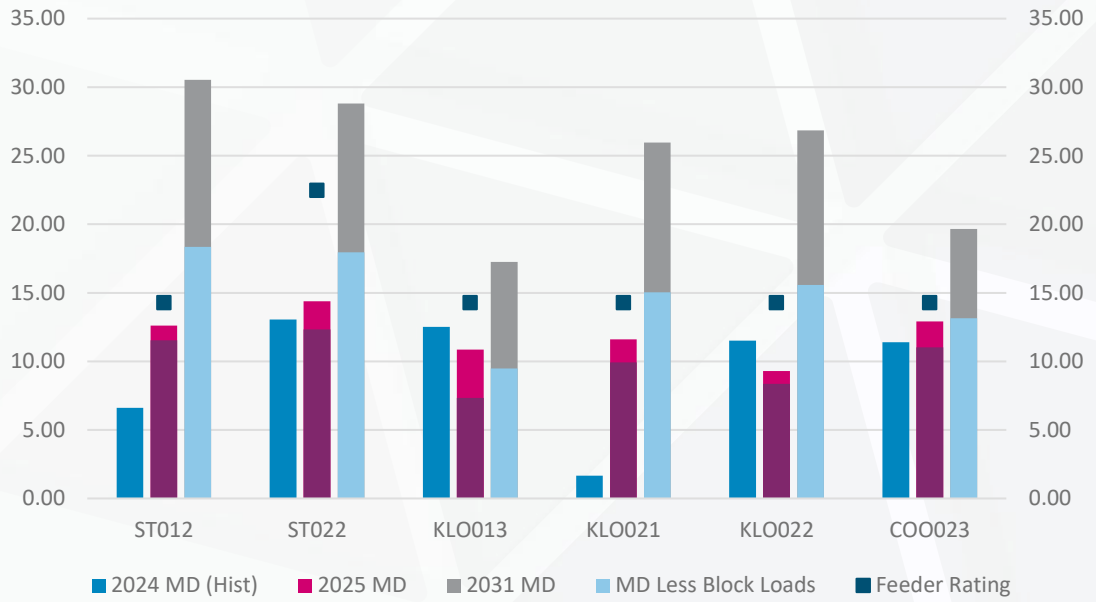
Northern Growth Corridor investment is driven by very high block loads on several feeders.

Summary of Jemena's proposal:

Demand forecasting drivers for Northern Growth Corridor Upgrade

- Jemena has identified population growth and the subsequent unserved energy at various feeders (ST-012, ST-022, KLO-013, KLO-021, KLO-022, COO-023) at Kalkallo, Coolaroo, and Somerton zone substations as the key driver of the Northern Growth Corridor business case. Under Jemena's forecast from 2025 to 2031, the majority of the growth across the six feeders is attributable to block loads, averaging a 64% contribution to load growth. However, it should be noted that Jemena's definition of block loads seems to have a low threshold, as many connections < 10A are included as block loads.
- By 2031, 4 of the 6 feeders are winter-peaking. Therefore, electrification plays a large part in the demand growth, comprising 18.7% of the growth on the winter-peaking feeders and 10.7% of the maximum demand on these feeders by 2031.
- EVs contribute to approximately 5% of the key feeders max demand and 9.5% of the total growth across the 6 feeders. The contribution is broadly consistent across the 6 feeders.
- Native demand growth contributes to c. 9.5% of the demand growth across the 6 feeders. Native demand growth is highest at Kalkallo, comprising 18.7% of the winter demand growth on KLO-022 and 18.2% of the winter demand growth at KLO-013.

