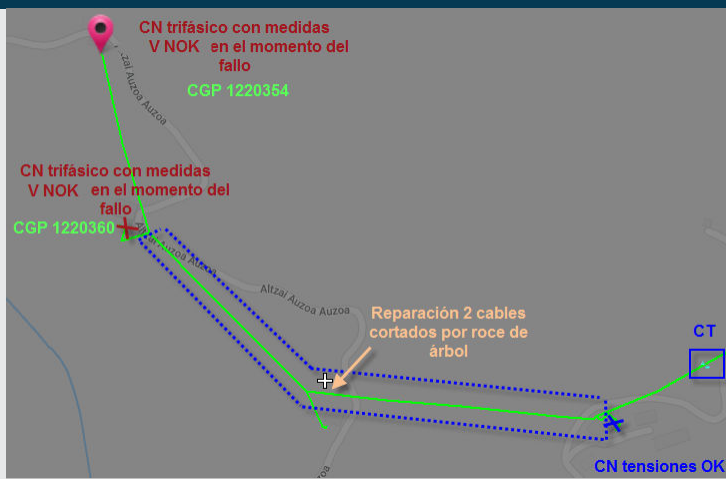
SUCCESS CASE 17.2024

LV Outage Detection

LEVERAGING SMART METER DATA TO RELIABLY DETECT LV OUTAGES



THE CHALLENGE

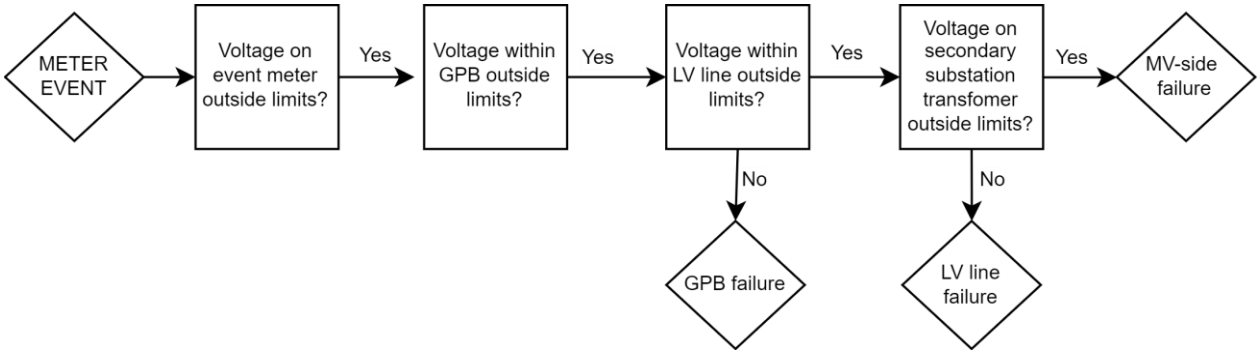
Before the digitalisation of the low voltage (LV) network, power outages at the LV level were only detected through phone calls received by the customer service call centre.

Solely relying on client notifications created a number of inefficiencies:

- Delayed incident resolution creating dissatisfaction among consumers.
- Complexity of the research of the failure, due to the lack of visibility over the location of the outage (e.g., client-side, LV side, or medium voltage (MV) side).
- Unnecessary crew assistance in the field due to misidentified client-side failures, causing increasing maintenance operational costs.

THE SOLUTION

Since 2021, i-DE's Outage Management System (OMS) runs an automated routine designed to detect and verify power outages in both LV and MV networks. Leveraging data from three-phase smart meters, this algorithm aims to promptly and accurately identify long-duration power disruptions.



The functioning of the algorithm, schematized in the image above, can be described as follows.

Event Trigger:

- The algorithm is initiated when a long-duration spontaneous event occurs on a three-phase smart meter.

Instantaneous Voltage Verification:

- Upon detecting the event, the system requests instantaneous voltage values from the meter that generated the event.
- If the meter successfully communicates and the voltage values fall outside the predefined normal limits, the algorithm proceeds to the next step.
- Lack of communication from the smart meter deletes the prediction, as it suggests a potential false positive.

Local Verification within the LV Network:

- To confirm the LV-side power outage, the system performs additional requests to check voltage values as described by the next point.
- The algorithm selects certain meters of the same general protection box (GBP) and the same LV line.

Medium-Voltage Confirmation:

- To assess MV-side outages, the system requests voltage measurements from the secondary substation power transformer.
- If the transformer's voltage values fall outside acceptable limits, the algorithm confirms an MV-side outage.
- Conversely, if the transformer's voltages remain within limits, the prediction confirms an outage on the LV side.

MAIN ACHIEVEMENTS

- **Over 4000 outage detections** before receiving any notice from customers.
- **0% false positive rate:** high reliability of predictions leading to zero unnecessary field crew deployments.

SUCCESS FACTORS

- **High reliability of PRIME communication,** minimising failed measurement requests.
- **Evenly distributed three-phase meters** for maximum network monitoring.
- **Granting information to field crews** on the possible location of failure considering the recorded events and measurements.

WAY FORWARD

- Inclusion of **LV grid topology** information in the algorithm to decrease prediction routine interruptions due to sending measurement requests to the wrong meters.
- Use of **phase connectivity** to detect which exact phases are affected by power loss and send measurement requests to single-phase smart meters installed on that phase.