



400 on-site audits reveal

The 8 most common risks in your electrical and automation systems

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Introduction

This report compiles and summarizes data collected by Schneider Electric™ from on-site audits of electrical distribution systems across 400 customer sites between 2017 and 2022. We intentionally selected diverse segments across various geographies to help ensure a valid cross-section of information. The eye-opening results indicate our findings are similar across all electrical system applications and geographic locations.

All information in this report is based on data from the following segments:

Methodology

- Life Science (30%)
- Food and Beverage (40%)
- Other (30%)
 - Buildings
 - Energy and Chemicals
 - Healthcare
 - Automotive and eMobility
 - Mining, Minerals, and Metals (MMM)
 - Water and Wastewater

The audits were conducted in these geographies:

- Europe (33%)
- APAC (23%)
- NAM (21%)
- South America (14%)
- Middle East/Africa (9%)

Our network consultants used best-in-class software to audit electrical and operator safety, electrical asset health and obsolescence, monitoring systems, technical documentation, and workforce empowerment training.

This report summarizes our 8 key findings and what they could mean for your electrical systems.

1

98% of audited sites had electrical safety risks

Nearly every audited site had *direct* safety risks – accessible live energized parts, lack of personal protective equipment (PPE), damaged protective equipment, corroded cables, damaged insulation systems, or underrated (vs. the installation's nominal value) equipment.

There were also *indirect* safety risks – lack of or an outdated single-line diagram (SLD), which increases operator risks during electrical maintenance operations.

Without an accurate electrical system diagram, operators may lack knowledge of:

- Whether or not the correct feeder is locked and tagged out.
- Redundancy within the installation, like a bypass that could re-energize the system.

These potential risks can lead to a disaster – a fatality, electrical fire, poor service continuity, and damaged company image.

2

89% of audited sites had no or only partial electrical SLD

A newly commissioned electrical installation has that new car smell with up-to-date technical documentation available to all maintenance personnel. But, as time passes, the installation evolves. Experienced maintenance operators may leave, or the network might undergo modifications. If the SLD has not been updated, there is no longer an accurate representation of the current electrical system.

This can potentially affect the operational safety of the electrical system. In this scenario, maintenance personnel cannot be sure that they are identifying all of the problems/threats or be certain the required safety precautions are being followed. Additionally, an out-of-date SLD may indicate that power system studies were not done since the modification and evolution of the electrical installation. As a result, service continuity and operator safety could be at risk.

Without an accurate SLD, planning for the future is nearly impossible

A SLD is critical for ensuring safe, reliable, and efficient operations in every facility.

As regulations change and businesses embrace sustainability targets by electrifying processes to reduce CO₂ emissions, it's impossible to validate if the existing electrical system could really handle the addition of a new electrical furnace, microgrid system, or assembly line changes without an accurate and complete electrical system diagram.

Example

A net-zero journey could include adding electric vehicle (EV) charging substations to your electrical system. Can your transformer safely withstand this new load? Is your SLD up-to-date so you can make proper loadflow calculations?

3

76% of audited sites had no or only partial digital monitoring systems

Over three-quarters of our audited sites had limited views of their energy usage due to a lack of network-connected power meters and current sensors.

Having proper metering devices in the right places provides a much more comprehensive understanding of a facility's electrical energy flow and consumption. Connected devices can be integrated with most energy management systems (EMS) or building management systems (BMS) to enable remote monitoring and control of electrical systems. These software platforms use the data gathered by connected devices and aggregate, analyze, and present it in the user interface. This enables facility managers to respond quickly to risks or adjust processes as needed, identifying processes or assets that consume large amounts of energy and helping staff implement actions to reduce consumption and reduce CO₂ emissions.

Digital metering devices also detect electrical system disturbances, such as voltage sags, harmonic distortion, overloads, and other power transients. These monitoring systems allow maintenance personnel to quickly identify and resolve issues before they cause downtime or damage to equipment, as repeated exposure to power transients can shorten electrical equipment lifespans.



Did you know?

The transformer is a critical asset in your electrical installation, and a failure may stop your production. You can connect and monitor your transformer to help anticipate potential failures or shutdowns with **EcoStruxure™ Transformer Expert**.

[Learn more](#)



4

98% of audited sites did not follow the maintenance recommendations of the manufacturer

Imagine driving a car and never maintaining it – no oil changes, new tires, service checks, or brake or fluid replacement. How long until it breaks down and leaves you stranded? The car could have run efficiently and problem-free for additional years had it been adequately maintained.

It's the same for electrical assets. Maintenance recommendations are designed to ensure the safe and optimal operation of equipment. Failure to follow these recommendations can lead to equipment failure, accidents, and injury to employees and building occupants while significantly reducing equipment life span.

Many manufacturers require their equipment to be maintained according to their recommendations to keep the warranty intact. Not following maintenance can shorten equipment lifespan and lead to a shutdown, safety risks, or failure, making the facility responsible for repairs or replacements. Poorly maintained equipment can also be less efficient, leading to higher costs, and leaves a facility non-compliant with regulations and guidelines requiring specific maintenance procedures. It's imperative to respect manufacturer recommendations to maximize your uptime and run your business.

5

29% of audited sites had damaged or poorly maintained capacitor banks

Capacitor banks (with or without harmonic filtering systems) are key assets in an electrical facility. They improve power quality, reduce energy costs, and increase system efficiency.

