Iberdrola

September 25th 2018

A digital utility as the utility of the future

Our discussion today

About Iberdrola

Our vision & the changing energy landscape

The electricity market in Spain

How OSIsoft is helping us

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How OSIsoft fits into Iberdrola

Key Facts & Figures

IBERDROLA IS ONE OF THE LARGEST UTILITIES WORLDWIDE

2017 Financials	
EBITDA: €7,319M	NET Profit: €2,804M

2017 Performance		
NET Production	137 , 632 GWh	Clean Energy 54%

Eurozone

#1 Wind energy producer

Present in Spain, Portugal, France, Italy, Germany & Greece

UK

#1 Wind energy producer

3rd largest Transport & distribution network company in Scotland, Wales and England

US, Mexico, Brazil

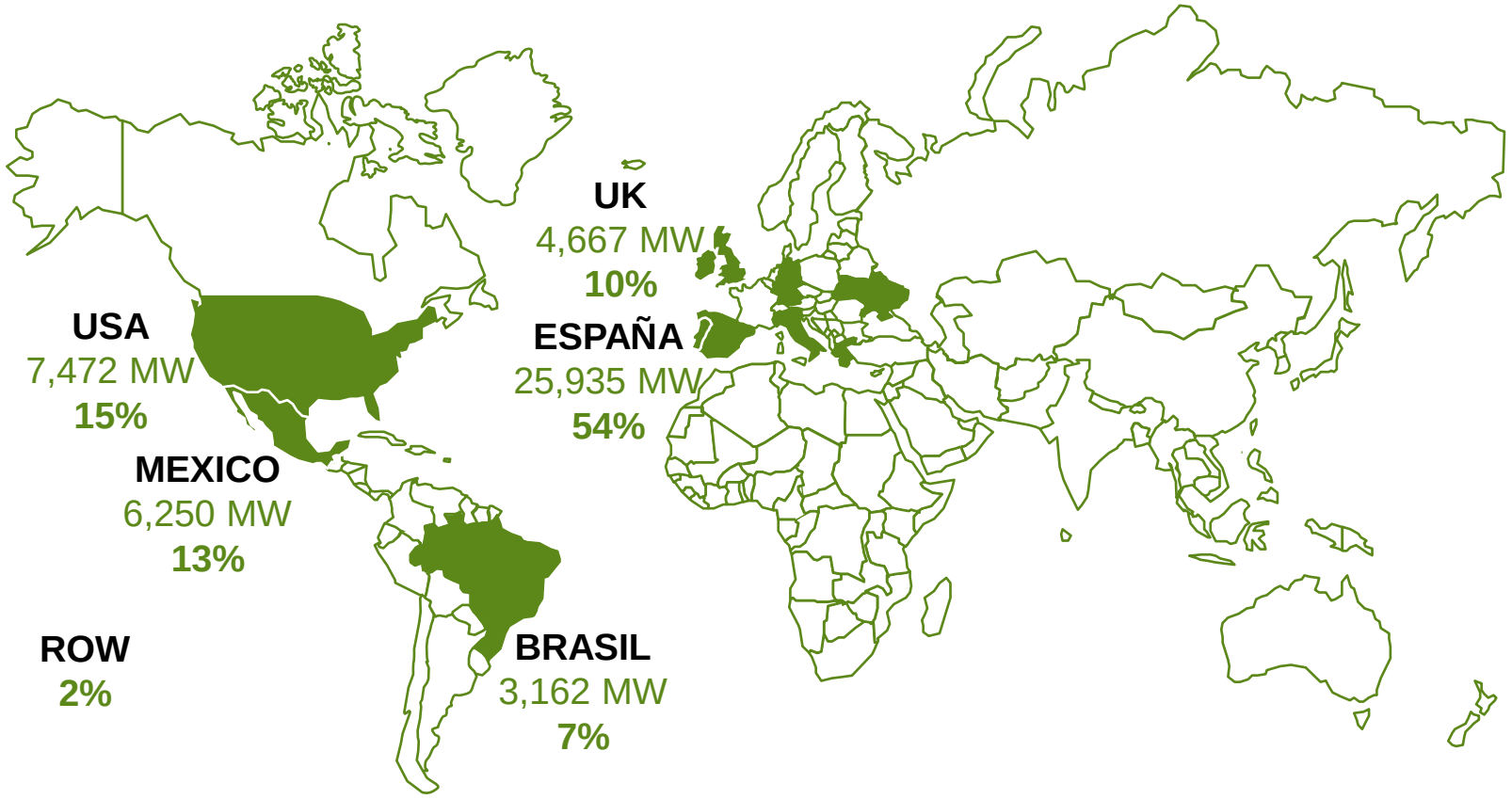
3rd largest wind energy producer in US

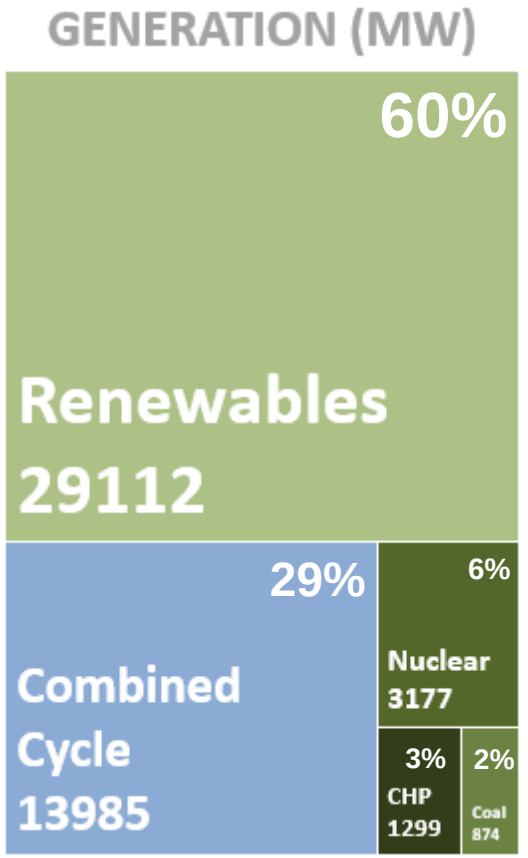
#1 private electricity producer in Mexico
Largest Electricity company in Brazil

