



## **Smart Grids development towards 2020 and beyond**

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## The European challenge

- Investments necessary in energy infrastructure estimated at 200 billion up to 2020
- Electricity market integration by 2014 to promote competitiveness
- Renewed efforts to reach the 20% energy efficiency target
- Massive RES production needs seamless integration and distribution
- Decarbonization of the economy by 2050



The grid is key to reach the targets

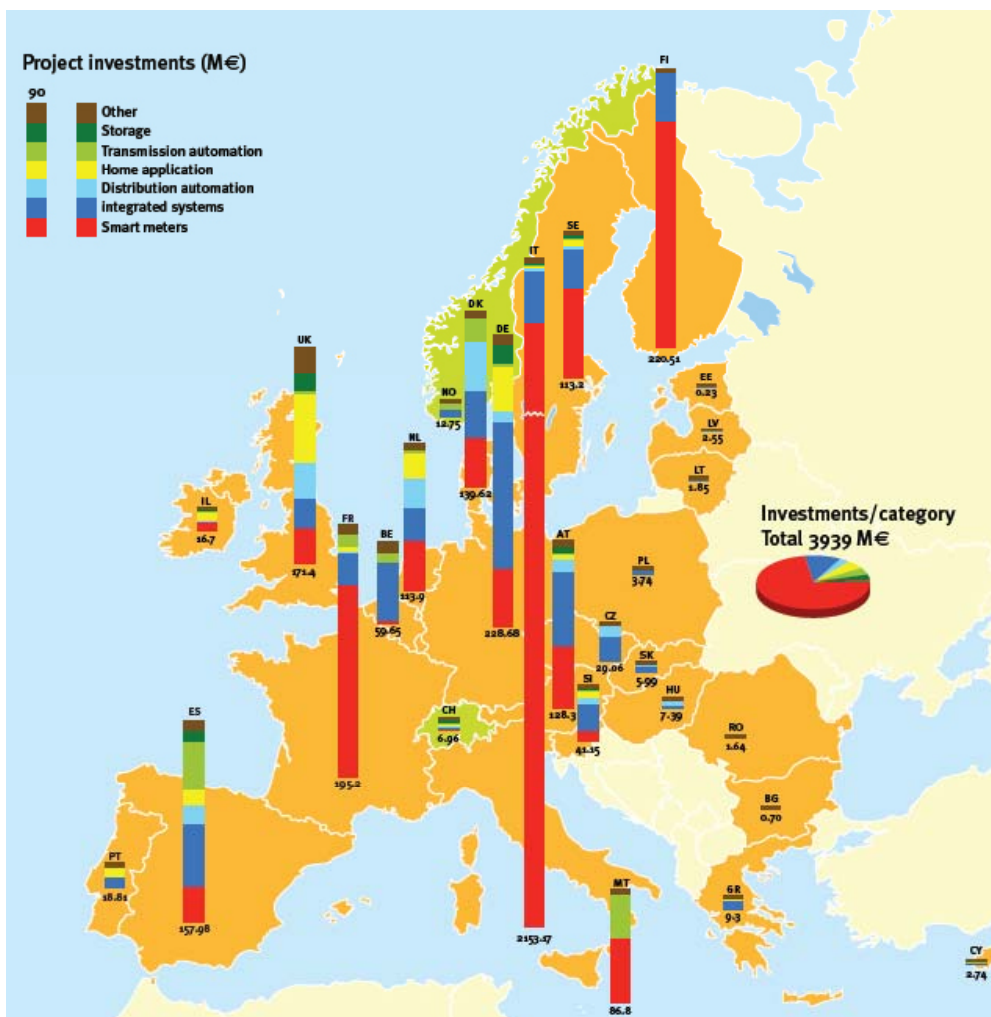
## The changing role of the DSO to meet the challenge

- controlling/dispatching **distributed generation**
- application of **storage** in the network
- controlling /managing/operating the EV **charging infrastructure**
- gathering and managing **smart metering** data
- enabling **Active Demand** and customer participation



