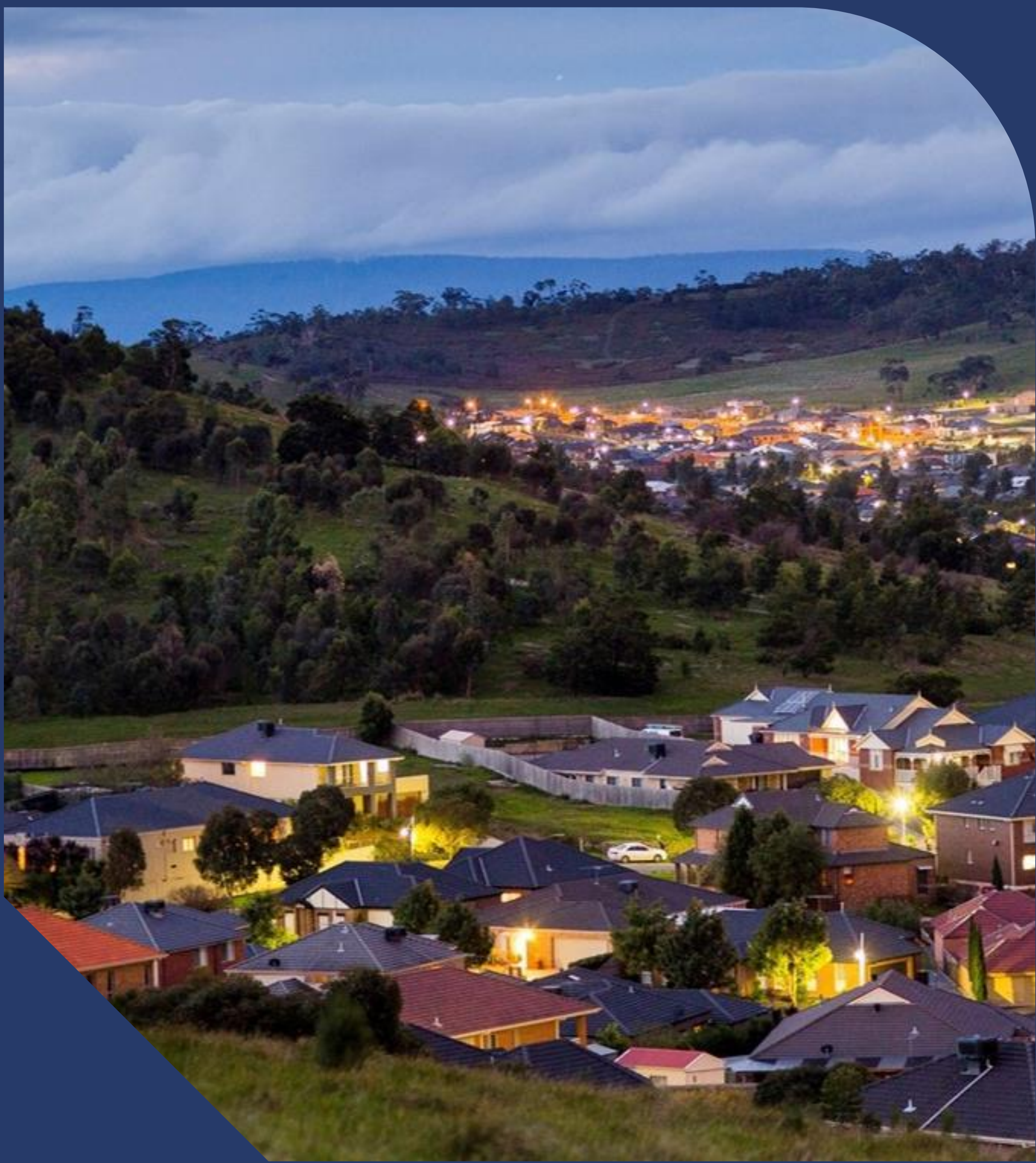
Electricity Distribution Price Review (EDPR 2026-31)

Business case: Demand Driven Augmentation in the LV Network & Flexible Services

Revised Proposal

Date: 1 December 2025



AusNet

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1. Executive summary

This business case presents AusNet's proposed investment plans to facilitate maximum demand growth across AusNet's existing low voltage (LV) and single wire earth return (SWER) distribution network, driven by electrification of transport and gas, particularly for homes and small businesses. Electrification is expected to grow rapidly over the 2026-31 regulatory period, driven by government policies to reduce emission reductions and increase the penetration of renewable energy. Table 1 (below) summarises key trends in customer growth and the electrification of homes and transport estimated for AusNet during 2026-31.

Table 1: Forecast Electrification Rates for AusNet, 2026-31

Customer type	2026	2031	% growth
All electric homes only	**265,621**	**533,713**	**101%**
Electric vehicles	**57,205**	**275,199**	**381%**

Source: AusNet

This business case outlines a program of work to economically reduce expected unserved energy (EUE) for customers in the existing LV and SWER networks, resulting from an increase in maximum demand from electrification. The program includes a combination of network augmentation and third-party flexible services (a type of non-network solution). Investment plans at the high-voltage (HV) distribution feeder, zone substation, and sub-transmission networks in response to electrification and maximum demand growth in general, are detailed in separate business cases.

Without the planned program of work, increasing demand in existing networks would lead to network asset import limitations in some areas, resulting in reliability impacts for customers. This includes the need to implement load shedding to ensure AusNet's assets operate within their thermal ratings and maintain voltages within the limits specified by the Electricity Distribution Code of Practice (EDCOP). Load shedding reduces supply availability for customers and can affect service continuity, particularly during periods of extreme ambient temperatures. Many of AusNet's LV and SWER network were designed and built for lower capacity connections and have been increasingly utilised by new demand from the electrification of gas and transport.

A proportion of our distribution substations and SWER lines are expected to be at risk of overload over 2026-31, particularly during 5pm to 9pm on days of extreme high or low ambient temperature. The network assets most at risk are those that are already highly utilised (or overloaded) at times of maximum demand, which were originally designed for lower demand patterns. This represents 14% of our distribution substation population and 43% of our SWER population. The limitations on these highly utilised assets are expected to worsen over the next regulatory control period, and additional sites will become constrained without further investment. Rising levels of electrification will increase these pressures, reducing reliability and quality of supply for affected customers.

AusNet have engaged with the Future Network Panel and the Coordination Group on AusNet's augmentation program for the LV network and SWER. Both the Future Network Panel and the Coordination Group supported AusNet investing to enable customers to electrify their homes and vehicles, based on AusNet's value of customer reliability (VCR), as well as AusNet considering a demand management program to incentivise non-network solutions as part of the investment program.

The preferred planned program of work is a proactive program which is specifically targeted at addressing network limitations that impact customer's reliability, needed in response to the growing maximum demand expected from increased electrification. Three options are considered in addition to the do nothing case which are targeted at mitigating EUE in the LV distribution substation and SWER networks, these being:

- **Do nothing**—no expenditure on addressing network limitations that impact customer reliability.
- **Option 1**—economic probabilistic planning approach to minimise the reliability impact of network import limitations on customers, by selecting network augmentation projects that have a positive net present value (NPV).
- **Option 2**—economic probabilistic planning approach to minimise the reliability impact of network import limitations on customers, by selecting an efficient mix of network augmentation and non-network flexible services that have a positive NPV.
- **Option 3**—deterministic planning approach to remove all EUE risk from the network using network augmentation projects.

AusNet proposes Option 2 at a total cost of $106.8 million (real, $June 2024) over the 2026-31 regulatory period, which represents a prudent and efficient investment to address the impacts of electrification. Applying a discount rate of 5.56% per annum, this proposed program option has a net economic benefit of $1,457 million (real, $June 2024) over the 20-year assessment period as shown in Table 2. The capex requirement for Option 2 is $104.3 million.

Table 2: Economic Evaluation of the Options ($m, $June 2024)

	FY27 to FY31 (undiscounted)			Full assessment period (discounted)			Comments
	Capex	Opex	Total cost	Total cost	Total benefits	NPV	
Do nothing	0.0	0.0	0.0	0.0	0.0[1]	0.0	This option does not address the identified need
Option 1 – Economic network augmentation	121.2	2.6	123.9	(115.7)	1,559	1,444	This is not the preferred option as it is not least cost
Option 2 – Economic network augmentation and flexible services	104.3	2.4	106.8	(100.2)	1,558	1,457	This is the preferred option as it maximises the NPV
Option 3 – Deterministic augmentation	502.5	10.0	512.5	(474.9)	2,038	1,563	This is the most expensive option

Source: AusNet analysis (relative to the base case of do nothing)

Over the 2026-31 regulatory control period, for an Option 2 investment, the amount expected unserved energy is expected be:

- 522 MWh pa lower for distribution substations.
- 128 MWh pa lower for SWER lines.

[1] The present value of total risk of EUE, is valued at $2,189 million over the analysis period (30th June 2024 dollars). Refer Table 6

2. Background

2.1. Electrification trends in Victoria

Electrification of gas and transport is expected to grow rapidly during the 2026-31 regulatory period, driven by market changes and government policy. Figure 1 summarises the trends expected in both electrification and installations of solar, comparing historical levels with the forecast out to 2050.

