Task 36

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Overview of the Recently Released Second Version of IEA Wind's Recommended Practices for the Implementation of Renewable Energy Forecasting Solutions

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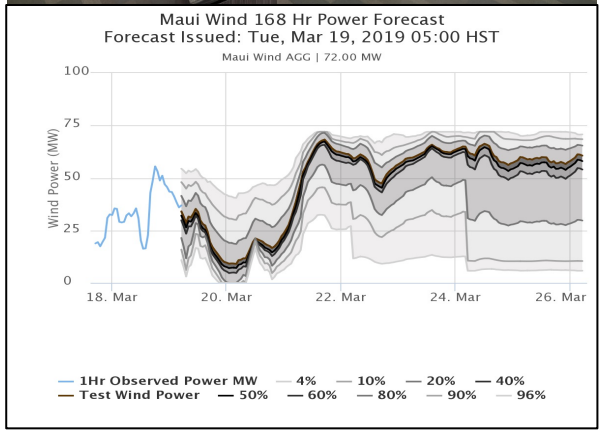
Overview

1. **Background**
   - The Problem: Selection of Optimal Wind/Solar Forecast Solutions
   - History of IEA Wind's Recommended Practice (RP) for Wind/Solar Forecast Solution Selection
2. **"Tour" of Recently Released RP Version 2**
3. **Where to Get the More Information: IEA Wind Forecasting Tasks 36 and 51**

Background Information

The Problem

- **Documented Benefits of Renewable Generation Forecasting:**
  - lower costs of variable generation integration (system)
  - high system reliability
- **Problem:** A substantial amount of the potential value of forecasting is not realized due to the use of non-optimal forecast solutions by users
  - Specification of the wrong forecast performance objective(s)
  - Poorly designed and executed benchmarks/trials of alternative solutions
  - Use of non-optimal evaluation metrics for forecast evaluation
  - Less than optimal availability of meteorological and operational data from wind and solar generation facilities



To Address this Issue: International group of experts have interacted under the framework of IEA Wind Task 36 to formulate a set of documents that specify the **“best practices” for selecting a renewable energy forecasting solution…….**

What is IEA Wind and Task 36/51?

What is the IEA (International Energy Agency)? (www.iea.org)

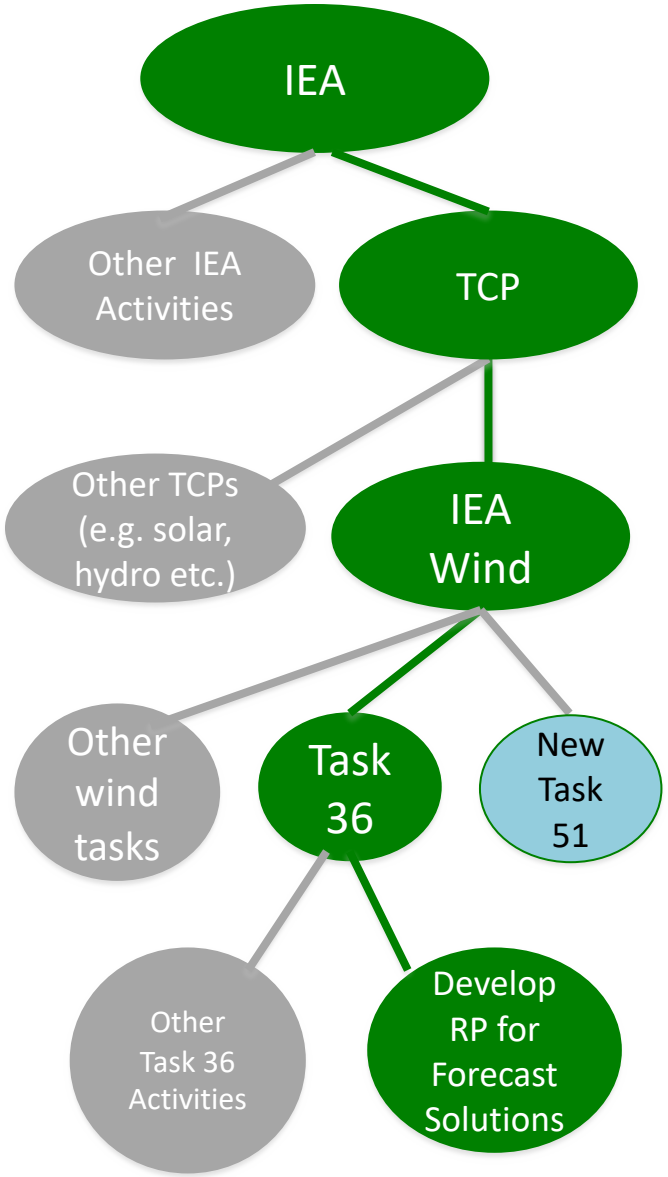
- International organization within OECD with 30 members countries and 8 associates
- Promotes global dialogue on energy, providing authoritative analysis through a wide range of publications
- **Sponsors Technology Collaboration Programmes (TCPs) on specific topics**

