BIDELEK SMART GRID:
A SUCCESS STORY

Bilbao, 20th September, 2017

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DISTRIBUCIÓN ELÉCTRICA

The “Smart Grids Challenge”

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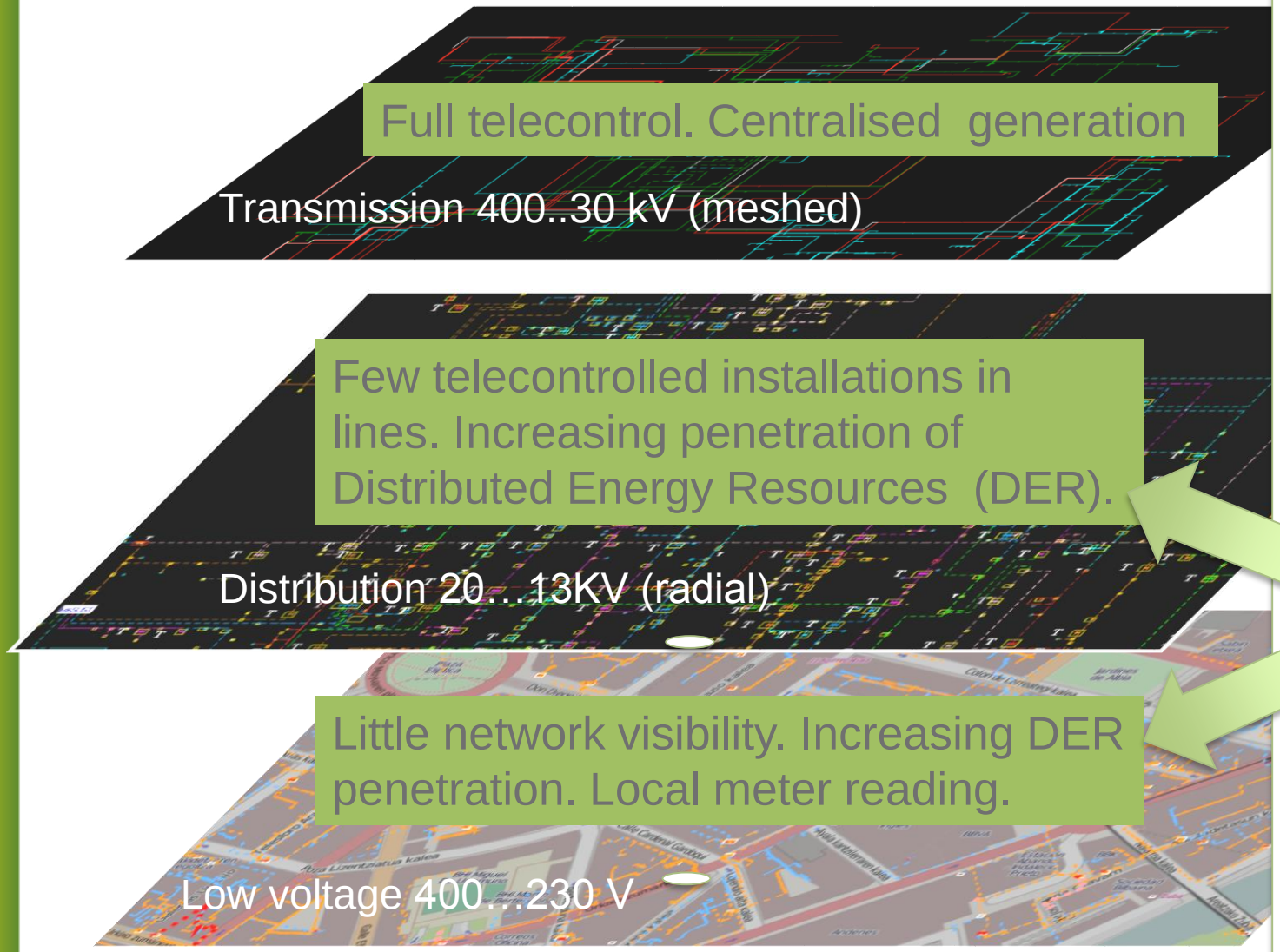
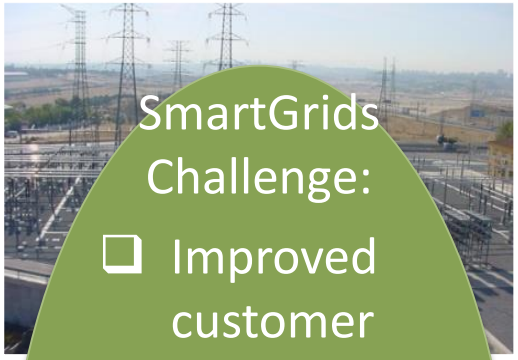
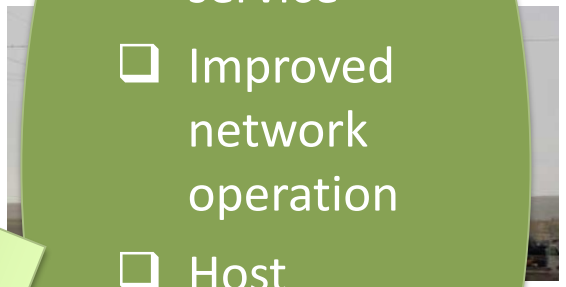
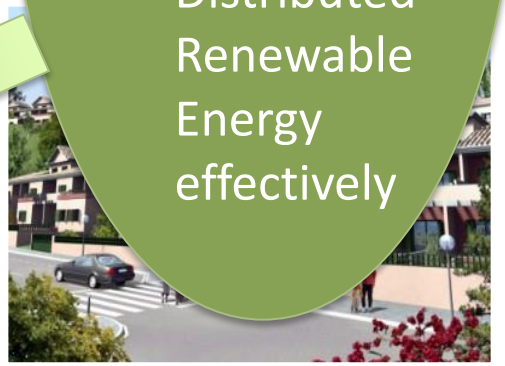




