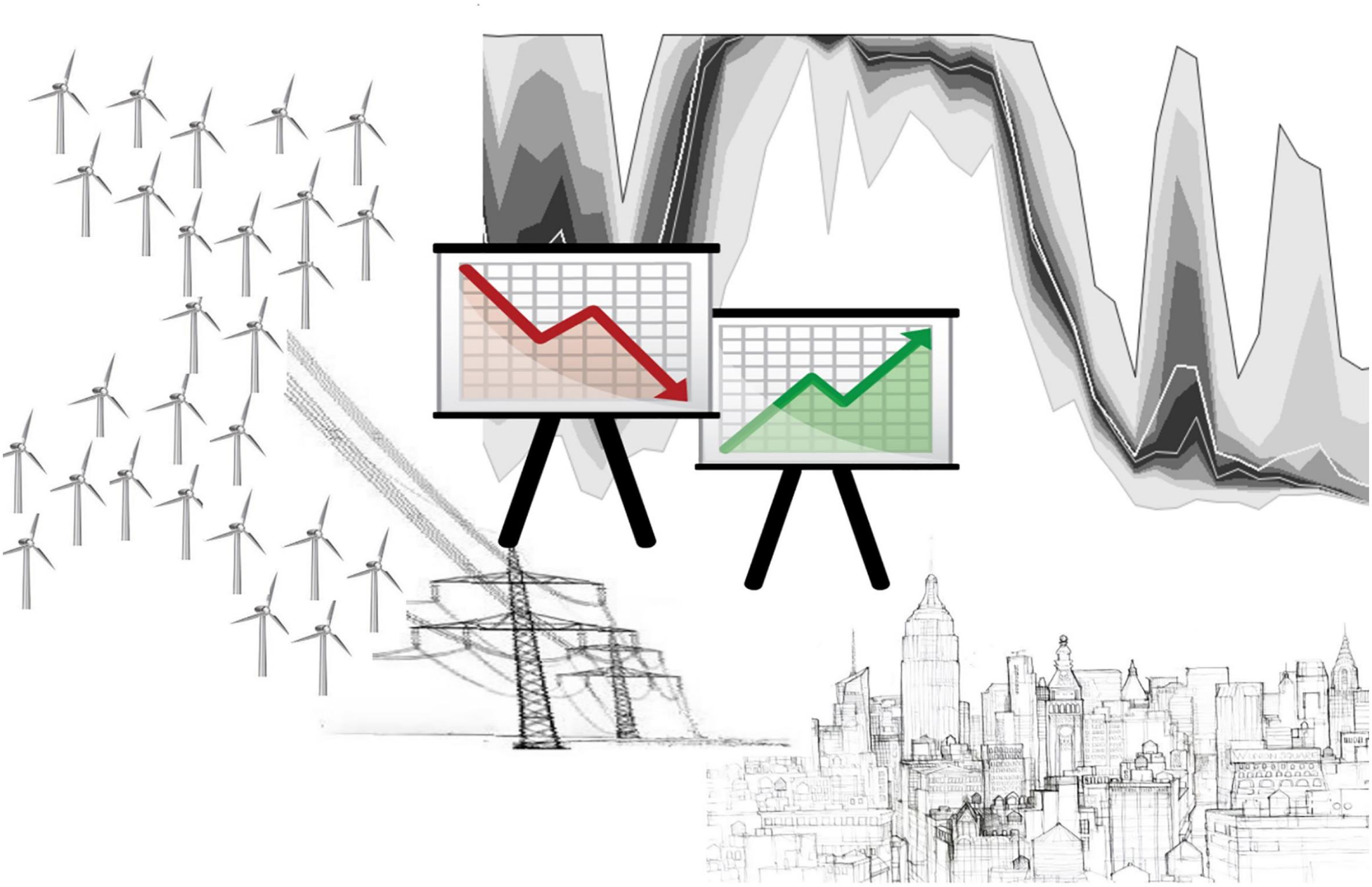

FIGURE 1: WIND POWER FORECASTING FOR GRID INTEGRATION. SOURCE: CORINNA MÖHRLEN, WEPROG

TASK 36 REPORT 2020

Forecasting for Wind Energy

Wind power forecasting is an essential part of the energy transition. High penetration of wind power in the grid is only possible with accurate wind power forecasts for the next minutes, hours and days. IEA Wind Task 36 combines some 250 people from forecast vendors, end users and academia to advance the field, to increase the value of forecasts and to provide advice on streamlining related business processes.

GREGOR GIEBEL,
DTU Wind Energy, Denmark

The Task is composed of three threads: Work Package (WP) 1 is focused on the Numerical Weather Prediction (NWP) improvements necessary to improve the overall forecasting accuracy. The collaboration of global NWP centres and other weather modelling groups improves the NWP models and gives better access to the input and output data. WP 2 is focused on the weather to wind power conversion step of the forecast process and the calculation of the uncertainty, and to a large extent is populated by wind forecast service providers (vendors). The mission of WP 3 is the assessment of how to improve the business practices of end users in order to realize the maximum value from probabilistic wind power forecasts.

