



IEA Wind Task 36 - Forecast Improvements

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NATIONAL LABORATORYDeutscher Wetterdienst
Wetter und Klima aus einer HandNREL
NATIONAL RENEWABLE ENERGY LABORATORYUL
TRUEPOWERMINES
PARISTECH

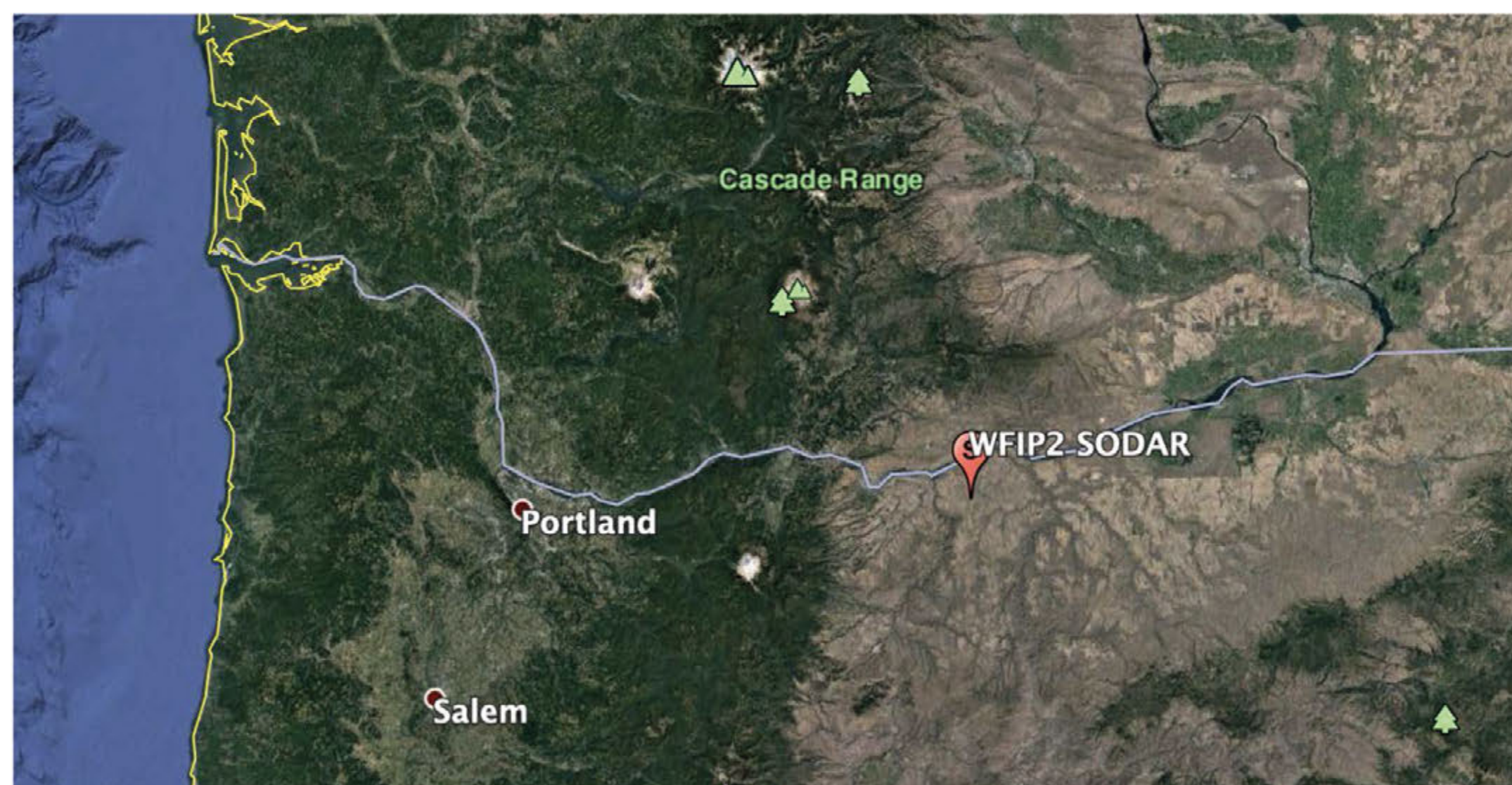
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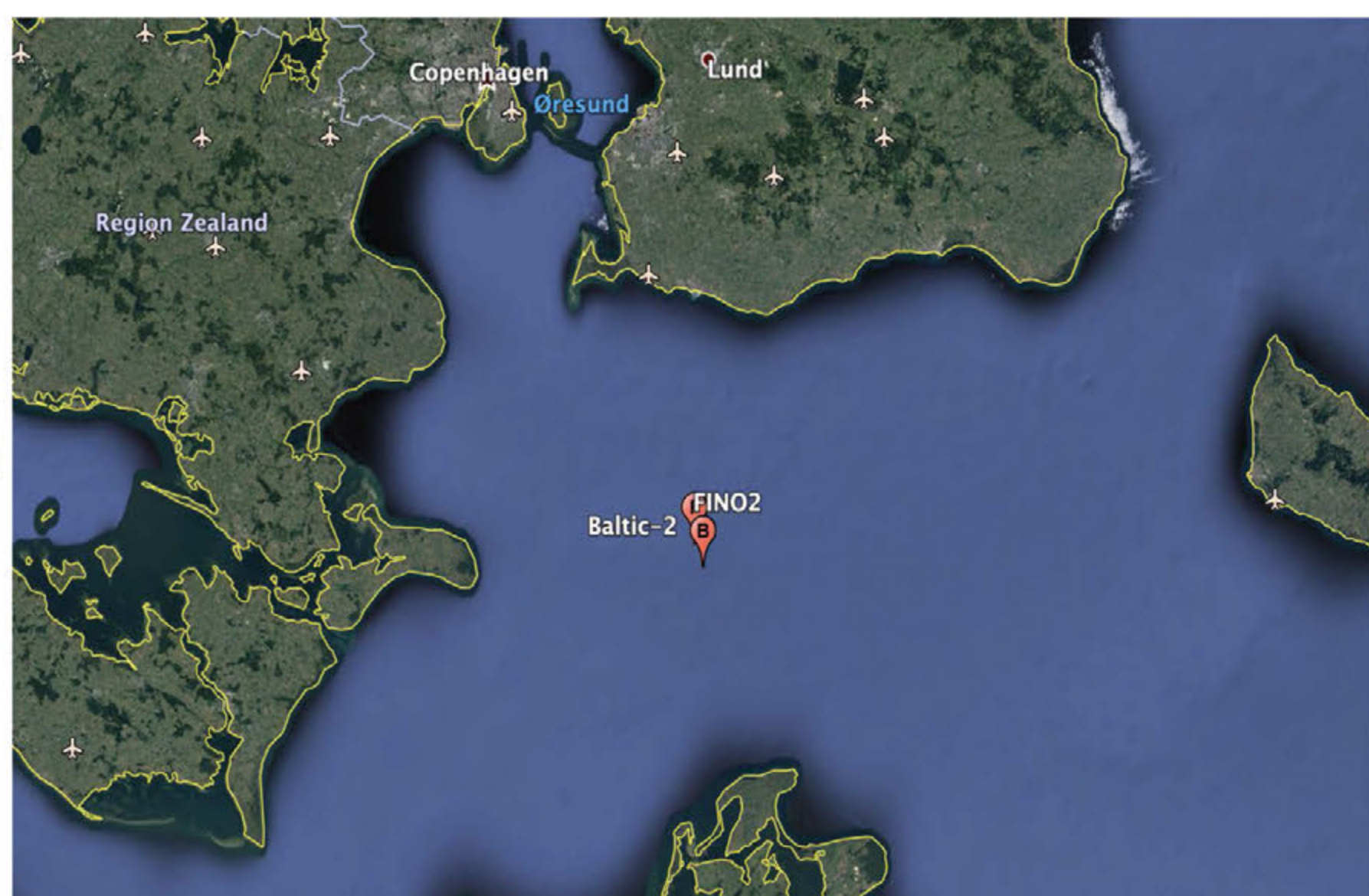
Summary

IEA Wind Task 36 Forecasting is the collaborative work of some 250 meteorologists, forecast vendors, academia and end users to investigate and identify significant advances in wind power forecasting and make them more visible to the user community, including to demonstrate the value of forecasts, especially of probabilistic forecasts. We write Recommended Practices, papers, an information portal and publish games for decision support practice.

