Distribution Networks: the hidden challenges and solutions

Gunnar Lorenz, Head of Unit DSO

EURELECTRIC

IEA Electricity Security Action Plan (ESAP) Workshop

"Future Challenges for Electricity Security"

Paris, 1 October 2013

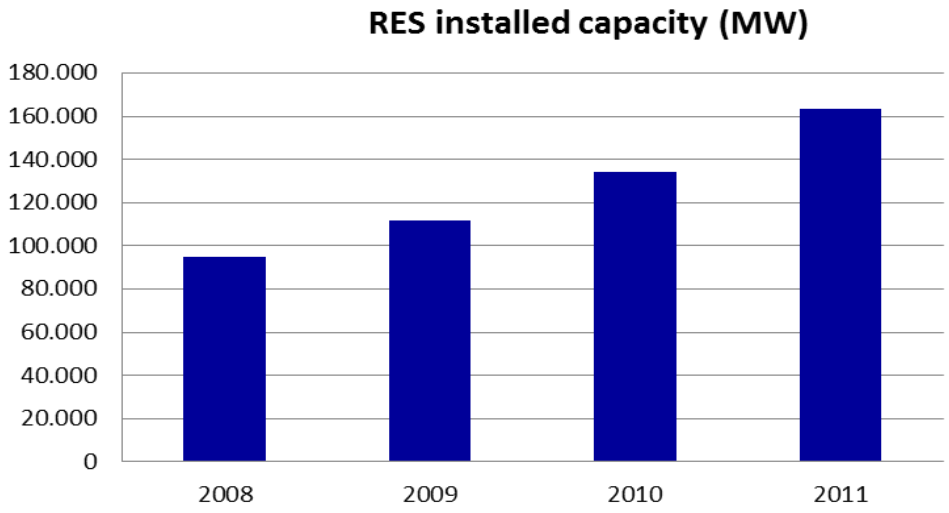
EURELECTRIC represents the EU electricity industry – all across the electricity value chain

ENERGY POLICY & GENERATION	ENVIRONMENT & SUSTAINABLE DEVELOPMENT	MARKETS	DISTRIBUTION NETWORKS	RETAIL CUSTOMERS



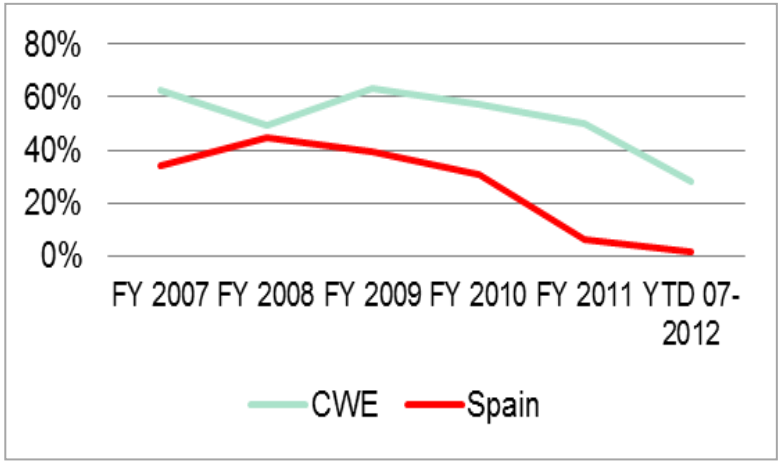


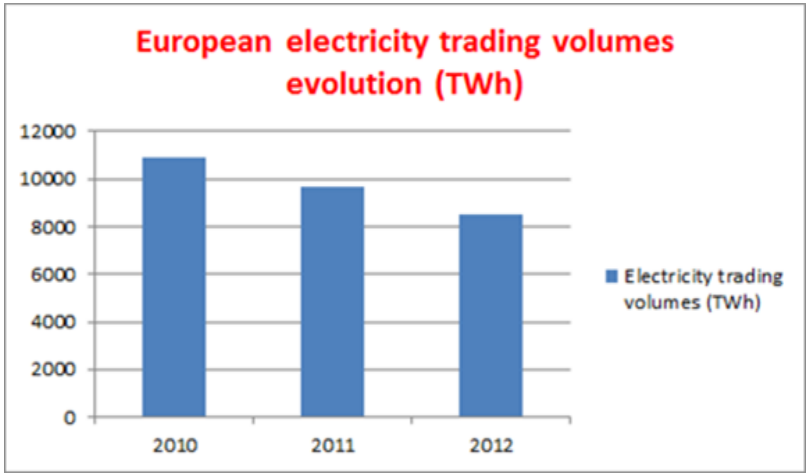
Continuous growth of subsidised RES while competitive part of the electricity sector is shrinking



