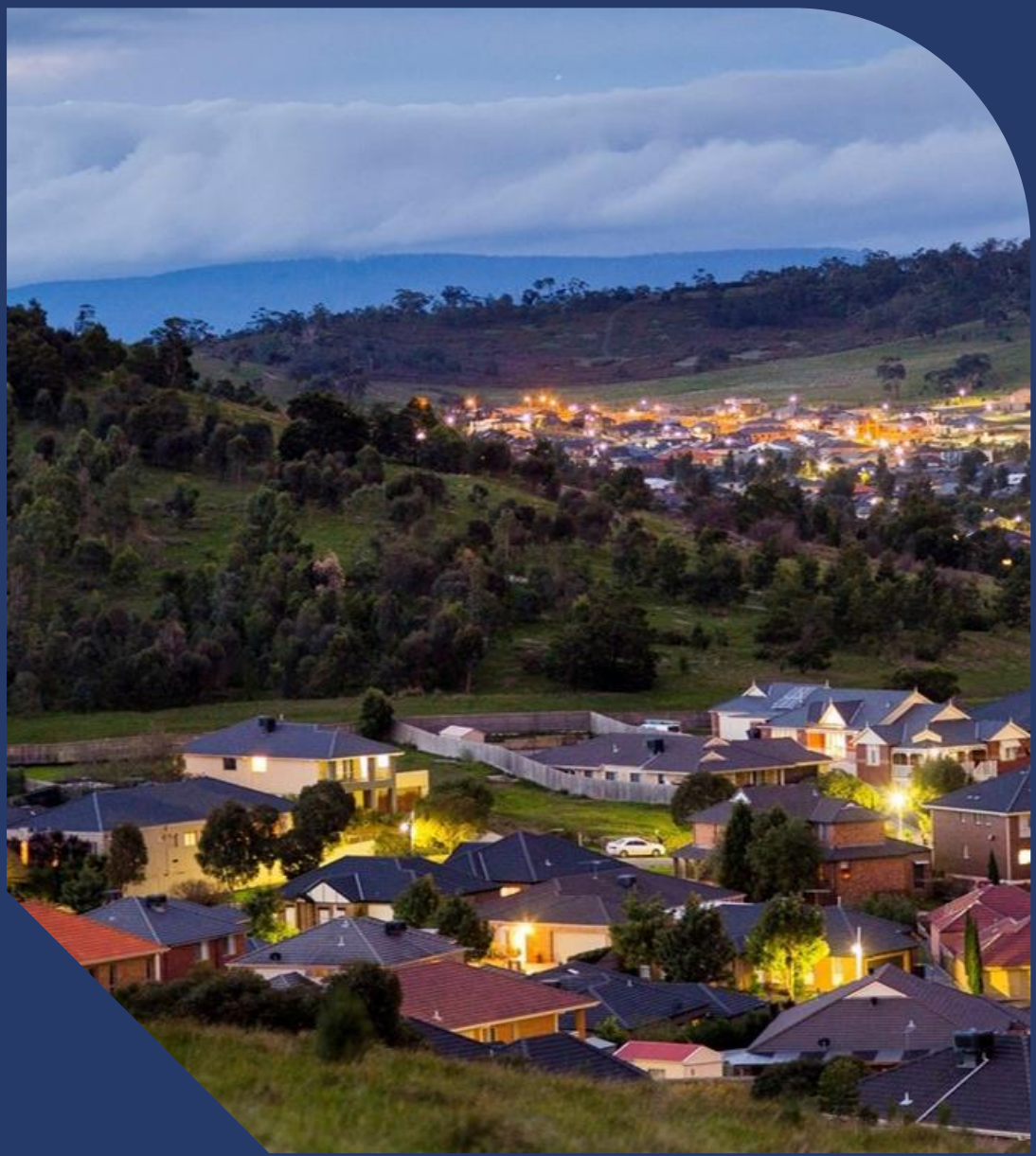
AusNet

Electricity Distribution Price Review (EDPR 2026-31)

Business case: Quality of Supply Program

Revised Proposal

Date: 1 December 2025



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1. Executive summary

Electricity is essential to the daily lives of Victorian households, supporting core activities such as cooking, heating, and charging electric vehicles. However, these basic needs are increasingly disrupted by voltage-related issues, including tripping solar inverters, damaged appliances, and power loss during peak demand. These disruptions cause significant inconvenience for customers and reflect non-compliance with the Victorian Electricity Distribution Code of Practice (EDCoP), which requires distributors to maintain supply voltage within defined limits to protect customers and ensure reliable service.

The EDCoP sets clear expectations for electricity distributors to deliver safe and reliable supply by upholding voltage quality. Maintaining voltage within prescribed limits is critical to protecting household appliances, ensuring customer safety, and supporting overall network reliability particularly as the grid undergoes rapid transformation due to increasing solar PV and electrification. Victoria's regulatory framework reinforces the importance of voltage performance by applying financial penalties for non-compliance. This underscores the essential role of distributors in safeguarding customer outcomes and maintaining long-term reliability across the network.

To maintain compliance and uphold customer reliability, AusNet has consistently addressed voltage performance through reactive initiatives, primarily via Quality of Supply Programs that resolve voltage issues identified through customer complaints. In recent years, this targeted program of works has played a crucial role in restoring supply quality and reducing an increased number of voltage non-compliance issues across the low voltage (LV) network.

In the current 2021-26 regulatory period, AusNet has invested approximately $25 million in reactive works, with the majority directed through the Quality of Supply Program. This includes $19.3 million in capital expenditure for Quality of Supply Program works that resolve individual voltage issues, and $4 million in operational expenditure for tap and phase balancing activities that enhance network voltage stability and reduce localised complaints. An additional $1.7 million has been spent on resolving customer claims through the Energy and Water Ombudsman Victoria (EWOV).

Most of this expenditure occurred between 2022 and 2025, driven by the growing impact of solar PV penetration and electrification on the LV network. We will continue this targeted program of works through the remainder of the current regulatory period, ensuring on-going compliance despite emerging challenges. AusNet expects to remain functionally compliant through to the end of 2025–26, meaning the network will maintain overall compliance with voltage standards by ensuring the vast majority of customers receive supply within prescribed limits and promptly addressing any isolated breaches through corrective actions.