Installed Capacity 2018

Total Power: 48,447 MW

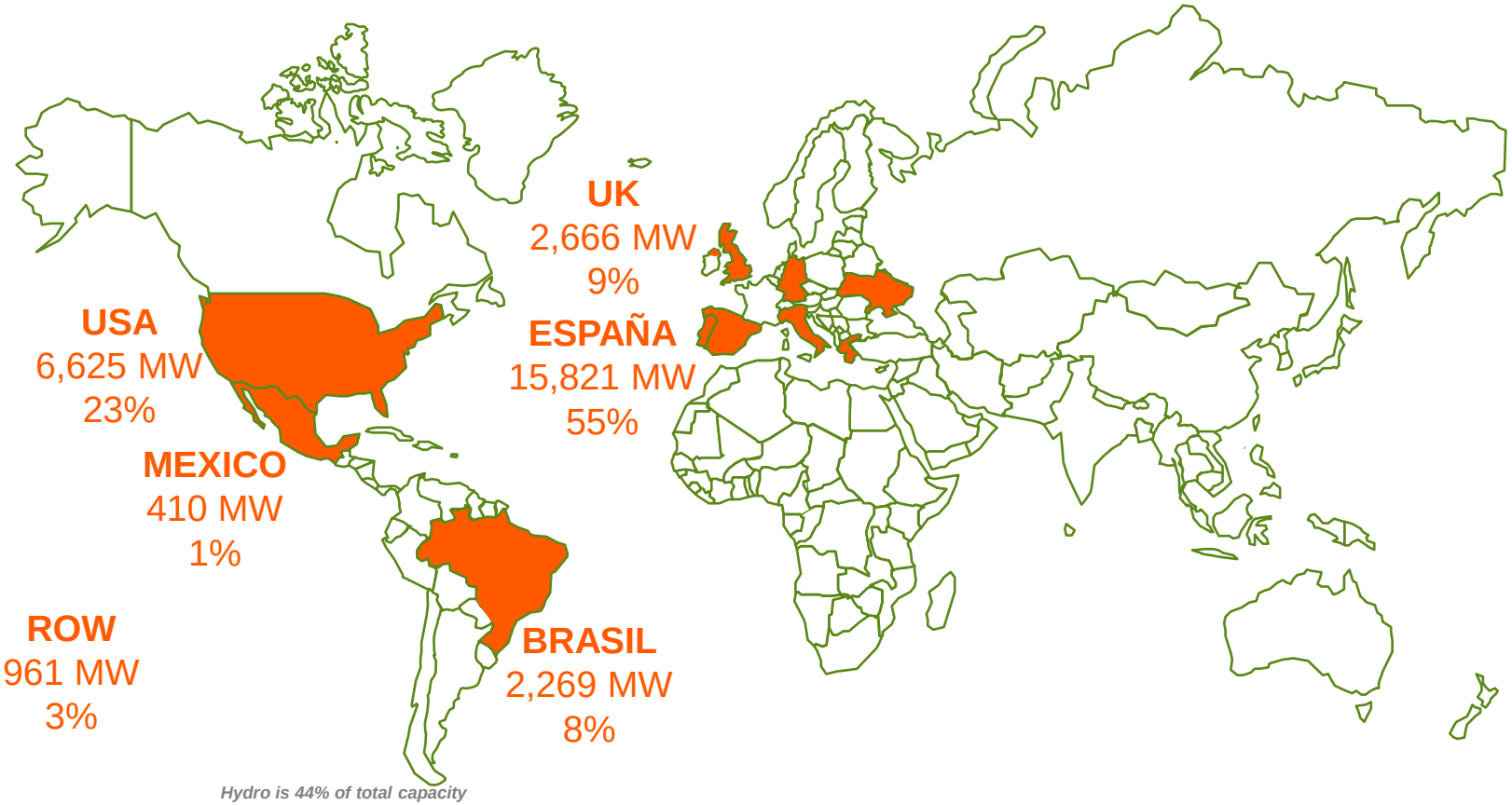
66% Emissions free





Installed Renewable Capacity

Consolidating our leading position in the renewable sector



Hydro is 44% of total capacity

more than 29.1 GW installed capacity

over 5 GW under construction.

Retail and Smart Solutions: Key figures

23 million services to customers

MEXICO

2k I&C services to customers
42.3 TWh energy sales

BRAZIL

1k I&C services to customers
12.7 TWh energy sales

UK

6 M services to customers
53 TWh energy sales

SPAIN & CE

16.6 M services to customers
71.4 TWh energy sales

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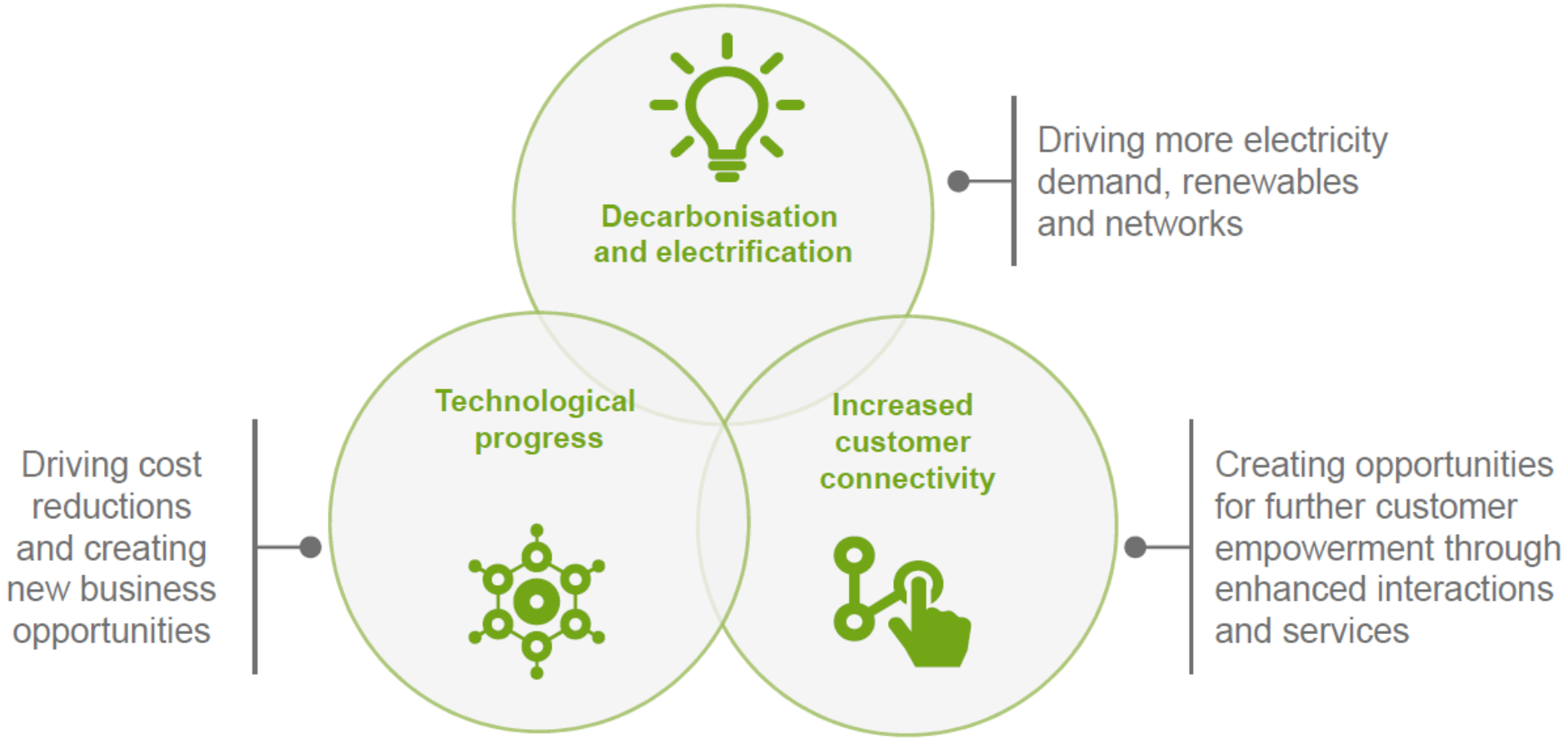
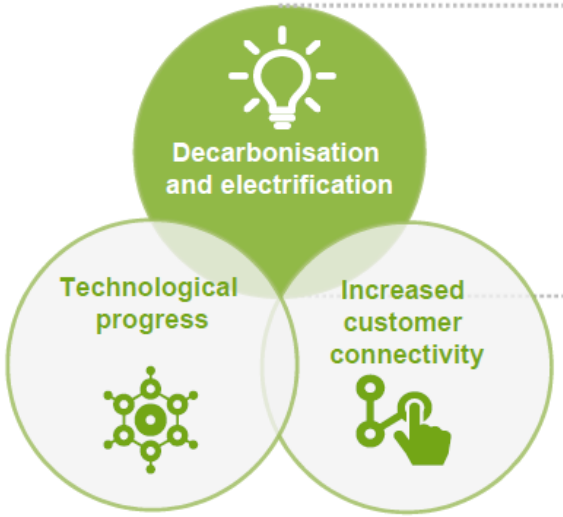
The energy sector continues to transform