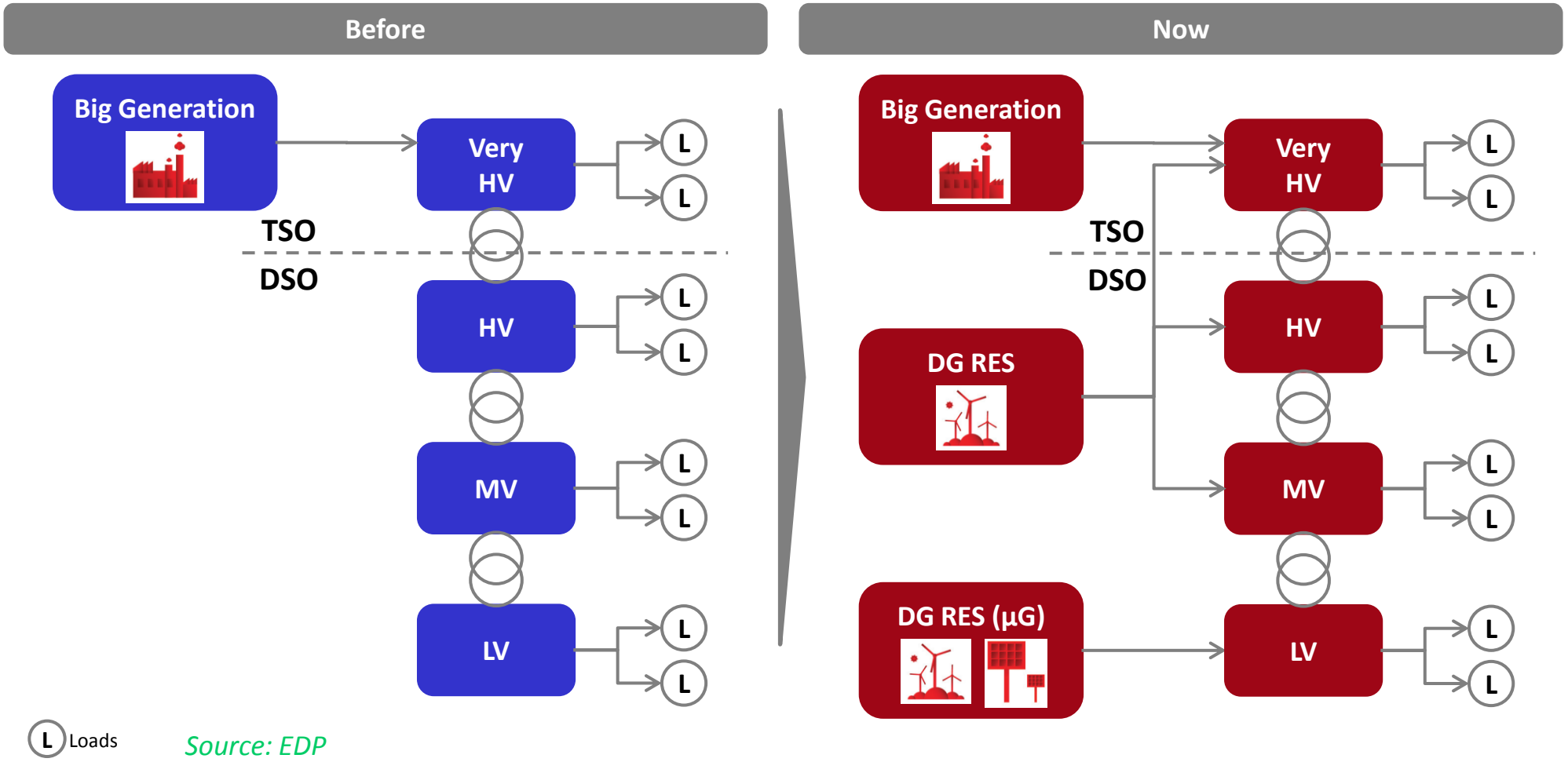
RES development independent of market conditions (e.g. demand)

Running hours of CCGTs in CWE and Spain





The majority of the new producers are connected to the distribution grids and must be integrated there



Source: EDP

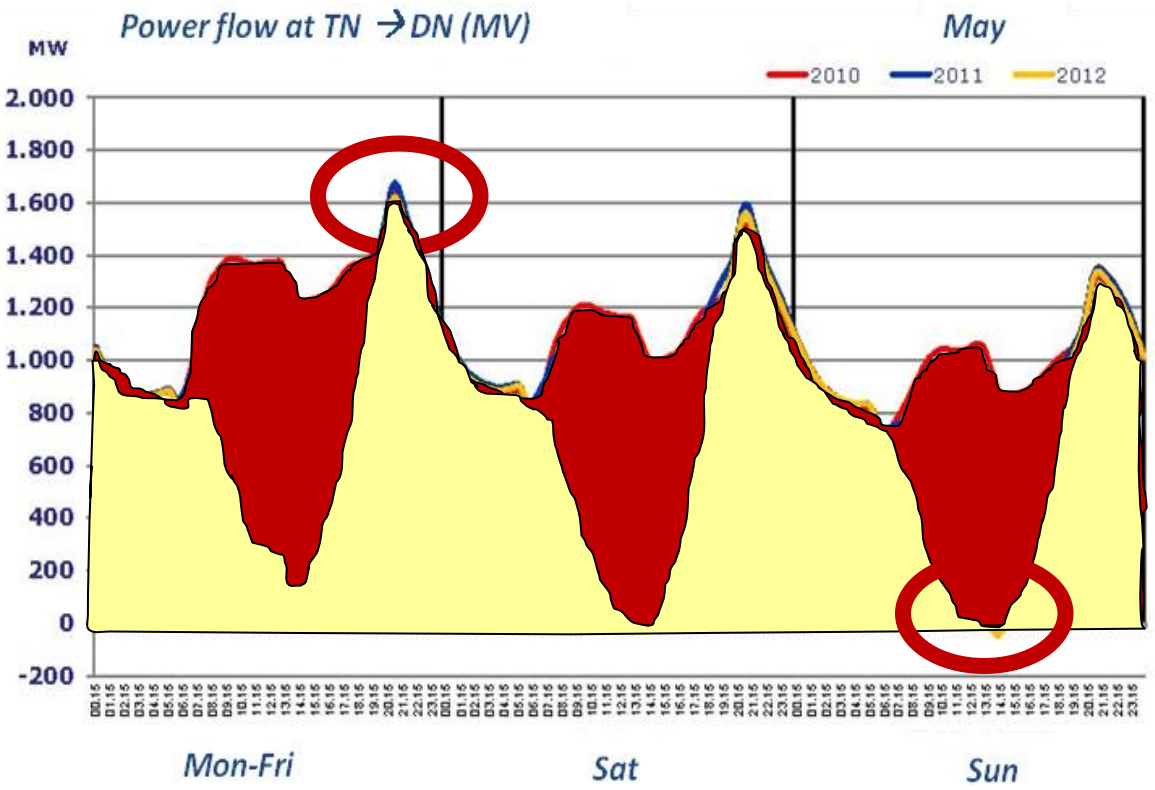
Integration of distributed RES requires fundamental change in distribution system design

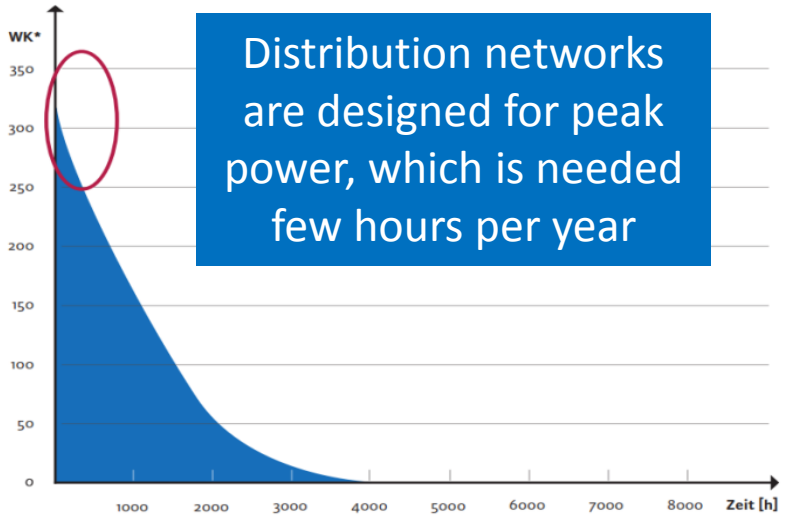
Distribution grid planning:
optimise investments in assets

