



CASE STUDY

Castellón Deployment
Iberdrola (Spain)

Iberdrola, Spain Broadband Power Line (BPL)

BACKGROUND

Domestic and European Union wide directives are encouraging more and more utilities to modernize their distribution grids. Spain became a pioneer by starting to replace traditional metering systems with modern standardized AMR solutions. In addition to the regulatory directives, Iberdrola grabbed this opportunity to think beyond metering. Iberdrola introduced remote management and control solutions for monitoring distribution transformers to add additional value to the investment.

The consequence is a previously unseen view into the energy network with measuring points at all critical edges on the grid. To handle the tremendous amount of gathered data, one of the core elements of the system is a stable and reliable communications network. As seen in the telecommunications industry, a hybrid solution was evaluated. A non-proprietary Power Line Carrier solution (PRIME) for communications between the meters at residential and industrial customers and the associated data concentrator at the distribution transformer was introduced.

The backhaul data transmission is based on a mix of communication technologies, in which Broadband over Power Line (BPL) is playing a significant role to interconnect the various media to low voltage transformer stations and to bridge the gap between the metering system and the existing communications infrastructure on the transmission level.

CASTELLON DEPLOYMENT

As part of the Iberdrola's STAR Project, Castellón became the first Spanish city with an intelligent power distribution grid. Iberdrola has 180,000 customers benefitting from improved power supply and quality and significantly reduced failure incidents. Iberdrola replaced or enhanced more than 100,000 meters currently used by residential and industrial customers with PRIME based smart meters from multiple vendors. Transformer stations were adapted to handle certain services remotely, read metering devices, and coordinate registrations, cancellations or modifications of subscribers.

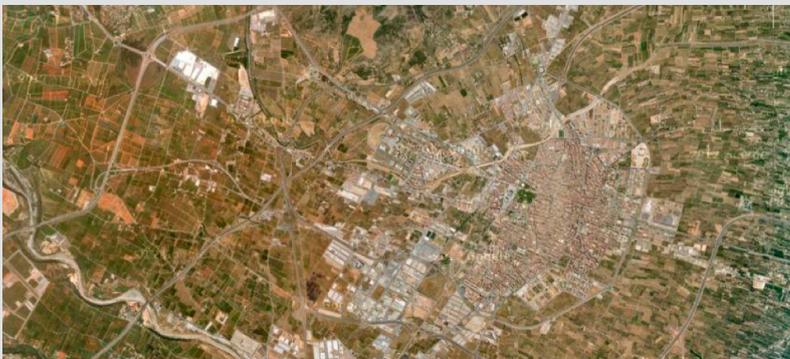


Figure 1: Castellon, Spain

Castellón proved to be the ideal deployment reference, representing a variety of typical network characteristics that will be found in other parts of Iberdrola's distribution network. The Castellón grid consisted of 531 transformer stations with a variety of configurations and 100,679 residential supply points attending to 181,439 residents.

The low voltage network consists of multiple and individual single-phase and three-phase meters with between 1 and 831 customers per transformer station and between 1 and 25 feeders per transformer station.

The complete city of Castellón today has a one-of-a-kind smart distribution network, including an end-to-end communications network from the utility to each residence, including remotely managed and read meters and data concentrators from various suppliers, all interoperable with each other. In addition, many distribution transformers are remotely controlled and managed.

ORMAZABAL CONTRIBUTION

Being a trustful partner during the initial technology evaluation process, Ormazabal is providing equipment and software for the advanced metering system, the transformer supervision and the network communications.

Ormazabal's PRIME-based Intelligent Data Concentrators (IDC) provide enhanced functionality at the core locations within the distribution grid in Castellón. Beyond meter data, the devices provide important information about the condition of the grid thanks to embedded sensing technology.

Ormazabal's MV-BPL solution (API-2000-SA) is bridging the intercommunications gap between transformer stations and forming a solid and cost-effective backhaul communications solution.