SmartGrids Challenge:

- ❑ Improved customer service
- ❑ Improved network operation
- ❑ Host Distributed Renewable Energy effectively





Public-Private Partnership

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EVE Ente Vasco de la Energía

- Technological leadership of the Project, setting the specifications, requierements and standards to comply with.
- Vision of the future electricty grids role and features.
- Fostering competition between suppliers, based on technical innovation and compliance with open standards and equipment interoperability
- Vision of the Smart grids as a way towards Energy efficiency and demand response
- Fostering the role of consumers and facilitating information about consumption.
- Financing of the Project and support to R&D projects

- ✓ Validation and demostration of new solutions in a real life electricity grid
- ✓ Dissemination of results and benefits of a Smart grid for all the stakeholders involved

Iberdrola´s Challenge

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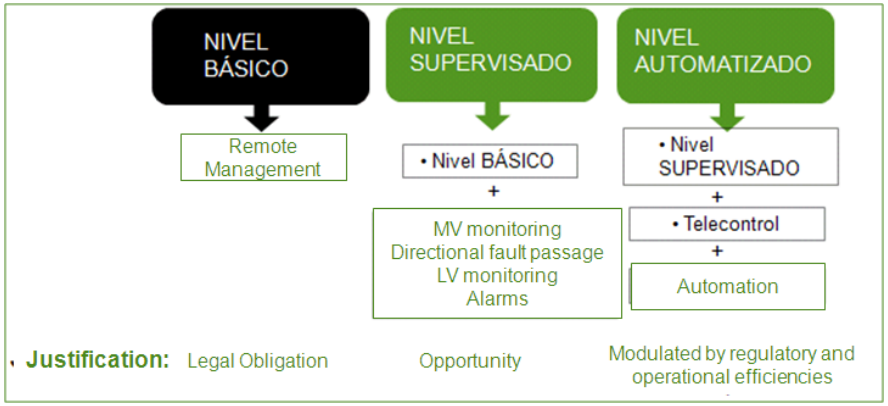
Fulfill the legal obligation for Smart metering deployment

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



Leverage the obligation as an opportunity to build the Smart grids new concept

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 Grid: Iberdrola model

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Customer ⟷ Retailer ⟷ Distribution Utility (Regulated)

Through Standards and Open Specifications

Smart Metering

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

Smart Grid

- Monitoring of medium and low voltage grid
- Detecting network faults (without trial and error)
- Automation and real-time control of the medium voltage
- Improved customer service
- Alarm facilities

Meters

LV network

Distributed Generation (Photovoltaic)

Secondary Substations

MV Network

Distributed Generation Wind and Photovoltaic

Primary Substations

HV Network

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Iberdrola and its suppliers have developed 45 new products and systems (already integrated in daily operation)

- Smart meters new functionalities
- New generation of Medium Voltage cabinets, electronic and sensors
- New generation of primary subsatation
- Automatic recovery of Medium Voltage network
- Low Voltage network management
- Low voltage lines monitoring (measurements, overcurrent, unbalances, fuse fusion, conectivity)
- Fraud detection
- MV and LV Electric risk situations detection

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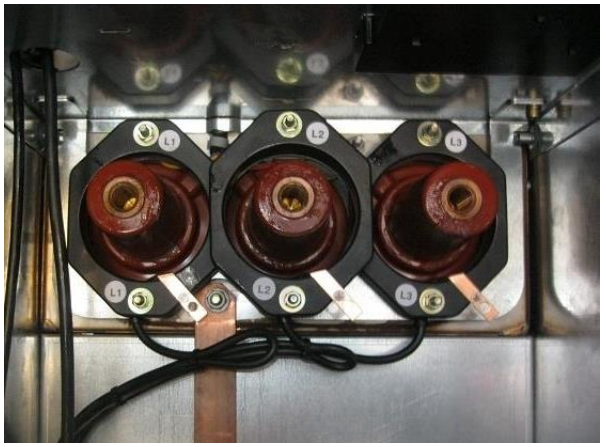
Development of libraries for communication with field equipment

Development of new functionalities and standardization of MV supervision and automation equipment.

- Fault pass-through detection, accuracy and real time measurements (current, voltage, active and reactive power)
- Open standards (TCP/IP, IEC-104, HTML, SOAP, XML, IEC-61850)
- Remote management and configuration.



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Systems improvement for integration of MV and LV supervision information:

- Integration in metering management system
- Integration in network operation system
- System for access and remote configuration of the facilities.

PLC communications optimization.