NWP Benchmark

US,
Columbia
Gorge

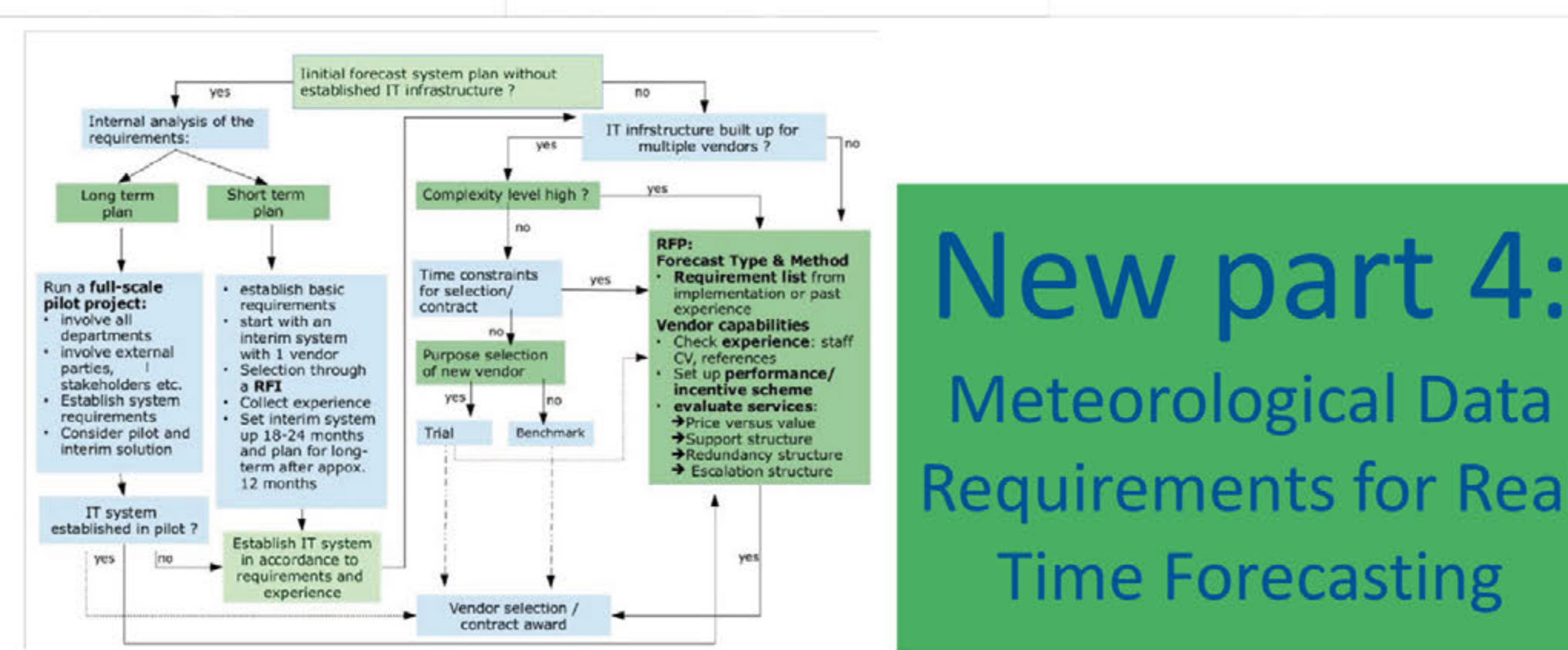
Baltic Sea



- 1 day in September 2016
- mountain waves observed
- observations and model meteorological data available, at 10/5 min resolution
- well documented in the literature, a wealth of information available about the region
- wind farms in the area (but data under an NDA)

