ENEIDA.IO

eneida DeepGrid®

Zero Faults Package

ROAD TO ZEN
Neighbourhood Grid Intelligence for ZERO EMISSION NEIGHBOURHOODS

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To find out more about eneida.io's products, please contact us at product@eneida.io

Working together with our Clients across disparate geographies, and varying levels of Distributed Energy Resources adoption, we've been crafting and refining critical Faults applications to further optimise the management of Low Voltage (LV) networks.

Through Client based rigorous field testing, we have endowed our applications with both accuracy, reliability and efficiency.

eneida DeepGrid® Zero Faults Package

Comprehensive solutions for reliable LV network management

In the dynamic landscape of Low Voltage (LV) networks, smooth operation is essential for Distribution System Operators (DSOs). Maintaining these networks effectively and responding swiftly to faults is imperative. Recognising this challenge, Eneida has developed a suite of applications tailored to address a wide range of faults.

This proactive approach streamlines network management and empowers DSOs to address faults precisely and efficiently.

Developed with and for DSOs

Our expertise lies in crafting solutions that not only monitor LV network functionality but also promptly address disruptions. In our portfolio, we offer the following applications:

- **High / Medium Voltage Line Down (HVLD / MVLD);**
- **Real-Time Alarms;**
- **Waveform Capture;**
- **Fault Classification, Impedance and Distance to Fault.**

Each application seamlessly integrates into LV networks management, providing DSOs a comprehensive toolkit to maintain and enhance network stability and performance. Explore how Eneida's solutions can revolutionize LV network management and safeguard uninterrupted service for communities and businesses.

Key Benefits

Real-time event notifications: Receive instant event notifications to speed up service restoration.

Targeted notifications: Direct notifications to maintenance personnel according to operational zones, geographic regions, or related to a specific asset.

Efficient asset management: Prioritise critical situations, intervene promptly, and implement preventive actions for more efficient network asset management.

eneida DeepGrid®
High / Medium Voltage Line Down (HVLD / MVLD)

When a High / Medium Voltage (HV / MV) line breaks, it can come into contact with the ground both on the supply or the load side. When the contact is on the supply side, this will likely generate a short-circuit fault, which will trigger conventional HV protections, which in turn will trip and clear the fault by disconnecting that part of the circuit. We define this situation as an HV Open Circuit.

Figure 1

On the other hand, if the line comes into contact with the ground on the load side, HV protections are unlikely to be triggered due to the extremely low current drawn by the fault. However, the line will remain energized due to the backfeed from downstream distribution transformers. We define this situation as HV / MV Line Down.

HV / MV line down poses a very serious safety issue for both field operators and consumers alike, as well as a significant societal cost. This has become a pressing concern for DSOs for multiple reasons:

Serious safety hazard to the public as contact with an energised line can cause serious injury or death.

Extreme risk of wildfires when the line falls on trees, branches, bushes or other dry vegetation.

Risk to the safety of livestock and wildlife either by direct contact or step voltage.

At Eneida, we take these issues very seriously, and therefore developed, the eneida DeepGrid® High / Medium Voltage Line Down (HVLD / MVLD), to detect and locate these faults, triggering alarms in real-time and classifying them as an HV Open Circuit or an HV Line Down.

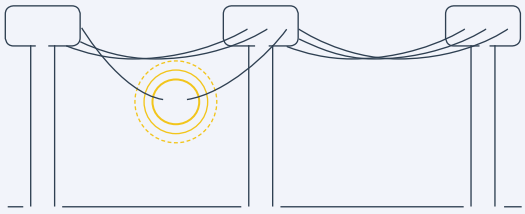

Figure 1 Depiction of HV Open Circuit

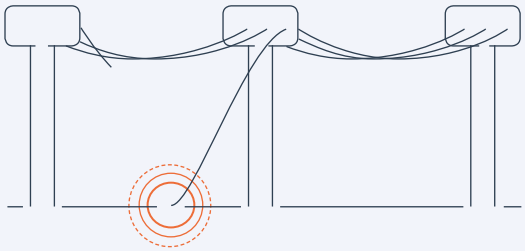

Figure 2 Depiction of HV Line Down

eneida DeepGrid®
Real-Time Alarms

The eneida DeepGrid® Real-Time Alarms (RTA) application provides notifications in real-time for key events that occur in the network.

