Securing Power during the Transition to Low Carbon Electricity Systems

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13th IEA-IETA-EPRI Annual Workshop on GHG Emission Trading

Paris, 11 September 2013

Outline

- Electricity security
- Climate policies
- Flexibility
- Capacity markets

Electricity security

Fuel Security

- Ensure continued fuel supply of gas, coal and uranium

Adequacy

- Generation capacity
- Network infrastructure

System Security

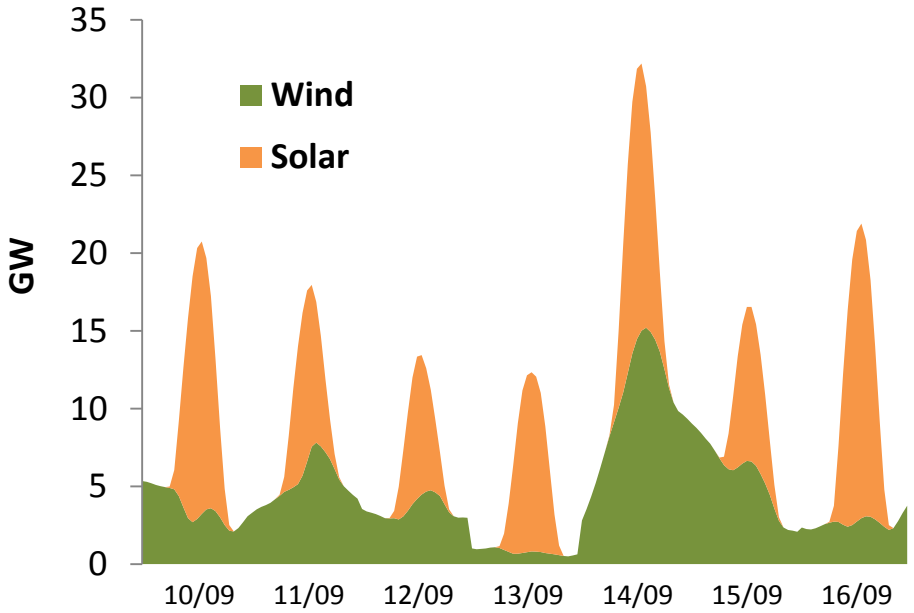
- Network operations
- Emergency protocols

Low-carbon policies have engendered uncertainties

- Carbon price (in)stability
- Energy efficiency policies
- Pace of renewable deployment
- Carbon emission standards
- Global climate negotiations

Renewable energy variability

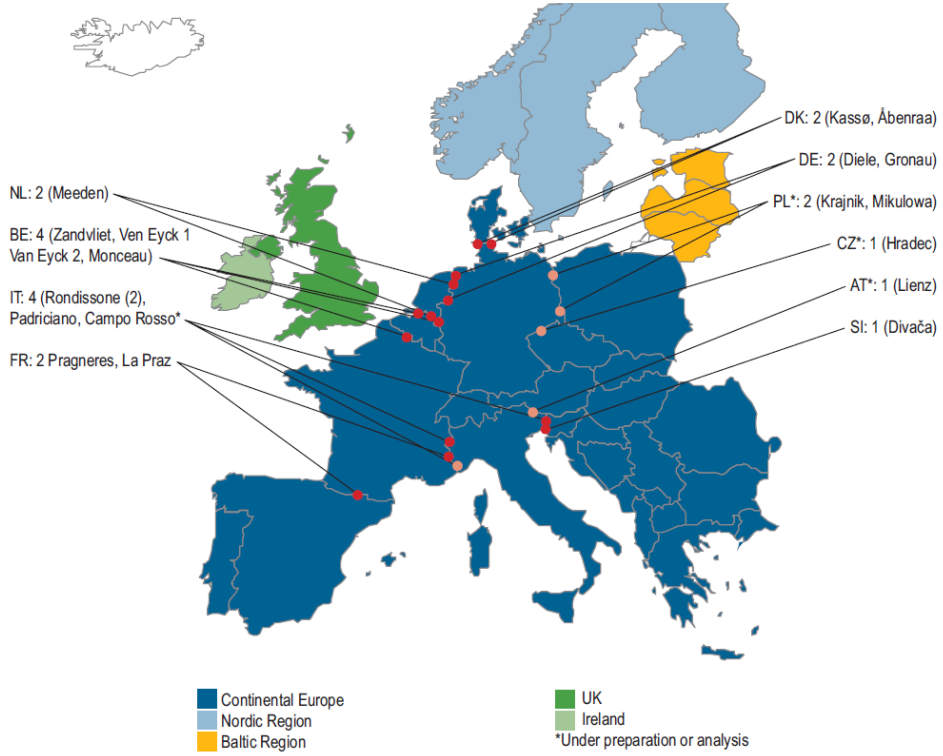
Germany, wind and solar power generation, 10-16 September 2012



