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IEA Wind Task 51 "Forecasting for the Weather Driven Energy System"

**Giebel, Gregor; Frank, H.; Draxl, C.; Zack, J.; Browell, J.; Möhrlen, C.; Kariniotakis, G.; Bessa, R.; Lenaghan, D.**

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# IEA Wind Task 51 "Forecasting for the Weather Driven Energy System"

Gregor Giebel, DTU Wind and Energy Systems

H. Frank, C. Draxl, J. Zack, J. Browell, C. Möhrlen, G. Kariniotakis, R. Bessa, D. Lenaghan

28 June 2023

Technology Collaboration Programme
by iea

iea wind

# International Energy Agency History

The IEA was founded in 1974 to help countries co-ordinate a collective response to major disruptions in the supply of oil.



Image source: dpa

*Specific Technology Collaboration Programs (in renewable energy):*

**Bioenergy TCP**
**Concentrated Solar Power (SolarPACES TCP)**
**Geothermal TCP**
**Hydrogen TCP**
**Hydropower TCP**
**Ocean Energy Systems (OES TCP)**
**Photovoltaic Power Systems (PVPS TCP)**
**Solar Heating and Cooling (SHC TCP)**
**Wind Energy Systems (Wind TCP)**

See iea.org!

IEA Wind countries
Installed capacity 457 GW
Wind share 6.1 %
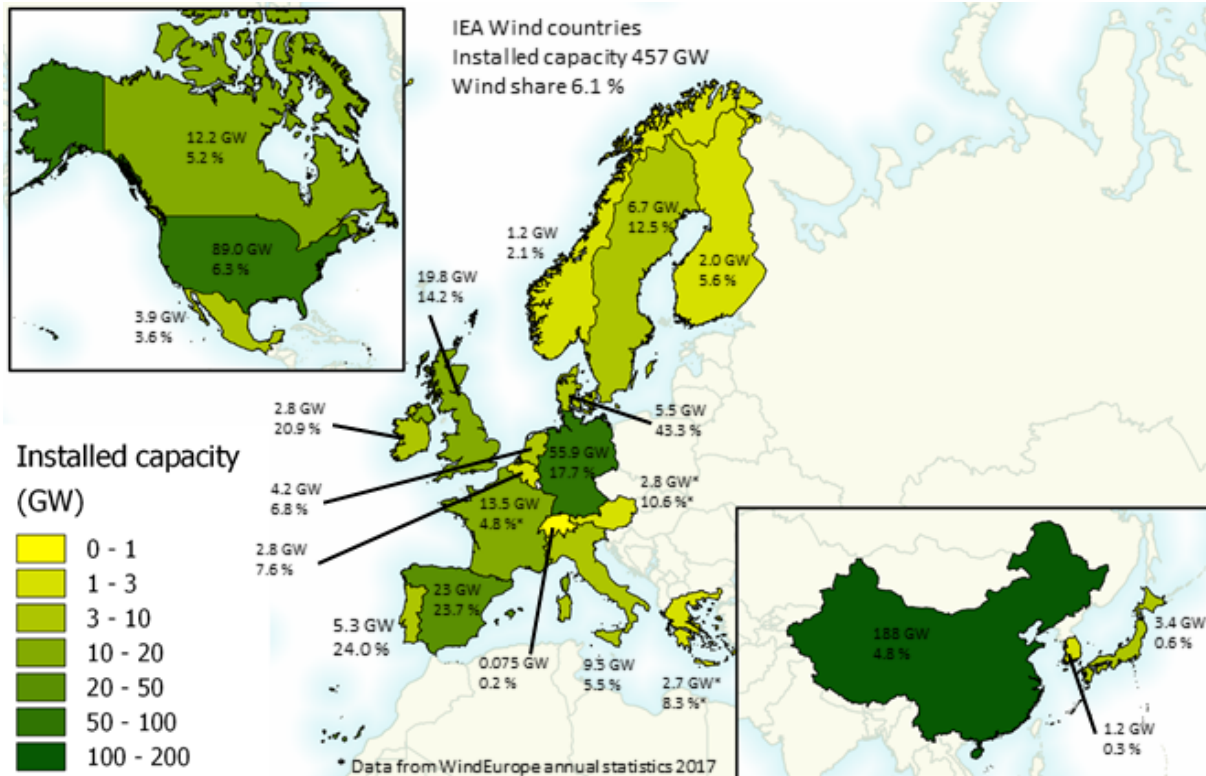
Task 51 members:
AT, CN, DE, DK, ES, FI,
FR, IE, NL, PT, SE, UK, US