Upon communicating an incident to the call center, it is investigated by the DSOs operation centre, which combines the reported data with other information available (e.g. data from sensors), generating request actions to field teams, if the incident is caused by a particular issue with origin in the distribution network.

This implies that the DSOs is dependent on electricity customers to receive notification of grid events and outages, rather than having an automatic event report system. Therefore, the trigger to the resolution process is an action taken by an individual (consumer), which is typically slow and generates a significant operational delay from the moment an event occurs to the moment the DSOs is able to take action.

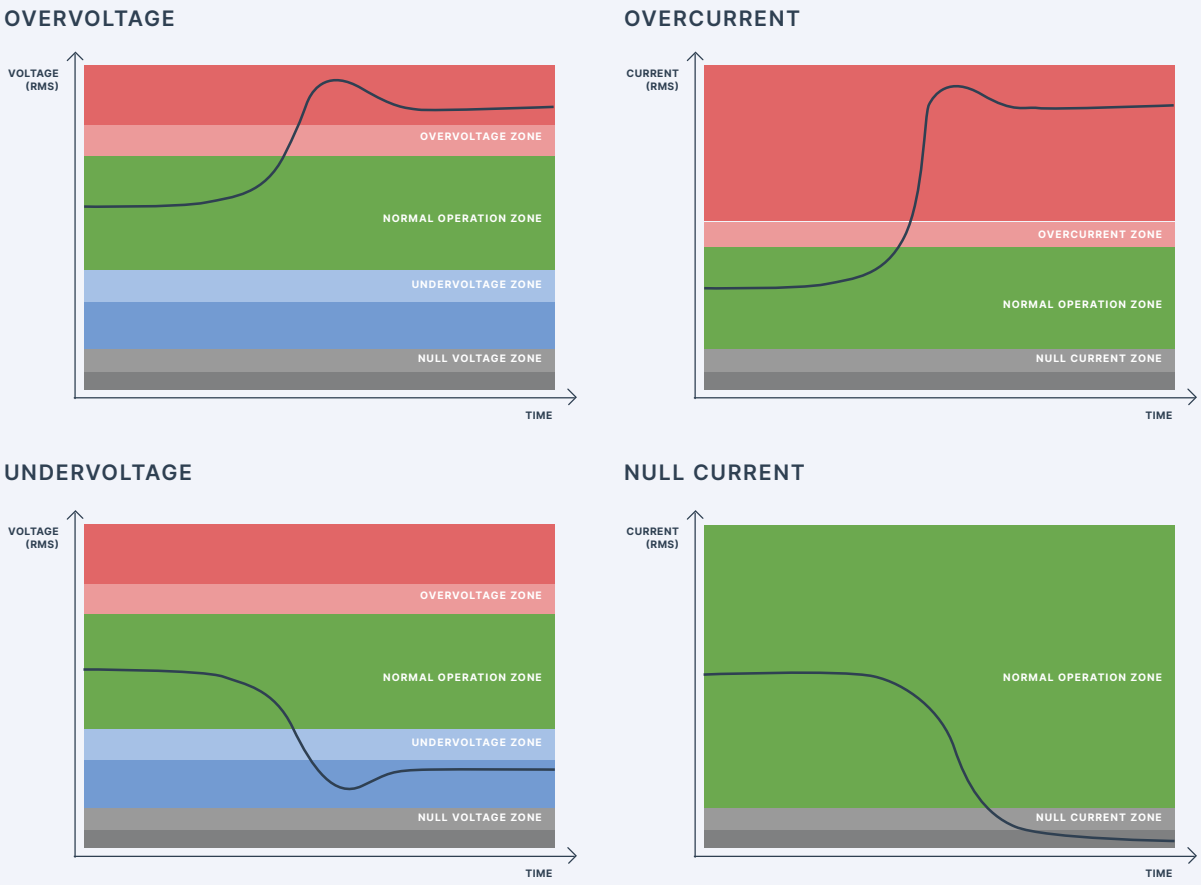

Figure 3 a eneida DeepGrid® Real-Time Alarms logic diagrams

eneida DeepGrid®
Real-Time Alarms

Eneida's mission
is to enable DSOs and their operational teams with the most appropriate tools that optimise this process, enabling proactiveness and enhancing the quality of and timing of critical decision-making.

