IEA TCP Wind Recommended Practice in Forecasting, and the corresponding IEC standard

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IEA Experts Group on R&D Priority-setting and Evaluation: Workshop Developments in demonstrations, tests and standardization
22 Nov 2024, Risø

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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: 2022-2025

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= May 2023, Reading	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= Sept '22, Dublin M2.1 / M36	PVPS Task 16, Hydro TCP, Hydrogen TCP, **IEC SC8A WG2**, …
Minute scale forecasting (WP2)				Workshop / Paper	D2.5 / M31, M36 = **April 2024, Risø**	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= **Spring 2025, Boulder**	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	

IEA Recommended Practice versus IEC Standard

- IEA Wind Recommended Practice (RP) for the Implementation of Renewable Energy Forecasting Solutions
  - Usually used to help industry to implement a (IEC) standard
  - Usually used to provide examples/use cases for industry
  - Here: first guideline for the industry
- IEC Standard
  - Binding recommendations to the industry on processes, methods and procedures
  - Examples may be helpful

IEA Wind Task 36/51 Experience – WHAT IS NEEDED IN INDUSTRY

Application Areas for the Standard

1. Grid Integration and System Operation with large amounts of non-scheduled Renewables

- Situational awareness in general and in critical weather events
- Grid related down-regulation or curtailments
- High-Speed Shutdown (HSSD) (cut-out) and recovery (cut-in) events
- Long- and medium term planning of capacities

2. Balancing and Trading

- Situational awareness in critical weather events
- High-Speed Shutdown (HSSD) (cut-out) and recovery (cut-in) events
- Short-term forecasting with updates from measurements
- Intra-day power plant balancing

3. Wind Turbine, Wind Farm and Solar Plant Operation and Monitoring

- Wind turbine and Plant Control
- Condition Monitoring

For all areas: Choice of appropriate forecast- and evaluation methods

IEA Wind Task 51 Experience – WHAT IS NEEDED IN INDUSTRY -- STATUS TODAY --

1. Evaluation Framework

- most evaluation in industry is on 1 metric, e.g. MAE, RMSE
- most evaluation in industry does not reflect the performance need of the application

2. Quality control and assessment of Measurements and Data communication

- no binding availability of specific signals of e.g. turbine availability, cut-out, avail.active power etc...
- no quality control or no binding quality in grid code for meteorological measurements
- no common standard for data communication and exchange

3. Deterministic and Probabilistic Evaluation

- use of probabilistic methods are rare
- probabilistic methods are often evaluated with deterministic metrics

GOAL: **Provision of guidance for manufacturer, farm operator, forecaster and end-user**

IEA Wind Task 51 Experience – WHAT IS NEEDED IN INDUSTRY -- OUTLOOK --

1. Evaluation Framework

Standard needs of a framework evaluation:

- reflect the performance needs of a specific application and forecast horizon
- Provide guidance for supplier and end-user for performance assessment and improvement needs

2. Quality control and assessment of Measurements an Data Communication

Standard needs a clear quality control and assessment structure:

- Reflection of the needs for forecast applications at **all time-horizons** (minute to seasonal)
- Extreme event awareness and reliable protection mechanisms
- Data quality assessment (AI, Cybersecurity) and sharing policies

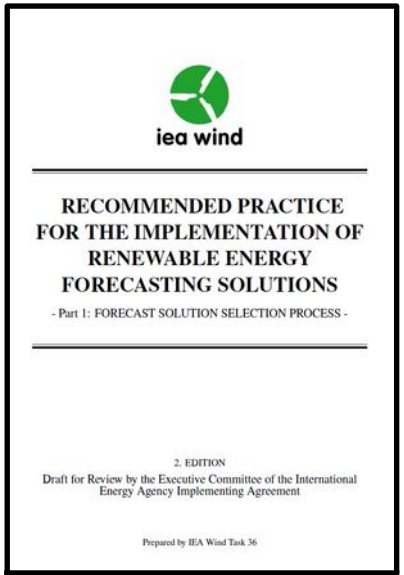
3. Deterministic and Probabilistic Evaluation

Standard needs a separation between deterministic and probabilistic forecasts and guidance for:

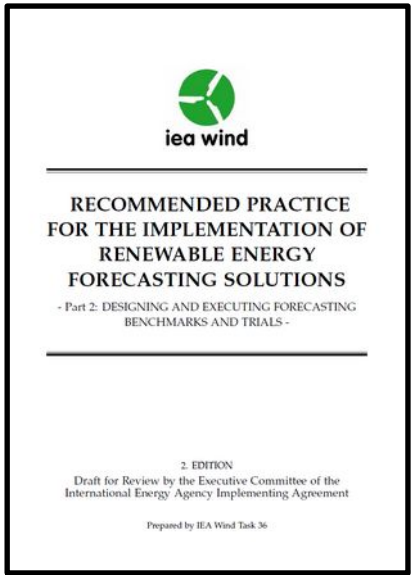
- high penetration of wind and solar call for probabilistic methods for proper risk assessment
- situational awareness cannot always be measured in monetary value – hence evaluation is tricky
- decision making and it's evaluation is non-trivial, also with probabilistic forecasts

GOAL: Provision of guidance for manufacturer, farm operator, forecaster and end-user

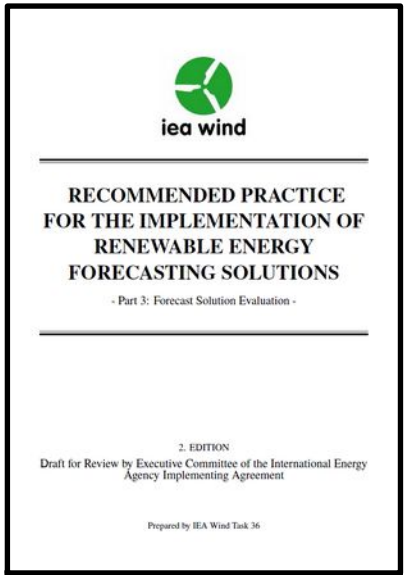
IEA Best Practice Recommendations for the Selection of a Wind Forecasting Solution v2: Set of 4 Documents



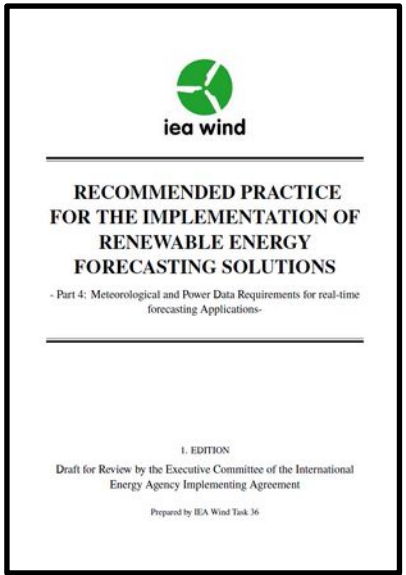
Part 1: Selection of an Optimal Forecast Solution



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

Second edition 2022

Elsevier Open Book

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DISCOUNT: Non-serials

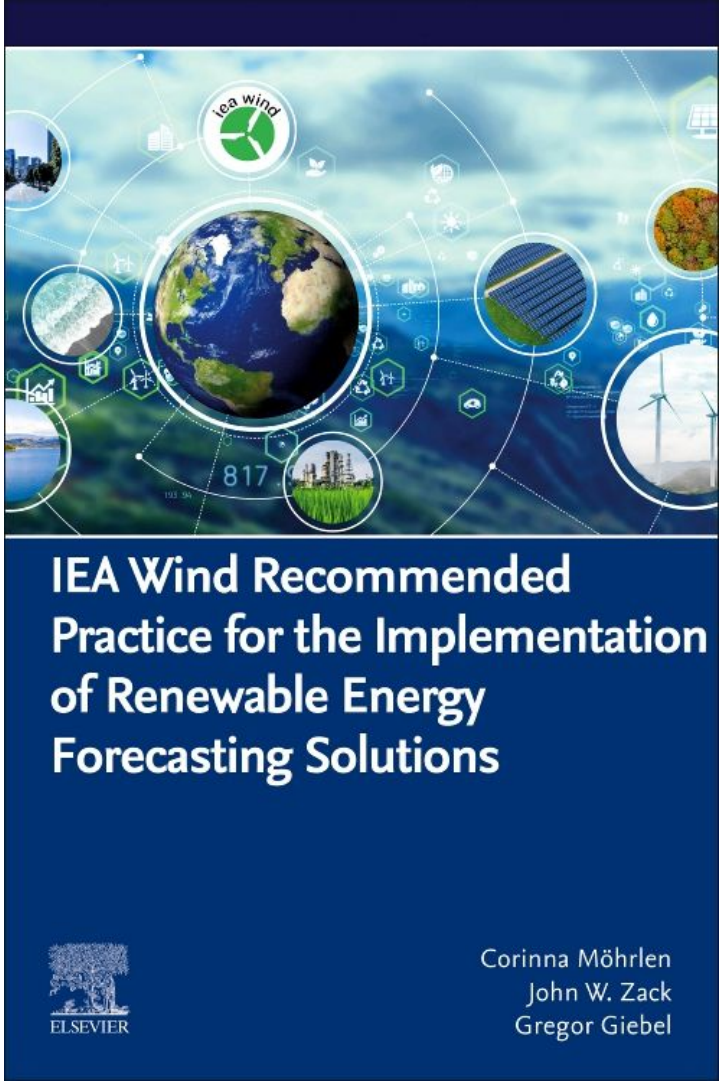
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https://www.elsevier.com/books/iea-wind-recommended-practice-for-the-implementation-of-renewable-energy-forecasting-solutions/mohrlen/978-0-443-18681-3