New equipment for secondary substations with low concentration of customers (~100)

- Concentrator, PRIME base node, 3G communications to system and LV supervision

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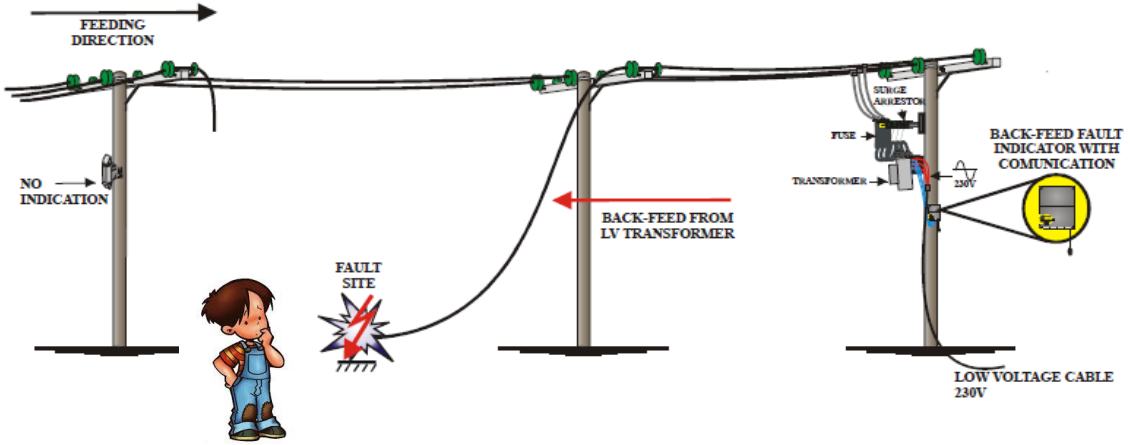
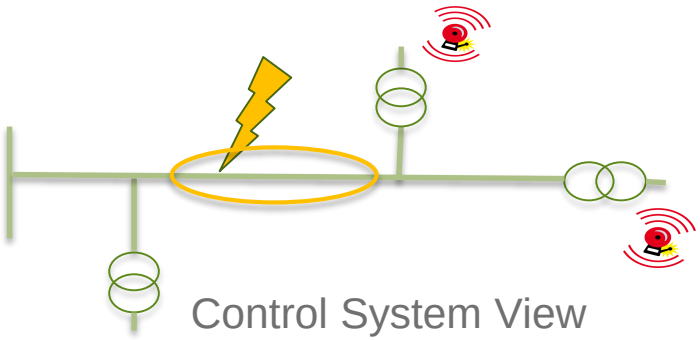
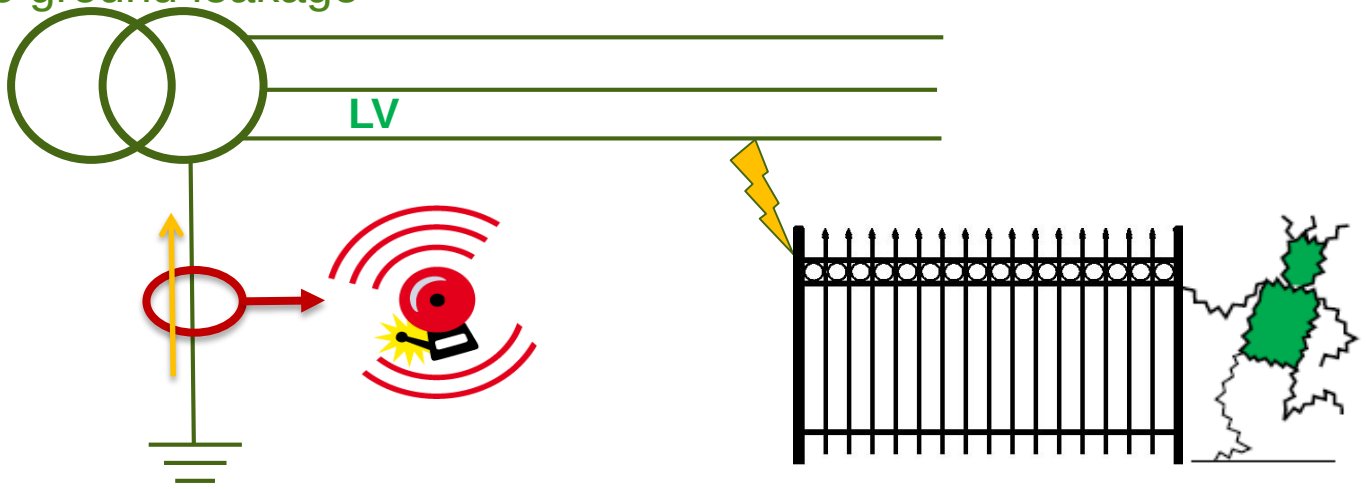
Security improvement:

- MV broke conductor detection (High impedance fault)





