

# IEA Wind Task 36 – Forecast Improvements

Gregor Giebel, DTU Wind Energy

W. Shaw, H. Frank, C. Möhrlen, C. Draxl, J. Zack, P. Pinson, G. Kariniotakis, R. Bessa

Poster PO.004 on the WindEurope ElectricCity, Copenhagen, 23-25 Nov 2021

Technology Collaboration Programme

by **iea**



# Task Objectives & Expected Results

## **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
- Meteorologists
- Forecast providers
- End-users and stakeholders

## **Task Work is divided into 3 work packages:**

- WP1: Weather Prediction Improvements
- WP2: Power and Uncertainty Forecasting
- WP3: Optimal Use of Forecasting Solutions

Current Term: 2019-2021



# Information Portal

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The Task 36 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-36/t36-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.

# D1.2 NWP Benchmark cases

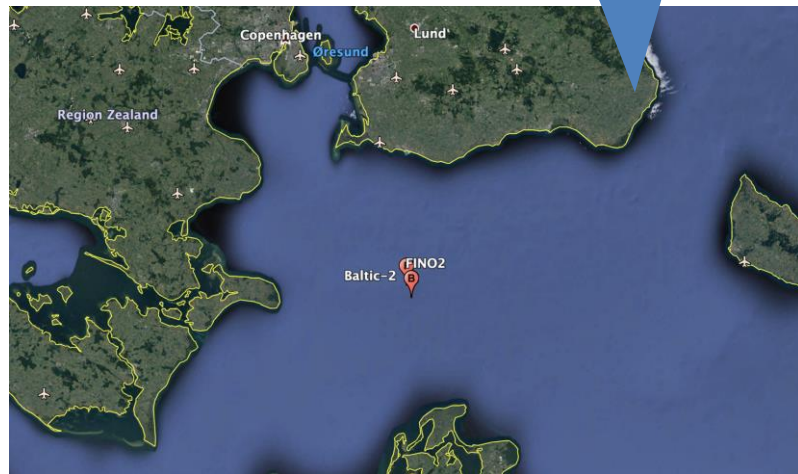
Started:  
June  
2021

## U.S. case



- 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)

## European case

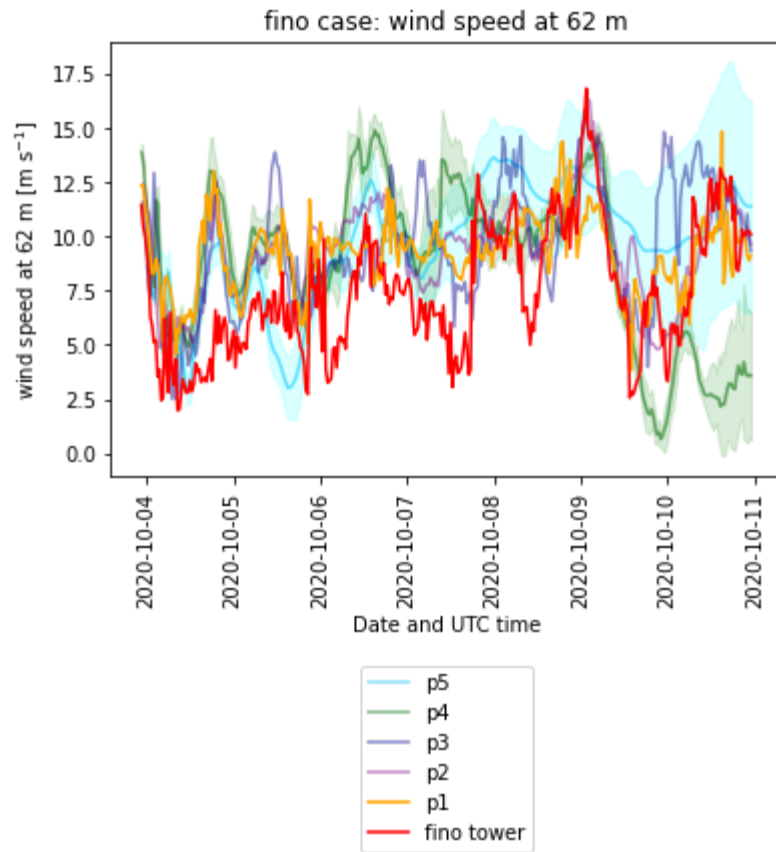


- 1 week in October 2020
- power output available every 15 min, with 100% turbine availability
- corrected nacelle wind measurements averaged over the farm every 15 min
- FINO2 is about 4 km NW of Baltic-2, **offshore**

