A European Supergrid
Harnessing Europe’s largest domestic energy resource

Paul Wilczek
Regulatory Affairs Advisor
European Wind Energy Association

Outline:

• Market development of wind power generation and outlook

• Current shortcomings in grid development and market design

• What is needed for a future European Supergrid

• Conclusions
EU member state market shares for new capacity installed during 2009. Total 10,163 MW

- Spain 24% (2,459 MW)
- Germany 19% (1,917 MW)
- Italy 11% (1,114 MW)
- France 11% (1,088 MW)
- U.K. 10% (1,077 MW)
- Portugal 7% (673 MW)
- Sweden 5% (512 MW)
- Denmark 3% (334 MW)
- Ireland 2% (233 MW)
- Poland 2% (181 MW)
- Other 6% (575 MW)
EU member state market shares for total installed capacity (2009). Total 74,767 MW

- Germany 34% (25,777 MW)
- Spain 26% (19,149 MW)
- Italy 6% (4,850 MW)
- France 6% (4,492 MW)
- U.K. 5% (4,051 MW)
- Portugal 5% (3,535 MW)
- Denmark 5% (3,465 MW)
- Netherlands 3% (2,229 MW)
- Sweden 2% (1,560 MW)
- Poland 1% (725 MW)
- Ireland 2% (1,260 MW)
- Other 5% (3,675 MW)
Share of new EU power capacity installed during 2009 (MW)

- Wind: 39%
- Natural Gas: 26%
- PV: 16%
- Other gas: 0%
- Fuel oil: 2%
- Coal: 9%
- Nuclear: 2%
- CSP: 1%
- Waste: 2%
- Geothermal: 0%
- Small Hydro: 0%
- Large Hydro: 1%
- Ocean: 0%
- PEAT: 0%
New installed capacity and decommissioned capacity in EU 2009
Net electricity generating installations in EU 2000 - 2009
EWEA targets in the EU up to 2020 and 2030

Two Scenarios up to 2020:

“Baseline” Scenario: 230 GW installed capacity, of which 40 GW is offshore. 580 TWh, 14.2% of EU electricity demand.

High Scenario: 265 GW installed capacity, of which 55 GW is offshore. 681 TWh, 16.7% of EU electricity demand.

Target for 2030:

400 GW, of which 150 GW is offshore. 1150TWh, 26.2-34.3% of EU electricity demand.
Backdrop

Large amounts of new spatially uncorrelated variable output generation bring new challenges at a European scale:

• Transmission network infrastructure is relatively weakly interconnected and increasing wind power generation causes significant effects on crossborder flows;
• Power market design is not optimally suited for RES integration; inefficiency of cross border allocations and lack of flexibility in time
• Desirable improvements go hand in hand with creation of single European electricity market
• The network and market aspects of largescale wind power integration had not been studied before at a European level.

TradeWind (and the parallel EWIS study) pioneering in this respect.
Momentum for grid development is evident:

**Highlights: Offshore Transmission projects and initiatives**

- September 2009 EWEA “Offshore Network Development Master Plan”
- North Seas Countries Offshore Grid Initiative signed by 10 countries
- EC Blueprint for an Offshore Grid as part of an Infrastructure Package under preparation
- First ENTSO-E TYNDP

**Grid infrastructure projects:**

- UK/Norway under consideration
- NorGer - Germany/Norway (private consortium)
- Krieger’s Flak (Denmark/Germany – Sweden on hold) with EERP financing
- Cobra cable (Netherlands/Denmark) with EERP financing and possibly as a “plug-in” solution for offshore wind farms in German waters
- East-West interconnector, EIB loan (Ireland/Wales)
- BrtitNed, EIB loan (UK/Netherlands)
- Skagerrak 4 (Denmark/Norway)
Kriegers Flak: Still a European flagship project?

Previous plans:
- Three wind farms
- Connected to Sweden, Germany and Denmark
- 1.6 GW
- Three TSOs: Vattenfall, Energinet.dk and Svenska Kraftnätt

Source: Kriegers Flak progress report
A European Supergrid

What is needed from the European stakeholders (+TSOs and Regulators):

• A European approach towards an optimised European electricity system should be promoted.

• Acknowledge that a European Supergrid will be beneficial rather than costly for consumers.

• Design and implement schemes that favour investment decisions, and ensure a cost recovery for the investors, especially on cross-border projects, which require a more coordinated approach.

• Coordination is critical for tackling the challenges of potential distortions created by different interconnection and transmission regimes.
Conclusions

• A coordinated System Development should be achieved: Transmission jointly with generation

• In a pragmatic, modular way based on:
  o Existing TSO plans and projects under study
  o Ambitious RES generation targets
  o Relevant studies: e.g. Offshore Grid, TradeWind, EWIS with its key findings:

  – Reinforcing the transmission corridors will significantly reduce operational costs of power generation
  – Wind power brings firm capacity, these benefits can be enhanced by better interconnection
  – A dedicated meshed offshore grid has significant economic value for Europe because it enables offshore wind and enhances trade
Further work needed in the following areas

• More detailed network representations to study reinforcements within the countries, also to interface with the offshore grid

• Other aspects should be entered in the equation, such as the role of other renewables, demand side management, and the interactions between transmission and more active and smart distribution grids.
Thank you very much for your attention
EWEA’s 20 year offshore network development plan

- All necessary grid updates to transport all electricity produced by planned, proposed, under construction and operating offshore wind farms to European electricity consumers in an economically sound way
- Recommends building a transnational offshore grid infrastructure to connect:
  - 40 GW by 2020
  - 150 GW by 2030
EWEA’s 20 year offshore network development plan

• Based on:
  - Existing TSO plans
  - TradeWind scenarios

• Added value of plan:
  - Provides step by step timetable for grid development
  - Suggested capacities
  - Integrated with development/concession zones
Offshore grid design

• **Lines/branches:** submerged HVDC cables characterised by transmission capacity,

• **Offshore nodes:** offshore platforms containing HVDC conversion equipment, switchgear etc. to serve as:
  – common connection points for a number of offshore wind farms;
  – common connection points for a number of other marine generators; and
  – intersection (junctions) of network branches.

• **Onshore nodes:** connection points to interconnect the offshore transmission grid to the onshore transmission grid.
EWEEA’s 20 year offshore network development plan

Source: EWEA 2009