Distribution network operation:
ensure reliability and quality of supply

Planning - Network Reinforcements

While asset utilization rate may drop, network investments needs do not





Distribution networks are designed for peak power, which is needed few hours per year

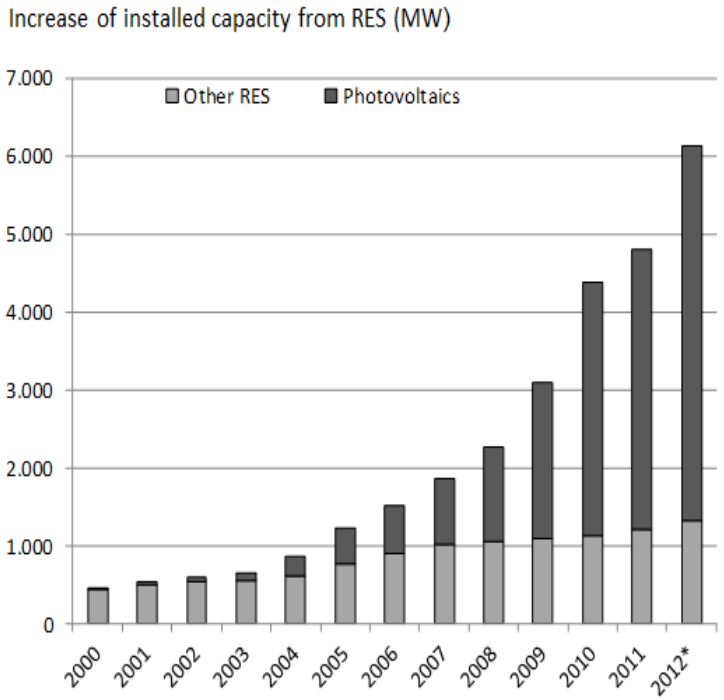
Power flows between transmission and distribution network in Italy, 2010-2012

Source: Enel Distribuzione

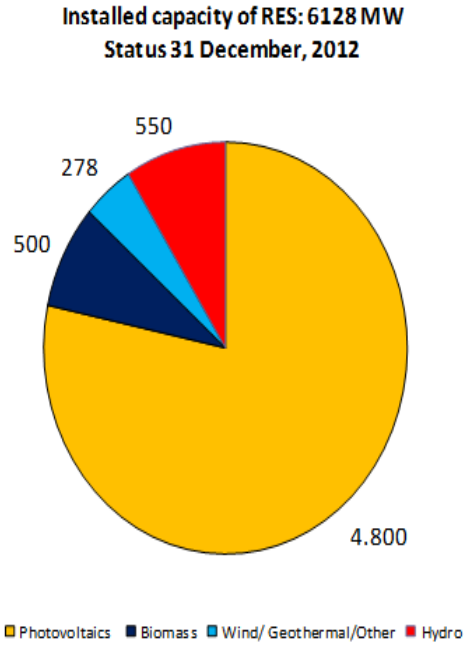
System Operation becomes more complex

Generation output on distribution networks often exceeds local load in some areas

Example: E.on Bayern



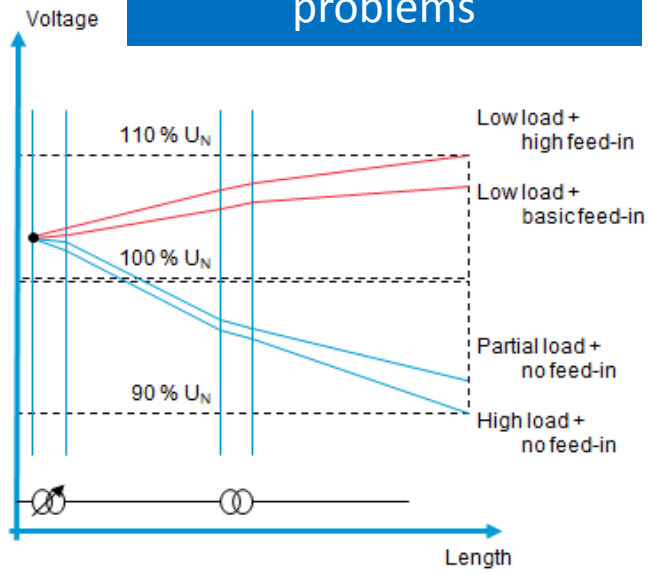
Peak load at E.ON Bayern grid: ~ 6.000 MW