Slide from Caroline Draxl, NREL – please contact  
[IEA.Forecasting.Benchmark@groups.nrel.gov](mailto:IEA.Forecasting.Benchmark@groups.nrel.gov) for participation

# NWP Benchmark analysis updates

- 5 organizations (2 companies, 3 weather or research) submitted forecasts with a mix of deterministic and ensemble forecasts
- Currently we focus on analyzing the FINO2 met tower/Baltic-2 wind farm case (a week in October 2020), especially on the ramp forecasts. The 7-day period only displays a few ramp events
- Our analysis is anonymous. **We still welcome forecast submissions** to increase the statistical significance of our analysis!
- WE-validate GitHub repo:  
<https://github.com/joejoeyjoseph/WE-Validate>  
- Participants' data are not shared on GitHub at this point



# IEA Best Practice Recommendations for the Selection of a Wind Forecasting Solution: Set of 3 Documents



EXPERT GROUP REPORT

ON  
RECOMMENDED PRACTICES FOR SELECTING RENEWABLE  
POWER FORECASTING SOLUTIONS

**Part 1: FORECAST SOLUTION SELECTION PROCESS**

1. EDITION 2019

Submitted to the  
Executive Committee of the  
International Energy Agency Implementing Agreement  
on 13<sup>th</sup> August 2019

- Part 1: Selection of an Optimal Forecast Solution



EXPERT GROUP REPORT

ON  
IEA RECOMMENDED PRACTICE FOR  
SELECTING RENEWABLE POWER FORECASTING SOLUTIONS

**Part 2: DESIGNING AND EXECUTING FORECASTING BENCHMARKS AND TRIALS**

1. EDITION 2019

Submitted to the Executive Committee of the International Energy Agency Implementing Agreement  
on 1<sup>st</sup> August 2019

- Part 2: Design and Execution of Benchmarks and Trials



EXPERT GROUP REPORT

ON  
RECOMMENDED PRACTICES FOR SELECTING RENEWABLE  
POWER FORECASTING SOLUTIONS

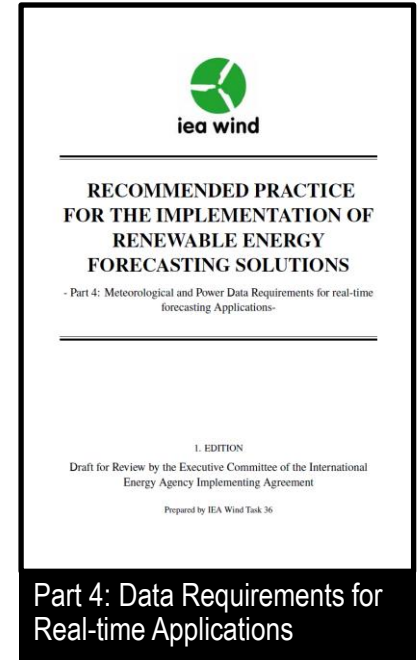
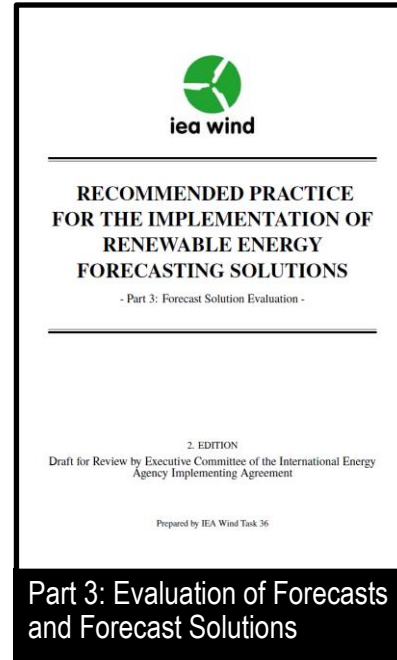
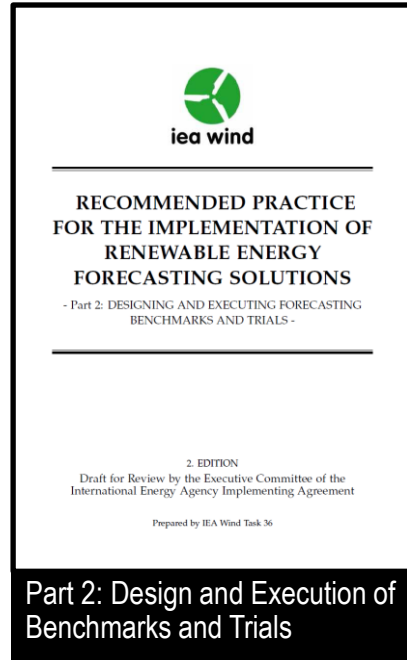
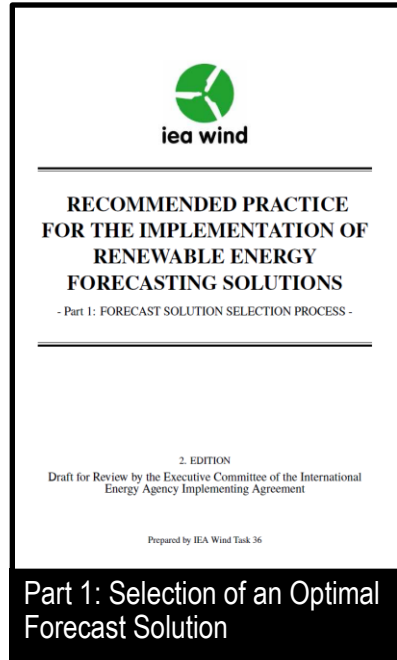
**Part 3: Evaluation of Forecasts and Forecast Solutions**

