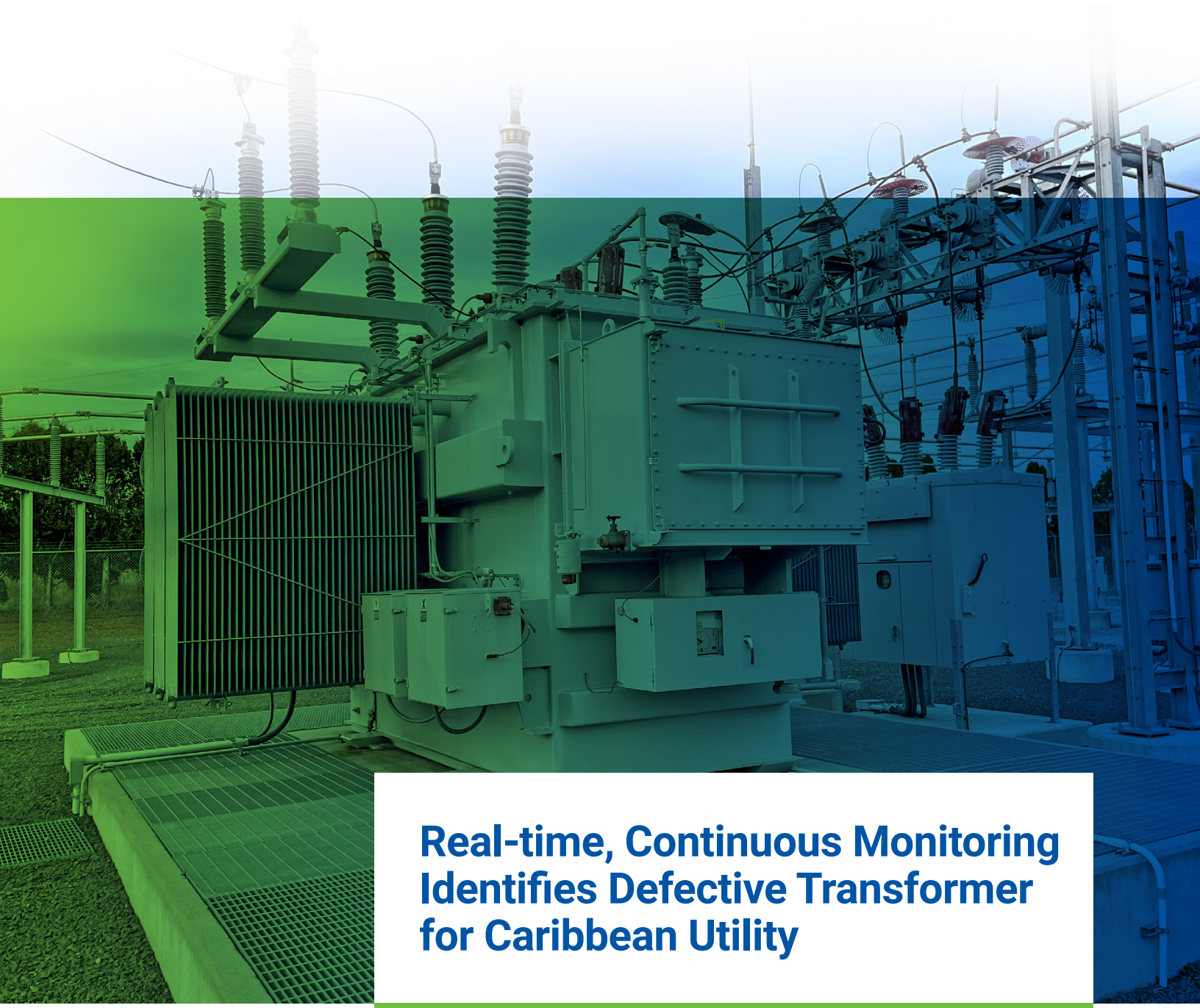
H2scan
ADVANCED HYDROGEN SENSING



Real-time, Continuous Monitoring Identifies Defective Transformer for Caribbean Utility

CASE STUDY

Challenge

A major utility in the Caribbean faced a challenge common to many utilities related to obtaining current and actionable performance data for its transformer fleet. The utility had transformers of varying ages and conditions scattered throughout an area serving more than 3 million customers. The traditional practice of sporadic, manual testing yielded uncertain and often unreliable results. The staff sought a more uniform sampling method or system to evaluate transformer health throughout its service area, to better manage these assets. Another challenge was its tropical location. Surrounded by ocean water, it needed a system designed and developed to withstand harsh or aggressive conditions such as exposure to saline water.

Manual Extraction

Background

Recently, the utility removed a transformer from service due to gassing issues. This transformer was initially installed in 2012 and had not reached the end of its anticipated service lifespan. The utility performed degassing, replaced insulating fluids and put the transformer back into service. What would best assist the utility was a system that could provide real-time, continuous monitoring and actionable data that would allow staff to instantly evaluate the transformer's condition since frequent manual testing was impractical and time-consuming.

Furthermore, the utility needed the solution to be cost-effective.

