

Why Smart Grids are needed and how they can benefit network users

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- Why do we need Smart Grids?
- Smart Grids definition
- New network services
- Network challenges
- Smart Grid solutions
- Regulatory challenges

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- In order to secure Europe's energy supply and to reduce greenhouse gas emissions, the **EU Climate-Energy Legislative Package** set the following objectives for 2020:
 - Cutting greenhouse gas emissions by at least 20 % with respect to 1990
 - Increasing to 20 % the share of renewable energies in overall consumption (currently about 8.5 %)
 - Saving 20 % of the projected energy consumption by improving energy efficiency
- More ambitious objectives are being developed for 2050

The EU goals for 2020

--- cover the three “pillars” of the European energy policy:

Sustainability

to actively combat climate change by promoting renewable energy sources and energy efficiency;

Security of supply

to better coordinate the EU's supply of and demand for energy within European integrated market;

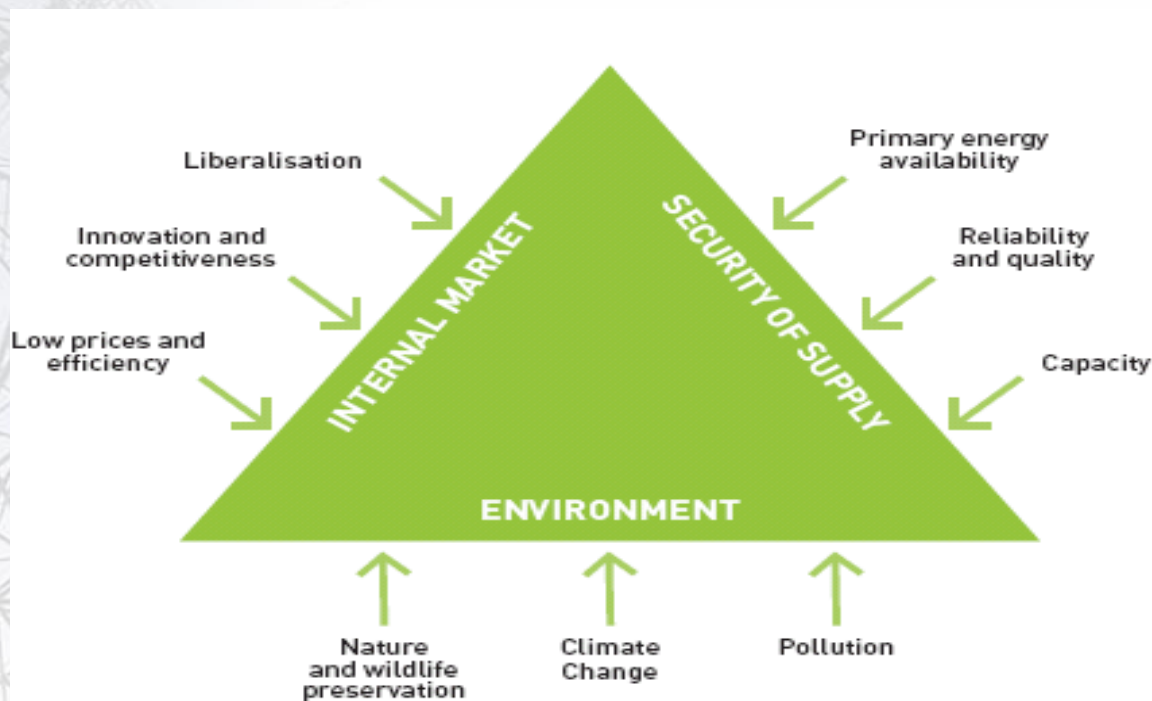
Competitiveness

to support the development of a truly competitive internal energy market by improving the performance of the European electricity grid.

The electricity sector will make a major contribution to achieving these targets, but engagement and support of all stakeholders will be essential.

Electricity sector: challenges for 2020 & beyond

- *Electricity grid evolution* will be needed to ensure **supply security**, connect and operate **clean** and **sustainable energy**, and give **value for money** to customers



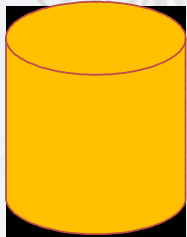
Can we achieve all?