1. EDITION 2019

Submitted to the  
Executive Committee of the  
International Energy Agency Implementing Agreement  
on 13<sup>th</sup> August 2019

- Part 3: Evaluation of Forecasts and Forecast Solutions

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



Currently under review, expected final in January – also as book!



# Review of uncertainty propagation

- Conceptual paper on the origins and propagation of uncertainty through the forecasting chain (D2.2)
- Wind power only
- Submitted to Renewable and Sustainable Energy Reviews
- Next paper should use data and quantify the contributions

## Uncovering wind power forecasting uncertainty origins and development through the whole modelling chain<sup>\*,\*\*</sup>

Jie Yan<sup>a</sup>, Corinna Möhrlein<sup>b</sup>, Tuhfe Göçmen<sup>c</sup>, Mark Kelly<sup>c</sup>, Arne Wessel<sup>d</sup> and Gregor Giebel<sup>c,\*</sup>

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### ARTICLE INFO

*Keywords:*  
wind power  
forecast uncertainty  
modelling chain

### 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, endogenous 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.

<sup>\*</sup> This paper was coordinated under the auspices of IEA Wind Task 36 'Forecasting for Wind Energy'. Corinna Möhrlein, Tuhfe Göçmen, Mark Kelly and Gregor Giebel were funded by the Danish EU/DP project 'IEA Wind Task 36 Phase II Danish Consortium', Grant Number 64018-0515.

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# Broader paper on uncertainty forecasting

Prediction Models  
Designed to  
Prevent Significant  
Errors

*By Jan Dobschinski,  
Ricardo Bessa, Pengwei Du,  
Kenneth Geisler,  
Sue Ellen Haupt,  
Matthias Lange,  
Corinna Möhrlen,  
Dora Nakafuji, and  
Miguel de la Torre Rodriguez*

## Uncertainty Forecasting in a Nutshell

DOI: 10.1109/MPE.2017.2729100

Digital Object Identifier 10.1109/MPE.2017.2729100  
Date of publication: 18 October 2017



IT IS IN THE NATURE OF CHAOTIC ATMOSPHERIC processes that weather forecasts will never be perfectly accurate. This natural fact poses challenges not only for private life, public safety, and traffic but also for electrical power systems with high shares of weather-dependent wind and solar power production.

To facilitate a secure and economic grid and market integration of renewable energy sources (RES), grid operators and electricity traders must know how much power RES within their systems will produce over the next hours and days. This is why RES forecast models have grown over the past decade to become indispensable tools for many stakeholders in the energy economy. Driven by increased grid stability requirements and market forces, forecast systems have become tailored to the end user's application and already perform reliably over long periods. Apart from a residually moderate forecast error, there are single extreme-error events that greatly affect grid operators.

Nevertheless, there are also forecast systems that provide additional information about the expected forecast uncertainty and estimations of both moderate and extreme errors in addition to the "best" single forecast. Such uncertainty forecasts warn the grid operator to prepare to take special actions to ensure grid stability.