Continued investment is required beyond this period to maintain compliance and ensure reliable supply, safe appliance operation, and enable electrification for customers. Electrification is accelerating in unpredictable pockets of our network, creating localised demand spikes which are already driving an increase in undervoltage complaints. These issues are difficult to forecast and cannot be fully mitigated through proactive programs. While CER enablement initiatives such as roll out of DVM, installation of feeder voltage regulators along with increased penetration of AS4777.2 Volt-Watt and Volt-VAR settings help manage voltage rise and voltage drop on our network, they are not intended to address all instances of overvoltage or undervoltage on our network and there will be resulting customer complaints where economic proactive investment has not identified, nor resolve site-specific undervoltage instances.

AusNet has the need to continue our Quality of Program at current expenditure levels, with a proposed allowance of $20.03 million for the 2026–31 regulatory period. This program is critical to AusNet's ability to maintain compliance, respond customer-reported issues, and ensure service quality across our network. Even with proactive voltage management initiatives, localised problems will persist particularly in areas where elevated voltages can significantly impact residential and industrial customers.

Maintaining this program ensures AusNet can respond effectively and uphold service quality across the network.

2. Background

2.1. Voltage Compliance Regulatory Requirements

Electricity distributors in Victoria must keep the voltage supplied to homes and businesses within safe limits. This is required by law to protect customers and ensure reliable service. The nominal voltage is 230 volts, with an allowable range between 216 and 253 volts. If too many customers experience voltage outside this range, the distributor is considered non-compliant. Hence, all Victorian distributors, including AusNet, monitor voltage using smart meter data and report their performance to the Essential Services Commission (ESC) every quarter. The ESC reviews these reports to ensure compliance with the standards set in the Electricity Distribution Code of Practice (EDCoP).

Voltage outside this range can cause problems: low-voltage makes appliances underperform, while high-voltage can damage equipment or create safety risks. For AusNet, managing voltage is critical for safety, customer satisfaction and reliability. It influences how we respond to complaints, plan for future demand, and invest in smart voltage management technologies especially as more customers install solar panels and electrify their homes.

Voltage Limits Across the Network

As mentioned above, maintaining voltage within safe limits is not just a broad requirement; it is defined by detailed technical standards. These standards specify allowable voltage ranges for different parts of the network and for short-duration events.

The EDCoP specifies these limits, and they vary depending on the voltage level and the type of event. For example, low voltage customers (<1 kV) must comply with AS 61000.3.100, which allows a variation of +13% and -10% around the nominal voltage of 230 V meaning voltages should generally stay between 216 V and 253 V. For short-duration events like switching or faults, the limits are slightly wider, and for high voltage networks, the tolerances differ to accommodate system stability.

Table 1: Standard Nominal Voltage Variations (EDCoP)

Voltage Level (kV)	Steady State	< 1 min	< 10 sec	Impulse Voltage
< 1	AS 61000.3.100	+13%, -10%	Phase-Earth +50%, -100% Phase-Phase +20%, -100%	6 kV peak
1 – 6.6	±6% (±10% Rural)	±10%	Phase-Earth +80%, -100% Phase-Phase +20%, -100%	60 kV peak
11	±6%	±10%	Phase-Earth +80%, -100% Phase-Phase +20%, -100%	95 kV peak
22	±10%	±15%	Phase-Earth +50%, -100% Phase-Phase +20%, -100%	150 kV peak
66	±10%	±15%	Phase-Earth +50%, -100% Phase-Phase +20%, -100%	325 kV peak

Table 1 demonstrates that as voltage level increases, the allowable percentage variation changes, and impulse voltage tolerances become much higher to handle transient events. AS 61000.3.100 also introduces percentile-based limits to account for natural variability over time.

These limits are expressed as V_1% and V_{99}%, meaning the voltage below which 1% or 99% of measurements fall during a survey period shown in table 2. This means that for single-phase customers, voltage should rarely drop below 216 V or rise above 253 V, ensuring stability for almost all customers.

Table 2: 230 V Nominal Steady-State Voltage Limits (AS 61000.3.100)

Steady State Voltage Measure (10 min r.m.s.)	Phase-to-Neutral Voltage Limit		Phase-to-Phase Voltage Limit		1 phase 3 wire centre neutral phase-to-phase voltage limit	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
V_1%	216 V	-	376 V	-	432 V	-
V_{99}%	-	253 V	-	440 V	-	506V

2.2. AusNet's historical voltage performance

Over the past four years, AusNet has operated in an increasingly complex environment, shaped by rapid growth in rooftop solar installations and the electrification of homes. These changes have introduced greater variability in voltage levels across the low voltage network compared to the previous regulatory period, particularly during periods of high solar generation and peak demand.

As more customers export energy from rooftop solar systems, voltage levels across the network can rise during times of low household demand. This over-voltage condition can lead to solar inverters disconnecting, appliances malfunctioning, and increased frustration among customers who expect their systems to operate reliably. At the same time, the electrification of homes has intensified demand, especially during peak usage periods. In areas with ageing infrastructure or long feeder lengths, this increased demand can result in undervoltage, which affects appliance performance, slow charging times, and contributes to increased customer dissatisfaction.

Figure 1 illustrates AusNet's over-voltage performance from Dec 2021 to Jan 2025, measured against the five percent compliance limit. In Spring 2022 and 2024, parts of the low voltage network exceeded this threshold, reflecting the growing pressure from increased solar PV generation especially during spring where there is high solar output at times where customers have low demand due to mild temperatures. This period of non-compliance underscored the need for targeted intervention to ensure we can meet the compliance standards while solar uptake continues to grow. AusNet implemented a series of reactive works through the Quality of Supply Program (SI Program), which successfully reduced the proportion of affected customers. Since then, AusNet has remained functionally compliant with voltage standards set by the ESC and voltage performance has stabilised below the regulatory threshold. However, managing over-voltage remains an ongoing challenge on our network due to the continued growth in solar installation on our network.

