Case Study

Executive Summary

Pacific Gas and Electric Company (PG&E) launched an EPIC project to evaluate next-generation solutions for **Dynamic Line Rating (DLR)** and **Asset Health Monitoring (AHM)** across its transmission network in California. The initiative aims to increase grid reliability, unlock hidden capacity, and prepare the system for extreme weather and higher renewable energy penetration.

As part of this demonstration, **PG&E is evaluating Sentrisense's SENTRI sensor**, a fully autonomous field device that combines DLR and asset health monitoring directly on overhead transmission lines. SENTRI provides continuous, real-time data on conductor temperature, sag, vibration, and fatigue, supporting data-driven maintenance and safer operation closer to true line capacity.

The Challenge

PG&E operates one of the largest and most complex electric networks in the United States. The utility faces increasing pressure from:

- Extreme weather events such as heat waves and high winds
- Growing congestion on existing transmission corridors
- Rapid integration of renewable energy sources
- The need to modernize aging infrastructure without costly expansions

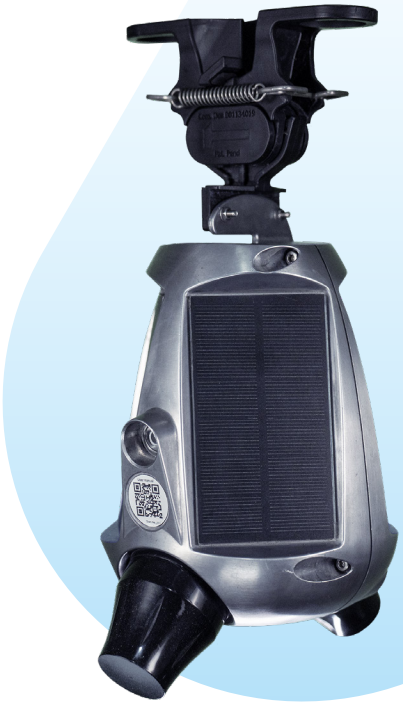
Traditional static line ratings limit how much power can be safely transmitted, often leaving capacity unused. At the same time, limited real-time insight into asset condition makes proactive maintenance difficult. PG&E needed technologies that could provide **continuous**, **field-based visibility** into both line capacity and asset health, while supporting long-term reliability and cost efficiency.

The Sentrisense Solution

What was deployed

- Real time data from the conductors. With SENTRI sensors mounted directly on overhead transmission lines
- Autonomous. The sensors recharge automatically using a solar harvester
- Continuous measurement of temperature, sag, vibration, and conductor fatigue
- Real-time data delivery to a dedicated monitoring platform

PG&E completed hardware installations and activated vendor dashboards as part of the broader technology demonstration, reaching trial deployment status.



What this meant for PG&E

- Direct, real-time insight from the conductor itself
- Ability to assess line behavior under real operating conditions
- Early visibility into mechanical stress and degradation patterns
- Support for data-driven maintenance and operational planning

By evaluating SENTRI, PG&E is exploring a cost-efficient way to extend asset lifespan while improving situational awareness across critical transmission corridors.

Results

Operational visibility

- Continuous monitoring of key conductor parameters
- Real-time data supporting Dynamic Line Rating decisions
- Improved understanding of asset behavior in changing conditions

Strategic impact

- Supports higher utilization of existing infrastructure
- Contributes to congestion reduction strategies
- Strengthens readiness for extreme weather scenarios
- Enables better planning for renewable energy integration

Grid modernization

- Demonstrates the role of field-based sensing in future grid operations
- Aligns with PG&E's broader innovation and R&D strategy
- Helps reduce reliance on costly traditional infrastructure upgrades

" This project is a critical step in modernizing California's grid. Fundamentally, it is focused on leveraging new technology to save California's families and businesses money. We see a clear path to unlocking significant value through Dynamic Line Rating and asset health monitoring technologies."

Mike Delaney
Vice President of Utility Partnerships and Innovation, PG&E

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Case Study

transelec

Executive Summary

Transelec, Chile's leading electric transmission company, faced a persistent challenge with cable theft and operational incidents across critical transmission corridors. These events directly impacted supply continuity, safety, and maintenance efficiency.

To address this, Transelec deployed SENTRI monitoring devices, locally branded as *Centinela*, across its transmission network. The solution provided real-time, georeferenced visibility into conductor behavior, enabling faster incident detection, improved coordination with security teams, and stronger preventive maintenance strategies.

Within the first year of operation, the system accurately detected all theft incidents occurring on monitored lines, supporting Transelec's goals of operational continuity, asset protection, and grid resilience.

The Challenge

Transelec needed a monitoring system capable of operating continuously across vast and remote transmission corridors, where access is limited and incidents often occur outside normal inspection windows.

