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eBook

Can Your LV Network Keep Up with Electrification?

Discover how utilities can unlock capacity, manage growing demand and reduce network risk at scale



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Executive Summary

Low-voltage (LV) networks are becoming the defining constraint in the energy transition - not due to a lack of infrastructure, but because capacity cannot be used with confidence.

Across the UK, Europe, and beyond, operators are under pressure to connect electric vehicles, solar panels, data centres, heat pumps, and distributed generation at pace. At the same time, they are managing ageing assets and increasingly constrained field resources.

The challenge is no longer visibility alone. It is enabling data-based decision making - knowing what capacity is available, where risk is developing, and what action should be taken next.

Without real-time insight into LV behaviour, many decisions default to conservative assumptions around headroom, voltage, load, imbalance and risk - delaying connections and triggering reinforcement earlier than necessary.

The value lies in turning network data into clear, actionable insights that enable confident decisions on connection, intervention and investment.

However, not all visibility delivers the same value, and not all low-voltage monitors deliver the same visibility. Many networks are already data-rich but action-poor – more data does not automatically translate into better decisions.

This eBook outlines

- Why LV networks are becoming the bottleneck
- Why capacity - not faults - is the defining challenge
- Why data-based decision-making is the real goal of monitoring
- Why “good enough” monitoring fails to support confident decisions
- What changes when visibility becomes actionable insight
- How integrated solutions such as PRESense enable prioritised, data-led intervention



Why Low Voltage Networks are Becoming the Bottleneck

Low-voltage networks are becoming the defining constraint in the energy transition. LV networks are no longer a secondary consideration - they are where the energy transition will be won or lost.

Demand is increasing faster than the ability to understand and manage it. Operators are being asked to connect more, faster, and often without the visibility required to do so with confidence.

In many cases, the challenge is not the physical capacity of the network. It is the ability to make data-based decisions on how that capacity is used, where intervention is required, and how to prioritise limited resources.

Without real-time insight into network behaviour, operators must rely on conservative assumptions.

As a result, LV networks are increasingly treated as constrained, not because they lack capacity, but because they cannot be operated with sufficient decision confidence.

This is not a network limitation. It is a decision limitation.

Introducing visibility is therefore not just an operational improvement. It is a requirement for enabling electrification.

However, visibility is only the starting point. The real opportunity is to move from assumption-led planning to real-time, data-led decision making - where operators know not just what is happening, but what to do next.

This creates a dual risk:

- ↘ Assets being underutilised due to conservative planning
- ↘ Assets being pushed beyond safe operating limits, increasing the risk of failure

In both scenarios, the network underperforms, either economically or operationally.



Operators must be able to answer, in real time:

- Where is capacity genuinely available?
- Where is risk developing?
- What action is required, and how urgent is it?

Without these answers, uncertainty persists, and where uncertainty remains, cost, delay, and inefficiency follow.

The opportunity is clear:

- Move from assumption to evidence
- Move from visibility to action
- Move from data to decisive intervention

Because in today's LV networks, the constraint is no longer infrastructure - it is the inability to act with confidence at the right time.

This is not a network limitation. It is a decision limitation.



Chapter 01

The Changing Role of LV Networks

From Passive Infrastructure to Active Constraint

LV networks have moved from the edge of system planning to the centre of it.

They are now where electrification is experienced most directly, where constraints emerge first and where customers are impacted most.

Across the UK and Europe, network operators are facing the same structural challenges:

- Increasing demand driven by EVs, heat pumps and distributed generation
- Greater variability in load profiles and network behaviour
- Growing pressure to accelerate Low Carbon Technology connections
- Constraints on capital investment and reinforcement
- Stronger regulatory focus on performance and delivery timelines

LV networks have moved from the edge of system planning to the centre of it

A System Designed for Stability - Now Managing Complexity

LV networks were not built for this level of complexity.

Historically, they operated under relatively stable, predictable conditions with limited visibility. That model worked because demand patterns were consistent and the change was gradual.

That environment no longer exists.

Today, the challenge is not simply understanding the network - it is making clear, data-based decisions on how to manage increasing demand, prioritise intervention, and use available capacity effectively.



The Visibility Gap is Now a Capacity Constraint

While transmission and medium voltage networks have been progressively instrumented, LV networks remain comparatively under-observed.

Operators often lack real-time visibility into:

- Available capacity at the point of connection
- Voltage behaviour and headroom under load
- How demand is distributed across feeders
- Early warning signs of network stress or degradation
- Emerging faults before customers are impacted

Without visibility, networks must be managed conservatively.