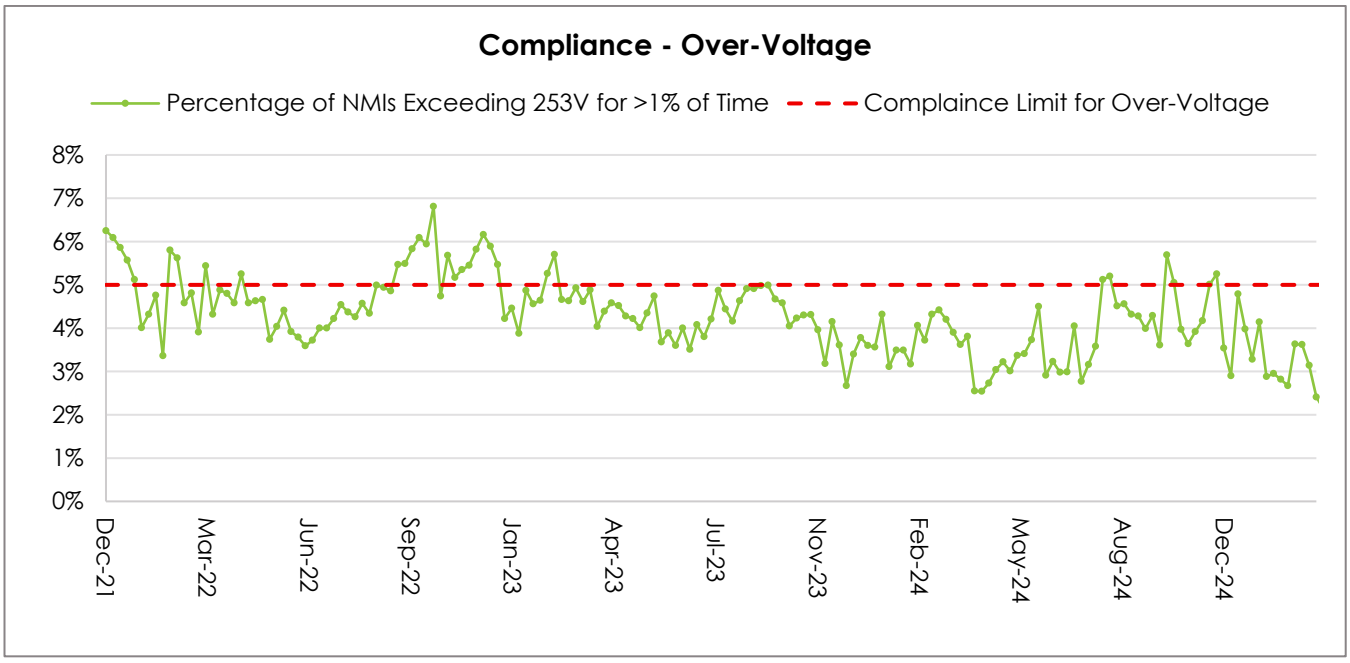

Figure 1: AusNet's LV Voltage Compliance – Over-Voltage (> 253V)

Figure 2 highlights an increase in undervoltage across AusNet's low voltage network, driven by rising customer electrification and the growing penetration of electric vehicles. These technologies are placing greater demand on the network, particularly during peak periods, resulting in more frequent instances of voltage falling below acceptable limits. This trend underscores the need for AusNet to continue its reactive Quality of Supply Program to stabilise voltage levels, prevent further deterioration in network performance, and support ongoing compliance with regulatory standards.

There is a distinction between the proposed Quality of Supply Program (this business case) and the program outlined in *Demand Driven Augmentation in the LV Network & Flexible Services* (LV Augex Business Case). The LV Augex program focuses on proactively upgrading network capacity to support electrification where it is economically justified. In contrast, instances of undervoltage are not limited to areas targeted for proactive investment. We anticipate a continued increase in undervoltage across the network during 2026–31, which will need to be addressed through reactive works.