- LV to ground leakage



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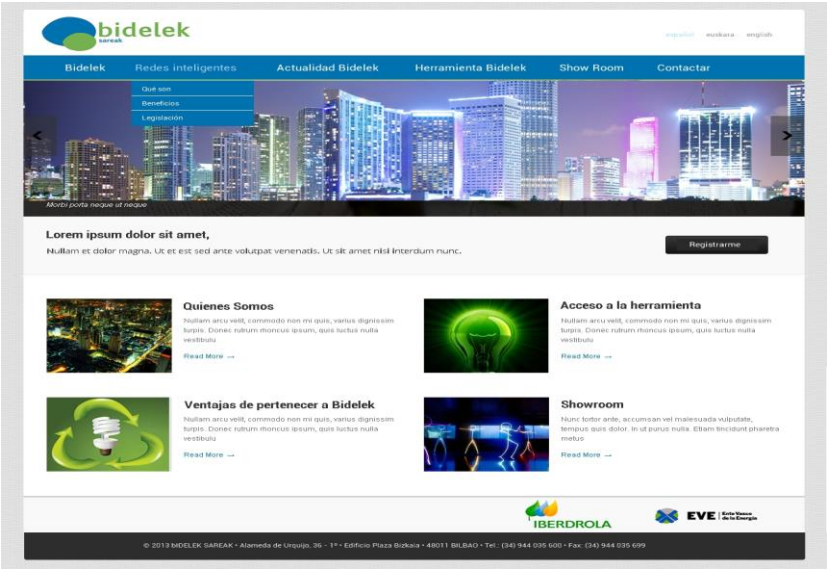
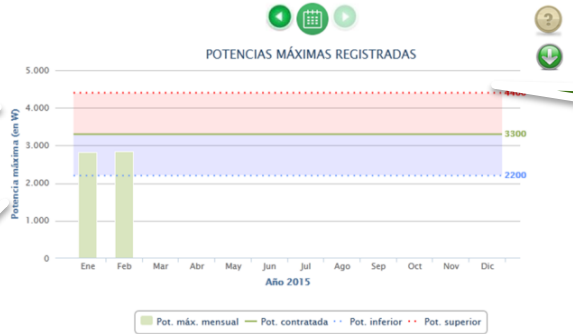
Web page to the service of a responsible consumption and the energetic efficiency for the customers:



- Access to historic consumption

- Top power consumption



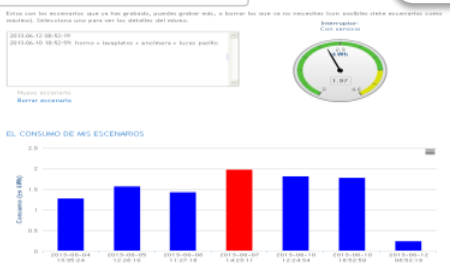
Actual metered Peak demand

Power contracted

Consumption alerts

"¿Should I contract more/less power?"

- Create your consumption scenarios



Real time on-demand power readings

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LV operation dispatch center

Advanced LV supervision:

- Meters LV line and phase Connectivity
- Secondary substation line supervision embedded on the metering system:
  - ✓ Information: Current, voltage, active and reactive power, quality of supply parameters.
  - ✓ Alarms: Blown fused, phase lost, voltage and current limits
- ✓ Functionalities for the system:
  - ✓ Balancing, fraud detection, LV fault detection, maintenance and investment optimization.

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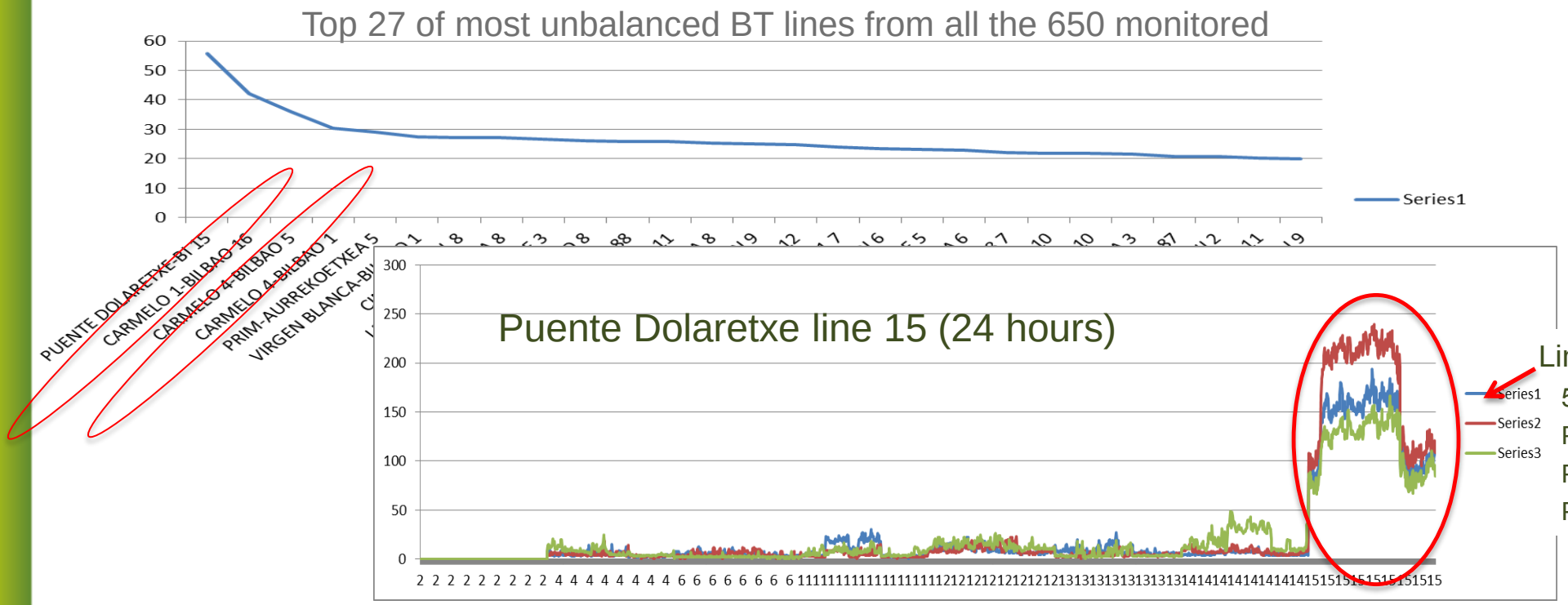