### The State of the Art in Forecast Generation

Today, some forecast systems have been developed specifically to predict the power production of single wind and solar units, differently sized portfolios, local transformer stations and subgrids, distribution and transmission grids, and entire countries. Nearly all forecast systems have one thing in common: they rely on numerical weather predictions (NWP) to calculate the expected RES power production. The way to transform weather predictions into power forecasts depends crucially on the end user's application and the available plant configuration and measurement data. If historical measurements are available, forecast model developers often use statistical and machine-learning techniques to automatically find a relation between historical weather forecasts and simultaneously observed power measurements. If no historical measurement data are available, e.g., for new installations of RES units, the transformation of weather to power is often accomplished by physically based models that consider the unit's parameters to map the internal physical processes.

# Use of probabilistic forecasting

Open Access journal paper  
48 pages on the use of  
uncertainty forecasts in the  
power industry

Definition – Methods –  
Communication of  
Uncertainty – End User Cases  
– Pitfalls - Recommendations

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



Review

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

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Academic Editor: David Wood

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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.

# 2<sup>nd</sup> Experiment Design (2021)

## Value of probabilistic power forecasts

### task 36

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

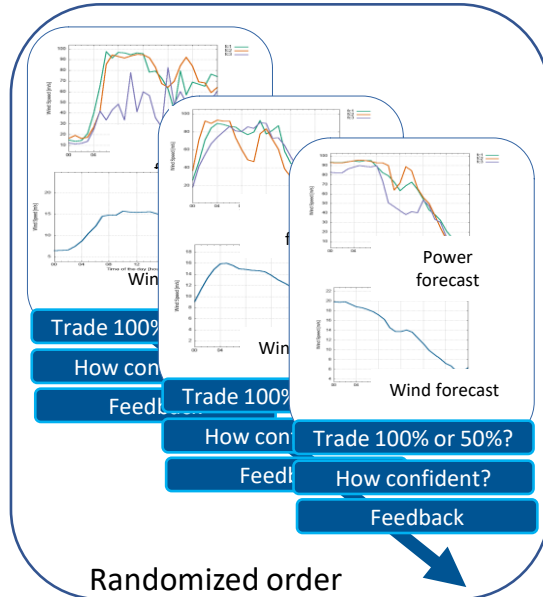
Design & Analysis: Dr. Nadine Fleischhut\*, Dr. Corinna Möhrlen\*\*

Host of Experiment: \*Max-Planck Institute for Human Development, Hans-Ertel Center for Weather Research, Germany

Ensemble Forecasts: \*\*MSEPS 75 Member EPS of WEPROG

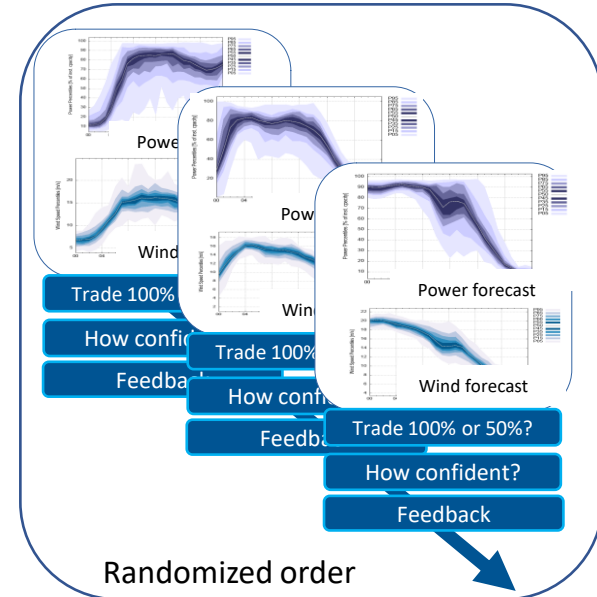
**Trade 100% or only 50% wind energy – given the risk of high-speed shutdown?**