The eneida DeepGrid® Real-Time Alarms (RTA) application provides notifications in real-time for key events that occur in the network. By promptly alerting operational teams (or maintenance personnel directly), these alarms enable swift intervention and preventive measures, helping to reduce downtime and the risk of future damage to equipment. Ultimately, the eneida DeepGrid® RTA aims to help improve system reliability and improve Key Performance Indicators (KPIs) such as Customer Minutes Lost.

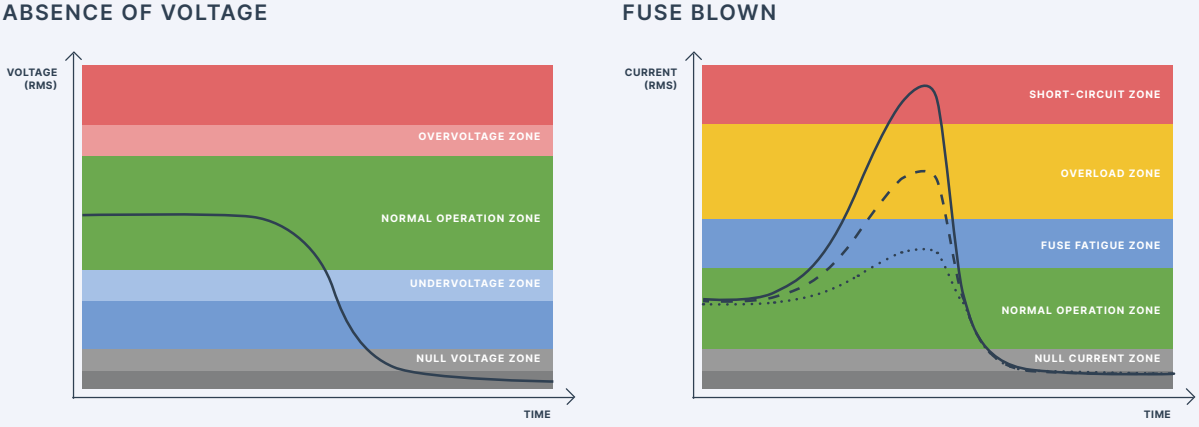

Figure 3 b eneida DeepGrid® Real-Time Alarms logic diagrams

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Waveform Capture

The eneida DeepGrid® Waveform Capture application (WFC) allows users to choose to receive a snapshot of the voltage and current waveforms around the time an event was detected. This feature can be enabled or disabled for each real-time alarm independently.

Users have the flexibility to set up waveform sampling and capture window settings.

For a single WFC-enabled alarm, this capture window can extend up to 4.8 seconds. The same capture window applies for multiple WFC-enabled alarms triggered simultaneously. If the accumulated capture window exceeds the allowed period, the alarms will be sent without waveform capture.

Examples of Waveform Capture in eneida DeepGrid® Discovery for different events:

Figures 4 - 8

The eneida DeepGrid® Waveform Capture application (WFC) allows users to choose to receive a snapshot of the voltage and current waveforms around the time an event was detected.

