International Energy Agency

Secure • Sustainable • Together

IBERDROLA DISTRIBUCIÓN ELÉCTRICA

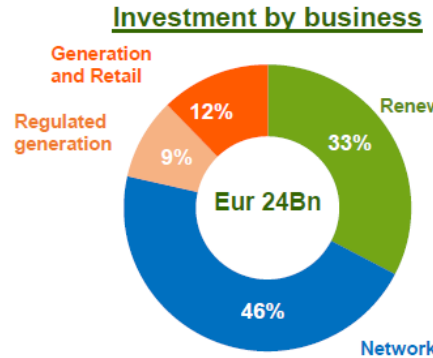
1st March 2016

Making Smart Grids real.
Experiences from Iberdrola.

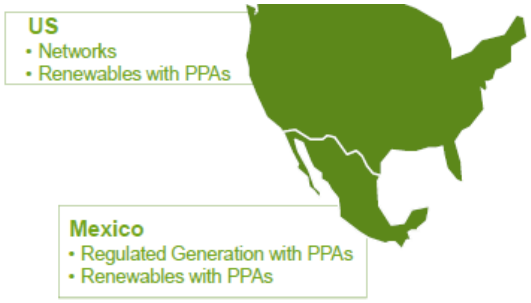
Javier Arriola. IBERDROLA.

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.
- € 24Bn investment for the period 2016-2020.



- Focused in 4 main areas:

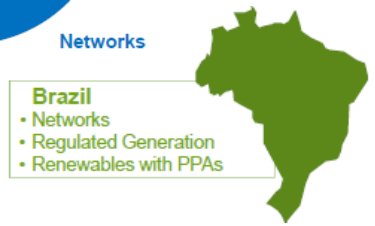


US
- Networks
- Renewables with PPAs

Mexico
- Regulated Generation with PPAs
- Renewables with PPAs

UK
- Networks
- Onshore wind
- Offshore wind
- Retail

Iberia
- Networks
- Storage
- Retail



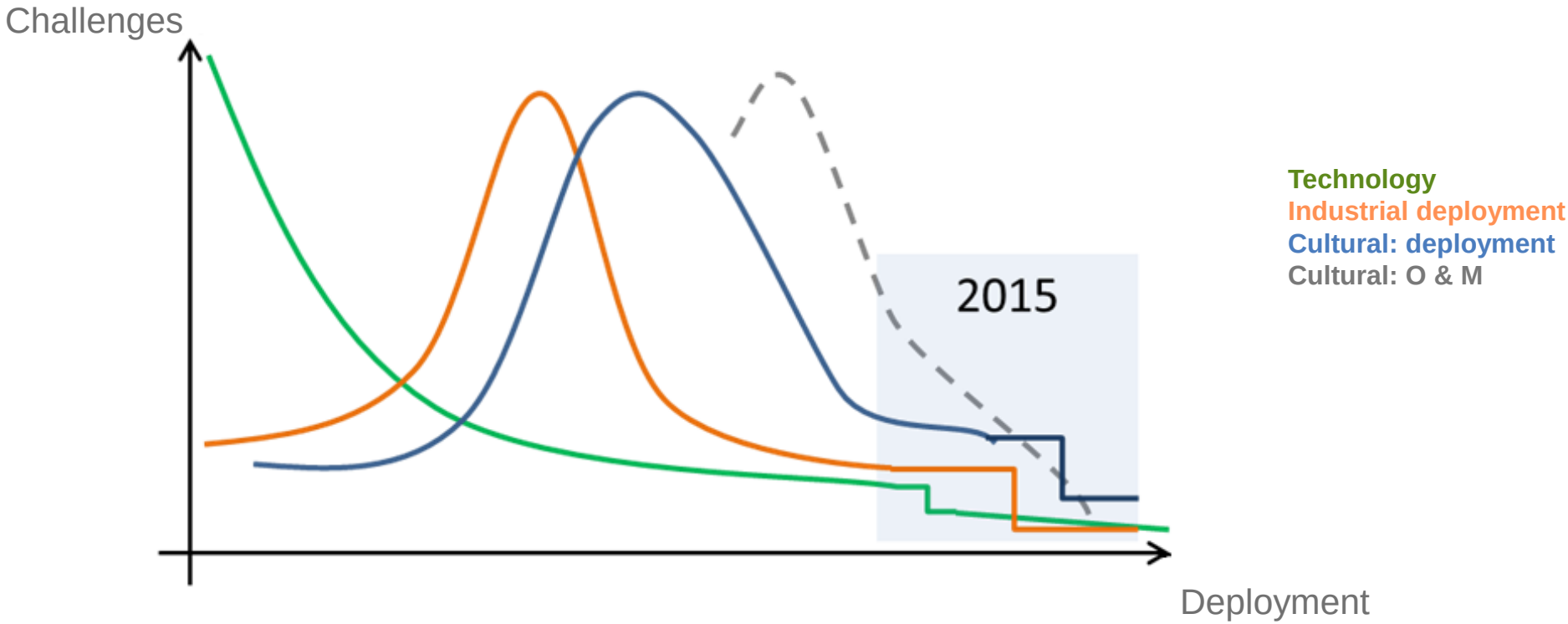
Brazil
- Networks
- Regulated Generation
- Renewables with PPAs