Each  
participant



20 decision situations with deterministic forecasts

Blocks randomized

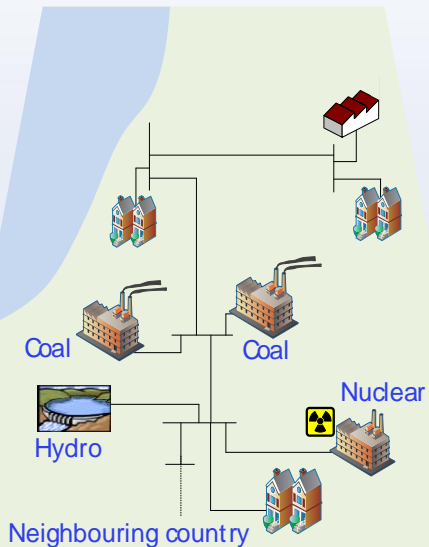


20 decision situations with probabilistic forecasts

# From Wind Integration to Energy Systems

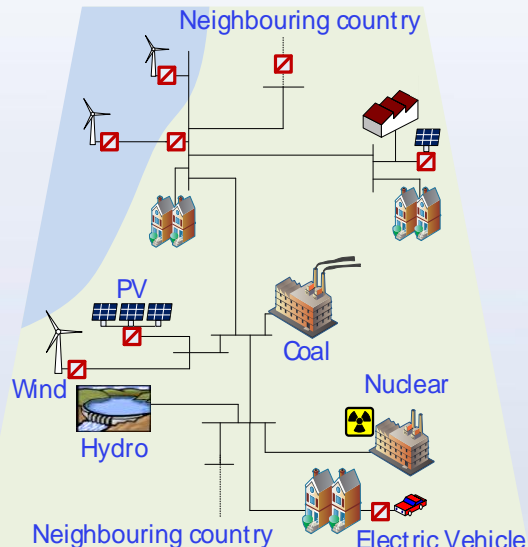
(almost) no RES

Past



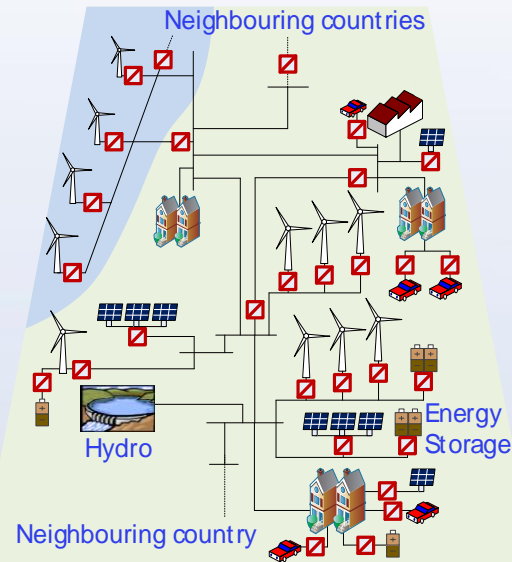
Some RES

Present



100% RES

Future



Forecasting needs: little

All RES separately

All RES with correct correlations and longer time scales

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
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	D2.1 / M7, M12	PVPS Task 16, Hydro TCP, Hydrogen TCP, ...
				RecPract on Forecast Solution Selection v3	M2.1 / M36	
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 / decision making under uncertainty (WP3)				Uncertainty propagation paper with data	D 2.6 / M42	PVPS T16
				Games RecPract v3 Training course	M18 M48 M12	
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 Data format standard	D3.5 / M15	ESIG 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



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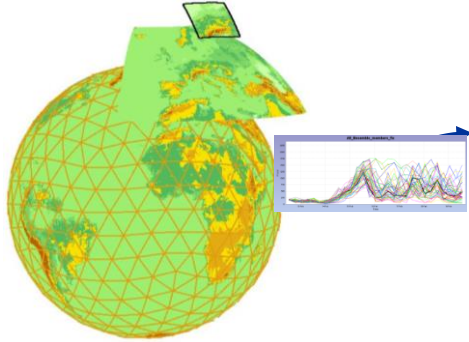
[grgi@dtu.dk](mailto:grgi@dtu.dk) (for access to mailing list)

Cell: +45 4056 5095

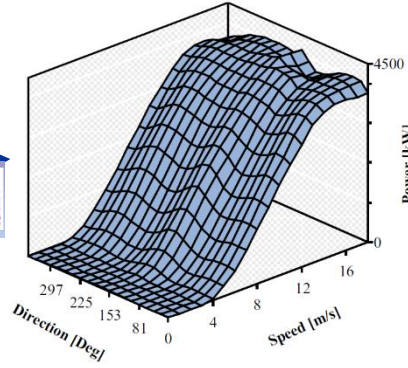
[www.IEAWindForecasting.dk](http://www.IEAWindForecasting.dk)

The IEA Wind TCP agreement, also known as the Implementing Agreement for Co-operation in the Research, Development, and Deployment of Wind Energy Systems, functions within a framework created by the International Energy Agency (IEA). Views, findings, and publications of IEA Wind do not necessarily represent the views or policies of the IEA Secretariat or of all its individual member countries.