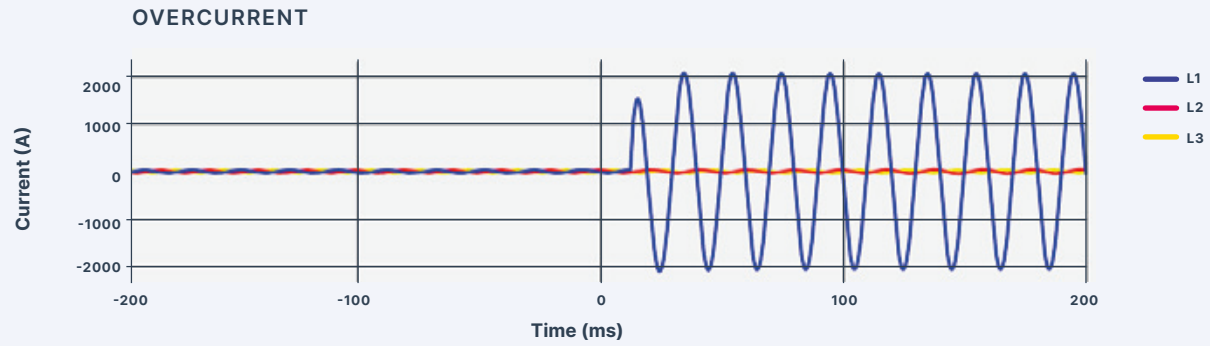

Figure 4 Overcurrent - Ignition of a line-to-ground short-circuit fault, detected by an overcurrent alarm.

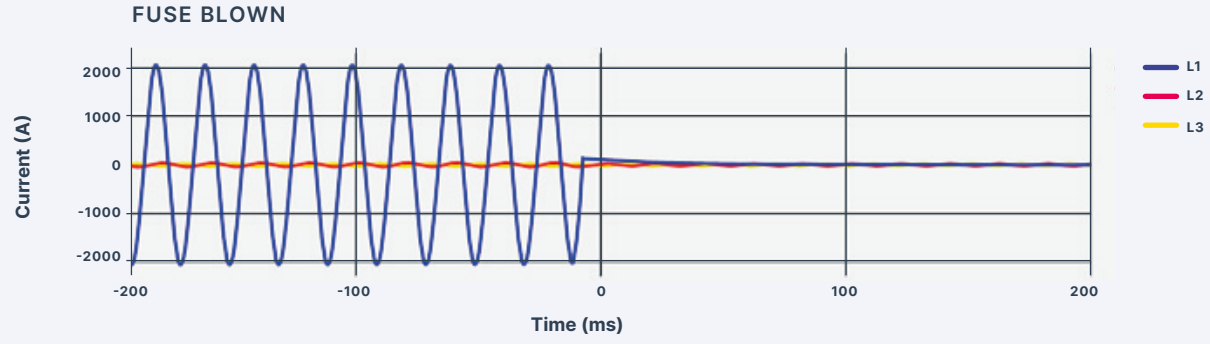

Figure 5 Fuse Blown - Current waveform associated with a fuse blowing and clearing a line-to-gound short-circuit fault.

eneida DeepGrid®

Waveform Capture

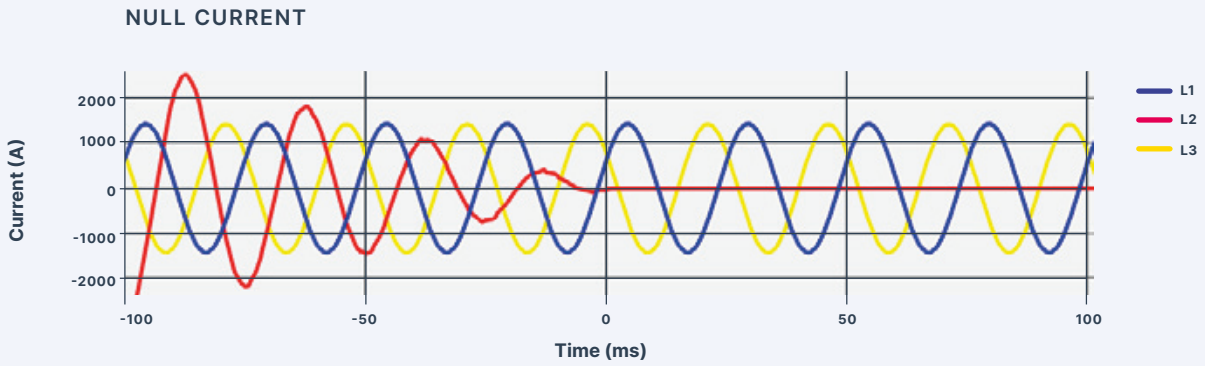

Figure 6 Null Current - Disconnection of the existing load, resulting in a null current in line L2.