Installed capacity (GW)

0 - 1
1 - 3
3 - 10
10 - 20
20 - 50
50 - 100
100 - 200

12.2 GW
5.2 %

89.0 GW
6.3 %

3.9 GW
3.6 %

6.7 GW
12.5 %

1.2 GW
2.1 %

2.0 GW
5.6 %

19.8 GW
14.2 %

2.8 GW
20.9 %

5.5 GW
43.3 %

55.9 GW
17.7 %

4.2 GW
6.8 %

2.8 GW*
10.6 %*

13.5 GW
4.8 %*

2.8 GW
7.6 %

23 GW
23.7 %

5.3 GW
24.0 %

0.075 GW
0.2 %

9.5 GW
5.5 %

2.7 GW*
8.3 %*

188 GW
4.8 %

3.4 GW
0.6 %

1.2 GW
0.3 %

* Data from WindEurope annual statistics 2017

# From Wind Integration to Energy Systems
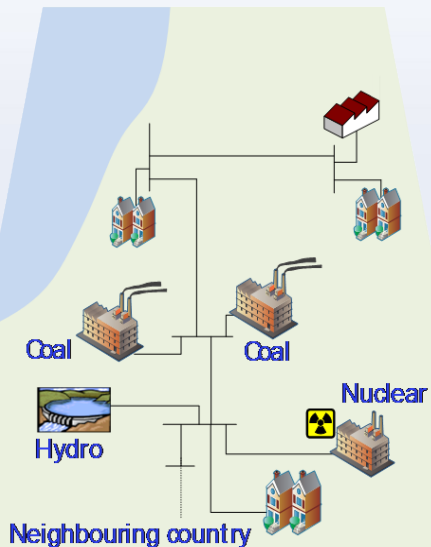
(almost) no RES — Past — Forecasting needs: little

Some RES — Present — All RES seperately

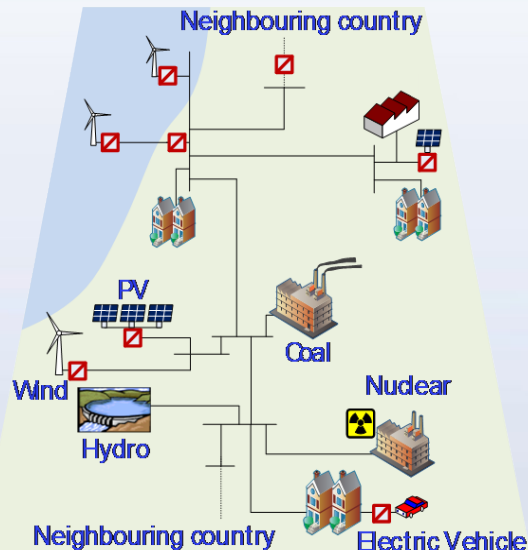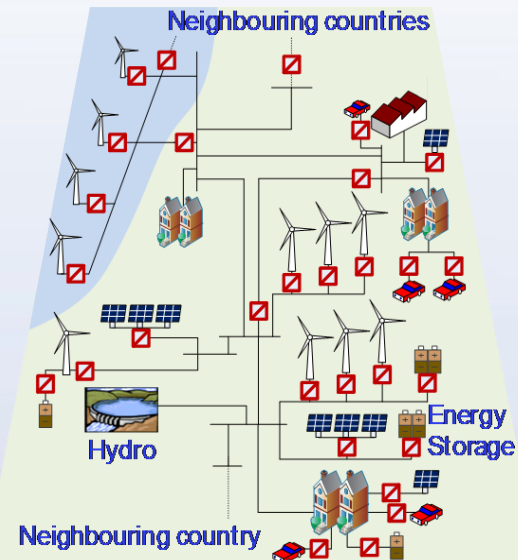100% RES — Future — All RES with correct correlations and longer time scales

Slide design: Ömer Göksu and Nicos Cutululis

The Task 51 Information Portal aims to be a useful resource for people in forecasting, especially providing links to publically available data for model development.

https://iea-wind.org/task-51/t51-information-portal/

# Information Portal

The Task members identified several issues which might be useful in an information portal for wind power forecasting. Those are:

- A list of meteorology masts with online data over 100m height, useful for verification of wind speed predictions
- A list of meteorological experiments going on currently or recently, either to participate or to verify a flow model against
- A list of publicly available wind power forecasting benchmarks, to test your model against
- A list of current or finished research projects in the field of wind power forecasting
- A list of future research issues
- A list of open weather data

For all of those, we would be happy to accept input, so head over to the site and see where you can help, or what you can use!

