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EWEA Response to the European Wind Integration Study (EWIS) Report – Main Conclusions in a Nutshell

A consortium of Transmission System Operators (TSOs) carried out the European Wind Integration Study (EWIS) from 2007 to 2009, financed by the European Commission, and provided the final draft report at the beginning of December 2009. The study was published in April 2010.

The overall aim of EWIS is to examine how best to accommodate wind generation on a large scale up to 2015, from the perspective of European TSOs. With this paper, EWEA aims to highlight the key results from the study and provide a first assessment of its conclusions.

EWIS Approach

EWIS's work covers all detailed technical, operational, market and regulatory aspects of the large-scale integration of wind power in Europe in the 2015 timeframe.

EWIS has focused on the immediate network-related challenges by analysing existing electricity markets, network operations, and the physical power flows and other related system behaviours.

The starting point for the analysis was the network and market conditions in 2008, with future challenges assessed against conservative representations of network extensions and reinforcements as per national network development plans. As such, development plans are available only for a limited number of years in the future, and 2015 has been chosen as a realistic time horizon.

In this kind of analysis, different scenarios are considered in order to account for uncertainties. In this case, the following alternatives were used:

- Future generation developments, especially the total capacity of wind generation installations, according to different wind development scenarios in Europe:
 - *Reference scenario*: the level of installed wind capacity in 2015 is the same as in 2008, while conventional power generation increases. This scenario was used in order to compare the effects of increasing amounts of wind in the subsequent scenarios.
 - *Best estimate*: This scenario foresees an installed wind capacity by 2015: 140 GW
 - *Optimistic Wind*: This scenario envisages a slightly higher amount of installed wind capacity by 2015: 185 GW.
 - Additionally, an *Enhanced Network* scenario was applied for the Optimistic Wind option, in order to have a first insight how the generation would operate if some key parts of the network were reinforced further. This is seen by



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EWIS as an outlook on how the network could be further developed beyond 2015.

- The impacts of fuel and CO₂ prices – by adjusting the merit order of generation in different market areas.
- The effect of different wind patterns across Europe – by using different year round wind production time series based on up-to-date measurements from across Europe.

Objectives of the Study

As EWIS works from a TSO perspective with a focus on only short to mid-term network development and operational issues, the study seeks to address the immediate network needs arising from increasing amounts of wind power.

In general, the objectives of EWIS are to address the network issues arising from wind power and furthermore develop proposals for a generic and harmonised Europe-wide approach towards wind energy integration, addressing:

- Operational/technical aspects;
- Market organisational arrangements arising in Europe;
- Regulatory/market-related requirements;
- Common public interest issues that impact the integration of wind energy.

In contrast to these short to mid-term projections from EWIS, alternative generation development projections that will achieve the EU's 2020 targets and beyond up to 2030 have been assessed by EWEA's TradeWind Study.

EWEA welcomes the acknowledgement by European TSOs of the benefits of large-scale integration of wind energy: avoided fuel costs and CO₂ emissions, improved energy security of supply, and wealth benefits through job creation in Europe. As a result, EWIS has sought to identify what needs to happen in the short term for such benefits to be achieved in practise from a TSO perspective.

The EWIS study correctly states that the energy markets lack the appropriate infrastructure, and that they are too nationally orientated instead of being linked between regions, creating higher energy supply risks and prices.

However, the EWIS study mentions the net benefits of interconnections solely in terms of a smoother integration of wind power, and fails to put them in a wider picture:

While the continued piecemeal development of transmission lines will certainly have a positive effect on the integration of wind energy, the real benefit from an economic, environmental and security of supply perspective only emerges when we move from looking at the individual projects in isolation towards looking at how to provide grid access to projects in combination.



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The development of transmission infrastructure as suggested by EWIS should not only be seen as part of the EU's efforts to meet the 20% RES target, or to improve energy security, or to reduce GHG emissions, but also to increase the level of interconnectivity, thereby helping to develop the emerging EU internal electricity market and increase competition and thereby provide consumers with affordable electricity in the long term.