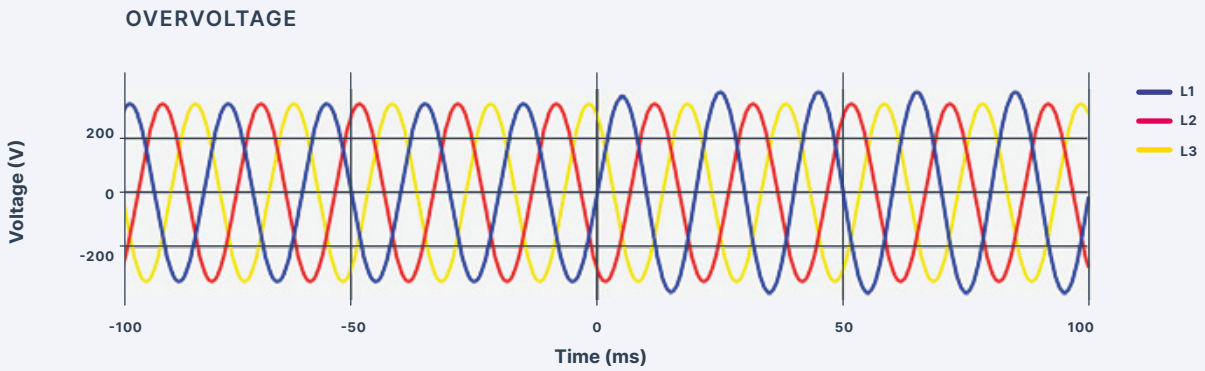

Figure 7 Overvoltage - The voltage slightly rises on line L1, surpassing the regulatory threshold.

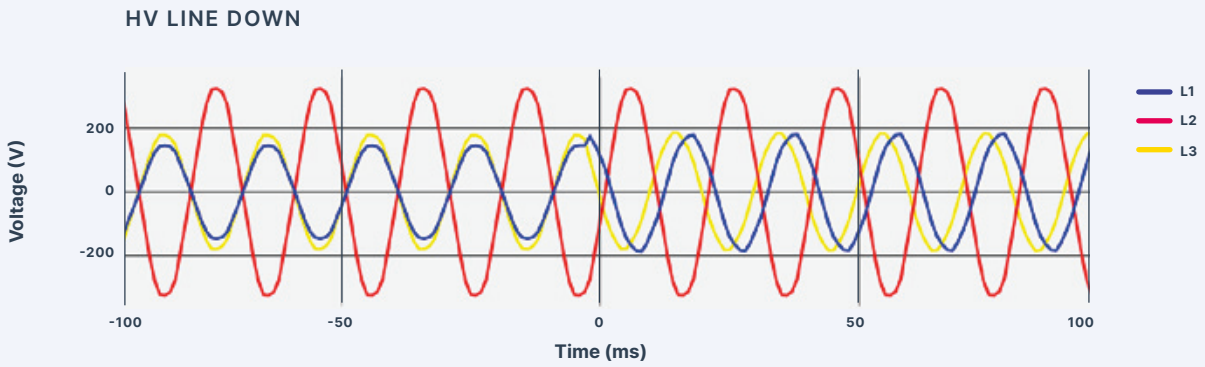

Figure 8 HV Line Down - Moment when an HV overhead line breaks, interrupting the voltage supply on one phase of the HV network and impacting the voltages on the LV side.

eneida DeepGrid®
Fault Classification, Impedance and Distance to Fault

When a fault occurs in the LV network, it typically leads to a power outage. In this situation, it is paramount that operational teams are able to act as quickly as possible to fix the issue and restore service to customers.

Eneida's mission is to enable DSOs and their operational teams with the most appropriate tools that optimise this process, enabling proactiveness and enhancing the quality and timing of critical decision-making.

