How Smart Grids can help meet the EU's climate change targets – the drivers, solutions and regulatory challenges?

Una SHORTALL
Deputy Secretary General,
Council of European Energy Regulators (CEER)

Structure

- Introduction to CEER

- What is a Smart Grid?
  - what a smart grid is not !
  - is it related to power generation?
  - is it different to smart metering?

- Benefits of Smart Grids?
  - drivers, smart grid solutions, regulatory challenges

- How can “smart grids” and “smart regulation” help meet the EU’s climate change targets?
  - renewables, customer response, plug-in electric vehicles
  - how energy regulators stepped up to smart grid/climate change challenges
  - future prospects for smart grids

Introduction to CEER

Council of European Energy Regulators (CEER)

- "Not for profit association" of 29 EU national energy regulators (EU-27 plus Iceland and Norway).
- CEER works closely with the European Commission and is a preparatory body of its advisory group on energy market issues – the European Regulators Group for Electricity and Gas (ERGEG)
- oversee the efficient functioning of Europe's energy markets in the consumer's interest
- help realise the EU's 3 energy goals of sustainability, competitiveness and security of supply.

What is a Smart Grid?

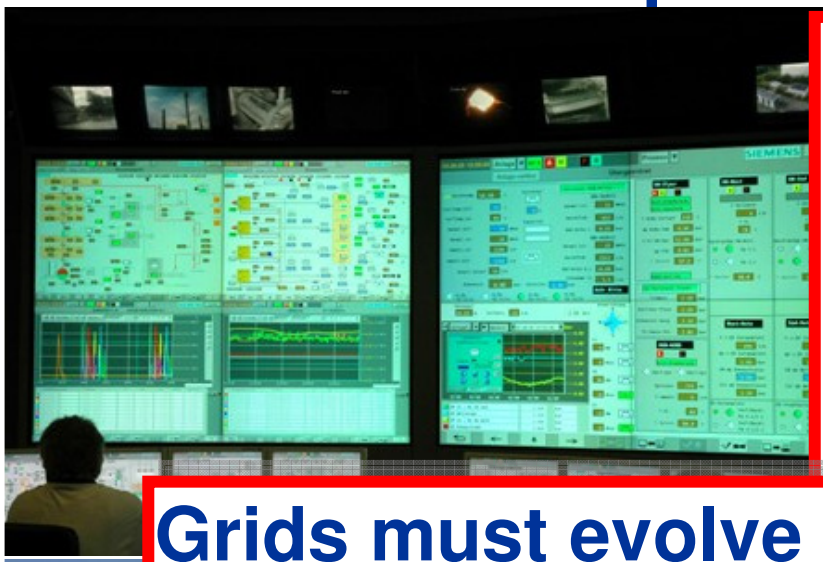
"Smart Grid is an electricity network that can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies."

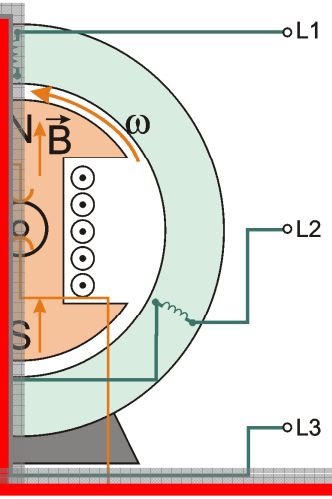
(www.smartgrids.eu)

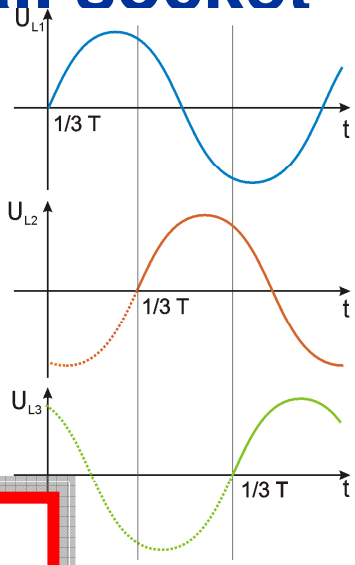
What the Smart Grid does not mean !