Free chapter download:

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



Collaboration/Liaison Proposal to work with IEC SC8A WG2 on standard for renewable energy forecast evaluation

Purpose: Quality Assurance

Technical specification aspects:

— Definitions of renewable energy generation forecasting and deviation evaluation e.g. probabilistic forecasting, ramping and ramp forecasts, mixed renewable stations, target groups and applications, metric calculations and choice of metrics etc.

— Use cases and case specific requirements.

— Specification, collection, processing methods, and quality control for evaluation data.

— Evaluation framework and process.

— Evaluation methods

— Normative requirements and examples for evaluation result documents



Objects: prediction service providers, wind farm or photovoltaic power plant owners, TSO, prediction technology R&D, stakeholders or individuals.

Collaboration/Liaison Proposal to work with IEC SC8A WG2 on standard for renewable energy forecast evaluation

International Electrotechnical Commission

International Electrotechnical Commission

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SC 8A Grid Integration of Renewable Energy Generation

Scope | Structure | Projects / Publications | Documents | Votes | Meetings | Collaboration Platform

Working Groups > WG 2

WG 2 Convenor & Members

Convenor	National Committee
Mr Shuanglei Feng	CN

SC 8A Officers

Chair	**Mr Frank Martin** (DK) Term of office : 2029-01
Vice-Chair	**Mr Bernhard Ernst** (DE) Term of office : 2026-01
Secretary	**Mr Yongning Chi** (CN)
Assistant Secretary	**Mr Zhankui ZHANG** (CN)

Title & Task

WG 2

Renewable energy power prediction

To develop a Technical Report addressing best practices around RE power prediction