The outcomes provided by eneida DeepGrid® through Fault Classification and Impedance and Distance to Fault estimations allows operational teams to guide faults dispatch teams directly to the most likely locations of the fault, largely reducing the area to be surveyed. This not only reduces the total DSO cost incurred during short-circuit fault by optimising the faults dispatch process, but also improves Key Performance Indicators (KPIs) such as Customer Minutes Lost.

Example of Waveform Capture, Fault Classification, Impedance and Distance to Fault in eneida DeepGrid® platform for a line to line short-circuit fault:

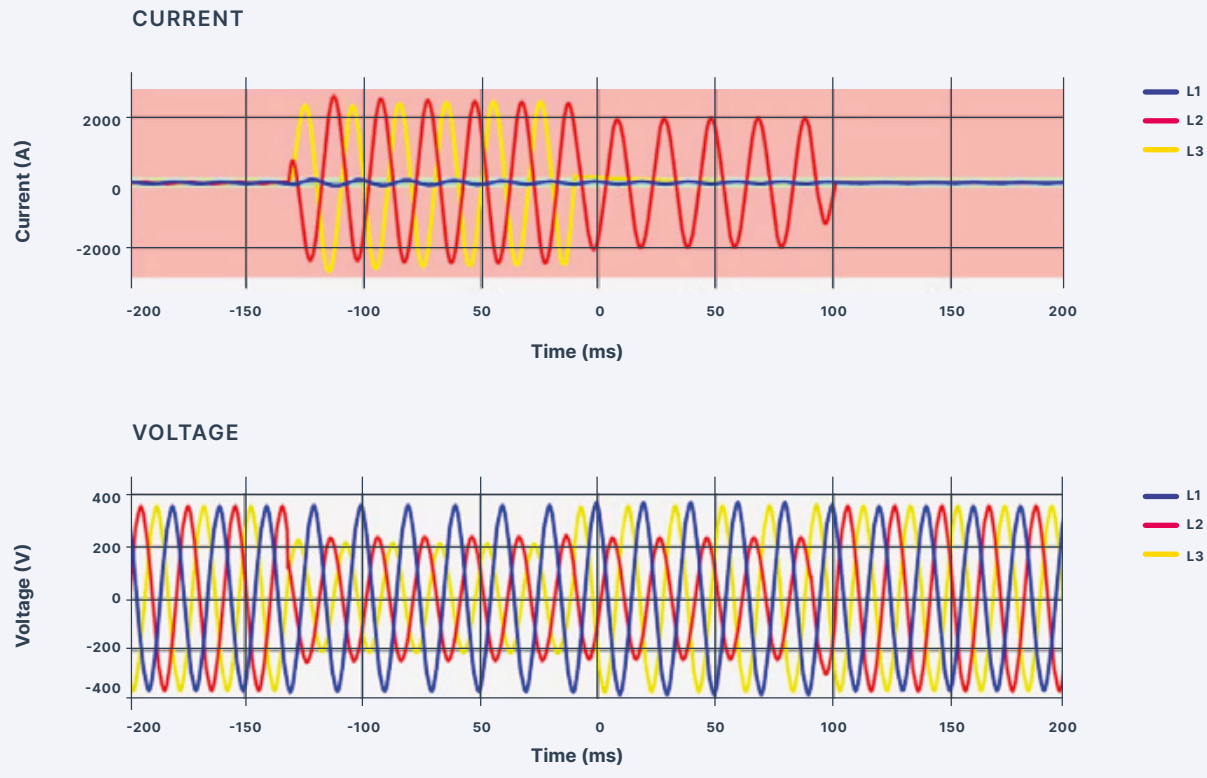

Figure 9 Waveform Capture for Short-Circuit event.