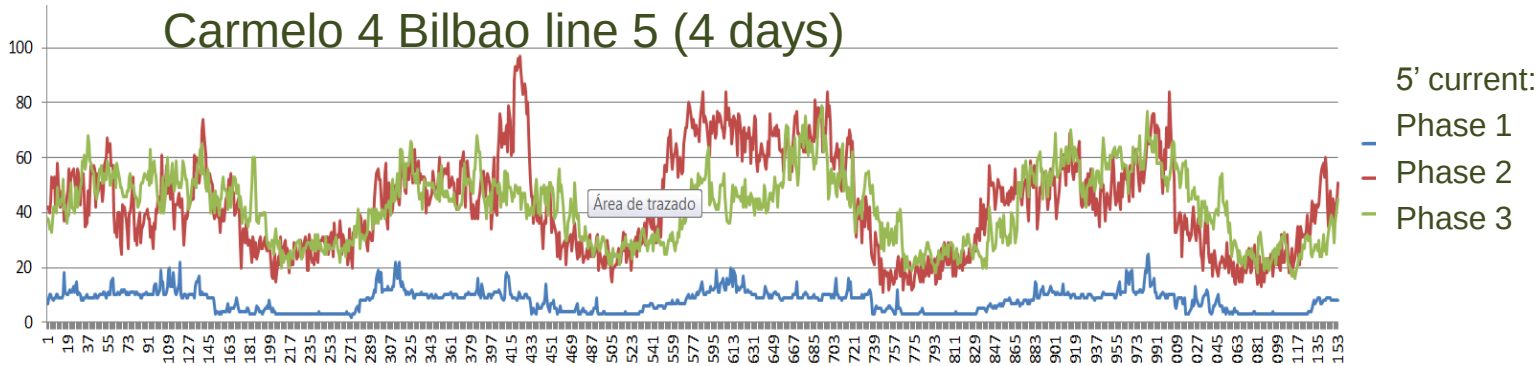

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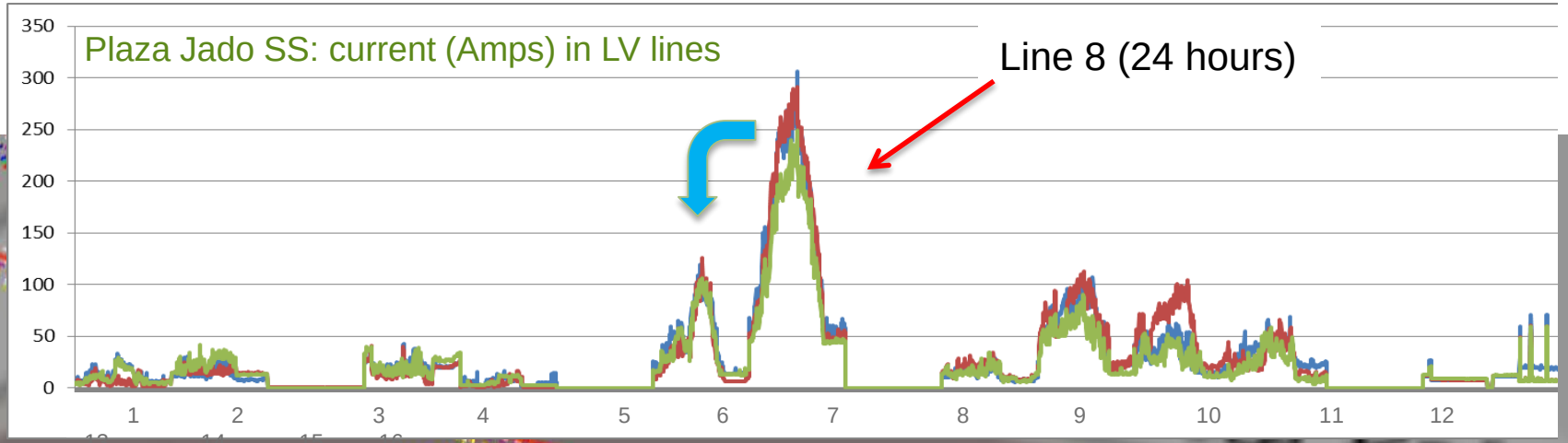
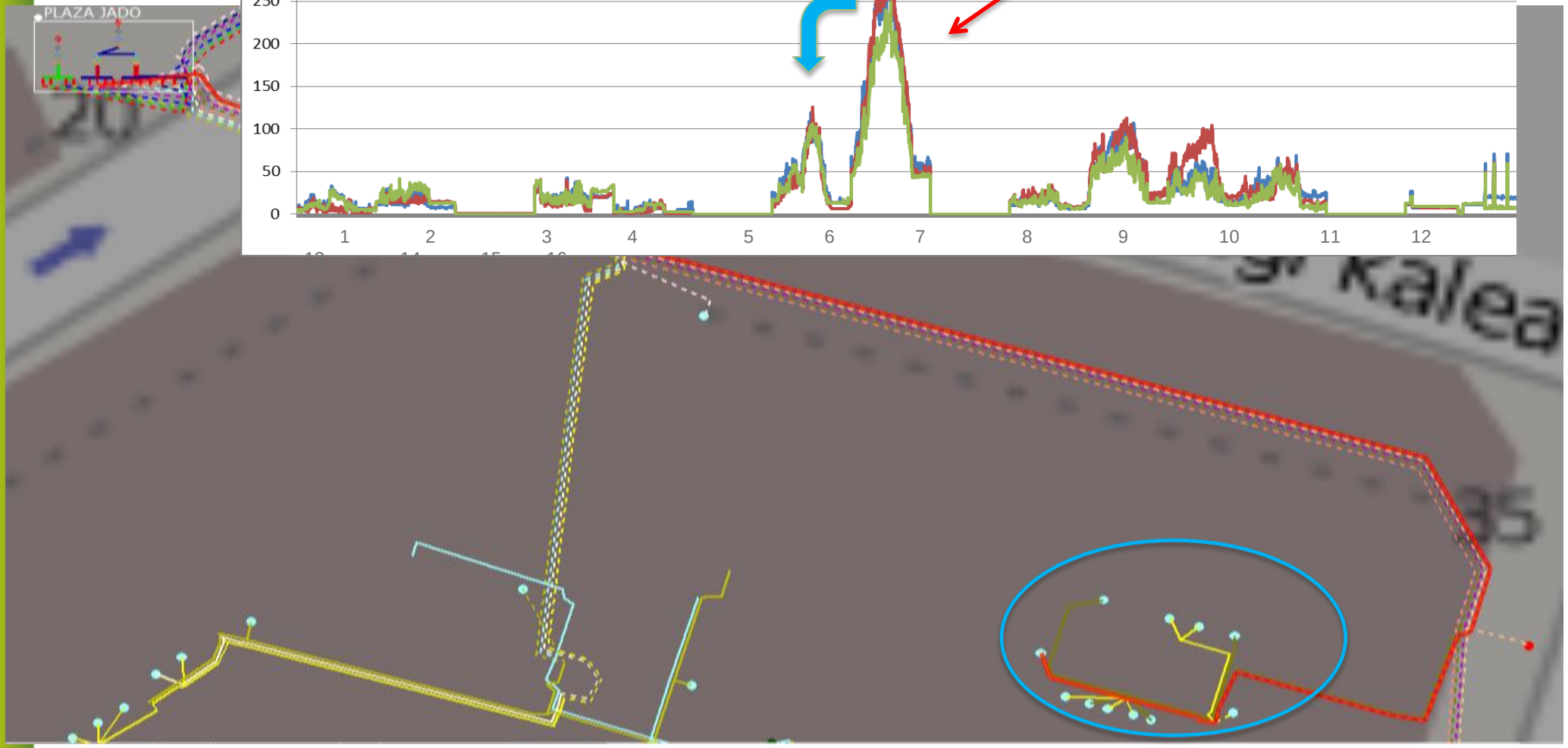
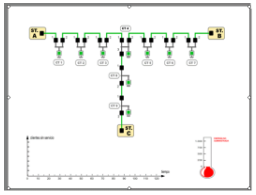