**Numerical Weather Prediction**



**Prediction model**

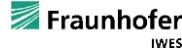


**End user**



Australian Government  
Bureau of Meteorology

**ENFOR**  
Forecasting and Optimization for the Energy Sector

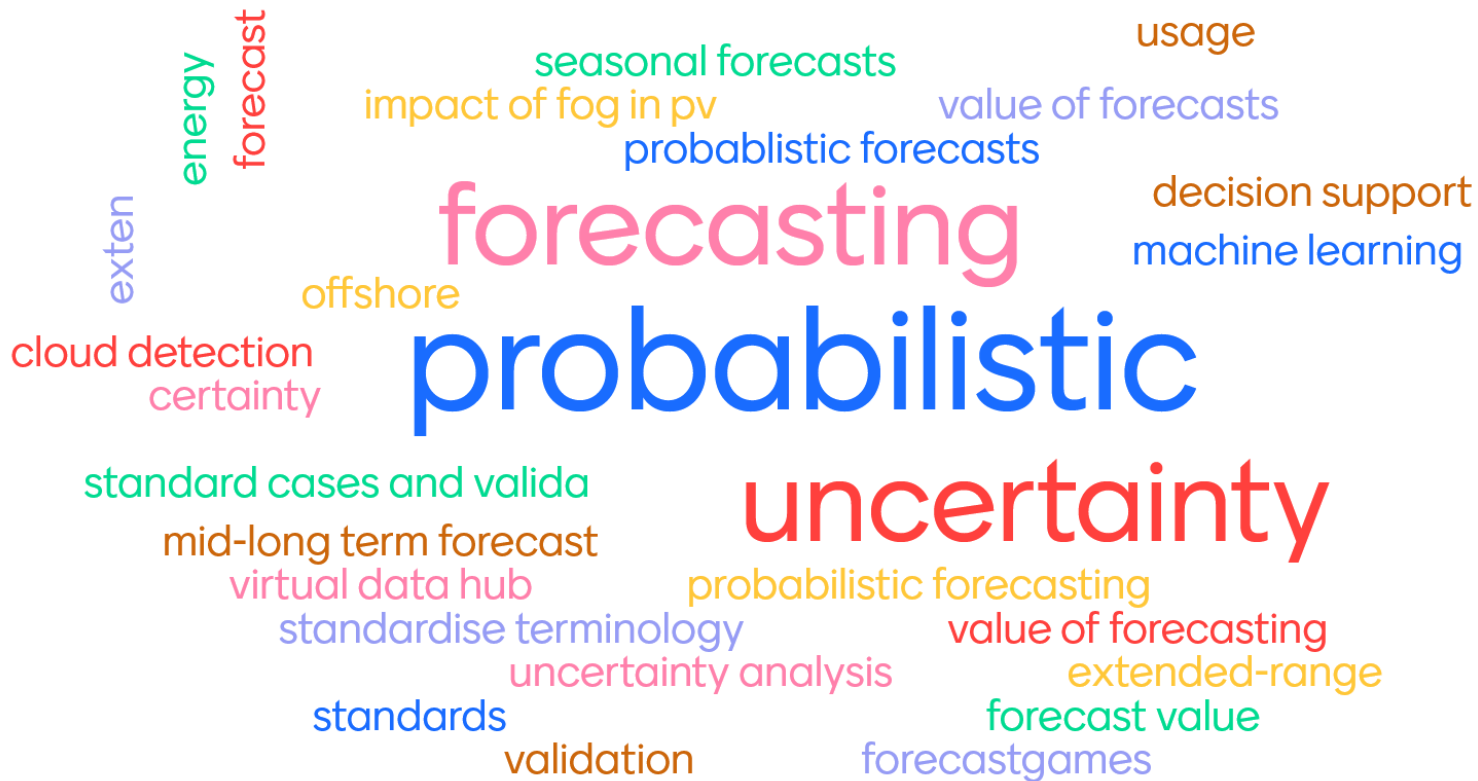