Number of PV installations: ~ 225.000

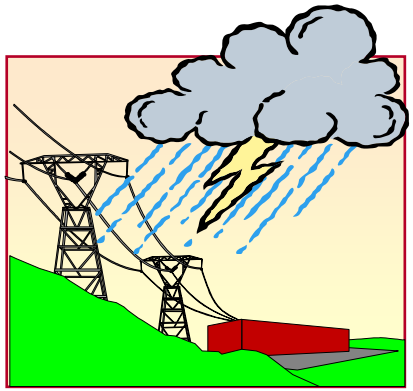
Source: E.on

More frequent voltage problems



Source: Mainova

Accelerating change makes innovation at distribution level an imperative



Long term

Network Planning

Connection & Access

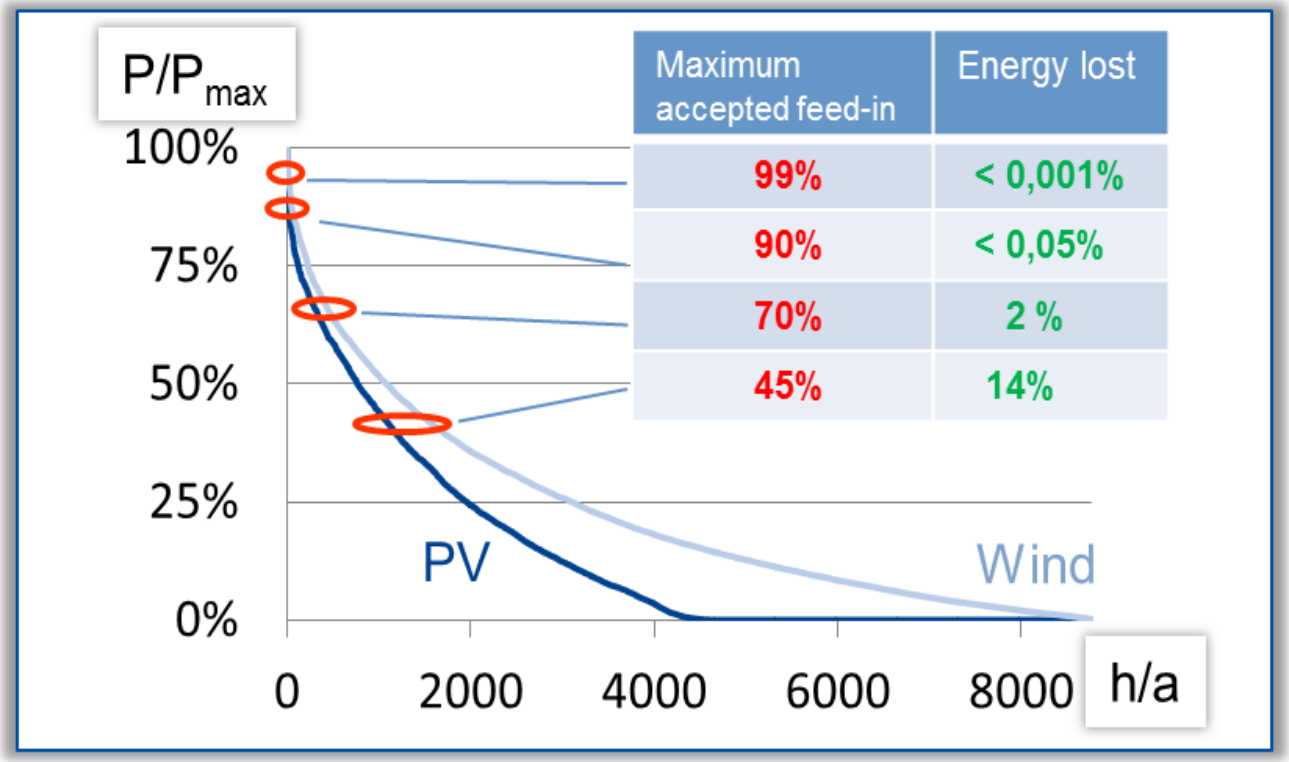
Operation

Real time

"Active System Management" allowing for greater **interaction between the key network processes** combined with **grid automation** would optimize the distribution network

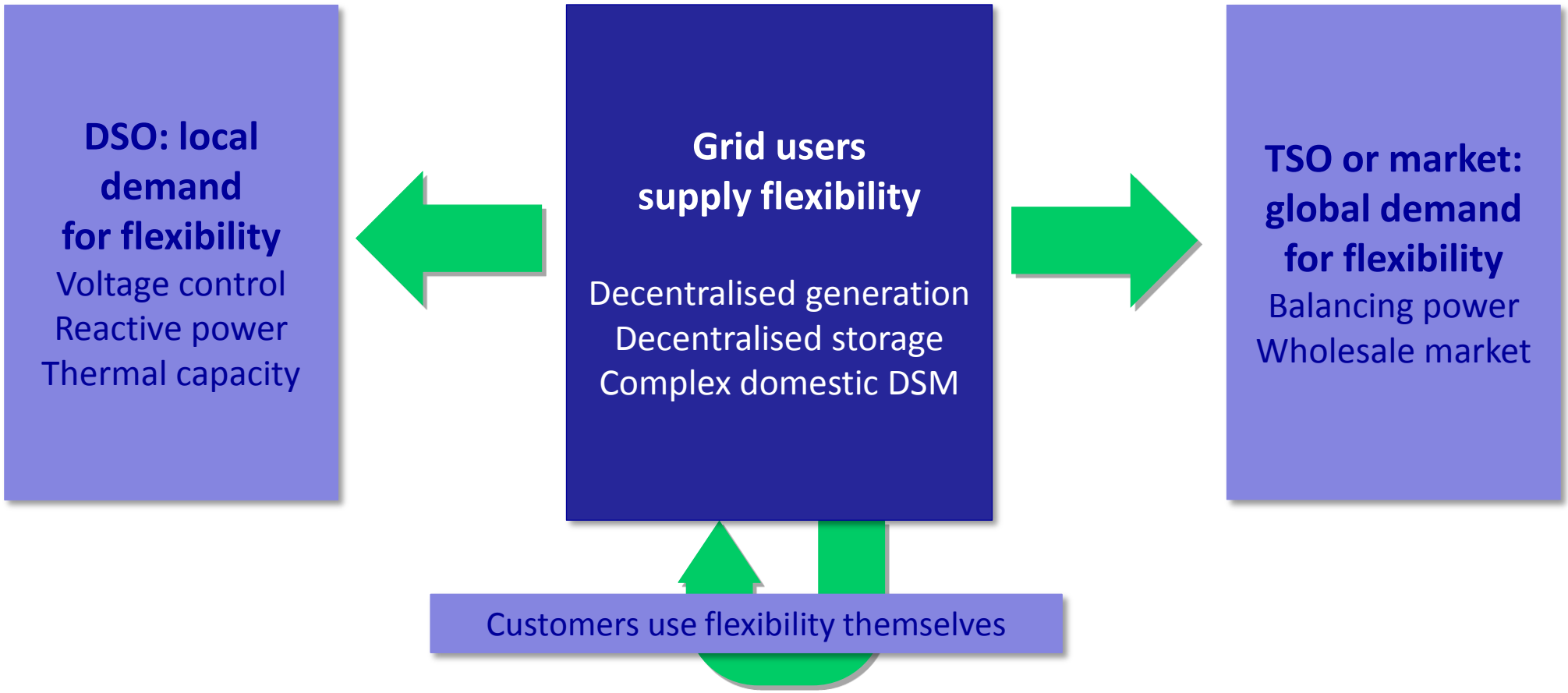
New types of network access could help reduce network investments