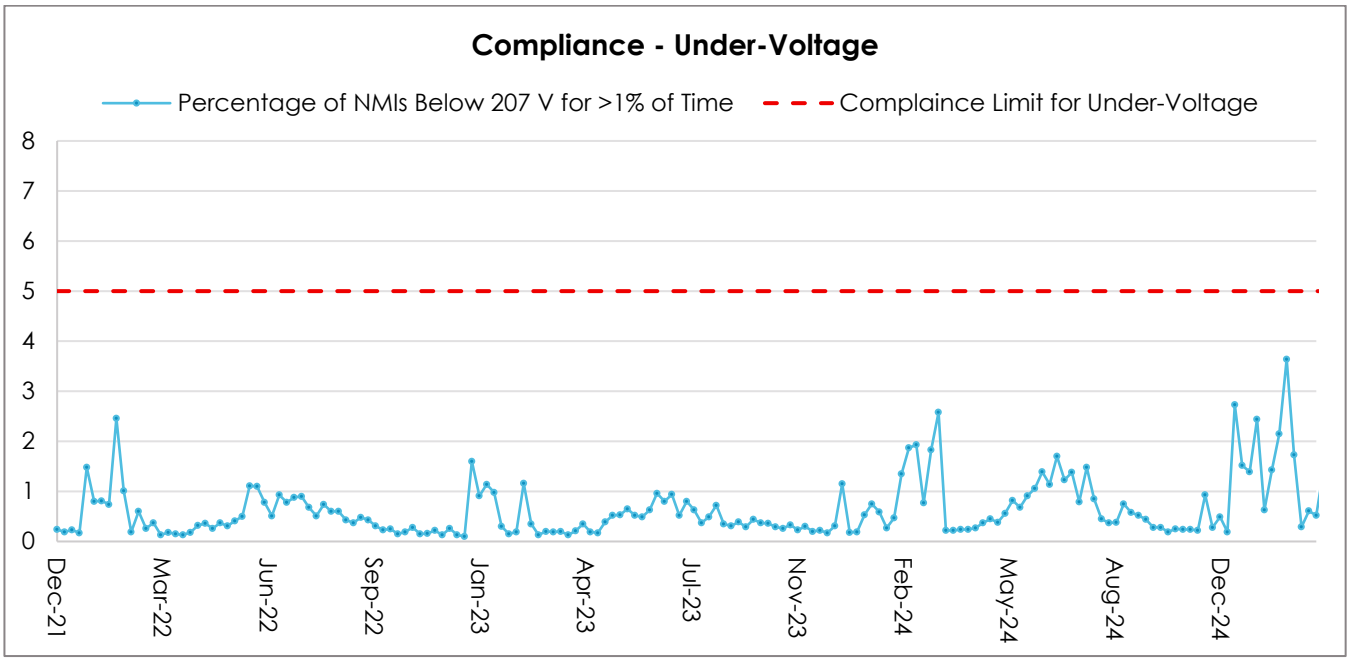

Figure 2: AusNet's LV Voltage Compliance – Under-Voltage (< 207V)

In addition to the operational impacts of voltage variability, AusNet has incurred direct financial costs through EWOV claims where compensation has been paid to affected customers as shown in figure 3. These claims typically arise from voltage-related issues such as appliance damage, inverter disconnection, and prolonged supply disruption.

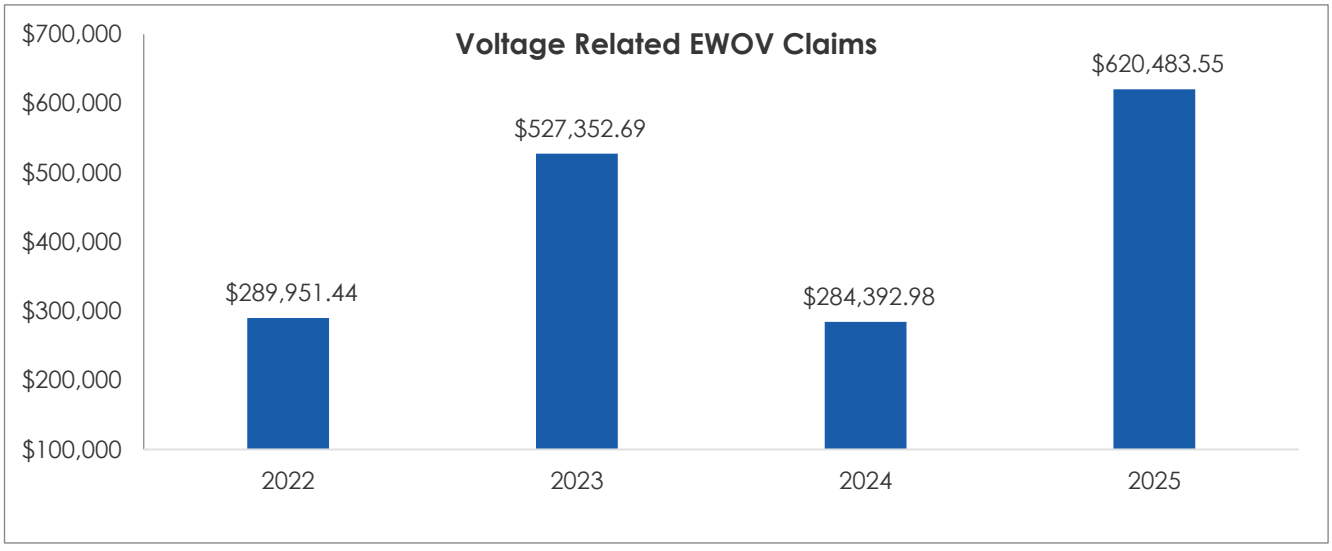

Figure 3: Voltage-related EWOV claims (2022-2025)

2.3. Purpose and scope

The purpose of this business case is to address the identified need for managing the quality of electricity supply across AusNet's distribution network and to present the Quality of Supply program that respond to this need. The objective is to ensure AusNet continues to meet its obligations under the Electricity Distribution Code of Practice (EDCoP), maintain customer satisfaction, and mitigate escalation of complaints to the Energy and Water Ombudsman Victoria (EWOV).

This business case outlines:

- AusNet's current levels of customer complaints related to quality of supply across the low voltage (LV) network.

- Impacts of unresolved quality of supply issues, including:
  - Safety risks from voltage fluctuations, imbalance, and equipment damage.
  - Customer distress caused by flicker, harmonics, voltage sags/swells, and inverter tripping
  - Operational and reputational cost and risks associated with EWOV escalations and compensation claims.

The need for a reactive program to address quality of supply issues and ensure timely resolution of customer complaints.

The scope of this business case is limited to managing power quality issues identified through customer complaints on the LV network.

3. Identified Need

3.1. Quality of Supply and Emerging Demand Trends

AusNet customers expect safe, reliable electricity supply every day. When power quality falls outside the acceptable range, the impacts are immediate and disruptive like malfunctioning appliances, higher energy costs as devices run inefficiently, and EV charging failures. These issues affect daily life and create frustration, leading customers complaints.

Voltage-related complaints provide a clear signal of how network conditions are impacting customers. AusNet records these issues using information provided by customers and power quality data from smart meters to check whether supply falls outside the limits set by the EDCoP. Historically, most complaints have been linked to high-voltages caused by solar PV exports during spring and summer, while low-voltage issues, more recently driven by electrification and EV charging, are becoming more common during winter.

The yearly voltage complaints trends (figure 4) shows a shift in customer-reported issues across 2022–2025. High-voltage complaints, driven by solar PV exports and result in inverter tripping, dominated early years but declined significantly by 2024–2025. This improvement is largely due to AusNet's targeted Quality of Supply Programs, which have played a major role in resolving recurring localised voltage issues and minimising customer impacts. In contrast, low-voltage complaints are rising steadily as electrification, EV charging, and electrification of winter heating demand stress local LV circuits, reaching near parity with high-voltage cases in 2025. This shift highlights a growing risk of undervoltage conditions as household energy demand accelerates. Furthermore, due to increasingly complex, site-specific voltage issues, the annual Quality of Supply expenditure remains steady, as these cases require extensive field work and higher-cost rectification.