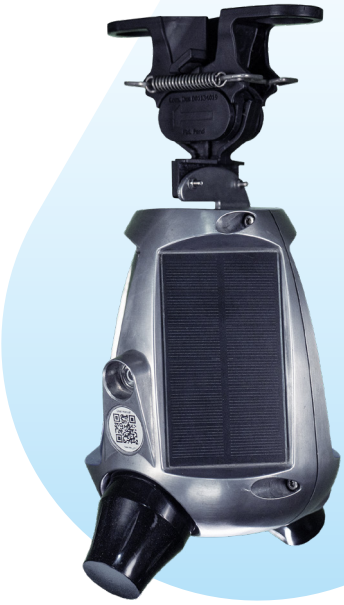
The solution had to provide immediate, actionable alerts, support coordination with police forces, and deliver data that could also be reused for asset health analysis and predictive maintenance.

The Sentrisense Solution

What was deployed

SENTRI devices were installed along transmission lines to continuously monitor conductor behavior. The system measures environmental and mechanical variables such as temperature and vibration, and transmits georeferenced data via cellular connectivity to a centralized dashboard.

The platform allows operators to visualize events in real time, receive alerts when abnormal activity occurs, and analyze historical data to support maintenance planning.

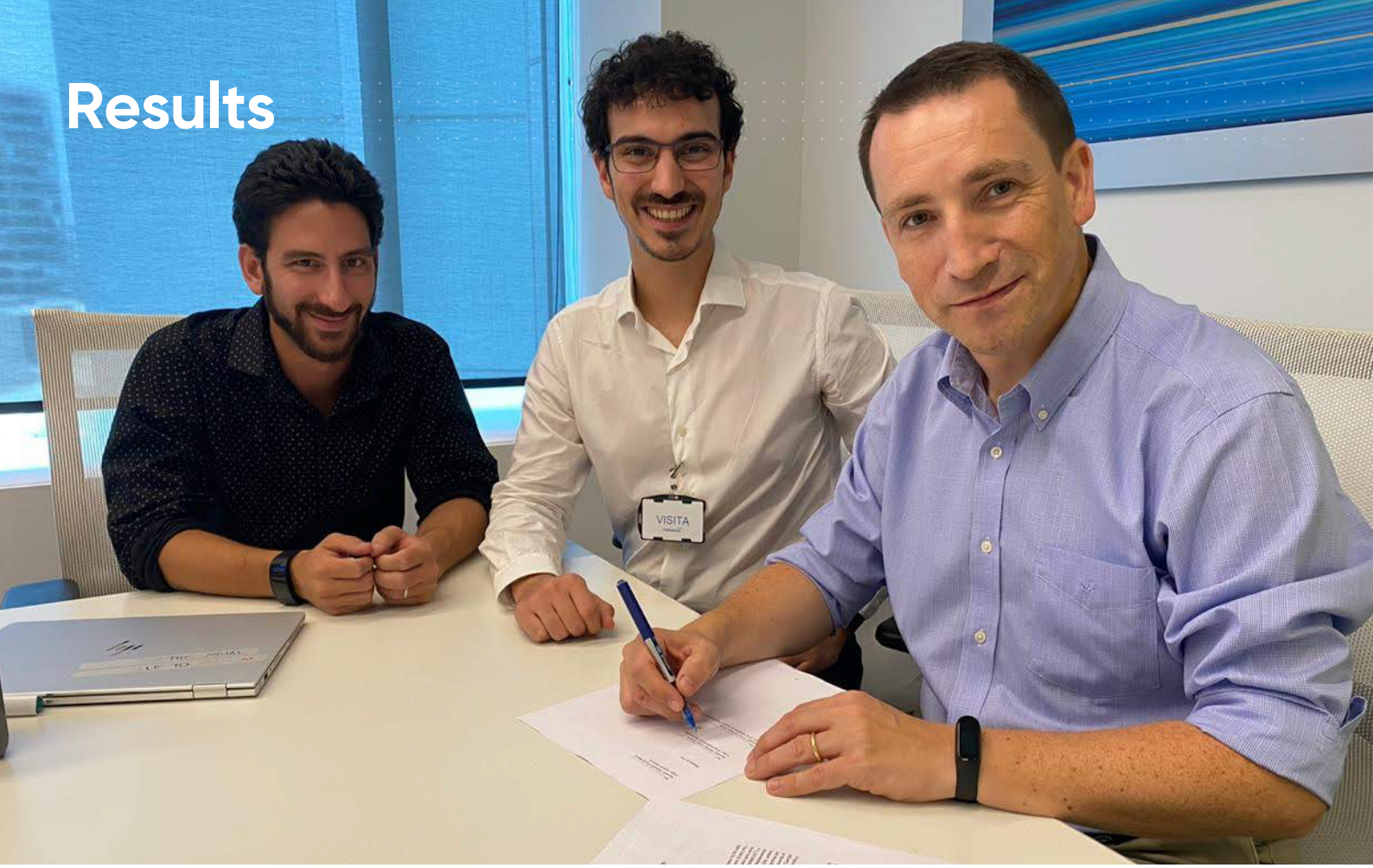


What this meant for Transelec

For Transelec, this meant moving from reactive incident response to proactive monitoring. Theft attempts could be detected immediately, enabling faster activation of repair crews and early notification to police forces.

At the same time, the collected data began supporting broader operational goals, including understanding line health and exploring predictive models to anticipate failures before they occur.

Results



The deployment of SENTRI devices significantly strengthened Transelec's ability to protect its infrastructure and maintain continuity of supply.

