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RESEARCH ARTICLE

Impacts of large amounts of wind power on design and operation of power systems, results of IEA collaboration

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ABSTRACT

There are dozens of studies made and ongoing related to wind integration. However, the results are not easy to compare. IEA WIND R&D Task 25 on 'Design and Operation of Power Systems with Large Amounts of Wind Power' collects and shares information on wind generation impacts on power systems, with analyses and guidelines on methodologies. In the state-of-the-art report (October, 2007), and the final report of the 3 years period (July, 2009) the most relevant wind power grid integration studies have been analysed especially regarding methodologies and input data. Several issues that impact on the amount of wind power that can be integrated have been identified. Large balancing areas and aggregation benefits of wide areas help in reducing the variability and forecast errors of wind power as well as help in pooling more cost effective balancing resources. System operation and functioning electricity markets at less than day-ahead time scales help reduce forecast errors of wind power. Transmission is the key to aggregation benefits, electricity markets and larger balancing areas. Best practices in wind integration studies are described. There is also benefit when adding wind power to power systems: it reduces the total operating costs and emissions as wind replaces fossil fuels and this should be highlighted more in future studies. Copyright © 2010 John Wiley & Sons, Ltd.

KEYWORDS

wind integration; grid integration; balancing; wind power forecast

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