Jemena's proposal: Demand Growth at Key Feeders (MVA)



Source: Baringa analysis of IR27 Q3 supporting data

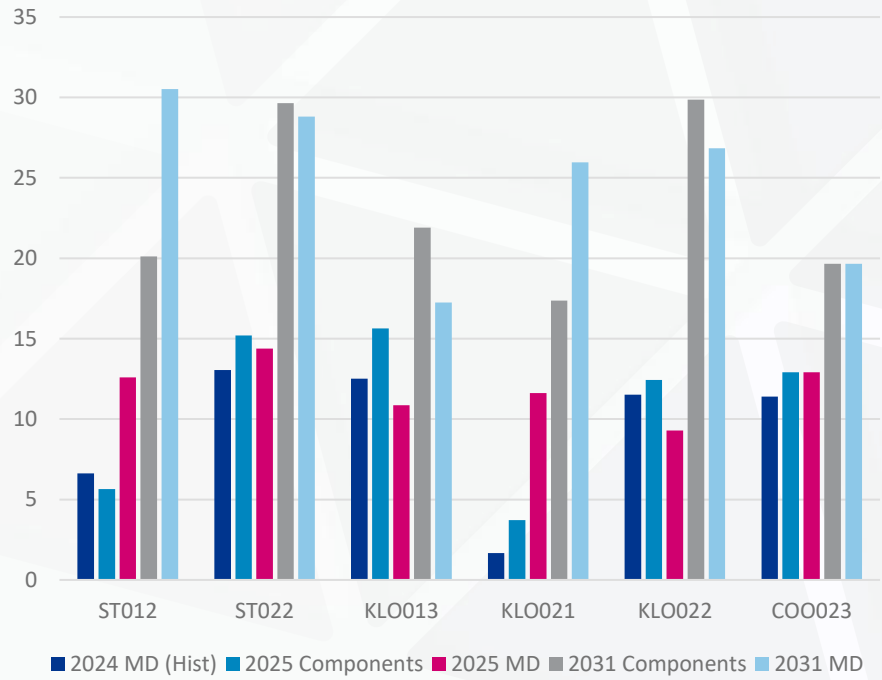
 |

Jemena's demand forecast has calculation errors and relies heavily on uptake of block loads.

Assessment findings

- Electrification contribution to winter peak demand at the six key feeders (10.7%) is broadly aligned or slightly higher than the statewide contribution in ESOO 2024 Central (8.8%), which suggests the electrification forecasts are broadly reasonable.
- On the other hand, the concerns we identified were:
  - EV contribution to winter peak demand at the six key feeders (5%) is broadly in line with Jemena's network level contribution (4.8%), but significantly higher than the statewide contribution in ESOO 2024 Central (2.3%)
  - KLO-021 and ST-012 have very strong jumps from 2024 historicals to the 2025 forecast. Jemena has noted that significant HV feeder reconfiguration has occurred as part of its COO/KLO REFCL and the reconfigure KLO-021 project.
  - For 11 of the 49 feeders for which Jemena has provided demand component breakdown, the sum of the individual components of demand (native, block load, EV, PV, ESS, electrification) do not sum to the total demand. This is the case for 5 of the 6 feeders (plotted to the right) forecast to have unserved energy in the business case. Notably KL-021 and ST-012 – the same feeders that have large jumps from historical MD figures– have significantly higher reported MD relative to the sum of their components.

Comparison of MD forecast with individual MD components (MVA)



Source: Baringa analysis of IR27 Q3 supporting data

Jemena's demand forecast has calculation errors and relies heavily on uptake of block loads.