Task 36: Forecasting for Wind Energy: (https://iea-wind.org/task-36)

- Objective: facilitate improvements in performance and value of wind energy forecasts
- Phase 1 was active from 2016 to 2018
  - Produced Version 1 of Recommended Practice for Selection of Forecast Solutions
- Phase 2 was active from 2019 to 2021
  - Produced Version 2 of Recommended Practice for Selection of Forecast Solutions

Task 51: Forecasting for the Weather Driven Energy System

- Began in January 2022 and will be active for 4 years
- Broader perspective on integrated forecasting applications but also continuing some Task 36 topics/activities
- We welcome additional collaborators in each of the Task 51 focus topics
- More information: https://iea-wind.org/2022/04/24/kickoff-meeting-of-task-51-forecasting-for-a-weather-driven-energy-system/



The Result
Recommended Practices for the Selection of Renewable Energy Forecasting Solutions

Target: Guidance for the optimal selection of renewable energy forecasting solutions for a wide range of user types and applications

Result: Set of 4 documents specifying IEA Wind Recommended Practices for:

1. **Forecast Solution Selection Process**
2. **Designing and Executing Forecasting Benchmarks or Trials**
3. **Forecast Solution Evaluation**
4. **Meteorological and Power Data Gathering for Real-time Forecasting Applications**

Current Status: Version 2 approved by IEA Wind ExCo at end of 2021
Download: https://iea-wind.org/task-36/task-36-publications/recommended-practice/

Overview of The Parts

Part 1: Forecast Solution Selection Process

- Presents an overview of the factors that should be considered in the **design of a solution selection process**
- Discusses the issues associated with each selection factor
- Provides a “Decision Support Tool” (DST) to assist users in the design and execution of a solution selection process
- **Addition in Version 2: updated DCT to include consideration of probabilistic forecasts in the solution selection process**

Part 1: Key Points

Issue: A poorly designed or executed benchmark or trial of alternative forecast solutions is more likely to lead to a less optimal selection than a selection process that clearly defines the problem to be solved

Advice: Part 1 provides a decision support tool for the design of a customized forecast solution selection process:
Remember: An optimal forecast solution needs careful formulation of the solution selection process, consistent with the problem size and the available expertise and resources

Updated Decision Support Tool

Significant Addition to Part 1 in Version 2: Data Exchange Standards

- **Purpose:**
  - propose standards to facilitate a timely and reliable **user-provider exchange** of the data required to implement and operate an optimal forecast solution for a user's application
- **Approach: 2 levels of standards**
  - Level 1: A high-level description of the information and data required to carry out a successful trial and operation of a specific forecast solution
  - Level 2: A detailed specification of both the format and method, which should be used to exchange data between the renewable forecasting provider and the renewable energy forecasting customer.