## Where are we now?

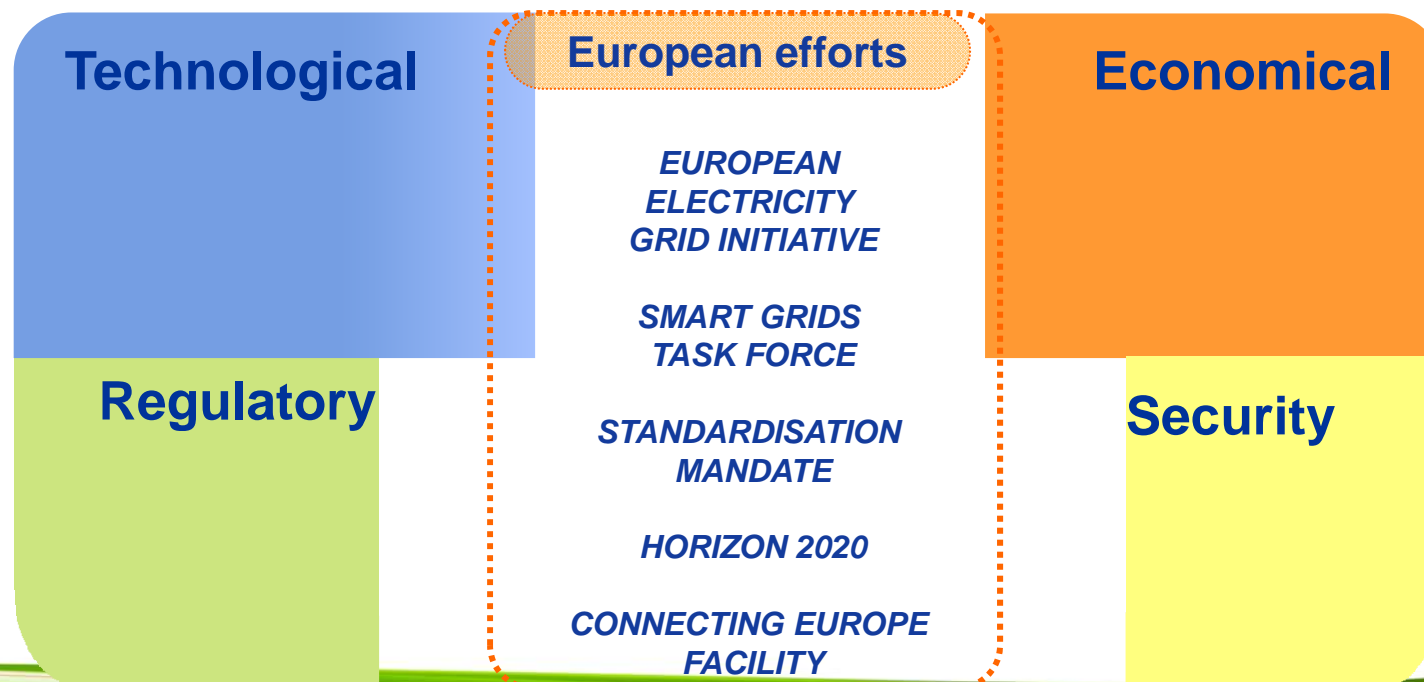
### *JRC Catalogue on Smart Grid projects in Europe*

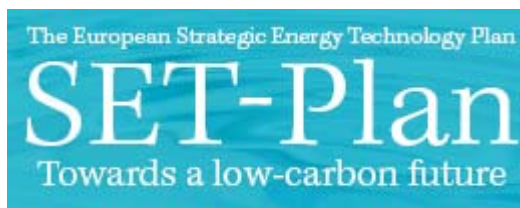


#### MAIN FINDINGS:

- **Distribution system Operators** playing a **leading role** in coordinating smart grids developments in Europe.
- Difficult to accelerate smart grids deployment without revising the current **regulatory framework**.
- Power system owners and operators are expected to sustain **the majority of investments** whereas several players might get benefits from smart grids.
- **Integration of new technologies is the key challenge** for the success of smart grids.

# Open Issues and barriers in an evolving electricity grid





### SET-plan Initiatives

- *Electricity Grid*
- CCS
- Smart Cities
- Sustainable Nuclear
- Solar
- Fuel Cells and Hydrogen
- Wind
- Industrial Bioenergy