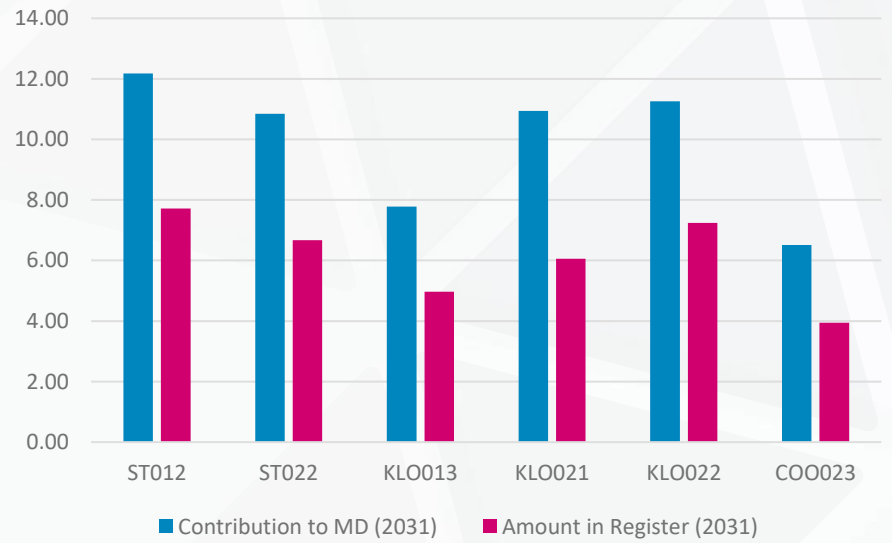
Assessment findings

- Jemena has provided the list of block loads at each feeder. It is difficult to determine the certainty of all block load and its uptake profile given the data provided, however a significant portion of the loads have already been connected and are assumed to take up load over time. For example, customers with connection dates as old as 2020 are still assumed to be taking up new load in the forecast, without evidence that there is spare capacity on these connections.
- We note it's important to have internal consistency between capex and capital contribution forecasts to avoid the potential for under- or over-recovery of capex. It is unclear whether the load ramp-up forecasts in the 2026-31 period for connections made in the 2021-26 align with ramp-up forecasts used in the 'incremental revenue' calculation at the time of connection. To the extent these differ, that would create the potential for under- or over-recovery by Jemena.
- The MW numbers for block loads included in the forecast MD are 60% higher than the total diversified MD in the list of block load (see chart to the right).
- KLO potentially double-counts its largest block load, having two entries with the exact same project address, construction date and estimated load.
- In Jemena's worked example for organic growth rates (IR27, Q9), the maximum organic growth rate applied is said to be 3%, which is approached gradually from 2025 to 2031. We note KLO-13 does not follow this annual pattern (as per table to the right). We note that some feeders are reaching annual native demand growth rates far exceeding 3%, e.g. KLO-22 reaching 6.7% in 2031 (as per table to the right).

Comparison of reported organic growth rates with native demand growth

	2026	2027	2028	2029	2030	2031
KLO-13 Summer Native Growth (Baringa Calculated)[1]	-1.4%	-0.1%	0.9%	1.0%	2.7%	3.0%
KLO-13 Organic Growth (IR27 Q9)	0.6%	0.9%	1.2%	1.5%	3.0%	3.0%
KLO-22 Winter Native Growth (Baringa Calculated)	2.9%	3.2%	3.8%	4.3%	6.0%	6.7%

MD contribution of block loads versus diversified block load total (MVA)



Source: Baringa analysis of IR27 Q3 supporting data

Plans to update demand forecasts for changes in external data

Instead of using AEMO's Feb 2025 IASR update, Jemena should update to the latest information available which will be July 2025 IASR plus any further updates in ESOO.

Key data sources (Jan 2025 initial proposal)	**Jemena's plans to update its forecast** (Dec 2025 revised proposal)	**Our assessment**
August 2024 IASR *CER Uptakes, EV profile*	• February 2025 AEMO IASR update	• Jemena should update their forecast inputs to align to AEMO's ESOO. Noting that AEMO's 2025 IASR is used as inputs for their 2025 ESOO. • There should be adequate time for Jemena to update to Final IASR 2025 (July 2025) before the revised proposal. • Jemena should ensure their max demand forecast in their revised proposal includes the 2024/2025 weather year. • Jemena has noted the update major customer forecast has 'sizable impact' on max demand forecast but did not provide any further details
Historical Network Data (Does not include Summer 2024/25)	• Historical Network Data (Does not include Summer 2024/25)	
Internal major customer forecast (Aug 2024)	• Updated internal major customer forecast (May 2025)	