- 20 M supply points + 10 M 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

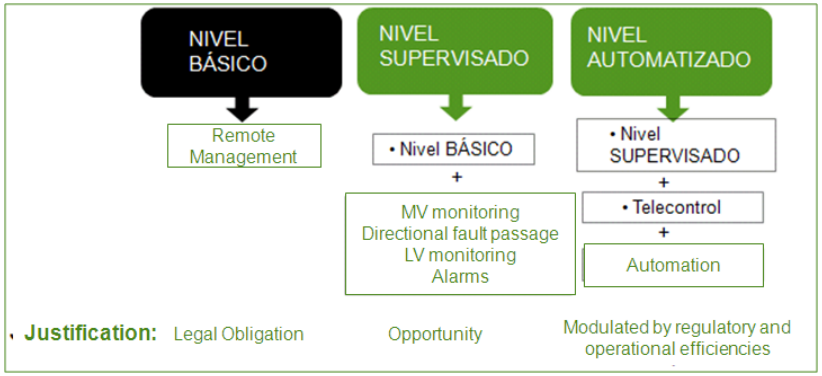


2016: Getting Smart Grids to enough maturity level to integrate into the business as usual

Spain: STAR Project. Vision.

Fulfill the legal obligation for smartmetering

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

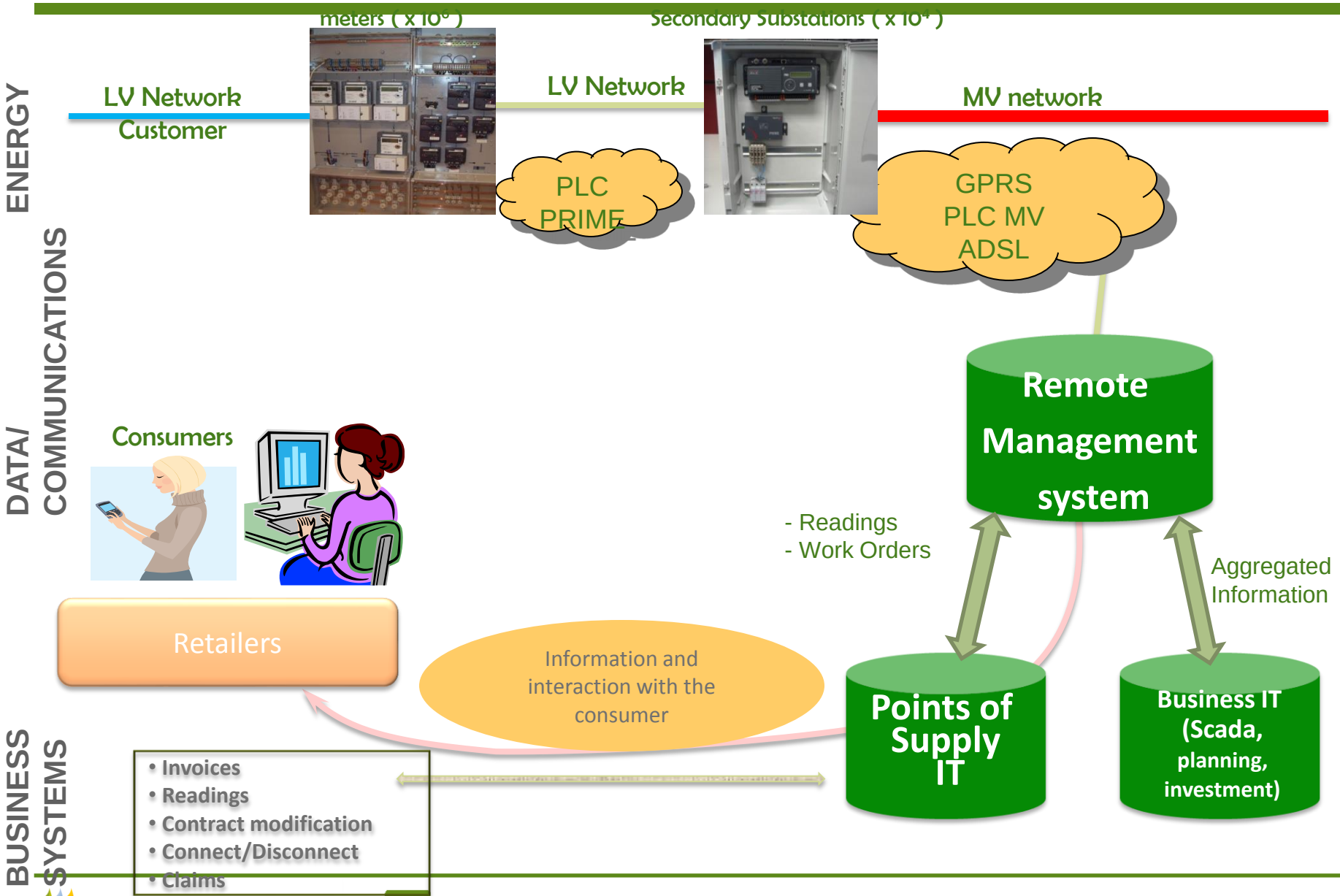


Leverage obligation to build smartgrid opportunity

- 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



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.*
	300 K Remote operations (Disconnection orders, Reconnect,…
Change of tariff	*6,1 M Change of tariff orders (Power limitation orders)*
On-demand reading	*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

Retailers & consumers information

Distribution Network Management Centre

Remote Management System + Operation System

Remote Management

- Remote reading of energy and power
- Remote reading of power quality characteristics
- Programming remote tarriffs
- 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

Meters
(x 10^6)

LV network

Distributed Generation (Photovoltaic)

Secondary Substations
(x 10^4)

MV Network

Growing no. of connections Distributed Generation Wind and Photovoltaic

Primary Substations
(Alredy automated)
(x 10^2)