Our investigation reveals the common causes of voltage related complaints include:

- High-voltages: Often linked to solar PV exports during spring and summer, causing inverter trips or installation delays.
- Low-voltages: Increasingly driven by electrification and EV charging, particularly during winter, leading to heating and appliance maloperation and, in some instances, failures.
- Other quality issues: Flickering, harmonics, phase imbalance, and voltage sags/swells degrade appliance performance and shorten equipment lifespan. This particularly impacts sensitive equipment frequently used by commercial and industrial customers.

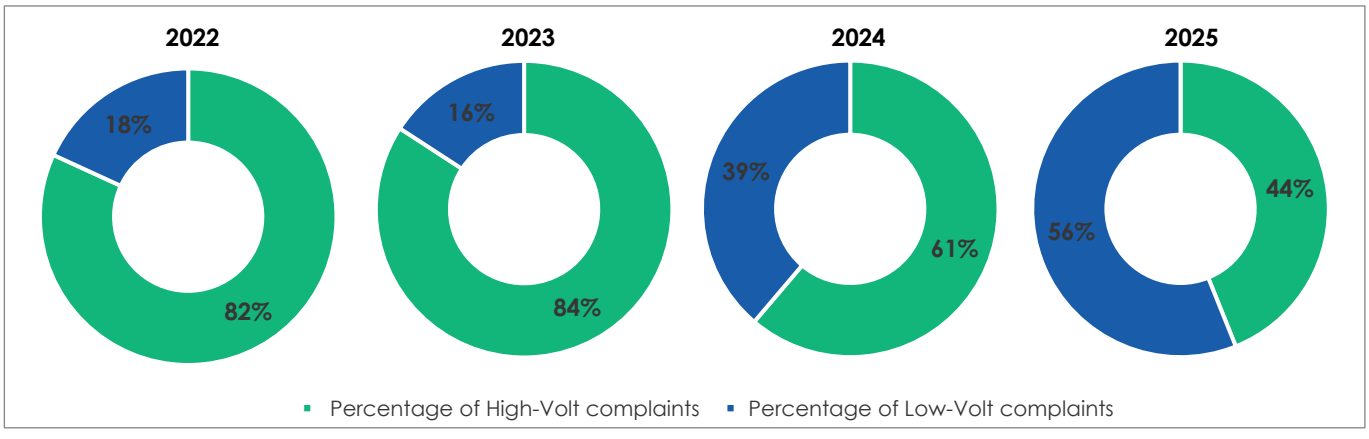

Figure 4: Yearly Trend of Voltage Complaints

Seasonal voltage complaint trends from 2022–2025 (figure 5) demonstrate how rapidly growing CER penetration is reshaping LV network behaviour. Spring and summer remain dominated by export-driven over-voltage as rooftop PV output surges on mild, sunny days when household demand is low, peaking at 165 cases in Spring 2022 and 128 in Spring 2023. By 2025, spring high-voltage complaints dropped sharply to 11. Conversely, summer (33 in 2025) and winter (26 in 2025) continue to show rising low-voltage complaints, driven by electrification and cooling in summer and heating in winter, which cause voltage drops during peak load periods. Together, these trends highlight that CER growth is driving a seasonal polarity - over-voltage in high-export months and under-voltage in high-load months. This strengthens the need for a dedicated Quality of Supply Program to address site-specific constraints and complex power quality issues.

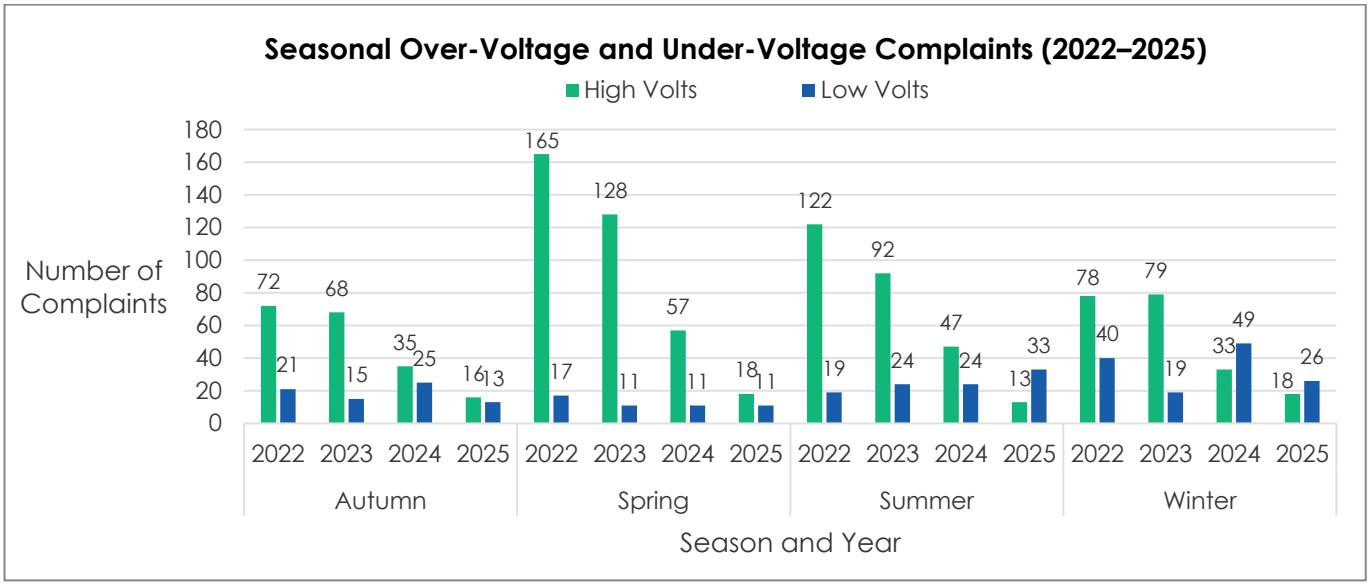

Figure 5: Annual Seasonal Over-voltage and Under-Voltage complaints tracked

Voltage complaints are often triggered by solar inverter trips caused by high-voltages or identified by PV installers during commissioning, particularly in spring and summer when PV output is highest. While AusNet's CER Enablement Program plays a critical role in improving hosting capacity and reducing seasonal over-voltage complaints, it does not fully address residual voltage issues such as harmonics, flicker, voltage unbalance, and voltage sags and swells complex problems that are harder to predict and require reactive investigation and resolution.

