IEA Wind Task 36: Forecasting for Wind Energy

Wind Integration Workshop 2016
Forecasting Session II

Vienna, 17th November 2016

Use of Forecast Uncertainties in the Power Sector: State-of-the Art of Business Practice

Task 3.1

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Background of this investigation: IEA Task 36: Forecasting for Wind Energy

Task Objective is to encourage improvements in:
1) weather prediction
2) power conversion
3) use of forecasts

Task Organisation is to encourage international collaboration between:
- Research organisations and projects
- Forecast providers
- Policy Makers
- End-users and stakeholders

Task Work is divided into 3 work packages:
WP1: Weather Prediction Improvements inclusive data assimilation
WP2: Development of a benchmarking platform & best practice guidelines
WP3: Communication of best practice in the use of wind power forecasts

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Task 3.1: Use of Forecast Uncertainties in the Power Sector: State-of-the Art of Business Practice

Purpose:

- Get an overview of the current use and application of probabilistic forecasts in the power industry sector;
- Investigate how participants estimate and deal with uncertainties.

Phase 1: **Collection of Information**

Phase 2: **Analysis of Results**

Phase 3: Communication and Dissemination

Work-in-progress over 3 years

How to participate:

1. **Go to our Webpage (www.ieawindforecasting.dk → news) or to our dropbox to collect a questionnaire**

2. **Fill it out and send it to <ieawind36.wp3@gmail.com> or upload it annonymously at out dropbox!**

Dropbox

→ **interview documents**:
https://www.dropbox.com/l/sh/2enjMxIGWsOvVvcGxBNjRo

Language packs (more to come...):
Danish: https://www.dropbox.com/l/sh/oeSDsHWoFrAsuY3oGxW6du
German: https://www.dropbox.com/l/sh/Zg2VHJNqitGADh5mG4KaNq

→ **submission**: https://www.dropbox.com/l/sQH9I8nW9LQlhYZNEGlyRG
*Submission possible as "**common user**"*: Interview Provision <ieawind36.wp3@gmail.com>

Purpose: **no need to register with Dropbox to delivery the interview**

How we setup the interviews

Questions were separated into 2 categories:

General character to identify:

→ the type of business

→ the size of the organisation

→ the span of the business processes

→ the possible existing barriers

Forecasting & uncertainty to identify:

→ the forecasting products used today

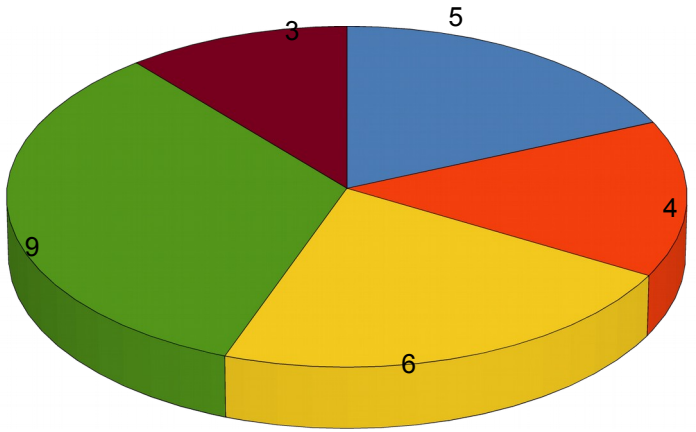
→ the knowledge & awareness of probabilistic products

→ the challenges that hinder the implementation of new products

Get a broad overview of state-of-the-art use of forecasting and uncertainty in the power market

