

Business from technology



IEAWIND Task 25 – OA report

IEAWIND ExCo 67 12-13th April 2011, Amsterdam
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IEA WIND Task 25

OBJECTIVE:

to analyse and further develop the methodology to assess the impact of wind on power systems



First phase 2006-08, 11 countries + EWEA participate

Second phase 2009-11, 13 countries + EWEA participate + Italy 2010-11.

- Provide an international forum for exchange of knowledge
- State-of-the-art: review and analyse the studies and results so far
 - methodologies and input data, system operation practices
 - **Final report 2006-08 published in July 2009**
- Formulate guidelines:
 - recommended methodologies and input data when estimating impacts and costs of wind power integration
- Quantify the impacts of wind power on power systems
 - range of impacts/costs; rules of thumb

www.ieawind.org/AnnexXXV



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

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Australia and France
considering joining



Country	Institution
 Canada	Hydro Quebec (A.Robitaille); Manitoba Hydro (T. Molinski); Natural Resources Canada (S.Lalande);
 Denmark	Risø-DTU (Peter Meibom); Energinet.dk (Antje Orths)
 EWEA	European Wind Energy Association (Frans van Hulle)
 Finland (OA)	VTT Technical Research Centre of Finland (Hannele Holttinen)
 Germany	ISET (Bernhard Lange); TSO Amprion (Bernhard Ernst)
 Ireland	ECAR/UCD (Mark O'Malley); TSO Eirgrid (Jody Dillon)
 Italy	TSO Terna (Enrico Maria Carlini)
 Japan	AIST (Junji Kondoh)
 Norway	SINTEF (John Olav Tande); TSO Statnett (T. Gjengedal)
 Netherlands	we@sea, ECN (Jan Pierik); TUDelft (M.Gibescu)
 Portugal	LNEG (Ana Estanquero); TSO REN (João Ricardo); INESC-Porto (J. Pecas Lopes); UTL-IST (Ferreira Jesus)
 Spain	University of Castilla La Mancha (Emilio Gomez Lazaro)
 Sweden	KTH (Lennart Söder)
 UK	DG&SEE (Goran Strbac), TSO National Grid (A.Hiorns)
 USA	NREL (Brian Parsons); UWIG (Charles Smith)

Operating agent budget/accounts



COSTS (€)	Budget yearly	Actual 2009	Actual 2010	Actual 1.1.-28.2.2011
Labour	40 000	40 855	30 365	5848
Travel	5 000	7 071	9 090	504
Other costs	2 000	4 962	3 745	0
TOTAL	47 000	52 888	43 200	6 352

- For 14 participants, 3357 euros/year (2009), 15 participants 3134 euros/year (2010-11)
- Should there be more participants, the euro/participant fee can be freed to cover the extra coordination cost
- Invoicing for 2010 in November

Update on IEA Secretariat

- Electricity Grid Coordination
 - Meeting 20th April 2011 – Secretary to join with OA through telephone
- IEA OCEAN OA commented their grid integration report
- IREG2 project is now GIVAR project (Grid Integration of Variables)
 - Simplified method to assess the integration impact as a first estimate for new countries (flexibility index)
 - Final reporting underway by Hugo Chandler (24th May, 2011)
 - Aidan Tuohy presentation Task 25 meeting 6th April, excel template to be sent over to Task 25 in May - The excel template send over to Task 25 is delayed and will delay Task 25 work on simplified methodology → proposal for next term
 - Request that Task 25 will continue and collaborate with next phase of GIVAR project





Update on GWEC/CIGRE/IEEE/IPCC

- GWEC request for wind integration presentations:
 - Brazil Windpower 2011, Rio, 31 August – 2 September (F.vanHulle?);
 - Windaba 2011, South Africa, 27-29 October (coincides with wind integration workshop);
 - China Wind Power 2011, Beijing, 19-21 October (M.O'Malley?)
- CIGRE: JWG18 high penetrations of wind power is writing a report (commenting round)
- IEEE: wind focus PES magazine under preparation (C.Smith)
- "European UWIG" 16-17th June Frankfurt (Ackermann)
- IPCC SRREN: Mark O'Malley coordinated rewrite of electricity integration chapter. Summary for policy makers commenting round



