European Wind Integration Study (EWIS)
Towards a Successful Integration of Wind Power into European Electricity Grids

EWIS Concluding Discussion
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Approach and Scenarios
Mr. Hermann Egger
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Objectives

• For the EWIS 2015 analysis, the goal was to bring common pan-European recommendations on how to best integrate wind power into the European grid.

• To facilitate this, European-wide scenarios were derived to analyse the impact of wind generation on the future grid.

• These scenarios and associated market simulations enabled the assessment of:
  – wind power production,
  – production from conventional power plants and the
  – exchange schedules.
European Wide EWIS Market Model

Point-in-time snapshot scenario analysis in the context of Year-round runs
- Statistics of cross-border congestion
- Marginal values for reinforcements
- Cost analysis

⇒ Results of Point-in-time scenarios are used for detailed network physics power flow calculations
**Statistical approach**

Year-round runs of the market model with PTDF-approximated cross-border flows
- permit a statistical analysis of congestion on borders
- offers information concerning which options may be economic to reinforce.

**Time field of observation**
**Statistical approach**
- *Results of the Market Model i.e. for Germany*

**DE – Nordic interconnectors**
- Transit from Germany to Denmark, Norway and Sweden

- Exchange partly not wind driven
- High exchange schedules at low NTC limits on DC connections
- DK and SE: Day/night volatilities with potential for wind power regulatory
- PL and CZ: Physical flows result from market driven southbound transit
- Mitigation measures on PL and CZ borders would increase inner German transit and DE-AT exchange

**DE-AT and DE-CH interconnectors**
- Connections to the south mostly used southbound
The integration of wind power 2015 is achieved through a massive adjusted dispatch of generation.

The surplus of wind power expected in 2015 will be balanced widely within the market areas described in 2015 scenarios.

⇒ Surplus of wind power provides benefits...
...avoiding emissions: Point-in-Time investigations from the market perspective underline that

⇒ CO2 emitting coal and gas production will be displaced partly
**Point-in-time approach**

- **Results of the Market Model** -

  - Wind power installations expected in 2015 in some areas are significant in terms of national load, i.e. ES up to 78%, DE up to 80%, and DK-W above 100%

  Analysis of exchange schedules on interconnectors at a high wind situation in northern Europe

  - Interconnectors: Cross border pinch-points
  - Exports to all neighbours, except DK-W
  - Transmission capacity: Fully loaded, exchange schedules at maximum capacity, except DK-W

  ⇒ Effects of wind to be checked on increased cross-border capacities
Well interconnected markets support wind power integration

High wind situation in north EU

- i.e. Germany
  - High wind power penetration 80% [1]
  - 40,7 GW wind power at 50,7 GW national load
  - Gas, coal and lignite substituted
  - Net exports to neighbours 14 GW

High wind situation in south EU

- i.e. Spain
  - High wind power penetration 78 % [1]
  - 22,4 GW wind power at 28,7 GW national load
  - Gas, coal and nuclear substituted
  - Wind power curtailment 2,4 GW
  - Net exports to neighbours 1,35 GW (France, max.)

[1] share of wind power production/load
Summary: The EWIS investigations from the market perspective underline

- The surplus of wind power expected in 2015 will be balanced widely within the market areas described in the scenarios.
- The integration of wind power 2015 is achieved through a massive adjusted dispatch of conventional generation:
  - Parts of the CO2 emitting coal and gas production will be displaced.
  - Few areas require wind curtailment.

- Well interconnected markets support wind power integration.
- Benefits of a potential network enhancement are seen as useful:
  - EWIS economic analysis identified candidate measures.
  - Further work focusing regional demands is required.