Quick deployment of wind and solar power raises new challenges

Controlling power flows

Phase- shifting transformers installed in the EU at a selection of borders



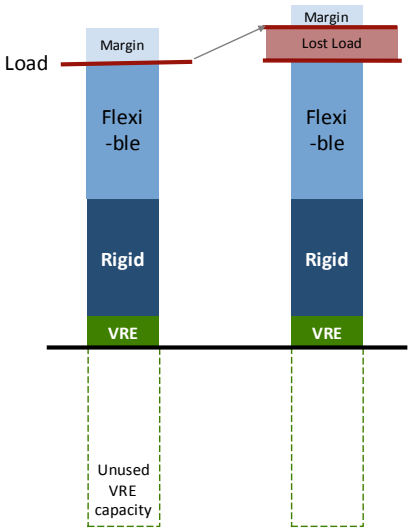
Source: Data provided by NRAs through the ERI (2012) and information from CEE NRAs (presentation at the ACER Workshop on Unplanned Flows, June 2012).

National TSOs install equipments to control flows at borders

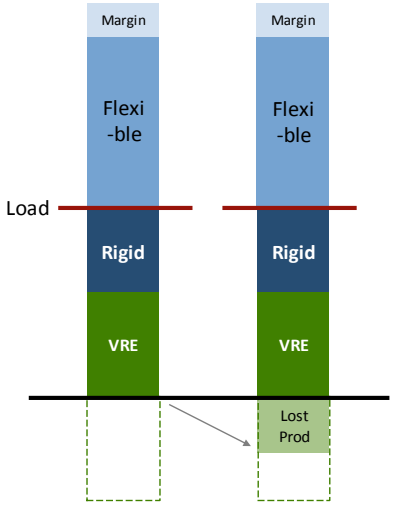
What kind of flexibility is needed?