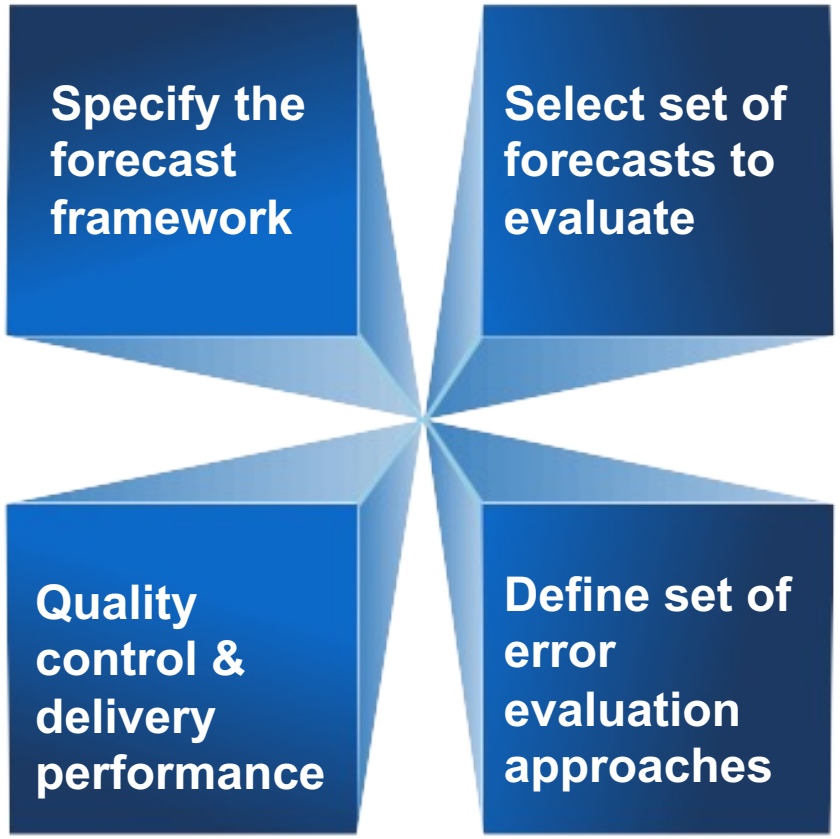
Part 2: Designing and Executing Forecasting Benchmarks or Trials

- Presents the three phases of a forecasting benchmark or trial
  - Planning
  - Execution
  - Analysis
- Discusses the factors and issues that should be considered in each phase
- Provides a list of pitfalls to avoid
- **Addition in Version 2: additional information about the evaluation and analysis of probabilistic forecasts**

Part 2: Key Points

Issue: A benchmark or trial often fails to provide meaningful information to the solution selection process because it is poorly designed or executed and usually requires more resources than planned!

Advice: use this recommended practices guide and/or consult “unbiased” experts if you plan a benchmark or trial.
If it becomes an academic exercise, it’s expensive learning!



Part 3: Forecast Solution Evaluation

- Presents the three key attributes of an evaluation process
  - Representativeness
  - Significance
  - Relevance
- Discusses the factors and issues that should be considered for each attribute
- Provides recommendations for conducting a high quality and meaningful evaluation

Part 3: Key Points

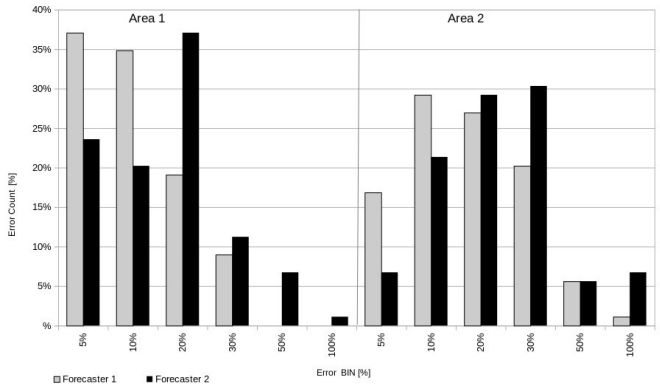
Issues: Many attempts to evaluate the accuracy of alternative forecast solutions yield misleading information to a user's solution selection process because of failures in one or more of the 3 key attribute areas:

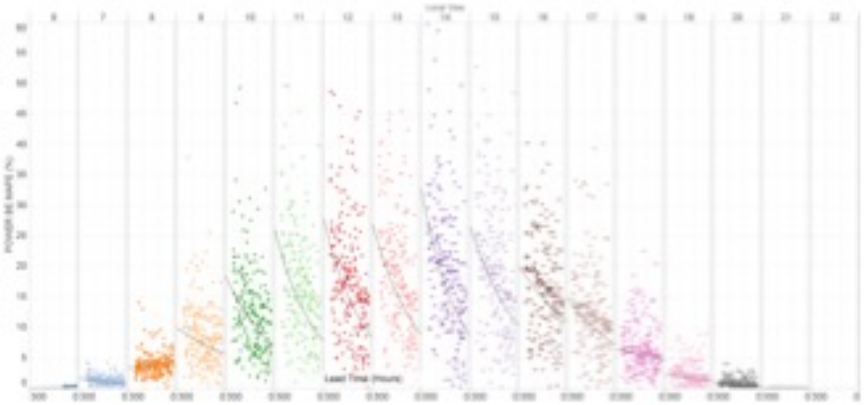
The most frequent and misunderstood mistake is with respect to "relevance"

- The user employs a set of accuracy metrics that are not appropriate, i.e. "not relevant" for the user's application
- Often accuracy assessments may give a good solution for someone else's problem, but not one's own problem!

