Enhancing Data Center Energy Security

Avoiding Preventable and Unforeseen Transformer Failures

Every data center carries the same unspoken hope… that the transformers powering your infrastructure will continue to run, reliably and indefinitely. Yet across the energy landscape, transformer failures are climbing, replacement timelines are growing and the losses incurred from energy interruptions are staggering.

Transformers rarely fail suddenly. Instead, they fail quietly, through an invisible internal degradation. But when they fail, the impact is big. The result is not just an outage, but financial loss, operational disruption, an environmental hazard and reputational impact. A transformer replacement can take a year or more to procure, and every unplanned outage erodes stakeholder confidence and trust.

The good news is that the paradigm has shifted. Modern monitoring technology means transformer losses are no longer inevitable. It's time to rethink transformer health monitoring.

The Rising Cost of Doing Nothing

Over the past few decades, transformer economics have changed dramatically. Pushed for business efficiency, modern transformers are often built with tighter design margins and less tolerance for stress.

So, when considering failure predictors, age alone isn't the problem. Heat, moisture and through-fault events are the primary stressors driving failure. In fact, most transformers fail before the planned end of life—not from age, but from operating blind in challenging real-world conditions, with operators unable to see damage accumulating inside.

The science behind transformer failures

Incipient transformer faults produce heat that results in fault gases being released into the transformer oil. Traditional monitoring methods rely on drawing manual oil samples for lab dissolved gas analysis to determine transformer condition. Depending on the capacity, the analysis is performed every one to four years.

Energy security is crucial to every data center, yet transformers, the most expensive and critical of the electrical assets, have no diagnostic capabilities.

Transformers don't fail suddenly, but rather due to the slow degradation of insulation elements. This means most failures are preventable.

How? Continuous hydrogen monitoring provides early warning and insights into transformer condition, triggering a response before catastrophe unfolds.

H2scan's GRIDSCAN® and Fleet Advisor® platforms deliver immediate, actionable insights for asset management, rendering avoidable losses obsolete.

But the latest industry intelligence indicates that transformer faults progress from initial gassing to complete failure in an average of 6 months, and that gap in visibility is a risk that few data centers can afford. If you can't see degradation occurring, you can't prevent failure and by the time lab results catch it, it's often too late. In contrast, continuous online monitoring provides immediate, actionable data on the asset condition.

The Simple Power of Single Gas Monitoring

Why monitor only hydrogen? It's the first gas produced in every type of internal fault, giving you the earliest possible indication of trouble. Multi-gas monitors analyze several gases, but their higher expense and upkeep often make them practical only for large, utility-grade transformers.

In contrast, single-gas hydrogen monitors provide the same early warning functionality with lower upfront and lifetime costs. In practical terms, when abnormal gas levels are detected and operating procedures require oil sample analysis, single hydrogen monitoring delivers fast, actionable insight at a more affordable price point.

Reasons to monitor key gas (H_2) continuously

1. Accurate real-time H_2 and moisture tracking provides early detection of all critical failure modes
2. Early intervention reduces stress on the transformer and avoids taking essential infrastructure offline
3. Single-gas, hydrogen monitoring provides a foundation for predictive maintenance and AI-driven data
4. Cost-effective to install across the entire transformer fleet

From Insight to Prevention: The H2scan Advantage

Modern reliability programs demand technology that's accurate, scalable, secure and built for harsh, real-world environments. H2scan's solutions provide exactly that, delivering continuous visibility of all the transformers working for you. Our GRIDSCAN® sensors provide accurate hydrogen, temperature and moisture measurements directly in the transformer oil or headspace. Notable capabilities include:

- Patented self-calibration with a 10-year sensing element warranty
- IoT and SCADA connectivity
- FM approved for favorable insurance treatment
- 1-2 hour installation on energized transformers

Complementing these sensors, Fleet Advisor® offers a secure, scalable IoT platform with insight-rich, actionable dashboards for transformer management. Designed for cyber-security and minimal IT overhead, it collects, processes and presents data wherever you are.

It's Time To Build a Proactive Future

Today's data centers face immense energy security pressure exacerbated by skilled labor shortages, rising equipment costs and long lead times. You cannot afford to operate blindly. The question is no longer "Why single gas monitoring?" but "How soon can we get started?" Your transformers are talking, and we can help you hear what they say. Ask us how.