Overview of operating challenges with high shares of variable renewable energy

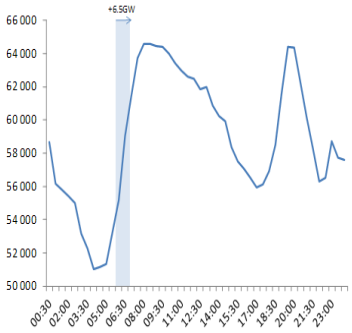
Peak load adequacy



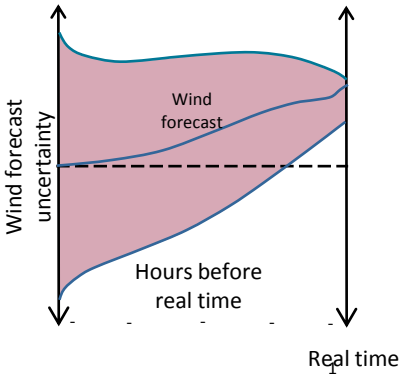
Minimum load balancing



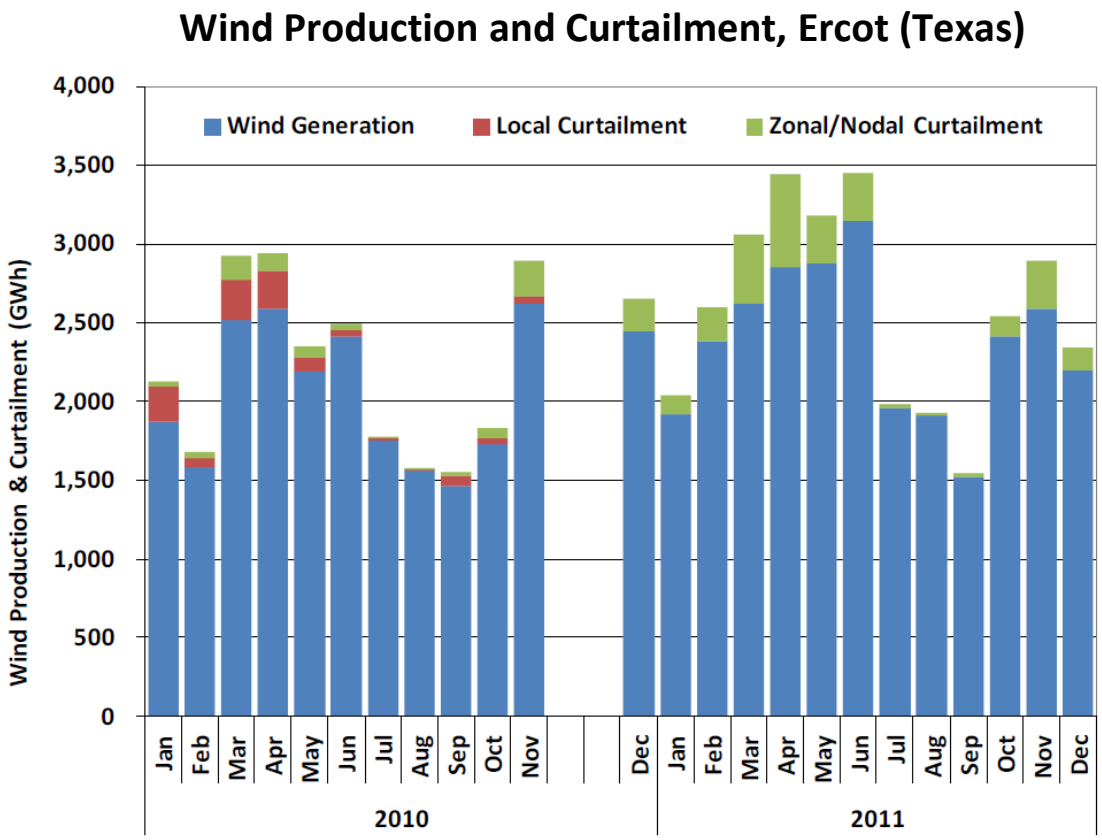
Ramp rates of residual demand



Predictability of renewables



