



# IEA WIND Task 25: Design and operation of power systems with large amounts of wind power



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## International collaboration on wind integration

- Started in 2006, now 17 countries + Wind Europe participate in this international forum for exchange of knowledge
- State-of-the-art: publishes reviews on the studies and results so far
- Formulates guidelines, e.g. Recommended Practices for Wind Integration Studies in 2013 → updated in 2017 to include solar PV
- Fact sheets and wind power production time series



## IEA WIND Task 25 participants

Country	Institution
Canada	Hydro Quebec (Alain Forcione, Nickie Menemenlis)
China	SGERI (Wang Yaohua, Liu Jun)
Denmark	DTU (Nicolaos Cutululis); Energinet.dk (Antje Orths, Peter Børre Eriksen)
Finland (OA)	VTT Technical Research Centre of Finland (Hannele Holttinen, Juha Kiviluoma)
France	EdF R&D (Vera Silva); TSO RTE (Jean-Yves Bourmaud); Mines (G. Kariniotakis)
Germany	Fraunhofer IWES (J. Dobschniski); FfE (S. von Roon); TSO Amprion (Peter Tran)
Ireland	Energy Reform (J. Dillon, M. O'Malley); UCD (D. Flynn); SEAI (J. McCann)
Italy	TSO Terna Rete Italia (Enrico Maria Carlini)
Japan	Tokyo Uni (JunjihKondoh); Kyoto Uni (Yoh Yasuda); CRIEPI (Ryuya Tanabe)
Mexico	INEEL(Rafael Castellanos Bustamante, Miguel Ramirez Gonzalez)
Norway	SINTEF (John Olav Tande, Til Kristian Vrana); NTNU (Magnus Korpås)
Netherlands	TSO TenneT (Ana Ciupuliga); TUDelft (Jose Rueda Torres)
Portugal	LNEG (Ana Estanqueiro); INESC-Porto (Ricardo Bessa)
Spain	University of Castilla La Mancha (Emilio Gomez Lazaro)
Sweden	KTH (Lennart Söder)
UK	DG&SEE (Goran Strbac Imperial College; Olimpo Anaya-Lara Strathclyde)
USA	NREL (Bri-Mathias Hodge); UVIG (J.C. Smith); DoE (Charlton Clark)
Wind Europe	European Wind Energy Association (Ivan Pineda, Daniel Fraile)

## Recommendations for wind integration studies

The report provides research institutes, consultants, and system operators with up-to-date guidelines on how to perform a wind integration study. It offers concrete methodology recommendations in a still evolving field, also pointing out future development needs. A flow chart of a full integration study is presented below in Figure 1.

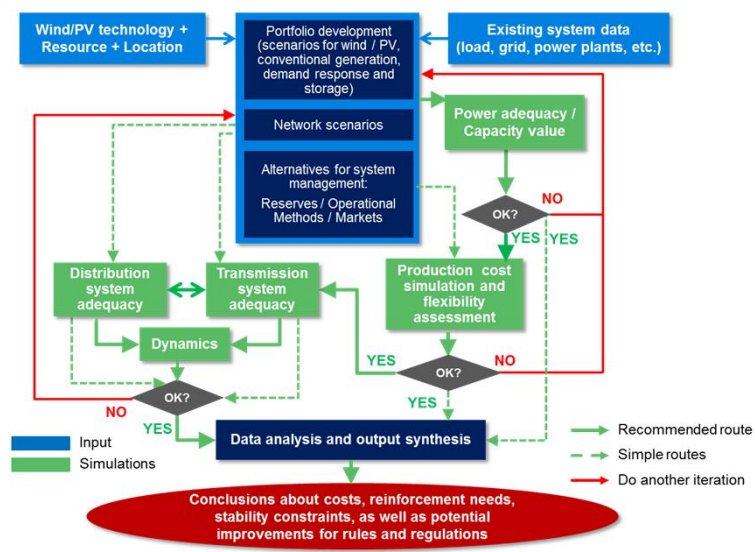


Figure 1. Flow chart for a complete integration study including all iterations recommended. Not all studies are addressing all parts of a full study.

## State-of-the-art report – Summaries of wind integration studies

Report is updated every 3 years. It summarizes results concerning transmission grids, balancing costs, capacity value, actual experience as well as enabling technologies.

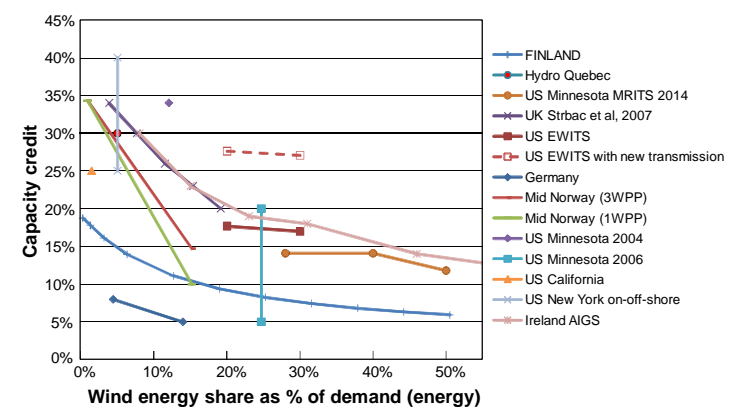


Figure 2. Capacity value of wind power in different countries and regions, results of studies.

## Many areas still evolving:

- Simulation tools: uncertainty in different time scales.
- Tools: network constraints with dispatch constraints, combining generation capacity expansion and dispatch optimisation
- Metrics and tools which evaluate the flexibility needs. Market rules impacting the studies