- The Smart Grid relates to the electricity network only (not gas) – it relates to both distribution and transmission level.
- Smart Grids are not new "super grids". They will not look different to today's electricity grids of "copper and iron" but Smart Grids will be more efficient and serve customers much better than today.
- The Smart Grid is no revolution but rather an evolution of continuously improving the grid to meet the needs of customers.

already a great deal of “smartness” in it…but "invisible” as final product comes from a wall socket



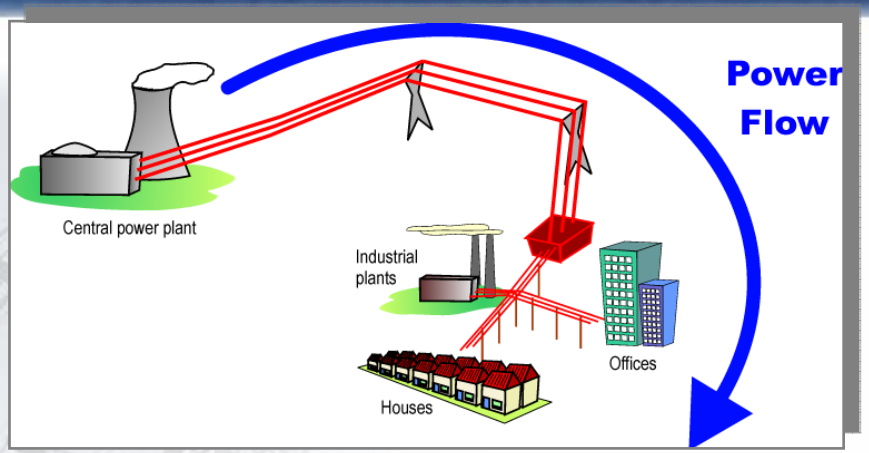


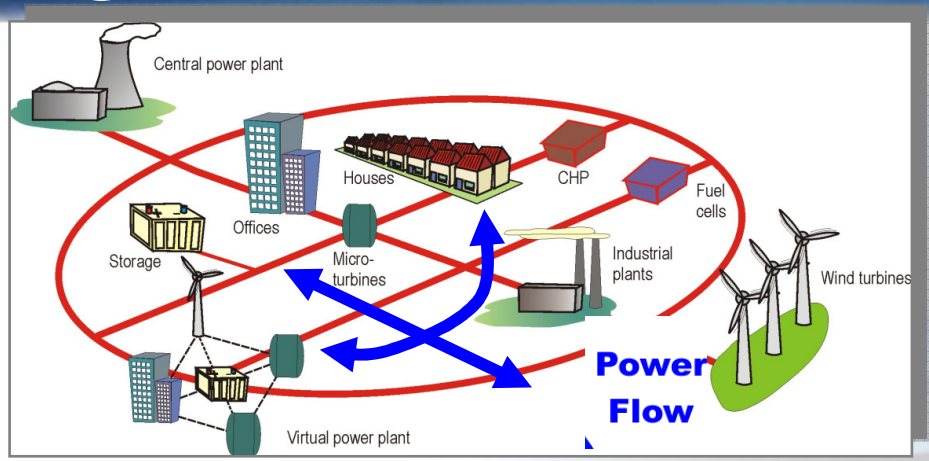


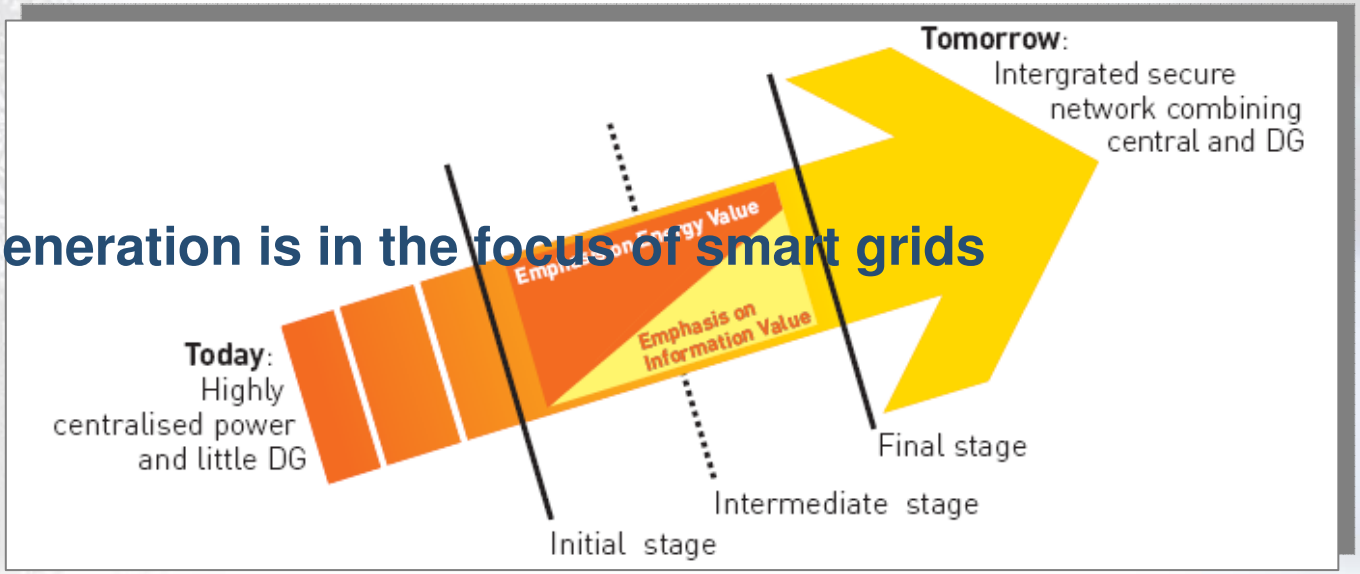
Grids must evolve into Smart Grids

Smart Grids not only provide power but also information and intelligence

Is the Smart Grid relevant to generation?

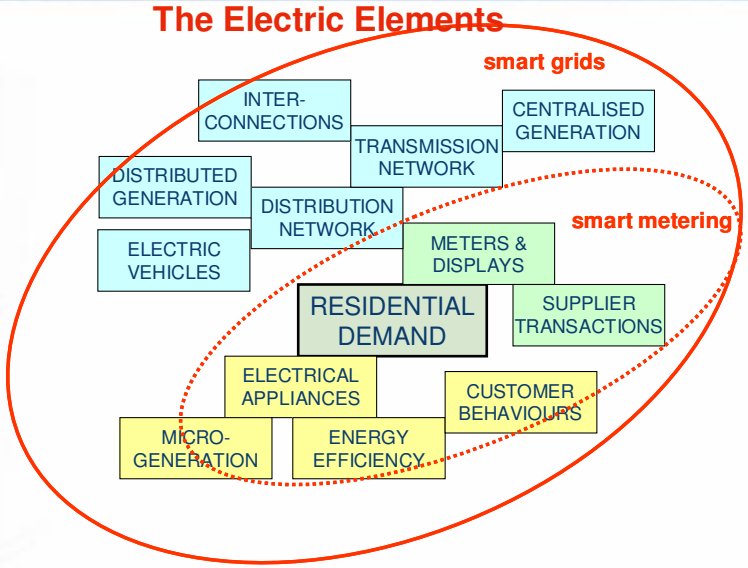






So, yes generation is in the focus of smart grids

Is the Smart Grid different to Smart Metering?



- Smart Metering does not provide a Smart Grid.
- Still, many benefits of smart metering e.g. better information on energy use allowing customers to better manage their consumption.
- Smart Grid is a much broader set of technologies and solutions than Smart Metering.

5 Main Drivers of Smart Grids

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

Source: ERGEG Public Consultation Paper on Smart Grids (Dec. 2009)

Benefits of Smart Grids

- Better facilitate the connection and operation of all generation (incl. renewables);
- Allow consumers to play a part in optimizing the operation of the system;
- Provide consumers with more information and options for choice of supply;
- Reduce the environmental impact of the whole electricity supply system;
- Maintain or improve system reliability, quality and security of supply;
- Maintain and improve the existing services efficiently;
- Foster market integration towards one, single-EU electricity market.