The system proved reliable in detecting theft-related incidents, reduced uncertainty during outages, and improved coordination between operational, maintenance, and security teams.

Beyond security, the data collected is now being analyzed to develop predictive maintenance models, expanding the role of the solution beyond monitoring into long-term asset management.

" Sentrisense has accurately detected 100% of thefts on lines equipped with this technology."

Alejandro Rehbein Oroz
Chief Strategy and Innovation OfficerTranselec S.A.

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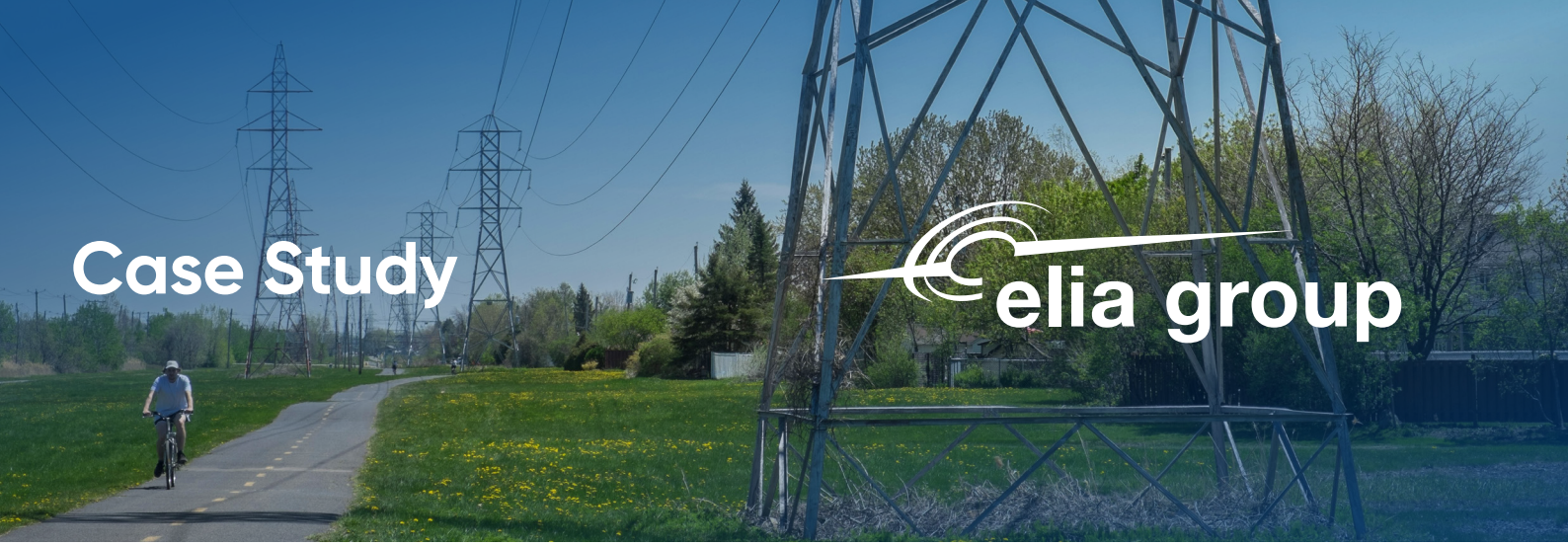

Case Study

elia group

Executive Summary

Elia Group, the electricity transmission system operator in Belgium, partnered with Sentrisense to evaluate a smarter way of assessing **the remaining lifespan of overhead copper conductors**. With portions of its network dating back nearly a century, Elia faced a complex challenge: how to detect fatigue in aging infrastructure before failure occurs.

To solve this, the project deployed **SENTRI** sensors to monitor **aeolian vibrations**—subtle, wind-induced movements that can reveal material fatigue invisible to the naked eye. After a full year of continuous monitoring, paired with lab-based fatigue tests, Elia was able to confidently assess the structural condition of decades-old assets.

The Challenge

Elia manages over **9,000 kilometers** of overhead transmission circuits. Among them, **1,351 kilometers** are copper conductors, many of which have been in operation for **several decades** without a reliable way to measure their fatigue.

Traditional inspection methods, including visual inspections, thermography, and UV/hyperspectral camera surveys, have proven insufficient for detecting deep material fatigue. These methods rely on surface-level cues or scheduled maintenance intervals, offering little predictive insight.

The result:

- Difficulty identifying aging assets proactively
- Limited visibility into conductor degradation
- High uncertainty when prioritizing replacements
- Risk of over- or under-maintaining infrastructure

Elia needed a **data-driven, predictive method** to monitor fatigue and help **optimize maintenance strategies** across its aging grid.