Timing	Milestone
2025 January	DNSPs submitted Proposals
2025 February	AEMO published Draft IASR 2025 **(window opened to re-run forecasts based on this assumptions set)**
2025 June	**Jemena expects to complete a final max demand forecast by end of June**
2025 July	AEMO to publish Final IASR 2025
2025 September	AER publishes Draft Determination
Window to re-run demand forecasts for feedback and update proposals	
2025 December	DNSPs submit Revised Proposals
2026 April	AER publishes Final Determination

* The Draft IASR 2025 includes higher electrification but, lower PV, EV, and higher energy efficiency.

Data centres

Data centres (DC) have a range of criteria for site selection. Typically, they prioritise speed to network connect, though also consider potential to upsize.

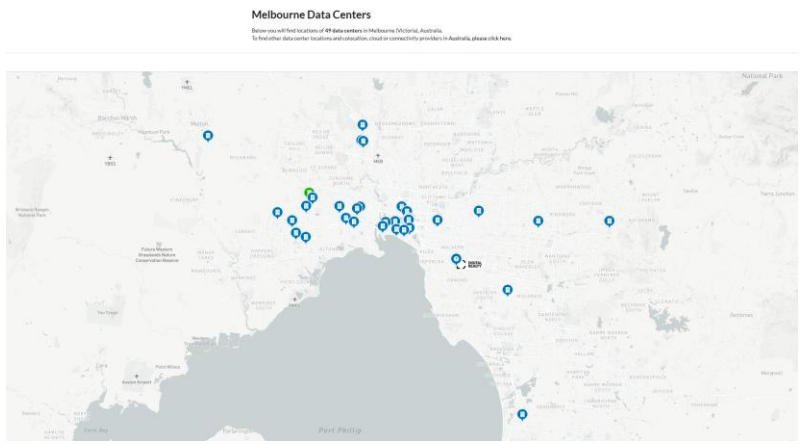
Site assessment criteria		Definition	Impact
	Speed to network connection	Locations that are able to accelerate connection to the network with simple processes can address development and commercial risk	Development timeline and cost
	Power capacity and availability	Capacity and availability of network connection and future network configuration options to upsize (feasibility of dual power supply)	Size, development timeline, resiliency
	Proximity to end users	Distance to the end users of DC services (population concentration, private/public sector customer demand)	Latency and cost
	Proximity to fibre	Distance to high-speed cables for data transmission (proximity to fibre providers, accessibility to cable landing stations)	Resiliency and latency
	Availability of internet service providers	Number and variety of ISPs offering services such as broadband in the area	Latency
	Proximity to other DCs	Distance to other operational DCs	Resiliency, disaster recovery
	Security and compliance	Adherence to regulatory standards and level of protection against physical and cyber threats	Compliance, safety
	Physical risk minimisation	Exposure of the site to environmental hazards, e.g., flight paths, flood risk, earthquake, hurricane	Safety, losses
	Site accessibility	Distance to an airport or port for shipping of hardware, roads for construction and maintenance, and a supply of skilled labour	Ease of operations

DCs are a rapidly growing sector, driven by increased appetite for cloud computing and AI-based applications, and are seeking distribution connections.

Different types of data centres

Edge	Colocation	Hyperscale
Smaller facilities usually with a capacity of less than 10MW, often placed near end-users	Provision of shared DC infrastructure and IT systems rented out for tenants	Large capacity of usually greater than 100MW, and supports major cloud services and extensive operations

Current DC siting map in Victoria*



Source: *Retrieved May 7, 2025 from Melbourne Data Centers

Commentary

The network connection needs differ amongst DC project types

- A key consideration on siting is available network capacity, as proponents will find more commercial attractiveness in speed-to-connect to the network as well as the ease of opportunity to scale.
- Proponents are typically focused in metropolitan areas to reduce latency (the time delay of data between device and data centre). Regional areas might be considered but only for some types of DCs and if there are very favourable network conditions.
- DCs typically have a ramp-up period (potentially as long as 10 years) where they will be operating below full load and right-sizing of network connection can be later updated.