IEA Wind Task 36 Forecasting works together with Task 32 on Lidars and IEA PV Task 16 on Solar Resource.

Progress and achievements

In 2020, we presented the Task at several conferences, often with a special session (most of which were online due to Covid-19), and continued to get valuable input for the work on an update of the IEA Recommended Practice on Forecast Solution Selection. The next version, to be published at the end of 2021, will add some solar forecasting specifics (in part with IEA PV Task 16), more examples, and a part 4 for the standardization of meteorological data on renewable power sites to be mandated in grid codes, and to be made available for better forecasts.

As a highlight, we published an overview paper on evaluation of wind power forecasts [2]. A main point in this publication was to highlight to the end users (rather than to academics) that the often-used Root Mean Square Error or similarly simple error measures do not always adequately reflect the intended use and value for the end users.

Another report with input from Task 36 saw the light as IEC TR 63043 'Renewable Energy Power Forecasting Technology' [3]. The report is a quite authoritative overview of forecasting for renewable power, and was produced by experts from IEC SC8A WG2, with large help from members of IEA Wind Task 36 Forecasting.

The NWP information portal was kept up to date throughout the process. Within several national weather providers, the use of tall tower data for online verification was discussed. Another list features open NWP data with links, for free use by vendors and academics alike.

Highlight

A new activity was to use a gamification of probabilistic forecasts to motivate their advantage over deterministic forecasts. In order to do this, Corinna Möhrlen (from operational forecast vendor WEPROG) and Nadine Fleischhut (researching decision making under uncertainty at the Max Planck Institute for Human Development) constructed a simple game [4], based on trading of wind power near the wind farm cut-out speed. In one instance, the players got three unrelated individual forecasts, in the other a fully probabilistic forecast. The first results of the game evaluated during a session on the IEA Wind Task 36 Forecasting Workshop on the Value of Forecasting in January 2020 in Glasgow [1], and showed that the participants not only preferred

TABLE 1. COUNTRIES PARTICIPATING IN TASK

Table 1. Task 36 Participants in 2020

	Country/Sponsor	Institution(s)
1	Austria	Zentralanstalt für Meteorologie und Geodynamik
2	CWEA	China Electric Power Research Institute; China Meteorological Administration; Envision; North China Electric Power University; Xinjiang Goldwind; Zhejiang Windey
3	Denmark	Technical University of Denmark (DTU); Danish Meteorological Institute; DNV; ENFOR; WEPROG; Energinet; ConWX; Ea Energianalyse.
4	Germany	Deutscher Wetterdienst; Fraunhofer Institute for Energy Economics and Energy System Technology; ForWind; Zentrum für Sonnenenergie und Wasserstoff-Forschung; WindForS; EWC; 4cast; Stuttgart University; Enercon; Tennet
5	France	MINES ParisTech; MeteoSwift; MetEolien; Electricité de France; Compagnie Nationale du Rhône; Engie Green; Réseau de transport d'électricité
6	Finland	VTT Technical Research Centre of Finland; FMI; Vaisala
7	Ireland	Technological University of Dublin; University College Dublin
8	Portugal	INESC TEC; Prewind; Smartwatt; Laboratorio Nacional de Energia e Geologia
9	Spain	Vortex; Iberdrola Renovables; Electricidade do Portugal Renovaveis; Red Electrica de España
10	United Kingdom	MetOffice; Reading University; Strathclyde University; UK National Grid
11	United States	Pacific Northwest National Laboratory; National Renewable Energy Laboratory; National Oceanic and Atmospheric Administration; National Center for Atmospheric Research; Electric Power Research Institute; UL Renewables; MESO, Inc.