Main conclusions and shortcomings

EWEA welcomes the following main conclusions:

- 1. Identified grid reinforcements:** In the enhanced network scenario, the benefits of increasing cross-border capacities (where the benefits are likely to justify the capital costs of such reinforcements) were explored. Twenty-nine potential reinforcements were identified with an indicative capital cost of € 12.3 billion. Almost half of these potential reinforcements relate to the potential development of offshore wind connections into offshore grids. This outcome is crucial for the wind industry as the suggested EWIS results on grid reinforcements will directly feed in ENTSO-E's so-called 10-year Network Development Plan, a first building block to facilitate planning and building new electricity infrastructure in a coordinated manner.
- 2. Significant net benefits by introducing new grid extensions and reinforcements:** The sensitivity analysis finds proof that enhancements in the European transmission grid in order to increase the cross-border transmission capacities can yield annual savings in operating costs of more than €1.9 billion. Comparing the 2015 net benefits of the enhancements in both the Reference scenario (€1.57 billion) and the Wind Optimistic scenario (€1.92 billion) to the annualised cost of the cross-border grid reinforcements (€0.9 billion) reveal the positive economic value of these network investments.
- 3. Significant reliability and efficiency benefits by enhancing operational arrangements:** In addition to network reinforcements, an economically attractive option in the short term is increasing system reliability and flexibility via measures that largely involve operational changes. These measures include:
 - Flow controlling devices (such as phase shifting transformers, series compensation and HVDC links) across Europe.
 - Coordinating system-to-generator and system-to-demand special protection arrangements to adjust power flows in the event of faults and other events.
 - Developing and using dynamic equipment ratings reflecting ambient conditions, loading and conductor temperatures.

These measures, as well as additional enhanced control facilities (with centralised wind forecasting and coordinated network responses) have been identified by EWIS as both the best way of addressing the short-term risks prior to establishing new



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reinforcements and also the best approach for obtaining most benefit from new transmission developments.

- 4. EWIS points out the importance of harmonising grid code requirements on wind generators:** The EWIS analysis has identified basic common features as well as the necessary regional differences that are relevant for establishing the network code requirements for wind generators. EWIS assessments have shown the benefits of improved ‘fault ride through’ characteristics and voltage control capabilities on modern wind turbine generators. Such characteristics increase system stability in the event of a fault event on the high voltage network and thereby reduce a barrier that might limit the amount of wind generation that could otherwise be integrated. Importantly, the EWIS results support the case for creating a first European Network Code on harmonised grid code requirements for wind generators on the basis of a so-called “Pilot Code”.

EWIS shortcomings:

- 1. No clear overview of the suggested grid reinforcements:** A list of the proposed 29 interconnectors and other grid reinforcements should be provided with the suggested capacities in order to assess directly the impact on the content of the ten-year network development plan (TYNDP).
- 2. Undue focus on short-term measures:** The suggested short- to medium-term actions (operational measures and grid reinforcements which don’t require major environmental consent) are certainly important in order to relieve the most urgent bottlenecks. Since the EWIS report will serve as input to the ENTSO-E TYNDP, it should be clearly stated that potential longer-term grid developments (up to 2020) are of utmost importance in order to reach the 2020 RES & GHG targets, and improve energy security in the EU. The report should therefore include any features on long-term grid development and recommend their inclusion in the deliberations of ENTSO-E on the TYNDP.
- 3. Incorrect cost-benefit assessment in relation to support schemes:** It appears from parts of the EWIS draft report that wind power generation is and will be much more expensive in the mid-term than conventional generation technologies. This is incorrect. The only value that is taken into account for wind power is the avoided fuel cost. Any cost-benefit aspects resulting from the capacity credit, for example, are not mentioned. It stands also in contrast with the conclusion from the year-round simulations, which showed that the annual benefits of wind generation across Europe, which accrue from avoided fuel and CO₂ costs, are expected to exceed current total support costs in scenarios with higher fuel and CO₂ prices.
- 4. Falling short of outlining truly European solutions:** EWIS should outline more concretely which measures could be applied on a Pan-European level to ensure a large-



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scale integration of wind energy. Additional enhanced control facilities (with centralised wind forecasting and coordinated network responses) are certainly an important feature on a national level and CECRE is rightly outlined as a best practise in Spain. However, the approach should go beyond that and outline solutions for inter-TSO cooperation, e.g. through regional control centres like CORESO and their uptake possibilities for other regions, e.g. the North Sea region.