Please find the full text of the task description here.

The task is led by Gregor Giebel from DTU Wind Energy.

# IEA Best Practice Recommendations for
# the Selection of a Wind Forecasting Solution v2: Set of 4 Documents



Part 1: Selection of an Optimal Forecast Solution



Part 2: Design and Execution of Benchmarks and Trials



Part 3: Evaluation of Forecasts and Forecast Solutions



Part 4: Data Requirements for Real-time Applications
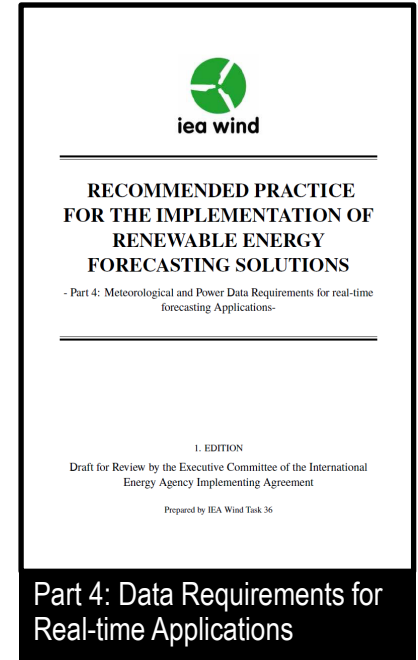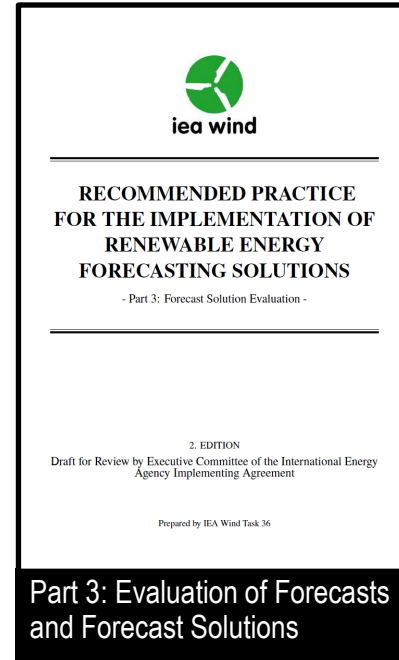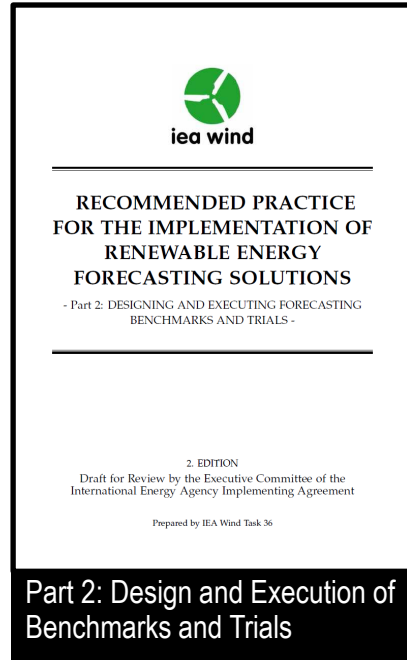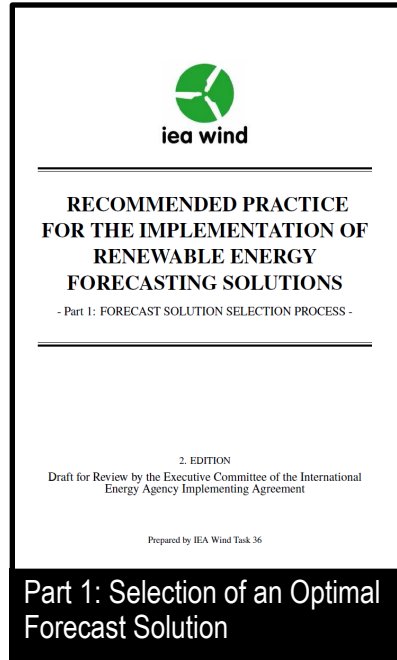
Also as book!
Introduction: https://www.youtube.com/watch?v=XVO37hLE03M

