

European Wind Generation

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Agenda

- ◆ European Network of Transmission System Operators for Electricity (ENTSOe)
 - ◆ Objectives of the organisation
- ◆ System Operations Committee
 - ◆ Workshop on Operational Challenges of Wind Power
 - ◆ European Wind Forecasting
 - ◆ European Transmission Reinforcement
 - ◆ European Technical Requirements
 - ◆ TSO coordination & Information Sharing
- ◆ Conclusions

ENTSOe



european network of
transmission system operators
for electricity

HOME

SYSTEM DEVELOPMENT

SYSTEM OF



We are the European TSOs.

42 TSOs from 34 countries. Replacing all 6 existing European TSO associations. With important new roles in the 3rd EU Energy legislative package. Active already before the package is in effect. We are ENTSO-E.

<http://www.entsoe.eu/>

◆ 6 predecessor associations.

◆ ATSOI

◆ BALTSO

◆ ETSO

◆ Nordel

◆ UCTE

◆ UKTSOA

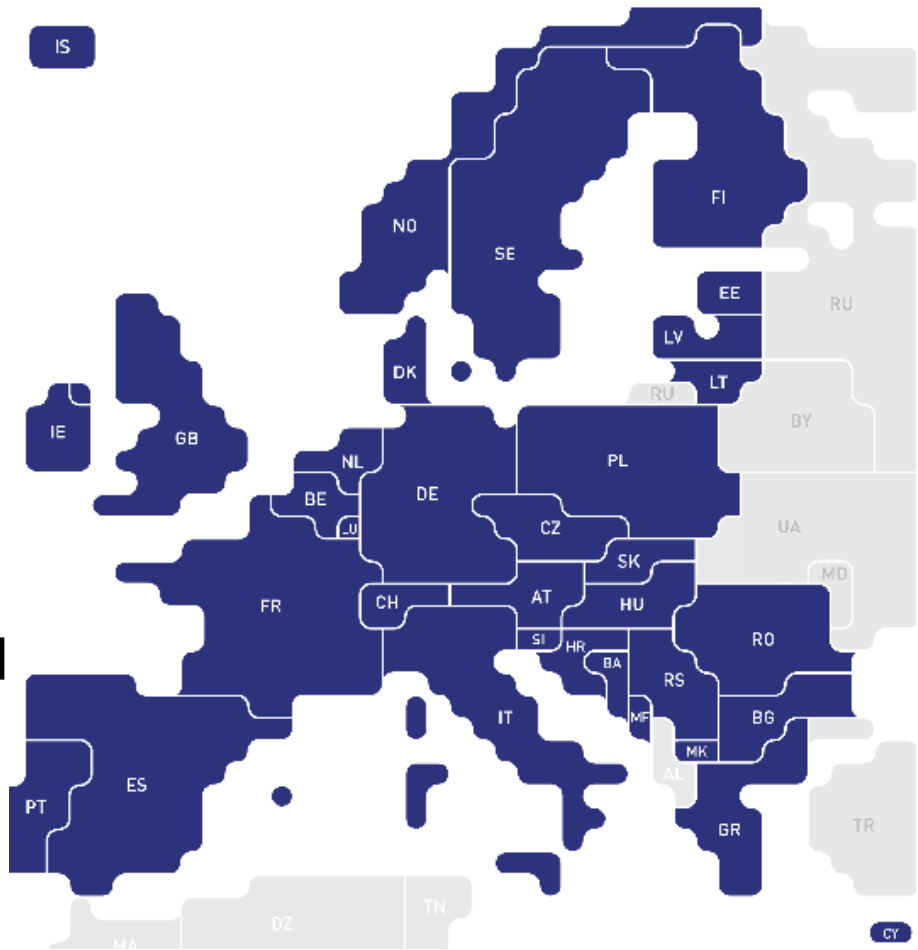
◆ Fully operational from July 09

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ENTSOe

- ◆ 42 TSOs from 34 countries
- ◆ Three main committees
 - ◆ System Operations
 - ◆ System Development
 - ◆ Market
- ◆ National Grid representation
 - ◆ Position on Governing Board
 - ◆ Representation on all committees



<http://www.entsoe.eu/association/members/>

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Purpose:

- ◆ Pursue the co-operation of the European TSOs both on the pan-European and regional level.
- ◆ Promote the TSOs interests.
- ◆ Have an active and important role in the European rule setting process in compliance with EU legislation.