- 1 week in October 2020
- power output available every 15 min, with 100% turbine availability
- corrected nacelle wind measurements averaged over the farm every 15 min
- FINO2 is about 4 km NW of Baltic-2

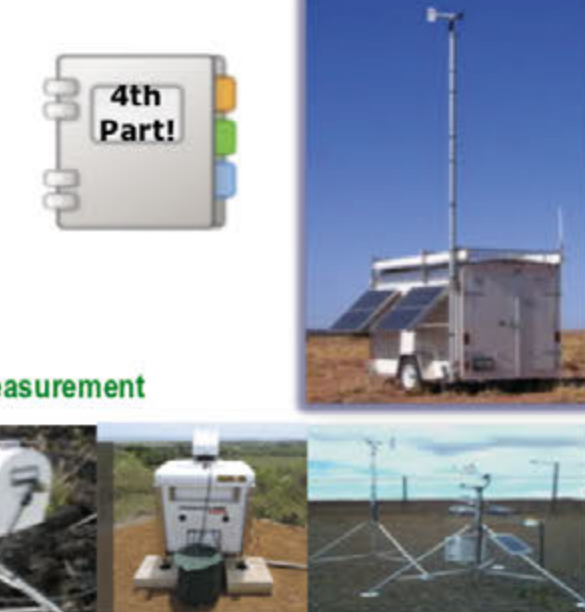
Forecast Solution Selection

IEA Recommended Practice
in three (soon 4) parts.Part 4: Meteorological and Power Data Requirements
For Real-time Forecasting Applications

Target: Provide guidance for deploying and operating on-facility meteorological sensors to gather data for input into renewable power forecasts

- Anticipated content:
- Background and Objectives
 - Meteorological Instrumentation for Real-Time Operation
 - Power Measurements for Real-time Operation
 - Measurement Setup and Calibration
 - Assessment of Instrumentation Performance
 - Best Practice Recommendations
 - Examples of System Operator Meteorological & Power Measurement Requirements

Seeking contributors and reviewers!
Current Status: In preparation



Use of Probabilistic Forecasts

The IEA Task published two papers on the use of probabilistic forecasting, a scientific overview and a more popular note. While probabilistic forecasts have existed for more than a decade, and while their use has been shown to be bene-ficial, the industry is still struggling to make use of the information that can be provided today.

A review paper on the uncertainty propagation through the forecast chain is coming up.



Review

Towards Improved Understanding of the
Applicability of Uncertainty Forecasts in the Electric
Power Industry