Conventional grid solutions

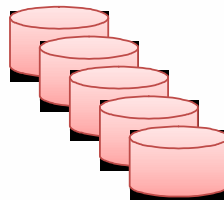
The Old Paradigm:

Generation follows Demand

- Basically, one way power flows
- Remote and centralised generation
- Limited communications
- Limited automation
- Mainly a passive network delivering electricity to passive households

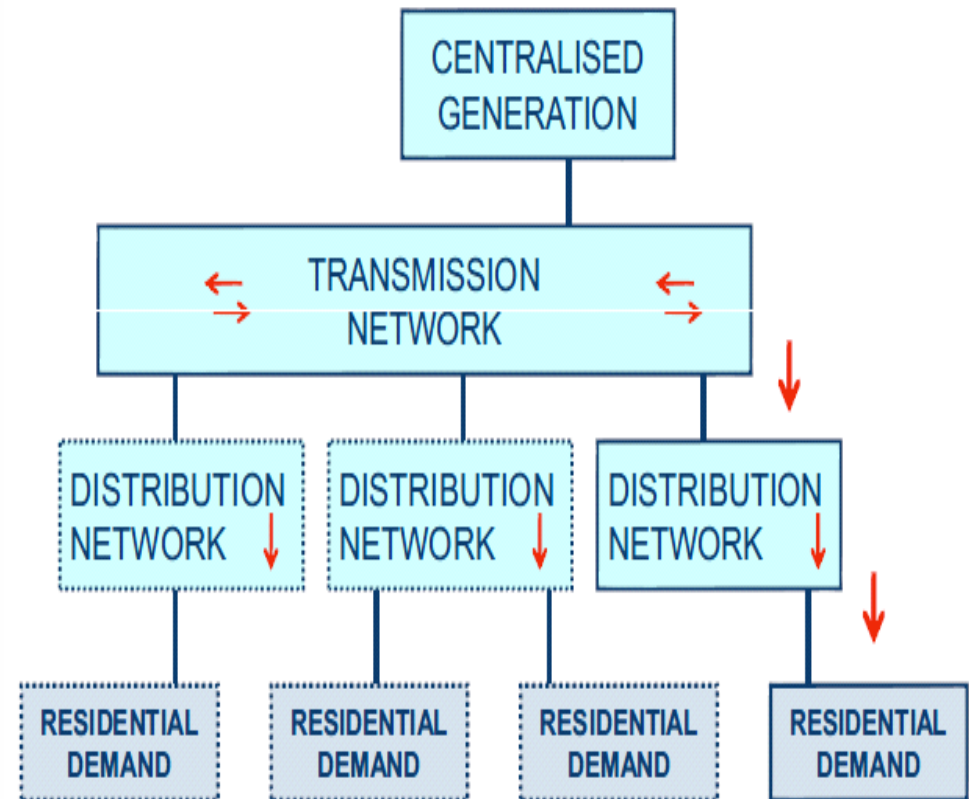


Centralised generation
fully predictable



Consumption
fully stochastic

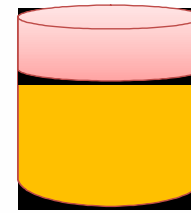
Source: ENTSO-E



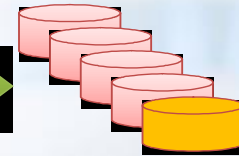
Smarter grid solutions

The new paradigm:
Intermittent production and Demand
contributes also to the system
balance

- Mix of traditional big power plants with distributed generation connected at LV and MV levels.
- The traditional network will be necessary but coexists with new network topologies and control philosophies.
- End-users will participate more actively into the new energy services to be available and the demand side management will contribute to network operation.
- Two-way communications will be available at all voltage levels and the central dispatching will coexist with decentralised control.
- Distributed storage and electric vehicles will appear.