Objectives

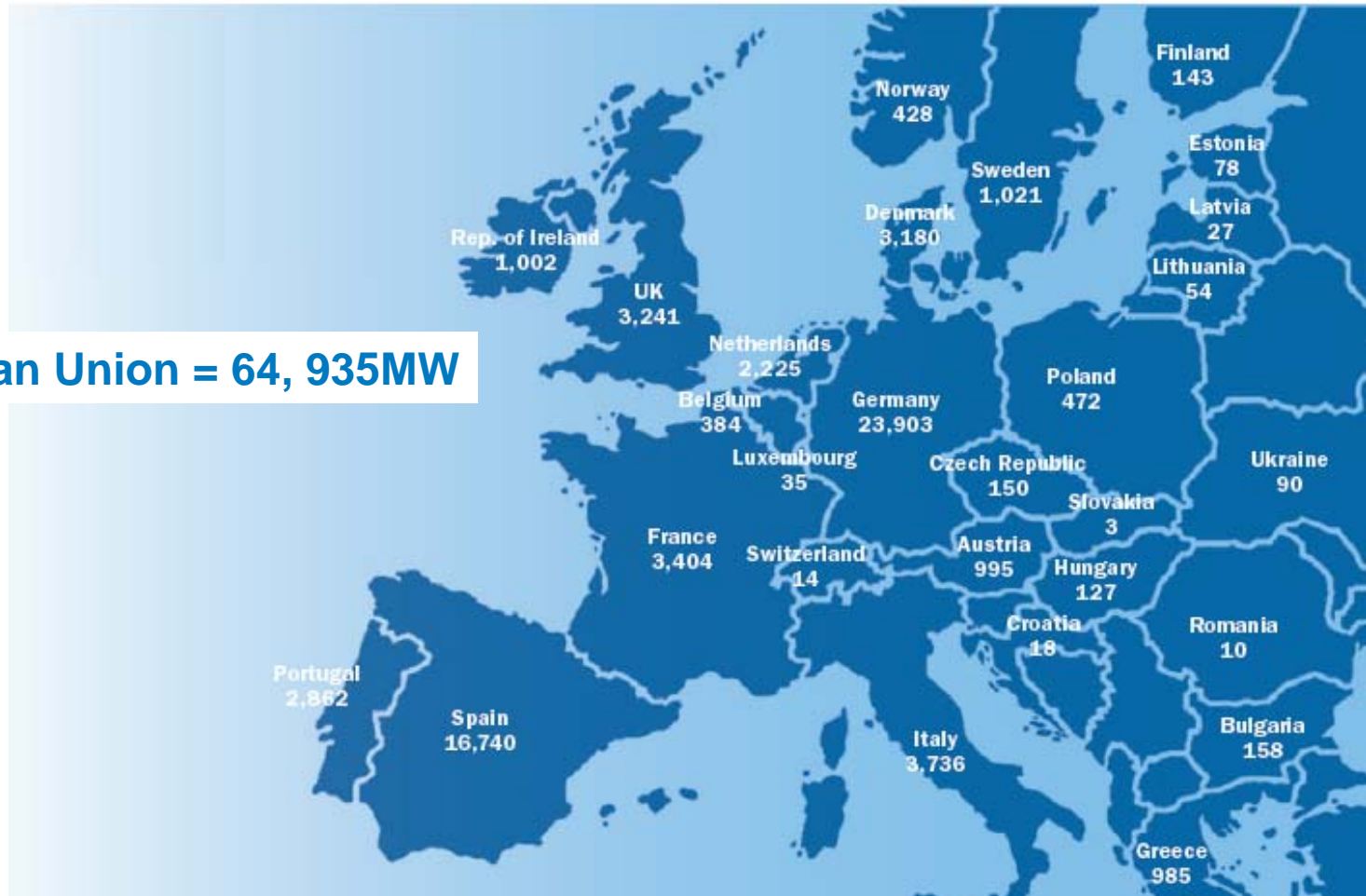
- ◆ Promote the reliable operation, optimal management and sound technical evolution of the European electricity transmission system in order to ensure security of supply and to meet the needs of the Internal Energy Market.