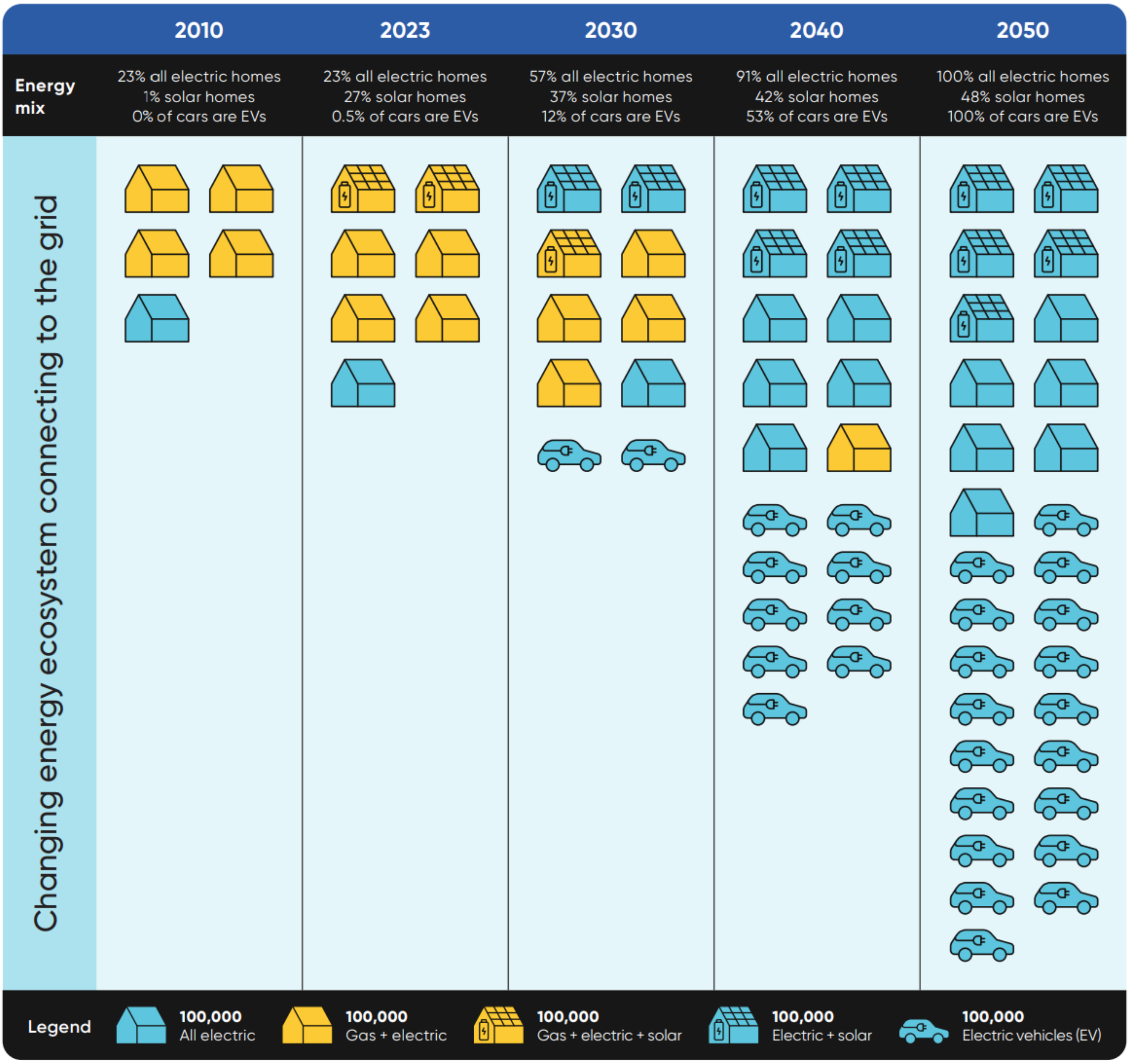

Figure 1: Historical and Forecast Customer Trends in AusNet's Network, 2010 to 2050

Source: AusNet.

The trends shown in Figure 1 are derived from independent sources including:

- Household number forecasts are based on the 2023 Victorian Government's Victoria in Future (VIF) five-yearly forecasts of population, using the 'Victoria in Future Small Areas' data set.
- All other forecasts are based on AEMO's 2024 ISP inputs for Victoria, extrapolated for AusNet's network.

Electrification is accelerating in both new and existing homes, driven largely by electric vehicle adoption among customers. As households replace gas appliances and add electric transport, demand on the network will rise significantly, placing strain on assets that were not designed for consistent high demand levels.

Without targeted augmentation, the LV network will become a major constraint on Victoria's decarbonisation and electrification goals. Growth in residential solar, batteries, EVs, and electric appliances, driven by strong policy and subsidies, including battery rebates will accelerate through the late 2020s. If upgrades do not keep pace, customers will face voltage issues, connection delays, and export limits, reducing the value of their investments.

A "no-investment" approach also undermines system-wide CER benefits. Our planning assumes deferring traditional augmentation via flexibility services and orchestration markets, but these cannot function without sufficient hosting capacity, predictability, and visibility. Without this, CER value is lost, peak demand rises, and reliance on gas peaking and emissions increase.

Targeted LV augmentation ensures the network enables electrification rather than constrains it. It safeguards reliability, preserves CER value, aligns with decarbonisation objectives, and avoids costly upstream investments. Without these works, the LV network cannot support the speed or scale of electrification expected in the next regulatory period.

2.2. Evolving flexible services market

AusNet are investing in the development of a Distribution System Operator (DSO) operational technology platform and intend to introduce applications with capabilities to support the introduction of Flexible Services for customers for the 2026-31 regulatory control period.

The Flexible Services capabilities aim to provide additional levers for AusNet to continue to support the efficient management of our electricity distribution network, and to address identified network limitations. The capabilities will allow AusNet to address identified network needs using a broader range of solutions (including non-network solutions) than just traditional network augmentations, to deliver lower cost distribution services for customers into the future.

2.2.1. Types of flexible services

Table 3 summarises various types of flexible services that can be utilised to efficiency defer network augmentation. It is important to note that most of the flexible services can be provided by AusNet or third parties.

Table 3: Flexible Services Options

Solution	Description	Advantages	Disadvantages	Applicability as a substitute for network augmentation
Load shedding	Demand-side only solution involving rotational tripping of supply of customers to curtail network load, to maintain the operation of the distribution network within its capabilities.	Proven method for addressing network import limitations. i.e. high use case maturity.	Can result in comparatively high adverse impact on customer supply reliability levels. (i.e., poor customer service outcomes)	Can be used to substitute network augmentation, however not a credible option to resolve reliability risk (this is the 'do nothing' option).
Export limiting	Involves limiting customer exports on the network by curtailing generation, to maintain the operation of the distribution network within its capabilities.	Proven method for addressing network export limitations. i.e. high use case maturity.	Can result in comparatively high adverse impact on customer generation output. (i.e., poor customer service outcomes)	Not suitable as a substitute for addressing maximum demand import limitations.
Dynamic Operating Envelopes (DOE)	Dynamically calculates and publishes the capability of the network to maximise the opportunity for increased customer demand on the network for imports or exports.	Sophisticated allocation of import and export capacity among customers.	Low technical maturity for import management, and low customer appetite at present as impacts on customer daily lives unclear.	Primary use case is for flexible export services. Could be applied for flexible import services, but most customer impacts untested yet.

Supply Capacity Limiting (SCL)	Utilises supply capacity limit function of a smart meter to rotationally trip supply of customers when their load exceeds a defined value. Alternatively, the load contactor of a smart meter can be used to trip downstream loads or generators (separate meter) within the customers' premises.	Relatively low-cost system to implement to manage demand. Reliably delivers the demand reductions required to address the need.	Individual customers may lose supply on a rotational basis, which may have a large impact on their reliability. Understanding supply capacity limits and managing electricity usage accordingly is challenging for customers.	Can be used to substitute network augmentation relating to maximum demand import limitations, however not a credible option to resolve reliability risk.
Behavioural Demand Response (BDR)	Providing near real-time information to a customer via a mobile app or other interface trigger a demand response to an imminent network limitation. The customer has full control over what actions that are taken (if at all) to vary their load or generation.	Provides a high level of flexibility and choice for customers. The solution encourages customer engagement, empowering customers to make informed choices about their energy usage and can lead to permanent behaviour changes.	A critical level of customer participation is needed in aggregate to avoid loss of supply on the network. Customer rewards payments are currently typically lower than customer expectations.	Can be used to substitute network augmentation relating to maximum demand import limitations.
Direct Load Control (DLC)	Involves establishing a communication link direct to customer loads to enable switching of duty-cycle change, thermostat control or other form of load control of large customer appliances that are enrolled into a direct load control scheme. (e.g., electric vehicle, air-conditioning, pool pump and/or storage).	Direct control of high energy consumption appliances can produce larger demand responses than behavioural programs. The solution is easily scalable and likely to have a lower operating costs than behavioural programs.	Customers may override direct load control, or the communication may be inadvertently interrupted. Upfront costs in setup or appliance rebates are required. Less flexibility for customers compared to behavioural programs.	Can be used to substitute network augmentation relating to maximum demand import limitations.
Third-party contracted Virtual Power Plant (VPP)	Virtual power plants are an orchestration of storage, generation, and/or demand response resources (including an aggregation of customer and community storage facilities, solar PV installations, EV charging stations, load control and demand response). They enable a scheduled response, to maintain the operation of the distribution network within its capabilities.	More reliable than other forms of demand response at meeting the need. VPPs participate in energy markets and provide grid services (value stacking) making them potentially more attractive investments than other forms of demand response solutions.	Energy limited or variable resources in the portfolio need to be managed carefully to be able to service an imminent network limitation. Implementing and managing VPPs involves integrating a diverse array of technologies. This complexity can pose challenges for system integration, data security, interoperability, and performance.	Can be used to substitute network augmentation relating to maximum demand import limitations, as well as export limitations.

Source: AusNet analysis

2.3. Customer insights

Customers recognise that electrification is a key trend and expect AusNet to work with government to support policy directions on electrification and solar. AusNet have consulted with the Future Network Panel and the Coordination Group on the impacts of electrification and our proposal to invest in the existing network to enable more homes and businesses to transition from gas to electricity and adopt electric transport. The Future Network Panel and the Coordination Group have supported efficient necessary investment to enable customers to electrify. The way AusNet measure efficiency is basing investment on the VCR.

The Future Network Panel and the Coordination Group have also welcomed the inclusion of a demand management program to incentivise non-network solutions as part of it.

2.4. Purpose and scope

This business cases describes the identified need in relation to addressing the reliability of supply impacts of electrification across the AusNet electricity distribution network at the low-voltage distribution substation and SWER network levels, and present credible options for programs of work that can address the need. This business case quantifies the:

- Current and estimated future levels of EUE across the low-voltage distribution substation and SWER network for each network asset.
- Costs and benefits of potential credible options to mitigate identified network import limitations,
- Forward looking programs of work for implementation in the 2026-31 regulatory control period that ensure that mitigating EUE is undertaken at least lifecycle cost.

The scope of this business case is to mitigate EUE associated with network import limitations driven by electrification at the low-voltage distribution substation and SWER network levels. Augmentation plans for high-voltage distribution feeders, zone substations, and sub-transmission networks in response to electrification and maximum demand growth are addressed in separate business cases. Other related programs with distinct objectives may include projects that overlap with those identified here. To avoid duplication of expenditure, AusNet has excluded any projects already captured in other business cases.