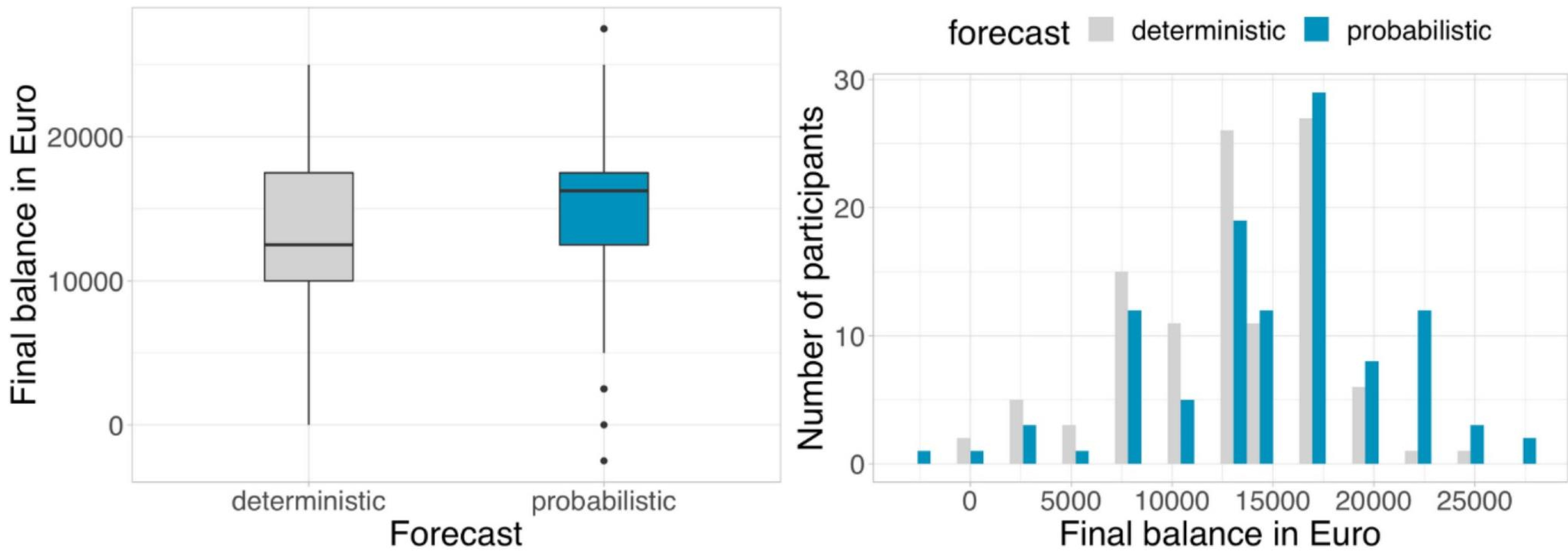

FIGURE 2: THE RESULTS OF THE FIRST FORECASTING GAME, AS PRESENTED ON THE WORKSHOP IN GLASGOW [1]. SOURCE: CORINNA MÖHRLEN, WEPROG

the probabilistic forecasts, but also had a higher income in the game from using them. Figure 2 shows the mean result and the variability of the results from the game. Probabilistic forecasts also seem to help the participating individuals to generally come to a result closer to the optimum, which could indicate a lessened workload and uncertainty for the decision maker. When asked afterwards, the participants preferred to get both a power and a wind speed forecast.

Outcomes and significance

Further increases in the amount of renewable energy to serve the electric and other energy demand are a key component of the battle on climate change.

However, too much wind power without accurate forecasts can endanger the stability of the grid. Task 36 Forecasting addresses this issue and thereby increases the potential amounts of variable renewable energy that the grid can absorb. Since these issues are also common in solar power integration, we will work together with IEA PV Task 16 on solar forecasting.

At the same time, the forecasting community lacks standardization of business processes for both forecast and measurement data exchange, collection, and evaluation. Standardization of forecast offerings and the language used to describe them has also been identified as a barrier to the effective integration of forecast solutions into business practices and hence the increased integration of renewable energy resources. Since standardization takes time, the IEA Wind Task 36 aims to provide industry guidelines in the form of recommended practice on selected topics (1) to ease market access for both companies in search of a forecasting systems to facilitate an increase in their renewable energy penetrations; (2) to enable new and established forecast vendors to more efficiently scale up their processes and (3) to ease comparison of forecast methods and improve the ability for end-users to distinguish among forecasting solutions.

Next steps

The second phase of Task 36 goes into its final year in 2021. Therefore, the major activity is to update the Recommended Practice on Forecast Solution Selection to a new version, which will include a new part 4 on the use of meteorological measurements from renewable power plants for forecasting. We also currently are conducting a weather prediction benchmark [5], catering for two distinct cases of a) mountain waves, and b) offshore prediction in the Baltic with short fetches. We also present standardized data tools, as well as an analysis of the value of forecasting in different market environments and a new more advanced and structured forecasting game to gain more psychological insights into decision making with probabilistic forecasts.

References

[1] https://www.youtube.com/channel/UCsP1rLoutSXP0ECZKicczXg

[2] Jakob W. Messner, Pierre Pinson, Jethro Browell, Mathias B. Bjerregård, Irene Schicker (2020): Evaluation of wind power forecasts—An up-to-date view. Wind Energy 23(6), pp. 1461-1481, June 2020. DOI: 10.1002/we.2497

[3] IEC TR 63043:2020 Renewable energy power forecasting technology. IEC, Geneva. 138 pages.

[4] https://mpib.eu.qualtrics.com/jfe/form/SV_d5aAY95q2mGI8El

[5] For collaboration, please contact Caroline Draxl, NREL, or the chapter author.

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