HV Network

Getting the value from Smart Grid

Smart Grid:
Significant value is generated from the technical improvement

Fault detection

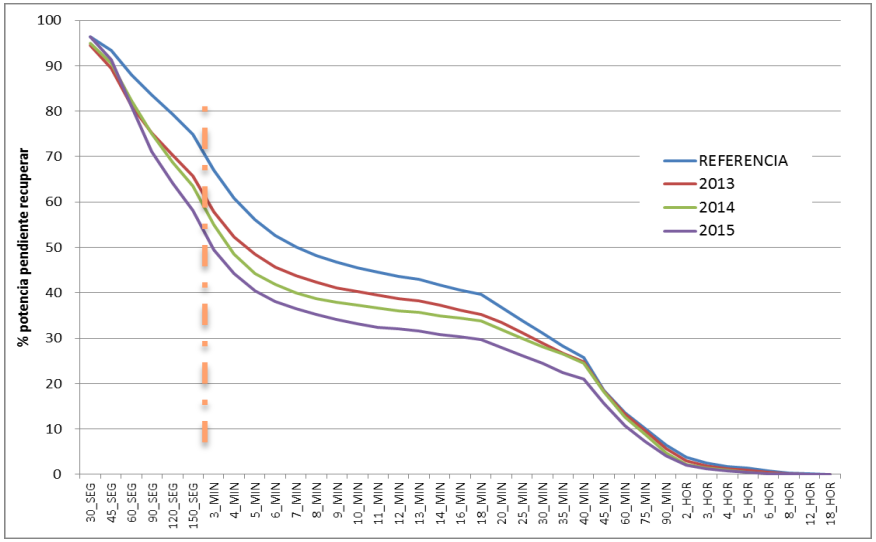
Automatic restoration

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:

CHOOSE 8 HOURS PLAN

- 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*

SUMMER PLAN

- Summer Plan
  - 2nd residences with a high energy consumption during the summer
  - *Lower price from June 15th to September 15th*

WINTER PLAN

- Winter Plan
  - 2nd residences with a high energy consumption during the winter
  - *Lower price from December 1st to March 1st*

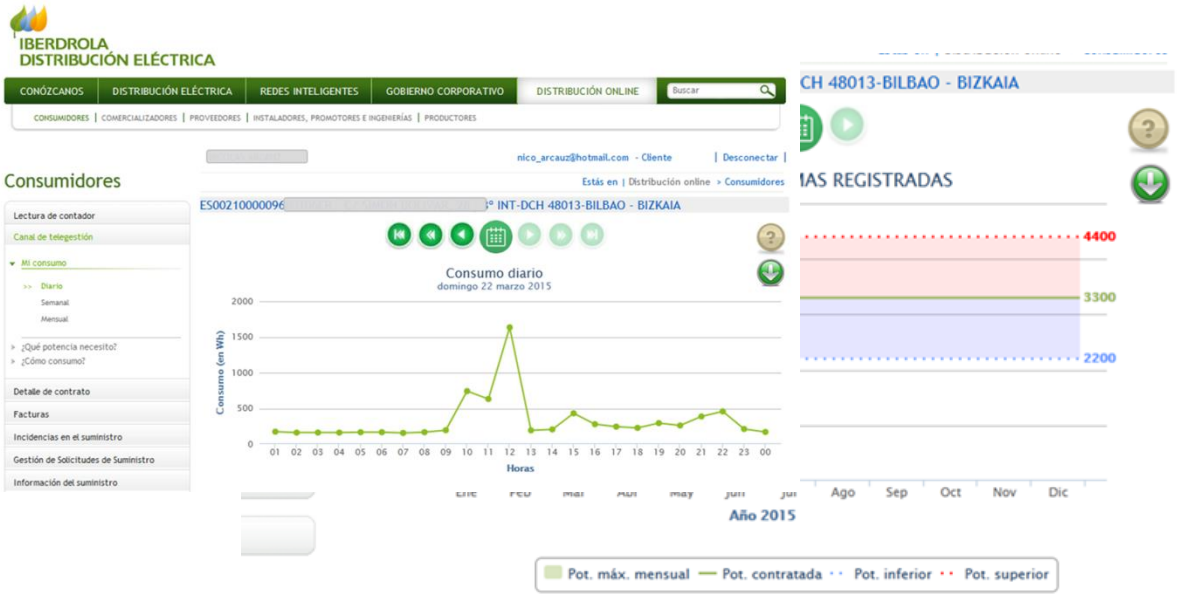
STABLE PLAN

- 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 24h / 365 days.*

8,760 HOURS PLAN

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

- Web portal:



- No more invoices based on estimates x 5

- Exceptions in internal pre-billing processes decrease x 10

- Invoices being re-processed are reduced substantially x 15