Standardised annual duration curve

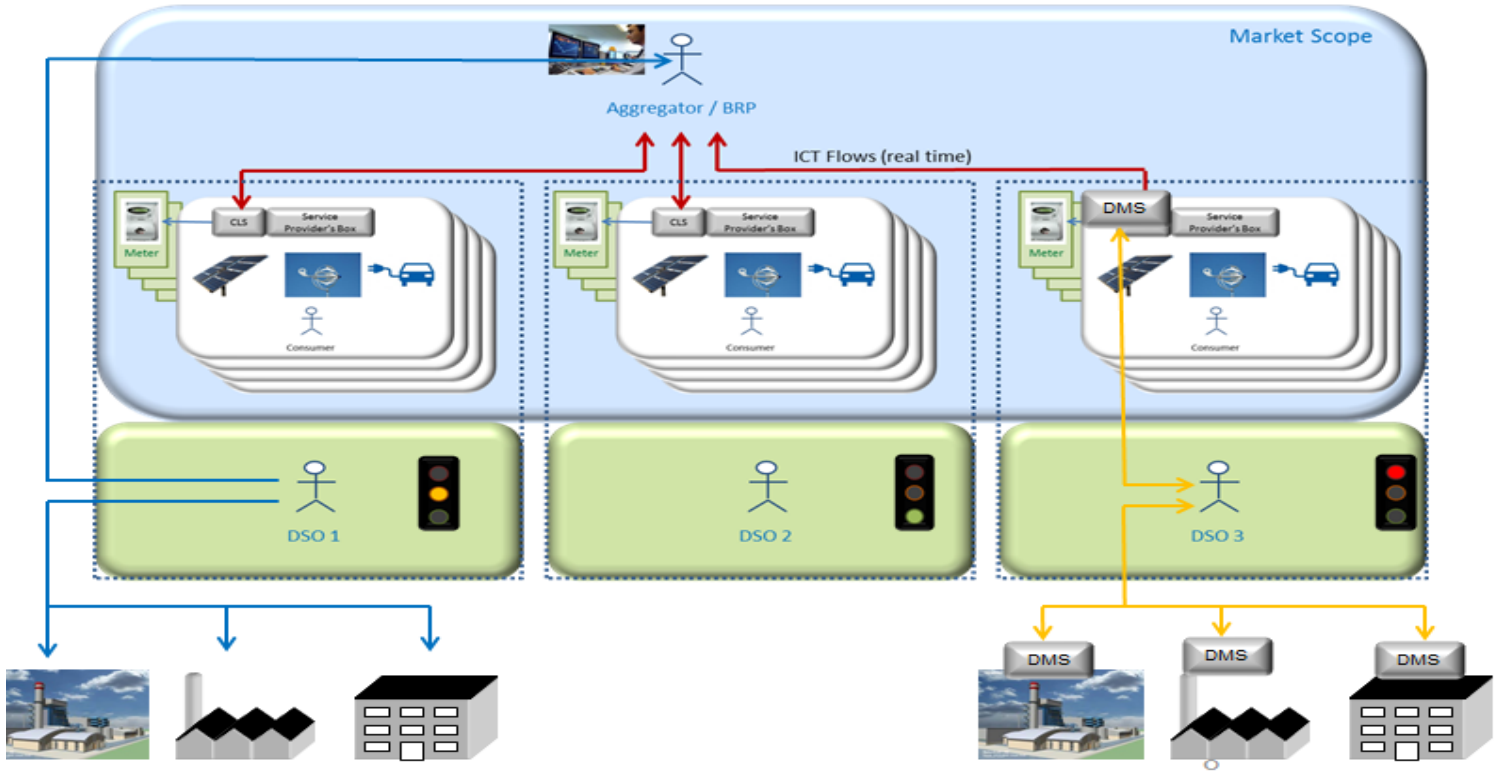


Source: RWE

Flexibility will be key for solving distribution grid constraints

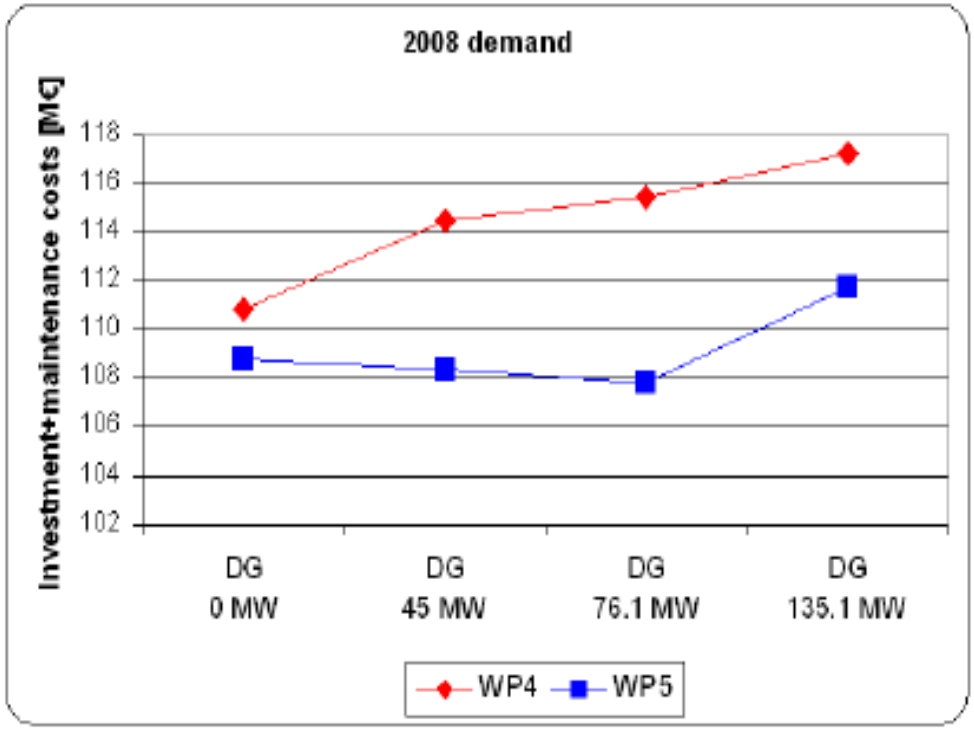


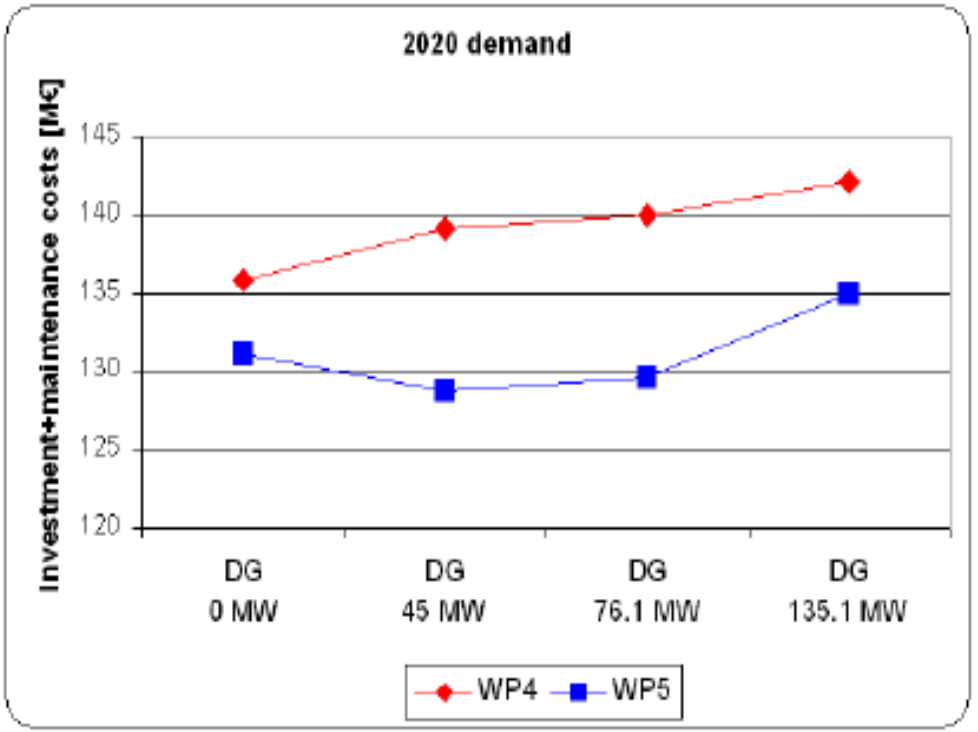
Flexibility will be key for solving distribution grid constraints *(cntd)*



New complexity will further increase **the need for information exchange** between **system operators** and **market players**