The Sentrisense Solution

What was deployed

- **SENTRI sensors** installed directly on copper conductors
- Continuous recording of **aeolian vibrations** over one year
- Lab-based cross-validation through fatigue simulations

What this meant for Elia

- Captured hard-to-detect signs of fatigue by monitoring vibration behavior
- Provided real data from the conductor to evaluate structural aging over time
- Enabled Elia to prioritize resources where actual degradation was occurring
- Opened the door to longer, safer operation of legacy assets

Results

Asset health visibility

- Verified that a nearly century-old conductor was in perfect health
- Demonstrated SENTRI's ability to track aging trends through vibration data
- Created historical vibration profiles for future comparison

Operational efficiency

- Reduced reliance on subjective or ineffective inspection methods
- Gained confidence in asset life expectancy and performance
- Informed future maintenance planning with **real-world data** instead of assumptions

Strategic impact

- Validated a new, **non-invasive monitoring approach**
- Set a precedent for aging infrastructure assessment
- Enabled scalable fatigue monitoring beyond visual inspection cycles

" Congratulations to the team! We were delighted to see how Sentrisense's solution serves at the same time society, corporations, and the environment. Excited for the journey together! "

Pierre-Henri D'haene
Chief Strategy & Transformation Officer at Elia

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Case Study

Executive Summary

ENGIE faced a steady increase in theft along Zone 1 transmission lines. These events created operational risks, extra costs, and exposure for on-site crews.

To address the threat, **ENGIE** deployed **SENTRI** sensors on vulnerable sections, using continuous monitoring and georeferenced alerts.

The system improved early sabotage detection and supported faster coordination with internal teams and police forces. No additional incidents were recorded, and the operational protection level was enhanced.

The Challenge

Cable theft became a recurring issue in the region, affecting critical sections.

The impact was clear:

- Direct risks for maintenance teams.
- Economic losses.
- Lower availability and supply stability.
- No early visibility of sabotage attempts.

ENGIE needed a reliable, continuous, adaptable system to detect abnormal activity in remote areas, even when lines were de-energized.

The Sentrisense Solution

Installed technology

- **SENTRI** sensors mounted directly on conductors.
- Autonomous operation with solar harvesting.
- Works even when lines are de-energized.
- Installation completed on live lines by **ENGIE's** technical team.

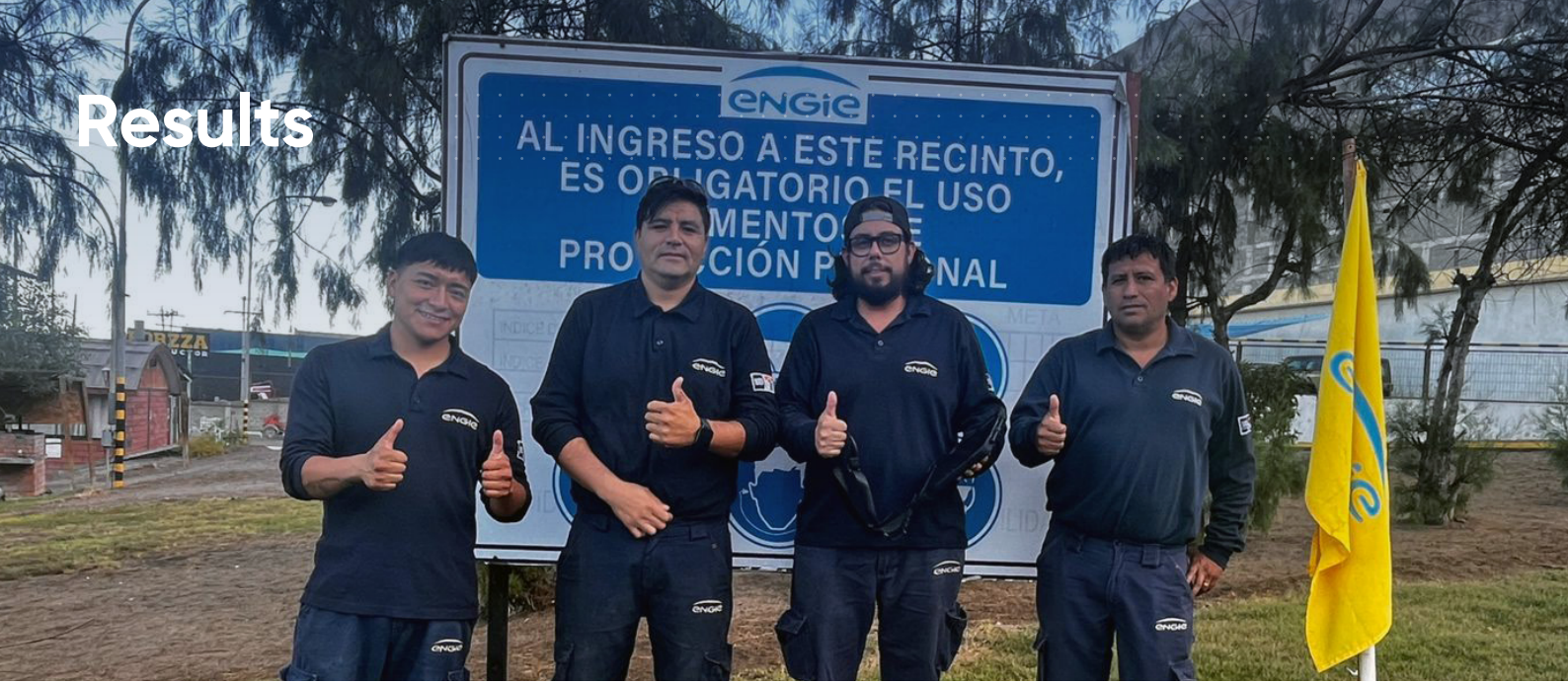
Applied capabilities

- Early detection of abnormal vibration linked to theft or sabotage.
- Real-time georeferenced alerts.
- Continuous monitoring of vibration, temperature, and mechanical tension.
- Online platform for operational analysis and asset management.