First Results: 24 (27) participants

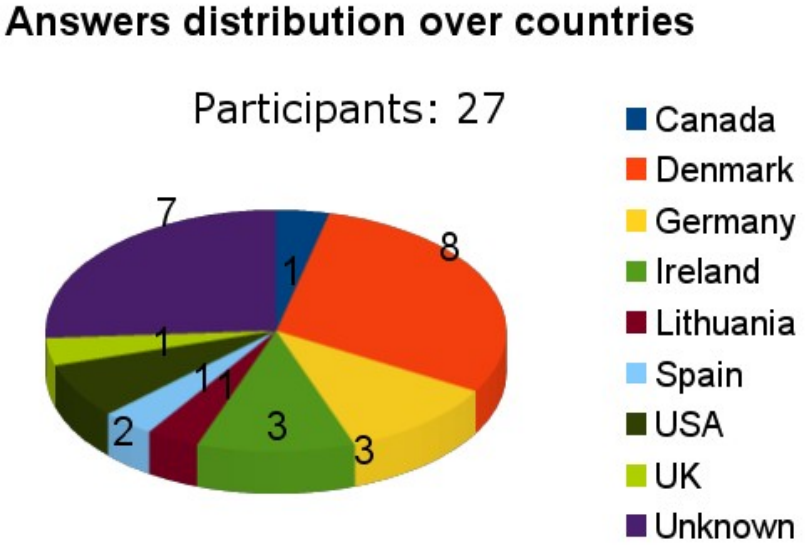
Questionnaires: Participation by Role



R&D	: Research & Development
PP_PMC	: Power Producer/Power Management Company
ESO	: Energy Service Organisation/Utility
SO	: System Operator
ETC	: Energy Trading Company

Under-representation of Traders

First Results: 24 (27*) participants



Note: "Unknown" means the interviews have been submitted anonymously

Under-representation of Asia/Africa/SouthAmerica

* 3 participant's questionnaires arrived after the paper submission deadline

Results: Basics of Questionnaire Participants

MW Portfolio	Total MW	Wind power	Solar power
[GW]	105 (147)	71 (102)	33 (45)
Max [GW]		22.7	15.5
Min [MW]		440	8

years operating	percent [%]
average	16
max	25
min	2

employee situation	percent [%]
meteorologists general	21
meteorologists at system operator	0 (1)

Forecast Types	wind power	solar power	demand	weather	price
percent [%]	79	71	46	63	29

Type of service	Managing	Trading	Balancing	O&M
percent [%]	14	50	27	9

Results: Use of Forecasting...

Trading type	day-ahead market	intra-day market	ancillary services	reserve market
percent [%]	92	63	25	29

Business hours:	24/7	7-- 22	9—5
percent [%]	60 (64)	5	35

Trading Model:	price taker	price maker
percent [%]	78 (80)	22 (20)

Type of forecast	single forecast	multiple forecasts
percent [%]	36 (37)	68

Knowledge of Ensemble Forecasting	Knowledge	Use EPS Forecasts	work after OPR rules
percent [%]	71	21	38

Use of Forecasting: May I ask the audience ?

Results from the questions to the audience in [%]

Forecast Types	wind power	solar power	demand	weather	price
amount	57	29	n/a	14	n/a

Type of service	Managing	Trading	Balancing	O&M
amount	17	33	17	33

Trading type	day-ahead market	intra-day market	ancillary services	reserve market
amount	67	33	n/a	n/a

Business hours:	24/7	7-- 22	9—5
amount	40	0	60

Use of Forecasting: May I ask the audience ?

Results from the questions to the audience in [%]