# Next: Forecasting for the Weather Driven Energy System

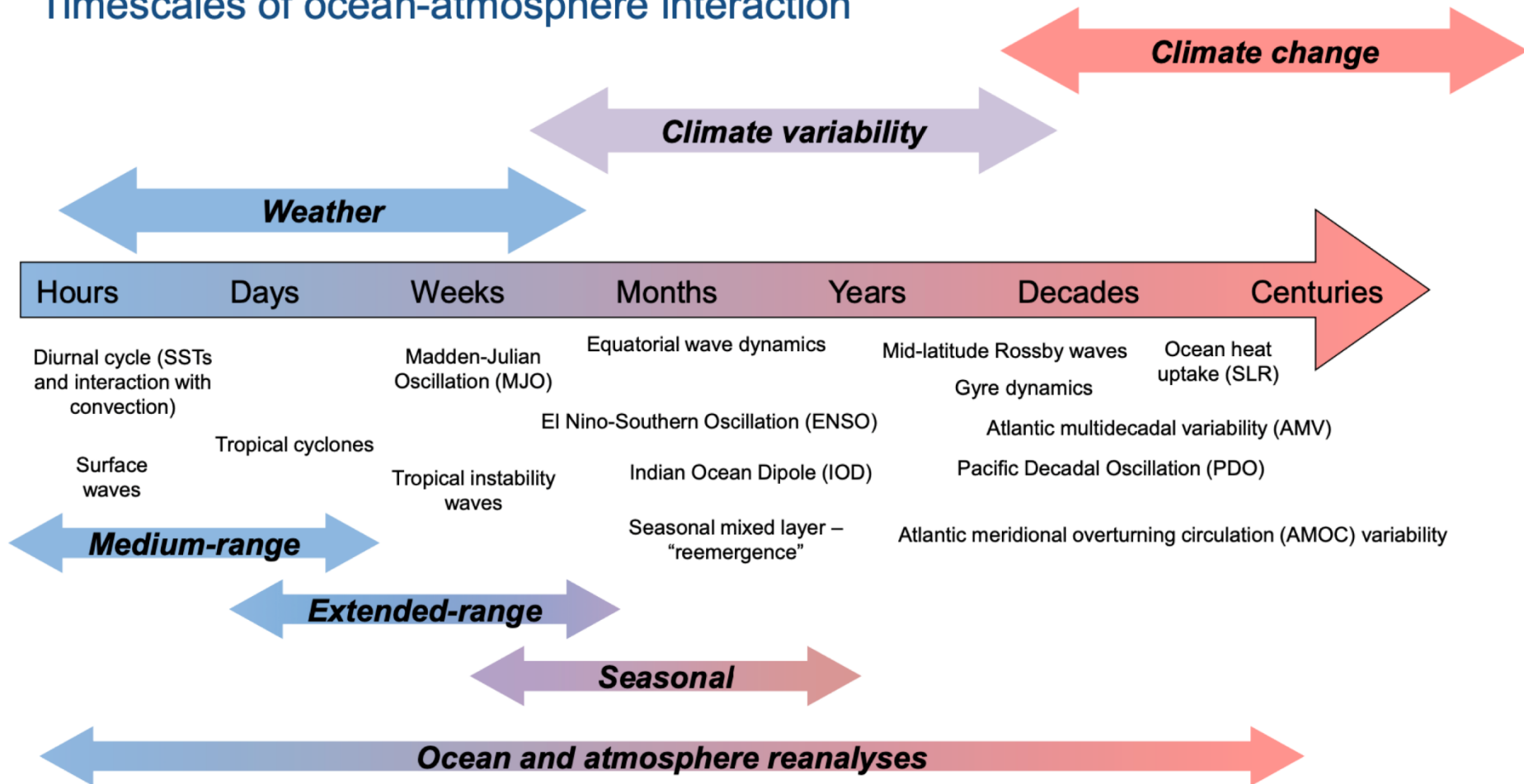
Preparations for the next phase of forecasting collaboration are ongoing. A recent Task meeting yielded this word cloud.

Strong collaboration with other TCPs.

To start 2022.



