2026 IERE-KEPCO Seoul Energy Equation Workshop
Seoul, South Korea
May 19–22, 2026

Format 3

Solving the Reliability Equation: Autonomous Robotic Inspection for Grid Stability & Availability

***Oussama Darouichi [1], Xuechun Yang [2]**
[1] Senior Director of Utilities, ANYbotics
[2] Head of APAC, ANYbotics

Keywords: *Autonomous Inspection, Grid Reliability, Asset Performance Management, Unmanned Operations, Predictive Maintenance*

Abstract ***(approximately 200–400 words in one page)***

In this presentation, we will explore robotic asset monitoring across the energy sector—from power generation to distribution—with a deep dive into specific substation success stories.

As global power grids transition toward a decentralized, high-penetration renewable future, the "Energy Equation" becomes increasingly complex, placing unprecedented stress on aging substation infrastructure. In isolated or constrained grids—where redundancy is limited and the consequence of failure is systemic—autonomous robotic inspection serves as critical "digital insurance" against catastrophic asset failure. This paper presents a real-world analysis of how this technology transforms maintenance from a cost center into a grid-reliability investment.

Central to this study is a 2026 case study from a major North American utility where the autonomous quadruped robot, ANYmal, detected a subtle 2°C thermal anomaly on a transformer bushing during a high-frequency routine inspection. This early detection occurred weeks before potential failure, allowing for a controlled repair that prevented an estimated $3.5 million in equipment destruction, regulatory fines, and unplanned downtime. This "save" highlights the strategic shift from manual, periodic inspections to continuous, high-frequency autonomous data collection that catches degradation 2–4 weeks before failure.

The success of these deployments is underpinned by a robust ecosystem of strategic partnerships with global energy leaders, including Siemens Energy, GE, Kanadevia Inova, and Yokogawa. These collaborations ensure that autonomous inspection is integrated into broader Asset Performance Management (APM) and grid-resilience frameworks. We argue that these "new tools" do not replace human labor but optimize it; by automating repetitive "walk-throughs," utilities can reallocate limited skilled resources from routine monitoring to high-value infrastructure hardening and new construction.

Looking ahead, the outlook for autonomous robotics in the power generation space is rapidly expanding. Beyond substation health, the technology is being deployed for power generation applications in Thermal Power Plant, Waste-to-Energy (WtE), and Hydro Power Plant. For example, ANYmal is also used to enable fully unmanned operations for remote Hydro Power Plants in Japan, increasing the inspection frequency from monthly to daily while keeping an eye on the ground in case of any emergency.