Update on presentations

- Nov2010 EWEA Grid Conference, Berlin
- Jan2011 Exchange of balancing services between the Nordic and the Central European synchronous systems, workshop Gardemoen, Oslo
- EWEA2011 conference 16 March, 2011, Brussels Expo – side event session IEAWIND DAY: **IEA Wind Task 25. Methodologies to Estimate Wind Power Impacts on Power Systems**
 - *Reserve requirements of wind power - Hannele Holttinen, VTT, Operating Agent Task 25*
 - *Modelling wind power in unit commitment and scheduling models – Peter Meibom, Risø-DTU*
 - *Transmission planning with wind power - J Charles Smith, UWIG*
- EWEA2011 conference: Very low attendance as a side event. Task 25 proposes to push harder a IEAWIND wind integration session for next conference





Journal articles

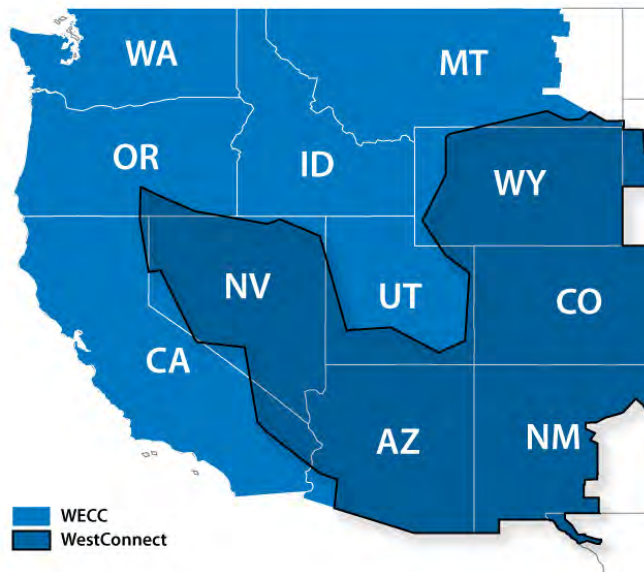
- Under work – 3 articles submitted extended abstract to IEEE Sustainable Energy call in February (reserves, UC, experience/freq control) . UC article to IEEE PES July, 2011
- Variability article under preparation
- Wiley WIREs Advanced Review and Overview articles:
 - **Wind integration (Overview) - H.Holttinen → In April**
 - **Planning transmission for wind power (Overview) Charles J Smith, Frans van Hulle → in April**
 - Capacity value of wind power Mark O'Malley, Michael Milligan
 - Estimating wind power impacts on balancing power systems Juha Kiviluoma, Peter Meibom, Lennart Söder
 - Storage and demand side options in integrating wind power Peter Meibom, Mark O'Malley, Juha Kiviluoma
 - Wind turbine capabilities for grid, Frans van Hulle

Progress: National case studies (1)

- Denmark: Risø-DTU is working on several wind integration studies involving the unit commitment and economic dispatch tool WILMAR. The TSO Energinet.dk is reporting their experience on wind integration and is also involved in the Offshore Grid initiatives in Europe.
- Japan: AIST and University of Kansai have reported on studies that assess other options than electric batteries in wind integration (demand side measures).
 - Norway: Sintef has reported on European wide balancing from Norwegian hydro power sources as well as simulations on the offshore grids.
 - Portugal: LNEG on behalf of the PT advisory board (LNEG, REN, INESC-Porto and IST) reports regularly on Experience on wind integration. Reports include variability of wind generation, transmission network planning, dynamic assessment of reserves, transient stability and storage planning (hydro, EV, others).
 - Spain: University Castilla la Mancha is reporting on experience on wind integration and variability of wind power, also to Canary Island system.
 - Sweden: KTH studies imbalance costs for wind power in the Nordic market, opportunities for hydro power producers in providing balancing services.
 - EWEA: Offshore Grid EU-project