As such, a zero-complaint outcome is not achievable, even with full deployment of CER Enablement. The Quality of Supply Program is specifically designed to manage these residual and complex issues. It complements CER Enablement by providing a reactive capability to resolve complaints that fall outside the scope of proactive voltage management.

Looking ahead, the low voltage network faces unprecedented pressure from two major trends:

- **Electrification of homes:** Gas-to-electric conversions for heating, cooking, and hot water are accelerating, driven by policy changes and customer preferences. This shift will substantially raise household demand, increasing the likelihood of undervoltage conditions during winter peaks. Figure 6 illustrates this trend, showing annual demand from gas-to-electric conversions forecast to more than quadruple by 2030 and exceed 500 MW by 2039. As customers increasingly transition to electric for their heating, cooking, and transport needs, it will become increasingly important to maintain quality of supply to minimise disruption and inconvenience for our customers.

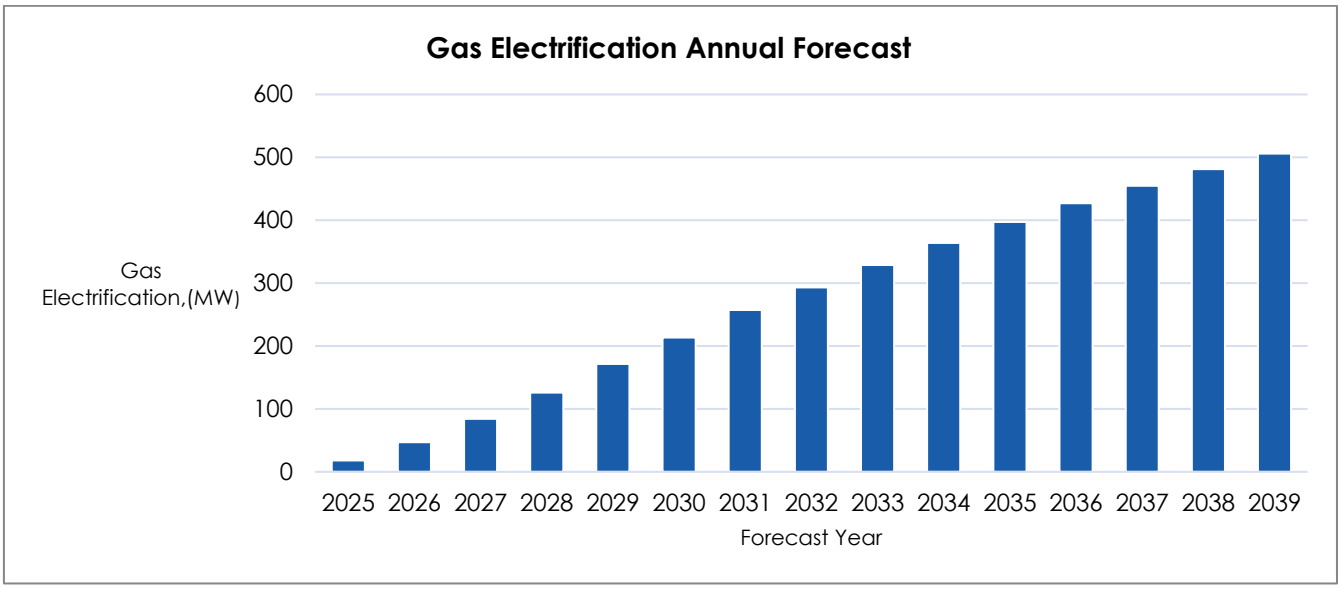

Figure 6: Projected gas electrification growth

- **Electric vehicle adoption:** The growing adoption of electric vehicles will further increase demand on the low voltage network. Internal forecasts indicate a significant rise in EV charging load, with most customers expected to charge their vehicles at home particularly in the evening and overnight. This shift presents a challenge for supply improvement planning. EV charging introduces new patterns of demand that are both higher in magnitude and more variable. Fast home charging can create sharp localised peaks, increasing the likelihood of undervoltage conditions and accelerating asset wear. Importantly, EV charging affects both EV and non-EV owners: For EV owners, reliable and fast charging is essential to support daily mobility. For non-EV owners, increased localised demand can degrade voltage quality. Without targeted supply improvements, these impacts risk undermining compliance with voltage standards and customer service expectations.

Figure 7 illustrates the scale of EV adoption, showing an accelerated growth of EV customers from 2027, almost doubling by 2031, approaching nearly 900,000 by 2039. This rapid uptake means households will rely on home charging, adding stress to local feeders, and because EV adoption can occur in unpredictable localised pockets, this program is focused on responding to these issues as they arise.

