Making Smart Grids real. Experiences from Iberdrola.

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IBERDROLA. Highlights. Global focus.

- €37Bn market value. #1 European utility by market capitalization.

- €2.5Bn net profit in 2015. Achieved 2016 outlook one year in advance.


- Focused in 4 main areas:
  - 20M supply points + 10M managed
  - Smart Grid high deployment level in areas where Iberdrola is operating.
  - Iberdrola is at the forefront of smart grid. Opportunity. Value proposition.
Smart Grids: an evolution based on challenges.

Deep technological transformation project -> Relevant challenges

Challenges

Technology
Industrial deployment
Cultural: deployment
Cultural: O & M

2016: Getting Smart Grids to enough maturity level to integrate into the business as usual
Fulfill the legal obligation for smartmetering

- 11 million smart meters for 2.018
- Open standards as a key driver for competitive prices

Leverage obligation to build smartgrid opportunity

- Pragmatic approach focused on
  - Quality of supply
  - Losses reduction
  - Operational efficiencies

Technological evolution as a foundation for a new way of managing distribution business
Smart Metering Model

LV Network
Customer

Secondary Substations (x 10^4)

MV network

GPRS
PLC MV ADSL

Remote Management system

- Readings
- Work Orders

Aggregated Information

Points of Supply IT

Information and interaction with the consumer

Retailers

Business IT (Scada, planning, investment)

Consumers

IT Business IT (Scada, planning, investment)

• Invoices
• Readings
• Contract modification
• Connect/Disconnect
• Claims

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IEA Smart Energy Systems
Getting the value from Smartmetering

Smart metering: Point of supply processes are running successfully

• Services are available on several meters from a competitive market.
• Significant number of annual operations:

| Remote meter reading | 45M Invoices based on remote meter readings |
| Disconnect / Re-connect | 55 M remote meters reading. Hourly values. |
| Change of tariff | 300 K Remote operations (Disconnection orders, Reconnect,… |
| On-demand reading | 6,1 M Change of tariff orders (Power limitation orders) |
|  | 210 K On-demand readings |

• Success rates objectives reached
• 5,6 M manual reading points already eliminated
• Customers web page.

6.9 M meters deployed and 38,000 secondary substations adapted
Smart grid model

**Remote Management**
- Remote reading of energy and power
- Remote reading of power quality characteristics
- Programming remote tariffs
- Remote connection and disconnection

**Smart Grid**
- Monitoring of MV and LV
- Alarm facilities
- Detecting network faults (without trial and error)
- Automation and real-time control of the MV network
- Improved customer service

**Distribution Network Management Centre**
- Remote Management System
- Operation System

**Retailers & consumers information**

** LV network**
- Meters ($\times 10^6$)
- Distributed Generation (Photovoltaic)

**MV Network**
- Secondary Substations ($\times 10^4$
- Growing no. of connections
- Distributed Generation
- Wind and Photovoltaic

**HV Network**
- Primary Substations (Already automated) ($\times 10^2$)

Institutional information:
- Iberdrola Distribución Eléctrica
- www.iberdroladistribucionelectric.com

IEA Smart Energy Systems
Getting the value from Smart Grid

Smart Grid: Significant value is generated from the technical improvement

- Fault detection
- Automatic restoration
- Meter events
- LV Supervision
- MV real time measurements

- Scada based automatic analysis and recovery.
- Operational efficiencies programme.
- Safety oriented features
- Equipment with remote management capabilities.
- Data use is becoming a competitive advantage for the business.
- Remarkable innovation activity to explore new opportunities.

Automation is growing significantly in the grid
Smart Grids industrial deployment model

• Initially designed as an specific activity, out of the business as usual.
• Led by a Project Office, responsible for criteria, coordinating the deployment and driving the transformation.
  • Key activities insourced.
  • Challenge to align the support from the organization.
  • Majority of the organization involved in deployment today.
• Installation activity fully outsourced.
  • Planned, designed and controlled by our own team.
  • Subcontractors had to adapt to smart grid.
• Experience has finally materialized in our own model:
  • Industrial model.
  • Fully led and supported by IT systems.
  • Combines: strong leadership + growing implication of the organization

Challenge is to move from an specific project to a business as usual activity, leveraging the deployment
Cultural Challenge

The largest challenge of Smart Grids is the cultural change of the organization

• The most important and extensive knowledge evolution of Iberdrola -> Managing human psychology for change achievement.

• Leverage the deployment to:
  • Acquire skills by the organization. Adapt IT.
  • Evolve the organization.

• Majority of the organization involved, focus in motivating the people.

• Integrate smart technology into a variety of electrical assets -> Add electronic knowledge to electrical skills -> Huge training activity.

• Leveraging the deployment to improve the traditional business:
  • Standardization focus.
  • Promoting the economical vision.
  • Fostering IT to support the business activity

SGs will be the technological lever to a new, more efficient organization
And about the consumer…

Smart Grids open up new opportunities for digital services and improvement in customer service

- **TOU tariffs:**
  - Customers with a high energy consumption at specific hours of the day.
  - Customers choose those 8 hours in which they want to have an optimal price.

- **Web portal:**
  - Summer Plan: 2nd residences with a high energy consumption during the summer.
  - Lower price from June 15th to September 15th.
  - Winter Plan: 2nd residences with a high energy consumption during the winter.
  - Lower price from December 1st to March 1st.
  - Customers with a stable consumption throughout the day.
  - Unwillingness to change their consumption habits to those hours in which the energy price is cheaper.
  - Fixed price 24/365 days.

- **8,760 Hours Plan**
  - Price sensitive customers, often tech-savvy, and with relative understanding/interest in the industry.
  - Willing to adjust their consumption to those hours with cheaper energy price.
  - Hourly pricing, based on daily spot market.

- No more invoices based on estimates
- Exceptions in internal pre-billing processes decrease
- Invoices being re-processed are reduced substantially