

SPECIAL REPORT

# INSIDE THE AUSTRALIAN GRID SURVEY

## How Voltage Management Could Reshape Australia's Energy Future

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The Energy Security Board's landmark voltage survey has triggered growing discussion across the electricity industry about how Australia manages one of the grid's least visible — but most important — operating parameters: voltage.

While electricity consumers are primarily focused on energy prices and reliability, the ESB report suggests voltage management may represent one of the largest untapped opportunities for improving energy efficiency, reducing emissions, and supporting the transition to a renewable-powered grid.



### AT A GLANCE: SURVEY HIGHLIGHTS



**Voltages often exceed optimal levels**  
Many locations recorded voltages above 240V, within the standard range (216V–253V) but higher than necessary.



**Significant regional variation**  
Urban areas are more stable, while rural and remote regions experience greater variability due to network characteristics.



**Energy efficiency opportunity**  
Voltage optimisation could reduce energy use by up to 10% in some areas.



**Renewable integration impact**  
High DER penetration contributes to voltage rise during low-load periods, requiring better management and coordination.



**Protects equipment and improves power quality**  
Keeping voltage within optimal limits extends equipment life and minimises wear and tear.

### WHY VOLTAGE MATTERS



Voltage is the electrical pressure that drives current through electrical systems and equipment.

The ESB survey found that many areas now experience persistently elevated voltage conditions, particularly during periods of low demand.

Even small increases above optimal voltage can materially increase electricity consumption for many categories of equipment and reduce overall efficiency across the grid.

### THE ENERGY EFFICIENCY EFFECT

Higher voltage leads to higher energy use, especially for resistive loads such as lighting and heating.

Voltage optimisation could reduce electricity usage by up to 10% in some locations.

#### THE NUMBERS

- 3% voltage reduction ≈ 2% energy savings
- 5% voltage reduction Can materially reduce peak demand
- 10 GWh annual user Potential savings of tens of thousands of dollars per year

### RENEWABLE ENERGY AND VOLTAGE RISE

Rooftop solar exports during low-demand periods can cause voltage rise in local networks, particularly in suburban and regional areas.

Recommended measures include:

- Dynamic inverter control settings
- Smart transformer tap changers
- Real-time voltage monitoring
- Dynamic export limits
- Advanced distribution management systems

These technologies will be essential as Australia's grid becomes more decentralised and renewable-powered.

### EQUIPMENT LIFE AND POWER QUALITY

Excessive voltage accelerates wear on motors, transformers, electronics and lighting systems.

Improved voltage regulation can:

- Extend equipment life by 10–15%
- Reduce maintenance requirements
- Improve power quality
- Reduce overheating and insulation degradation
- Lower failure rates for sensitive equipment

This is critical for industries relying on automation, data centres and electronically controlled systems where power quality impacts productivity and reliability.

### A MODERN GRID MANAGEMENT STRATEGY



The ESB recommends voltage management become an active component of Australia's energy policy.

Key initiatives include:

- Increased deployment of smart meters
- More granular voltage monitoring
- Advanced network analytics
- Regulatory reforms encouraging active voltage management
- Greater consumer awareness of voltage efficiency



Stronger coordination between DNSPs, regulators, renewable providers and large electricity users is essential for a stable, efficient grid.

“Voltage management is no longer just an engineering issue — it's a strategic energy efficiency opportunity.”

— Industry Observer

### THE BIGGER PICTURE

Effective voltage management is a low-cost, high-impact strategy to support Australia's energy transition.



Lower national electricity consumption



Reduced carbon emissions



Lower peak demand



Deferred infrastructure upgrades



Improved renewable integration



Greater grid resilience

The ESB survey reinforces a growing industry consensus:  
**The future electricity grid will not only require cleaner energy — it will also require smarter voltage management.**



### REFERENCE

Energy Security Board (2023)  
Voltage Analysis of the LV Distribution Network in the Australian National Electricity Market.

The report is available at:  
<https://www.energy.gov.au/government-priorities/energy-security-board/publications>