Role of Smart Grids in Climate Change

Smart grids can reduce carbon emissions and improve energy efficiency by :

- directly reducing power losses, thus energy consumption.
- allowing more large scale renewables (e.g. wind, solar) and distributed generation (DG) (e.g. small windmill or micro-CHP)
- help consumers better participate, using their energy more efficiently. An increase in DG can allow consumers to act also as producers selling back their excess electricity (e.g. plug-in electricity vehicles)

Smart Grids can reduce the need for costly new generation, grid capacity by reducing energy usage and peak demand.

More renewables and demand response – challenges for smartness

- Today's networks were not built to cope with large scale low/zero carbon generation and an effective demand response.
- Ageing networks need to be replaced/reinforced to connect more renewables. For large scale renewables, cost effective connection solutions are needed as often located distant from the demand (load) centres.
- Electricity production (supply) and demand must balance. Intermittent renewables (e.g. wind) offer balancing opportunities (as alternatives to today's often high-carbon power plants or pumped storage) but also challenges to maintain balance.
- Need to connect large amounts of off-shore wind
- The grid must be able to cope with more small scale or distributed generation (DG) e.g. windmill, small hydro plants or micro-CHP.

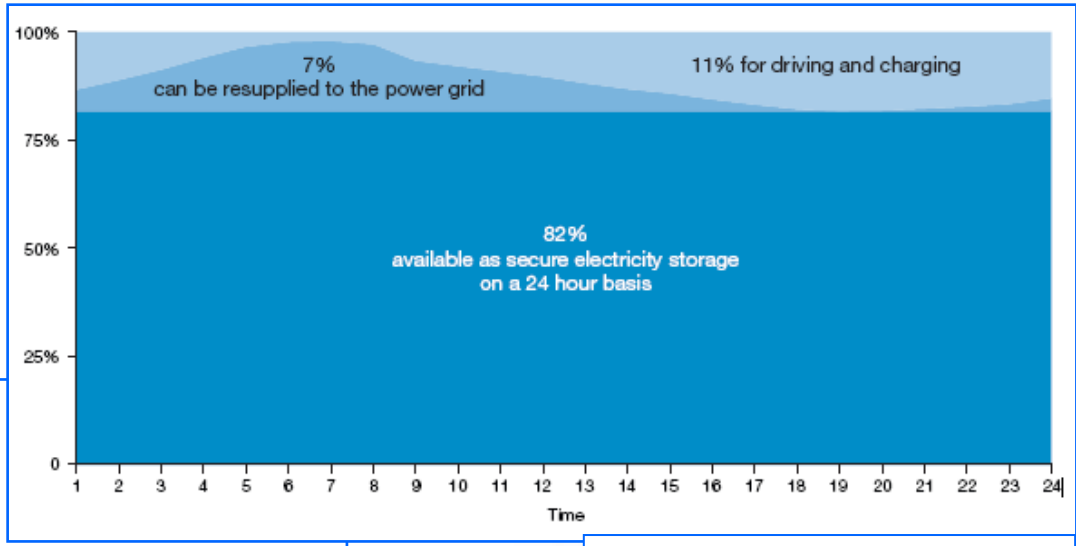
Plug-in Electric Vehicles – Storage and smart consumption