The hierarchy applied for removing duplicate projects from the programs of work is as follows:

- 1st priority – *Demand Driven Augmentation in the LV Network & Flexible Services* (this business case)
- 2nd priority – *CER Enablement*

3. Identified need

3.1. Emerging Network Constraints

3.1.1. Impact of electrification

The impact of electrification is already observable on AusNet electricity and gas distribution networks and the scale of these impacts is expected to continue to accelerate in the 2026-31 period. As shown in Figure 2, AusNet's gas network has seen decreases in residential gas volumes since 2023, with lower average usage per customer which is clear sign of electrification in the Victoria context.

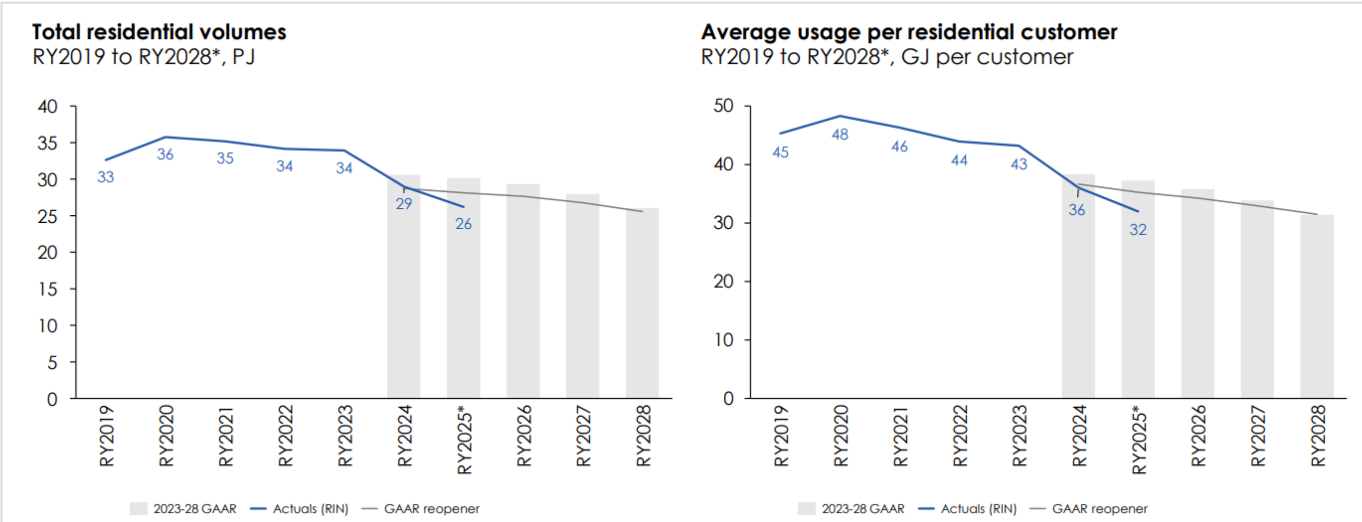

Figure 2: Gas Volumes on AusNet's Network, 2019 to 2028

Note AusNet's gas network covers the West Victoria and Melbourne's inner western suburbs.

Source: AusNet

We have seen increases in peak and average winter electricity demand in the last few years. The per customer increase in peak electricity demand from gas electrification is material, as shown in our recent analysis below. Figure 3 shows this impact in aggregate, from 2022 to 2025, average nighttime peak load on peak winter days for our small customers has increased 23% for small customers on our network. Figure 4 shows an example of impact from full electrification of heating and hot water from a single customer in our Electri-fair-cation trial. This shows the expected impact on evening peak in winter, largely driven gas electrification.

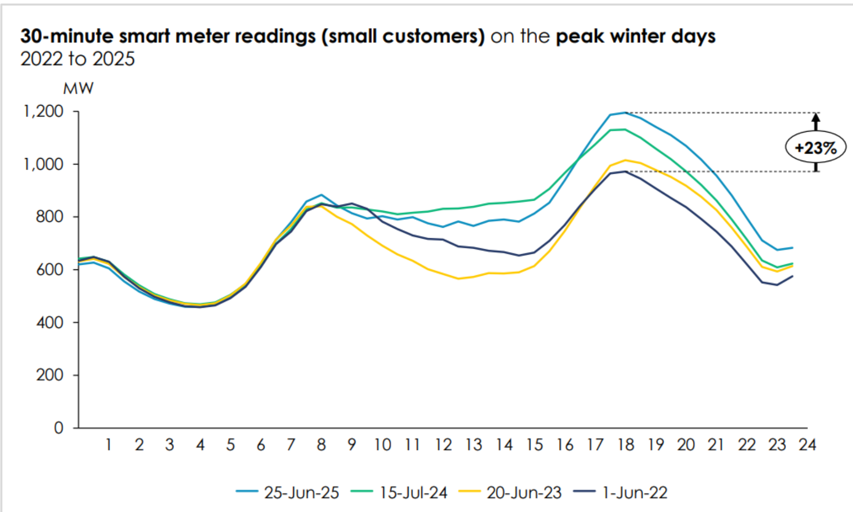

Figure 3: Peaks Loads, Winter Days (2022 to 2025)

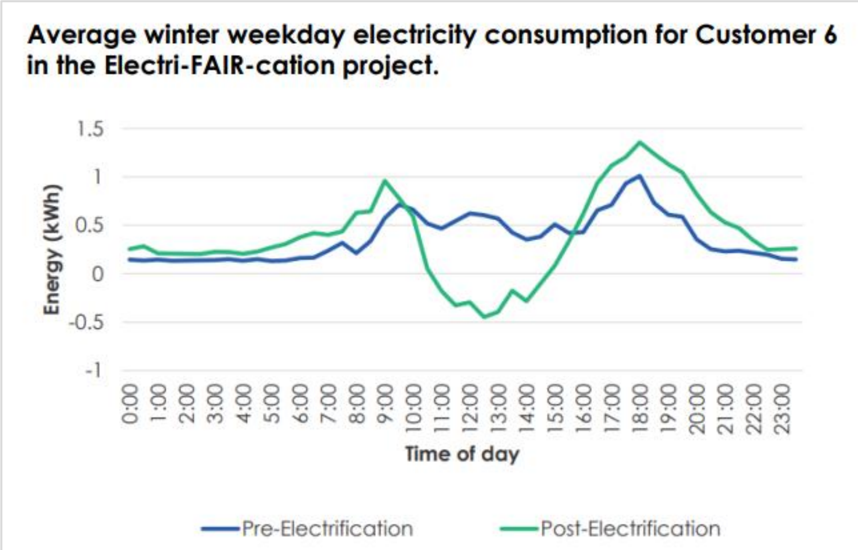

Figure 4: Impact of Electrification (Example Customer)

This customer electrified their gas heating and hot water systems. They also installed a 6.6 kW solar system

Source: AusNet

3.1.2. Lack of load diversity on LV network

Distribution substations (on the LV network) typically serve a small group of customers. Across AusNet's entire network the average number of customers per distribution substation is 14.24 (the median is 2). By comparison, an average zone substation serves 13,364 customers. Because each distribution substation has relatively few customers, modest changes in individual consumption can significantly alter its overall load. For example, if several households adopt high-demand electrification technologies, the substation's utilisation can increase sharply, creating localised capacity challenges sooner than at higher network levels.

As electrification accelerates, evening peak loads on the low-voltage network are rising sharply. As illustrated in Figure 5, a 50% increase in night-time load for just six customers can drive a 25% increase in load on a distribution substation, whereas the same change represents only 0.02% for a zone substation. This disproportionate impact means LV assets experience capacity challenges first, creating constraints and increasing the risk of sustained overloads. These limitations restrict the ability to connect new loads due to electrification.

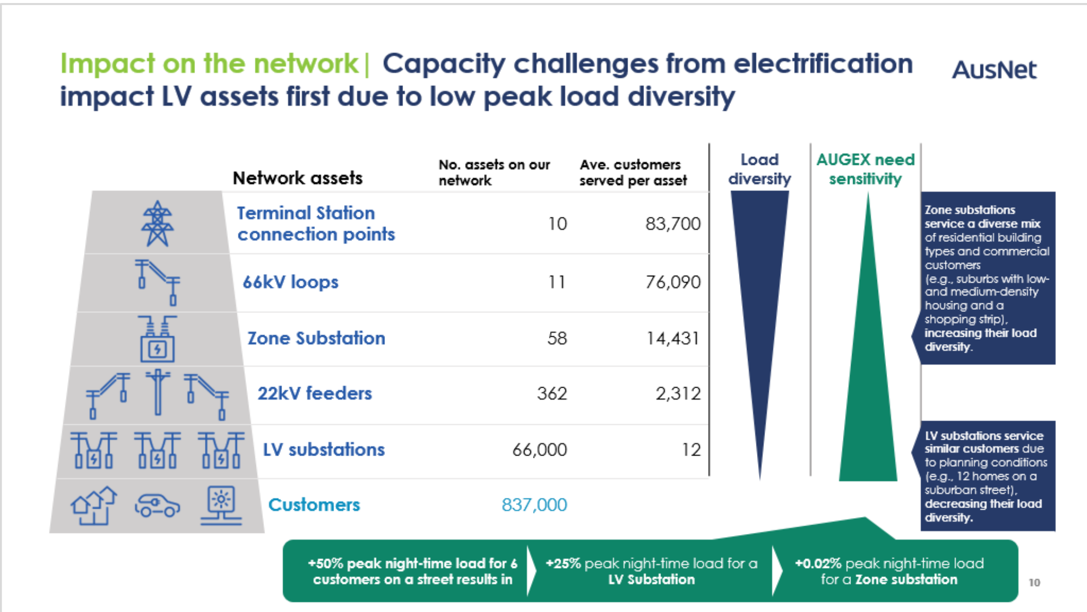

Figure 5: Network Assets and Load Diversity

3.1.3. Current Capacity Gaps in LV Substations

Figure 6 highlights a structural challenge arising from rapid electrification and distributed energy uptake across Victoria. Distribution substations were originally designed for stable residential loads with modest diversity, but the accelerating adoption of electric vehicles, reverse-cycle heating, and rooftop solar has significantly changed consumption patterns. Figure 6 shows the average capacity per customer for substations with five or more customer connections. The median substation provides 4.8kVA per customer - below the current design standard of 5.25kVA and well short of the projected 8kVA required to support future electrification.