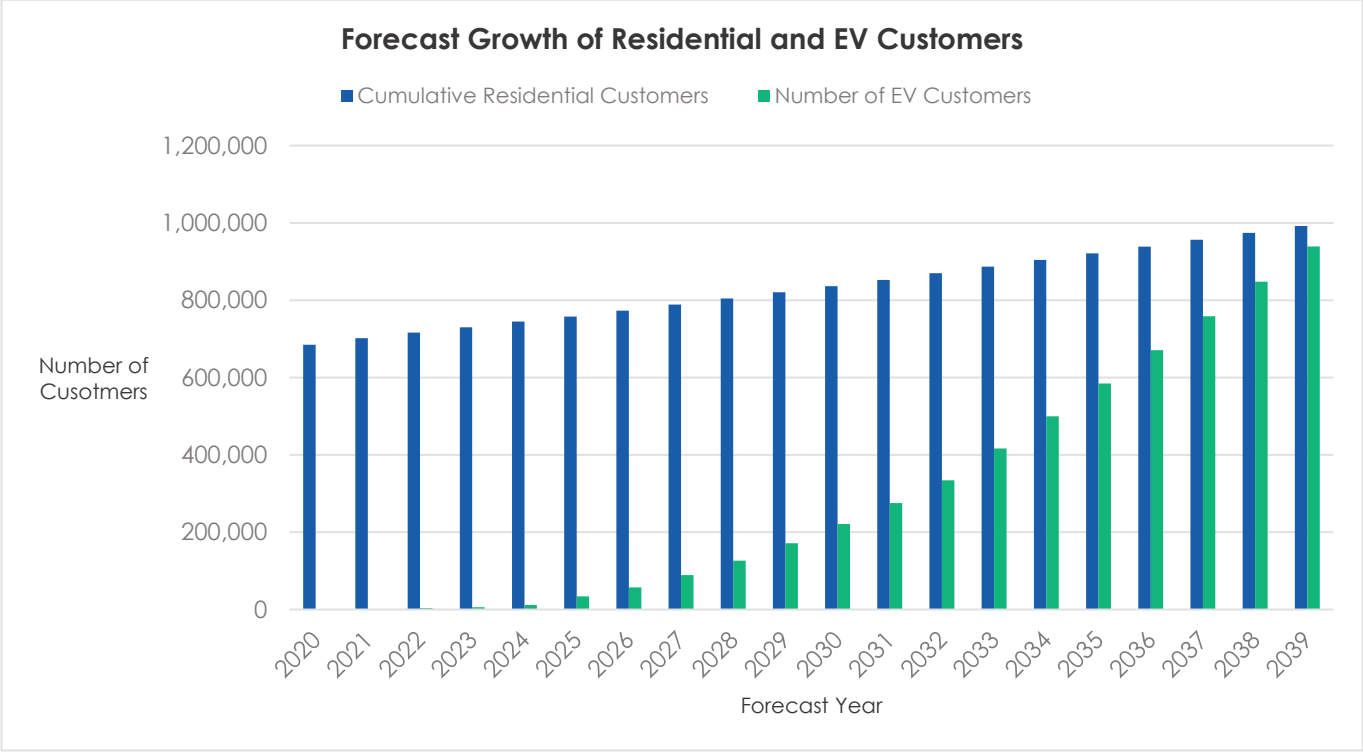

Figure 7: Projected number of EV customers

Figure 8 shows the associated EV load growth rising steadily from 2025 to over 170 MW by 2040. Some of this additional load may coincide with evening peaks, creating sharp voltage drops and increasing the risk of non-compliance.

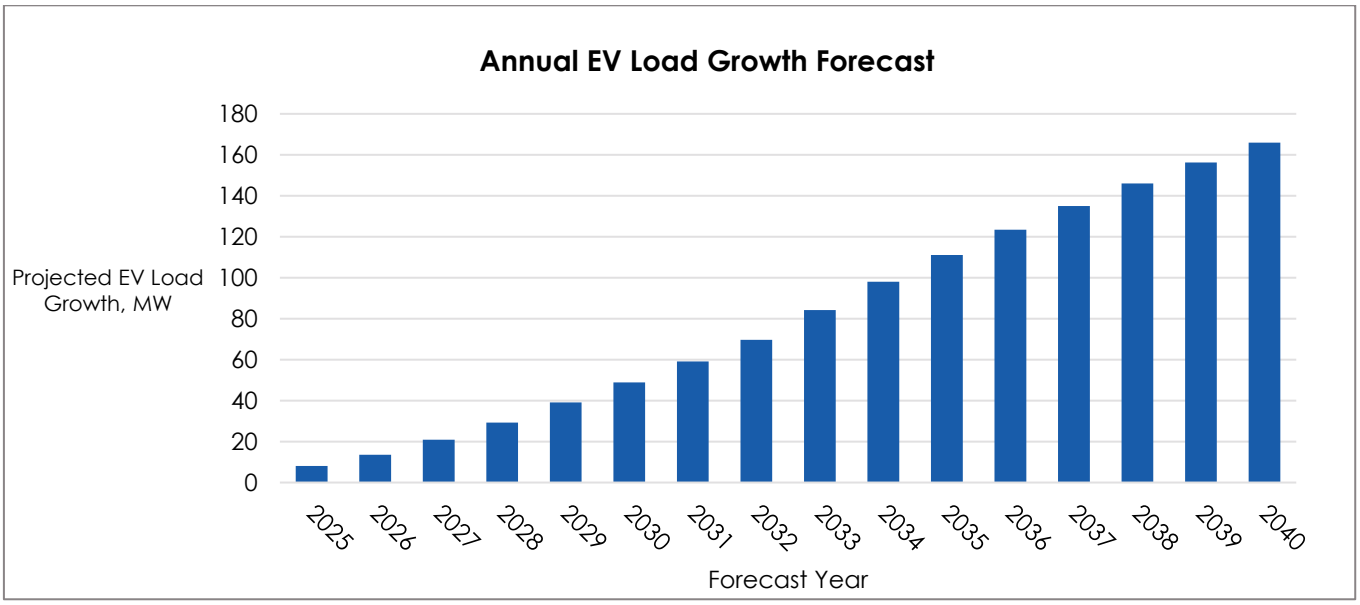

Figure 8: Projected EV load growth

3.2. Current Response – Quality of Supply Program

To manage these challenges, AusNet operates a Quality of Supply Program that addresses customer-reported power quality issues. This program is primarily reactive and urgent in nature, triggered by complaints received through AusNet's Customer Service Centre.

Since 2022 AusNet has averaged 360 low voltage network power quality complaints per year, with an annual cost of approximately $3.5 million (Table 3). The program follows a structured approach:

- Identify the root cause of the issue.
- Develop a technically sound and economically feasible solution.
- Prioritise low-cost operational (opex) solutions over capital-intensive (capex) options.
- Ensure no alternative solution exists before proceeding with capex investment.

This ensures timely, cost-effective resolutions while maintaining compliance with EDCoP.