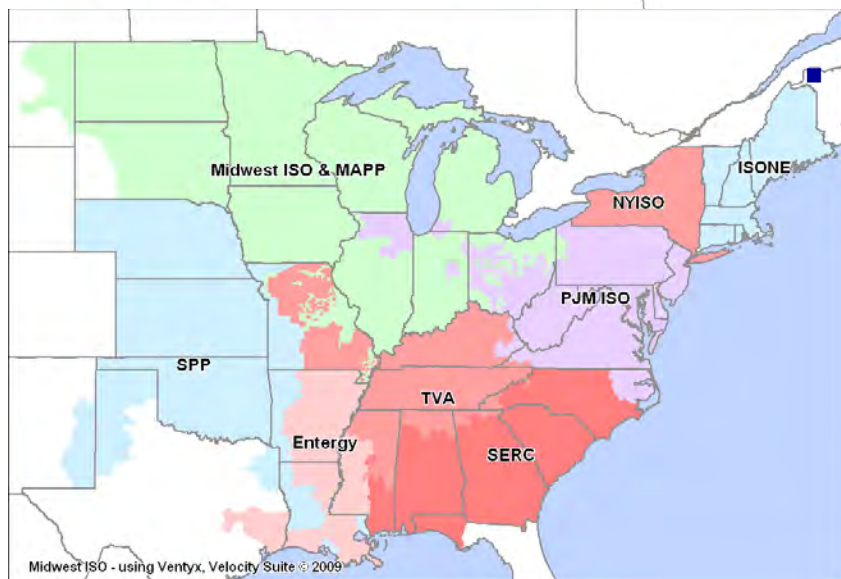


US: 2 large-scale integration studies completed



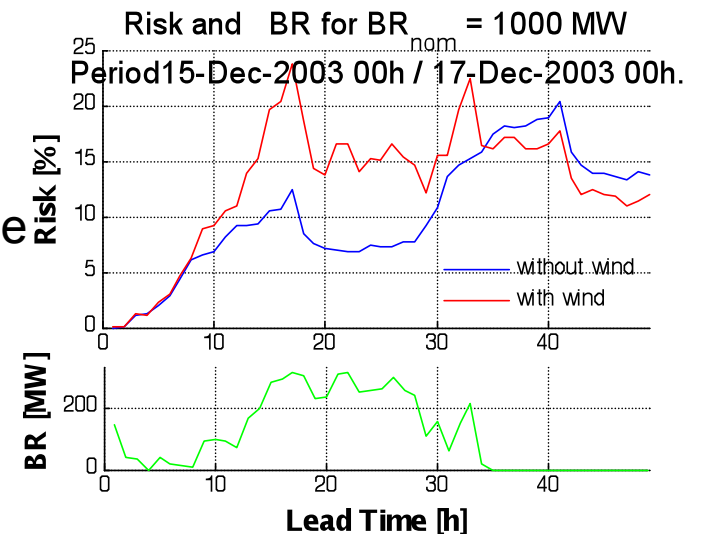
- Western Wind and Solar Integration Study
 - Wind energy penetrations 10, 20, and 30% of annual energy; solar 1, 3, 5%
 - Cases compare
 - Higher-quality wind, remote from load that needs transmission built
 - Lower-quality wind, closer to load with no required transmission

- Eastern Wind Integration and Transmission Study
 - 3 scenarios at 20% energy penetration from wind
 - Various mixes of on-shore and off-shore
 - 1 scenario at 30% energy penetration of wind



Canada: Hydro Quebec studies

- Frequency regulation and load-following reserves: Comparison between 3 approaches, 2 statistical approaches and power grid simulation (HQ own development). Both the simulator and analytical approaches provide similar needs in terms of additional reserves. Simulator advantage for comprehensive impact studies
- Balancing Reserve (horizon 1 to 48 hours)
 - A new methodology for the computation of balancing reserve based on risk to not satisfy the load and our energy market commitment (economic decision). Depends on the combined load and wind power forecast uncertainties as well as the generation failures occurrence
- Wind Power Capacity Credit : A sequential Monte-Carlo approach using 36 years coincident load and simulated wind power data. Analysis of the wind power generation during low temperature triggered peak demand periods where the wind turbines could reach their operational limit at around -30°C



Germany: 2 studies published

dena Grid Study II - Integration of Renewable Energy Sources in the German Power Supply System from 2015 – 2020 with an Outlook to 2025

- 39 % of total power production by RES in 2020
- Requirements for the power system to be able to integrate this amount in conjunction with a cost-efficient operation of conventional power plants and increased European power trading.