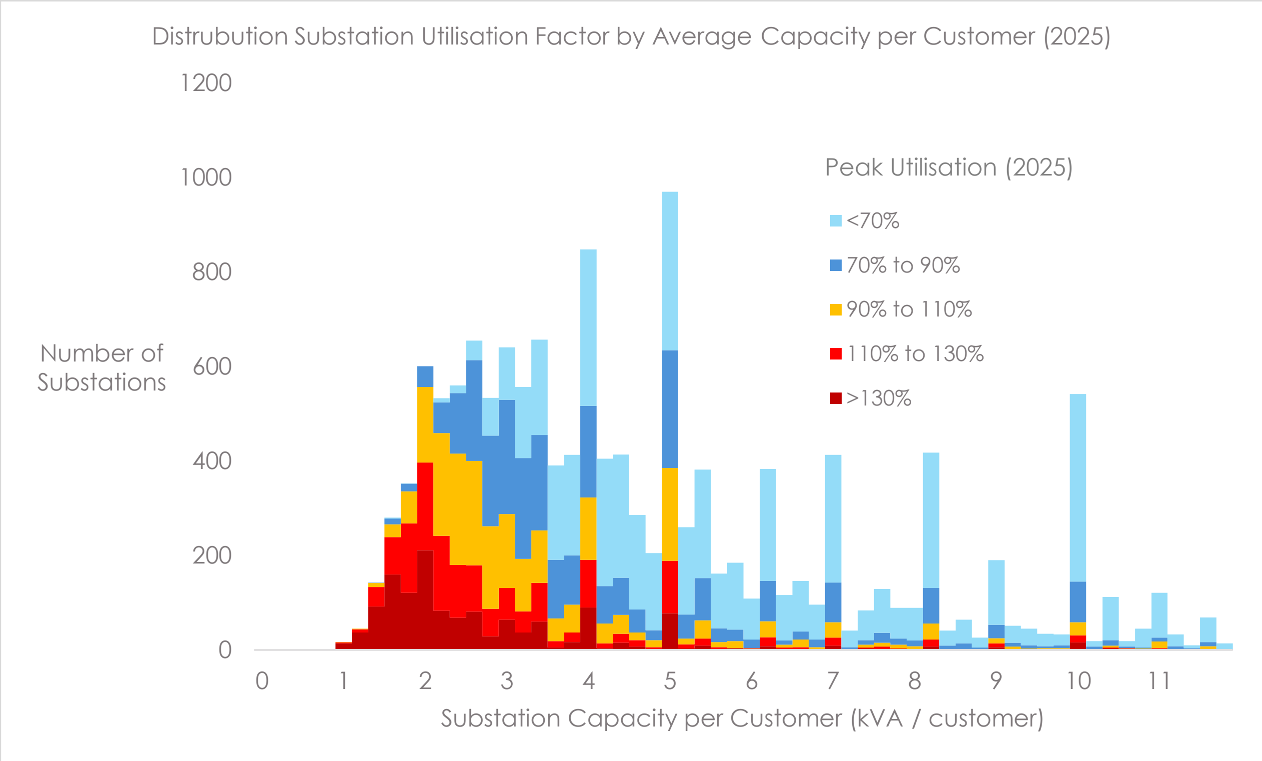

Figure 6: Histogram of Substation Utilisation Factor by Average Capacity per Customer

The concentration of substations operating at or above 130% utilisation (as shown in red) shows the urgency for targeted augmentation. These assets are not isolated anomalies; they represent systemic pressure points that will multiply as electrification accelerates. Without proactive investment, constraints will limit customer connections, increase the risk of sustained overloads, and compromise reliability during peak periods.

Figure 7 shows the distribution of SWER isolating substations throughout the network. The vast majority (77%) of SWER isolators are rated at 100kVA – 28% of which have recorded a maximum demand in excess of 130% its rated capacity (as indicated by the red bars in the figure below).

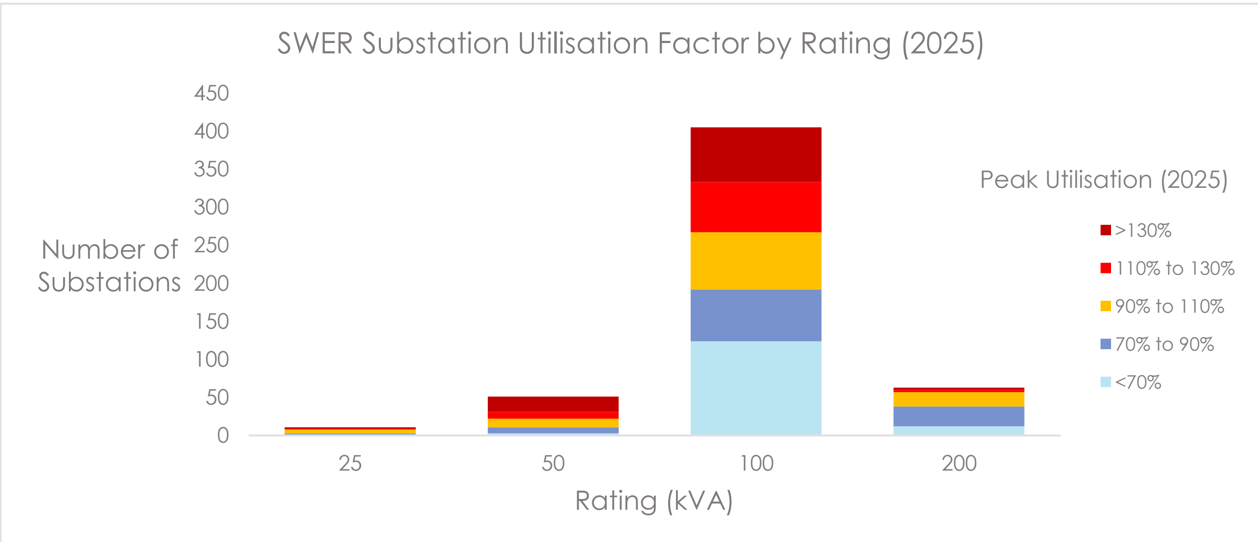

Figure 7: Histogram of SWER Isolating Substation Ratings

Figure 8 shows the cumulative number of lots built in a central region of our network. The blue bars (from 1999 to 2012) were built under 3kVA design standards. After a detrimental summer in 2012, subsequent lots were built under 4kVA design standards (as indicated by the green bars). From mid-2024 the standard for new estates increased to 5.25kVA per lot with space allowed to increase to 8kVA per lot, to accommodate the future impacts of electrification of gas and transport.

While there is uncertainty over the appropriate post-electrification capacity required to be provided by the network. The LV network is vast - including over 66,000 distribution substations - and the majority of these are expected to require capacity upgrades to enable full electrification. Our proposed program is a modest start on this investment task.

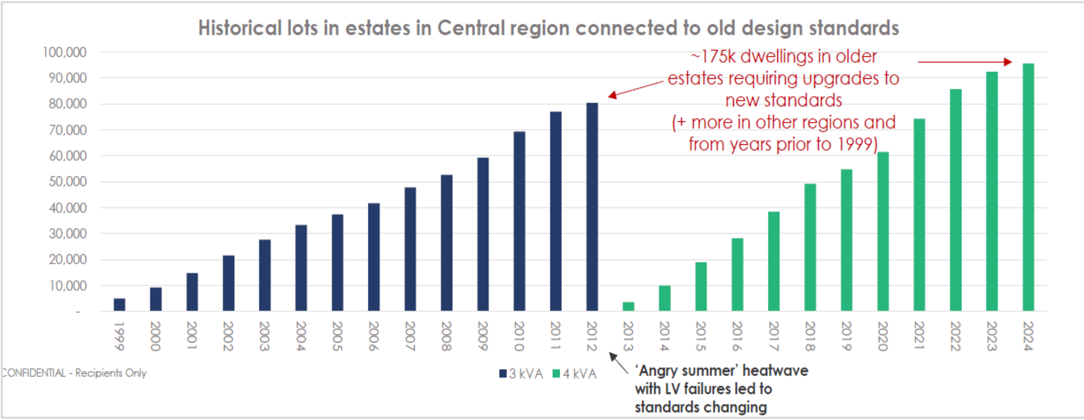

Figure 8: Cumulative Number of Lots Built Under 3kVA Standards (1999 to 2012) and 4kVA Standards (2013 to 2024)

3.1.4. Substation Age Profiles

The age profile of LV substations provides important context for understanding emerging capacity challenges. As shown in Figure 9 (overall LV network), older substations exhibit a higher proportion of assets operating above 110% utilisation. This is expected given historical design standards and decades of incremental load growth.

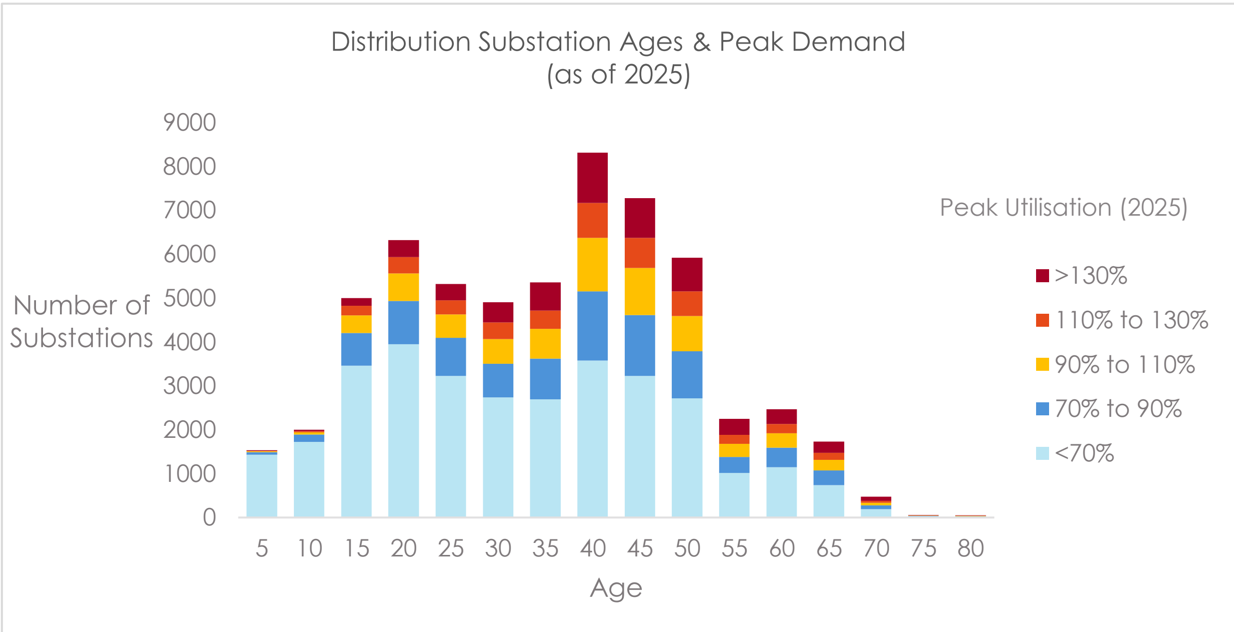

Figure 9: Histogram of Substation Ages (Across the Overall LV Network)

Figure 10 (urban feeders only) reveals a more concerning trend: a significant spike in overloading among substations less than 20 years old, many of which are less than halfway through their typical service life. This pattern suggests that the issue is not simply one of ageing infrastructure; it reflects a fundamental shift in demand dynamics.