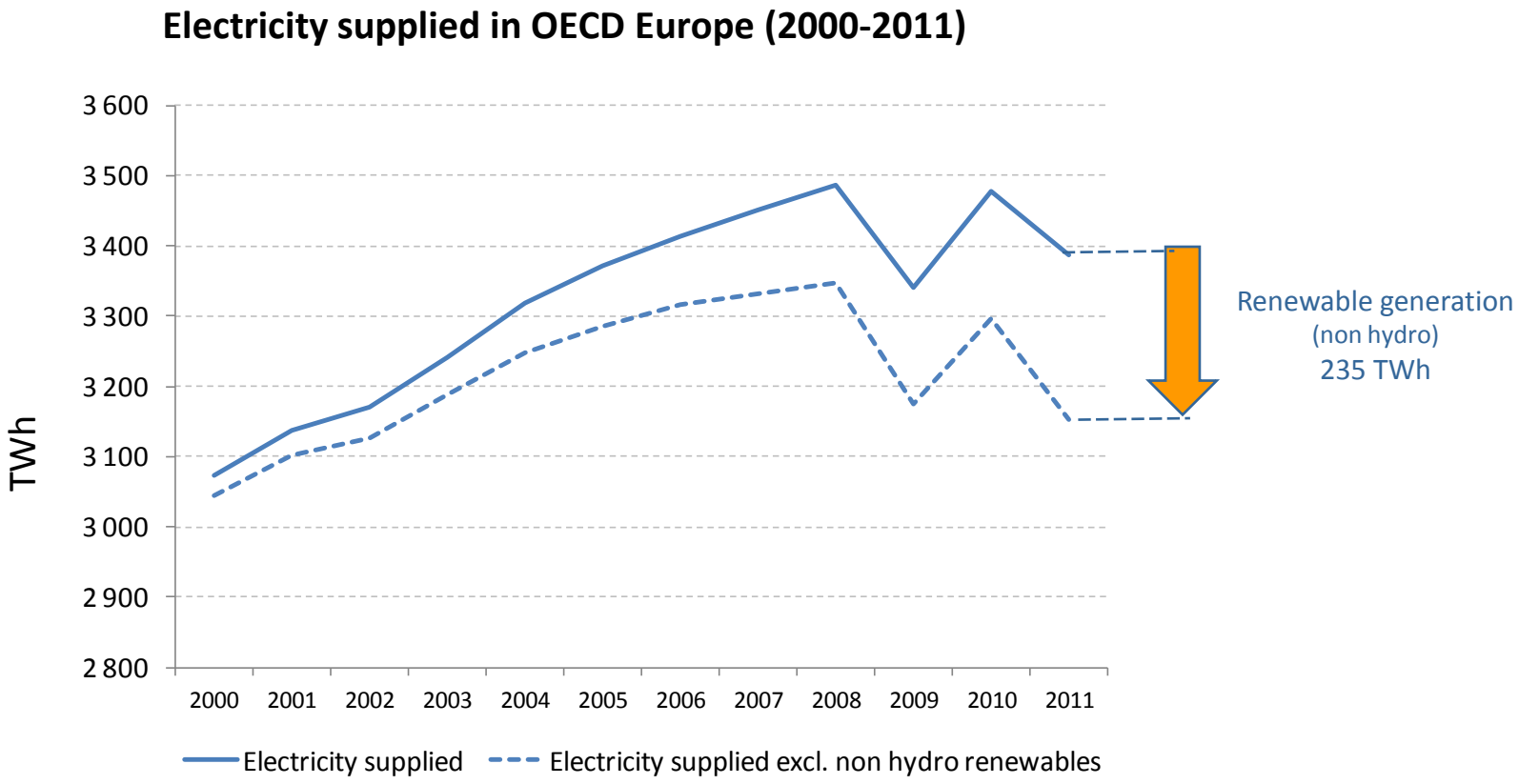
Wind and solar power plants will need to provide flexibility in order to secure system operations



Source: Potomac Economics, ERCOT SOM report 2011

A market platform for flexible services can create a level playing field for all technologies, including renewables