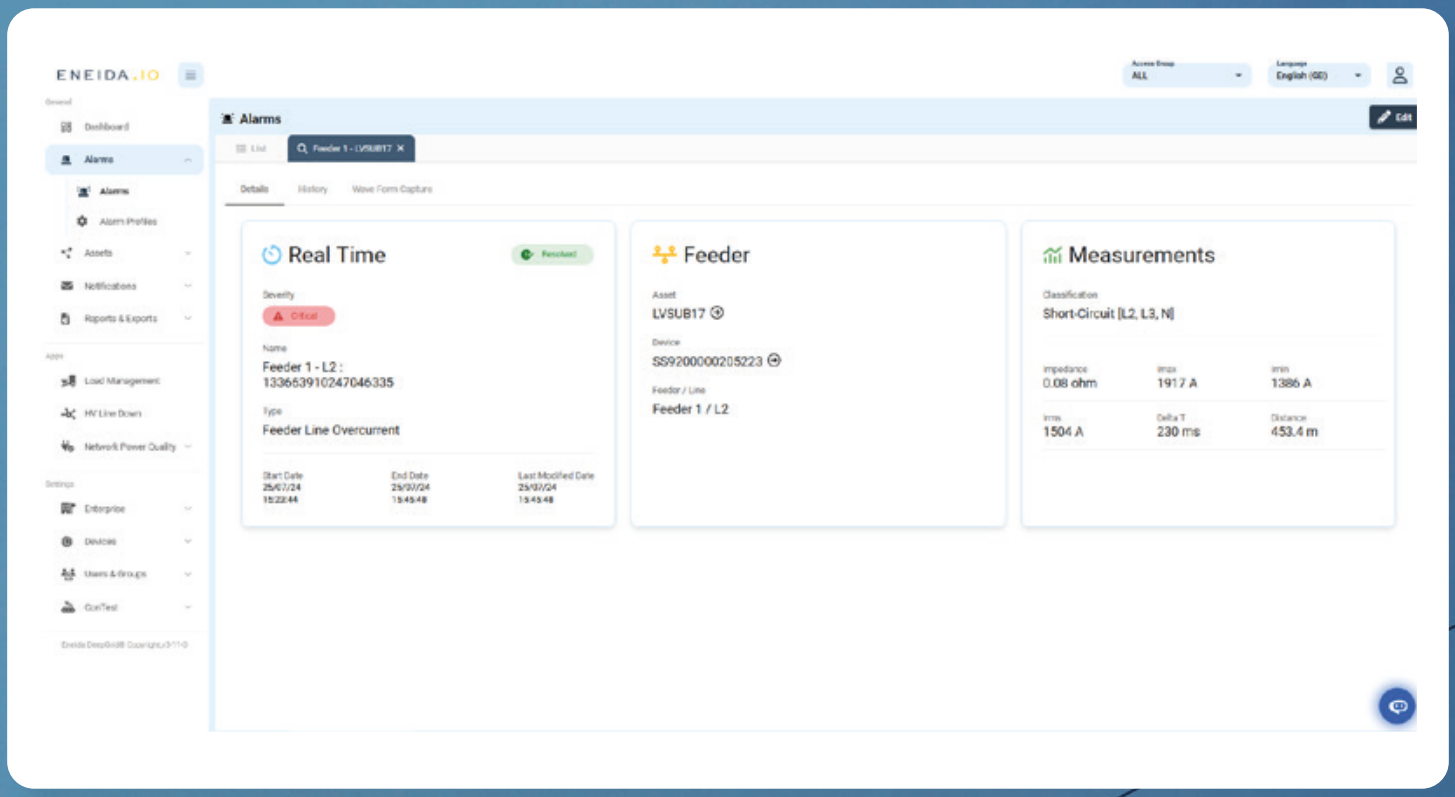

Figure 10 Impedance and Distance to Fault in Alarm Details page for a Short-Circuit event.

eneida DeepGrid®
Pre-Fault Detection

The degradation of underground cables in LV networks poses a great challenge, specifically with regards to predictive maintenance.

When a permanent fault develops in a cable, it typically leads to a short-circuit and, consequently, an unplanned power outage that lasts until the cable is repaired.

By monitoring pre-fault activity in real-time, eneida DeepGrid® detects early indications of cable and joint degradation that may indicate a fault developing over time.

Continuous monitoring of this activity, both the frequency of these events and their intensity, enables DSOs to perform planned predictive maintenance routines on the most critical locations of the LV network, thus avoiding unplanned outages.