The decision to connect to the distribution or transmission network

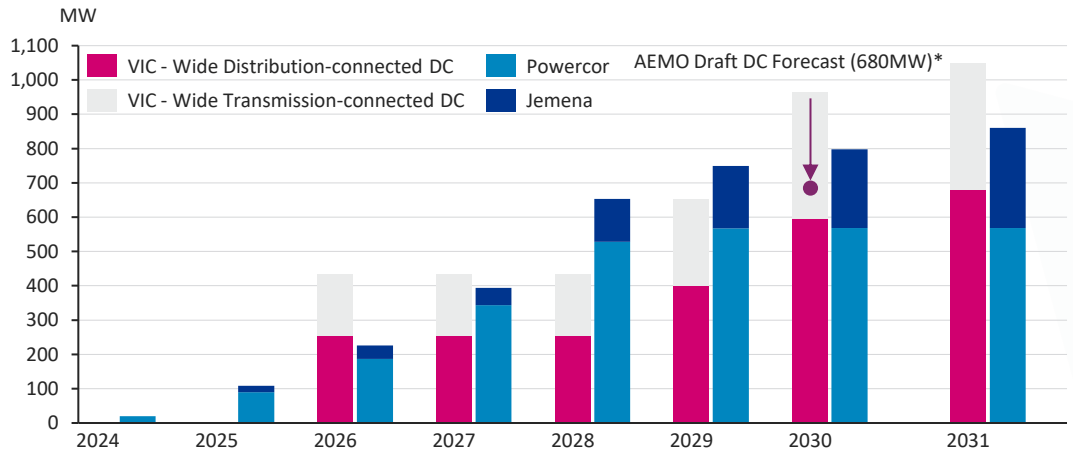
- DCs connected to the distribution network are typically edge facilities, allowing them to be close to end users, however, they can also be co-location facilities under certain circumstances.
- Conversely, hyperscale DCs typically require transmission connections due to the need for progressively scalable consumption over time and high reliability requirements.

Near-term DC siting

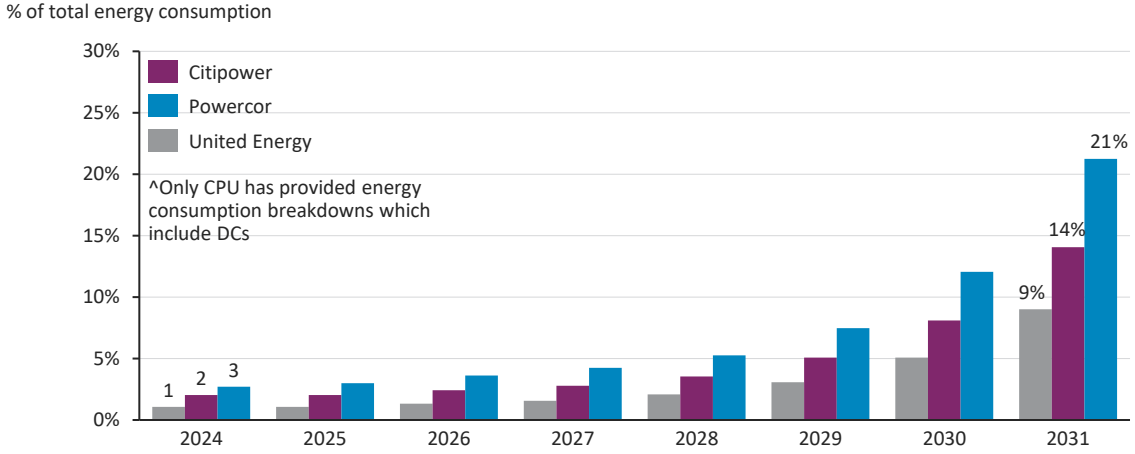
- The focus for the initial tranche of new DCs (expected during forthcoming regulatory period) will likely be siting in high density metropolitan areas, as they will service streaming services that require fast broadband and limited latency.
- The current locations of DCs support this underlying need to sit within a ‘cloud availability zone’. That is, within proximity of the end-user population and typically close to existing infrastructure.