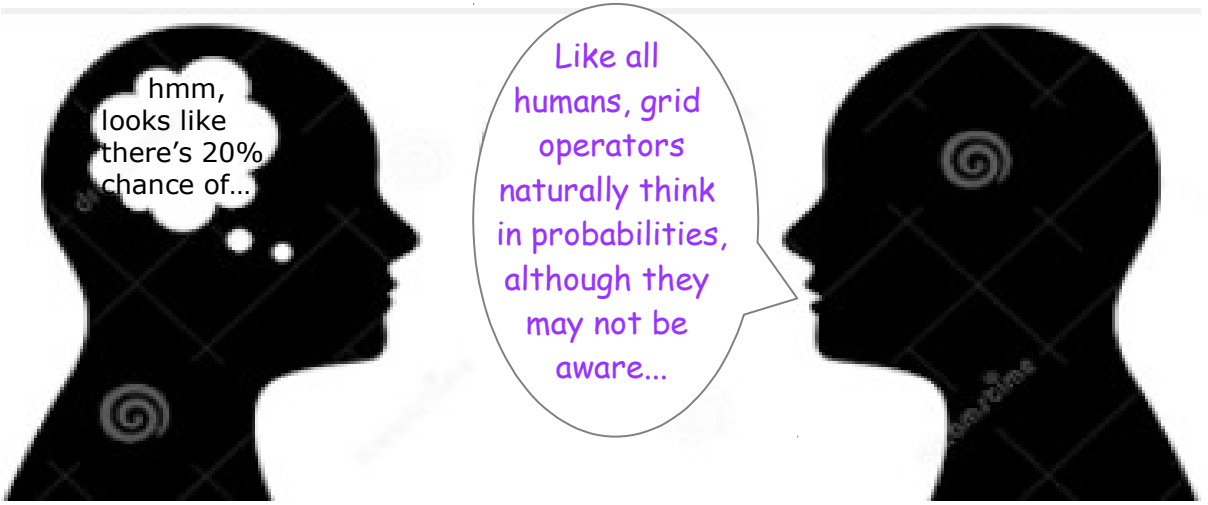
Trading Model:	price taker	price maker
amount	n/a	n/a

Type of forecast	single forecast	multiple forecasts
amount	25	75

Knowledge of Ensemble Forecasting	Knowledge	Use EPS Forecasts
amount	63	38

Area in the world	Area 3 (Africa)	Area 4 (Asia)	Area 1 (Europe)	Area 5 (India)	Area 2 (N. America)	Area 2 (S. America)	Area 6 (AUS|NZ)
amount	0	38	38	0	13	6	6

Improvement or Impairment ?



Year 2011: DoE study[1] led by ALSTOM - 33 system operators in 18 countries

only 25% of respondents ranked importance of probabilistic forecast as HIGH

→ the lowest percentage of all the forecasting products

→ reason: no experience in dealing with probabilistic information?

Year 2016: IEA Task 36 Wind Energy Forecasting WP3.1 with 27+11 participants

71% (63) know something about Probability/Uncertainty Forecasting, but only 21% (38) use probabilistic forecasts