Operational integration

- Alerts connected to asset security teams.
- Direct coordination with police.
- Dashboard used for event tracking and prioritization of vulnerable spans.

Results

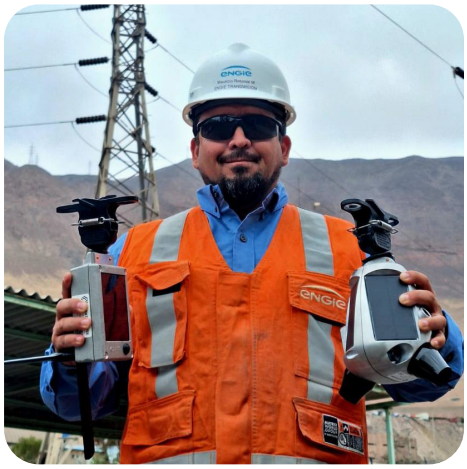


Operational impact

- Significant drop in theft incidents on affected lines.
- Stronger deterrence through faster response times.
- Less exposure for field teams in high-risk zones.
- Better continuity on critical lines.

Technical visibility

- More accurate detection of abnormal activity.
- Constant monitoring, even on de-energized lines.
- Historical data used for preventive maintenance decisions.



" With Sentrisense, we feel supported at every step. The interaction is close, the follow-up is constant, and always focused on our success. The service is fast, the platform improves continuously by incorporating our feedback, and we now rely on self-managed equipment that helps us work more efficiently."

Mauricio Retamal
Head of Transmission Lines Maintenance
Engie

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Case Study

anell

Executive Summary

Anell, a distribution system operator in Catalonia (Spain), is working to modernize its network to meet the challenges of a high-renewable future. As part of the **OPENTUNITY project**, Anell launched a pilot on **Real-Time Thermal Rating (RTTR)** to explore how real-world temperature data can unlock hidden capacity in medium-voltage lines.

To validate its data-driven RTTR models, Anell partnered with **Sentrisense**, deploying SENTRI sensors directly on a live conductor. The objective: compare measured temperatures against algorithmic estimates, improve model accuracy, and pave the way for scalable smart grid solutions.

The Challenge

Anell, like many DSOs, historically relies on **static and conservative assumptions** when defining the current-carrying capacity of its lines. These estimates are often based on worst-case weather conditions and don't reflect the real-time thermal behavior of the grid.

The problem is twofold:

- Capacity is underestimated under favorable conditions
- Operators lack visibility to optimize the network dynamically

To support the grid's evolution, particularly as more renewable energy sources are integrated, Anell needed **accurate, real-time conductor temperature data** to train and validate an RTTR algorithm.