Operational Challenges of Wind Power

Operational Challenges of Wind Power

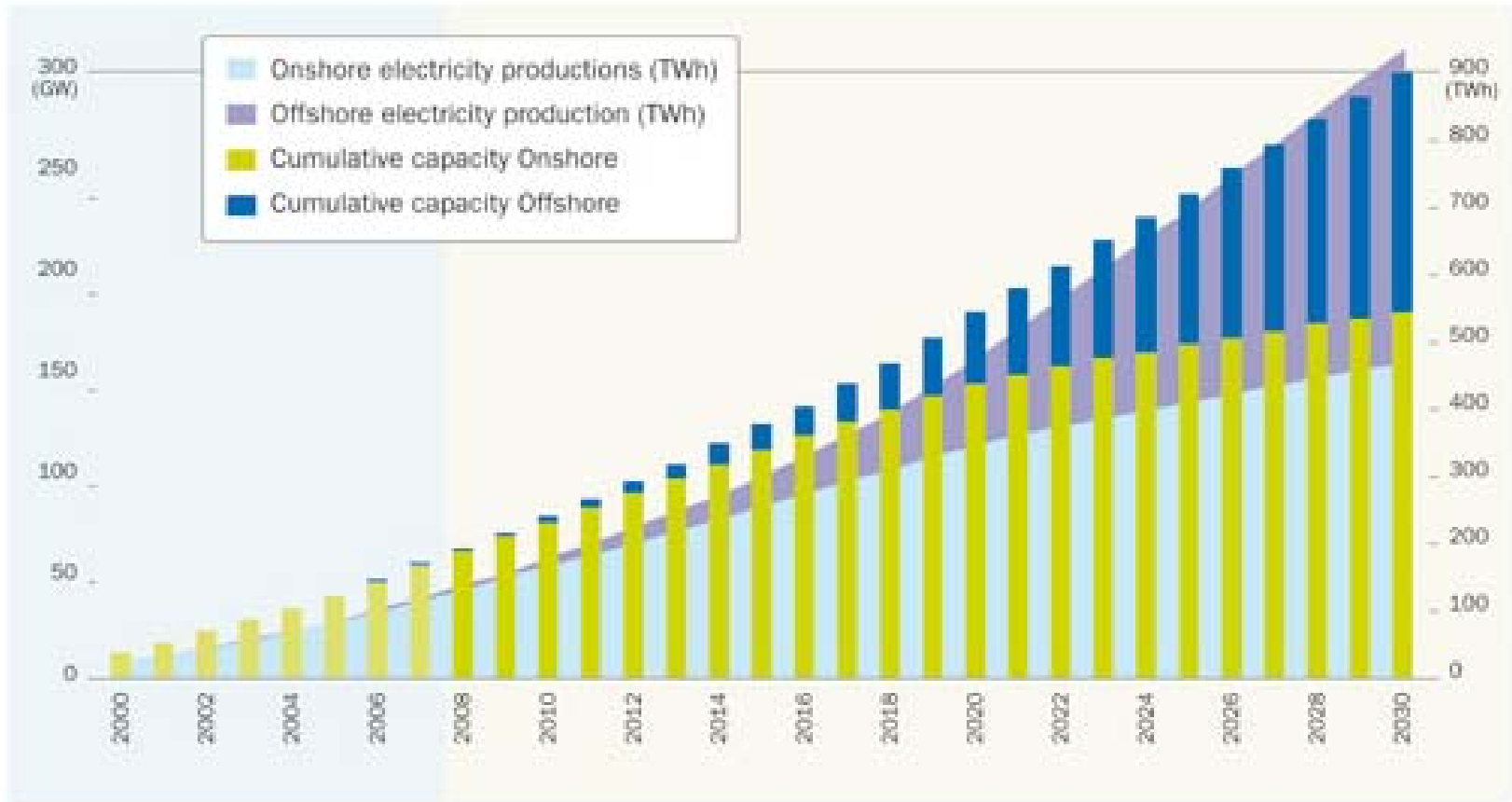
◆ European Wind Capacity (end of 2008)

European Union = 64, 935MW



Operational Challenges of Wind Power

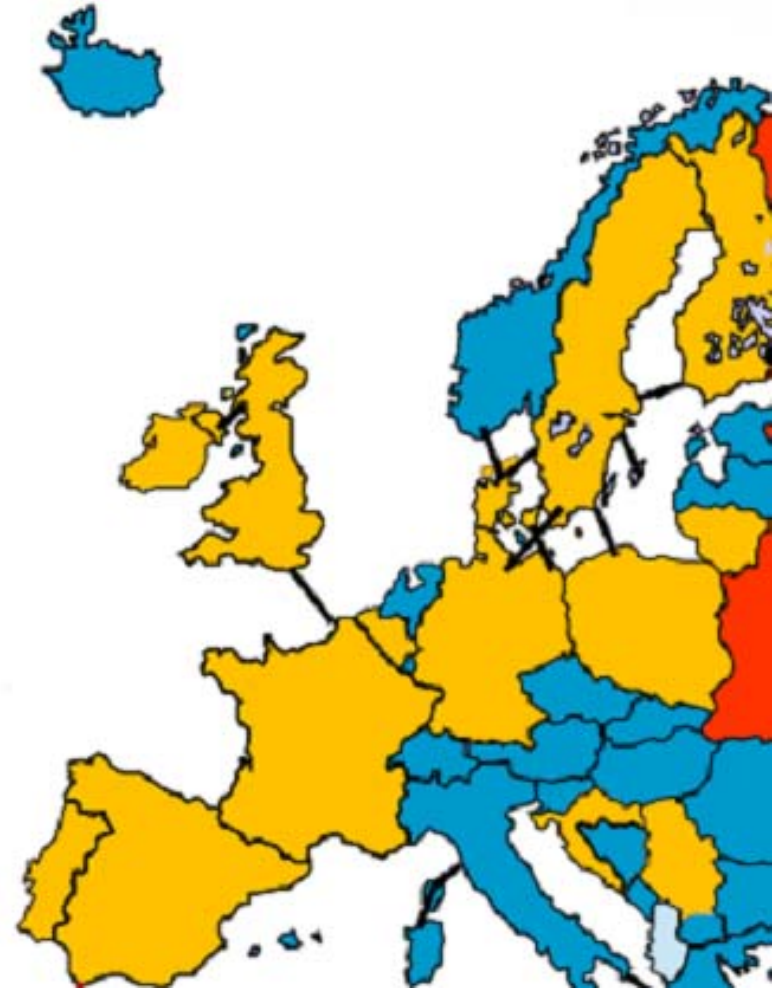
- ◆ Significant future growth in wind capacity across EU



<http://www.ewea.com/>

Operational Challenges of Wind Power

- ◆ ENTSOe - System Operations Committee
 - ◆ Workshop (2 day) on Operational Challenges of Wind Power
 - ◆ 22nd June 2009, Madrid
- ◆ Good attendance
 - ◆ >80% of installed EU wind capacity operated by TSOs
- ◆ Various conclusions from workshop for further focus.