Table 3: Quality of Supply Program Current Period Expenditure ($m, nominal)

Year	2022	2023	2024	2025	2026 (Forecast)	Total 2022-2026
Expenditure	3.32	3.91	3.42	5.79	5.61	**22.06**

Source: AusNet analysis

Note: Designs for forecast expenditure are finalised, and construction is scheduled to begin Jan 2026.

Customer Impacts and EWOV Escalations

When voltage issues are not resolved promptly, customers face serious consequences—damaged appliances, disrupted daily routines, and unexpected financial burdens. In some cases, these unresolved complaints escalate to the Energy and Water Ombudsman Victoria (EWOV), where customers seek formal resolution and compensation.

Some of the EWOV cases include:

- Berwick: Transformer failure caused a power surge that damaged household appliances.
- Croydon North: Transformer explosion led to widespread equipment failure.
- Bundoora: High-voltage incident damaged multiple appliances.

All work undertaken arises from registered customer complaints where there is a high probability of escalation to EWOV if not addressed promptly. Failure to act not only increases the risk of formal investigations but also requires additional resources for EWOV enquiry processes and can lead to more extensive and costly corrective actions following EWOV's findings.

These cases are not just financial; they represent disruption to daily life, loss of essential household equipment, and emotional stress for affected customers. They also highlight the importance of a responsive and well-funded Quality of Supply Program that can resolve issues before they escalate.

Maintaining this program is essential to:

- Ensure compliance with EDCoP Chapter 20.
- Prevent escalation of unresolved complaints to EWOV.
- Avoid more costly corrective actions following investigations.

4. Options Assessed

4.1. Credible Solutions

AusNet considers a range of credible solutions that are able to address identified voltage compliance limitations. To identify which solutions are least-cost technically feasible to resolve the nature of the identified limitation, a set of decision rules are applied to each asset (at each network level) using the measured actual and forecast operating conditions and limitations.

The range of credible solutions considered are as follows:

- Network capex solutions
  - Transformer upgrades (lower impedance) and replacements (with wider tapping ranges)
  - New transformers
  - New feeders and circuits
  - Splitting or reconfiguring circuits
  - LV Stacom – that offers dynamic, real-time voltage support and can address multiple power quality issues more effectively than traditional opex interventions.
- Network opex solutions
  - Tap changes
  - Float voltage setting changes and line drop compensation
  - Phase balancing
- Non-network alternatives (including storage, inverter support).

4.1.1. Network solutions

The Quality of Supply program is compliance-driven and ensures that individual customers remain within EDCoP voltage limits. It addresses localised voltage issues that broader system-wide measures cannot resolve, focusing on site-specific solutions to achieve regulatory compliance.

To identify least-cost, technically feasible options, AusNet applies decision rules to each asset and network level based on actual and forecast operating conditions.

The credible solutions considered include:

- **Transformer upgrades (lower impedance) and replacements (with wider tapping ranges)**
  To cater for voltage limitations that are caused by low short-circuit levels, or a lack of available buck taps during times of minimum demand.

- **New transformers and new circuits**
  To cater for voltage limitations that are caused by long or high impedance circuits, by splitting up and reconfiguring the network with shorter circuits and fewer customer per circuit.

The typical opex work undertaken to complement network augmentation solutions include:

- **Tap changes**
  To allow the voltage to be lowered (raised) when the voltage is elevated (depressed) across all operating conditions. Many of AusNet's legacy transformers are operating at their extreme buck tap and cannot be tapped down any further without a transformer replacement.
- **Float voltage setting changes**
  This has been completed across many of AusNet's sites already.
- **Phase balancing**
  Targeted at sites where there is significant unbalance at maximum demand causing a wide voltage spread across phases.

4.1.2. Non-network solutions

Installing small-scale or community batteries at strategic points on the network allows excess solar energy to be stored during periods of high generation and discharged during peak demand. This approach helps maintain voltage stability and may mitigate both over-voltage and under-voltage conditions.

In addition, advanced inverter functions such as Volt-Watt and Volt-VAr provide dynamic voltage control by adjusting power output in response to network conditions. These capabilities, implemented through customer engagement programs, are essential for improving hosting capacity and supporting compliance with voltage standards as CER uptake continues to grow.

4.2. Quality of Supply program

We propose to continue our Quality of Supply program focussed on addressing quality of supply issues occurring within the 2026-31 regulatory period. This program is specifically targeted at addressing customer complaints and meeting quality of supply standards prescribed in the EDCoP Chapter 12.

The program is "reactive" so that immediate corrective actions can be undertaken to respond to customer complaints and quality of supply compliance issues.

Each year the customer service centre receives a significant number of customer complaints, mainly relating to the following issues:

- Voltage quality – low-voltage (LV), high-voltage (HV), voltage fluctuations and flickering
- LV circuit failures (e.g. fuse operations) due to LV unbalance issues

Complaints received by our customer service centre are reviewed by engineers to identify the problem and develop a least cost solution to address the issue. Capital works follow a detailed investigation only if no technically or economically feasible alternative solution exists.

To maintain compliance and customer satisfaction, AusNet propose to continue the Quality of Supply Program of $ 20.03 million. This represents the forecast capital expenditure that is prudent for AusNet to be investing in the network to address its quality of supply of supply EDCoP non-compliance and customer complaint issues.

Maintaining expenditure levels for the Quality of Supply Program, alongside the CER Enablement Program, will help manage seasonal voltage complaints while addressing residual and complex issues such as harmonics, flicker, and voltage unbalance. Despite proactive investments, a zero-complaint outcome is not achievable, making this reactive program essential for resolving site-specific problems and ensuring compliance with quality of supply obligations.

Table 4 presents the Quality of Supply Program forecast expenditure. The expenditure that has been identified for this program and reflects the expenditure to address Quality of Supply in the 2027-31 regulatory control period.

Table 4: Quality of Supply Program Forecast Expenditure ($m, 30th June 2024 dollars)

	FY27	FY28	FY29	FY30	FY31	Total FY27-31	Total FY22-26 expenditure
Capex	(4.02)	(4.01)	(3.99)	(3.99)	(4.02)	**(20.03)**	**(19.28)**

Source: AusNet analysis

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