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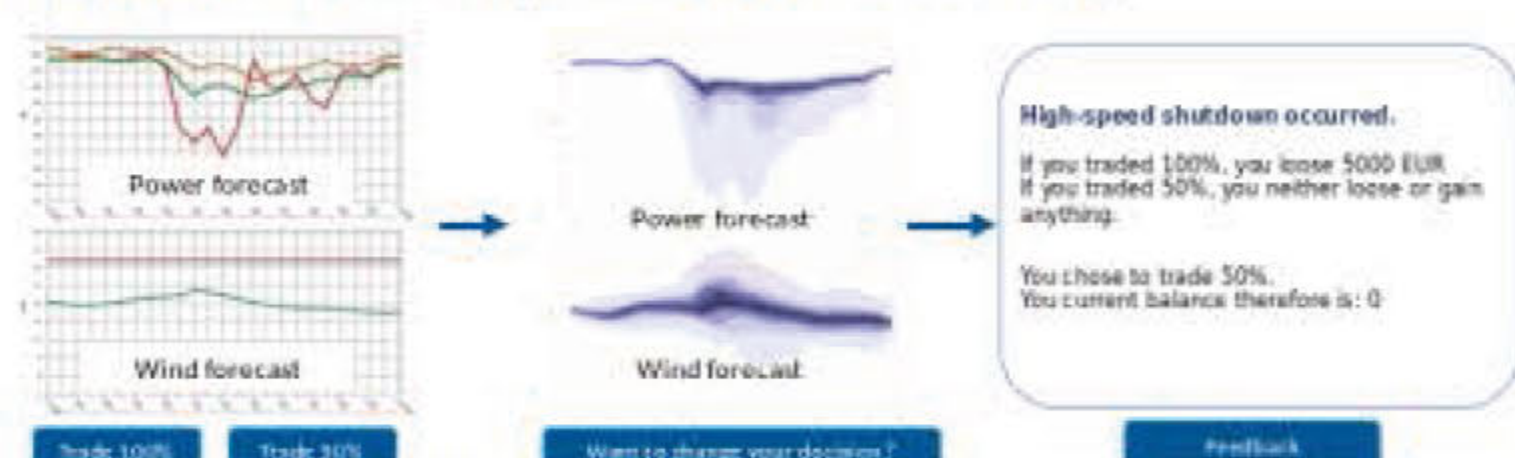
Abstract: Around the world wind energy is starting to become a major energy provider in electricity markets, as well as participating in ancillary services markets to help maintain grid stability. The reliability of system operations and smooth integration of wind energy into electricity markets has been strongly supported by years of improvement in weather and wind power forecasting systems. Deterministic forecasts are still predominant in utility practice although truly optimal decisions and risk hedging are only possible with the adoption of uncertainty forecasts. One of the main barriers for the industrial adoption of uncertainty forecasts is the lack of understanding of its information content (e.g., its physical and statistical modeling) and standardization of uncertainty forecast products, which frequently leads to mistrust towards uncertainty forecasts and their applicability in practice. This paper aims at improving this understanding by establishing a common terminology and reviewing the methods to determine, estimate, and communicate the uncertainty in weather and wind power forecasts. This conceptual analysis of the state of the art highlights that: (i) end-users should start to look at the forecast's properties in order to map different uncertainty representations to specific wind energy-related user requirements; (ii) a multidisciplinary team is required to foster the integration of stochastic methods in the industry sector. A set of recommendations for standardization and improved training of operators are provided along with examples of best practices.

Online available: <http://www.mdpi.com/1996-1073/10/9/1402>

IEA Wind Task 36 "Probabilistic forecasting
games and experiments" initiative

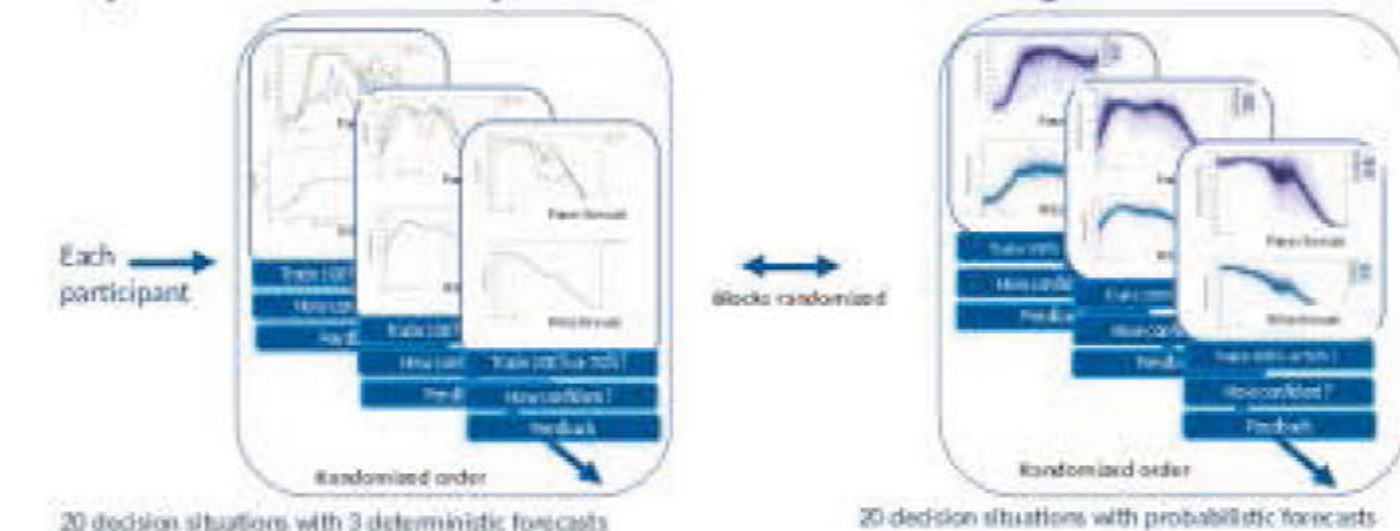
Corinna Möhrlein, WEPROG and Nadine Fleischhut, MPI for Human Development