 = Attended Workshop

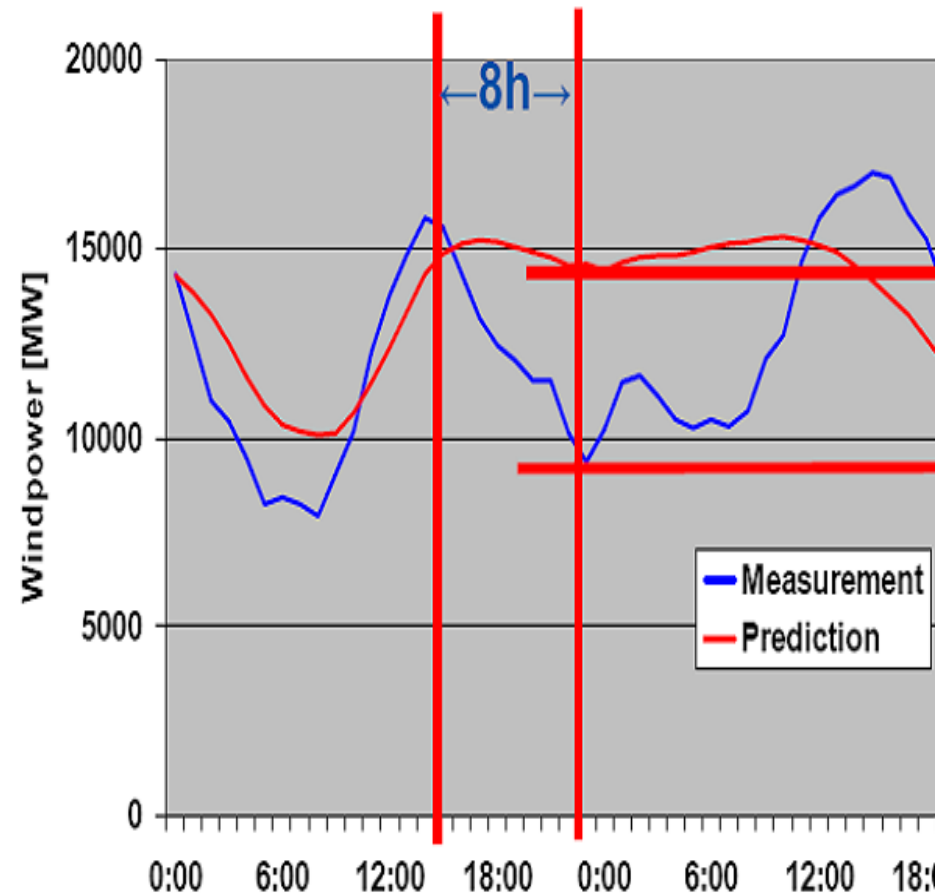
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Main Themes from Workshop