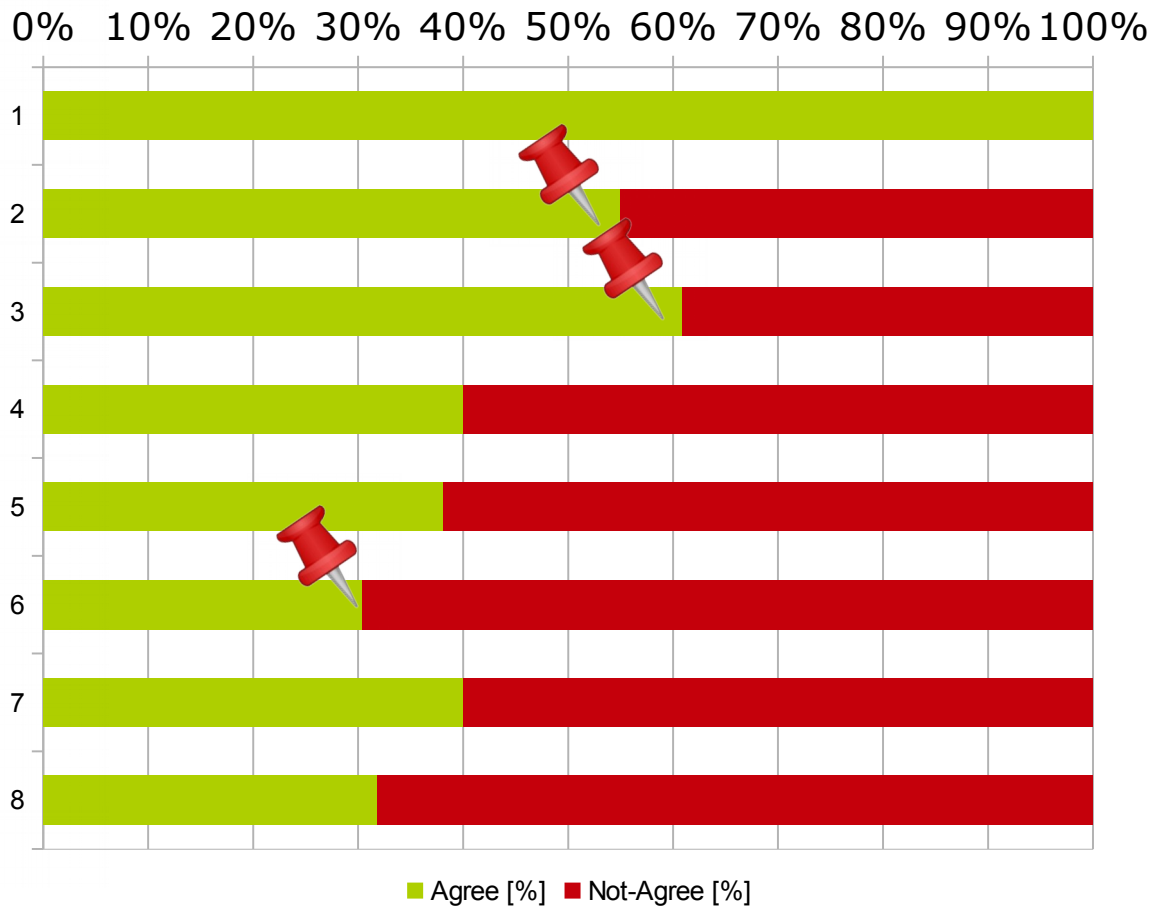
*numbers in brackets are answers from the audience

→ Did those who considered it important actually implement it

[1] http://www1.eere.energy.gov/wind/pdfs/reliable_grid_operations.pdf

Results: Statements about uncertainty in the power market

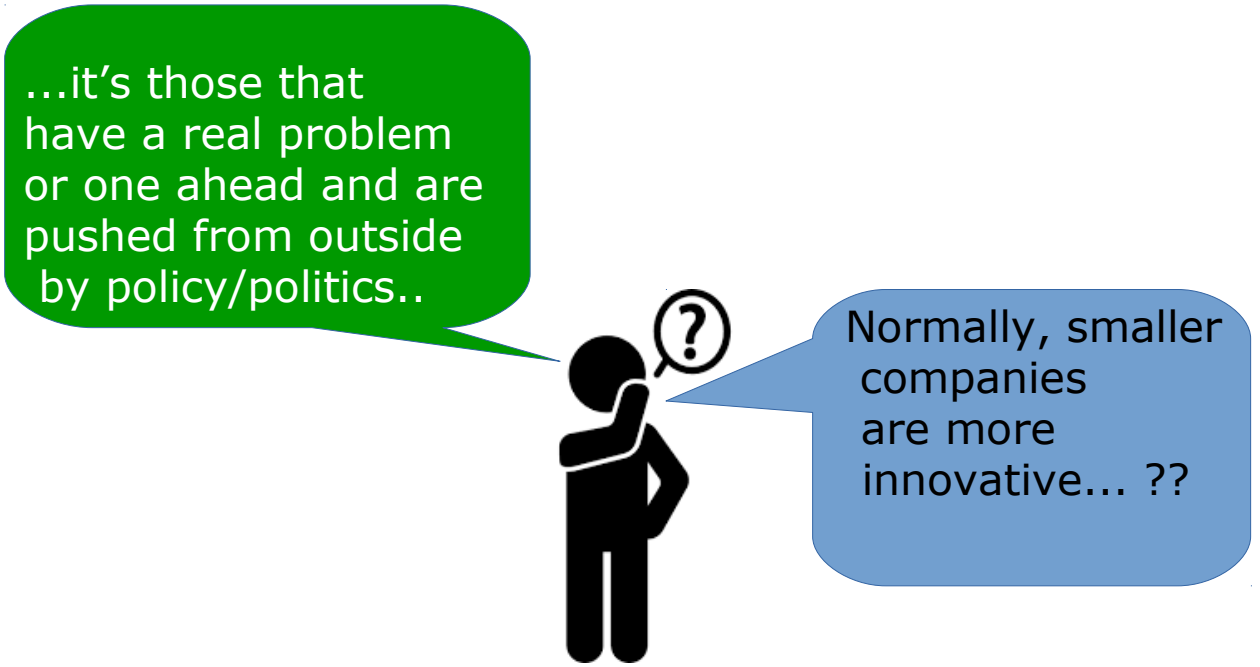
Question
Weather is one out of many uncertainty sources
Insufficient knowledge about tools and approaches
Fear of that speculative planning may result in a loss
Lack of staff to undertake the job
Lack of IT solution(s)
More information may lead to slower decision making and loss of important time
Flexibility in real-time staff resources would be desirable, but is not feasible
Company has access to confidential market information and is not allowed to speculate