# Elsevier Open Book

**ISBN: 978-0-443-18681-3**

**PUB DATE: November 2022**

**FORMAT: Paperback**

**Editors: Corinna Möhrlen, John W. Zack, and Gregor Giebel**

https://www.elsevier.com/books/iea-wind-recommended-practice-for-the-implementation-of-renewable-energy-forecasting-solutions/mohrlen/978-0-443-18681-3

Chapter downloads:
https://www.sciencedirect.com/book/9780443186813/iea-wind-recommended-practice-for-the-implementation-of-renewable-energy-forecasting-solutions

**NEWS: Error evaluation being proposed to IEC as Technical Specification or International Standard,** in SC8A WG2



IEA Wind Recommended Practice for the Implementation of Renewable Energy Forecasting Solutions

Corinna Möhrlen
John W. Zack
Gregor Giebel

| Work Streams: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| **Atmospheric physics and modelling (WP1)** | ★ | | | List of experiments and data | D1.1, Ongoing | WMO, PVPS T16 |
| **Airborne Wind Energy Systems (WP1)** | ★ | | | Presentations on workshops | Part of D2.1 | Task 48 Airborne Wind Energy |
| **Seasonal forecasting (WP1)** | ★ | | | **Workshop** / Paper | D1.6 / M19 | Hydro TCP, Hydrogen TCP, Biomass TCP |
| **State of the Art for energy system forecasting (WP2)** | | ★ | | **Workshop** / Paper<br><br>RecPract on Forecast Solution Selection v3 | D2.1 / M7, M12<br><br>M2.1 / M36 | PVPS Task 16, Hydro TCP, Hydrogen TCP, … |
| **Forecasting for underserved areas (WP2)** | | ★ | | Public dataset | D2.4 / M24 | WMO |
| **Minute scale forecasting (WP2)** | | ★ | | **Workshop** / Paper | D2.5 / M31, M36 | Wind Tasks 32 Lidar, 44 Farm Flow Control and 50 Hybrids |
| **Uncertainty / probabilistic forecasting (WP3)** | | | ★ | Uncertainty propagation paper with data<br><br>RecPract v3 | D 2.6 / M42<br><br>M48 | PVPS T16 |
| **Decision making under uncertainty (WP3)** | | | ★ | Training course<br>Games | M12<br>M18 | |
| **Extreme power system events (WP3)** | | | ★ | **Workshop** | D3.6 / M42 | Task 25, ESIG, IEA ISGAN, PVPS T16, G-PST |
| **Data science and artificial intelligence (WP3)** | | | ★ | Report | D2.3 / M30 | |
| **Privacy, data markets and sharing (WP3)** | | | ★ | Workshop / Paper<br>Data format standard | D3.5 / M15 | ESIG<br>IEEE WG Energy Forecasting |
| **Value of forecasting (WP3)** | | | ★ | Paper | D 3.4 / M33 | |
| **Forecasting in the design phase (WP3)** | | | ★ | | | Task 50 (hybrids), PV T16, hydrogen TCP |

# Work stream Atmospheric Physics

| WS: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| **Atmospheric physics and modelling (WP1)** | | | | List of experiments and data | D1.1, Ongoing | WMO, PVPS T16 |

Knowing the atmosphere and its developments is the basis for forecasting for all horizons beyond a few hours. Especially with the new emphasis on seasonal forecasting and forecasts for storage management, the weather forecasts are in focus. This work stream spans mostly WP1, where the larger meteorological centres are at home, but crosses over into WP2, where the derived application variables need knowledge of the meteorology.

D 1.1: Online summary of major field studies supportive of wind forecast improvement; list of available data (ongoing)

Image source: NOAA

# Work stream Airborne Wind Energy
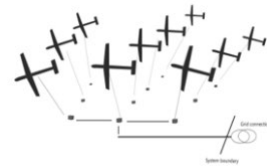

(b) AWE farm

| Work Streams: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| Airborne Wind Energy Systems (WP1) | | | | Presentations on workshops | Part of D2.1 | Task 48 Airborne Wind Energy |

- Novel topic, winds in 300-600m height

- Mapping state of the art on workshop

- Collaboration with Task 48

Image source: Task 48 presentation on IEA Wind ExCo 88, Nov 2021

# WS State of the Art and Research Gaps

| WS: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| **State of the Art for energy system forecasting (WP2)** | | | | Workshop / Paper <br><br> RecPract on Forecast Solution Selection v3 | D2.1 / M7, M12 <br><br> M2.1 / M36 | PVPS Task 16, Hydro TCP, Hydrogen TCP, ... |

In year 1, the new Task will organise a **workshop** on the state of the art and future research issues in energy forecasting, inviting other TCPs (PVPS Task 16 already has voiced interest). The workshop is modelled after the first workshop in Task 36, which established a baseline and research agenda. The established state-of-the art will be carried forward in the recommended practice guideline for forecasting solution selection and its dissemination to the industry at workshops, webinars, conferences, white papers and a book publications. Every WP contributes to this activity.