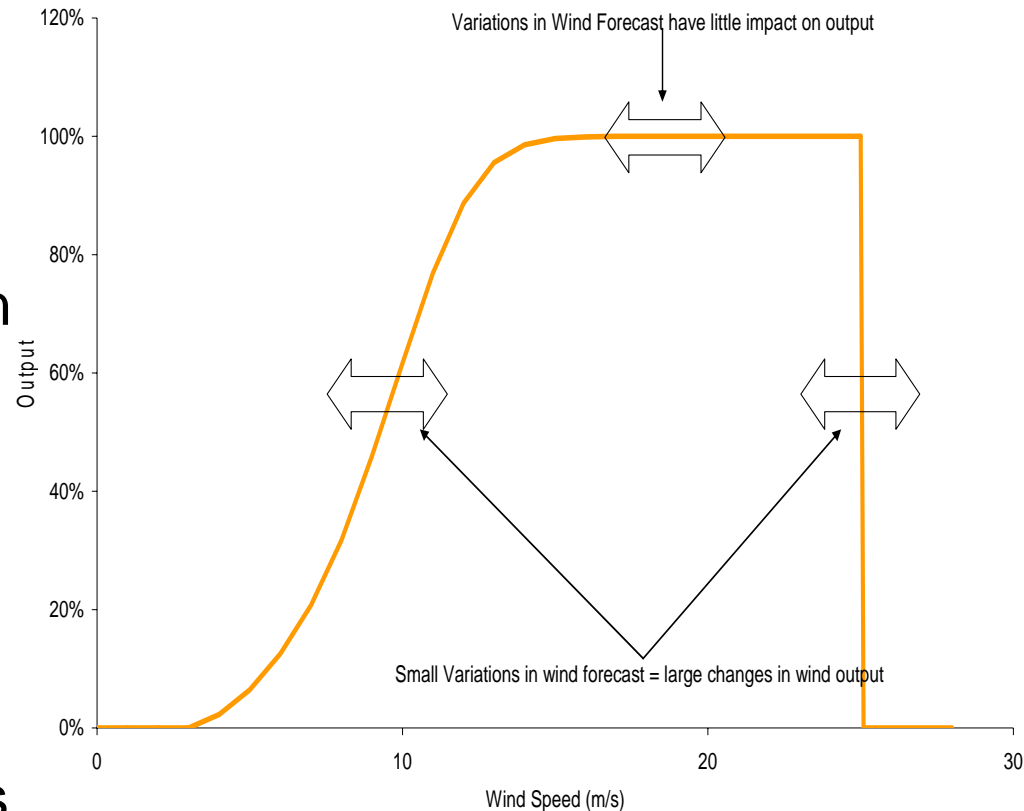
European Wind Forecasting

- ◆ Wind Forecasting Themes
 - ◆ Majority of time the wind forecast vs. actual has low errors
 - ◆ Should expect large errors 1 or 2 days a year
- ◆ Deviations from Forecast
 - ◆ Occur over hours i.e. not a response issue
 - ◆ Responsibility to balance depends on market structure
 - ◆ GB has a 1 hour gate



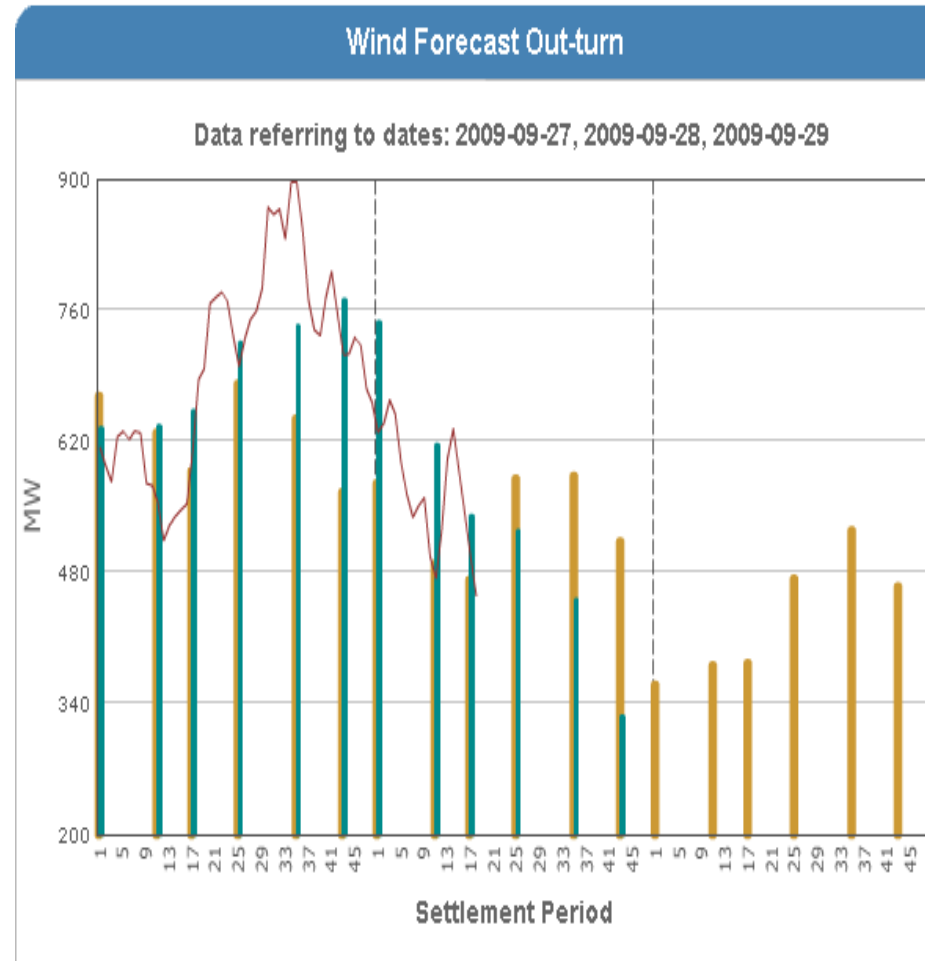
European Wind Forecasting

- ◆ Main areas of future focus
 - ◆ Improvements in meteorological forecast (focusing on startup and cut off wind speeds) improve system operation
 - ◆ Sharing online measurements (where applicable) and relevant forecasts
 - ◆ Joint development of forecast models and tools



European Wind Forecasting

- ◆ National Grid Focus
 - ◆ Publish forecasts to the market
 - ◆ Review new wind forecasting applications
 - ◆ Additional incentive schemes
 - ◆ Persistence forecasting for Control Room
 - ◆ OC2 Margin forecasts
 - ◆ Modification Proposal P243