Beta Testing H2scan Sensors

In late 2023, the utility decided to beta test the H2scan GRIDSCAN™ 5000 Hydrogen Sensor on a 24 KVA, 115/13.2 kV transformer. This transformer had a known history of gassing issues, making this piece of equipment an ideal candidate for the pilot program.

The H2scan sensor was installed in December 2023—an installation that took less than two hours to complete without requiring an outage or power shutdown. The utility was impressed with the ease of installation and the ability to access data via the cloud.

In April 2024, the transformer was energized with load. In May 2024, less than a month later, the H2scan sensor detected a significant increase in hydrogen levels in the transformer. Upon receiving this information, the utility pulled a manual sample for lab testing. The lab results confirmed 80 parts per million (ppm) of hydrogen and 52 ppm of acetylene in the sample, closely matching the H2scan sensor's reading of 82-83 ppm of hydrogen.

The Solution

After receiving the lab results confirming the elevated levels of hydrogen and acetylene, the utility took immediate action. They de-energized the transformer and asked the transformer manufacturer to inspect the unit. During this inspection, the team discovered that the low-side winding was severely damaged. Based on these findings, the utility decided to permanently remove this unit from service and seek a replacement unit.

The utility was able to leverage the data from the sensor as a life extension or service determination tool. Early warning of the presence of hydrogen alerted the utility to a potential problem, enabling its staff to send a team for inspection and to pull the transformer from service, saving it from a potentially catastrophic failure. It demonstrated the value of real-time monitoring by enabling the utility to take proactive measures to protect their infrastructure and maintain reliable service to their customers.

The performance of the GRIDSCAN 5000 Hydrogen Monitor in this situation showcased its key features:

1. **Early detection capability, providing a timely warning**
2. **Continuous, real-time data monitoring**
3. **Accuracy in harsh environmental conditions, including corrosive saline atmospheres**
4. **Cost-effectiveness, priced significantly lower than competitors' options**
5. **Ease of deployment, making it ideal for widespread use across multiple transformers**

Success Factors

The utility's swift response, enabled by H2scan's technology, was key to its success. Upon detecting the high gas levels, they immediately de-energized the transformer and brought out the manufacturer for inspection. The inspection revealed severe damage to the low-side winding, leading to the decision to remove the unit from service and seek a replacement.

This early detection prevented a potentially catastrophic failure of the transformer, highlighting the GRIDSCAN 5000 as an effective life extension tool for critical assets. The utility was able to replace the transformer based on its actual condition rather than relying solely on age or guesswork.

Broader Impact

As a result of this successful pilot, the utility is taking significant steps:

- ***Working with H2scan to get the sensor specified on new transformer units***
- ***Planning retrofits for existing transformers across their fleet***
- ***Working with H2scan to overcome cybersecurity concerns and prove the safety of the system***

The utility is looking to implement the H2scan solution specified for new transformers and a retrofit for an initial 80 critical units, expanding to potentially cover hundreds more transformers across the entire fleet (transmission, generation, distribution). Rollout is planned during a four-to-five-year period.

Key Benefits for Global Application

The GRIDSCAN 5000 Multi-Sense Monitor from H2scan offers utilities several benefits:

- **Early Warning System:** Detects issues before they escalate
- **Cost-effective:** Half the price of less reliable competitors
- **Reliability:** Ten-year warranty on the hydrogen sensing element
- **Connectivity:** IoT/SCADA/ADMS ready with Modbus or DNP3
- **No Maintenance:** Patented auto calibration eliminates drift and the need for periodic calibrations to maximize uptime
- **Easy to Install and Operate:** No moving parts and small form factor
- **Rugged and Reliable:** Rated for harsh environmental conditions (meets or exceeds IP68 standards for exposure to water and dust)

About H2scan

H2scan is a leading developer and manufacturer of high-performance hydrogen sensing solutions, dedicated to delivering the most reliable industrialized sensing solutions to OEM (Original Equipment Manufacturer) partners, distributors and end customers globally. The company's latest Gen 5 solutions offer unparalleled accuracy, maintenance-free operation and cost-effectiveness in hydrogen sensing. Trusted by industry giants like ABB, Siemens, ExxonMobil, Shell, Procter & Gamble and others, its products are integral in shaping the new Hydrogen Economy for a clean, secure and affordable energy future.

H2scan products are also used by utilities for transformer fleet asset management, by the chemical industry to optimize hydrogen processes, and for safety monitoring in enclosed areas susceptible to hydrogen leaks and energy storage charging out-gassing and other similar hydrogen sources.

Built on solid-state technology pioneered at Sandia National Laboratory and the U.S. Department of Energy, H2scan boasts 44 patents covering its core technology, software and product innovations.

Learn more at www.h2scan.com.

Traci Hopkins started her journey in electric power reliability in June 2012 as an adjunct instructor in various Training & Education departments for transformer technologies. Shortly after, she transitioned into the role of Diagnostic Analytic Coordinator for the international market while continuing to support training & education through international events. In 2022, she joined H2scan as the Sales Manager, Latin America responsible for promoting hydrogen sensing across multiple industries. Traci has received the CRL, MTMP, MTRP and DPS Training certifications. Traci is also a Senior member of IEEE PES, the Association of Asset Management Professionals, and WIRAM (Women in Reliability and Asset Management) organizations.