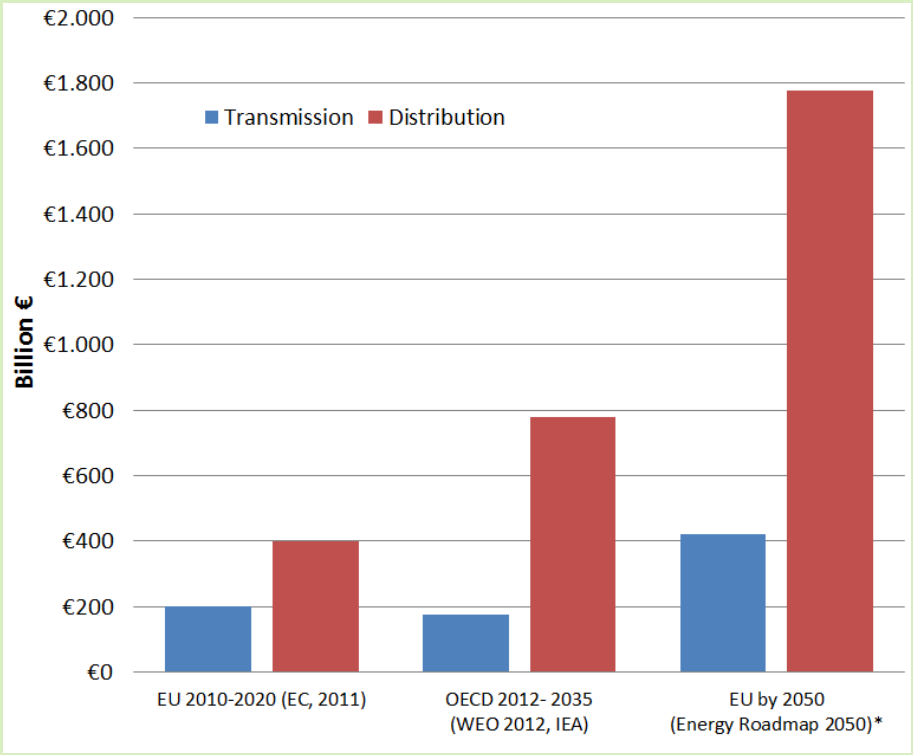
Each distribution network should be assessed individually to ensure a technically acceptable, cost-effective balance between different solutions





IMPROGRESS project - Comparison of BAU distribution Investments and maintenance costs (WP4) and costs when applying active system management solutions (WP5) for a Spanish distribution network

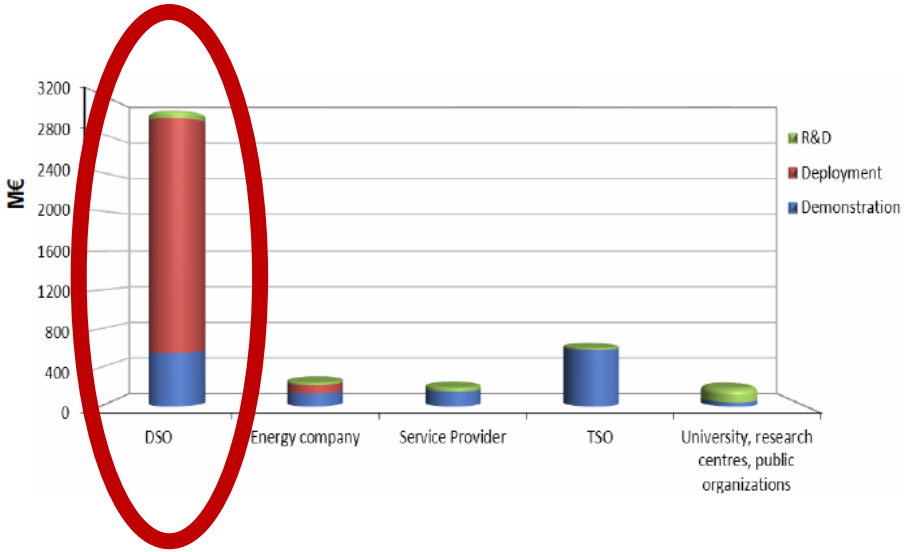
#1 Innovation-friendly network regulation