1. Experiment with sequential Decision-Making



Game: Decisions were to be made in 12 cases
- participants make decisions first based on deterministic and can correct their decision after being presented with probabilistic forecasts
- whether or not a high-speed cut-off takes place within the forecast time
- whether to trade 50% or 100% generating power of an offshore wind park

2. Experiment with separated Decision/Making

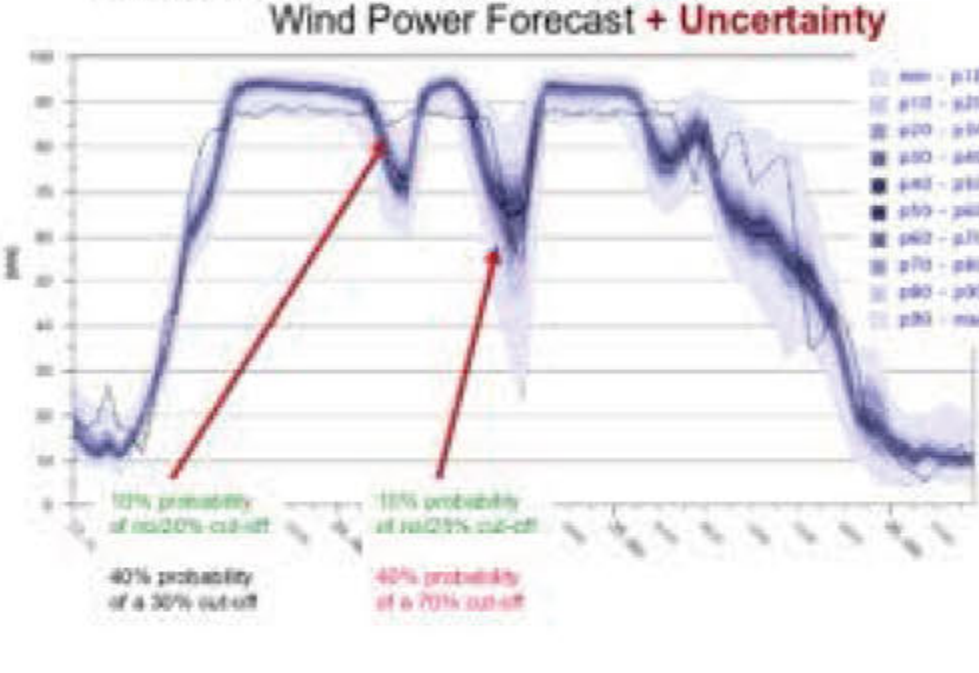


Game: Decisions are to be made in 2 times 20 cases
- participants make decisions based on deterministic or probabilistic forecasts
- request on participant's confidence level regarding their decision
- real-time environment, e.g. participants may be surprised by forecasts that fail to warn or over-predict

Conclusions from the 1. experiment:

- Tailor information:** Probabilistic information can improve decisions, if the targets are defined precisely
- Decision support:** Define decision strategies based on probabilistic information by:
 - providing cues for interpretation (e.g. highlight critical thresholds)
 - putting information in perspective (e.g. comparison, typical distribution)
 - allowing users to develop decision strategies based on real experience
 - providing simple and robust heuristics/decision strategies for users