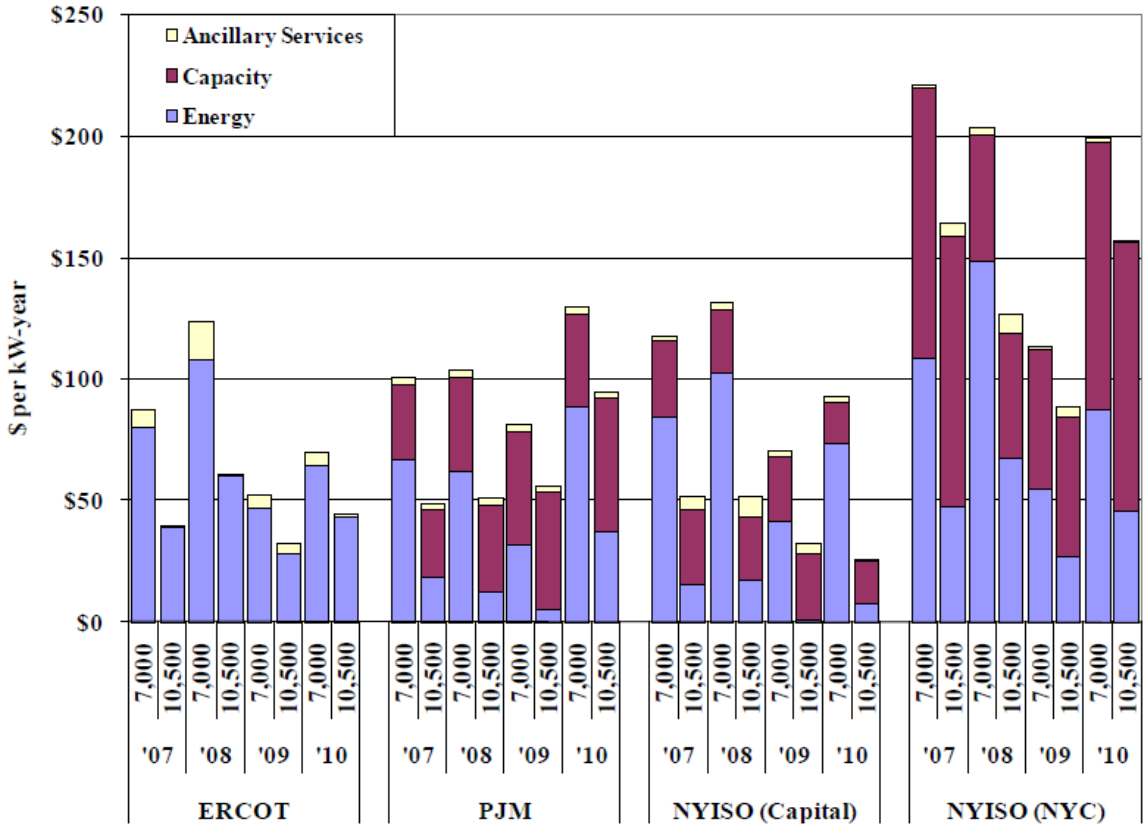
Does Europe need new investments?



In Europe, 'residual' electricity supply (i.e. net of non-hydro renewables) decreased by 6% between 2008 and 2011

Power plant revenues (US markets)

Figure 34: Comparison of Net Revenue of Gas-Fired Generation between Markets



Source: Potomac Economics

Options to address generation investment and operations issues

Basic package

Possible optional measures

A Improved climate and low-carbon policies

- Improve certainty/credibility of energy policies
- Design of low carbon support instruments

Ex:
- UK carbon price floor
- US Clean Energy Standards
- Renewable premium in Germany

B Better energy markets

- Remove restrictions on electricity prices
- Locational Marginal Pricing (LMP)
- Develop missing markets
- Integrate day ahead, intraday, balancing and reserve markets

Ex: ERCOT, ISO-NE, Australia

C Standards & Procedures

- Reliability criteria
- Generation adequacy forecasts (planning)
- Technical flexibility and controllability requirements

D Targeted contracting

Contracts to:
- avoid mothballing of existing assets
- trigger new investments
- relieve congestions
- promote demand side response

Ex: Strategic reserve

E Market-wide capacity mechanism

- Capacity payments
- Central buyer of capacity
- Decentralised capacity market
- Combined capacity and flexibility market

