WS Uncertainty / Probabilistic FC / Decision making:

Probabilistic Forecast Games and Experiments

Goals and Objectives of the Initiative

Our aim is:

i test the **most known** and **observed barriers** of making use of uncertainty/ probabilistic/risk forecasts:

– skepticism – reluctance – misinterpretation –

ii **develop solutions to overcome** these personal barriers

Tools and design structures integrated in our experiments make use of:

i. Use of "**decision from experience**" principle rather than "**decision from description**"

ii. Use of "**learning with feedback**" principle rather than "**theoretical learning**"

iii. Use of **Gamification**: a game illustrates an action without the seriousness and responsibility that comes from real applications and "**a more relaxed atmosphere**"

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2nd Experiment Design (2021/22)

Value of probabilistic power forecasts

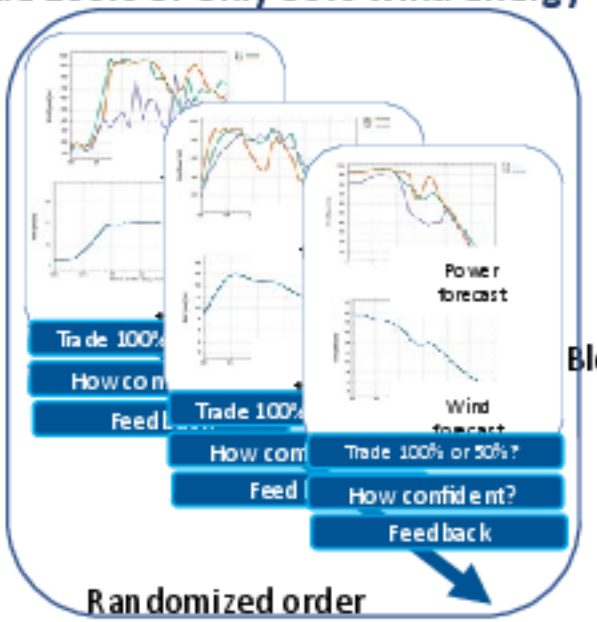
Online: https://meteorology.mpib.dev/wind-power-decisions/about.html -- **Go to "Play again?" to play..**

How do professionals decide based on probabilistic wind & power forecasts?

Design & Analysis: Dr. Nadine Fleischhut*, Dr. Corinna Möhrlen**
Host of Experiment: *Max-Planck Insititute for Human Development, Hans-Ertel Center for Weather Research, Germany
Ensemble Forecasts: **MSEPS 75 Member EPS of WEPROG

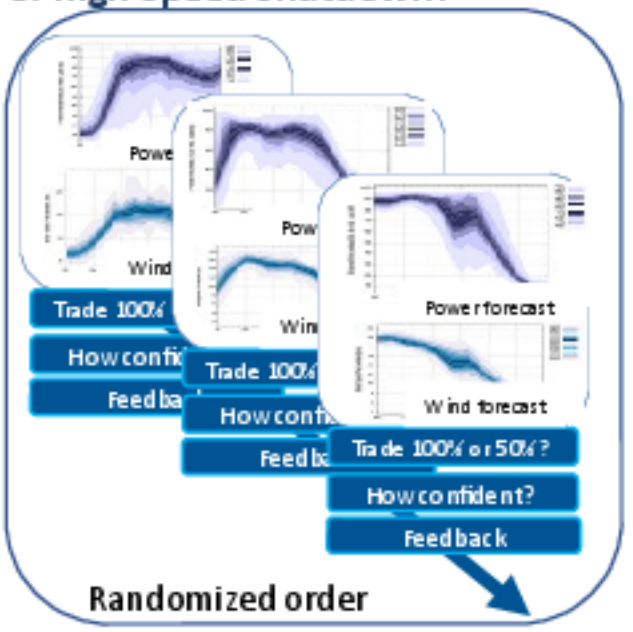
Trade 100% or only 50% wind energy – given the risk of high-speed shutdown?

Each participant



20 decision situations with deterministic forecasts

Blocks randomized



20 decision situations with probabilistic forecasts

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1st Experiment Design (2020)

Value of probabilistic power forecasts

How do professionals decide based on probabilistic wind & power forecasts?

