

# POWER cluster



## Technical and Economic Analysis of Offshore Wind

Development of wind power in the North Seas is one of the important steps toward meeting the EU environmental targets. There have been a large potential for development of wind power project in this area.

However the timing, size, and grid connection, etc. of those projects are often not yet identified. Before those wind power development can be realized, questions regarding, e.g., their effects on the operation of the connected existing onshore power grid, the benefits that wind power development would bring in the European electricity markets, the changes in power trading in the areas and the benefits to those countries involved, etc. have to be answered.

In this part of the Power Cluster project, studies have been made to address these.

To perform the technical analysis, the collection of publicly available data of, e.g., the wind farms and the grid data for different electrical grids involved in the region, i.e., Nordic grid, UK grid and the European grid (ENTSO-E) has been carried out. A complete electrical grid model connecting all these regions has been developed to facilitate the analyses of different technical questions posed by wind power on grid operation. Additional data and information on the generation capacity mix, marginal production cost of each generation technology, cross-border power exchange limits, etc for various countries involved

in the integrated system has also been collected for the economic benefits of wind power. For this purpose, a simplified model of the Europe-wide electricity market has been developed based on the dc optimal power flow framework.

### Main outputs and results

Main achievements include:

- A study on voltage angle of power system with offshore wind. The study demonstrated that integration of the North Sea Grid would not significantly affect the stability of power systems in different countries,
- A study on the economic effects of large amount of offshore wind power on the power market in Europe. The results show that wind power in the North Sea would help to reduce the total generation costs in the system and increase the power exchange between countries,
- A scientific paper has been published,
- Two master theses have been completed.

### Challenges

More realistic systems, more detailed data as well as different markets can be studied in the future. The economic benefit can vary with the actual generation mix and their cost in the systems, as well as rules for international markets.



### Partners involved

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The Interreg IVB  
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