Capacity is assumed rather than evidenced. Decisions are based on risk avoidance rather than actual performance. As a result, networks often operate below their potential.

In practice, this creates two opposing risks – networks are either underutilised due to conservative assumptions, or assets are pushed closer to their operating limits without early intervention, increasing the risk of failure.

Visibility as the Enabler of Electrification

Visibility at LV is not simply about monitoring network behaviour.

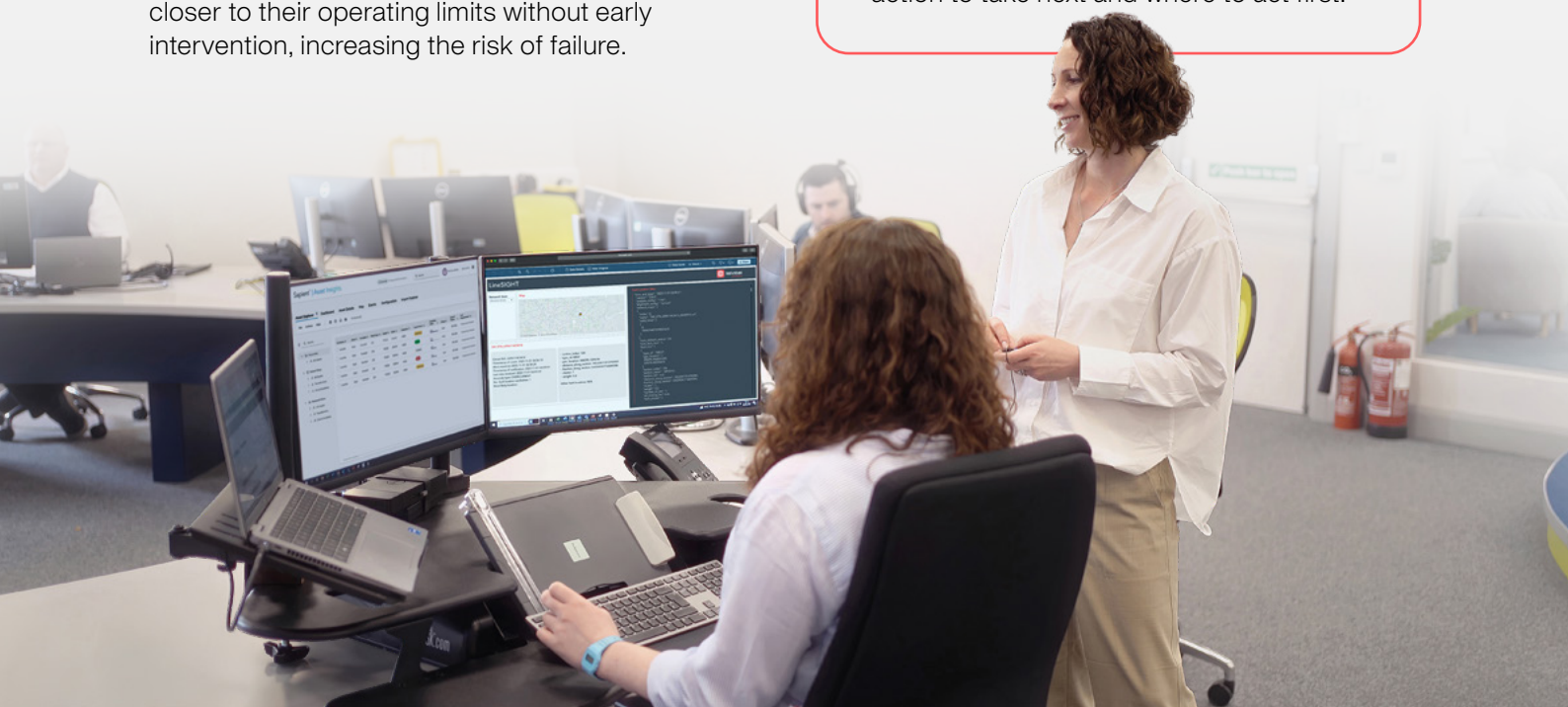
It is about enabling confidence.

However, visibility alone does not resolve the issue. Value is created when visibility is translated into actionable insight that supports confident, data-based decision making.

With real-time insight, operators can:

- Understand true network headroom
- Make faster and more informed connection decisions
- Target investment where it delivers the most value
- Optimise the use of existing infrastructure

Importantly, visibility alone does not improve outcomes. It is the ability to act on that visibility that creates value. This is what enables operators to move from understanding the network to knowing what action to take next and where to act first.