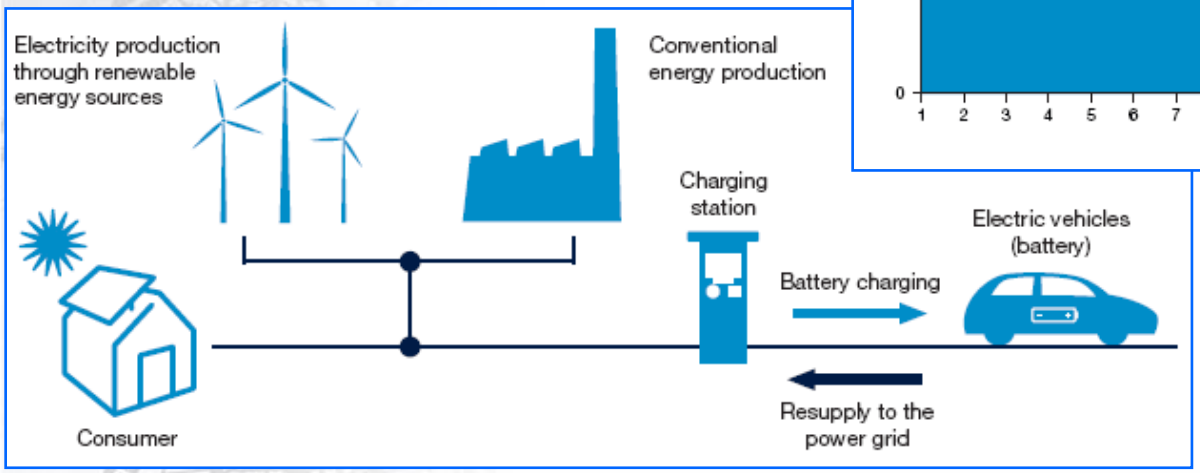
Source: www.moveabout.net

- Plug-in electric vehicles offer potential for distribution storage and leveraging consumption.
- If consumers charge them off-peak and discharge them on-peak, they could (potentially) reduce carbon emissions.
- But still regulatory challenges to avoid increases in peak demand.

Smart Grids, Plug-in Vehicles and Storage

If 20% of cars are electric by 2020 no need for new power plants or grid reinforcements in Austria, a 16% cut in carbon compared to normal cars.





Assumptions on the distribution of daily battery levels required for travelling and charging as well as possible resupply of nonused battery capacities

Source: "The Impact of Electric Vehicles on the Energy Industry", Study by Price Waterhouse Coopers, 2009 in Austria
http://www.klimafonds.gv.at/typo3conf/ext/dam_download/secure.php?u=0&file=758&t=1259701899&hash=b38060d67c38fd6aac897153f213b6de

Some initiatives to make affordable electric cars publicly available

- Already “electric car sharing” in Copenhagen (15 cars), Oslo (45 cars) – book online for hours/days (incl. insurance), car’s “mindbox” collects data www.moveabout.net
- Zero local emissions and energy efficiency 3 times that of normal combustion engine
- Vorarlberg, Austria - 100 (VLOTTE) cars by end ‘09, all energy produced is from RES for charging stations. Rent a mobility card (500 Euro a month), can buy car after 4 yrs at 25% of initial price) www.vlotte.at

Energy Regulator's role in Smart Grids an Climate Change – some examples

- The Regulator controls network tariffs and hence the network operators revenue streams. Regulators can set targets.

Smart Grids:

- Regulators must enable network companies to identify and prioritise specific Smart Grid solutions to meet network users' needs and incentivize them to be deployed.

- Regulators must act as key facilitators of smart grids and find ways of encourage an adequate level and scope of more radical innovation.

Climate Change:

- Regulators can drive energy efficiency – encouraging network companies to focus more on performance, and suppliers to sell less (not more) energy

- Regulators can change basic market rules (e.g. to support renewables)

Smart Grids requires Smart Regulation (1/2)

1. Costs & benefits to be qualified and quantified
   - "Smartness" by smart regulation"
2. Pilot projects and deployment need coordination
3. Know-how
   - Systematic approach
   - Dissemination and follow-up
4. Scope for the deployment
   - be practical, look first to 2020, www.smartgrids.eu

Smart Grids requires Smart Regulation (2/2)

5. Roles & responsibilities
   - Network Operators (TSO / DSOs) as prime movers – they must reinvent how they manage the network using innovative and smart technologies
   - Regulators to take care of customers‘ and society interests (monopoly …)

6. “Activation and intelligence” in distribution and a single, integrated EU grid in transmission (EU‘s 3rd Energy Legislative Package)