How do we have to interpret these results?

- ➔ considerable **lack of knowledge** about tools and applications to deal with uncertainty
- ➔ **gap in understanding** existing solutions & relating them to solve "own" problems
- ➔ still a **mistrust** towards uncertainty information
- ➔ still **wrong perception** of probabilistic/uncertainty forecasts associated with speculation
- ➔ **big data: no concern** for overwhelming amounts of information, but **rather lack of understanding**

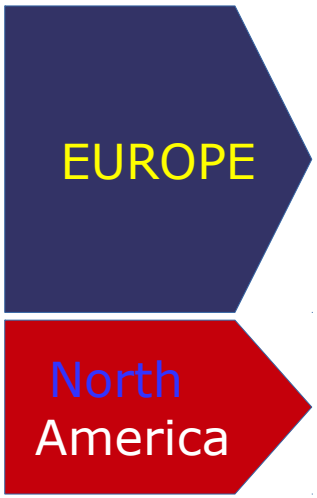
How do we have to interpret these results?



Surprisingly...

→ **Larger organisations** have more focus on optimisation and staff resources to test and verify new technologies in comparison to smaller organisations

Findings from our first country investigations



Denmark
Germany
France
Ireland/UK
Portugal
Spain

USA
Canada

	Type 1	Type 2
Integration incentive	Tax Credits	FIT Tarrifs
Payment structure	PPAs	Trading on Power Markets
Forecasting	Centralised	De-Centralised
Project Types	Large scale	Mixed scale(s)

There are quite some differences between the integration methods…

What are the challenges behind these differences ?

Challenges that require answers...

- **Lack of Transparency caused by changing/unclear policies** (for example Denmark, Germany, France):

  → How do we ensure transparency ?

- **Virtual Interconnections create enlarged price areas:**

  → When do we need prize zones ?

- **Data Handling of small and medium sized projects:**

  → How do we need to design the grid infrastructure, if we also have many small projects ?

- **Trading processes of small and medium sized actors:**

  → How can we ensure they still are part of the strategy ?

Where do we go from here: next steps

Overcome computational barriers related to the scaling of stochastic optimization solutions

Showing business cases and examples of excellence for the use of uncertainty forecasts

Quality of measurements is becoming very relevant due to the increasing need of intra-day balancing

Research to create models capable of jointly modeling uncertainties & their impact on electricity market prices

Defining new research for new & future requirements

Thank you for your attention !

Follow us:

Project webpage

http://www.ieawindforecasting.dk/

Task-page:

http://www.ieawindforecasting.dk/topics/workpackage-3/task-3-1

http://www.ieawindforecasting.dk/topics/workpackage-3/task-3-5

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