D 2.1: **Workshop** and paper on **state-of-the-art and future research issues** in the forecasting of weather-dependent energy system variables (M7=Summer 2022, M12=Dec 2022) -> **September 2022 in Dublin!**

M 2.1: Version 3 of IEA Recommended Practice on Forecast Solution Selection (M36=Dec 2024)

# Workshop

State of the Art and Research Gaps in
Forecasting for the Weather Driven Energy System

September 12/13 2022, University College Dublin

http://www.iea-wind.org/task51/

# State of the Art and Research Gaps Workshop, Dublin 2022

- Personal and online some 60 participants

- Slides and video on https://iea-wind.org/task51/task51-work-streams/ws-state-of-the-art-for-energy-system-forecasting/

- Journal paper being worked on

# WS Seasonal Forecasting

| WS: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| **Seasonal forecasting (WP1)** | | | | Workshop / Paper | D1.5 / M19 | Hydro TCP, Hydrogen TCP, Biomass TCP |

**Seasonal forecasts are growing in importance for the power grid planning, especially, where hydropower, storage and other technologies are involved. This topic is also interlinked to the uncertainty forecasting work stream and will focus on the communication between weather and energy community. Seasonal forecasts are a subset of weather forecasting, and are therefore managed by WP1. WP3 will interlink these communities and serve as a platform to establish new applications for the use of seasonal forecasting in the energy community and the transformation into a carbon free energy system.**

**D 1.5: Convene workshop and develop paper on seasonal forecasting, emphasizing hydro and storage (M19)**

Data source SEAS5 ensemble mean from C3S ECMWF | Reference 1993-2016 | Run

Background image: Vortex FdC

Hydrogen TCP

IEA PVPS

IEA HYDRO

iea wind

Wind Speed Anomaly @ 100m - [%]

# Workshop

# Seasonal Forecasting for the Weather Driven Energy System

Stakeholders in the electric energy system have expressed a growing interest in sub-seasonal to seasonal (S2S) forecasting information in their applications. Therefore, to facilitate the dissemination of information about S2S forecasting products, skill, applications, issues, and best practices to members of the electric energy community, the team of the International Energy Agency's (IEA) Wind Task 51 (https://iea-wind.org/task51/), entitled "Forecasting for the Weather Driven Energy System", would like to invite you to a S2S forecasting workshop with the goal of gathering information about methods used to produce S2S forecasts, the current state-of-the-art skill in S2S forecasting for variables relevant for energy system applications, current and planned research activities intended to improve the current level of skill, types of public and private sector operational S2S forecasting products, the range of S2S applications in the energy community and the quantified or perceived value obtained from those applications, the sensitivity of user's application performance to variations in forecast skill, and the unmet S2S-forecasting-related needs or desires of the energy user community.

MAY 17–19, 2023  |  University of Reading, UK                    DRAFT AGENDA
All times are British Summer Time (UTC+1)

# WS Minute scale forecasting

| WS: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| **Minute scale forecasting (WP2)** | | | | Workshop / Paper | D2.5 / M31, M36 | Wind Tasks 32 Lidar, 44 Farm Flow Control and 50 Hybrids, PVPS T16 |

On the power plant level, forecasts some minutes ahead can be used for battery control in hybrid power plants, in wind farm flow control (it takes minutes for the wind field to pass through a larger wind farm), and sometimes also in market structures like the Australian market, which operates on a 5-min schedule. Advances in minute-scale forecasting have been investigated in phase 2 and will be further developed and communicated to the industry. Since minute scale forecasting mainly uses data driven tools (statistical or machine learning), the WS is administered by WP2, but has connections to WP1 for knowing the wind flow through a farm, and to WP3 with regards to usage of the forecasts. We plan to have a workshop together with the IEA Wind Tasks on Lidar and on Hybrid Power Plants, and possibly others.