Chapter 02

The False Economy of ‘Good Enough’ Monitoring

The Increasing Focus on Cost

Low-voltage monitoring is widely accepted as a critical aspect of network management, with thousands of devices being rolled out across networks. It unlocks the vital visibility that is needed to make confident decisions – but not all monitors are created equal. As LV visibility becomes a priority, many operators face a practical question: How much monitoring is enough?

In response, low-cost monitoring options are often considered attractive - allowing broader deployment at a lower initial investment.

However, the effectiveness of monitoring is not defined by coverage alone. It is defined by whether it changes decisions. More specifically, it is defined by whether it enables confident, data-based decision-making across the network.

Data-Rich but Action-Poor

A common challenge across networks is the gap between data availability and operational impact.

Basic monitoring solutions may provide large volumes of data, but if that data does not identify emerging risk, explain network behaviour or support confident intervention, then it does not fundamentally improve how the network is managed.

It instead leads to a familiar outcome: more data, more analysis and limited change in operational decisions. In effect, networks become data-rich but remain action-poor. In this scenario, visibility exists, but decision-making remains unchanged - meaning investment has been made without improving how the network is actually operated.

Cost Is Visible. Risk Is Not.

Why Quality of Insight Matters

To deliver value, monitoring must do more than observe steady-state conditions.

It must capture:

- Transient and abnormal events
- Early-stage deviations from normal behaviour
- The signals that indicate where intervention is required

Without this level of insight, uncertainty remains, and where uncertainty remains, conservative decision-making persists. This directly limits the ability to prioritise action, particularly in environments where both capacity and field resources are constrained.

The Real Test of Monitoring

The purpose of LV monitoring is not visibility for its own sake. It is to remove uncertainty from critical decisions.

Every solution should be judged on these question:

Does it allow operators to answer confidently:

- Can this connection proceed without reinforcement?
- Where is capacity genuinely available?
- Is this network stable under peak and seasonal variation?
- Where is risk developing, and how quickly is it escalating?
- What intervention is required, and how urgent is it?

If those questions cannot be answered with confidence, then the solution has not delivered its purpose, regardless of how widely it is deployed.

PRESense was designed to address these core questions. PRESense is the leading LV monitor for full-spectrum grid visibility. Unlike other basic monitors, PRESense captures both routine load data and high-speed triggered events simultaneously, ensuring no critical activity is missed – enabling confidence in every decision.

By introducing continuous, high-resolution monitoring at the substation level, PRESense provides a real-time view of LV network behaviour, enabling operators to detect developing faults, understand available capacity, prioritise interventions and move towards a proactive operating model. Ensuring operators can make accurate data-led decisions.



ACTIVITY
Capacity Alert

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From Device Cost to Total Cost

The mistake many organisations make is focusing on the cost of deployment, rather than the cost of uncertainty.

Because uncertainty has consequences:

- Repeat site visits to diagnose unclear issues
- Emergency interventions triggered too late
- Reinforcement driven by assumption rather than evidence
- Delays in approving customer connections

These costs are rarely attributed to the monitoring strategy — but they are directly driven by it.

This is why the true measure of value is not initial investment, but whether the solution reduces the total cost of operating and developing the network (TOTEX).

Why Higher Value Solutions Deliver Better Economics

While lower-cost solutions may reduce upfront investment, they often fail to reduce downstream cost drivers.

By contrast, solutions that enable:

They also enable operators to prioritise work more effectively - ensuring limited field resources are deployed where they deliver the greatest operational and commercial impact.

The investment decision is therefore not about device cost - it is about whether the solution reduces the total cost of operating and developing the network.

Many operators have already fallen into this trap and have felt the knock-on impact of focusing on short-term cost reduction instead of long-term value gain.

Early insight into network behaviour + More accurate diagnosis of issues + Targeted and planned intervention = Can materially reduce these costs.

Chapter 03

From Visibility to Action



Turning Insight into Operational Change

1 Visibility changes what operators can see.

2 Insight changes what operators understand.

3 Intervention changes outcomes.

The transition from reactive to proactive network management depends on how effectively these three stages are connected.

The critical step is ensuring that insight leads to clear, prioritised, data-based decisions - not just improved understanding.

From Reactive Response to Planned Intervention

Traditionally, LV networks have been managed through reactive response. Issues are identified after customer impact, and work is planned under time pressure and at a higher operating cost.

With improved visibility, operators can identify emerging issues earlier and respond in a controlled way.

This enables:

- Planned intervention instead of emergency response
- Targeted field activity rather than exploratory work
- Reduced operational disruption
- Better use of resources
- Cost savings

However, the real value is not just earlier intervention - it is the ability to determine which interventions should be prioritised based on network risk, impact and available resources.