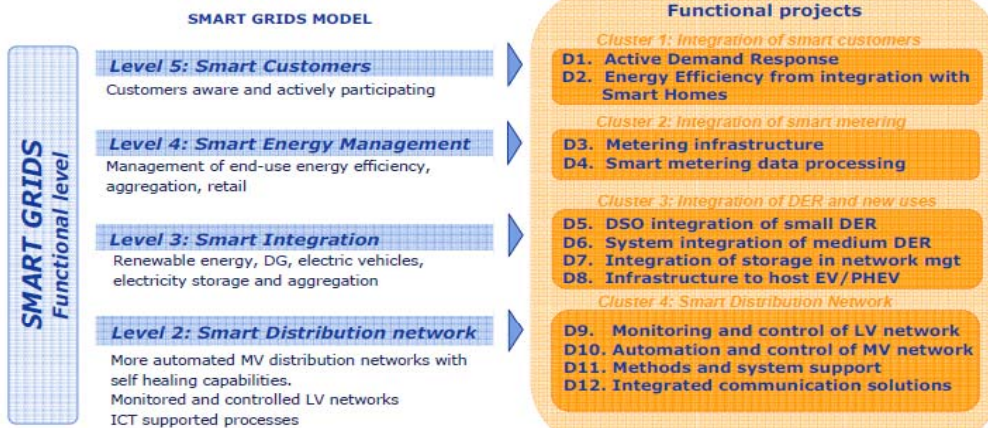


### European Electricity Grid Initiative – EEGI

A single, stronger and smarter European electricity grid will have a central role to accommodate the resulting massive deployment of renewable and decentralized energy sources







- Accelerate innovation and development of Smart Grids
- RD&D programme, 2 billion Euro
- DSOs and TSOs cooperation
- Conduct the extra RD&D efforts needed to develop new solutions and overcome barriers
- Grid+ to drive and assist the EEGI

## Priority areas in the EEGI Roadmap

Smart Grids Functionalities	Project	YEAR										Total Costs	2010-2012
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019		
Tools for local balancing, dispatching and load management	D 1	ADDRESS			Active Demand Response							190	--
	D 2	BEWARE Smart Homes/Smart Grids			Integration with Smart Homes							120	--
Large scale integration of small and medium size Distributed Energy Res.	D 3	OPEN METER Existing Deployment			Smart Metering Infrastructure							150	150
	D 4	Existing Deployment			Smart Metering Data Processing							20	20
Integrated Communications for Smart Grids	D 5	Active Distribution Network			Integration of small DER							90	90
	D 6	Active Distribution Network			Integration of medium DER							150	150
Monitoring and Control of Low Voltage networks	D 7	STORAGE TECHNOLOGY			Integration of storage technologies							60	--
	D 8	ELECTRIC VEHICLES			Integration of Electric Vehicles							100	100
Integration of Electrical Vehicles – smart charging	D 9	Active Distribution Network			Monitoring and control of LV networks							100	100
	D10	Active Distribution Network			Automation and Control of MV networks							90	90
	D11				New methods and systems support							80	80
	D12	Active Distribution Network			Integrated Communications Solution							50	50



# Launching EEGI projects now is key



## FINANCING

- HORIZON 2020
- CONNECTING EUROPE FACILITY
- NER300
- National Funds
- National Regulatory Incentives



### MAP

What Smart Grid related projects are already underway?

### SELECT

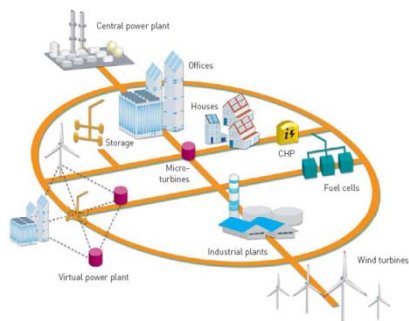
What should be part of the EEGI (and not already done)?

### MEASURE

What KPIs are chosen to measure progress of EEGI?

### SHARE

What knowledge should be shared and what are the mechanisms?



## EEGI PROJECTS

## What Regulators can do?

### Challenges

*The **benefits** of Smart Grids are spread among different players (customers, network operators, new service providers) but **costs** are mostly incurred by network operators so this must be properly remunerated.*

- The traditional paradigm of driving down costs should be replaced by a long-term perspective which **takes account of R&D** and innovation efforts taken by the industry, and move from a **cost-based** to a **performance-based system**.
- Regulators should also contribute to the definition of **roles and responsibilities**, **new markets** for ancillary services and new **remuneration schemes**.




### The Italian case:



- DSOs have an obligation of connecting all DG generation and DGs have dispatching priority.
- Example of incentive regulation: 2% extra WACC remuneration for a period of 12 years for selected investment related to smart grids (Resolution ARG/elt 39/10).