IEC TR 63043 ED1: Renewable Energy Power Forecasting Technology

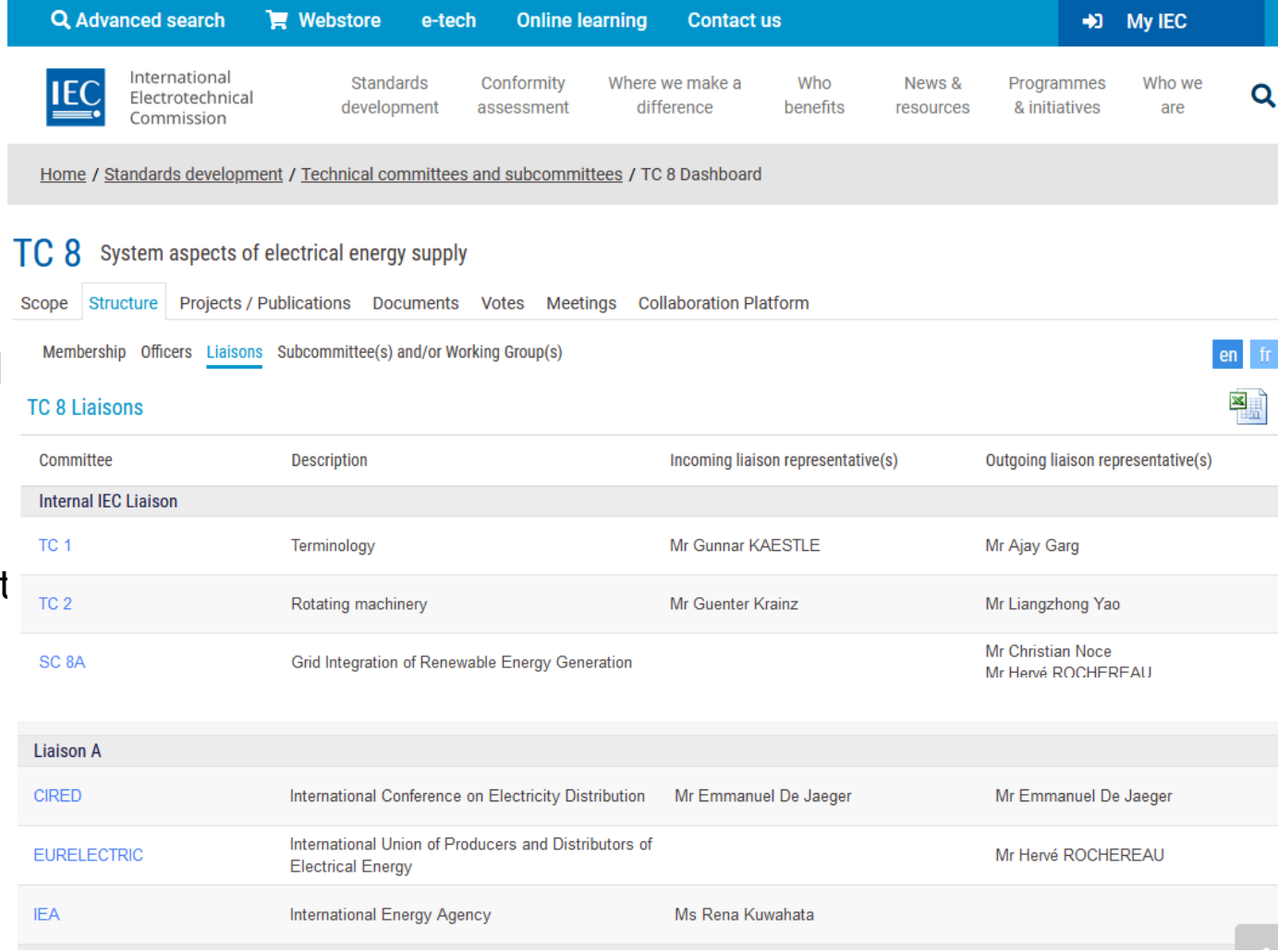
Quite recent (2020) text from Sub-Committee 8A Grid Integration of Renewable Energy Generation, Working Group 2 Renewable energy power prediction. Based on a collaboration with IEA Wind Task 51.



https://webstore.iec.ch/publication/26529

Liaison

- A-Liaison (probably) means we can be involved in standardisation work with that SC
- IEA confirming that it applies to TCPs



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TC 8 System aspects of electrical energy supply

Scope | Structure | Projects / Publications | Documents | Votes | Meetings | Collaboration Platform

Membership | Officers | Liaisons | Subcommittee(s) and/or Working Group(s)

en | fr

TC 8 Liaisons

Committee	Description	Incoming liaison representative(s)	Outgoing liaison representative(s)
Internal IEC Liaison			
TC 1	Terminology	Mr Gunnar KAESTLE	Mr Ajay Garg
TC 2	Rotating machinery	Mr Guenter Krainz	Mr Liangzhong Yao
SC 8A	Grid Integration of Renewable Energy Generation		Mr Christian Noce Mr Hervé ROCHEREAU
Liaison A			
CIRED	International Conference on Electricity Distribution	Mr Emmanuel De Jaeger	Mr Emmanuel De Jaeger
EURELECTRIC	International Union of Producers and Distributors of Electrical Energy		Mr Hervé ROCHEREAU
IEA	International Energy Agency	Ms Rena Kuwahata	

IEA List of TC/SCs Liaisons

Total A Liaisons	4	Total	4

en fr

Liaisons with IEC TC/SCs

Committee	Description
Liaison A	
TC 8	System aspects of electrical energy supply
TC 82	Solar photovoltaic energy systems
TC 88	Wind energy generation systems
TC 114	Marine energy - Wave, tidal and other water current converters

Organization

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https://www.iec.ch/dyn/www/f?p=103:46:603791764174058::::FSP_ORG_ID,FSP_LANG_ID:3314,25

Summary

IEA Wind Task 51 ”Forecasting for the Weather Driven Energy System” is the largest global discussion group for forecasting
Wrote a Recommended Practice for the Implementation of Renewable Energy Forecasting Solutions

- IEC SC8A WG2 ”Renewable Energy Power Forecasting” is a standardisation group for renewables forecasting
- Wrote a Technical Report ”Renewable Energy Power Forecasting Technology” with strong involvement from IEA Experts
- Now works on a standard on error evaluation based on IEA Recommended Practice

www.iea-wind.org/task-36
www.IEAWindForecasting.dk





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