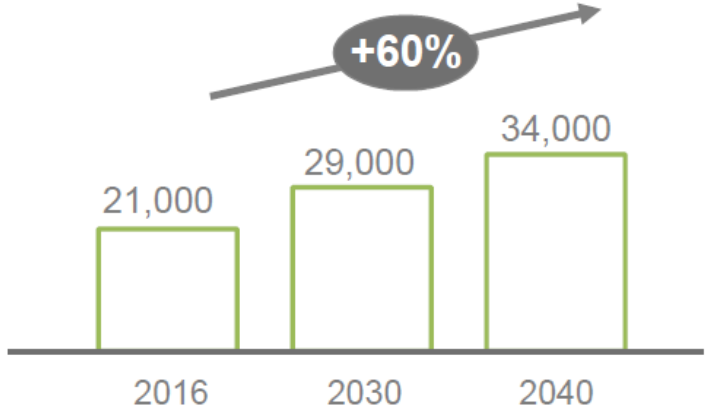
Our vision & the changing energy landscape

Decarbonisation and electrification are driving substantial demand growth



World electrification[1]

Electricity demand, TWh



% electricity in final energy demand

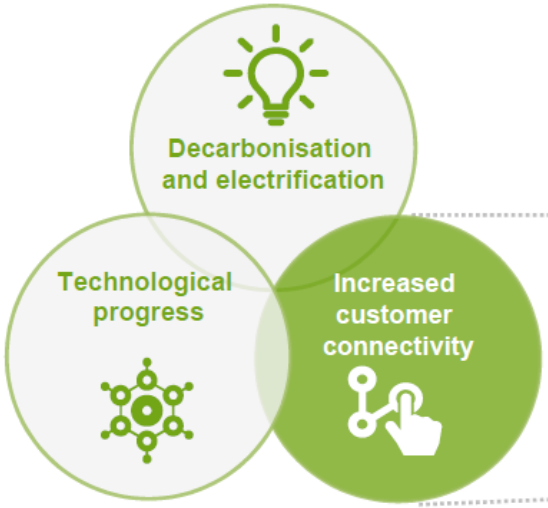
19% 21% 23%

Paris Agreement reinforces emissions reduction targets

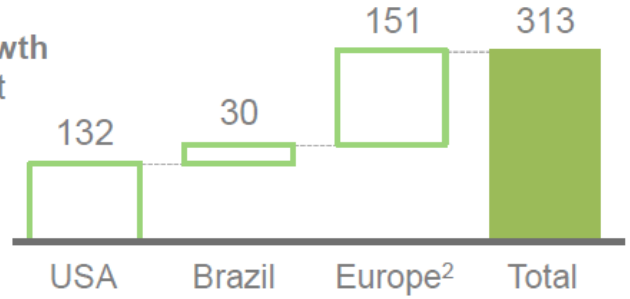
[1]World Energy Outlook 2017, International Energy Agency

Our vision & the changing energy landscape

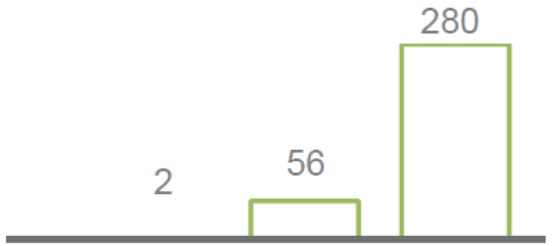
Creating opportunities for further Customer empowerment



Smart meter growth
Global 2020 smart meter stock, M[1]



Electric Vehicle growth
Global stock, M[3]



% EV / Total car fleet

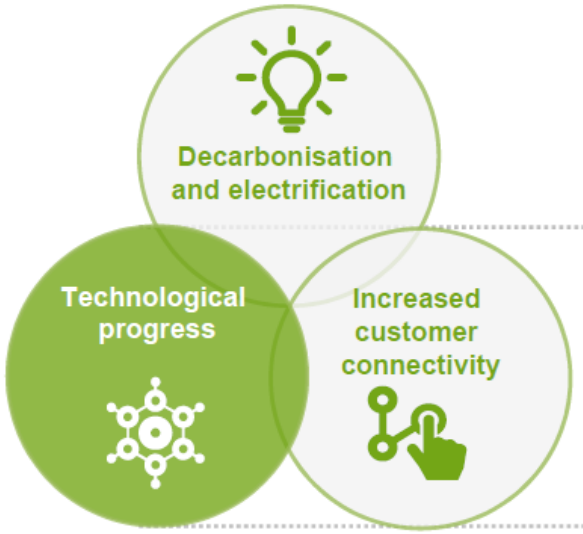
~0.2% ~15%

Increased EV penetration leads to **growth in peak and total demand**, requiring **investments in Networks and Renewables**

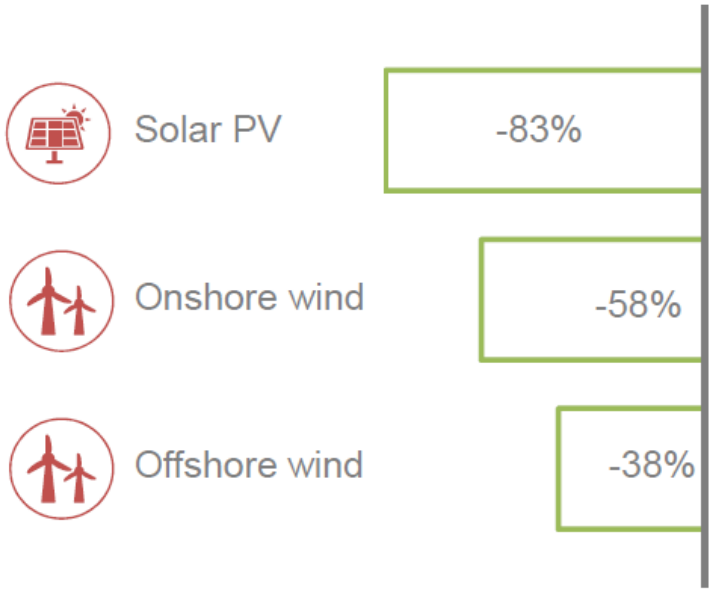
[1]Navigant Research [2] Includes France, Italy, Germany, UK and Spain [3]Global EV Outlook 2017 (Reference Technology Scenario), International Energy Agency

Our vision & the changing energy landscape

Technological progress is enabling efficiency opportunities and fostering renewables and networks growth