The German government's Energy Concept for an Environmentally Sound, Reliable and Affordable Energy Supply

- Reduction of the emission of greenhouse gas of about 55% by 2030, 70% by 2040 and 80-95% by 2050.
- Covering 50 % of the gross electricity consumption by contributions of renewable energies in 2030, 65% by 2040 and 80% by 2050

Download of the studies:

<http://www.dena.de/en/topics/energy-systems/projects/projekt/grid-study-ii/>

<http://www.bmwi.de/English/Navigation/Service/publications,did=367764.html>



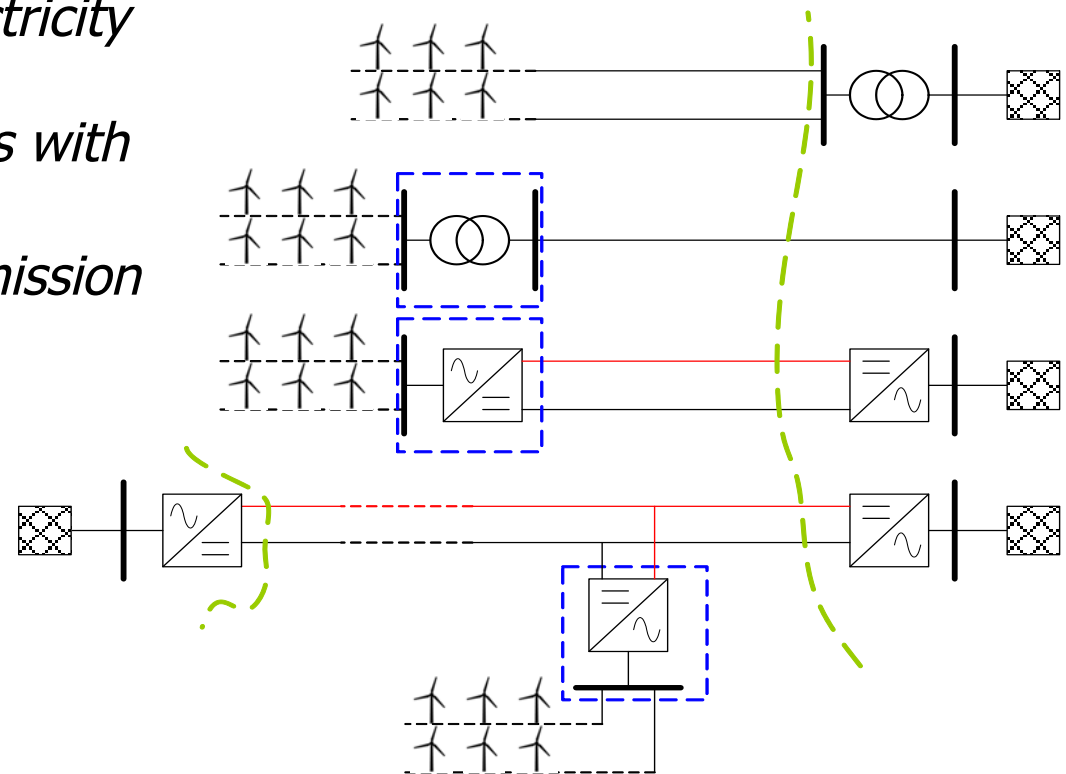
Netherlands Research

How to operate future transmission schemes for offshore wind power?

- Developing a Transnational Electricity Infrastructure Offshore*
- Round the year security analysis with bottleneck ranking*
- Sustainability Benefits of Transmission*