Key Benefits

- **Increase asset lifespan.**
- **Avoid irreparable faults and unplanned outages.**
- **Cut costs on asset replacement.**
- **Increase network reliability.**
- **Improve KPIs such as Customer Minutes Lost.**

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Pre-Fault Detection

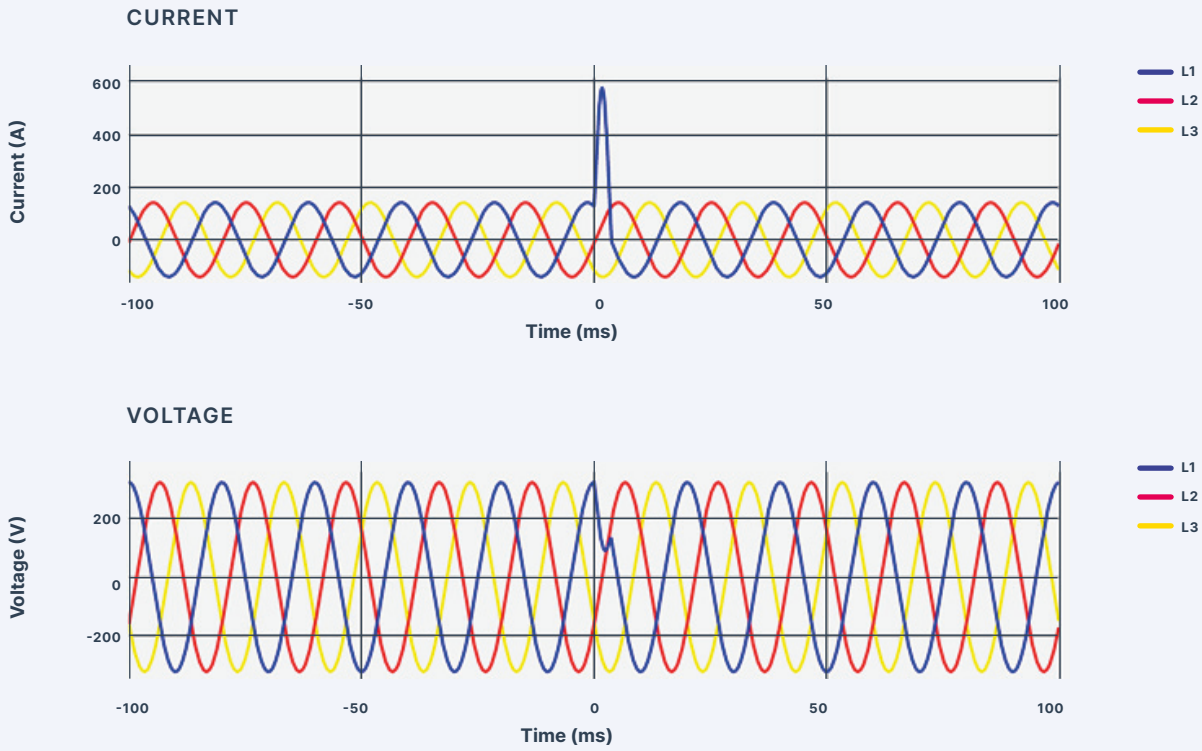

Figure 11 Pre-fault event Waveform Capture

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The current paradigm of ever-increasing distributed energy resources, such as photovoltaic (PV) production, and nonlinear loads like Electric Vehicles (EV) and Heat Pumps (HP), creates a very demanding environment for DSOs. Not only may these technologies, however necessary, threaten the stability of the network, but they also add complexity to already challenging issues. Such is the case of fault detection and location, for example.

Therefore, it is increasingly necessary for DSOs to be endowed with tools that enable them to deal with these issues by having access to comprehensive algorithms which:

- **Incorporate the influence of these technologies in their decision-making process;**
- **Enable DSOs to be proactive, getting key information directly into the control room instead of depending on external sources, such as customer complaints;**
- **Instantly access key metrics, such as faults classification, impedance, and distance to fault, which can help optimize the fault response process.**

Discover the power of our fault apps in boosting LV network reliability and performance, securing seamless service for both communities and businesses!

www.eneida.io To find out more about eneida.io's products, please contact us at **product@eneida.io**

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