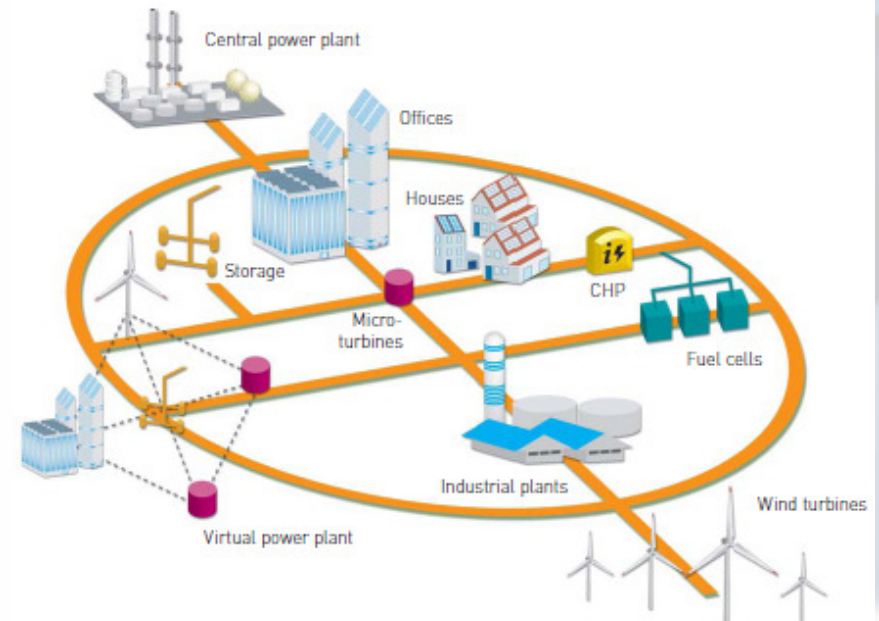


Some generation
is stochastic and
dispersed



Some consumption
is controllable

Source: ENTSO-E



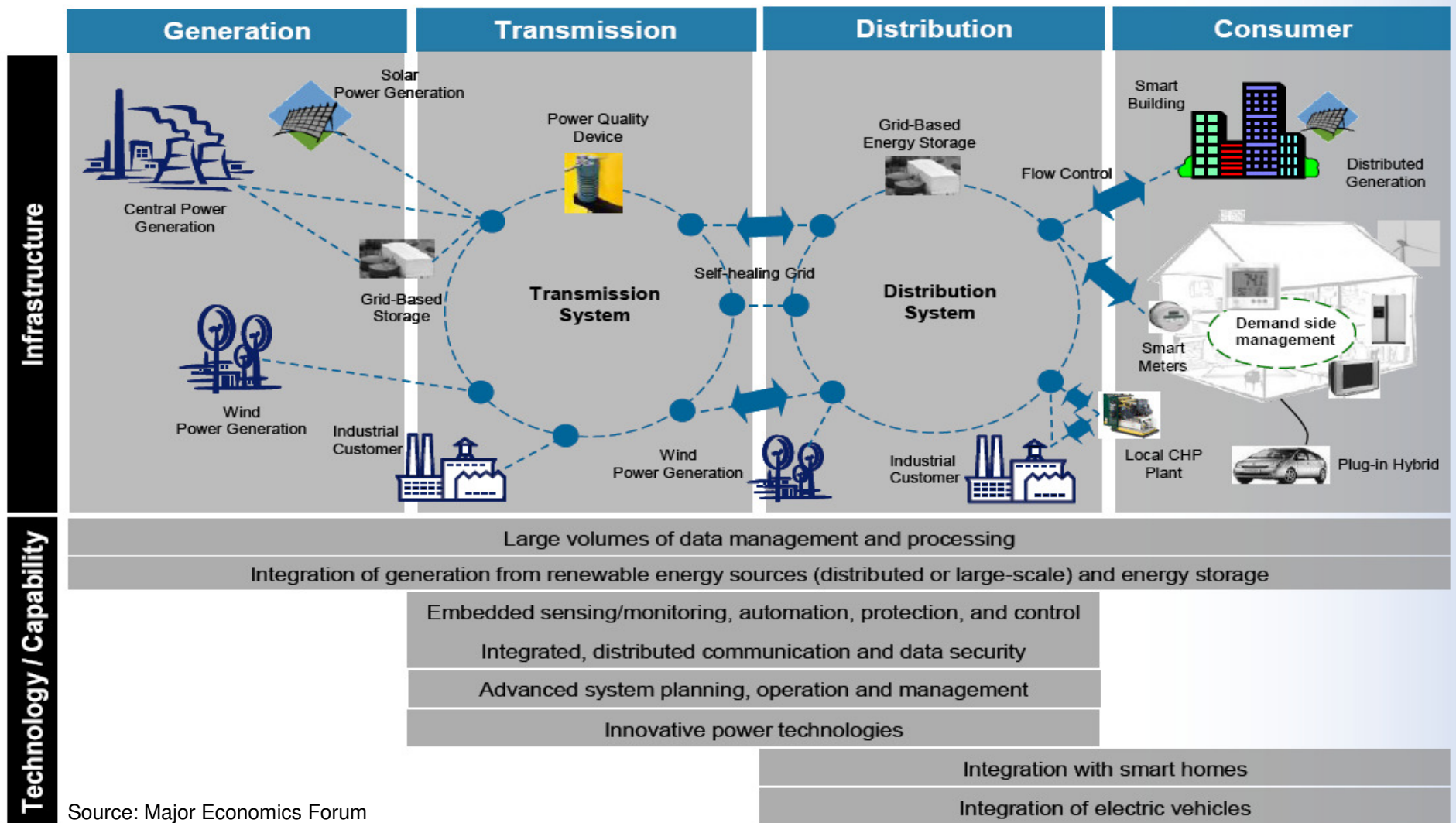
Source: EU Technology Platform SmartGrids

so Smart Grids' main drivers are...