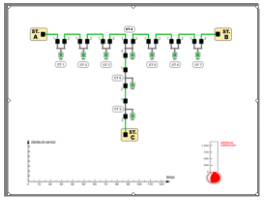


Posibility of transfering load between lines 7 and 8

Operation system integration

- Automatic reconfiguration algorithm

Past 

Nowadays 

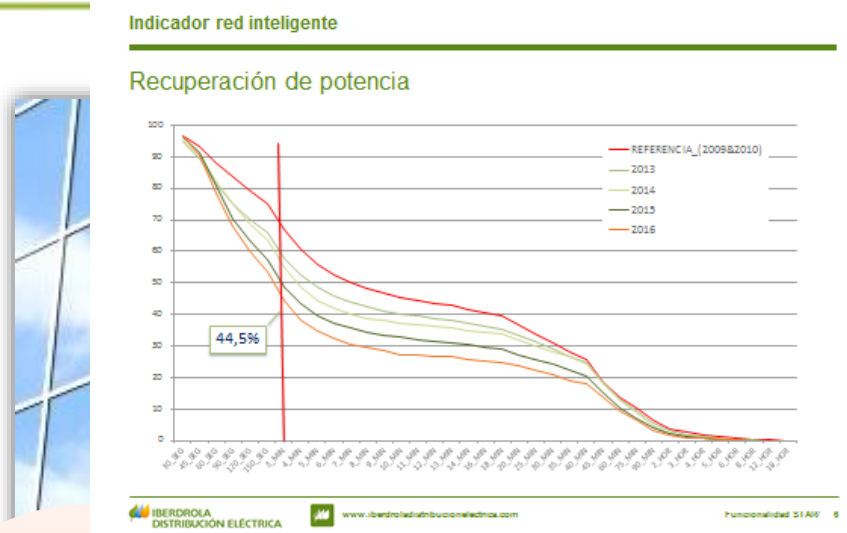
Inicio	Tipo	Tip Origen	Origen	Actua	Causa	Tipo Act	Anomalia	Nº Interrup	Durac máx. (hh:mm)	T - máx. (hh:mm)	Nº de CT-S	Nº Clientes	Potenc KVA	Energ KVAh
19/11/2012 08:12	IM	Linea Subterranea MT de ID	ST LA PLANA CASTELLON NORTE	ST LA PLANA 25C.INGLES LA PLANA 20 L-25 IN_2	Internas Instalaciones	11	No	6	1:02	1:02	44	3.734	18.666	312
	Nº :521.201	Comentario:	AVERIA ST LA PLANA - 20 - 25C.INGLES : AVERIA ST LA PLANA - 20 - 25C.INGLES EN CABLE SMT EN TERMINALES CELDA INCIAT. COM. VAL. EN CTD FRAVIFE SL.											

