

INTELLIGENTLY MANAGING METERING ASSETS IN A CHANGING ENVIRONMENT

Pedro FELÍCIO
EDP Distribuição – Portugal
pedro.felicio@edp.pt

ABSTRACT

The subject addressed is how did EDP Distribuição faced the challenge of managing its millions of metering equipments and associated metering processes. The target was to keep track of asset's location, status, technical parameters, operations and life cycle, as well as to define new workflows and simplify the existing ones concerning the processes associated with the metering activity. These aspects became more critical as new intelligent metering technologies started making part of EDP's reality.

The main problem was how to manage, how to input and update data throughout several already existing systems in EDP Distribuição, shared by different Departments with different responsibilities and targets.

The solution adopted consists on a platform tool for data management and on the re-design of corporate processes and workflows.

Positive results have immediately came out, adding value to daily operational work, notably in large volume data operations such as equipment registration as well as in rolling out work orders for jobs being carried out in the field.

INTRODUCTION

Power grids are in a rapidly changing environment. A shift from the traditional Production-Transportation-Distribution value chain into a network of Distributed Production and Smart Grids, where Customers can also be Producers and energy can flow in more than just one direction. This paradigm shift is more than an academic experience put into the field and could be a scientific article on its own. In EDP case the main drivers are: pressure from the electricity market regarding remote metering; fossil energy sources are becoming scarce and its prices are becoming inaccessibly high; and environmental green conscience and energy efficiency/rational usage moved from fashionable speeches into real needs for the sake of our children's future. Smart Grid concept seems the optimal answer to these challenges and hence, EDP is moving into Smart Grids. This paradigm change has a real impact on the Power Grid: new ways of energy flow management, energy metering and operational safety are being implemented. Notably, intelligent devices with capabilities of energy management have been developed for deployment into Smart Grids, some of these intelligent devices can be installed directly into Customers home, a powerful tool for every Customer which becomes thus able of efficiently managing its own energy. In what concerns to Smart Grids, everyone has a role to play. Such changes in Smart and Distributed networks demand a

tight asset control of the intelligent metering devices as well as the more traditional metering devices which still have to co-exist in the network during the transition period. It became clear that EDP Distribuição had to enhance its ways of managing the metering assets.

THE NEED FOR CHANGE

At EDP Distribuição, metering equipment means all equipments used in metering activity: meters, modems for remote metering, circuit breakers, voltage and current transformers. Basically, an equipment has 4 important stages in its life cycle at EDP Distribuição: registration, installation at site, removal from site and status change. Equipments are first registered prior to delivery to EDP warehouses. This registration was basically a new entry in the corporate commercial system, comprising equipment type, serial numbers and some key parameters. This was a task carried out by the Metering Management Department of EDP Distribuição. The information for this registration is found on the delivery documents also sent by the suppliers. Simultaneously to this activity, Warehouse Management Department made an entry on the purchase material corporate system indicating how many physical units came into the warehouse, after a careful inspection to the equipments and documentation's conformity. Thus, there were two entities involved, one registering equipment serial numbers while the other registering the quantity. Both registered the type of equipment delivered.

Equipments are installed following the course of Work Order execution. To place a meter at Customer site is a task that can only be done when requested by a Work Order, which mainly indicates the Customer ID, the location, the task to be performed and the team to carry the job. This action is reflected on corporate commercial system where the equipment becomes associated to the Customer location, which becomes true upon successfully closing the Work Order in the system. Once installed, the equipment changes its status accordingly in the system, thus preventing a second installation without uninstalling first. Equipment can be uninstalled (removed from Customer site) at any moment but also based on Work Requests. After being uninstalled, equipment status changes accordingly making it free to be consequentially used at a different Customer or marking it as permanently unusable equipment (like in the case of serious malfunction equipment).

Several reasons can take a team to Customer site for corrective or preventive maintenance on metering equipment, most notably equipment malfunction, replacement or reconfiguration. For those purposes, the

Metering Management Department issues Work Orders sometimes on individual basis and sometimes on large numbers. Having a Customer pool of 6million+, it's not difficult to find situations of large number of Work Orders being issued with a common purpose but for different Customers. At EDP Distribuição those large sets of Work Orders are know as Campaigns. An example of a Campaign is the reconfiguration of meter's cycle for low voltage Customers. Managing a Campaign adds difficulty to manage an individual Work Order because it's necessary to control all the Work Orders comprising the Campaign and keep track those closed and those still to be executed. Regarding metering issues, Work Orders and Campaigns are launched and managed by the Metering Management Department. Work Orders and Campaigns however are executed in the field by teams under regional network departments.