D 2.5: Workshop and paper on minute-scale forecasting for hybrid power plants or wind farm control, in conjunction with Task 32 on Lidars, Task 44 on Farm Flow Control and Task 50 on Hybrid Power Plants (M31=Summer 2024, M36)

# Minute scale forecasting

- How to use Lidars, Radars or SCADA for very short t
- 30 sec – 15 min
- Workshop with ~~~~~~~~ars at Risø 12/13 June 20
- Slides available from ~~~~~~~~~~~bsite.
- Complete workshop on You~~~~
- Summary paper in Energies journa~~~



**Spring / Summer 2024!**

## Minute-Scale Forecasting of Wind Power—Results from the Collaborative Workshop of IEA Wind Task 32 and 36

Ines Würth [1,*], Laura Valldecabres [2], Elliot Simon [3], Corinna Möhrlen [4], Bahri Uzunoğlu [5,6], Ciaran Gilbert [7], Gregor Giebel [3], David Schlipf [8] and Anton Kaifel [9]

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5. Department of Engineering Sciences, Division of Electricity, Uppsala University, The Ångström Laboratory, Box 534, 751 21 Uppsala, Sweden; bahriuzunoglu@computationalrenewables.com
6. Department of Mathematics, Florida State University, Tallahassee, FL 32310, USA
7. Department of Electronic and Electrical Engineering, University of Strathclyde, 204 George St, Glasgow G11XW, UK; ciaran.gilbert@strath.ac.uk
8. Wind Energy Technology Institute, Flensburg University of Applied Sciences, Kanzleistraße 91–93, 24943 Flensburg, Germany; david.schlipf@hs-flensburg.de
9. Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg, Meitnerstraße 1, 70563 Stuttgart, Germany; anton.kaifel@zsw-bw.de
* Correspondence: wuerth@ifb.uni-stuttgart.de; Tel.: +49-711-685-68285

**Abstract:** The demand for minute-scale forecasts of wind power is continuously increasing with the growing penetration of renewable energy into the power grid, as grid operators need to ensure grid stability in the presence of variable power generation. For this reason, IEA Wind Tasks 32 and 36 together organized a workshop on "Very Short-Term Forecasting of Wind Power" in 2018 to discuss different approaches for the implementation of minute-scale forecasts into the power industry. ~~~ is an international platform for the research community and industry. Task 32 tries to ~~~~ tigate barriers to the use of lidars in wind energy applications, while IEA Wind Task 36 ~~~~ the value of wind energy forecasts to the wind energy industry. The workshop ~~~~~ that need minute-scale forecasts: (1) wind turbine and wind farm control, ~~~~~ y trading and ancillary services. The forecasting horizons from ~~~~~ for turbine control to 60 min for energy market and grid ~~~~~ applied to generate minute-scale forecasts rely on point ~~~~ scanning lidars or radars, or are based on point ~~~~ sensing devices. Upstream data needs to be p~~~~~~~ can either be used in statistical time series ~~~~~~~~ have advantages but also shortcomings. The ~~~~~~~~~~~ ed for further investigations into the minute-scale fore~~~~~~~~~~ a cross-disciplinary exchange of different method experts sh~~~~~~~~~~~ more efforts should be directed towards enhancing quality and reliab~~~~~~~~~~ t data.

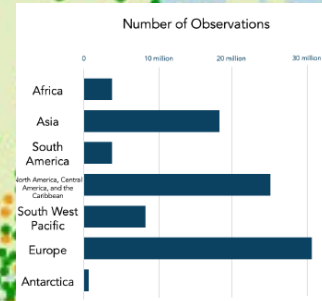**Keywords:** wind energy; minute-scale forecasting; ~~~~~~~ rizon; Doppler lidar; Doppler radar; numerical weather prediction models

# WS Forecasting for underserved areas

| WS: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| Forecasting for underserved areas (WP2) | | | | Public dataset | D2.4 / M24 | WMO |

Number of Observations

Forecasting in the established markets like Europe, North America or China has both a long tradition, and a well-established infrastructure. But in sync with the wind industry opening up new markets for the technology, the grid operators and/or market participants need good solutions to deal with the novel influx of power. However, both data availability and possibly market or grid code structures might be quite different in those places. The quality of the forecast needs to be provided by the vendors, which is why this WS is run by WP2. The recommended practices for the implementation of renewable energy forecasting solutions will also serve the under-served markets as valuable guidelines. An adaptation considering the limitations of under-served or emerging countries will be one focus area in collaboration with WP1.