7. Criteria for selection of projects, of T/DSOs and for follow-up

9. Smartness should ultimately result in reduced costs, improved efficiency and customer benefits.

How regulators stepped up to the smart grids/climate challenges (1/2)

EU level:

- Regulators are "facilitators" of smart grids: public consultations, workshops (e.g. Smart Grids - June 09, Smart Meters – Dec. 09)
- on Advisory Council of Smart Grid Technology Platform since 2005
- work with European Standards bodies to enable interoperability of smart utility meters
- Numerous reports (and FactSheets) on Smart Metering, Smart Grids, Sustainability etc. on **www.energy-regulators.eu**

How regulators step up to the smart grids/climate challenges (2/2)

At International level:

- Newly created International Confederation of Energy Regulators (ICER) – 200 regulators worldwide (www.icer-regulation.net), chaired by Lord Mogg (also CEER President)
- CEER chairs ICER's Climate Change Working Group
- ICER's first output – World Energy Regulators' Statement on Climate Change contains eight concrete commitments by regulators worldwide (including Energy Efficiency Report to next G8 Ministers' meeting in 2010)

Prospects for the Future (1/2)

- 3rd Package of energy laws adopted (see Annex)
- EU Commission' current "EU 2020 Strategy" consultation to make the EU a "smarter, greener social market"
- EU Commission's new Task Force on Implementation of Smart Grids (end 2009 – mid 2011) to advise the Commission on coordinating first steps of implementation (regulators are fully involved), with a view to defining a Road Map for Implementation by May 2011.

Prospects for the Future (2/2)

- As we look to rebuild our electricity infrastructure to take account of climate change aims, will we simply fix what's broken or will we prepare for a smarter future?

The answer is a smart one!

- Smart grids, coupled with smart regulation, will transform grids, generation, consumer participation in the market in a way we haven't before imagined.

Thank You

Una Shortall
Council of European Energy Regulators
una.shortall@ceer.eu
www.energy-regulators.eu

Annex

Smart Grid is an old / new duty of Network Operators ever since!

- Legal Framework for Smart Grids?
  - "old" Directive 2003/54/EC (Article 3): competitive, secure, environmentally sustainable electricity market; security & quality of supply; **energy efficiency** / demand-side mgmt; **environmental / climate protection**
  - "new" Directive 2009/72/EC (Article §): as above + renewable sources + **environmental goals** + economic infrastructure incentives + **optimizing electricity use** by energy undertakings + **energy services** + **smart grids**
- TSOs
  - "old" Directive 2003/54/EC (Article 9): **adequate transmission capacity** and reliability; **managing energy flows**; **secure, reliable and efficient system**; ancillary services; **information, coordination, interoperability**
  - "new" Directive 2009/72/EC (Article 12): as above + demand response
- DSOs
  - "old" Directive 2003/54/EC (Article 14): **Secure, reliable and efficient distribution system**; priority on **environment & renewables** / CHP; energy efficiency / demand side response; **distributed gen.** supplant for grid expansions
  - "new" Directive 2009/72/EC (Article 25): Same as above

Measure SmartGrids Effect(iveness)

- Reduced carbon emissions and improved energy efficiency;
- Adequate capacity of transmission and distribution grids;
- Enhanced efficiency and better service in electricity supply and grid operation:
  - by using ancillary services across transmission and distribution grids,
  - with integration of balancing markets across the national borders,
  - through active control, automation and management services in distribution grids
  - and by empowering customers through home automation;

Measure SmartGrids Effect(iveness)

- Uniform grid connection and access for all kind of grid users;
- Better security and quality of supply:
  - by well coordinated operation of transmission and distribution,
  - with intelligent preventive and emergency control and coordinated restoration,
  - by operating the grid as “one integrated EU transmission grid” and with adequate reliability and voltage quality;
- Effective support of the electricity market by:
  - load-flow control (e.g. by phase shifters or power electronics)
  - and increasing cross-border interconnection capacities, where it is more beneficial;
- Coordinated grid planning and development through common EU, regional and local grid planning to optimize grid infrastructure