The maximum demand forecast for data centres from Jemena and Powercor is 27% higher than Baringa's estimates for distribution connected data centres.

Analysis of DC contribution to system-level maximum demand by DNSP



DC contribution to energy consumption by DNSP^



Commentary

- Baringa has developed a preliminary view on a potential pipeline for DC demand growth as of June 2025. **This bottom-up estimate is based on public information and limited market testing**. Our estimate has some alignment with and incorporates AEMO's latest draft publication and so provides a useful starting point.*
- Our analysis indicates that over the 2026-31 regulatory control period, Jemena and Powercor's DC demand forecast is broadly similar to our forecast for **the entirety of Victoria** which includes both transmission and distribution connections, whereas their forecast is distribution only. We note that timing is subjective and based on the best available information, but we also recognise there is a high degree of similarity between the distribution level forecasts for the first years of the regulatory period.
- However, we consider that there will be a proportion of DCs connecting to the transmission network given their projected capacity requirements. While there will be DCs that may initially connect at the distribution-level, they may also at a later stage uprate their connection and consider switching to a transmission-level connection should they require further capacity upgrades (i.e. all DCs in the DNSPs forecasts may not remain at the distribution-level).
- Therefore, our benchmarking view is that Jemena and Powercor are proposing an optimistic and high estimate of their incoming DC pipeline and their appropriate network connection requirements.

Baringa bottom-up DC estimate assumptions:

- Projects <10MW are edge DCs connecting into the distribution network,
- Projects between 10-100MW with a weighting towards distribution
- Projects >100MW are hyperscale facilities with a 50% probability applied to transmission or distribution

Source: Draft 2025 Data Centre forecasts presentation, Oxford Economics, AEMO, April 2025. AEMO also acknowledge DCs have the potential to contribute towards significant growth in future demand. In its latest draft ESOO, DC demand growth in Melbourne is approximately 680MW by 2030. Our current view is slightly lower at 597MW, as AEMO has applied future demand weighting.

Jemena's probability-weighted approach to data centre demand is more subjective than other DNSPs, however it is unclear how it is included in their top-down forecast.

Jemena's methodology for DCs for demand and consumption

Scenario	Connection Likelihood	Connection Likelihood (Status)	Initial Load Delay	Ultimate Load Delay	Initial Load Scale	Ultimate Load Scale
Low	100%	1. In Flight	Delay 2 year	Delay 5 year	60%	60%
	50%	2. High	Delay 3 year	Delay 8 year	40%	40%
		3. Medium	Delay 5 year	Delay 10 year	20%	20%
		4. Low	Abandoned	Abandoned	0%	0%
		5. Unlikely	Abandoned	Abandoned	0%	0%
Base	100%	1. In Flight	Delay 1 year	Delay 3 year	90%	70%
	70%	2. High	Delay 2 year	Delay 5 year	70%	50%
		3. Medium	Delay 3 year	Delay 8 year	50%	30%
		4. Low	Delay 5 year	Delay 10 year	30%	10%
		5. Unlikely	Abandoned	Abandoned	0%	0%
High	100%	1. In Flight	On time	Delay 2 year	100%	100%
	90%	2. High	Delay 1 year	Delay 3 year	80%	80%
		3. Medium	Delay 2 year	Delay 5 year	60%	60%
		4. Low	Delay 3 year	Delay 8 year	40%	40%
		5. Unlikely	Delay 5 year	Delay 10 year	20%	20%

Uptake Scenario	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Customer forecast	0	10	40	40	60	100	100	100	100	100	100
Base	0	0	9	36	36	54	54	54	70	70	70