D 2.4: Inventory and web interface of data and tools for forecasting applications in underserved areas. (M24)

Graphics source: WMO 2021: The value of Surface-Based Meteorological Observation Data: Costs and benefits of the Global Basic Observing Network. Image source: WMO

# WS Uncertainty / Probabilistic FC / Decision making

| WS: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| **Uncertainty / probabilistic forecasting / decision making under uncertainty (WP3)** | | | | Uncertainty propagation paper with data | D 2.6 / M42 | PVPS T16 |
| | | | | Games | M18 | |
| | | | | RecPract v3 | M48 | |
| | | | | Training course | M12 | |

Uncertainty is inherent in the forecasting of weather driven power generation. The preparation of calibrated uncertainty measures is done by the WP2 stakeholders. In WP3, the integration of forecast uncertainty into power grid management, wind power bidding strategies, and storage operation, will be analysed considering the role of humans (and their perception of uncertainty and risk), costs and benefits of end-users. Since this is the research topic needing more attention, WP3 is responsible for this WS. Analysis of critical bottlenecks in forecasting accuracy, as well as validation and value determination, are topics that will be dealt with in interdisciplinary groups and collaborations with associated partners and other WPs. Additionally, a qualitative overview paper of the propagation of uncertainty through the modelling chain was submitted in mid-2021. A natural extension of the work is to use the techniques on real data, to calculate the results and to publish it as a new paper.

# D 2.6: Paper on uncertainty propagation in the modelling chain, using quantitative data (M42)

# M 2.1: Version 3 of IEA Recom. Practice on Forecast Solution Selection (M36)

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# Review of uncertainty propagation

- Conceptual paper on the origins and propagation of uncertainty through the forecasting chain (D2.2)

- Wind and solar power

- Renewable and Sustainable Energy Reviews 2022

- Next paper should use data and quantify the contributions

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## Uncovering wind power forecasting uncertainty origins and development through the whole modelling chain[★,★★]

Jie Yan[a], Corinna Möhrlen[b], Tuhfe Göçmen[c], Mark Kelly[c], Arne Wessel[d] and Gregor Giebel[c,*]

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**ARTICLE INFO**

**ABSTRACT**

Wind power forecasting has been supporting operational decision-making for power system and electricity markets since 30 years. Efforts of improving the accuracy and/or certainty of wind power forecasts, either deterministic or probabilistic, are continuously exerted by academics and industries. Forecast errors and associated uncertainties, which propagate through the whole forecasting chain, from weather provider to the end user, cannot be eliminated completely due to many reasons; for instance, endogenetic randomness of weather systems and varying wind turbine performance. Therefore, understanding the sources of uncertainty and how these uncertainties propagate throughout the modelling chain is significant to implement more rational and targeted uncertainty mitigation strategies and standardise the uncertainty validation. This paper presents a thorough review of the uncertainty propagation through the modelling chain, from the planning phase of the wind farm and the forecasting system through the operational phase and market phase. Moreover, the definition of the uncertainty sources throughout these phases build the guiding line of uncertainty mitigation throughout this review. In the end, a discussion on uncertainty validation is provided along with some examples. Highlights of this paper include: 1) forecasting uncertainty exists and propagates everywhere throughout the entire modelling chain and from planning phase to market phase; 2) the mitigation efforts should be exerted in every modelling step; 3) standardised uncertainty validation practice and global data samples are required for forecasters to improve model performance and for forecast users to select and evaluate the model's output.

### 1. Introduction

High penetration of wind power has been recognised globally as one of the most important features of current and future sustainable power systems. The natural randomness and variability of the wind itself can aggravate negative impacts of wind power on power system operation and market trading, which strengthens the significance of forecasting technology. Wind power forecasting (WPF) started more than three decades ago [16], with the first operational forecasting tools arriving at system operation level some 10 years later at the Danish transmission system operator ELSAM [10]. Since then, researchers have been making continuous efforts to improve the forecasting accuracy and reliability.

It is impossible to achieve perfect predictions of wind power at any given time or location, due to chaotic atmospheric motions having temporal and spatial scales that typically span more than six orders of magnitude [17, 18, 19]. Along with the complex wind field, wind turbine performance creates nonlinear and time-varying uncertainties in wind power forecasting. To improve the value of forecasts and their usage, we practically consider three questions: why, when and to what extent the forecasting uncertainty will happen [20]. Accordingly, this further guides the mitigation of forecasting uncertainty. There is plenty of literature in this area, and can be clarified into following three categories.