<http://www.bmreports.com/>

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European Transmission Reinforcement

European Transmission Reinforcement

- ◆ Studies indicate
 - ◆ Significant transmission reinforcement required for managing future wind
 - ◆ Interconnection between regions mitigates risks
 - ◆ Market integration and harmonisation of rules mitigates risks
- ◆ Effectiveness depends on scale
 - ◆ National to Regional to Inter-Regional



Figure 24: Changes of electrical power transmission in UCTE Scenario North

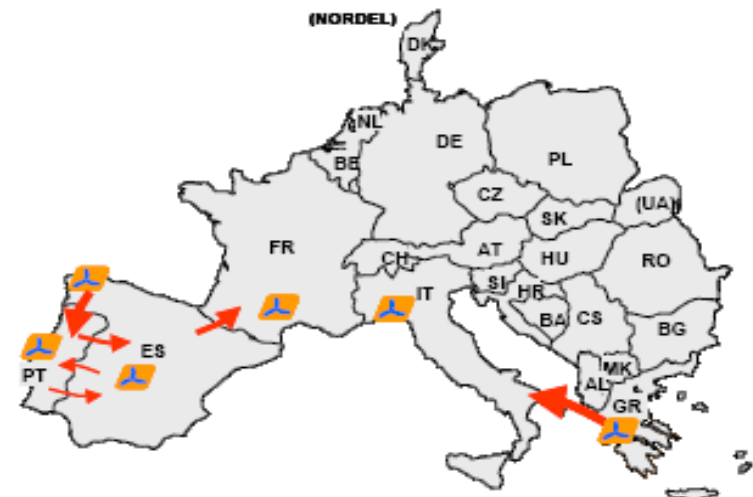
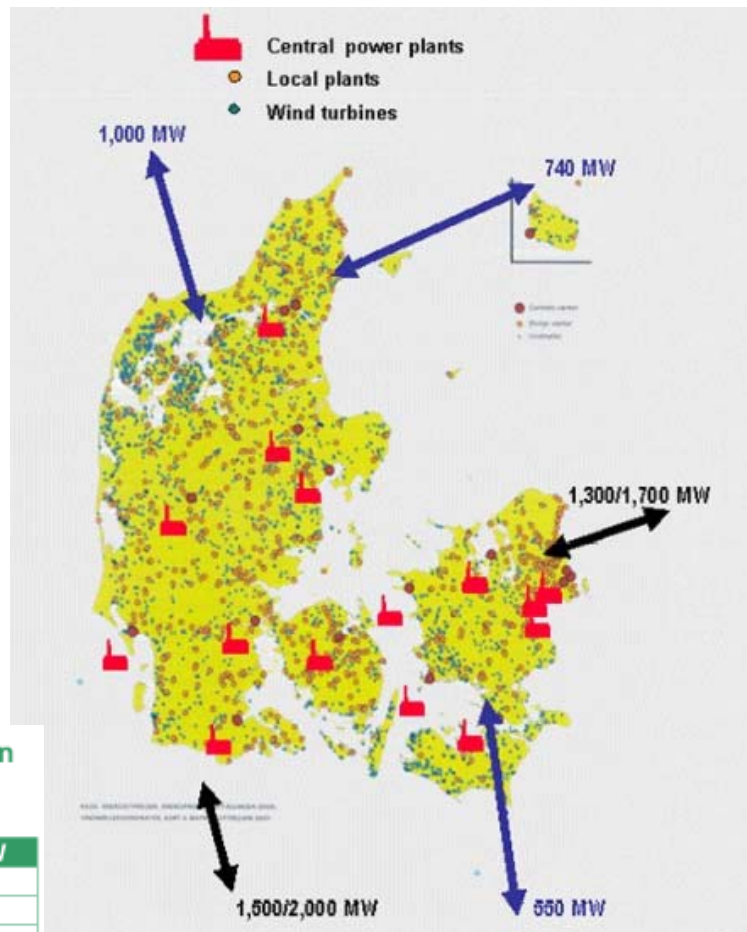


Figure 25: Changes of electrical power transmission in UCTE Scenario South

European Transmission Reinforcement

- ◆ Denmark TSO overview
 - ◆ High wind capacity relative to demand
 - ◆ High Interconnector capacity relative to demand
 - ◆ Collaboration with other TSOs to ensure stable operation



Western Denmark

Peak load	1.250 - 3.700 MW
Central power plants	3.400
Local CHP	1.700
Wind Power	2.400