Delay 1 year x 90% Delay 1 year x 90% Delay 3 years x 70%

Commentary

- Jemena considers *all* block load connection requests (including DCs), irrespective of how advanced the connection process is, as part of their demand forecasting approach. This contrasts to the other DNSPs that consider 'committed and contracted' block loads including DCs in their demand forecasts. Jemena have self-reported a high likelihood of past connection enquiries leading to a signed contract and delivery.[2]
- When considering how block loads are included in their forecast, Jemena adjusts the customer-provided load forecasts and timings based on their own assessment of connection likelihood.
- Jemena uses different categories to identify the likelihood, ranging between 'In-Flight' (customer has a signed connection agreement) or Unlikely (customer is in enquiry phase only). See the LHS.
- Projects deemed less likely see delays to their date of first load and date of full uptake (ultimate load) as well as deratings to the initial and ultimate load. It should be noted that even 'In Flight' block loads typically receive a 30% derating to their ultimate load. Ramp rates for increasing capacity requirements over time are a weighted average of *all* enquiries, rather than committed connections.
- These block loads are included in Jemena's system-level maximum demand forecast (which is produced by Jemena's consultant). However, it is not clear how they are included. That is, they appear to be included as a manual addition to the consultant's system level output which then produces the total contribution to maximum demand, which may overstate demand in areas that do not have DCs as a driver. We note that Jemena's consultant also produces a separate system-level forecast that excludes block loads.
- For Jemena's underlying ('bottom-up') demand forecast, only existing block loads are included. That is, only known DCs are included and expected/forecast DCs are excluded.

Source: (1) JEN – RIN – Support – Major Customers – Forecast Methodology – 20250131, p. 15; (2) JEN – Att B-01 – Unforeseen event expenditure – 20241015 (from 2021-26 capex reopener application). P. 19

The magnitude of data centres connecting to the Jemena network is material and clear supporting documentation of all applications is required to address concern.

Assessment findings

	Materiality	Reasonableness	Concern
Max/min	●	●	Significant concern
Energy	●	●	Significant concern

Jemena's data centre connection checklist (excerpt)

Ultimate Maximum Demand (MD) calculations	
1	Total Site Maximum
2	Please specify the basis of calculation
	(such as X kW/m2 for each type of load)
3	Details of equipment contributing to the MD and detailed breakdown:
	IT load (kW)
	Cooling load (kW)
	Lighting load (kW)
	Other load type (kW)
4	Estimated Peak Power Usage effectiveness PUE
5	Load Diversity assumptions (%)
6	Anticipated power factor during maximum demand
Site Load Profile Information – *Jemena will require a separate document detailing the below.*	
1	Forecast annual coincident maximum demand load up take at least over the next 10 years (summer and winter)
2	Forecast annual coincident minimum demand at least over the next 10 years (summer and winter)
3	Estimated annual energy consumption (please specify the basis of calculation)
4	Load profile to show how the electricity usage fluctuates over 24 hr period during typical summer and winter day

Commentary

- Jemena's probability-weighted approach results in low and unlikely connections still providing a minor contribution to the demand forecast. In order to be satisfied that these customers will proceed, we have sought further detail on what information Jemena requests from prospective data centre connections as evidence. Information on connection process status we would expect to see closer to commercial operation dates include (but are not limited to):
  - Land acquisition
  - Feasibility studies
  - Financial approvals
- This information was not produced during our review process. We have therefore relied on existing documentation that Jemena has referenced to support their inclusion in the forecast. For later years of the regulatory period, a probability-based approach in principle is reasonable and used in other parts of the regulatory submission. Jemena must establish credible assumptions for this approach and/or consider excluding from the forecast and including as contingent project instead to better represent certainty.
- The approach could benefit from a more detailed description on how demand, and risks are managed and mitigated throughout the forecasting process. Reliance on customer enquiries absent detailed contracted project assessments may lead to overestimating broader market trends. Specific contingency plans for potential delays or cost overruns should be considered as these impacts will be lagged. While ample opportunity has been provided, it is possible that further information could allay some of the concerns.
- Given the materiality and uncertainty on demand and expenditure, a more reasonable approach would be to only include the high likelihood connections in the early years of the period, with more speculative connections (Low or Unlikely) excluded. To address materiality and uncertainty concerns, the contingent project assessment process may be a useful mechanism for the AER to consider for data centres.