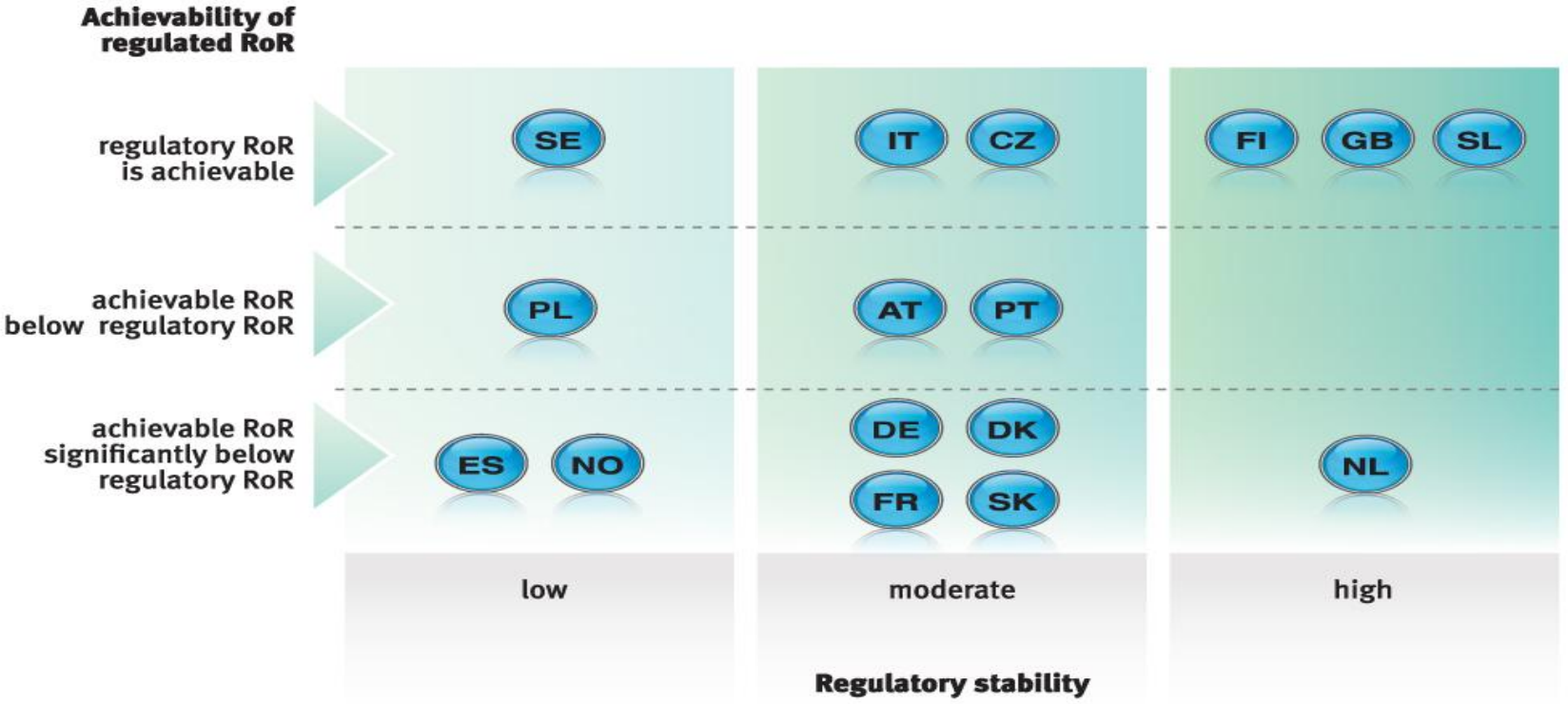
Distribution network investments share within overall network investment is expected to rise from 2/3 by 2020 to 4/5 by 2050

upper range values considered

Main investors in Smart Grids pilots are DSOs

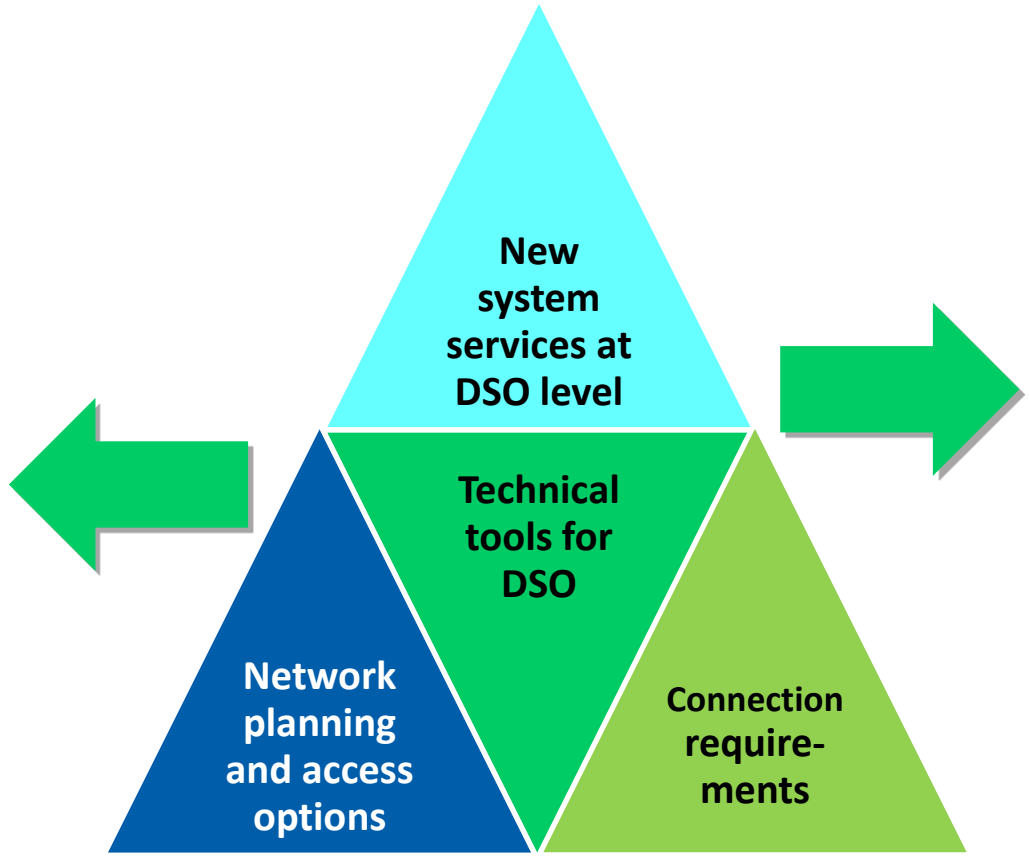


Grant appropriate regulatory incentives to secure smart DSO investments in distribution grids