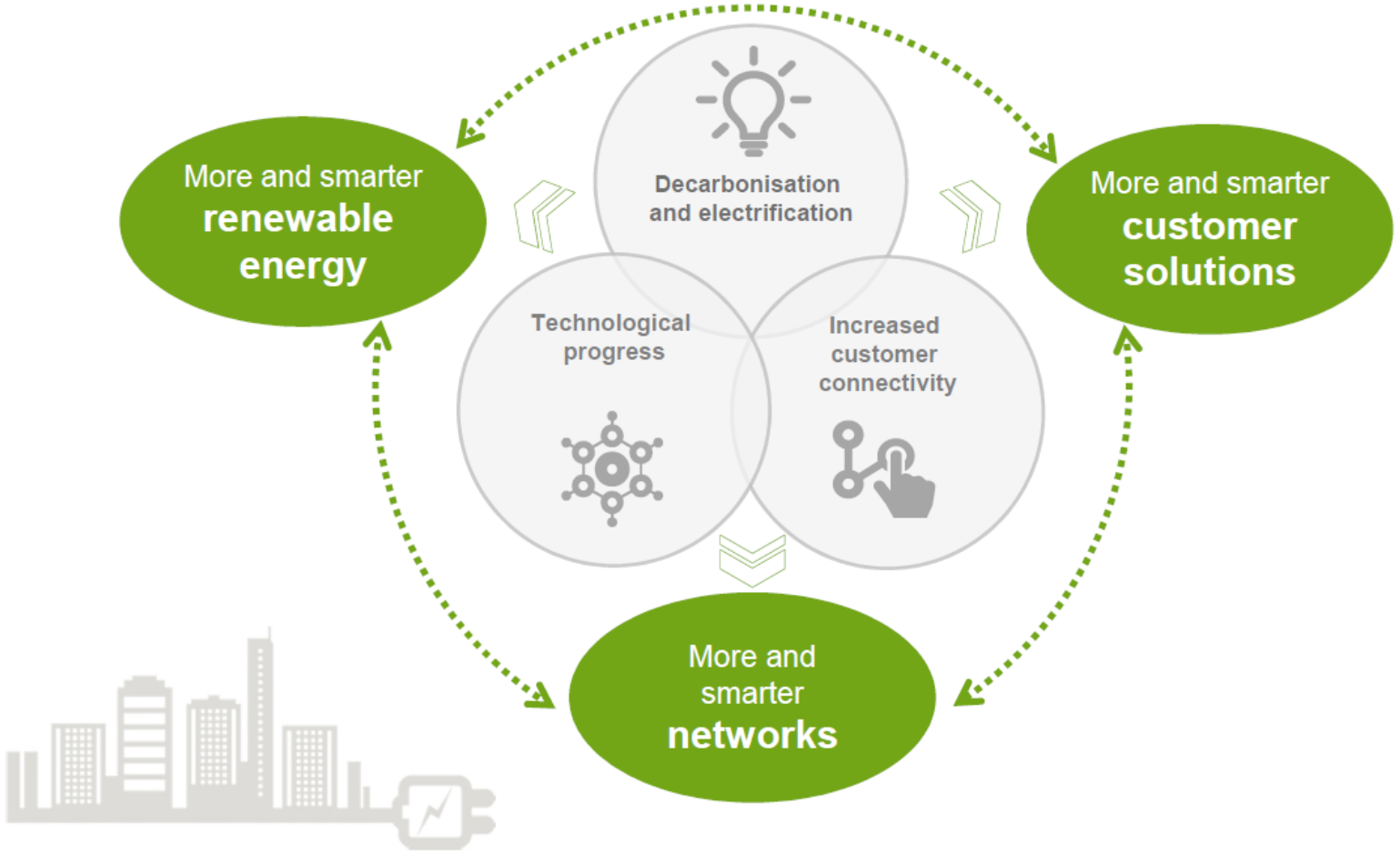


Renewables cost reduction[1]
LCOE evolution, Δ 2010-18



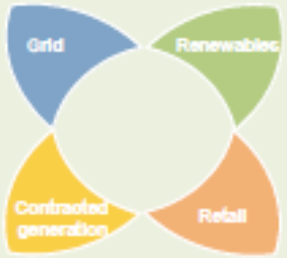
Our vision & the changing energy landscape

These trends reinforce the focus of our three businesses



Digitalization

Digital is transforming the way we operate and will generate €600M additional EBITDA by 2022



Automation

Advanced O&M model

Preventive maintenance

Big data

Digitalisation of customer services

New e-solutions

...

Operational improvements

Transformation of processes

New products and services

EUR 600 M additional **EBITDA** in **2022**

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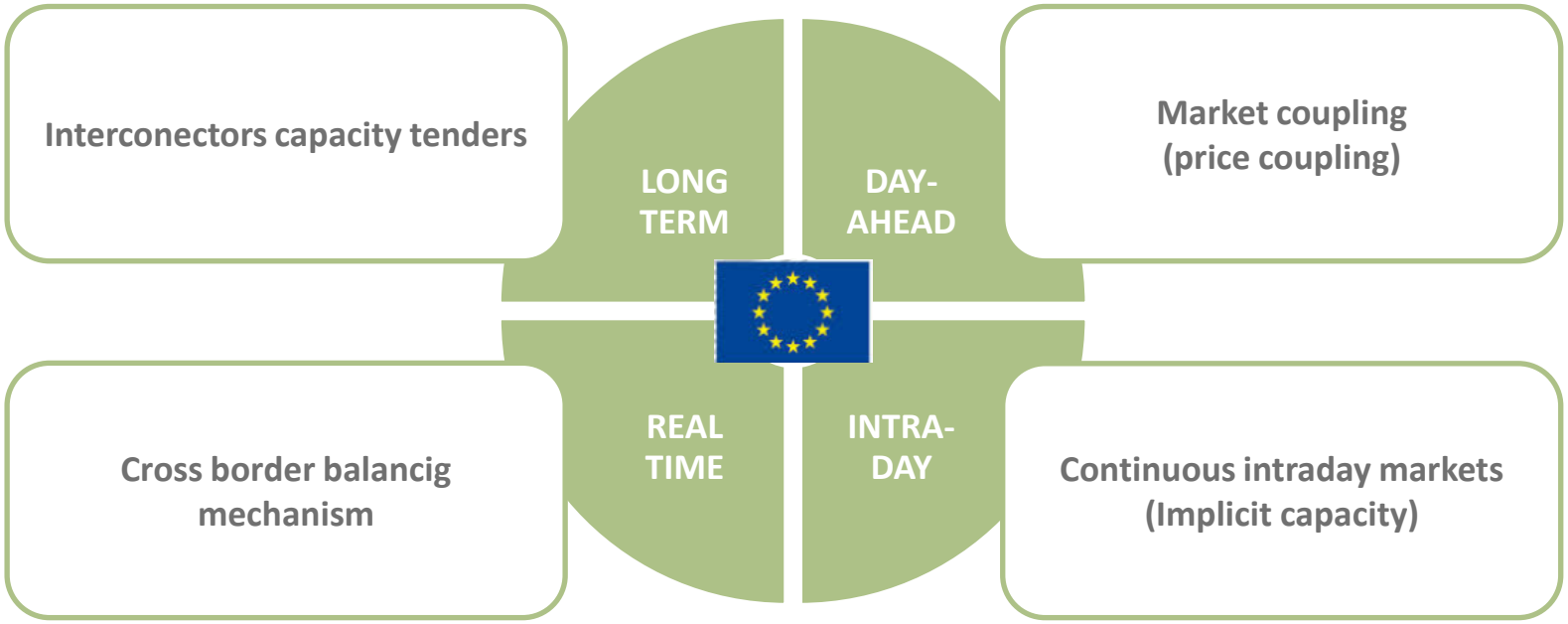
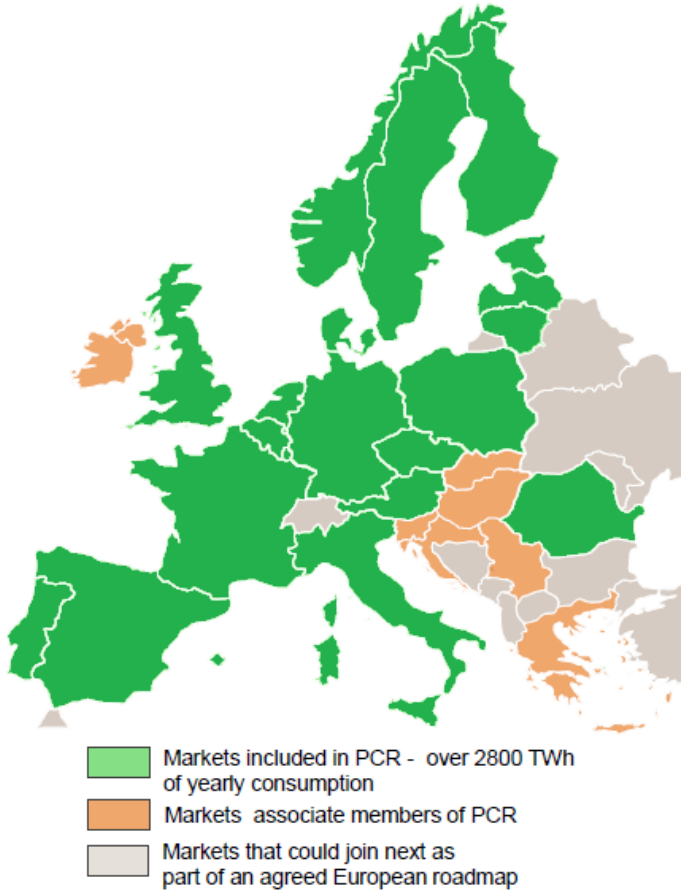
European regulatory integration