Eastern Denmark

Peak load	880 – 2.600 MW
Central power plants	3.800
Local CHP	650
Wind Power	750

<http://www.e-pages.dk/energinet/137/>

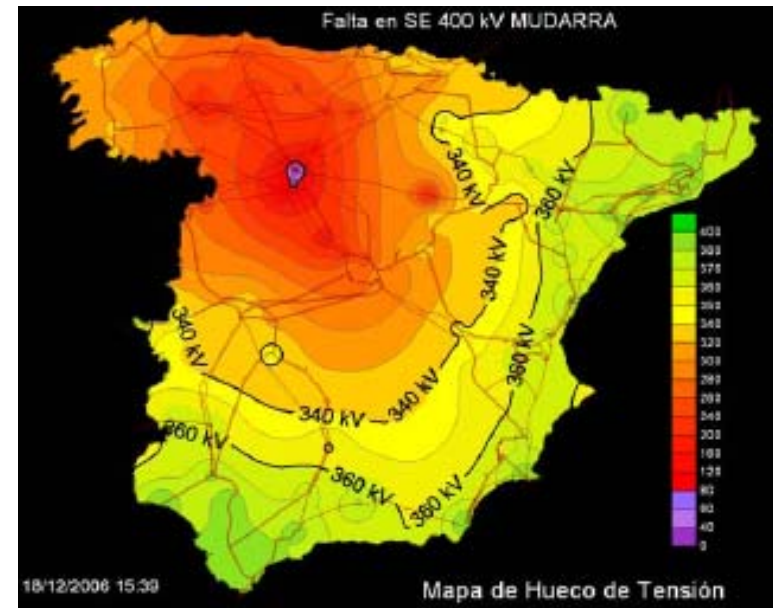
European Transmission Reinforcement

- ◆ National Grid Perspective
 - ◆ GB Interconnection with Europe is increasing
 - ◆ BritNed (HVDC between GB and Holland)
 - ◆ East – West (HVDC between GB and Republic of Ireland)
- ◆ Common rules between TSOs being investigated
 - ◆ Emergency Assistance
 - ◆ Accessing Short Term Operating Reserve
 - ◆ Dynamic Response
 - ◆ Black Start via HVDC (depends on technology)

European Technical Requirements

European Technical Requirements

- ◆ Fault Ride through
 - ◆ Spanish experience of voltage dips tripping wind farms
- ◆ Reactive support
 - ◆ Various TSOs reported issues
- ◆ Fault levels
 - ◆ Generally lower fault levels with wind turbines
- ◆ System Inertia
 - ◆ Lower inertia when wind replaces conventional generation



European Technical Requirements

- ◆ National Grid Focus
 - ◆ Rigorous testing against Grid Code requirements
 - ◆ Reactive range
 - ◆ Step change response
 - ◆ Frequency response

- ◆ Future Focus
 - ◆ System Fault levels
 - ◆ System Inertia Requirements *

Grid Entry Point voltage
(or User System Entry Point voltage if Embedded)

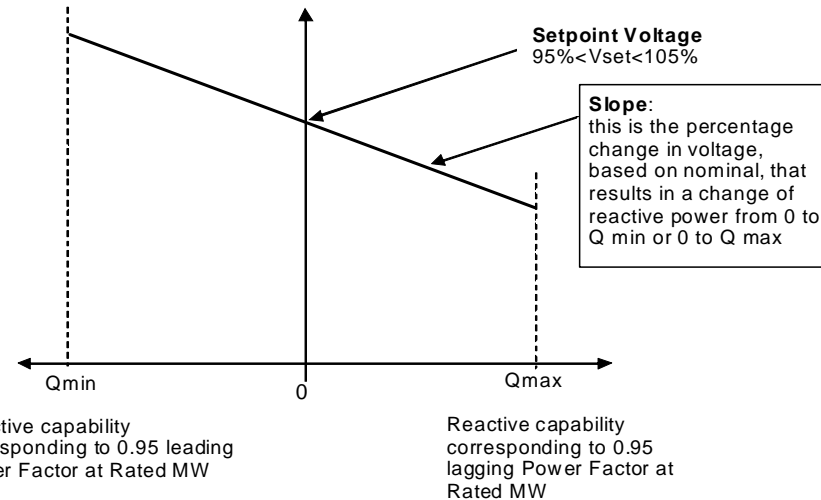
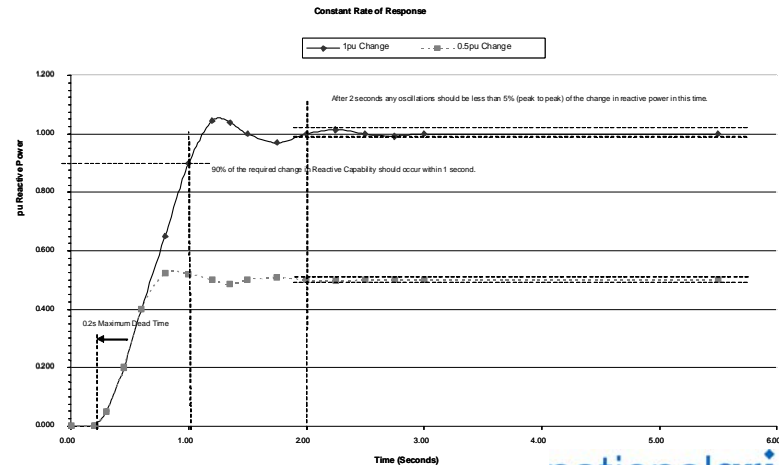