On the verge of implementing a Smart Grid, it became clear that the equipment management and associated field work had to be improved, seeking a better coordination between the several entities involved, more control and more efficiency over the equipment registration and life cycle.

METER ASSET MANAGEMENT

Objectives

On the process of moving into a Smart Grid, EDP Distribuição needed to manage its metering assets and all associated business processes in a more efficient way. In fact, asset management was not a new subject for EDP Distribuição, the innovation here is in doing it in a better and less costly way. The main goals of metering asset management for EDP Distribuição were:

- Asset inventory;
- Technical characterization and supporting documentation archiving;
- Keep record of asset movement, events/anomalies and configuration history – Product Life Cycle;
- Establish and keep a correlation between metering process and metering asset management;
- Handling requests from internal and external customers;
- Automatic workflows (e.g.: Parameterization activities);
- Implementation of the rules for selecting installations to be operated;
- Metrological control campaigns;
- Roll-out of specific actions over a massive set of equipments (e.g.: due to regulation changes, compliance issues, maintenance, etc.);
- Establish workflows associated to equipment's Life Cycle:
 - Delivery and registration to warehouse,
 - Delivery to operational teams,
 - Registration upon installation at site,
 - Registration upon uninstalling from site,
 - Keep update of equipment parameters and configuration,

- Data flow between several existing corporate systems,
- Reports of equipment quantities and movements for internal control,
- Automatic interface with corporate purchasing system, upon real-time quantities and movements of equipments;
- Workflow and equipment documentation storage (digital): catalogues, data-sheets, procedures, guiding manuals, reports and parameter configuration files;
- Reports regarding activity control: performance indicators and goal achievement;
- Identification of patterns among equipment performance or events prompting for action;
- User friendly, swift and intuitive environment;
- Advanced data research criteria;
- Data aggregation and recovery;

These goals mentioned above were to be achieved in the new metering asset management solution that EDP Distribuição was about to implement. Whatever the solution would be, it should not lose sight of the main drivers for this change:

- Providing clean and accurate data to the electricity market;
- Strict control over metering assets and metering business processes:
 - metering installation and maintenance,
 - distributed generation processes,
 - smart grid asset management and
 - preventive maintenance processes;
- Integration and data flow with other different corporate data systems;
- Data availability;

Obstacles

The main obstacles to overcome:

- Data scattered throughout different systems with different languages and running in different platforms;
- Dubious and missing data in the storage systems at the time;
- Complexity brought by the transition to Smart Grid, involving new equipments and new processes;

ENHANCED METER ASSET MANAGEMENT

Divide and Conquer

A software platform was developed starting from a well-known asset management tool available from the market and used as a base to build on. The solution in fact comprises not only the software platform but also all our improved workflows and new processes.

As moving with different systems and involving processes of different entities, this project was expected to be a highly complex one. Hence, a divide and conquer approach was launched and the project was planned to be deployed over 4 phases.

Phase 1

In Phase 1, we've built the core of the solution, existing data was migrated into this new platform and the basic interfaces were launched, Figure 1:

- Interface with the commercial system of EDP Distribuição (contractual and customer data);
- Creating and transferring assets over warehouses;
- Generation of Work Requests;
- Campaign management;

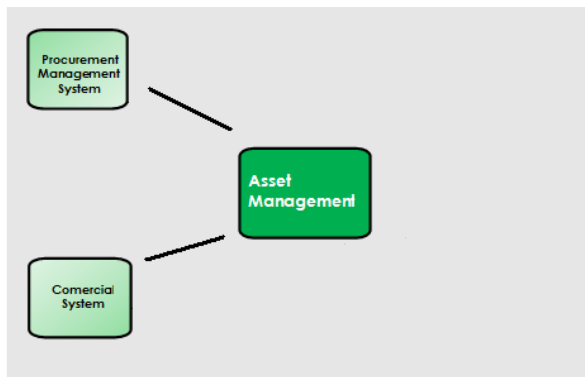


Figure 1 – Phase 1 of the asset management solution.

At the end of this stage, it was already possible to register equipments upon arrival at the warehouse, keeping track of equipment movements and to manage massive roll-outs of work orders for operational teams.