European targets for supply security, competitiveness, sustainability and integration of electric systems (with increasing renewable share) lead to a single energy market

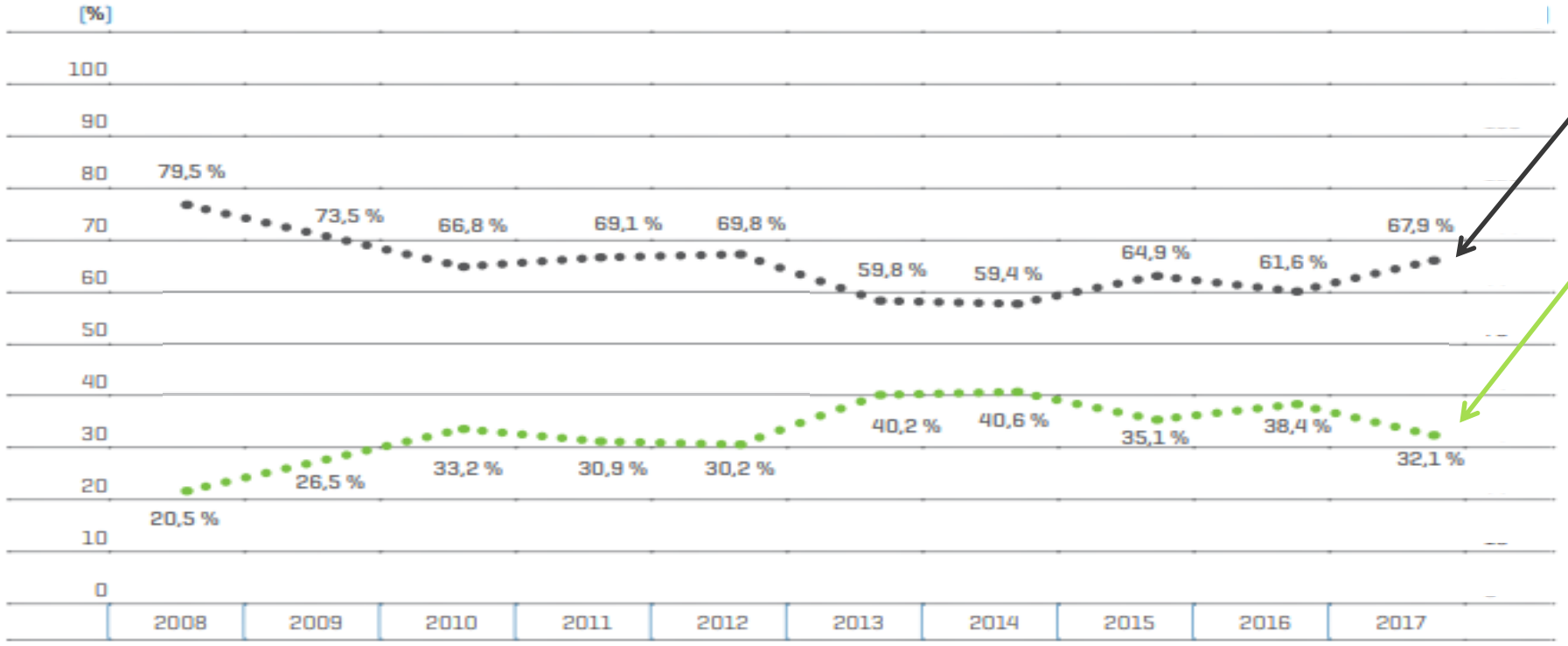




Thermal generation gap evolution in Spain

There is a high renewable generation share in the current generation mix

Evolución de la generación renovable/no renovable y emisiones de CO_2 asociadas a la generación de energía eléctrica. Sistema eléctrico nacional



RENOVABLES: HIDRÁULICA, HIDROEÓLICA, EÓLICA, SOLAR FOTOVOLTAICA, SOLAR TÉRMICA, RESIDUOS RENOVABLES Y OTRAS RENOVABLES
NO RENOVABLES: NUCLEAR, CARBÓN, FUEL/GAS, CICLO COMBINADO, COGENERACIÓN, TURBINACIÓN BOMBEO Y RESIDUOS

Decreasing non-renewable share

Increasing renewable share

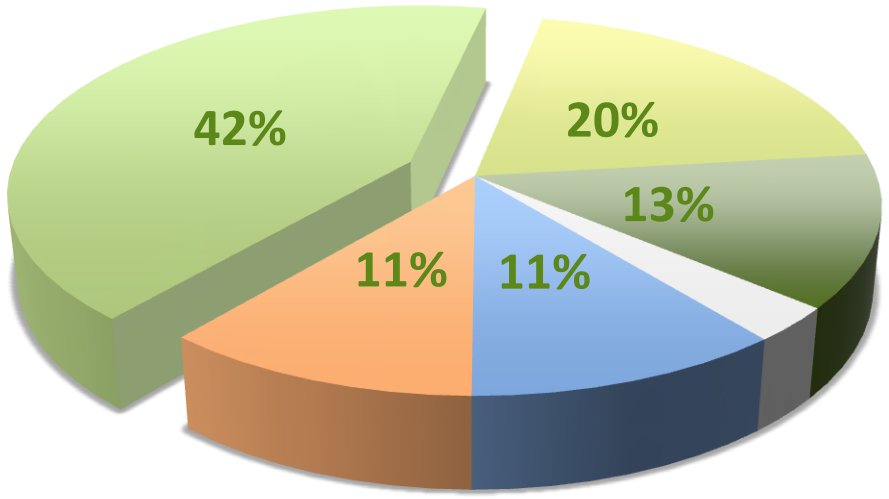
~ 40%

Higher renewable generation implies lower thermal generation given a constant energy demand