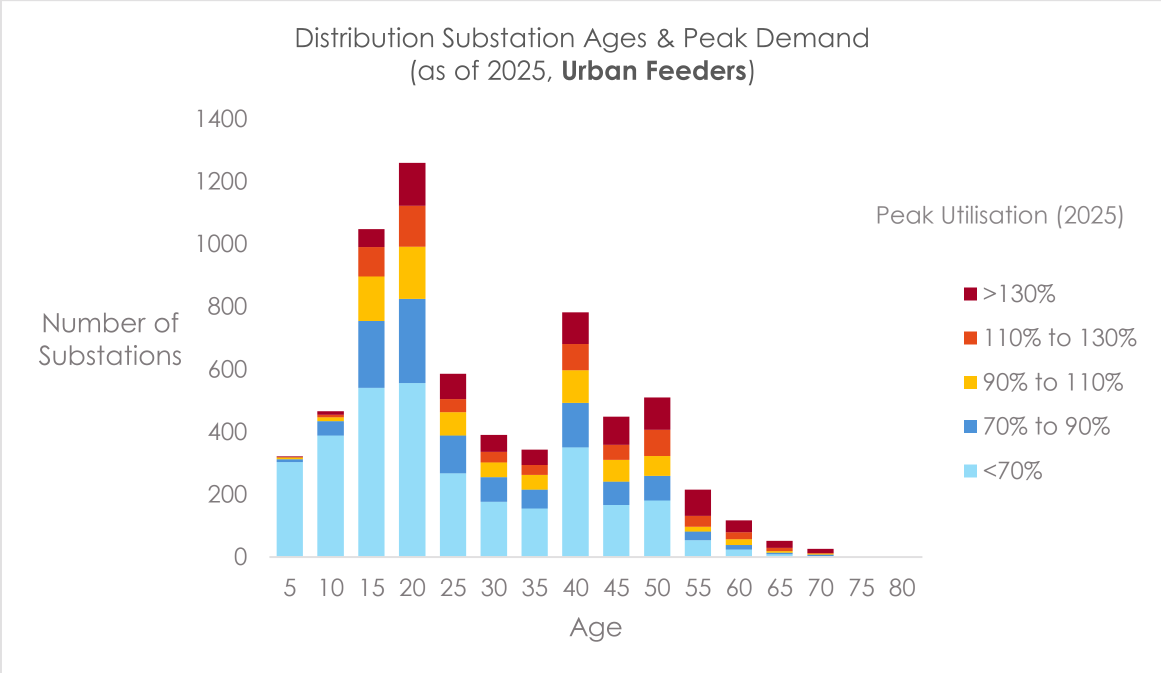

Figure 10: Histogram of Substation Ages (Connected to Urban Feeders Only)

These new peaks are driven by inflexible demands such as heating systems, cooking appliances and air conditioning. These loads cannot be easily shifted without compromising customer comfort. While these assets were fit for purpose when installed, the accelerating transition to a decarbonised economy means they are now under increasing stress, requiring targeted investment to prevent reliability degradation.

3.1.5. Historical Trends in Unserved Energy

An analysis of past outage data was conducted to estimate the quantity of historically unserved energy since FY2018. For each distribution substation outage, a baseline was fitted to the demand profile to estimate what demand would have been, had the outage not occurred. This baseline was used to estimate how much energy went 'unserved' due to the outage. Figure 11 is an illustration of this methodology for a single outage:

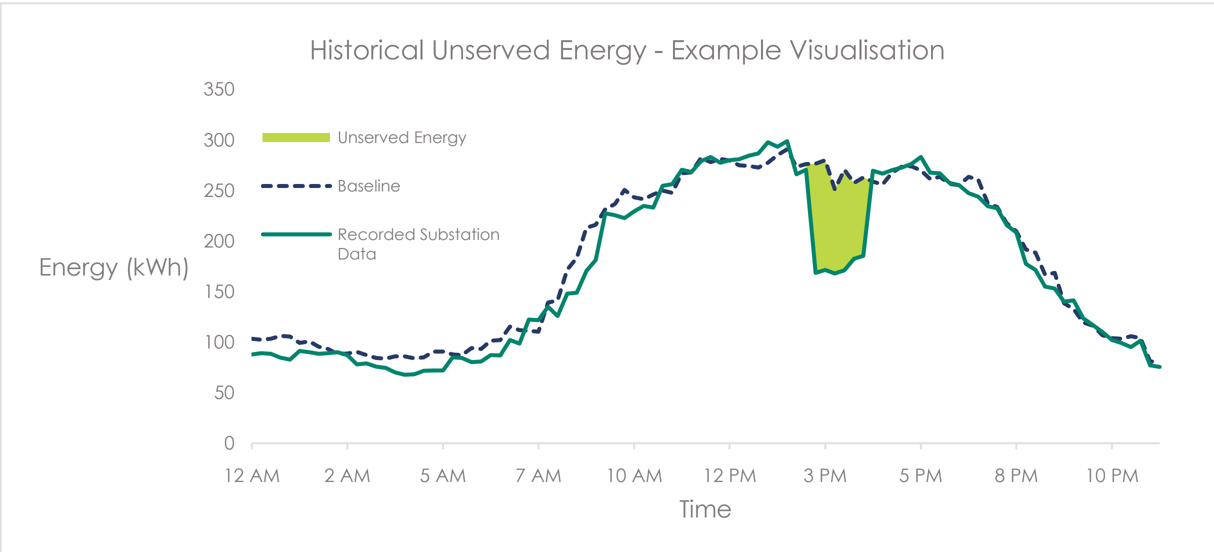

Figure 11: Example Unserved Energy estimation for an LV fuse fault

This process was repeated across all outages to collate the results as shown below. It is evident that much of the unserved energy occurs in summer. Figure 12 shows the impact of outages throughout summer is increasing in severity. In the 2025 Financial year, approximately 174.05 MWh of energy went unserved due to outages resulting from electrical or thermal overloads.

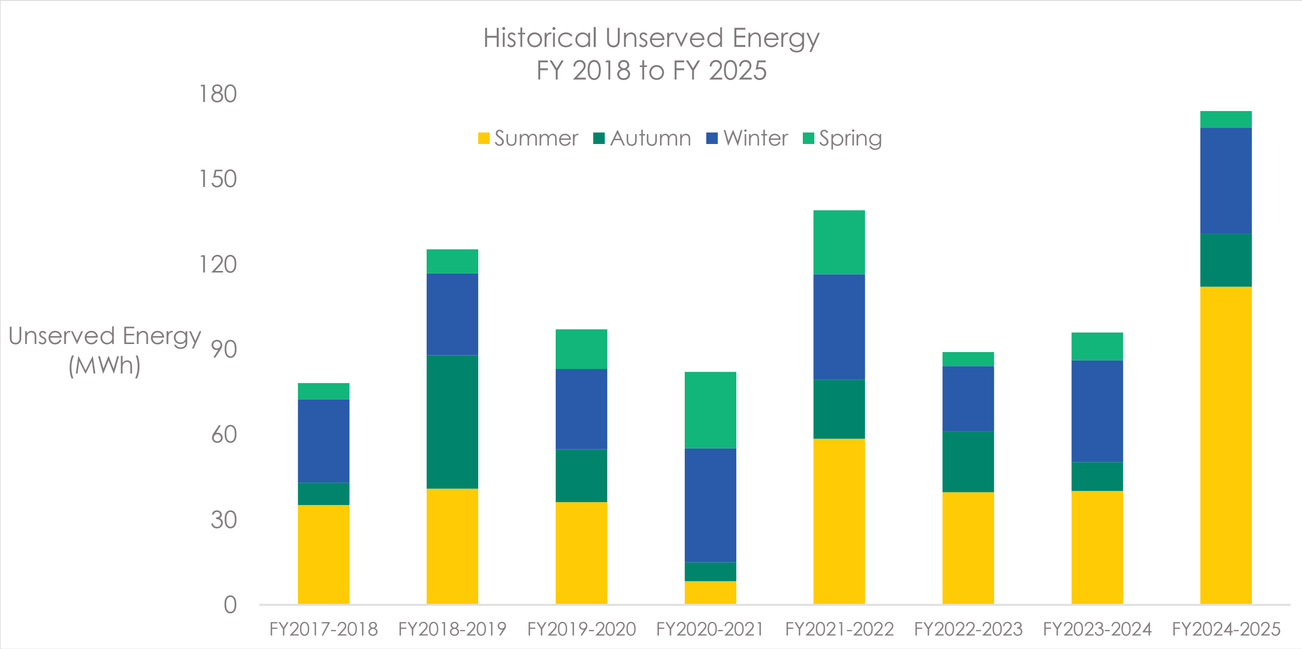

Figure 12: Historical Unserved Energy per Financial Year (Distribution Substations Only)

3.2. Forecast risk profile

With residential EV charging and residential gas substitution starting to grow, a proportion of our distribution substations and SWER lines are expected to be at risk of overload over the next regulatory control period, particularly during 5pm to 9pm on days of extreme high or low ambient temperature. The network assets most at risk are those that are already highly utilised (or overloaded) at times of maximum demand. The limitations on these already highly utilised assets are expected to worsen over the next regulatory control period and additional overloaded sites will emerge without further investment, with the expected levels of electrification, adversely impacting the reliability and quality of supply for our customers affected.

Therefore, for customers electrifying their gas appliances and cars on this subset of highly utilised distribution substations and SWER networks, is likely to result in material detrimental impacts on reliability of supply for all customers in these localised areas of the network.

By the end of the 2026-31 regulatory control period, under a 'do nothing' investment scenario, we expect that there will be an additional 1060 distribution substations within the >110% maximum demand range (an increase of 11.2% from 2025). Table 4 summarises this increase:

Table 4: Number of Distribution Substations Exceeding 110% Rated Capacity

	2025	2031	Percentage Increase
Number of substations exceeding 110% of rated capacity	9,472	10,532	11.2%
Number of customers served by the substations above	168,945	189,029	11.9%

The figures below show forecasted 2031 maximum demand values. The number of distribution substations in the most extreme maximum utilisation range (>130%) has increased by 18.4%. The number of substations within the 110% to 130% range increased by 5%. This demonstrates an increase in levels of overloading by 2031.