Advice: put considerable effort into understanding and incentivising the problem solution before employing a forecast provider.

Remember: Inappropriate metrics lead to wrong solutions!





Part 4: Meteorological and Power Data Gathering for Real-time Forecasting Applications

- **Objective:** Provide guidance for the optimization of the selection, deployment, maintenance and quality control of sensors and communication channels to produce the highest quality and timely on-facility meteorological and generation-related data to the RE forecast process
- **Motivated by the experience that forecast quality is significantly impacted by the on-facility data issues:**
  - sensors not representative of the ambient atmospheric environment experienced by the generation assets
  - no information about the actual operating conditions of the facility (e.g. outages and curtailment)
  - have embedded bad data elements due to poor quality control
  - not provided in a timely manner
  - characterized by incomplete sensor meta-data

Part 4: Contents

1. **Background and Objectives**
   - Data requirement differences – Forecasting vs. other renewable energy (RE) applications
   - Existing applicable standards" RE-based and general meteorological
2. **Meteorological Instrumentation for Real-time Operation**
   - Key attributes of sensor alternatives for wind projects
   - Key attributes of sensor alternatives for solar projects
3. **Power Measurements for Real-time Operation**
4. **Measurement Setup and Calibration**
   - Selection factors for instrumentation
   - Optimal placement of sensors
   - Calibration and Correction Methodologies
   - Maintenance and Inspection schedules
5. **Assessment of Instrumentation Performance**
   - Uncertainty characteristics of measurements
   - Historical and real-time data quality control standards and methods
6. **Summary of Best Practice Recommendations**

Where to Get More Information

HYB22 Paper

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RP-related Publications

RP Documents:
https://iea-wind.org/task-36/task-36-publications/recommended-practice/

2019, 2020 & 2021 Wind Integration Workshops
Paper in Proceedings
Presentation

2019 & 2020 ESIG Workshops
Presentations

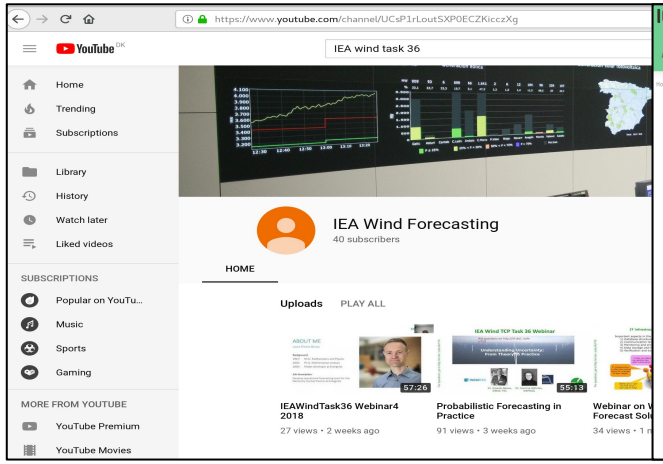
YouTube Channel
Webinar on Recommended Practices

Task 36 Information

→ **Task 36 site**
- https://iea-wind.org/task-36/

→ **Research Gate Project**
- www.researchgate.net/project/IEA-Wind-Task-36-Wind-Power-Forecasting

→ **IEA Wind Forecasting YouTube Channel:**
- www.youtube.com/channel/UCsP1rLoutSXP0ECZKicczXg