Design & Analysis: Dr. Nadine Fleischhut*, Dr. Corinna Möhrlen** & Dr. Ricardo Bessa (INESCTEC)
Host of Experiment: *Max-Planck Insititute for Human Development, Hans-Ertl Center of Weather Reseach, Germany
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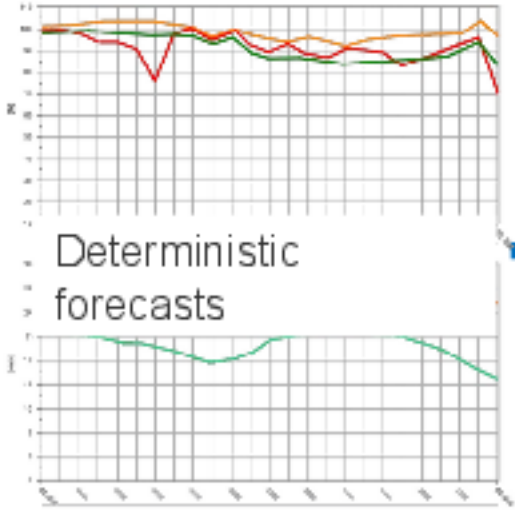
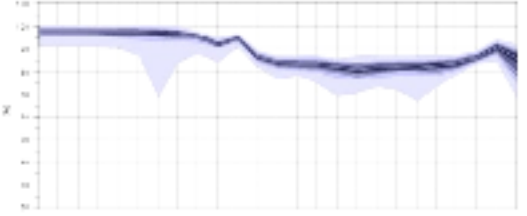


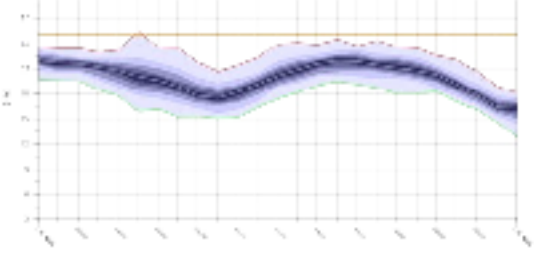
Deterministic forecasts

→ 1st Decision

Power forecasts



Wind forecasts



→ Probabilistic forecasts → 2nd Decision

Cost function

	HSSD	No HSSD
Trading 100%	-5000	5000
Trading 50%	0	2500

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Questions to answer in Task 51

How can probabilistic wind/power forecasts benefit decision making?

Risk communication: **How can we improve risk perception ?**

- Using transparent representations, evidence-based design and evaluation
- Do we have to move from *generation* forecasts to *impact* forecasts ?

Decision support: **How to design decision strategies based on probabilistic information ?**

- What cues need to be provided for interpretation (e.g. highlight critical thresholds)
- How do we put information in perspective (e.g. comparision, typical distribution)
- How can we allow users to develop decision strategies based on realistic experience
- How can we Provide simple and robust heuristics /decision strategies for users

Next steps:

- Evaluate the current running Game/Experiment ---→ please share the link** !!!
- Design a new experiment for the Summer Workshop
  - use results from experiment 1 and 2 to see, whether there are unanswered questions
  - what other questions should we investigate ???

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Extreme Power Events

In February 2021, an extreme winter storm event caused a **massive electricity generation failure in the state of Texas,** which resulted in a **loss of power for more than 4.5 million homes**. … bringing attention to the energy system crisis and its potential causes. While much press has been dedicated to identifying the entities and individuals potentially at fault, **determining exact causes and accurately assigning responsibility for an event this complex requires expert input and opinion**…..

Texas Outage Sheds Light On 'Unreliability' ...
According to the Austin American-Statesman, the Texas **power supply relies chiefly on natural-gas** plants. Those supplied 40% of the grid to the Lone-Star State while the second-largest source was of power was wind at 23%….

Reliability

Resilience

What does that mean for forecasting in the future with 80% … 100% renewables on the grid ?

Do we have to move from *generation* forecasts to *impact* forecasts ?

Do we not have to think wind + solar together with demand ?

Do we not have to collaborate and think all (CO_2-free) generation together ?

Need of broiad collarboration….

- IEA Bioenergy Task
- IEA HybridTask
- IEA PVPS Task
- WMO SG-ENE

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