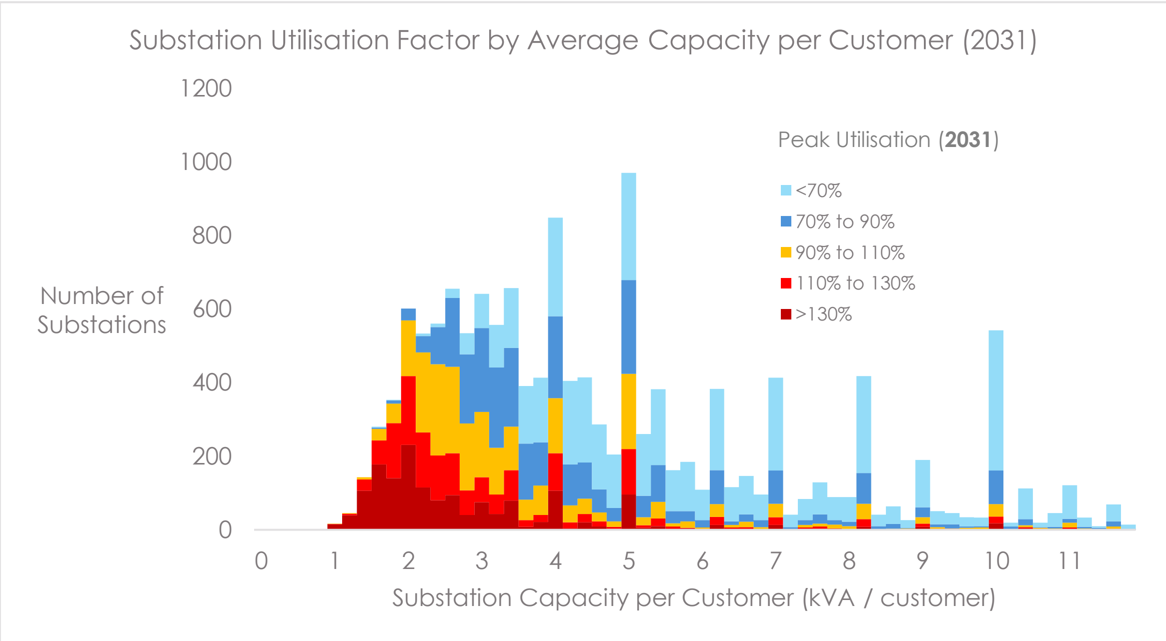

Figure 13: Histogram of Substation Utilisation Factor by Average Capacity per Customer

(Includes only substations with five or more customers) (colours indicate the forecast peak demand, by FY2031)

Similarly, for SWER isolating substations there is an expected 10.8% increase of substations within the >110% range (including a 14.5% increase in substations reaching a peak utilisation above 130%).

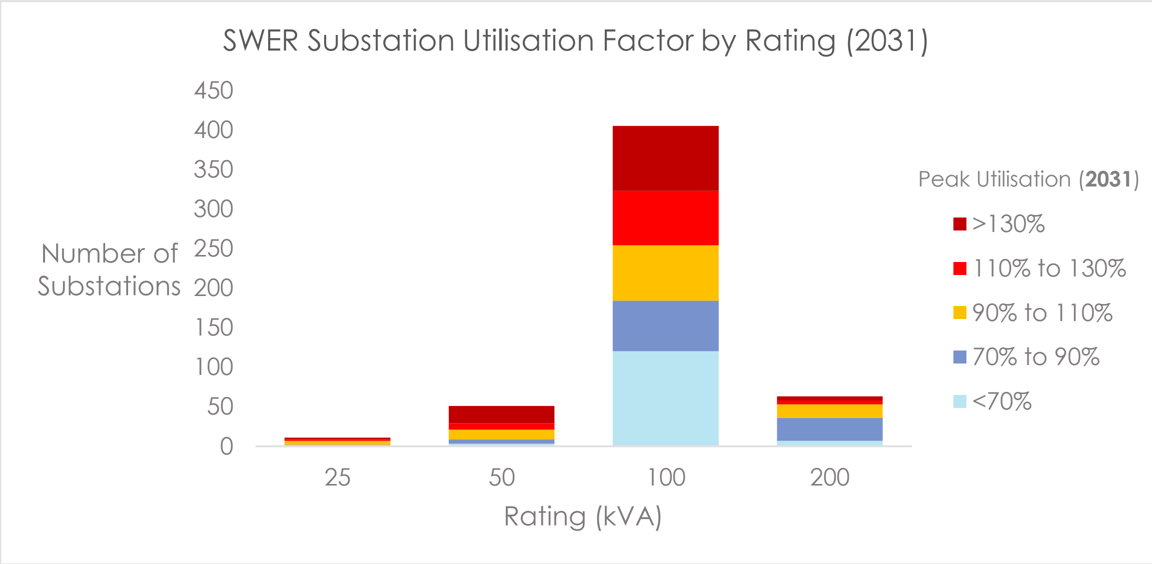

Figure 14: SWER Sub Utilisation by Rating

3.3. Key inputs and assumptions

Key inputs, calculations and assumptions used in this business case are described in detail in AusNet's Hosting capacity and voltage compliance, electrification and CER enablement methodology document. Other key assumptions used in this business case are summarised in Table 5 (below).

Table 5: Key Assumptions

Parameter	Value	Comments
Discount rate	5.56%	Average of 4.11% and AEMO's 2023 IASR central case (7.00%)
Evaluation period	20 years	Benefits calculated for the first 10-years, then maintained from years 11 to 20. No benefits assumed beyond year 20.
Value of customer reliability	Site specific	Using the AER's December 2024 Values of Customer Reliability (VCR), which provide an appropriate methodology for quantifying the value of unserved energy (EUE). The AER-published VCR for each customer class is applied and weighted according to that class's proportion of total electricity consumption.
Unit Rates	Budget estimates	Based on average budget estimates from past projects, adjusted for inflation where applicable. Note that augmentation costs are higher than replacement costs due to additional design requirements and necessary upgrades to supporting structures and connected upstream and downstream assets (e.g., fuses, poles, conductors).

Source: AusNet analysis

3.3.1. Unit Rate assumptions

We have reviewed our unit rate for DSS augmentation to ensure it remains an accurate estimate and have not change the cost input for LV augmentation. Our summer winter readiness estimates have aligned with this unit rate.

The AER has applied a lower unit rate in their summer/winter preparation draft decision. We understand this is based on the replacement rate for a DSS. Replacement and augmentation unit rates for DSS are not interchangeable. Augmentation projects for LV assets have addition drivers which are not capture by a repex rate and therefore these projects have wider and more costly scopes. These can include:

- **Upgrade to a higher capacity transformer**: This includes the additional design required for augmentation projects beyond the replacement rate.
- **Pole replacement**: Replacement of existing poles to support heavier weight of new transformer
- **LV circuit:** Upgrade the low-voltage circuits to support increased capacity which includes upgrading conductors to carry more loads. load balancing between circuits of the affected substation and adjacent substations as required.
- **Replacement of insulation and protection equipment:** New fuses, surge diverters, insulators and split circuit may be required.
- **Third phase conductor**: Third phase extension in existing single-phase network to connect new 3ph transformers

There can be large variability in DSS augmentation costs due to the various scale of scope required for that area of the LV network. Our rate represents a reasonable average rate DSS upgrade, providing long-term sustainable improvements that support increased demand as customers electrify their loads.

4. Options Assessed

4.1. Credible Solutions

In developing the options for this business case, AusNet has used the cost of the most credible network solution for upgrading significantly overloaded low-voltage distribution substations or SWER networks, such that they completely address the identified network import limitation at each site, that being either;

- Upgrading (or a new) distribution transformers, and splitting (or new) low-voltage circuits
- Upgrading SWER lines from single steel to twin steel conductor and increasing the size of the isolation transformer

AusNet have used unit costs from similar recent projects and applied these to the volume of assets identified through the economic analysis, by network level.

AusNet have also considered non-network solutions (including storage and third-party flexible services) and their associated costs.

4.1.1. Network augmentation

The typical work undertaken under network augmentation solutions include:

- **Upgraded distribution transformers and split low-voltage circuits**

  Split up and reconfigure the low-voltage circuits of a distribution substation with shorter circuits (and fewer customer per circuit) and upgrade the capacity of the existing distribution transformer.

- **New distribution substation with new low-voltage circuits**

  Establish a new distribution substation using a new transformer and new low-voltage circuits to transfer load away from the adjacent import-limited distribution substation.

- **Upgrading SWER lines**

  The backbone of the SWER line can be rebuilt from single steel to twin steel conductor and increasing the size of the existing isolation transformer.

- **Rebuild SWER as multi-phase**

  Alternatively, where a SWER line branches off into two or more spurs, the SWER backbone back to the distribution feeder can be upgraded to multi-phase, and the isolation transformers located down at the spurs. This solution is only viable in limited situations as easement renegotiation is often needed with the additional poles or wider easement required.

4.1.2. Non-network solutions and flexible services

Battery energy storage or flexible services could be used to support network loading and therefore alleviate overload-related network import limitations.

The opportunity lies with storage and flexible services in being able to defer or displace network augmentation by discharging (or reducing load or increasing generation) in the vicinity of the network limitation during maximum demand. The opportunity to adopt these non-network and flexible services solutions is impacted by:

- Storage requiring value stacking with market benefits, given its current higher cost premium; and
- Flexible services relying on ability to generate customer response and control customer generation / load, in sufficient numbers to be effective.

4.2. Assessment approach

4.2.1. Assessment methodology

The regulatory framework facilitates quantifying a prudent level of electrification augmentation investment through the AER's VCR[2] methodology. AusNet has adopted this VCR methodology in its probabilistic planning as an economic approach to valuing the impact of network limitations on customers, with the aim of mitigating EUE through an Electrification Program.

The network assets considered for this program are those that have limitations whose EUE mitigation solutions are in themselves economically viable, based on the VCR methodology. To identify the limitations and economic viability of the projects which make up the program, AusNet has developed a detailed model that maximises the use of its advanced metering infrastructure (AMI) data and other measurement data, to determine the network performance and its characteristics, in-lieu of power system simulation and modelling assumptions. Figure 15 show the process diagram for modelling components that identify and economically justify expenditure.