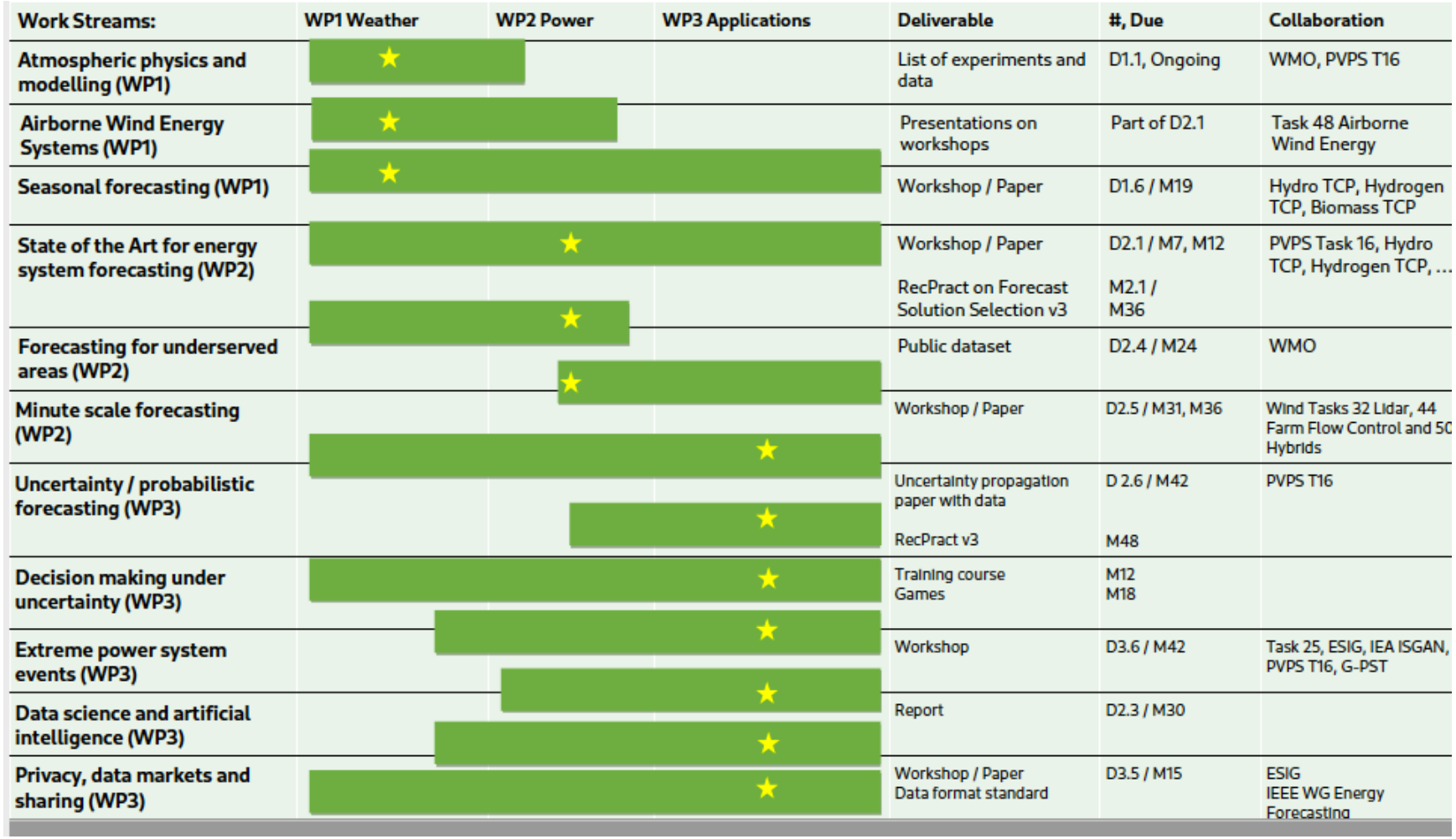


Looking Forward:
IEA Wind Task 51 (2022-2026): Technical Collaboration Opportunities

Objective: Facilitate international collaboration of experts to

- establish the state-of-the-art in methods and levels of performance,
- develop recommended practices and
- identify key unresolved issues

to maximize the operational value of weather-driven forecasting information in grid systems with a high penetration of renewable generation



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 RecPract on Forecast Solution Selection v3	D2.1 / M7, M12 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 RecPract v3	D 2.6 / M42 M48	PVPS T16
Decision making under uncertainty (WP3)			★	Training course Games	M12 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 Data format standard	D3.5 / M15	ESIG IEEE WG Energy Forecasting

For more information about participating in the collaboration, contact Task 51 co-operating agents: Gregor Geibel at DTU (grgi@dtu.dk) or Caroline Draxl at NREL (Caroline.Draxl@nrel.gov)