Evolución Mercado			AFECTA		RECUPERA		SITUACIÓN	
			POTENCIA	CLIENTES	POTENCIA	CLIENTES	POTENCIA	CLIENTES
T1	Afectados	19/11/2012 08:12	18666	3734			18666	3734
T2	Recuperados	19/11/2012 08:14			4179	32	14487	3702
T3	Recuperados	19/11/2012 08:14			14016	3699	471	3
T4	Recuperados	19/11/2012 08:44			260	1	211	2
T5	Afectados	19/11/2012 08:52	260	1			471	3
T6	Recuperados	19/11/2012 08:52			393	2	78	1
T7	Recuperados	19/11/2012 09:14			78	1	0	0

Benefits for the DSO

- Operational costs reduction
  - SAIDI reduction
  - Less technical losses
  - Fraud detection
- Investments optimization: life extensión for the network assets as a result of management, control and maintenance improvements

Type of operations	Success ratio
Daily reading success	97%
7 days reading success	98%
Monthly reading success	99%
Disconnection orders	89%
Reconnection orders	92%



"target: reduction of 10% in grid losses"

"20% reduction of costs in field operations"

"16% increase of profits beacuse of improved efficiency and incentives"

Benefits for the consumer

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- Reduction of the consumption and the electricity bills
- More information and tools to control and manage consumptions
- Increased service quality and reliability of the electricity supply
- Comfort and Access to new services

"3,8M€ annual savings in the basque Energy bill"

"16% reduction in duration of incidents"

"40% reduction in number of incidents "

Benefits for the environment: CO2 emissions cutdown

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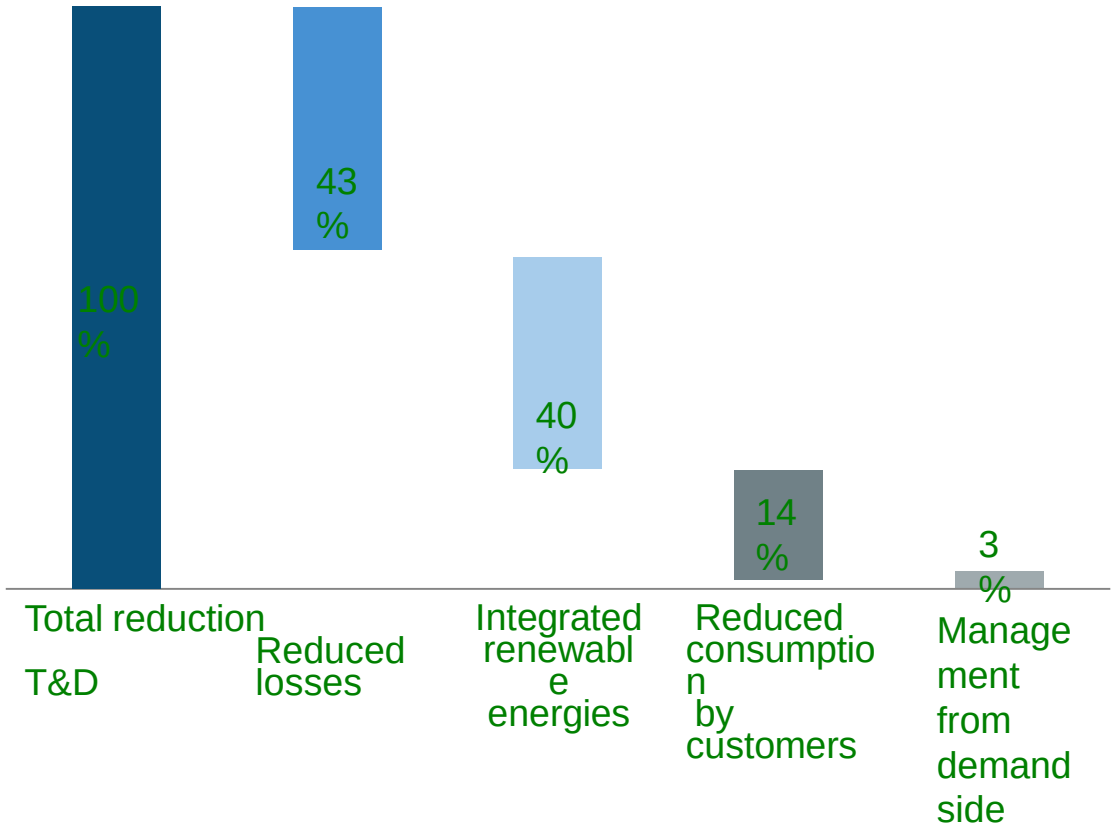
Environmental impact from Smart Grids