For more information on details please refer to the '*Hosting capacity, electrification and CER enablement*' methodology document.

Figure 15: Electrification (demand driven augex in the LV network) program modelling

Modelling Inputs

Customer segmentation and demand scenarios, network characteristics, outputs from AusNet's Tactical Hosting Capacity (THC) model, actual voltages, operating states and demand measurements from AMI and SCADA.

↓

SWER and LV Models

These models determine the network export ratings, CER hosting capacity, CER curtailment levels and network thermal overload and voltage compliance limitations arising in each part of the network (SWER and LV) over the forecasting period, for different demand and customer segmentation scenarios. The outputs of the models are:

Forecast annual numbers of customers in each steady-state over-voltage and under-voltage (defined in the Victorian Electricity Distribution Code of Practice - EDCOP) voltage distribution bin.	Forecast expected unserved energy at risk for each network asset in each year over the planning horizon, where customers are at risk of being load-shed by AusNet due to identified network import limitations.

↓

Electrification Economic Model (demand driven augex in the LV network)

The Electrification program economic model applies the VCR methodology to identified import limitations, using the costs and characteristics of credible options to identify the preferred option for each location, ranking projects to develop a program of works of the most economically viable projects.

↓

Electrification (demand driven augex in the LV network) Program Business Case (this business case)

[2] Update Value of customer reliability | Australian Energy Regulator (AER), 18th December 2023.https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/customer-export-curtailment-value-methodology

4.2.2. Valuing expected unserved energy

This business case utilises the VCR[3] values published by the AER in December 2024. The electrification program models are specifically tailored for assessing the value of EUE in the form of customer load-shedding that may be needed to address thermal overload and voltage limitations due to forward power flow breaching import ratings.

The assessment approach in this business case applies VCR to the importing of load that causes maximum net demand to increase to levels that exceed the import rating of each network asset under assessment. This is referred to as the EUE at risk, because the load contributing to these network import limitations is at risk of having to be load shed by AusNet.

The steps taken to do this included:

- Comparing the annual load profile (based on customer segmentation, maximum and minimum demand forecasts) with the calculated import rating, for each asset under assessment.
- Identifying the energy at risk at times when the annual load profile breaches the asset's import ratings.
- Weighting the results by the 10POE and 50POE demand scenarios to get an expected value.
- Multiplying the EUE at risk calculated from this process with the location specific VCR for each year of the analysis period.

4.2.3. Economic evaluation approach

The proposed program expenditure is derived from an assessment approach that aims to maximise the net economic benefit to customers as follows:

- Using the costs and avoided risks (calculated from the do nothing risks above) of the identified credible solutions, the NPV of the solution at each asset location is calculated.
- The site NPVs are ranked to develop a program of works of the most economically viable projects, comprising only NPV positive projects.
- The optimum timing for each project occurs when the annualised avoided risk exceeds the annualised cost of the project.

The present values are calculated using a discount rate over a 20-year planning horizon, ignoring forecasted risk and benefits beyond 10-years.

An expenditure profile is developed based on the list of economically viable sites and their optimum timing forming a programme of works.

Three program options were considered, with Options 1 and 2 following the economic probabilistic planning approach. Option 3 applies a deterministic planning approach to allow for zero constraints.

[3] https://www.aer.gov.au/industry/registers/resources/reviews/values-customer-reliability-2024

4.3. Do Nothing Option

The 'do nothing' option assumes that AusNet Services would not undertake any proactive investment in mitigating EUE levels across the distribution network – that is, none of the programs are adopted. Since this option assumes no investment outside of the normal operational and maintenance processes, this is a zero incremental investment cost option.

By the end of the 2026-31 regulatory control period (i.e, 2031-32), for a do nothing investment scenario, the amount of EUE is expected to rise by 0.7 GWh pa for distribution substations, and 0.25 GWh pa for SWER lines.

The present value of total risk of EUE relating to network import limitations, is valued at $2,189 million over the analysis period (real 30th June 2024 dollars) as shown in Table 6.

Table 6: Do Nothing Risk ($m, Undiscounted, $June 2024)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31	Full assessment period (discounted)
Expected Unserved Energy	22.8	28.2	36.3	48.3	66.5	**202.1**	**2,189**

Source: AusNet analysis

The incremental investment cost of do nothing is zero.

The do nothing risk represents an upper limit of the pool of potential benefits that are available to credible options that can address the identified need, as detailed below. AusNet do not consider that the do nothing option is viable due to significant customer outcome risk.

4.4. Option 1 – Economic Network Augmentation

Option 1 reflects current industry practice. It applies an economic approach to mitigate EUE through network augmentation only where there is a positive NPV. This traditional method prioritises physical upgrades and represents the baseline approach widely used across the sector. The number of sites identified for EUE mitigation under this option are shown in Table 7, and the corresponding positive NPV is presented in Table 8.

Table 7: Option 1 Projects

Optimum project type	Number of identified sites
SWER augmentation	34
LV distribution substation augmentation	759

Source: AusNet analysis

Table 8: Option 1 NPV Analysis ($m, Undiscounted, $June 2024)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31	Full assessment period (discounted)
Cost	(27.3)	(27.9)	(21.0)	(31.0)	(16.7)	**(123.9)**	**(115.7)**
Benefits	-	13.0	20.4	29.8	45.1	**108.3**	**1,559**
NPV (discounted)	**1,444**						

Source: AusNet analysis (benefits are relative to do nothing, representing reduced do nothing risk).

4.4.1. Cost

4.4.1.1. Capital expenditure

Table 9 represents the forecast capital expenditure in network augmentation that is economically prudent for AusNet to be investing in the network to enable electrification.

Table 9: Option 1 Capital Expenditure ($m, Undiscounted, $June 2024)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31
SWER	(8.9)	(3.8)	(6.4)	(19.1)	(5.1)	**(43.3)**
DSS	(18.4)	(23.8)	(14.1)	(11.1)	(10.5)	**(77.9)**
Total	(27.3)	(27.6)	(20.5)	(30.2)	(15.6)	**(121.2)**

Source: AusNet analysis

4.4.1.2. Operating expenditure

Table 10 represents the forecast incremental operational expenditure that is economically prudent for AusNet to be investing in the network to enable electrification.

Table 10: Option 1 Operating Expenditure ($m, Undiscounted, $June 2024)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31	Full assessment period (discounted)
Total	-	(0.27)	(0.55)	(0.75)	(1.06)	(2.6)	(11.4)

Source: AusNet analysis

4.4.2. Benefits

Under Option 1, EUE is expected to decline by 522 MWh per year for distribution substations and by 128 MWh per year for SWER lines over the 2026–31 regulatory period.

The cumulative present value of benefits delivered by this option are forecast to avoid 54%[4] of the do nothing risk over that period, and by the end of the 20-year economic analysis period, avoid 71%[5] of the total do nothing risk. The value of those benefits is shown in Table 11.

Table 11: Option 1 Benefits ($m, Undiscounted, $June 2024)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31	Full assessment period (discounted)
Avoided EUE	-	13.0	20.4	29.8	45.1	**108.3**	**1,559**

Source: AusNet analysis (benefits are relative to do nothing, representing reduced do nothing risk)

[4] 108.3 ÷ 202.1 = 54%
[5] 1,559 ÷ 2,189 = 72%

4.5. Option 2 – Economic Network Augmentation and Flexible Services

Option 2, the preferred approach, uses an economic framework to mitigate EUE through an efficient mix of targeted network augmentation and non-network flexibility services, applied only where there is a positive NPV. This approach balances cost and reliability outcomes while leveraging flexible services to defer traditional augmentation where feasible. The number of sites identified for EUE mitigation under this option are shown in Table 12, and the associated NPV is presented in Table 13.

Table 12: Option 2 Projects

Optimum project type	Number of identified sites
SWER augmentation	34
LV distribution substation augmentation	559
Flexible service at LV distribution substations	205

Source: AusNet analysis

Table 13: Option 2 NPV Analysis ($m, Undiscounted, $June 2024)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31	Full assessment period (discounted)
Cost	(27.2)	(25.7)	(14.7)	(26.1)	(13.2)	**(106.8)**	**(100.2)**
Benefits	-	12.9	20.4	29.9	45.2	**108.4**	**1,558**
NPV (discounted)	**1,457**						

Source: AusNet analysis (benefits are relative to do nothing, representing reduced do nothing risk)

4.5.1. Cost

4.5.1.1. Capital expenditure

Table 14 represents the forecast capital expenditure in network augmentation that is economically prudent for AusNet to be investing in the network to enable electrification.

Table 14: Option 2 Capital Expenditure ($m, Undiscounted, $June 2024)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31
SWER	(8.9)	(3.8)	(6.4)	(19.1)	(5.1)	**(43.3)**
DSS	(18.2)	(21.6)	(7.8)	(6.3)	(7.1)	**(61.0)**
Total	(27.2)	(25.4)	(14.1)	(25.4)	(12.2)	**(104.3)**

Source: AusNet analysis

4.5.1.2. Operating expenditure

Table 15 represents the forecast incremental operational expenditure that is economically prudent for AusNet to be investing in the network for electrification. This includes non-network service payments to third party providers for flexible services.

Table 15: Option 2 Operating Expenditure ($m, Undiscounted, $June 2024)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31	Full assessment period (discounted)
Network	**-**	**(0.27)**	**(0.53)**	**(0.67)**	**(0.92)**	**(2.39)**	**(9.7)**
Flexible services	**-**	**(0.01)**	**(0.01)**	**(0.01)**	**(0.01)**	**(0.03)**	**(0.1)**
Total	**-**	**(0.28)**	**(0.54)**	**(0.68)**	**(0.93)**	**(2.42)**	**(9.8)**

Source: AusNet analysis.

Refer to section 6 for the method of evaluating the non-network solutions.

4.5.2. Benefits

Under Option 2, EUE is expected to decline by 522 MWh per year for distribution substations and by 128 MWh per year for SWER lines over the 2026–31 regulatory period.

The cumulative present value of benefits delivered by this option are forecast to avoid 54%[6] of the do nothing risk over that period, and by the end of the 20-year economic analysis period, avoid 71%[7] of the total do nothing risk. The value of these benefits is captured Table 16:

Table 16: Option 2 ($m, Undiscounted, $June 2024)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31	Full assessment period (discounted)
Avoided EUE	-	12.9	20.4	29.9	45.2	**108.4**	**1,558**

Source: AusNet analysis (benefits are relative to do nothing, representing reduced do nothing risk)

Option 2 shows that orchestration and demand-side flexibility can defer traditional investment while maintaining reliability. Although not universally applicable, these services provide a cost-effective alternative as part of a balanced approach to network planning.

