

# WG3 Wind Integration

Hannele Holttinen, Chair

## WG3 Wind integration: Objective.

### q Objective:

- § Integration of wind power: enable high penetration levels
  - with low integration costs,
  - maintaining system reliability (security of supply).

### q Vision:

- § In 2030 high penetration of wind power in Europe
  - what needs to be done in R&D to make it happen

## WG3: Four main areas

- q Wind power plant capabilities
  
- q Grid planning and operation
  - § accelerated/improved extension and reinforcement
  - § Improved/ optimised operation of existing grid
  
- q Energy and power management
  
- q Energy markets

# 1. Wind power plant capabilities – R&D priorities

- q Impacts of higher penetration levels of wind power on requirements needed
- q Opportunities for providing ancillary services
- q Verification of compliance

## 2. Grid planning and operation – R&D priorities

- q Improved operation of existing grid
  - Operational tools, prediction tools for (local) grid operation
  - Europe-wide operation
  - Wind power management as integral part of grid operation
- q Extension and reinforcement, transmission adequacy
  - Transmission technology
  - European wide planning, maintaining security and reliability
  - Transmission for low capacity factor resource
- q Models/simulation tools
  - Validation, implementation, generic WT/WF models
  - Tools for dynamic calculations of the European power system
- q Offshore transmission
- q New power system architecture

## 3. Energy and power management – R&D actions

### q System operation

- § Improved system and portfolio management tools
- § Assessment and demonstration of benefits and costs of several options in providing ancillary services and power balancing in higher wind penetrations

### q Long term planning

- § Impacts of high penetration of wind on power system operations
- § Impacts of high penetration of wind on power adequacy
- § 100 % renewables system, wind/solar/wave/hydro/biomass interaction, electricity and fuels

## 4. Energy markets – R&D actions

- q Market rules and design development for international and local market place to accommodate wind power
  - § Gate closure, predictions, imbalances,
  - § Markets for ancillary services, incentivise demand side and flexibility.
- q Market modelling
  - § Price fluctuations, impacts of wind on the market prices and on conventional generation technology investments.
  - § Demonstration of virtual power plants in market environment. Market nomination tools needed to integrate wind power, other generation, demand and storage from all over Europe to a tradable product.
- q Market access to adapt to newcomers and new services
  - § Interface/IT tools,
  - § Costs and market designs should enable market access for electricity from small wind power producers.

Main area	Research priority	Demonstration action
Wind power plant capabilities	Grid codes requirements	<ul style="list-style-type: none"> <li>•Influence of requirements upon WT electrically and mechanically,</li> <li>•Detailed simulation and field measurements to find out what happens at WT/WF connection point during symmetrical and unsymmetrical grid fault.</li> </ul>
Wind power plant capabilities	Opportunities for meeting requirements	Demonstrate the concept of wind power plant pilot plant
Wind power plant capabilities	Determine means of verification	Monitoring of voltage dips
Grid planning and operation	proof of concept	Multi terminal HVDC connections (offshore)
Energy and power management	System operation	<ul style="list-style-type: none"> <li>•Improved system and portfolio management tools</li> <li>•Demand-side management combined with wind power</li> </ul>
Energy and power management	Long term planning	Investigate high penetration of wind power in isolated grids
Electricity market	Market access	Test demand elasticity in markets



## Infrastructure, training, education

### q Infrastructure –

§ Test facility for wind power plant capabilities

§ Dissemination of wind integration experience to TSOs, utilities, "UWIG workshops" for Europe

### q Training and education

§ Lack of electrical power engineers

## WG3: Impacts of R&D.

- q Increased power system reliability with high wind penetration
- q Increased power system efficiency and reduction of emissions
- q Improve the value of wind power
- q Reduction of wind integration cost has a potential of 50-500 Million Euros annual savings in 2020
  - § estimated balancing costs 1-8 €/MWh
  - § assuming 0.1-1 €/MWh reduction by R&D