# WS Data Science and Artificial Intelligence

| WS: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| **Data science and artificial intelligence (WP3)** | | | | Report or paper | D2.3 / M30 | |

Data-driven decision-making under risk and uncertainty is being augmented with advances in data science (e.g., deep learning with heterogeneous data sources) and artificial intelligence (e.g., reinforcement learning for optimization) techniques. WP3 will administer the WS and will collect success cases of application in the forecasting and decision-making domain of wind power forecasting, and study different paradigms for integrating uncertainty, data science and AI, such as: human-in-the-loop decision making, digital twins for decision support, interactive machine learning, etc. Finally, trust and security of data-driven methods will be a topic of analysis, in particularly considering industry requirements for integrating new technologies in their business processes. For meteorologists, the numerical weather prediction models change faster than the climate. How can the local adaption or some kind of AI adapt to this without running a new and old model in parallel for a long time? To shorten this parallel time would free up some effort to be used somewhere else.

D 2.3:  Report and conference papers on techniques to optimize the use of data science/AI tools for the forecasting of energy-application variables (M30)

# WS Privacy, Data Markets and Sharing

| WS: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| **Privacy, data markets and sharing (WP3)** | | | | Workshop / Paper Data format standard | D3.5 / M15 | ESIG, IEEE WG Energy Forecasting |

The transformation of the energy system towards a carbon free generation, and the EU strategy for Common European data spaces that will ensure that more data becomes available for use in the economy and society, requires new policies for data sharing (monetary and non-monetary incentives) and privacy, but also developments of regulatory frameworks and data market designs. This will cover different use cases, such as forecasting and operation & maintenance of wind power plants, where data sharing across the energy value chain can bring benefits for multiple stakeholders (e.g., improved predictability, reduced O&M costs, improvement of turbine component reliability, etc.). The Task also develops its own API, to become a common open-source framework, standardised across vendors, and looks into other data transfer issues.

D 3.5: Summary of use cases, such as forecasting and operation & maintenance of wind power plants to show benefits of data sharing across the energy value chain (M15)

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# WS Extreme Power System Events

| WS: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| **Extreme power system events (WP3)** | | | | Workshop | D3.6 / M42 | Task 25, ESIG, IEA ISGAN, PVPS T16, G-PST |

Weather extremes are a threat to the power system, not only due to destruction of hardware, but also due to inadequate unit commitment, grid planning and available generation units. The challenges are broad and reach into the power markets, where extreme prices can be caused by extreme weather events. Knowledge and exchange of information on how to forecast extremes and mitigate effects from such extremes are topics that need attention in the next phase. While there is a strong weather dependency in this WS, the work will be structured according to the needs of the end users, and therefore administered by WP3.

D 3.6: Convene **workshop** on extreme power system events (M42, summer 2025)

Image source: Deutsche Welle

# WS Value of Forecasting

| WS: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| **Value of forecasting (WP3)** | | | | Paper | D 3.4 / M33 | |

Without value for the end users, there wouldn't be a market for forecasts. The incremental value of increase accuracy is though much harder to assess. The value proposition is though quite country and market specific. Therefore, we will analyse different market structures w.r.t. to the regulatory framework, the amount of renewable power in the system (i.e. whether it is a price taker or price maker), the possibilities for gaming and the implications of gaming for the system.

D.3.4: Documentation and communication of the assessment of the value of probabilistic forecasts in selected markets, bidding strategies (M24)

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# WS Forecasting in the Design Phase

| WS: | WP1 Weather | WP2 Power | WP3 Applications | Deliverable | #, Due | Collaboration |
|---|---|---|---|---|---|---|
| **Forecasting in the design phase (WP3)** | | | | | | Task 50 (hybrids), PV T16, hydrogen TCP |

An assessment of the expected forecasting accuracy for a given site was already investigated for a single case in Europe. However, since then it has been quiet.

- o Case in Denmark analyzed during SafeWind project

The new Task will analyse the tradeoffs between normal siting of the turbines, and the forecast capability type.

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# Summary Forecasting for the Weather Driven Energy System

- Relaunch of Task 36

- Framework conditions changed since first phase of Task 36: RES is not small addition to system, but IS the system; sector coupling to transport, heat, X…

- Has new challenges for new forecast horizons (seasonal forecasting…)

- Needs strong **collaboration with related TCPs** (solar, hydro, hydrogen, …) and related Tasks (Integration, Lidar, Farm Flow Control, Hybrids, …)

- Data markets coming into focus


- 4 public workshops: State of the art (2022), Seasonal Forecasting (2023), Minute Scale Forecasting (2024) and Extreme Power System Events (2025).

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# [www.IEA-Wind.org/task-51](www.IEA-Wind.org/task-51)

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**Technology Collaboration Programme**
by iea