# Timescales of ocean-atmosphere interaction



# 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)

# 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)

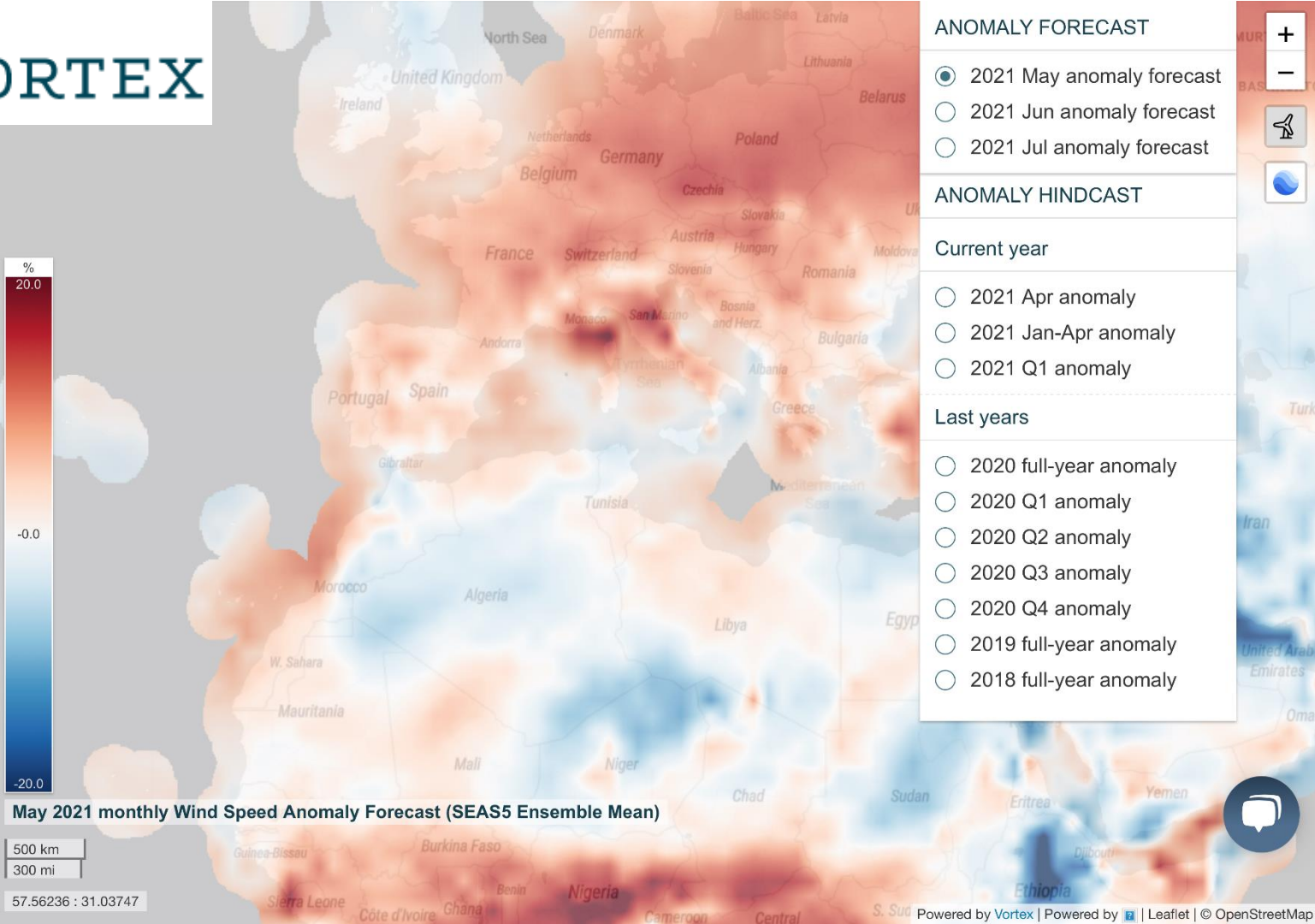
Data source SEASS ensemble mean from C3S ECMWF | Reference 1993-2016 | Run

Background image: Vortex FdC

Wind Speed Anomaly @ 100m - [%]









# 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	D2.1 / M7, M12	PVPS Task 16, Hydro TCP, Hydrogen TCP, ...
				RecPract on Forecast Solution Selection v3	M2.1 / M36	

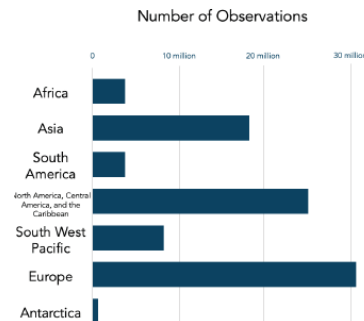
In year 1, the new Task will organise a **workshop** on the state of the art and future research issues in energy forecasting, inviting other TCPs (PVPS Task 16 already has voiced interest). The workshop is modelled after the first workshop in Task 36, which established a baseline and research agenda. 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. While every WP contributes to this activity, the conversion to application variables such as power is central here, therefore this WS will be managed by WP2.

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, M12)

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

# 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



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)

# 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, M36)

# 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)

# 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)

# WS Data Science and Artificial Intelligence

WS:	WP1 Weather	WP2 Power	WP3 Applications	Deliverable	#, Due	Collaboration
Data science and artificial intelligence (WP3)				Report	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)

# 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)

# 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. However, since then it has been quiet. The new Task will analyse the tradeoffs between normal siting of the turbines, and the forecast capability type.

# 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