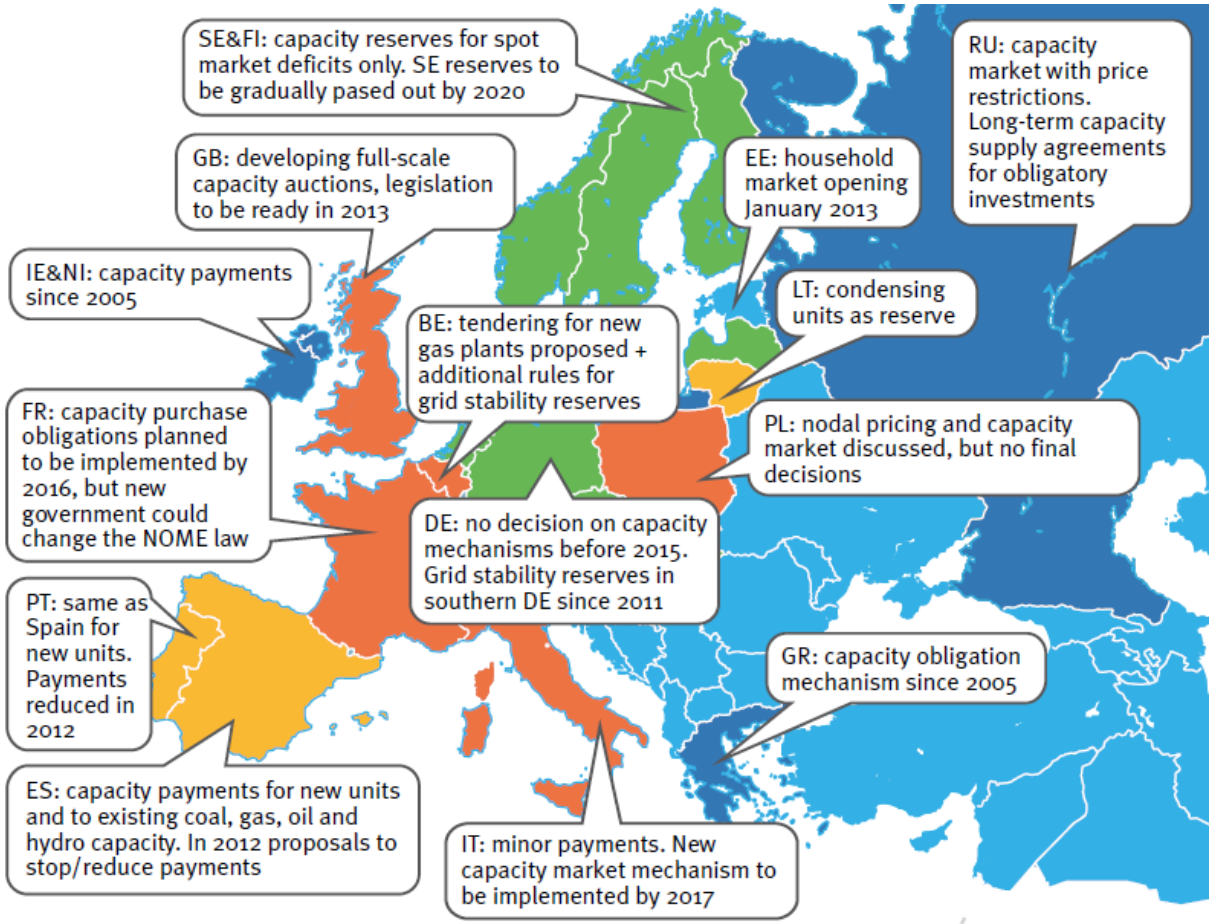
Ex: PJM, ISO-NE, Spain, France

Concluding comments

- **Stable and predictable climate policies would solve some the power investment problems**
- **Increasing shares of wind and solar power exacerbates the investment issues**
- **Capacity arrangements can create a safety net to cope with uncertainties caused by climate policies**

Back-up

Capacity remuneration mechanisms across Europe



*) No capacity payments to power plants in the day-ahead and intraday market, but balancing market reserve capacity is contracted in advance

Source: Eurelectric

Inexistent coordination of capacity mechanisms