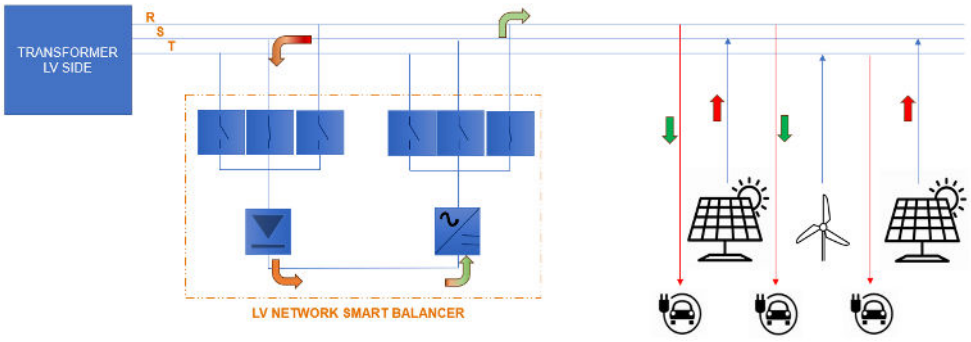
SUCCESS CASE 16.2024

LV NETWORK SMART BALANCER

DEALING WITH QUALITY SUPPLY PROBLEMS AND DISTRIBUTED GENERATION IN LV NETWORKS

THE CHALLENGE

Low voltage (LV) networks are unbalanced systems, especially under certain conditions: neutral wire loss, unbalanced charges, distributed generation or networks with long tracts. In certain situations, these conditions make LV networks sensitive to non-compliance with quality supply requirements. This occurrence mainly affects customers and usually involves compensation costs due to failures or solar inverter disconnections for overvoltage protection, reducing drastically the performance of distributed generation. In this context, a system dealing with smart power transfer among the three phases allows achieving voltage balance in the LV network and transferring energy among generation and consumption units that are not connected to the same phase, substantially increasing the efficiency and flexibility of the grid.



***Working principle**. In this example, the LV Network Smart Balancer allows energy transfer from a high generation phase (S) to a high consumption phase (R).*

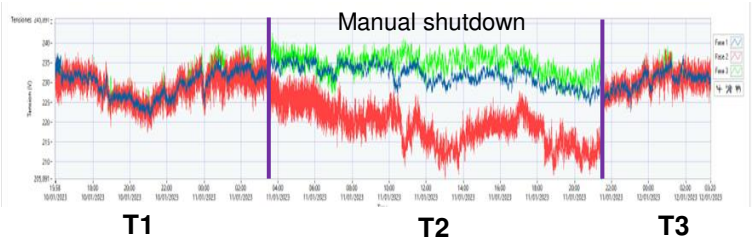
THE SOLUTION

The LV Network Smart Balancer was developed to solve problems in LV networks where voltage unbalance issues arise. The solution was fully designed and produced by the multidisciplinary team specialised in SMART Solutions of the Spanish company Aplicaciones Tecnológicas S.A. which promotes the digitalisation of the energy market through an innovative range of products and services based on distributed monitoring and equipment.

The LV Network Smart Balancer deals with smart power transfer between phases by means of distributed equipment installed in an LV network. This system provides a scalable solution by adding as many LV Network Smart Balancers as required and foresees continuous communication to analyse data, algorithm adaptation, diagnosis, and integration of other functionalities (such as energy storage management) in remote and advanced network monitoring.

MAIN ACHIEVEMENTS

Results achieved at different locations across Spain clearly indicate a **significant reduction** (80% on average) **of over-voltage and under-voltage meter events**, demonstrating the beneficial effect of deploying the system. Besides that, the associated IT platform allows for the evaluation of the voltage values in the LV network, the power transfers and the diagnostic information to manage the system, trigger alerts, develop automatic reports, and more.



Effect of LV NETWORK SMART BALANCER.

*At **T1**, LV NETWORK SMART BALANCER is working and balancing the network so, there are no significant voltage differences among phases.*

*At **T2** a manual shutdown was performed so, the natural response of the network appears, showing a strongly marked undervoltage in one of the phases.*

*At **T3**, the equipment was turned on again evidencing its balancing effect.*

POC RESULTS

LOCATION	EVENTS REDUCTION
Madrid 1	-81,73%
Lugo 1	-88,59%
Pontevedra 1	-95,18%
Cuenca 1	-75,75%
A Coruña 1	-100%
Madrid 2	-92,21%
Madrid 3	-75,48%
Madrid 4	-73,91%
Pontevedra 2	-79,38%
Pontevedra 3	-33,95%

The LV Network Smart Balancer and its algorithm for Smart Energy Transfer among phases have shown high performances in **managing voltage unbalances**, **bringing flexibility to LV networks** in case of distributed generation, unbalanced consumptions, long LV sections, etc.

KEY SUCCESS FACTORS

- **Voltage unbalance detection** and determination of power transfer among phases.
- **Power transfer** from high generation phase to high consumption phase.
- **Non-dependence on communications availability**, making the device and its working procedure fully autonomous.
- **Remote access** to adequate algorithm parameters.
- Monitoring of **quality parameters** and **configurable threshold** alarms.