[6] 108.4 ÷ 202.1 = 53%
[7] 1,558 ÷ 2,189 = 71%

4.6. Option 3 – Deterministic Augmentation

This option focuses on eliminating all Expected Unserved Energy (EUE) within the distribution substation and SWER networks. The sites identified for implementing EUE mitigation measures under this option are listed in Table 17, while the corresponding NPV is presented in Table 18.

Table 17: Option 3 Projects

Optimum project type	Number of identified sites
SWER augmentation	170
LV distribution substation augmentation	2,674

Source: AusNet analysis

Table 18: Option 3 ($m, Undiscounted, 30th June 2024 Dollars)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31	Full assessment period (discounted)
Cost	(100.6)	(101.7)	(101.7)	(103.8)	(104.7)	**(512.5)**	**(474.9)**
Benefits	-	11.2	14.2	44.7	63.9	**134.0**	**2,038**
NPV (discounted)	**1,563**						

Source: AusNet analysis (benefits are relative to do nothing, representing reduced do nothing risk)

4.6.1. Cost

4.6.1.1. Capital expenditure

Table 19 represents the forecast capital expenditure in network augmentation to deliver option 3.

Table 19: Option 3 Capital Expenditure ($m, Undiscounted, $June 2024)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31
SWER	(100.7)	(100.7)	(14.0)	-	-	**(215.3)**
DSS	-	-	(85.7)	(100.8)	(100.7)	**(287.2)**
Total	(100.7)	(100.7)	(99.7)	(100.8)	(100.7)	**(502.5)**

Source: AusNet analysis

4.6.1.2. Operating expenditure

Table 20 represents the forecast operating expenditure in network augmentation to deliver option 3.

Table 20: Option 3 Operating Expenditure ($m, Undiscounted, $June 2024)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31	Full assessment period (discounted)
Total	-	(1.0)	(2.0)	(3.0)	(4.0)	**(10.0)**	**(46.4)**

Source: AusNet analysis

4.6.2. Benefits

By the end of the 2026-31 regulatory control period (i.e. 2031-32), for an Option 3 investment, the amount of EUE should be minimal if this program is adopted.

Table 21: Option 3 Benefits ($m, Undiscounted, $June 2024)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31	Full assessment period (discounted)
Avoided EUE	-	11.2	14.2	44.7	63.9	**134.0**	**2,038**

Source: AusNet analysis (benefits are relative to do nothing, representing reduced do nothing risk).

5. Preferred option and sensitivity testing

Option 2 is the preferred option over the 2026-31 regulatory control period, which represents a prudent and efficient mix of network augmentation and non-network flexible services, to manage the risk of growth in demand from electrification. Option 2 was chosen as the economic option with the highest NPV and least cost. Table 22 summarises the options.

Table 22: Economic Evaluation of the Options ($m, $June 2024)

	FY27 to FY31 (undiscounted)			Full assessment period (discounted)			Comments
	Capex	Opex	Total cost	Total cost	Total benefits	NPV	
Do nothing	0.0	0.0	0.0	0.0	0.0[8]	0.0	This option does not address the identified need
Option 1 – Economic network augmentation	121.2	2.6	123.9	(115.7)	1,559	1,444	This is not the preferred option as it is not least cost
Option 2 – Economic network augmentation and flexible services	104.3	2.4	106.8	(100.2)	1,558	1,457	This is the preferred option as it maximises the NPV
Option 3 – Deterministic augmentation	502.5	10.0	512.5	(474.9)	2,038	1,563	This is the most expensive option

Source: AusNet analysis

Under Option 2, EUE is expected to decline by 522 MWh pa for distribution substations and by 128 MWh pa for SWER lines over the 2026–31 regulatory period.

The cumulative present value of benefits delivered by this option are forecast to avoid 54% of the do nothing risk over that period, and by the end of the 20-year economic analysis period, avoid 71% of the total do nothing risk.

Table 23 compares the costs and benefits of the program options for credible variations in input variables.

Table 23: Sensitivity of Electrification (Demand Driven Augex in the LV Network) Program NPV ($m, $June 2024)

	Central assumptions	4.11% discount rate	15% reduction in capital costs	5% increase in demand	7.00% discount rate	15% increase in capital costs	5% reduction in demand	Comments
Do nothing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Option 1	1,444	1,795	1,474	2,035	1,199	1,428	1,013	
Option 2	**1,457**	**1,815**	**1,487**	**2,054**	**1,211**	**1,444**	**1,022**	This is the preferred least cost option
Option 3	1,563							This is the most expensive option

Source: AusNet analysis

This table illustrates that the decision to select Option 2 as the preferred option remains robust, being the option with the least cost, and NPV remaining positive under all credible sensitivities.

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[8] The present value of total risk of EUE, is valued at $2,189 million over the analysis period (30th June 2024 dollars). Refer Table 6.

6. Flexibility services

6.1.1. Approach to scoping flexible services

AusNet's assumptions regarding service uptake are based on evidence from prior trials and analysis of emerging market trends. Research indicates that participation levels and associated benefits are achievable within the upcoming regulatory period. Without these capabilities, the identified need would require traditional network augmentation, resulting in significantly higher costs for customers.

Table 24: Key flexibility Services Assumptions

Mechanism	Target customers	Uptake	Assumed % peak demand reduction from model
Direct Load Control	Medium and large C&I customers	5%	3.2%
Behavioural Demand Response	All customers	5%	2.4%
Total	**Customers with CER**	**10%**	**5.6%**

6.1.2. Method for evaluating non-network solutions

This section describes AusNet's approach to evaluating 'flexible services' that can efficiency defer network augmentation.

The criterion for applying flexible services is based on a risk management approach:

- **Reliability:** Minimise the risk of customer outages by applying flexible services, while acknowledging that these services may not consistently achieve full performance due to uncertainties, limited monitoring and control, and the relative immaturity of the technology. In some cases, a degree of accelerated transformer ageing may be acceptable to manage residual overload risk rather than removing the flexible service entirely. The reliability of each flexible service is assessed in relation to the reliability of the associated distribution substation.
- **Uptake rate:** The opt-in uptake rate of third parties being able to secure different types of flexible services needed to provide an effective network support service. The uptake rate of a flexible services is expressed as a percentage of the total number of customers, noting that most flexible services are expected to be an aggregation of customer response.
- **Costs:** The high-level costs of flexible services based on the scope, including the fixed cost of an augmentation versus the cost of operating an effective flexible solution that is dependent on the level of kW overload, growth rate, energy kWh pa at risk, and frequency/duration of service, or a combination of all these.

The comparison of the level of impact of flexible services on peak demand reduction is shown in Table 25.

Table 25: Expected Peak Demand Reduction From Flexible Services, at Different Levels of Utilisation

Overload (% of substation rating)	Peak demand reduction[9] (% of substation rating)	Shortfall (% of substation rating)	Applicability of flexible services
0.0%	**5.6%**	**Nil**	Flexible services not required.
5.0%	**5.9%**	**Nil**	Flexible services meets entire need (i.e., eliminates EUE) up to 6% overload.
6.0%	**5.9%**	**0.1%**	Flexible services leaves some residual EUE above 6% overload. The shortfall grows larger with higher utilisation making flexible services less attractive compared to traditional network augmentation.
10.0%	**6.2%**	**3.8%**	
20.0%	**6.7%**	**13.3%**	
30.0%	**7.3%**	**22.7%**	

[9] Peak demand reduction (% of DSS Rating) = Peak demand reduction (% of DSS Utilisation) x DSS Utilisation (%)

Source: AusNet analysis

Two key customer experience considerations apply when deploying flexible services at highly utilised sites. First, higher overload levels increase residual unserved energy that flexible services cannot fully mitigate. Second, greater annual EUE at these sites heightens the impact on customers, requiring more frequent or prolonged participation, which may reduce engagement. To balance the benefits of flexible services against the risk of customer attrition, AusNet has defined three scenarios based on minimum economic thresholds for service delivery. The base case scenario adopted for this business case is summarised in Table 26.

Table 26: Scenarios

Scenario	Percentage of Eligible DSS Sites	Number of Eligible DSS Sites
High	30%	315
Base	20%	210
Low	10%	105

Source: AusNet analysis

We have adopted the **base** scenario for Option 2 in this business case.

The application of Flexible Services has the effect of reducing the 'do nothing' EUE, which can be approximated based on the load-duration curve as illustrated in Figure 16(below).

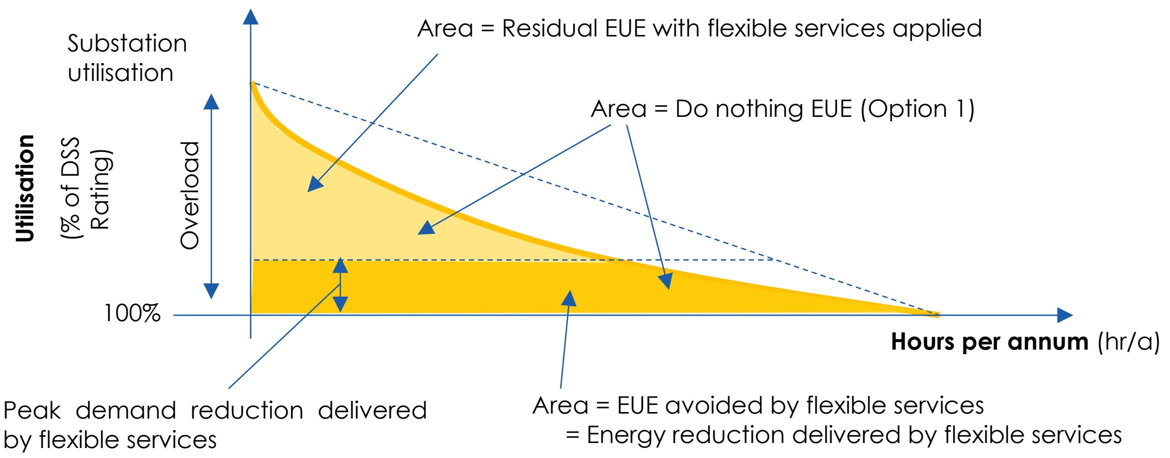

Figure 16: Reduced EUE provided by Flexible Services

6.1.3. Calculating the costs to deliver flexible services and net benefit of flexible services

Please refer to supporting document for details on the costs to deliver flexible services:

1. *Flexible services and non-network solutions* and
2. *DSO Addendum*.

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