The Sentrisense Solution

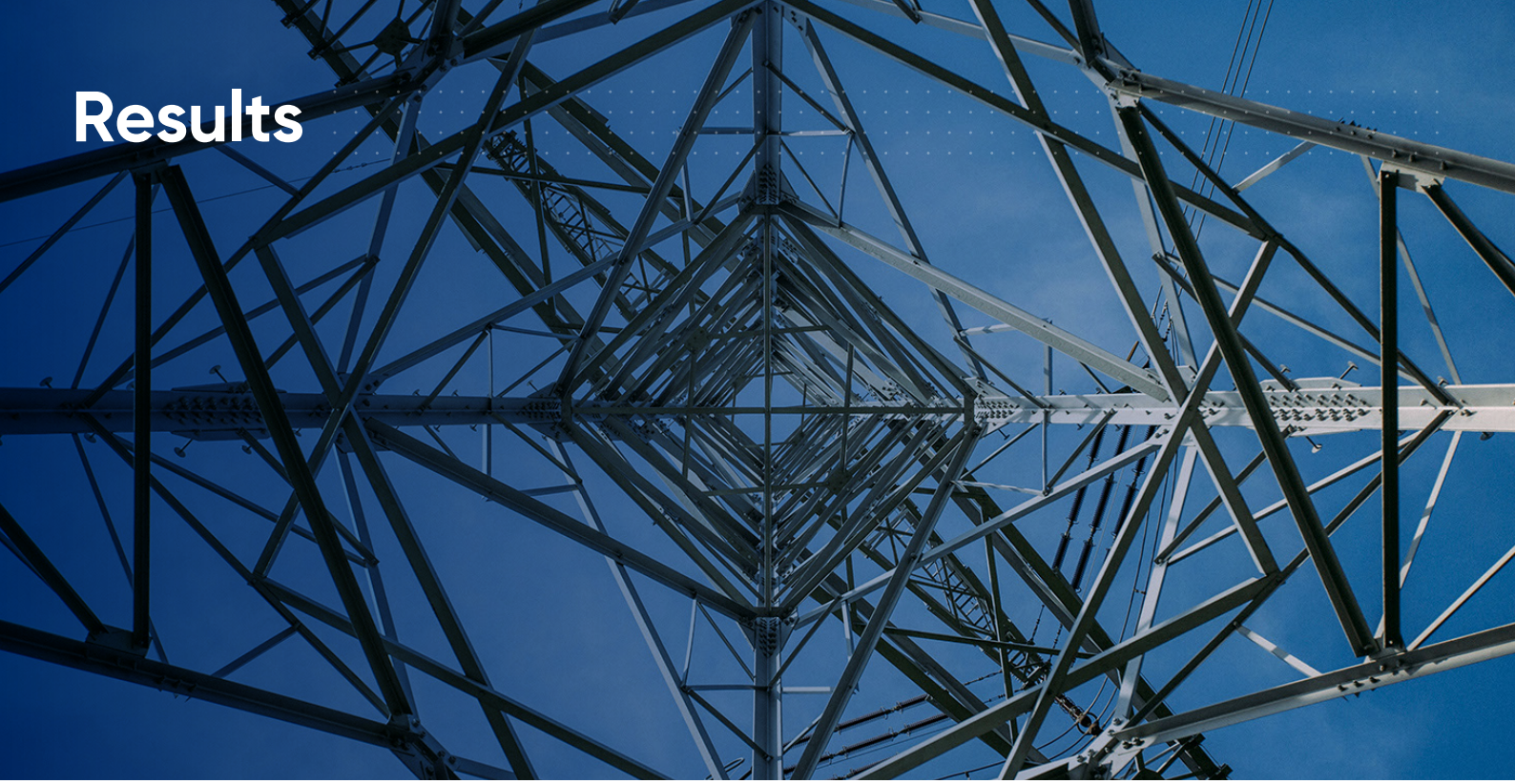
What was deployed

- SENTRI sensors installed on a **medium-voltage conductor** in Anell's distribution grid
- Fully autonomous operation, capturing and transmitting temperature data in real time
- Lightweight, cost-effective sensor design optimized for easy installation and minimal disruption

What this meant for Anell

- Direct access to real conductor temperature under real grid load and weather conditions
- Ability to compare real-world measurements with OPENTUNITY's predictive thermal model
- Data to improve the accuracy and reliability of RTTR algorithms before wider deployment
- A practical, affordable way to gain field insight without full-scale sensor rollout

Results



Operational insight

- Real-time conductor temperature data received continuously
- Live validation of ambient + current-based RTTR estimations
- Improved understanding of how environmental conditions impact actual line performance

Strategic benefits

- Informed development of a scalable RTTR algorithm
- Smarter operation decisions during critical network events
- First step toward unlocking dynamic capacity across the grid

Technology validation

- SENTRI confirmed as a viable tool for affordable thermal monitoring in medium-voltage networks

" If we have better information on the capacity of our grid in real time, we can take better decisions when operating it at critical moments. Sentrisenses' SENTRI Real-time thermal rating provides us just that. "

Anell team

Click Here to Learn More

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Case Study

fjellnett

Executive Summary

Fjellnett AS is a regional power distribution company operating in Nord Gudbrandsdalen, Norway, managing over 1,274 km of high-voltage lines and serving more than 14,500 metering points across five municipalities including Lom, Vågå, Sel, Lesja, and Dovre.

During winter, de-energized lines run cold, accumulating ice that, combined with crosswinds, triggers violent low-frequency oscillations known as galloping, causing conductors to whip and ultimately break. The root cause had gone unidentified for years.

Sentrisense deployed its OHL monitoring technology across three phases of a critical span, capturing vibration and weather data from December 2023 to March 2024. The analysis revealed that the installed dampers were inadequately designed for the site's icing conditions, a finding that directly led to a fix that eliminated the problem.

The Challenge

Fjellnett's lines in the mountainous Gudbrandsdalen valley are de-energized during winter, leaving conductors cold and highly susceptible to ice accumulation. With no current flowing through them, the lines drop to ambient temperature, and the conditions in this region are extreme: temperatures remained below 0°C during 98% of the winter, reaching lows of -28.7°C.

The main objective was to determine the factors linked to the fall of power lines installed in Norway. Due to the harsh winter environment, the utility suspected that severe weather and physical stressors were contributing to the mechanical failure of their infrastructure, but they needed precise data to diagnose the root cause.

The Sentrisense Solution

To investigate this issue, Sentrisense deployed its novel technology for monitoring overhead power lines. Data collected from December 2023 to March 2024 was analyzed to detect events associated with high-energy vibrations and damaging power surges. The devices captured critical oscillation records, which were analyzed alongside local meteorological data to accurately map the conditions under which the line was operating.

Results

Acting on Sentrisense's findings, Fjellnett redesigned the dampers, and the conductor failures stopped. Beyond galloping, the monitoring also captured aeolian vibrations throughout the period.

The analysis was completed showing the motion alert system has a clear correlation with actual galloping events, demonstrating that the technology can support not only post-event analysis but also real-time intervention. Following the success of this deployment.