Source: JEN – Att B-01 – Unforeseen event expenditure – 20241015 (from 2021-26 capex reopener application).

Appendix

Abbreviations and Technical glossary

Note: This section is identical across all reports.

Technical glossary

Term	Definition
Block loads	Customers that drive significant step changes in loads, e.g. data centres, apartments.
Bootstrapped weather year	A synthetic weather year created by resampling weather data from historical records to simulate a range of plausible weather conditions.
Consumption/Energy Forecast	In the context of this review, consumption/energy forecast is the DNSP's forecast of energy volume summed across a measurement period (typically year or month). This contrasts to max/min demand, which is the maximum/minimum interval reading across a measurement period.
Gas electrification	The process of replacing gas appliances and industrial processes with electrical equivalents, e.g. electric stoves, heat pumps.
Historical data use	Approach to incorporating historical data into the forecast
Monte-Carlo Simulation	An approach that uses repeated random sampling to approximate numerical results. It leverages randomness to estimate solutions.
Native Demand Forecasting	In the context of this review, the approach to forecasting demand based on traditional drivers, e.g. population and consumption per customer, in contrast to technology-driven demand growth, e.g. electric vehicles and rooftop solar
Post modelling adjustments	Manual adjustments to a forecast made outside of the core forecasting model.
Profile Creation	The process of generating interval level, e.g. charging profile for an electric vehicle, generation profile for rooftop solar.
Scenario use and sensitivities	The DNSP's selection and usage of base and alternative scenarios and whether they run any sensitivities to the base scenario.
Spatial disaggregation	Approach to mapping system-level demand drivers to the level of network elements, e.g. Feeders, Zone Substations.
Spatial Pop Forecast	Approach to applying population forecasts at the level of network elements, e.g. Feeders, Zone Substations.
Technological uptake	Demand growth driven by customers deploying Consumer Energy Resources, e.g. electric vehicles, rooftop solar, BtM batteries
Weather normalisation	The approach to adjusting demand data to account for weather variability and extreme events to allow for better evaluation of demand trends.

Abbreviations

Term	Definition
ABS	Australian Bureau of Statistics
AEMO	Australian Energy Market Operator
AGIG	Australian Gas Infrastructure Group
AMI	Advanced metering infrastructure
ARIMA	Autoregressive integrated moving average, a type of predictive statistical model
BtM	Behind-the-meter
BESS	Battery energy storage systems
BNN	Bayesian neural network
CER	Consumer energy resources
CIC	Customer initiated capital
CPI	Consumer Price Index
CPU	In the context of this report, Citipower, Powercor, United Energy
DC	In the context of this report, a data centre
DCCEW	Department of Climate Change, Energy, the Environment and Water
DELWP	Department of Environment, Land, Water and Planning
DNSP	Distribution network service provider
DoT	Department of Transport
ERA5	Fifth generation of ECMWF (European Centre for Medium-range Weather Forecasts) Atmospheric Reanalysis of the Global Climate
ESOO/GSOO	Electricity Statement of Opportunities/Gas Statement of Opportunities
EV	Electric vehicles
GAM	Generalised additive model
GSP	Gross state product

Abbreviations

Term	Definition
HDD/CDD	Heating degree days/cooling degree days
HV/LV	High voltage/low voltage
IASR	Inputs, Assumptions and Scenarios Report
ISP	Integrated System Plan
NPI	National Pollutant Inventory
POE	Probability of exceedance
PV	Photovoltaic
SA2	Statistical areas Level 2
VIF	Victoria in Future
ZSS	Zone substation