Source: EURELECTRIC, Regulation for Smart Grids, 2011

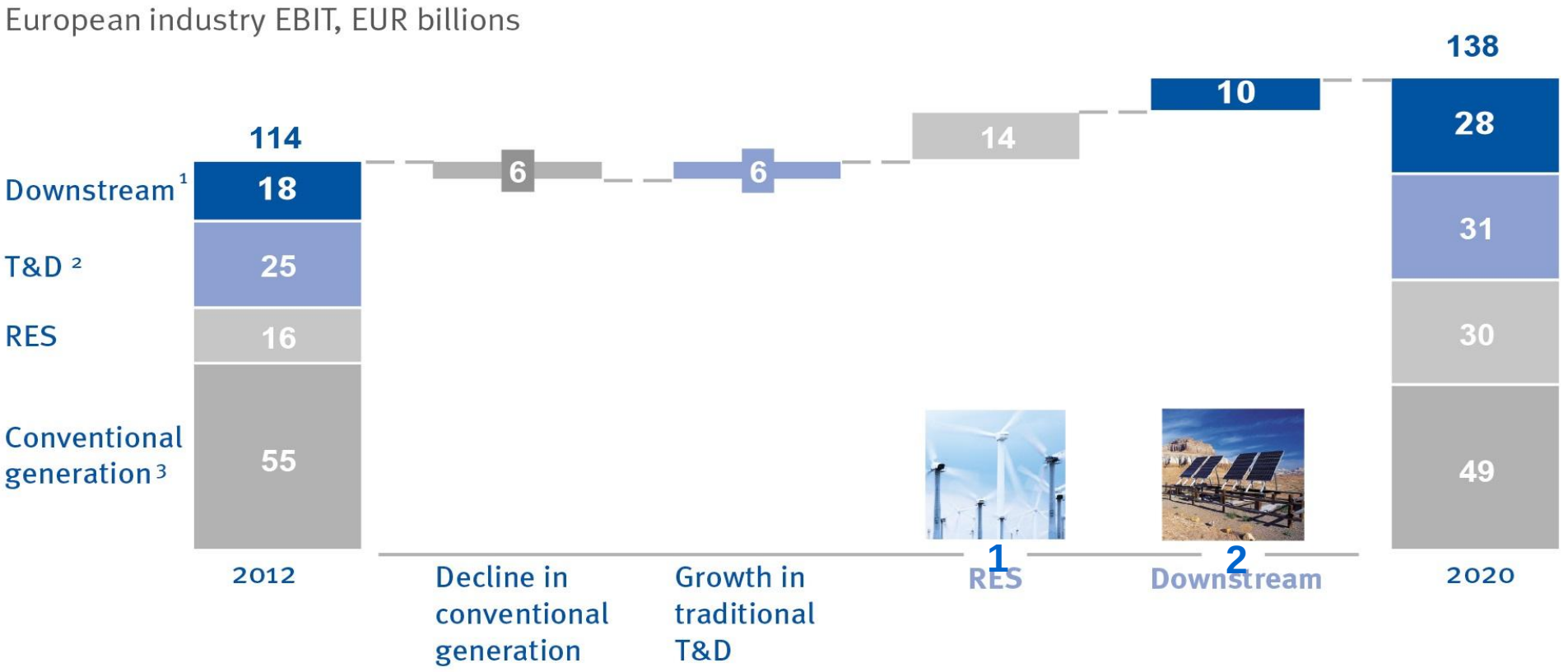
Rules and regulation should be adapted to steer the most cost-efficient system solutions



Revision of grid connection and access rules?

Implementation of the EU Energy Efficiency Directive

#2 Unlocking the potential of "downstream" flexibility



1 Includes power sales and new downstream (distributed generation and storage, electric vehicle infrastructure, new downstream products and services, power flow optimization)
2 Includes smart grids
3 Assuming no change in commodity prices vs. today

Source: McKinsey Industry vision team analysis

Creating a flexible electricity system

Flexible and back-up generation capacity

Integrated wholesale markets & necessary transmission grid

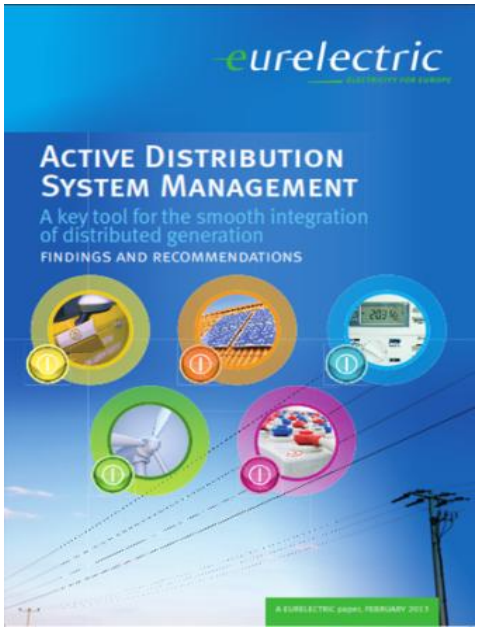
Distribution grid

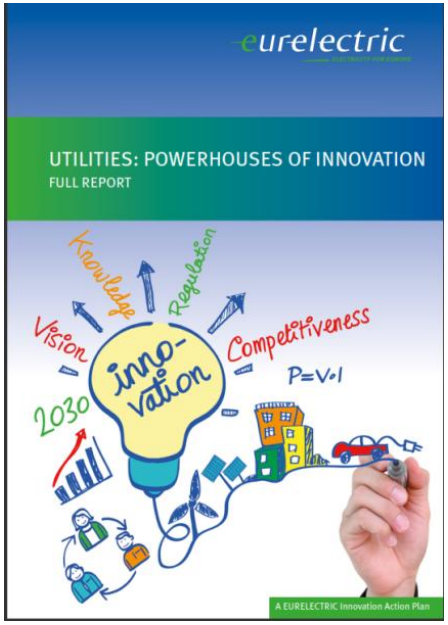
Demand side management & storage

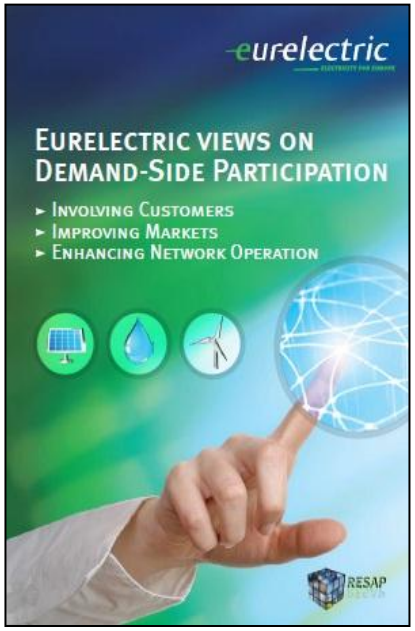
A real system approach to cope with the RES development in Europe

Thank you for your attention!

glorenz@eurelectric.org







http://www.eurelectric.org/power-distribution