Source: Ge SI 2008

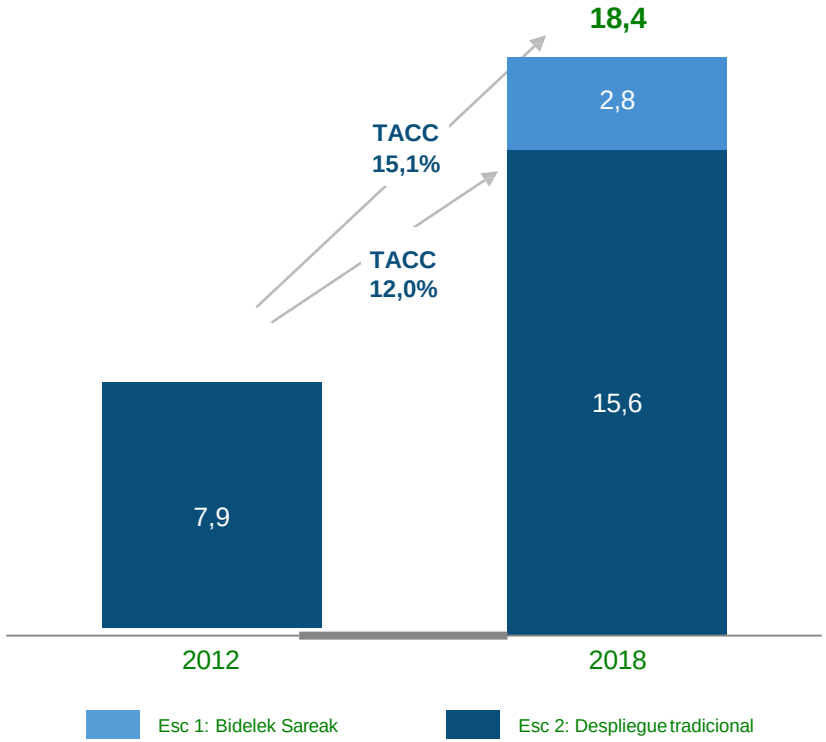
Remarks

- The information available to consumers makes them aware of their expenses so they can regulate their consumption more efficiently
- Although that efficiency is not the result of consumer environmental awareness it does have an impact on it
- System automation and improved efficiency make it possible for operators to carry out their work remotely, so operator fleet transit is reduced, thereby cutting down on CO_2 emissions associated to their vehicles
- Integration of renewable energies through distributed generation helping to lower contaminant gas emissions
- One of the highest sources of CO_2 emissions is energy generation. As grids and user efficiency is improved, energy is reduced so CO_2 emissions are lower

The bigest emissions cutdown is produced thanks to energy efficiency improvement and renewable energies integration

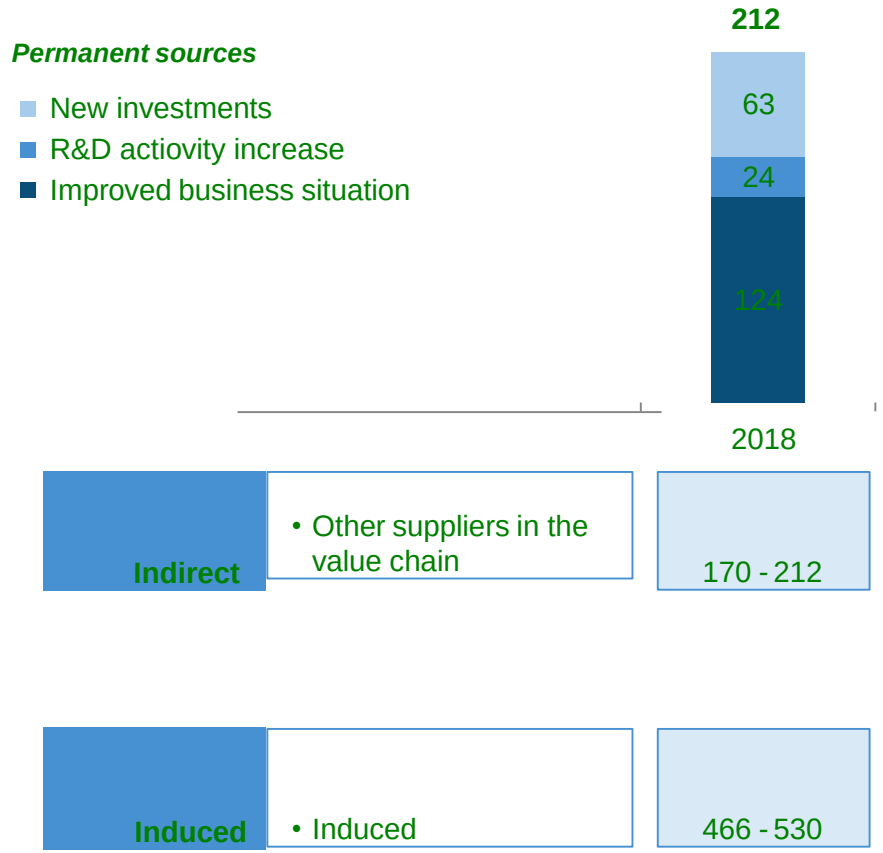
BENEFITS FOR THE ENERGY BUSINESS SECTOR: R&D AND EMPLOYMENT

Which has been the impact of Bidelek Sareak in the increase of R&D actiivty? (2012-2018, M€)



Nota: Algunas empresas han incluido su gasto de I+D+i global en lugar del gasto en I+D+i de los productos / servicios empleados en Bidelek Sareak

Direct employment sources due to Bidelek Sareak project (#, 2012-2018)



Win to win formula: Work together

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Conclusions

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- **The leadership of the DSO (Iberdrola) is a key factor in the deployment of the Smart grids: clear scope, technical requirements, financial and business case, execution planning for improving the quality of service.**

- **Private-Public partnership has been important to foster consumer orientation (information and energy savings and efficiency) and for the financial contribution.**

- **The involvement of a competitive supply chain is key to guarantee the technological development of high level systems and equipment, the compliance with standards and open systems and the interoperability requirements.**

Conclusions

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Public-partnership

Iberdrola´s greater investment

Industry activity growth

Turn over due to higher economic activity

Industry development and leadership

- **What about the future? Industry is willing to repeat this successful collaboration story. Continuous combining efforts to be industry leaders and a reference**