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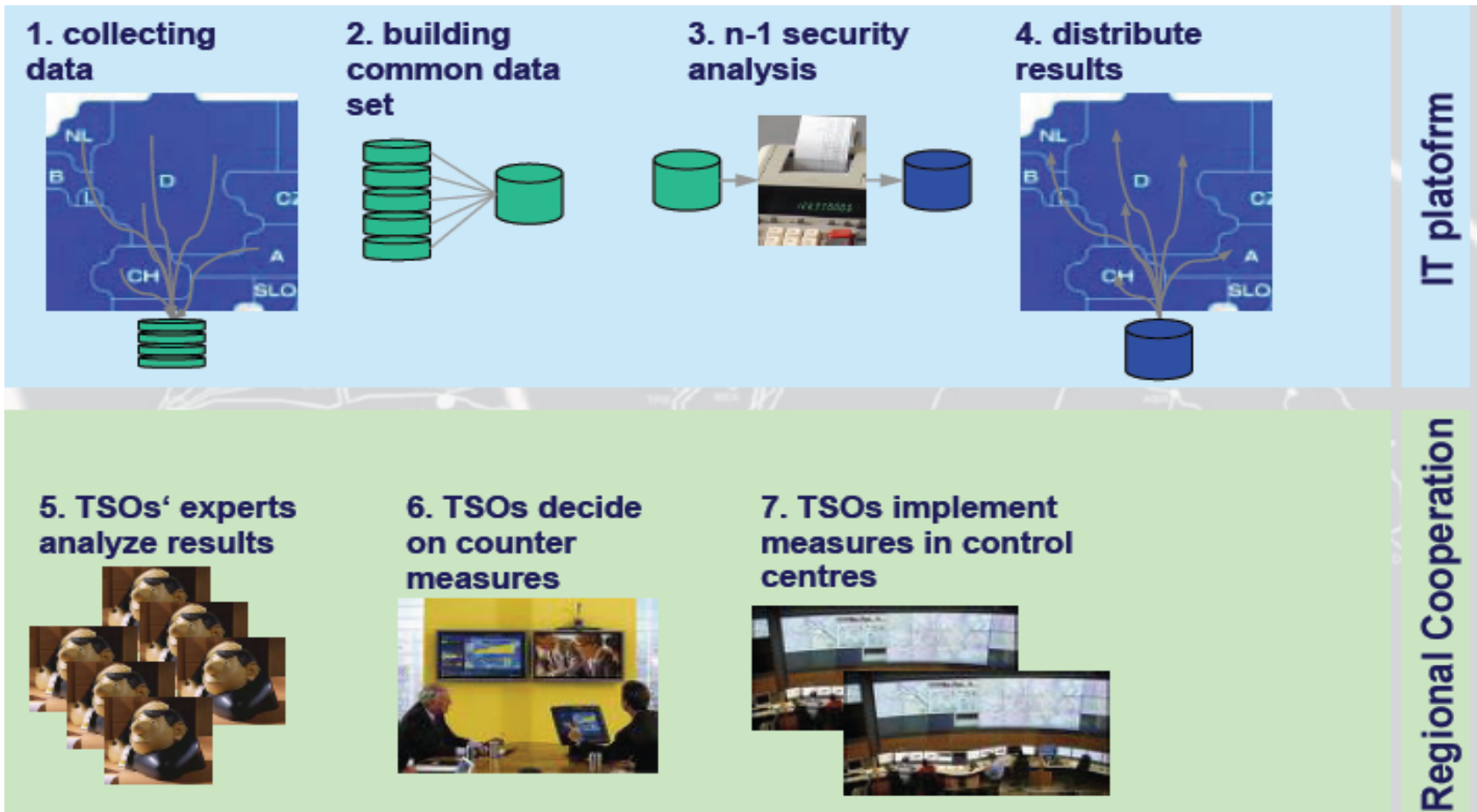


* Future Balancing Services Requirements: Response

European Coordination & Information Sharing

European Coordination & Information Sharing

- ◆ Considered vital to efficient System Operations



European Coordination & Information Sharing

- ◆ National Grid becoming more involved at a Regional Level



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CORESO

a concrete approach for a Regional Coordination Service Center within the Central Western European region

Why Coreso?

The construction of the European electricity market goes through a phase of regional consolidation. Seven regions have been set up.

This is how a [Memorandum of Understanding \(MoU\)](#) was signed on 6 June 2007 by the German, Belgian, French, Luxembourg and Dutch governments and the concerned actors (TSOs, power exchanges, regulators, market players) to support the regional Central Western Europe initiative. The MoU

LAST UPDATES:

- Corporate Governance
- History
- Coreso launches around the clock operations
- 2 Days Ahead Process
- Exchange Program D-1

UPDATES ALERT

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<http://www.coreso.eu>

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Conclusions

- ◆ Significant growth in wind across the EU anticipated
- ◆ TSOs are focusing their collective resources on the main issues of integration wind
- ◆ Operation of the Power System will fundamentally change
- ◆ Pan European Problems require pan European solutions
- ◆ National Grid fully involved