## Case study: Enel Isernia Project

### *A pioneering project integrating various Smart Grid elements*

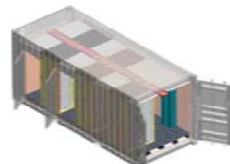
-  **Funding:** AEEG (Italian Regulator) – Resolution 39/10 +2% Additional WACC on investments *related to Smart Grids and energy Efficiency* investment
-  **Project budget:** 10M€ (approx.)
-  **Objectives:** Demonstrate, under real field conditions, new telecommunication technologies aimed at testing a series of Smart Grid technologies (including storage systems)



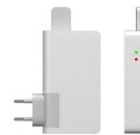
### *The project addresses four smart grids related technologies*



Integration of  
renewables



Storage



Customer Engagement  
(demand response)



Electric Vehicles

## The European financing framework

### Challenges

- Current EC financing structures are **not appropriate for a coherent and continuous support** in the development of grid demonstration projects.
- European RD&D funding schemes lack a multi-year perspective, giving **long-term visibility and creating links and synergies** among relevant projects.
- More coordination **between European financing schemes and synergies with national financing schemes** must be pursued.
- A more **DSO focus** is needed in current European financing schemes to implement the vision.



NER300

Connecting Europe Facility

Structural Funds

Horizon 2020

- **Demonstration projects to provide the necessary know-how for future roll-outs.**



The EEGI is important to coordinate large scale demonstrators at the European level to create a shared knowledge.

- **A first chunk of public money to test solutions at their earliest stage of development.**



The European Commission and Member States must join efforts on funding, to sustain the commitment of the industry.

- **National authorities must provide the right regulatory framework to foster full deployment.**

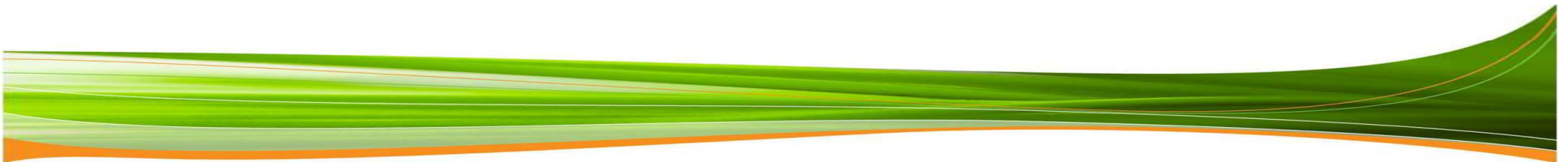


Regulators must become “smarter” by identifying roles, responsibilities and remuneration schemes.



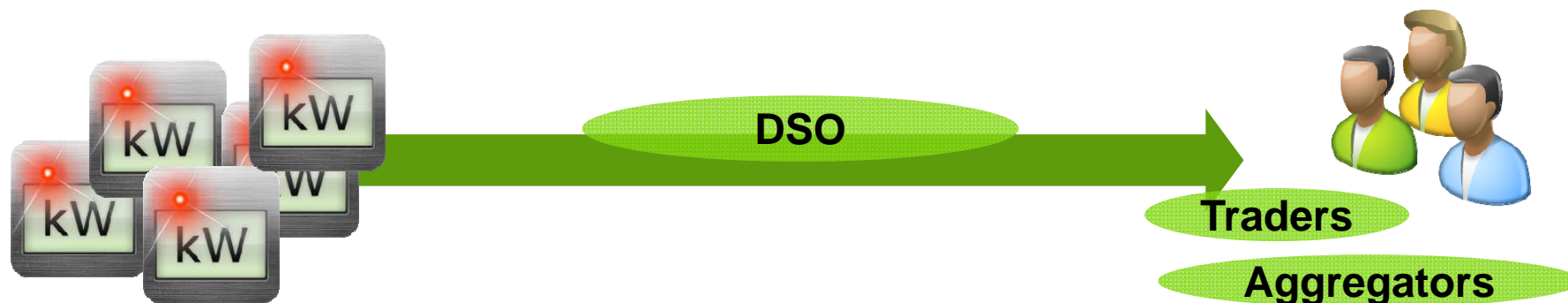


# BACK-UP



## The DSO challenges towards 2020

### Smart Metering



#### towards 2020

- full **rollout** of smart metering solutions
- ensure billing based on real consumption
- interfaces** to export consumption data and profiles and location dependent information (e.g., production vs. consumption balance)
- cyber security

