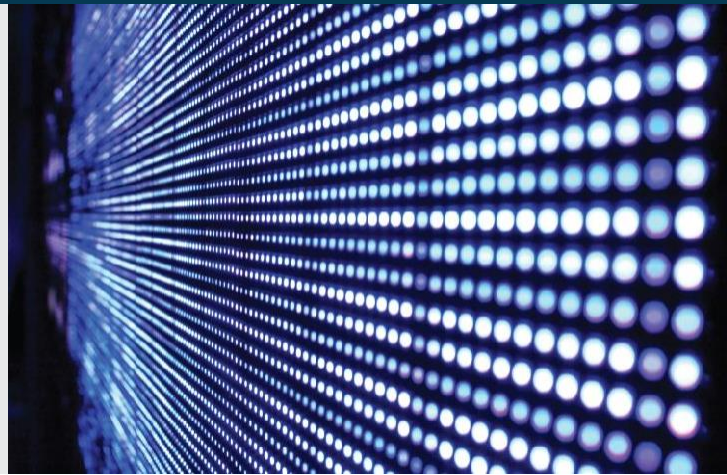


## SUCCESS CASE 22.2024

# reCONNECT

USING SMART METER DATA  
TO MINIMIZE AND PREDICT  
LV NEUTRAL LOSSES



## THE CHALLENGE

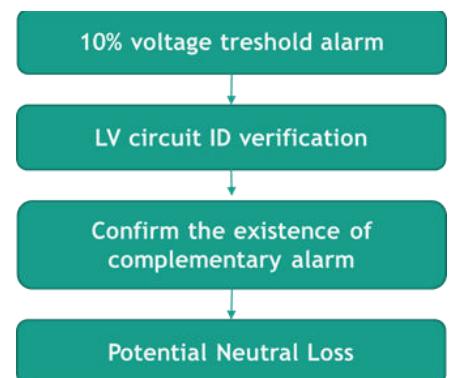
**One of the most common failures in low voltage (LV) grids with a strong impact on customers' sites is neutral loss.**

Neutral loss can be not only a cause of LV outages but also client equipment failures. Every year, E-REDES registers around 1000 neutral loss-related incidents that lead to compensation costs, according to Portuguese regulation. The rollout of smart meters in mainland Portugal, soon to be completed, is an opportunity to leverage smart grid functionalities, by analysing the volume of information and setting up alarm systems to reduce this type of anomaly.

## THE SOLUTION

The reCONNECT project was launched in 2023 to leverage Smart Grids to anticipate and mitigate anomalies in the LV network, seeking more efficient asset management, reducing costs, supply interruptions and improving the customer experience. In a neutral pre-rupture situation, there is typically a progressive imbalance in the voltages of the distinct phases. Neutral loss cases can be subdivided into intermittent cases and abrupt cases. The described solution addresses intermittent cases.

By gathering the smart meters' voltage alarm data and the unique circuit ID of the LV grid, it is possible to identify every circuit in which low and high voltage alarms are generated at the same 10-minute interval. By signalling the circuits in which low voltage and high voltage are detected simultaneously, it is possible to **proactively identify latent neutral loss and act to avoid total loss**. To manage these situations and prevent the associated risks, E-REDES has developed an **algorithm to identify latent situations of neutral loss** through analysis of voltage variation events.



Voltage unbalances are not exclusively due to neutral losses but can also be a consequence of short-circuit power, grid load unbalances or distributed generation power injection. Hence, a score was established within the algorithm to identify a behaviour closer to the one sought and prioritise the circuits.

Priority is also given to circuits with more registered alarms, more connected clients and three-phase smart metering devices installed.



**Data resulting from the analysis is integrated into the systems that manage the grids,** resulting in intervention requests being sent to the field, for the teams to search and correct potential neutral loss incidents. Currently, in 2024, imminent neutral loss **analysis is being carried out daily for all mainland Portugal.**

## MAIN ACHIEVEMENTS

This methodology has shown good results for both underground and overhead LV grid circuits, with a **detection rate of more than 70% for real cases of intermittency.** Most cases detected in underground grids were due to connection loss in bimetallic terminals. In overhead circuits, most cases were detected in connectors or conductors. The following figures relate to the pilot phase in 2023:

- **79%** of cases sent for field inspection correctly identified.
- **119** successfully prevented neutral loss cases.
- **4148** potentially affected clients.

## KEY SUCCESS FACTORS

- **Rolling out smart meters** and ensuring high equipment penetration for more efficient problem detection.
- **Consistent access to smart grid infrastructure data** (assets, operational and measurement data).
- **Adequate IT infrastructure to handle massive amounts of data and run the algorithms.**
- **Agile, trained, and well-coordinated field teams,** given that it is not possible to predict how quickly a latent neutral failure will evolve.
- **Running a dedicated pilot,** with extensive involvement of various areas of the organisation, to select methodologies, guarantee developments, test and optimise solutions, and ensure correct alignment between the involved parties.