DIREC 2010

„Leap frogging to new era“

Jörg Zeumer

27.10.2010

content

- predictability and scheduling
- Grid integration issues
- tap energy in low wind speed areas
- off-shore wind potential and grid integration

- Some transmission line provider (Germany etc.) use already modern wind prediction systems in their control rooms. They are based on wind prediction model combined with the actual data from clustered wind farms. The wind prediction model is feeded by actual weather data more than once a day. Details colleague from GL G+H

Task of the turbine manufacturer:

- Modern wind turbines are able to deliver via standartisized interfaces continuously the actual turbine data.
- Via this interface it is also possible to control the turbine (power curtailment, reactive power control etc.)

Grid integration issues: How have they been addressed in countries that have a large proportion of wind energy

REpower Systems

General:

- **First of all: Policy, Grid provider and renewable industry have to understand their problems and their capabilities to find out an integrated and cost effective solution**
- **vision of policy, problems of grid provider, capability of wind industry**
- **Nearly 10 years ago, Wind turbines were seen as “consumer” from grid providers. That means wind turbines of the first generation delivered no capabilities to stabilize the grid.**

Grid integration issues: How have they been addressed in countries that have a large proportion of wind energy

- **In countries with high wind penetration (for example Germany, Spain, Portugal) or special grid condition (weak or island grids, for example Australia, USA, Canada, UK) the grid code requirement increase powerfully. That means that modern wind turbine technology should help to stabilize the grid.**
- **These grid code requirements are comparable to the requirements of conventional power plants (nuclear, carbon).**

Grid integration issues: How have they been addressed in countries that have a large proportion of wind energy

- **Vision Policy, for example grid stability:** For most of the European countries grid stability is very important. If grid stability is one vision of the countries' policy, these countries can learn from the history of European wind industry (2 examples).
  - **Save money:** In Spain and Germany (20GW, 25 GW installed wind capacity) there were huge upgrade programs necessary to fit the turbines of the first generation to the modern ones. These upgrades can cost 2 to 5 times more money compared with an implementation during the planning phase of a wind park. (FRT, reactive power).

Grid integration issues: How have they been addressed in countries that have a large proportion of wind energy

- **Paying for grid stability services:** To speed up the implementation of grid stability services in wind power plants some countries pay extra feed in tariff for these services. For example Portugal pay for extra reactive power capability, (UK frequency control, Germany and Spain FRT capability, Germany 0,5ct per kWh)

Likely technology improvements in order to tap energy in low wind speed periods as well as in low wind regimes

- **Trend on the market:** Larger rotor diameter

  3.2M114 => Advantage: The nominal power is reached earlier. Due to a lack of Transmission lines in some regions the grid connection capacity is limited (better use of wind capacity).

- **Higher hub heights (120 to 140m) => Improvement cost of towers. Hybrid, transportable solutions**

- **Alternative=> To bring grid and access road in the region were the wind is (policy program)**

- **Reduce cost to energy**

Exploitation of off-shore wind potential and grid integration

Advantages Offshore:

- **Higher average wind speed**
- **Space around the European coasts**
- **No transport limitation**
- **Lower visual impact**

Exploitation of off-shore wind potential and grid integration

- There is enough wind around Europe's coast to power Europe seven times over.
- In 2009, 3% (2.8%) of Europe`s total installed wind power capacity was offshore. This is about 2 GW in 39 offshore wind farms. Installed over the last 8 years. But more than a quarter of these capacity in 2009 (582 MW)
- 100 GW are in a various stage of planning (mainly UK, Germany, Netherlands)
- EU targets 2020 20% electricity energy from renewables => Produce 14-17% of the EU's electricity with wind, that means 230GW (40GW Offshore)
- EU targets 2030 40% electricity energy from renewables => 26-35% wind, that means 400GW (150GW Offshore)

Exploitation of off-shore wind potential and grid integration

To speed up the German Offshore business (fixed in a law) :

- **feed in tariff is offshore higher compared to onshore => start up technology**
- **The grid provider has to deliver (inclusive financing) the grid connection near to the Offshore wind farm (big Offshore socket). For big wind farms or wind farms far from the coast “Tennet” (former e.on) use HVDC connections => Advantage save and fast grid connection**

Thank you

source: VDMA