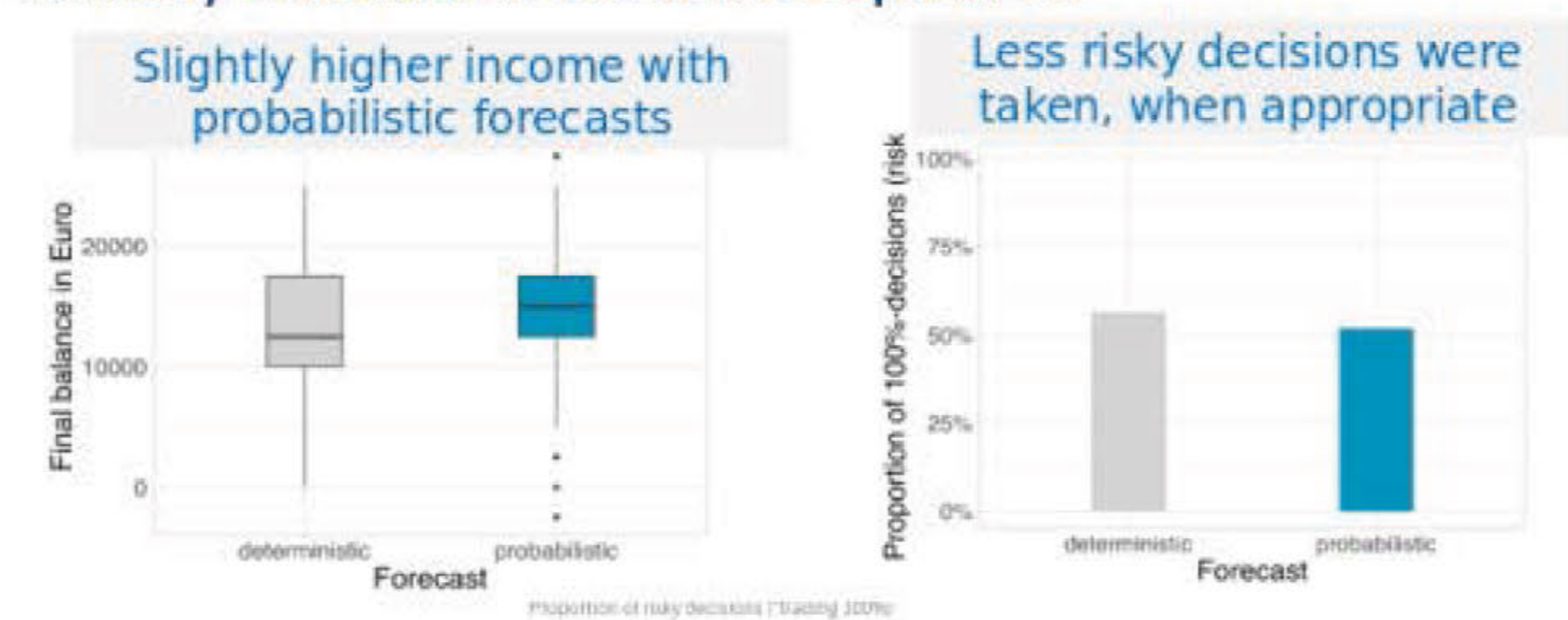
Cost function for the experiments:

Scene: Decision to be made for Intra-day:
Wind Power Forecast + Uncertainty

Situation:
In short-term balancing or grid operation:
Using uncertainty forecasts...

Does the uncertainty forecast alone give confidence and will I always make the correct decision...?

Summary of the main results from 1. Experiment



Analysis of 1st experiment showed:

- Participants changed their mind in 16% of the cases
- 91% of participants changed their mind at least once
- No one wanted to make decisions with deterministic forecasts alone



J. Dobachinski, R. Bessa, R. Du, K. Geisler, S.E. Haupt, M. Lange, C. Möhrlein, D. Nakafuji and M. de la Torre Rodriguez: Uncertainty Forecasting in a Nutshell: Prediction Models Designed to Prevent Significant Errors. IEEE Power and Energy Magazine, vol. 15, no. 6, pp. 40-48, Nov.-Dec. 2017, doi: 10.1109/PEM.2017.2729100

**Next Phase:
Forecasting for the
Weather Driven
Energy System**
Includes wind, solar, demand, P2X, correlations...
2022-2026 (hopefully)

MEET US AT E-D50 or at IEAWindForecasting.dk!