- Large-scale renewable energy sources including intermittent generation
- Distributed generation including small-scale renewable energy sources
- Active customer participation
- Market integration and market accessibility
- Improved operational security

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The concept of Smart Grids

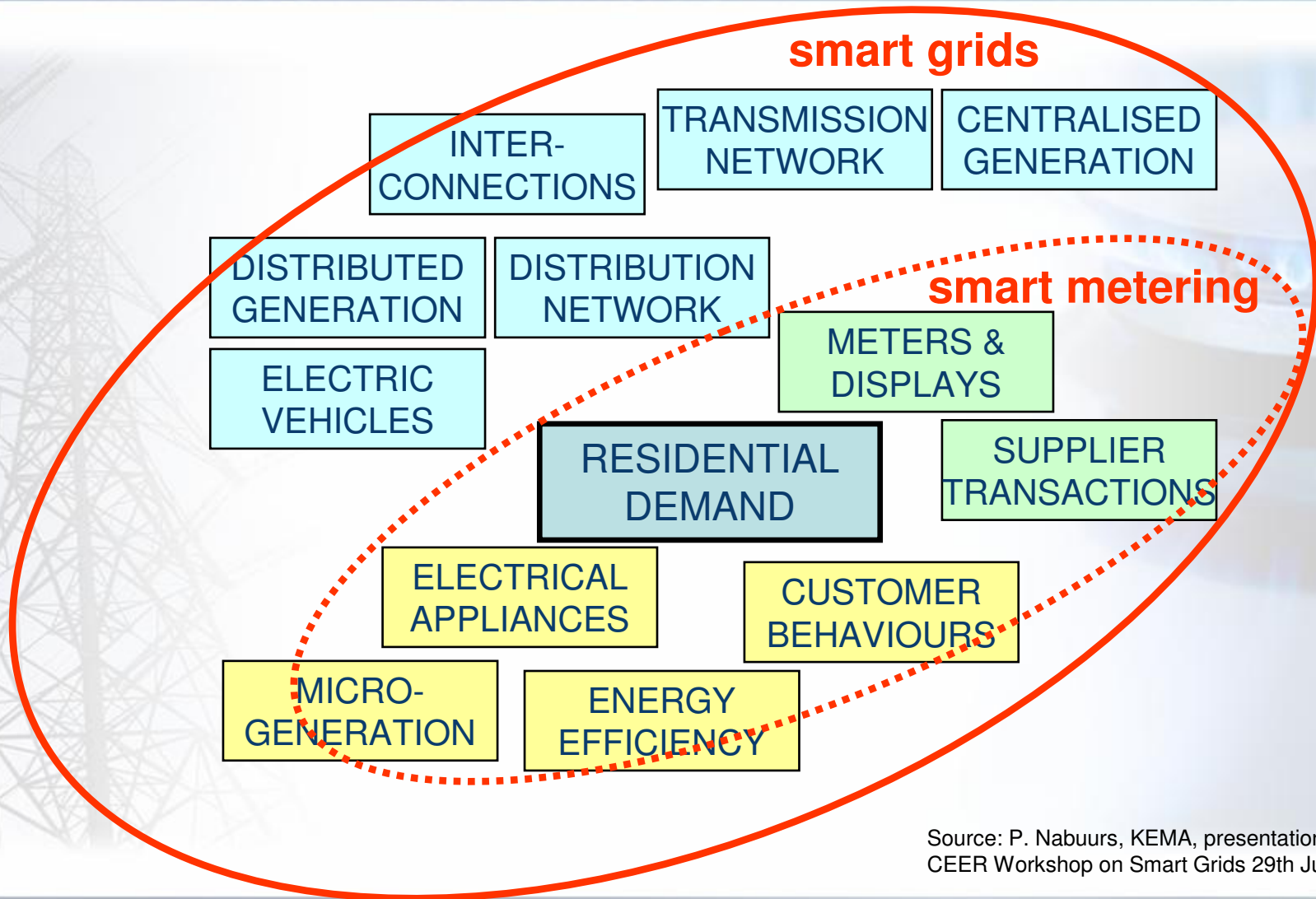


Source: Major Economics Forum

The concept of Smart Grids

- Smart Grid is about how to:
 - design,
 - plan,
 - build,
 - operate and
 - maintain the future electricity grid
- ... in order being able to meet the EU goals for 2020 without compromising on costs, quality, security or safety!