Generation and Renewable share 2018

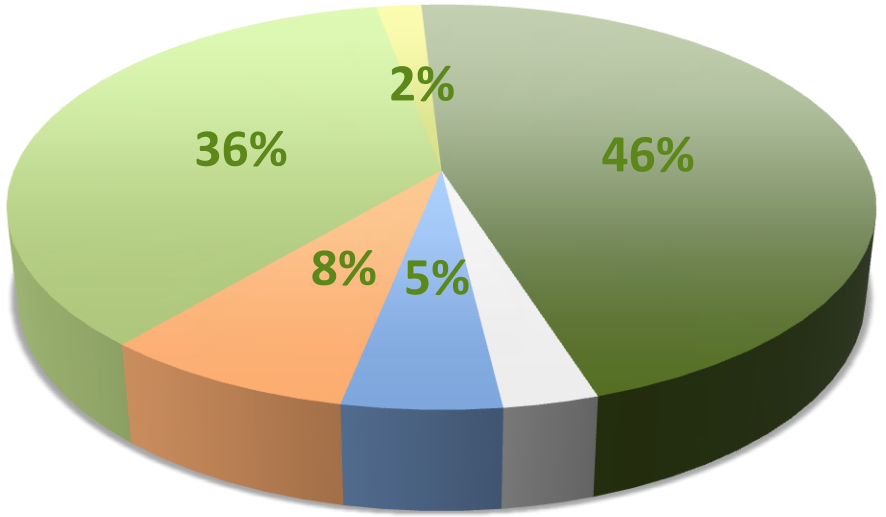
~20% of the generation is wind energy

Generation share



Renewables
Nuclear
Carbon
Fuel & Gas
Combined Cycle
Cogeneration

Renewable share

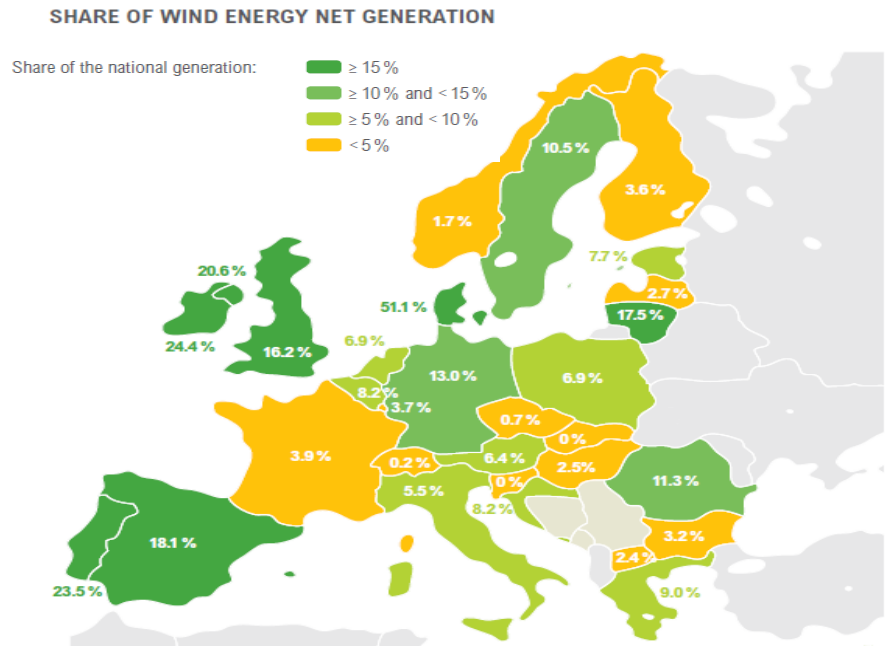


Hydro
Turbine Pump
Wind
Thermal
Solar (Thermal)
Solar PV

Integration of wind generation in the iberic system

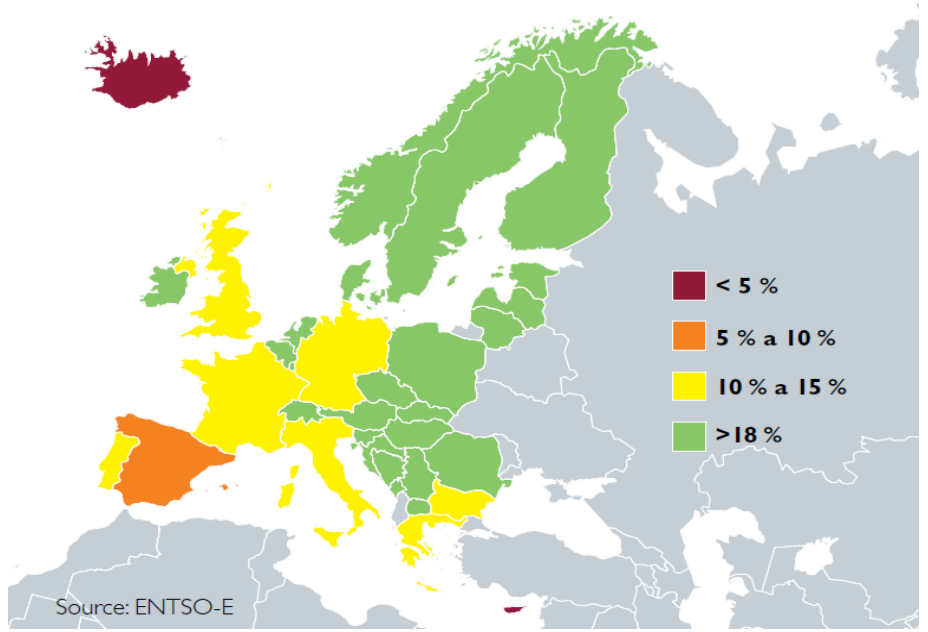
HIGH WIND PENETRATION
>18 %

23GW installed wind capacity



BUT LOW INTERCONNECTION RATIO
<10 %

Spain is an "energy island"



Combined Cycle generation is key to keep the balance and stability of the electric system

Long term outlook in Spain

EU targets: Renewable - CO_2 - Efficiency

How? Electrification (electric vehicle & heat pumps) + Increase renewable share in electricity generation

Decreasing PV and wind investment costs makes high renewable share posible in the Spanish electric system, with capacity to meet domestic goals

Combined Cycles are necessary to guarantee energy supply when renewable generation is not high enough: this capacity should be rewarded through capacity auctions (UK model)

Increasing CO_2 costs and investments to reduce emissions will undoubtly force coal stations to close from 2019 onwards