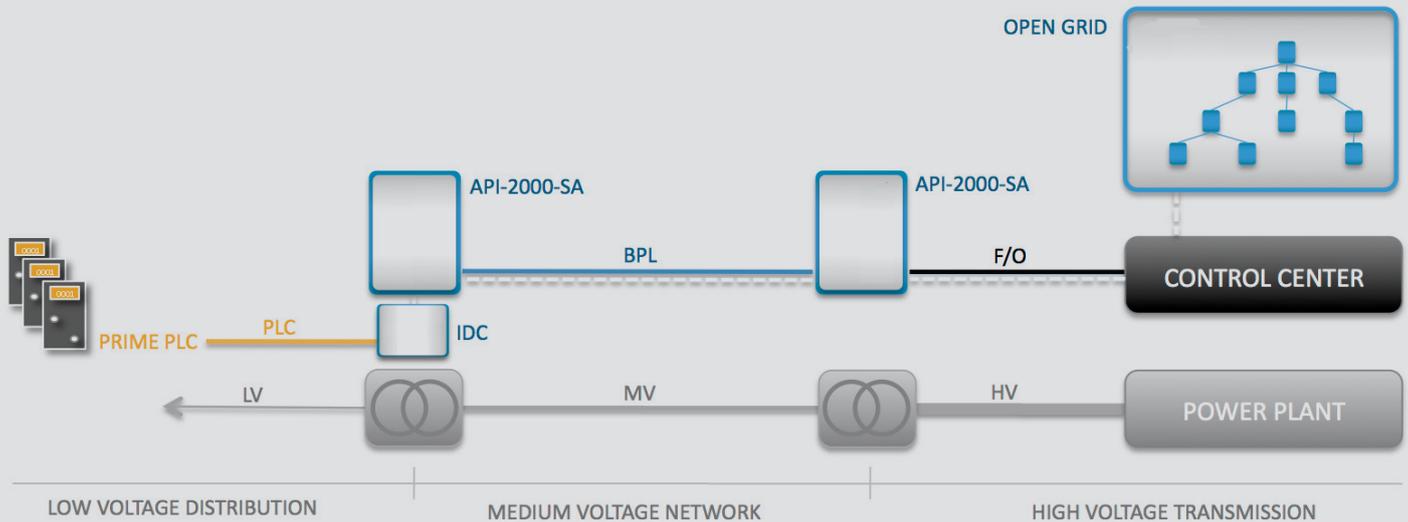


Figure 2 – PRIME Metering Communications in Low Voltage-, combined with MV-BPL for interconnecting Medium voltage Transformers

PRIME METERING SOLUTION

The PRIME technology is providing an open, single specification and standard narrowband power line technology, designed to enable beyond metering applications within a utility's distribution grid. As a one of the founding members and strong contributors to the research and development of the PRIME Alliance and the PRIME technology, Ormazabal significantly participated to accelerate the availability of products and services based on this worldwide standard and promote the broad adoption and use of the PRIME specification while supporting the idea of true multi-vendor interoperability and compatibility with the global standard. Together with Iberdrola and other leading industry members, Ormazabal created a global standard that was first commercially deployed as part of the STAR Project in Castellón, Spain

ORMAZABAL INTELLIGENT DATA CONCENTRATOR (IDC)

The IDC product line is forming a combination of Meter Data Collection, Low Voltage Supervisory functions and GPRS connectivity in multiple product options. The products used in Castellón have the ability to aggregate, analyze and report both meter data and low voltage measurements.

In addition, the Ormazabal Intelligent Data Concentrator uses meter data and measurements of the low voltage lines to allow advanced services such as asset management, performance benchmarking and enable decisions on grid optimization. The IDC offers a combination of a Data Concentrator with embedded Low Voltage Sensing and Analytics to ensure a cost-effective solution to monitor and manage not only the metering network but also the entire distribution grid.

ORMAZABAL Medium Voltage BPL (API -2000-SA)

The Ormazabal Medium Voltage Broadband Powerline communication (MV-BPL) solutions are used by electric utilities to extend their communications into the medium voltage network and to interconnect metering systems and distribution assets with the operation center through a cost-effective non-proprietary channel.

The coupling of the signal to the MV grid can, in principle, be done by capacitive or inductive methods. In practice the capacitive coupling method showed the best overall performance in Spain and is also the solution required for coupling to oil isolated cables. With good planning and in particular with a meshed network the assembly of the capacitive couplers can be carried out without interrupting the power supply to the end customers.

In Castellón twenty-five individual MV-BPL cells interconnecting a total of 229 transformer stations are deployed, which equals in an average number of transformer stations. MV-BPL is a reality for AMI deployments and is proven in the field in Castellón. The defined concept for MV-BPL is scalable and well suited for large scale deployments. Performance goals can be met and the future work is focusing on improvements of the concepts, extension of the solutions with high availability and standardized communication.

OPENGRID MANAGEMENT PLATFORM

Ormazabal's OpenGrid® software applications assist Iberdrola in managing the communications infrastructure, grid devices, data concentrators and provide capabilities that are needed for the future expansion of the deployment. The system is capable of discovering, securing and managing the wide range of remote devices across the network.

Within the Castellón project, OpenGrid allows Iberdrola to handle Fault, Configuration, Accounting, Performance and Security (FCAPS) as well as device messaging and control remotely. It forms the basis of a smart asset management and the discovery of deployed distribution transformer station equipment, such as the Station Data Concentrator, Low Voltage Analytics and MV-BPL devices. The open architecture of OpenGrid allows Iberdrola to integrate the applications into their existing Network Operations Platform.

It ensures that large numbers of simultaneous notifications are communicated to Iberdrola's operations center properly during T&D network events, enabling a priority-based communication scheme to ensure timely delivery of measurement data.

FUTURE PERSPECTIVES

Iberdrola's vision for additional features and services are solutions and systems ensuring redundancy and high availability networks. As per the PRIME approach for metering, it is for all areas of deployment that standards-based solutions are favored. The work to achieve this has already started and is also part of the European Frame Program 7 Grid4EU project in which Ormazabal participates as well.



Figure 3 – Enabled Transformer Stations in Castellon

Ormazabal strongly focusses on expanding beyond traditional AMI installations and targets the further features expansion of its transformer management and monitoring products. As per the growing number of distributed renewables, the integration of such micro-generation will become an important priority, especially in markets like Spain.

Iberdrola will leverage the experiences gained and learned in the Castellón deployment to implement and deploy such technologies on its grid throughout Spain.

CONCLUSION

Castellón proved that intelligent electric distribution grids are no longer simply a vision or evaluated on a trial or pilot scale. Iberdrola deployed a beyond AMR system with remote management and control solutions for distribution transformers, based on a future proven communications network on mass deployment scale for an entire city.

The products and solutions are fully operational and providing efficiency and reliability improvements beginning on Day One. Intelligent Distribution Networks, Connected Intelligence® - deployed, proven and available today!