#### beyond 2020

- Real-time **Signaling** location-dependent and customer-dependent information **seamlessly integrated** with Energy Management Systems, Energy Market and Aggregators
- Multi-utility metering services
- Supporting **LV Monitoring and Control** by collecting in a fine-grained way network operation parameters

# The DSO challenges towards 2020

## Network Operations



### towards 2020

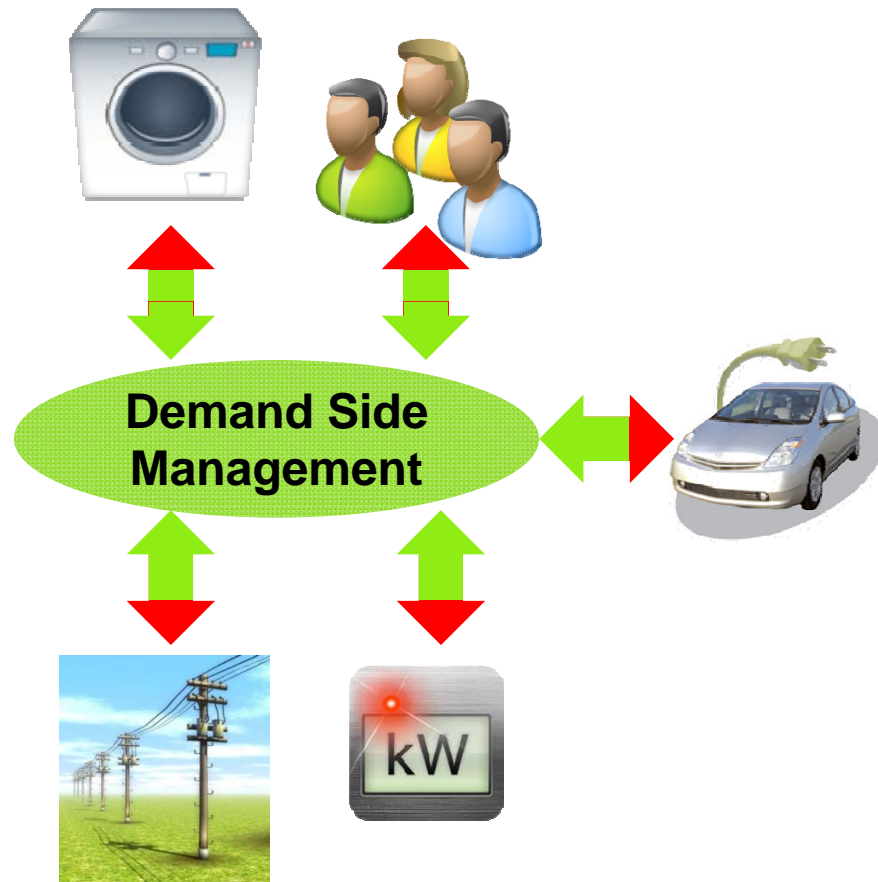
- introduce **smartening equipment**, e.g.
  - Energy Storage Systems
  - DG control systems
- introduce sensors, actuators and **Distribution Management Systems**
- **dynamically operate** the grid according to the real-time energy flows

### beyond 2020

- TSOs and DSOs **both balancing** the grid and performing **energy dispatch**
- **Ancillary service bi-directionally** provided through the TSO/DSO interface
- Advanced operations like **micro-grid** or **islanding** operations
- **Reconsider the whole electricity grid** designed more than one century ago (e.g., meshed or micro-grid operations)

# The DSO challenges towards 2020

## Smart Customers and New Loads



### towards 2020

- Support energy **market unbundling**
- Share metrological** information with final user and third parties (e.g., aggregators or service providers)
- steer** the introduction of **EV Charging Infrastructure** in order to minimize impact on the grid (smart charging)

### beyond 2020

- Customers** as **key players** in the energy market
- Aggregators offering **ancillary services** that are procured by Grid Operators
- Introduce **advanced EV Charging Infrastructure** operations like V2G

# The DSO challenges towards 2020

## Distributed Generation



### towards 2020

- connect DGs and enable dispatching priority for the energy they produce
- prevent RES intermittency from negatively impacting **Quality of Service**
- support the definition of **grid rules to harmonize DG** equipment to be controlled by network operator

### beyond 2020

- DGs participate to the **grid balancing** by providing ancillary services according to an energy market for ancillary services (e.g., voltage control)
- Advanced** European-wide stochastic **tools** and network automation **systems**