Prioritisation in a Resource-Constrained Environment

Across many LV networks, the constraint is not just budget - it is people.

There is a growing gap in LV and HV engineering resources, limiting the ability to carry out network interventions at the pace required.

This makes prioritisation critical. Operators must be able to determine:

- Which assets are at risk of failure or overload
- Where intervention will deliver the greatest operational impact
- How to deploy limited field teams most effectively across the network

Without this level of insight, work is often reactive, duplicated or misdirected - increasing cost and reducing network performance.

Data-based decision making enables this prioritisation, ensuring that intervention is targeted, timely and aligned to real network conditions.

What Actionable Insight Looks Like in Practice

Actionable insight is not more data.

It is clarity on:

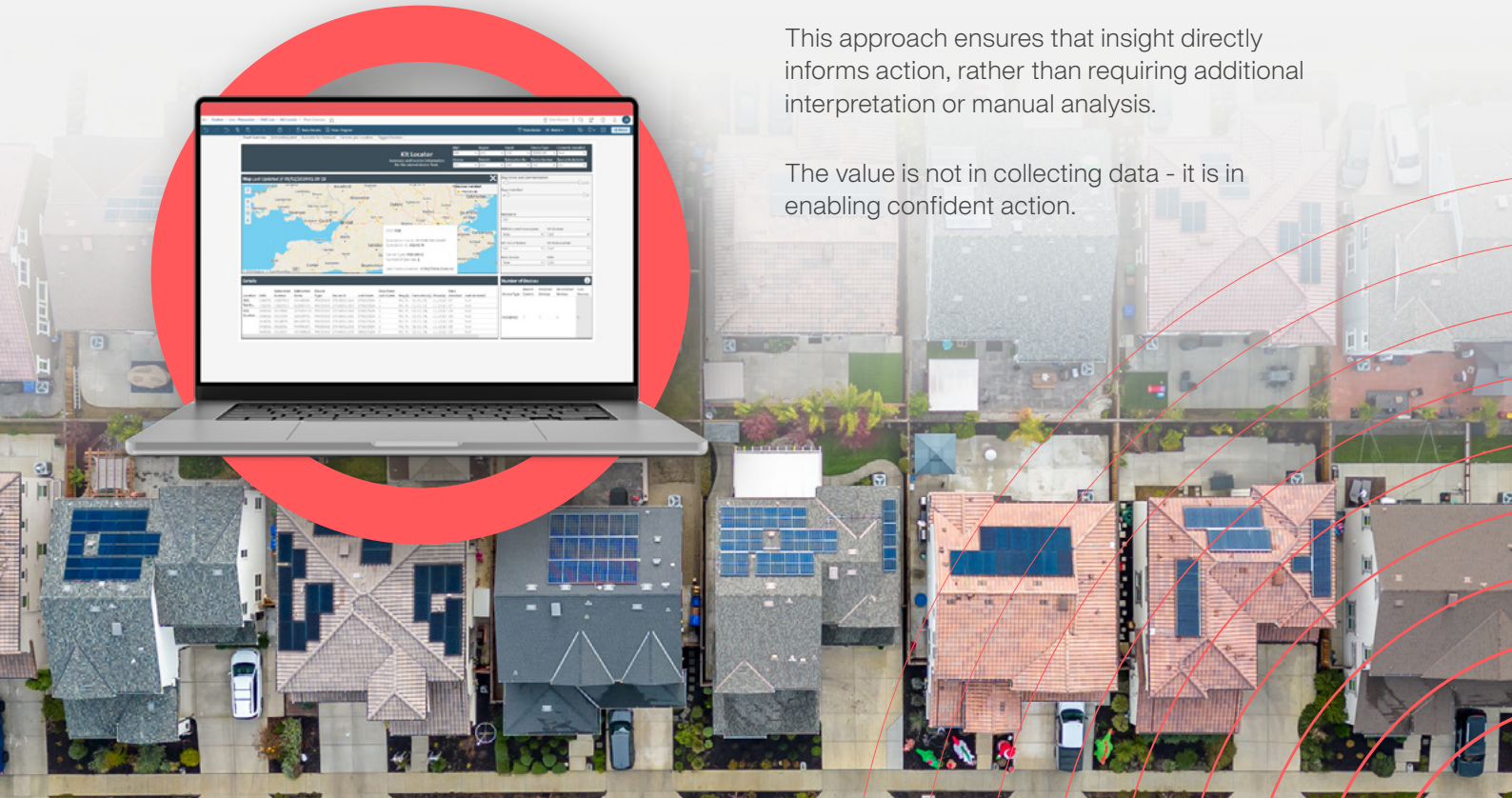
- What is happening
- Where it is happening
- Why it matters
- What to do next

This is what enables data-based decision making in practice - turning network data into clear, operational decisions rather than additional analysis.