Following the trial, Mr. Asbjørn Vang of Fjellnett confirmed that the utility was highly satisfied with the results, noting that the data successfully validated their ongoing concerns regarding severe ice accumulation and line sagging.

Armed with the proof of high-energy galloping and excessive line weight, Fjellnett engaged SINTEF Energy Research for further mechanical evaluation. Leveraging the context provided by the Sentrisense trial, SINTEF discovered that the specific line clamps in use featured a design unsuitable for the extreme tension and galloping conditions present on that span.

As a direct result of the visibility provided by Sentrisense, Fjellnett was able to replace the inadequate hardware, proactively preventing future line failures and significantly improving the resilience of their grid.

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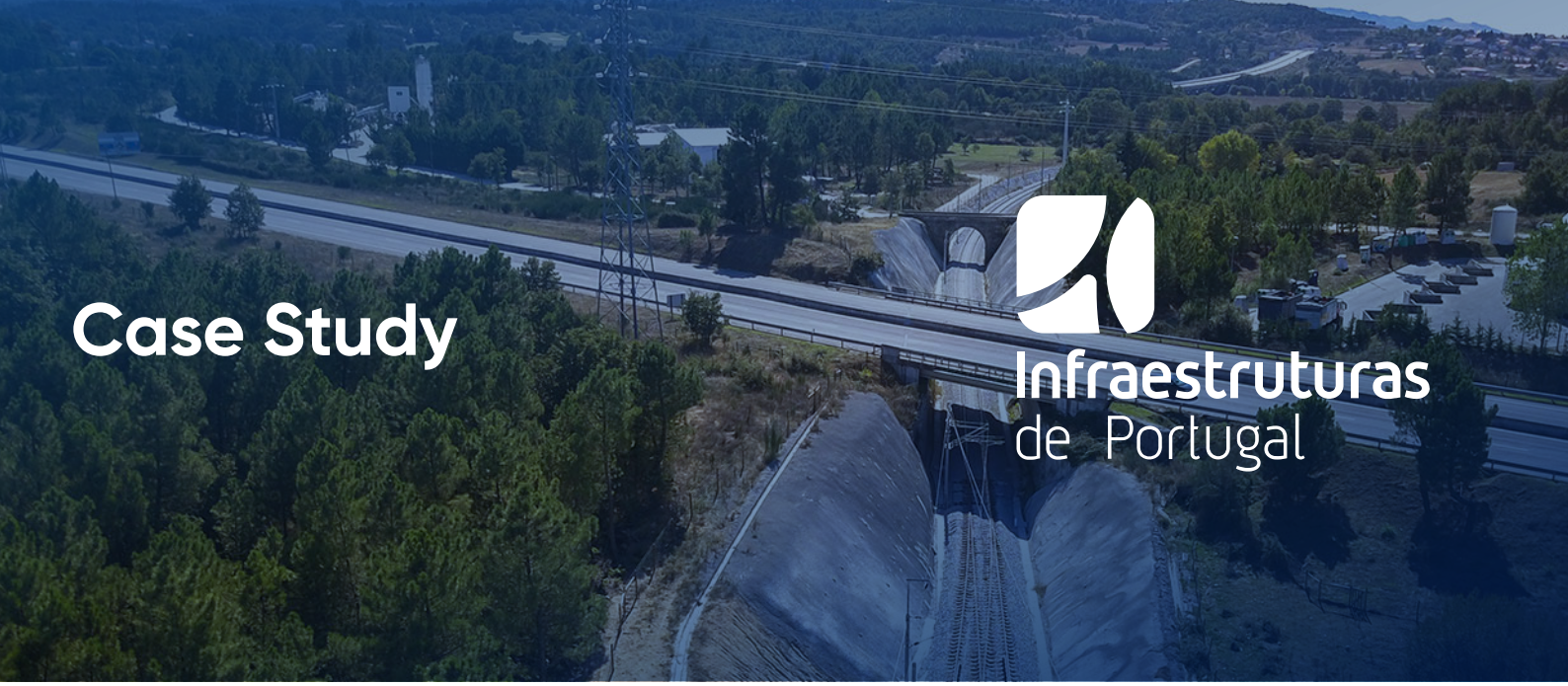


Case Study

Infraestruturas de Portugal

Executive Summary

Infraestruturas de Portugal (IP), the national railway infrastructure company, sought to explore new ways to detect cable theft in catenary systems. With theft cases rising across European rail networks, IP tested **SENTRI**, the monitoring solution by **Sentrisense**, in a real-life setup on a de-energized railway line. The objective was to assess whether a sensor originally designed for overhead power lines could be adapted for railway infrastructure. The pilot confirmed SENTRI's ability to detect abnormal vibration and tilt, send real-time alerts, and operate reliably in semi-remote environments.

The Challenge

Catenary systems are increasingly targeted by theft, especially in remote or non-operational areas. These incidents result in:

- Costly repairs and service delays
- Limited real-time detection capability
- Exposure to safety risks for inspection crews
- Lack of automated monitoring on non-electrified stretches

Infraestruturas de Portugal needed to test if SENTRI could provide early alerts, reduce detection time, and support theft prevention strategies with minimal deployment effort.