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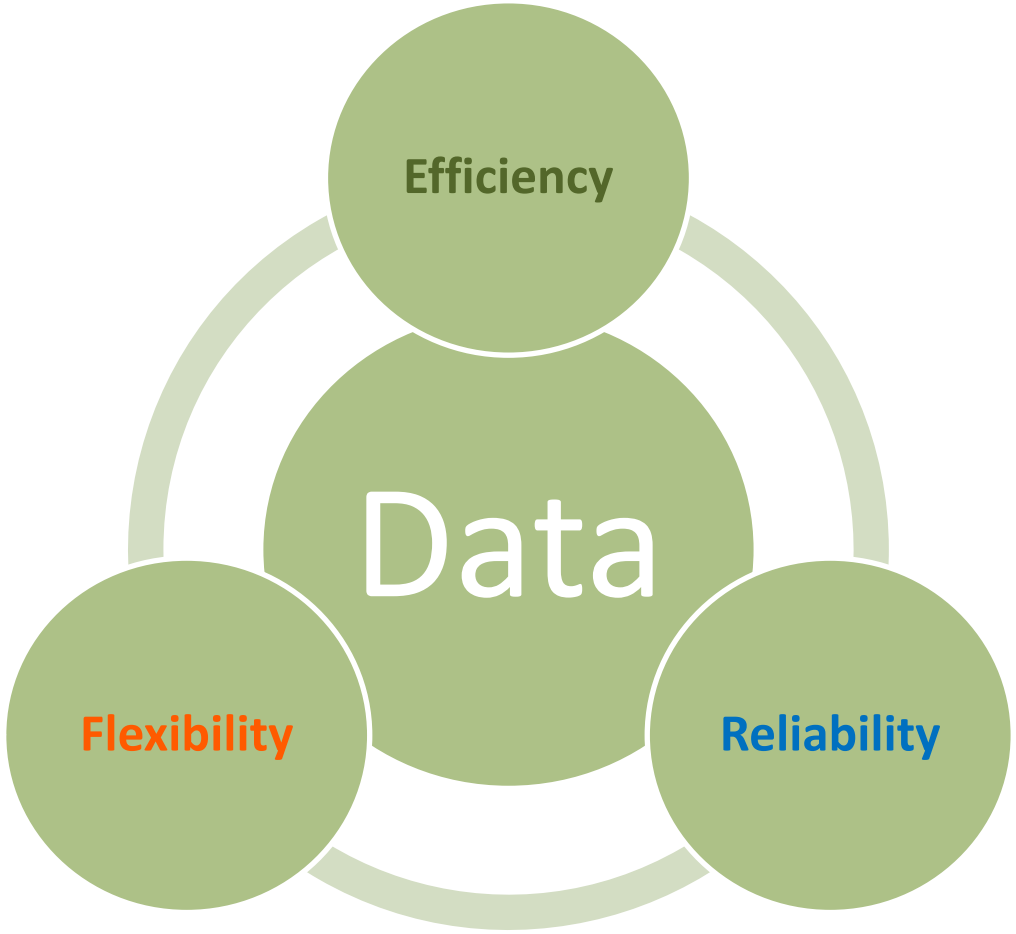
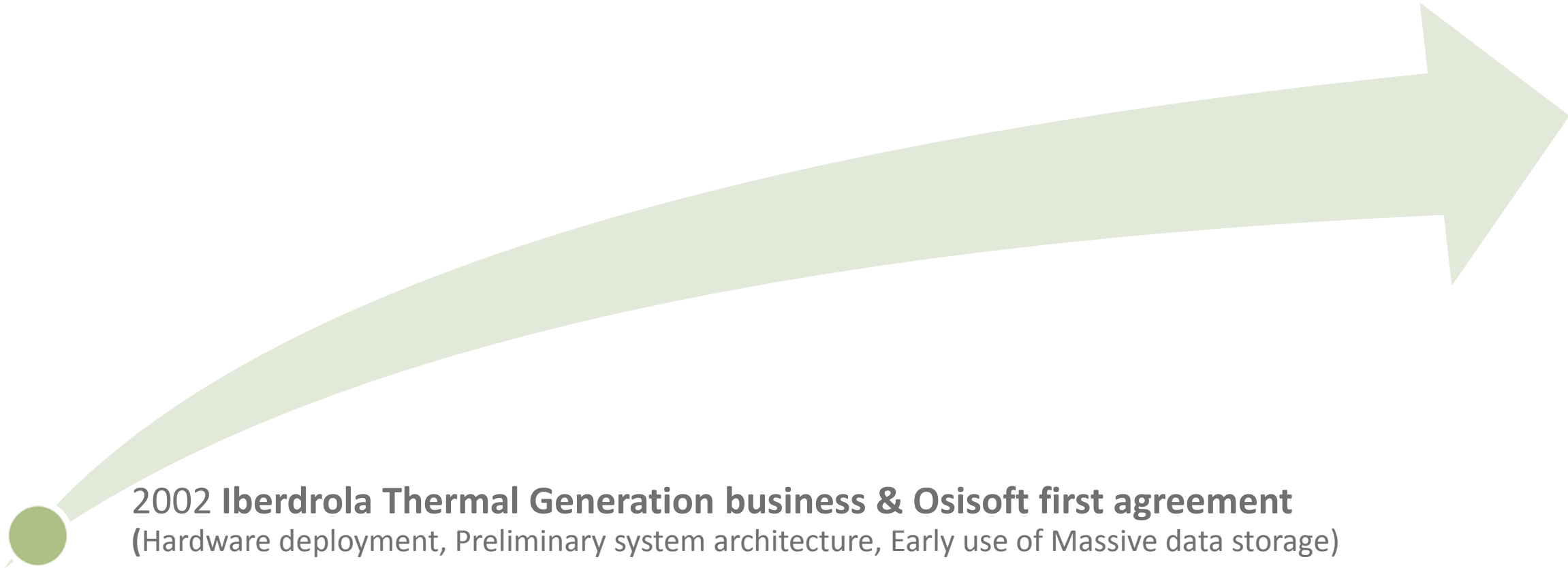
Towards full digitalization of the processes

How can Combined Cycle Power Plants effectively play their role in the current electric system?



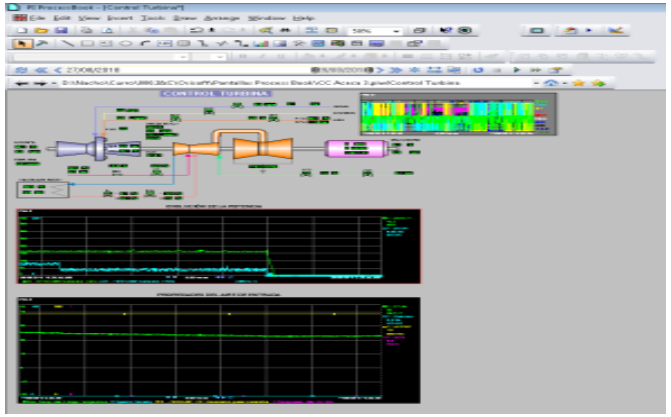
Towards full digitalization of the processes

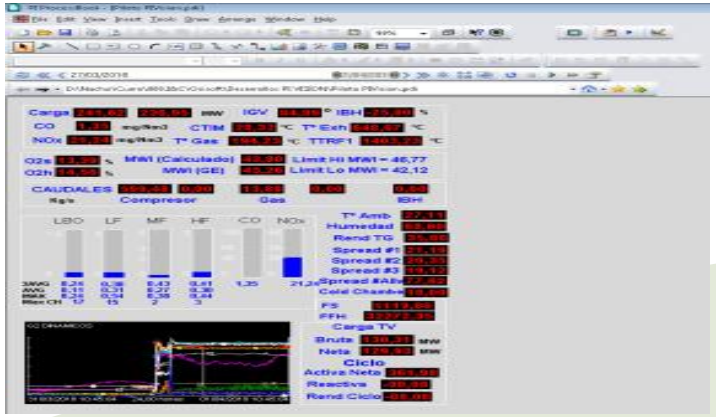
Iberdrola & OSIsoft Relationship

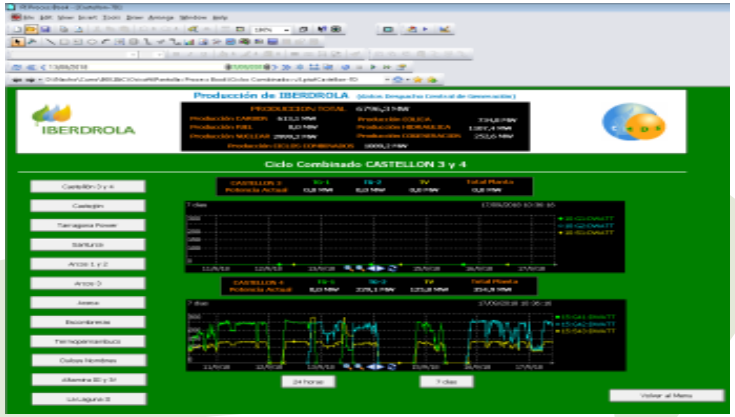


2002 **Iberdrola Thermal Generation business & Osisoft first agreement**
(Hardware deployment, Preliminary system architecture, Early use of Massive data storage)

Iberdrola & OSIsoft Relationship







2005 **Deployment of Process Book displays for**
Operation Monitoring, Performance Process, Troubleshooting & reporting

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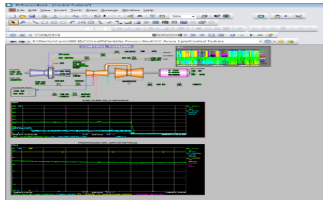

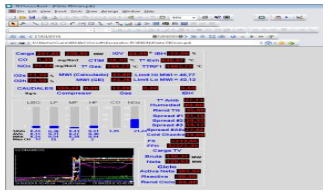

2010 **Enterprise Agreement**
Iberdrola Renewables

2005 **Deployment of Process Book displays**
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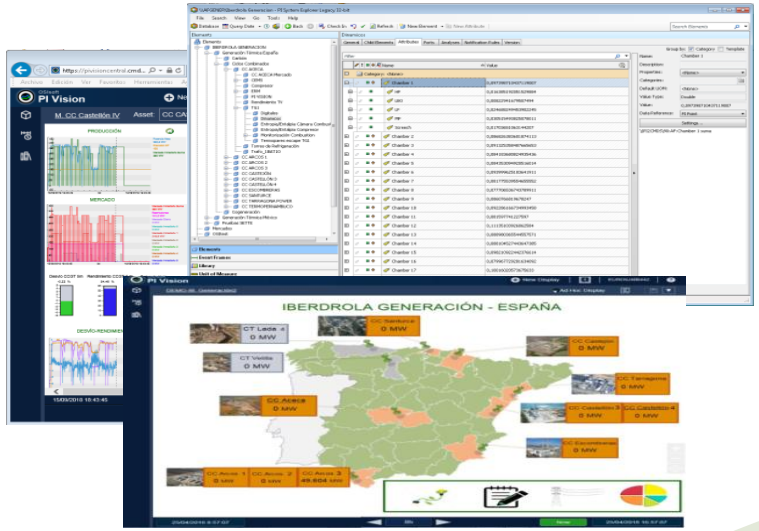

