

Optimizing Distribution Transformers

The demand for distribution transformers is projected to surge by 160% to 260% from 2021 levels by 2050, driven largely by electrification trends, including electric vehicles (EVs), heat pumps and increasing renewable energy sources.^a This burgeoning demand underscores the critical need for real-time monitoring and management solutions that enhance grid resilience, optimize existing infrastructure, and prevent transformer overloading. Edge Zero is uniquely positioned to address these challenges, providing utilities with the tools necessary to navigate the complexities of the evolving energy landscape.



Electrification and Increased Demand

The anticipated rise in transformer demand stems from a multifaceted electrification effort that will fundamentally alter energy consumption patterns. As noted by NREL, this increase necessitates real-time data for utilities to manage peak loads effectively and allocate transformer capacity strategically.

Failure Rates and Causes

Aging Infrastructure

Many transformers are nearing or past their lifespan. By 2050, up to 80% of transformers will require replacement, significantly impacting utility operations and reliability.^a

Extreme Weather Events

Severe weather patterns have been shown to exacerbate transformer failures. Heat waves, storms and hurricanes can lead to significant damage, prompting costly replacements.

Overloading

Repeated overloads can substantially reduce transformer life expectancy, increasing failure rates. And, load profiles are becoming more complex as DERs integrate into the grid.

^a **Solution Brief Routinely Cites:** National Renewable Energy Laboratory. (2024). Major drivers of long-term distribution transformer demand. <https://www.nrel.gov/docs/fy23osti/84327.pdf>

Distributed Energy Resource Integration

The integration of DERs, such as solar and battery storage systems, necessitates advanced monitoring capabilities. As NREL suggests, the management of bidirectional power flows is also crucial for optimizing transformer usage.

Demand factors and power quality metrics should support distribution planning and the adequate sizing of transformer assets to avoid replacing them before end-of-life due to overloading.

Edge Zero supports DER integration through its solution, providing utilities with measurements including:

- Capacity Loading Percentage
- Bidirectional Power Flow Monitoring
- Voltage, Current and Other Power Quality Metrics
- Real and Reactive Power Data
- Customizable Reporting Dashboards
- API Integration with Other Utility Systems

Edge Zero supports distribution transformer optimization through its minute-level transformer data and daily forecasting mechanisms:

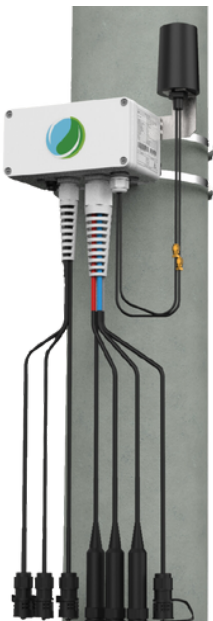
- Informed Cost Deferral through Load Management Programs
- Tailored Proactive Maintenance Scheduling
- Improved Load Growth Forecasts
- Optimized Asset Sizing
- Enhanced Asset Siting

Load Growth and Transformer Optimization

The expected growth in load from EV charging stations, data centers and industrial electrification efforts presents a challenge for utilities to optimize transformer performance.

Edge Zero's load analytics and transformer-level visibility empower utilities to forecast load growth accurately, allowing utilities to right-size equipment and support electrification efforts without routinely overloading too-small capacity distribution transformers to failure.

A Bundled Hardware and Software Solution



EdgeSensor (600 Series)

Grid Edge Power Quality Monitor – Grid and Transformer Monitoring Unit

The EdgeSensor (600 Series) is a compact tool for pole-mounted and pad-mounted distribution transformer management. This power quality monitor delivers real-time insights into low voltage network performance. Equipped with mesh-network capabilities, the EdgeSensor reports live transformer data and status alarms, empowering utilities to optimize transformer operations and enhance overall reliability.

EdgeConnected™

Low Voltage Monitoring Platform

The EdgeConnected platform harnesses live data from the cost-effective EdgeSensor product line, delivering valuable insights for effective asset management, program design and measurement and verification, all crucial for optimizing distribution transformer performance.