The Sentrisense Solution

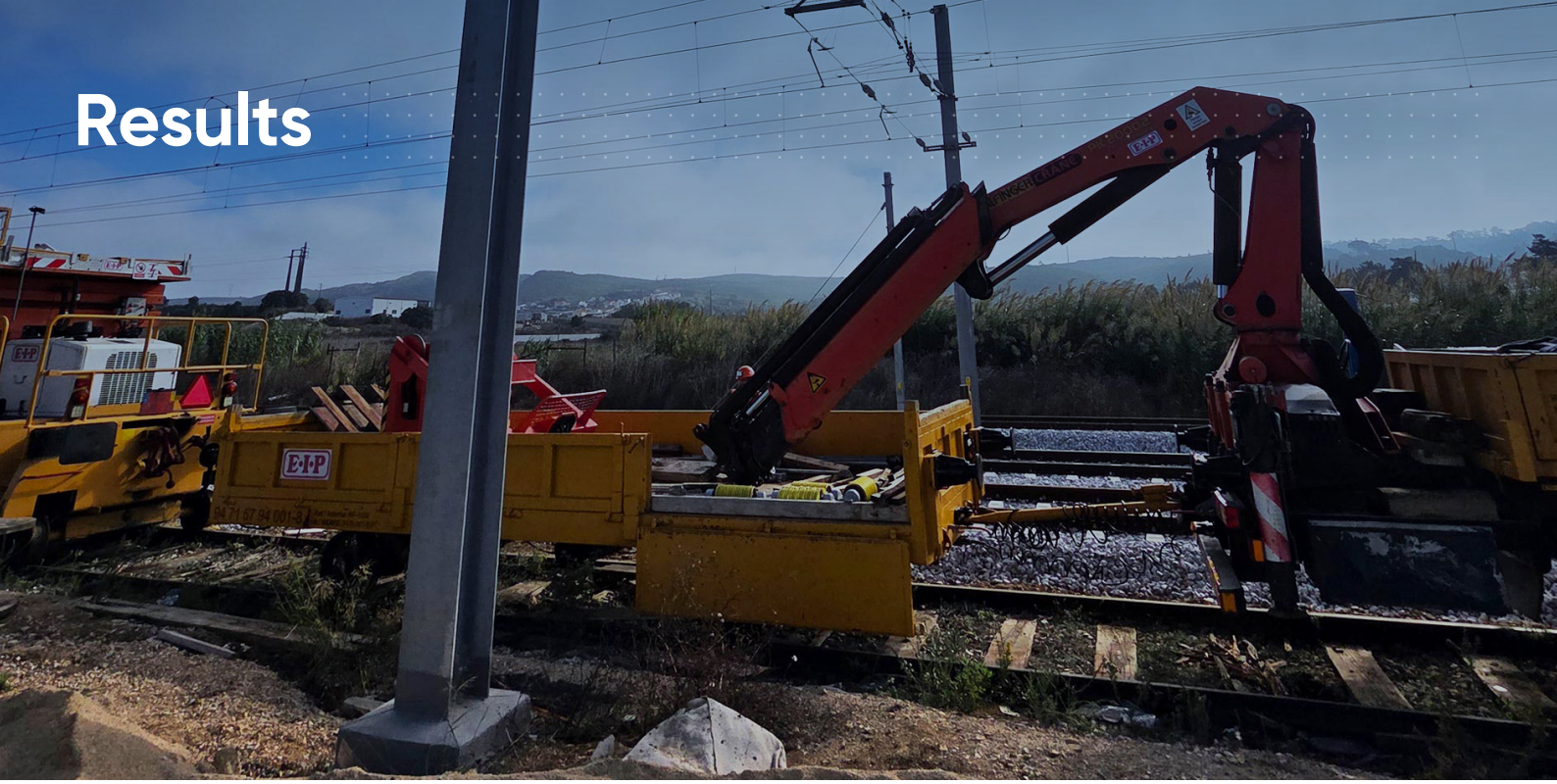
What was deployed

- A SENTRI unit was installed on both a **support cable** and **contact wire**
- The sensor was mounted using a standard extensible rod
- The test was conducted under safe, **de-energized conditions**
- Controlled vibrations were applied to simulate theft scenarios
- Data was collected via **4G** and displayed on the Sentrisense platform

What it meant for the client

- Proved SENTRI's adaptability to rail environments
- Enabled early detection of disturbances without power supply
- Showed that short-term deployments are viable without heavy tooling or major disruption
- Demonstrated stable communication even in semi-remote areas

Results



Operational visibility

- Simple and fast installation process
- Consistent transmission of sensor data (motion, tilt, signal, battery)
- Real-time alerts generated from controlled disturbances

Technical validation

- Accurate detection of vibration above defined thresholds
- Clear differentiation between minor and significant events
- No signal loss or data sync failures during the testTilt readings remained stable after installation

Strategic insights

- SENTRI can act as a theft detection system in rail infrastructure
- Monitoring enables earlier response and potential deterrence
- Opens the door to broader applications: fatigue monitoring, impact detection, or integration with SCADA

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