2017 Enterprise Agreement Iberdrola Thermal Generation
Digitalization Program launched: Asset FrameWork Analysis, PIVision, Advance system architecture

2010 **Enterprise Agreement**
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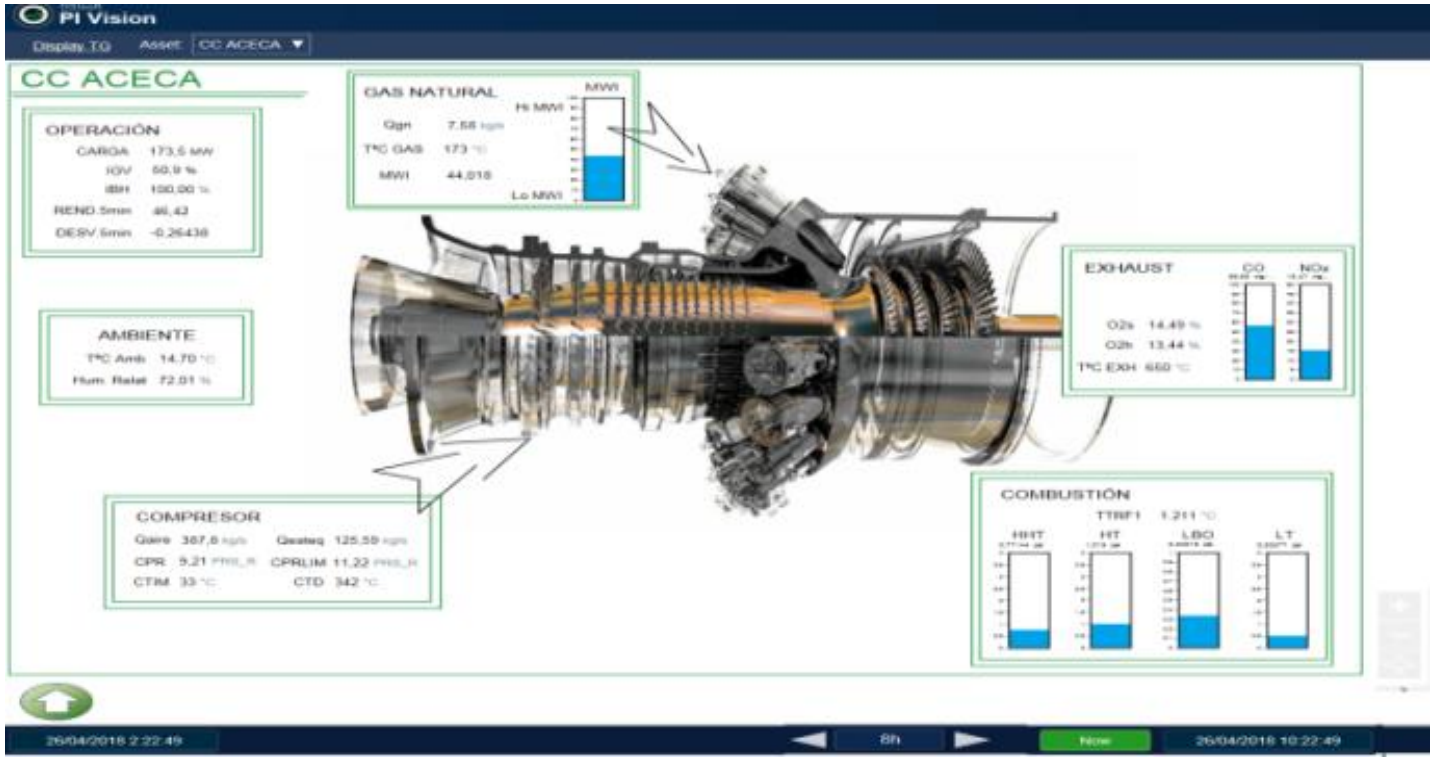
Use of OSIsoft Technology: Applications

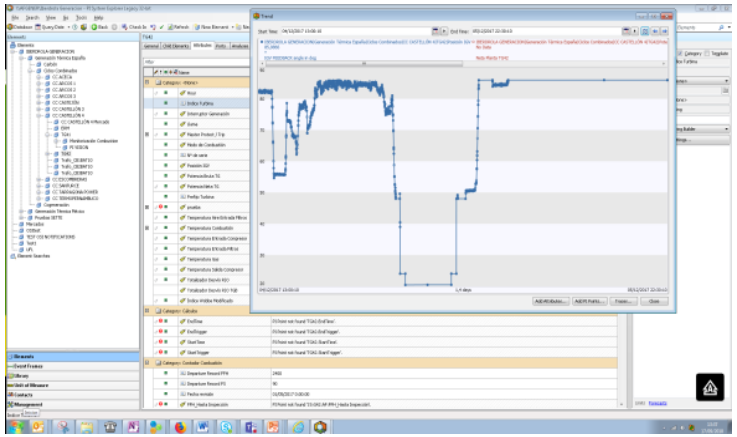


- Real-time Data Access
- Operation status & performance
- Mobile display environment

- Efficiency Improvement
- Equipment Real-time monitoring

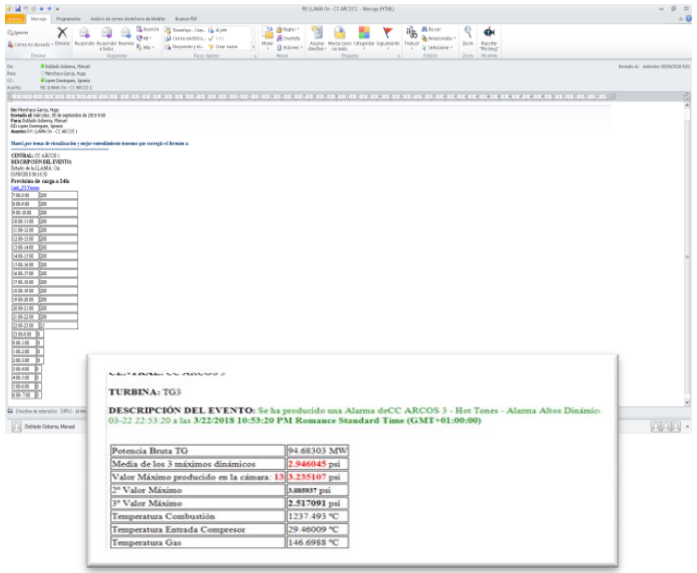
Ongoing feedback to OSIsoft about improvement proposals

Use of OSIsoft Technology: Applications



- Performance Analysis
- Asset analysis replicability by means of template use
- Process algorithm improvement

- Excel based Analytics via Datalink
- Sensitivity Analysis



- Event Notifications
- Operational Best practices
- Automatic reporting routines

Ongoing feedback to OSIsoft about improvement proposals

3 Summary Messages

1. **Decarbonization, Renewable growth and Integration of electric systems is a non-stop process**
2. **Utility companies have to lead but also adapt their processes focusing on customer needs**
3. **Digitalization is the common driver towards a successful future**