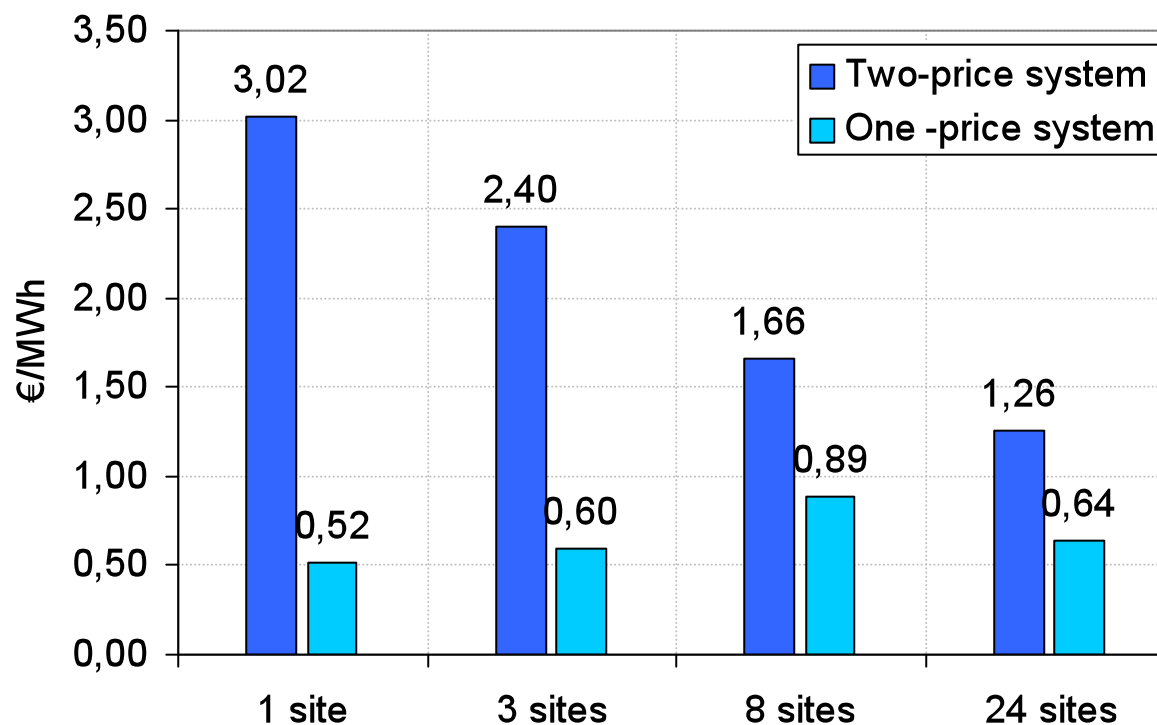
Operating VSC-HVDC

Wind Farm Fluctuations, Stabilization Services

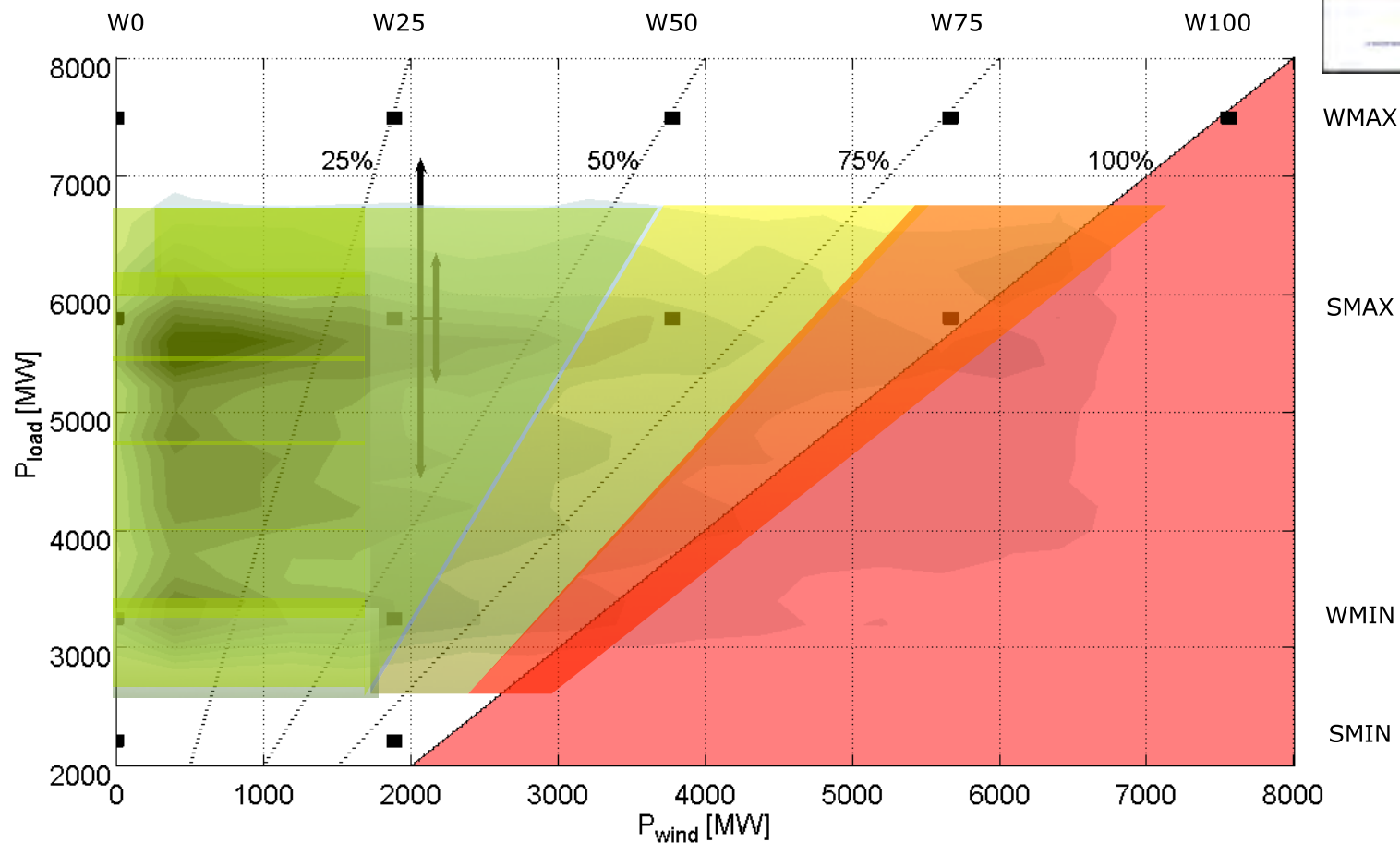
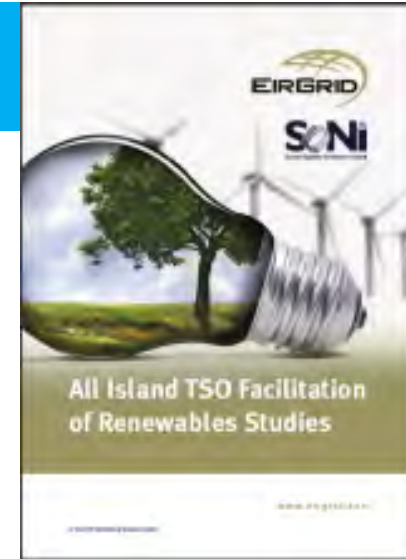


Finland – balancing costs from Nordic market

- Day-ahead forecasts – comparison for a producer with 1 versus several sites and comparison for different balance settlement rules



Ireland – operational boundaries for instant wind penetration



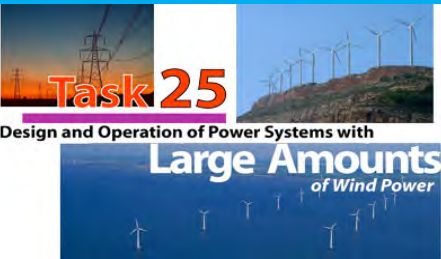


Next term

- Journal articles on methodologies, experience, variability → submit
- A simple methodology to assess the range of wind power impacts for different power systems – take up work from IEA GIVAR (IREG2) project.
- Task 25 session to Ackermann workshop Oct 2011 (or separate papers)
- Portugal October 2011 (hosted by LNEG, Lisbon)
- Task 25 session to IEEE power system conference July 2012
- **FINAL REPORTING IN 2011 (and a workshop):**
 - **Recommendations** (Take up results from journal articles)
 - **Summary report – update summary from 2009 report**
- **PROPOSAL FOR NEXT TERM (by Sep, 2011)**



Next 3 years of Task 25 - 2012-2014



- International forum for grid integration – continue the good work
- Simplified assessment (GIVAR flexibility index further development)
- Update of Recommendations and summaries
- Experience – lessons learned. New studies evolving – lessons learned
- Database of wind power production data
- Larger penetration studies
- Implications to market design and operation
- Operation and planning time scales merging → issue for methods/tools
- Broadening the scope to other uncertainty-sources (PV, ...) – how?
- More concrete collaboration between the national projects?
- "Round robin" test of wind integration methodologies? f.ex. for dispatch models (only research models)? Reserve requirement calculations?





**VTT creates business from
technology**