Phase 2

In Phase 2, it was notably developed the ability of registering intelligent devices in the Smart Grid system and receiving events from it. It was also possible to handle faults from the remote meters and act accordingly (corrective maintenance), Figure 2:

- Interface with the Smart Grid system also under implementation at EDP Distribuição;
- Event Management tool;
- Data Reports;

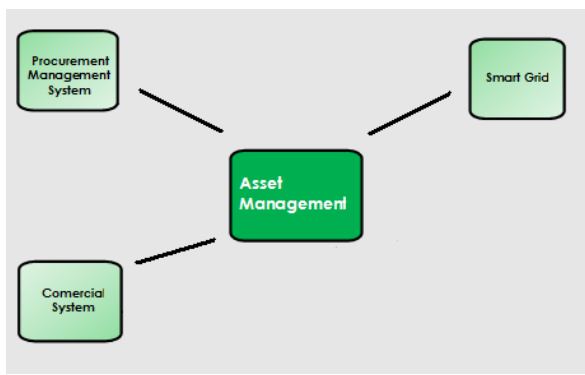


Figure 2 – Phase 2 of the asset management solution.

Phase 3

In this Phase it was developed the interface to the existing remote metering system (billing data collector), Figure 3. New modules were also built for preventive maintenance, namely Time Based Maintenance (TBM) and Condition Based Maintenance (CBM) functionalities:

- Interface with remote metering central system;
- Preventive Maintenance over metering assets;

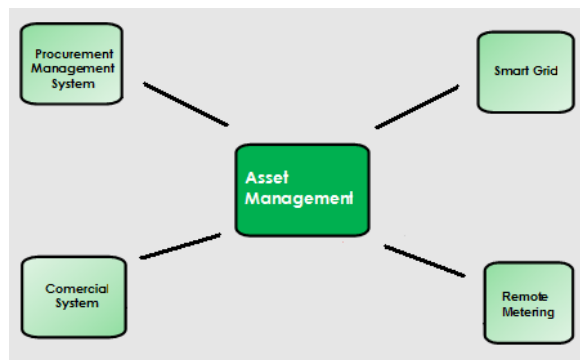


Figure 3 – Phase 3 of the asset management solution.

Phase 4

With Phase 4, it became possible to visualize where intelligent meter devices are installed within the power grid. It's now clear and workable the upstream and downstream network components interacting with the intelligent meter devices. This was the interface between the asset management tool and the geographical system, Figure 4:

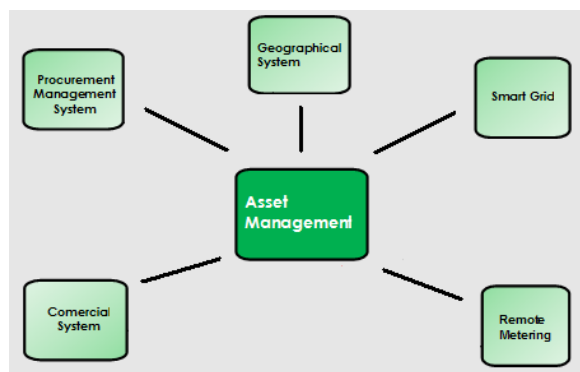


Figure 4 – Phase 4 of the asset management solution.

Registering equipment serial numbers, types, quantities and relevant parameters started being done by one entity at one time. The optimal choice is the warehouse personnel doing it upon equipment arrival. Rolling-out and managing Campaigns is done at one point too. Those data are propagated into the existing relevant systems thus keeping the legacy and smoothing the transition but adding value to the whole process.

RESULTS AND CONCLUSIONS

The solution we've built brought us a huge impact. We can now take benefit from:

- Metering assets' life cycle clearly under control;
- Massive generation and control of Work Requests;
- Improved and more efficient logistics over equipments;
- Maintenance automatic functionalities over metering assets (TBM; CBM);
- Monitoring the life cycle of the new Smart Grid intelligent devices, joining a new asset management philosophy with top technology remote metering devices;

A 5th phase is being planned to include more functionalities over Work Requests for operational teams.

This solution is on its way to be the tool for Metering Asset Management at EDP Distribuição. It brought us improvements in data acquisition and validation processes. Serial numbers of meters are now scanned via optical barcode readings in the warehouses, thus saving time and costs, Figure 6:



Figure 6 – Optical reading at EDP warehouse.

New processes improving daily operations have been developed. Creating Work Requests based on metering assets has never been so easy, it can now be done by selecting either the equipment or the location, and it also can be done massively for the purpose of field campaigns which is one of EDP Distribuição's major activities.

We can now enjoy the benefits of managing the whole life cycle of metering equipments, including smart grid's intelligent devices. Such success is actually driving other Departments of EDP Distribuição to consider similar approaches for managing their own assets.

ACKNOWLEDGEMENTS

A great word of gratitude to all colleagues and end-users at EDP Distribuição, their contribution and collaboration was of immeasurable value. Also sincere thankfulness to all colleagues of EDP Valor and warehouse personnel involved in this Project, for their support and patience.