Solutions such as PRESense are designed around this principle - combining routine monitoring with high-speed, event-driven capture so critical activity is not missed and supporting targeted response rather than trial-and-error investigation. PRESense is more than just a device; it's a solution that provides a step change in how networks are managed – from reactive to proactive management.

This approach ensures that insight directly informs action, rather than requiring additional interpretation or manual analysis.

The value is not in collecting data - it is in enabling confident action.



Chapter 04

Unlocking Capacity and Accelerating Connections

Capacity is the Defining LV Challenge

Capacity is increasingly the defining challenge for LV networks.

Capacity constraints are often perceived as physical limitations - but in many cases, they are driven by a lack of confidence in the data required to make connection and intervention decisions.

Without real-time insight, operators must assume that additional demand will exceed acceptable thresholds.

This results in:

- Delayed connection approvals
- Conservative planning decisions
- Premature reinforcement



Capacity is the Defining LV Challenge

When LV networks are monitored effectively, capacity becomes measurable.

Capacity shifts from inferred to evidenced

This enables more confident decision-making and more efficient utilisation of existing infrastructure.

Unlocking Hidden Capacity

In many LV networks, capacity already exists within the network but cannot be confidently accessed.

With improved insight, operators can:

- Identify unused or underutilised capacity
- Optimise network performance dynamically
- Accelerate additional connections without reinforcement

This is how flexibility is unlocked from existing infrastructure.

Accelerating Electrification

Faster and more confident connection decisions are critical to enabling electrification.

With advanced monitors such as PRESense, operators can:

- Approve connections based on real data
- Reduce unnecessary reinforcement
- Support higher utilisation without increasing risk

Electrification becomes a managed process rather than a constrained one.

Where PRESense Makes the Difference

Integrated LV monitoring and analytics solutions, such as PRESense support this shift by providing a real-time window into LV behaviour and prioritising interventions. Working in tandem with existing smart metering infrastructure, PRESense delivers unparalleled visibility into network health, providing confidence in decisions and actionable insights.

PRESense is more than just a device; it's a strategy that moves beyond standalone monitoring towards a unified hardware, software and analytics solution that enables consistent, data-based decision making across the network.

The outcome is not simply better visibility. It is stronger decision confidence, which is the prerequisite for unlocking capacity without compromising performance.



When LV networks are monitored effectively, capacity becomes measurable.

Chapter 05

Real-World Impact

When insight becomes actionable, operators are reporting:

- Fewer repeat site visits
- More efficient use of field resources
- Faster, more confident decision-making
- Additional network capacity – enabling faster LCT connections
- Improved stability under increasing load
- Reduction of faults and enhanced quality of supply for customers

These are not incremental improvements. They are the result of removing uncertainty from the system and replacing it with clarity, prioritisation and early action.

This allows organisations to move from reactive to proactive operation - reducing repeat faults, avoiding unnecessary interventions, and improving consistency across the network.

Adopters of PRESense have made the transition from reactive to insight-led operation, and the results are significant.

Colchester, UK

- Fault identified within days of installation (Device ROI within 1 week of installation)
- Located and pinpointed within 5 hours
- Enabled repair before peak Christmas trading period

Impact

- £3,269 cost saving
- 22 staff hours saved
- Avoided transport disruption and unnecessary excavation

Conclusion

Low-voltage networks are central to the success of the energy transition. As demand accelerates and electrification scales, the ability to understand and manage these networks in real time is no longer optional.

Reactive operation can no longer keep pace. The challenge is not visibility - it is decision confidence.

Operators must move from:

- Assumption to evidence
- Visibility to action
- Monitoring to decision-making

Because data alone does not create value. Decisions do.

Across LV networks, capacity is often not missing - it is held back by uncertainty. When that uncertainty is removed, networks can deliver more using the assets already in place.

Connections accelerate, interventions become targeted, and costs are controlled.

Integrated solutions such as PRESense enable this transition by combining real-time visibility with actionable, prioritised insight. An investment in advanced monitors such as PRESense, future-proofs your network monitoring strategy and ensures benefits not just now, but in the future also.

In an environment where uncertainty drives cost, delay and inefficiency, the ability to act with confidence is the true differentiator.

The future LV network is not simply visible. It is understood, optimised and actively managed to perform better over time.



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