Our audit data indicates that once capacitor banks are installed, there is sometimes no ongoing maintenance prescribed and no one to validate if the capacitors are working properly. Therefore, as electrical systems evolve, existing capacitor banks may not adapt to network changes. Any harmonics in the electrical system can quickly destroy capacitors.

Poorly specified or improperly sized capacitor banks can result in:

- A higher current draw from the electrical supply system leading to inefficiencies
- Increased energy costs
- Higher power factor
- Power factor penalties from the utility

Changes in the plant's usage patterns or nonlinear loads (LEDs, drives, HVAC systems, or EV chargers) may lead to a higher amount of harmonic current generated, which can damage capacitor banks, accelerate equipment aging, and sometimes even lead to electrical fires.



Did you know?

You may be paying power factor penalties as part of your electricity bill. With the right capacitor banks, you could cancel this expense and save money every month.

6

79% of audited sites had obsolete electrical equipment

Today's typical electrical installation could have been designed and made operational decades ago. Depending on how this installation was managed, several devices within the system could now be obsolete. **This was the case in nearly 8 out of 10 site audits.**

Obsolescence means these devices are no longer available or serviceable. Facility operators face an increasing likelihood of downtime, experiencing safety hazards, and having reduced energy efficiency. Obsolete electrical equipment may also be incompatible with current energy management or building management systems, which may limit the ability to realize the full efficiencies and features of these technologies.

Example

Analog power meters are simple and reliable devices, but are not equipped to communicate with modern software platforms that require digital data for analysis and control. Relying on these devices would mean valuable data and insight would be missed, resulting in reduced efficiency and unmonitored energy consumption.

Digital power meters can provide real-time data on energy consumption and power quality to building or energy management software, which is an essential element for effective energy management.



7

71% of audited sites lacked spare parts to ensure service continuity

The majority of our audited sites struggled with spare parts identification and management. Identifying the correct inventory balance according to process criticality is a constant challenge: too many spare parts, too few spare parts, or even cataloging obsolete spare parts.

While some non-critical feeders in a facility's electrical system can shut down without affecting production, other critical feeders energize key processes. Any shutdown can result in millions of euros in production losses in a very short time.

8

93% of audited sites had no recent protection coordination studies

A protection coordination study ensures protective devices, such as circuit breakers, fuses, and relays, are coordinated. This helps ensure that in the case of an electrical fault on one feeder, only the faulty part of the system will be disconnected, not the complete installation.

When an electrical installation is new, the protection coordination studies are correctly adjusted and accurate. But as time passes in an installation's lifecycle, there is inevitable evolution, modification, and replacement of protection devices.

Some loads (e.g., speed drives, motors) may be replaced, but the protection relay settings are often not revised to consider the new system setup. The result could be a load drop and nuisance tripping, leading to a complete factory shutdown.

Example

One industrial process suffered a feeder failure that caused a total production stoppage, resulting in more than €3M in losses. An up-to-date SLD and a new protection coordination study could have avoided this situation.



Did you know?

A protection coordination study ensures that only the faulty feeder disconnects in case of an electrical fault instead of the entire installation. When did you last complete a **power system study**?

[Learn more](#)

EcoConsult can address the risks

Most businesses' primary focus is productivity – increasing the number of finished products or delivering key goods or services to market within a given timeframe. But business productivity relies completely on the health and maintenance of your electrical and automation systems, a dependence that is too often taken for granted.

Without healthy, well-maintained, and efficient electrical and automation systems, business operations, operator, and facility safety are at significant risk. **However, this risk can be addressed with the right expert services.**



Did you know?

EcoConsult consulting services for electrical and automation systems can audit, evaluate, and map your electrical and automation assets and systems.

[Learn more](#)

With best-in-class software and digital technologies, EcoConsult helps optimize and digitize your assets and systems so you don't have to. We can help:

- **Improve** operator and system safety and efficiency, maintain assets, and safeguard against disruptions.
- **Optimize** sensors and monitoring systems to support predictive maintenance strategies and improve service continuity.
- **Ensure** equipment is properly maintained and operating efficiently and reliably to promote energy savings, lower operating costs (OpEx), reduce safety risks, and propose a 10-year maintenance plan with EcoCare.
- **Maintain** capacitor banks and harmonic filtering systems to reduce electricity costs, avoid equipment breakdown, help avert potential fire risks, increase system efficiency, and reduce CO₂ footprint.
- **Audit and assess** electrical equipment, identify obsolete equipment from service, and propose a modernization plan with EcoFit.
- **Define** a list of spare parts and recommend equipment replacements.
- **Recommend** corrective actions or changes in the protection scheme and protective device settings and optimize their coordination to improve electrical power system continuity.
- **Update and maintain** your electrical SLD with EcoConsult Electrical Digital Twin.

Our trusted advisors assess your existing power and automation systems to identify potential safety and performance issues, helping to reduce your risks and improve resiliency and operational efficiency.

Are you ready to embrace digitization to help overcome sustainability challenges?

This report involved audits representing a diverse cross-section of industries and geographies. The results were enlightening and indicated improvements are needed in many areas of electrical system management. We hope the report catalyzes positive maintenance and safety changes in electrical and automation systems.

Every year, Schneider Electric audits hundreds of industrial sites, data centers, and buildings. Our expert consultants systematically identify and design recommendations for solutions that are easy to deploy and maintain and are resilient against critical safety, resiliency, and efficiency issues. We provide actionable insights so you can focus on your core business and extract the most from your electrical and automation systems.

Get your EcoConsult Audit site now

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