Electric elements



Source: P. Nabuurs, KEMA, presentation at CEER Workshop on Smart Grids 29th June 2009

ERGEG Definition on Smart Grids

- Smart Grid is an electricity network that can cost efficiently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to ensure economically efficient, sustainable power system with low losses and high levels of quality and security of supply and safety.*

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New network services

Generators and "prosumers"

Fundamental needs

- Timely connection and operational access, with minimum constraints
- Transparent, non-discriminatory terms for grid connection and access based on the costs of an efficient network
- Opportunity to participate in the electricity market with the same opportunities as competing generators (e.g. without disadvantages due to lack of interconnection capacity and consequent congestion) ensuring a level playing field of same "quality" for all market participants
- Appropriate remuneration for ancillary services provided by the generator to the grid

New network services

- Efficient provision of connections at all voltages levels and at all locations (including offshore)
- Access products designed for intermittent sources of generation
- Balancing services that better manage intermittent generation
- Enhanced trade within national and integrated markets including intra-day trade until near the operating hour

New network services

Customers (particular small)

- A competitive, affordable price for the electricity they use (which implies fairly regulated network charges consistent with safe, efficient networks as well as a competitive energy market)
- Fair fees for their connection to the network
- A quality of supply comparable to the one they have received in the past (with significant variations for the continuity of supply due to local differences)
- No electricity shortages or unreasonable price increases due to external conditions (e.g. availability or price of fuels or network constraints)

New network services

Network companies, retail suppliers and EScO

- Dynamic pricing information and time of use energy pricing
- Financial incentives to actively manage demand – the customer could offer demand management to the party balancing the system, the supplier or the network company
- For those customers who choose to also generate electricity, it will also be necessary to fully incorporate this activity in the marketplace
- For those customers who prefer an improved quality of supply, tailored contracts between the customers and the network operator for enhanced continuity of supply or voltage quality (not forgetting the customer responsibility in immunising its own electrical plants from non severe disturbances)
- The opportunity for aggregators to provide services on behalf of customers to network companies and the energy markets

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Network challenges

Generators and "prosumers"

- Network capacity planning
- Providing new connections
- Providing economic access products for intermittent generation
- Balancing between consumption and production at different voltage levels and within geographical regions
- Facilitating trading between Member States
- Ancillary services

Network challenges

Customers

- Customers will require more details about his consumption patterns than today
- Interoperable communication facilities
- Developing remuneration framework or market schemes to compensate customers who manage their consumption according to system requirements
- Tailored quality of supply.
- Activities 'beyond the (smart) meter', e.g. remote control of final appliances
- Active demand management.

Network challenges

Traditionally

- Ensuring network operational security
- Providing an optimal amount of network capacity (at transmission and distribution level)
- Minimising transmission and distribution losses
- Minimising demand for ancillary services (e.g. reserve)
- Guaranteeing satisfactory quality of electricity supply

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Smart Grids solutions

- Apply increased intelligence to the way networks are designed, planned, build, operated and maintained
- A general believe (but not proven) that the needs from the network of future will be delivered at lower costs with smarter solutions than with existing conventional solutions
 - Hence; smart solutions must be developed and approved through demonstration projects, otherwise there is a real risk that opportunities will be missed or delayed
 - Lack of active network evolution could constrain the delivery of the EU's goal for 2020 and further future targets

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Regulatory challenges

- European energy regulators approach this issue from a **technology neutral perspective**. The deployment of new technologies must be **a means to an end, not an end in itself**.
- Investment in 'smarter' networks must **provide better value and direct benefits for all grid users**, and indirect benefits such as greater diversity both for the electricity supply system and society as a whole.
- As mentioned; there is a growing consensus that 'smarter' networks will **be required to meet the 2020 EU targets** and it is vital that regulatory mechanisms stimulate such developments **directly (e.g. by market rules and minimum requirements) and by efficient regulatory incentives**.
- **Regulators** therefore act as **key facilitators** in this process, by identifying and removing possible barriers and by finding solutions that provide an **appropriate balance between all the stakeholders' positions**.

Regulatory challenges

- A major challenge for regulators is to find ways of encouraging an **adequate level and scope of innovations** while providing an **appropriate degree of protection of customer interests** and **cost-efficient development** of the network.
- Regulators will critically assess the incentives for network companies to **pursue value for money of innovative solutions to the benefit of consumers**.
- This challenge is also one of the characteristics of a monopoly business like electricity grid operation, where instead of competition or a technology “revolution” (which are the major forces driving innovation in market businesses), additional regulatory support is needed.

Thank you for your attention!

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