IEA Wind Task 36

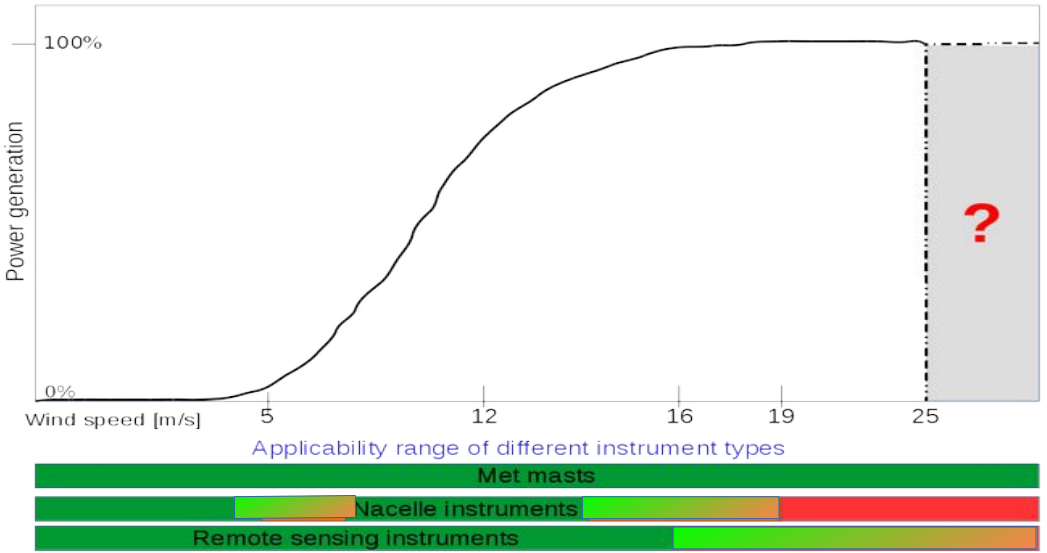
Workpackage 3.3: Develop data requirements for real-time forecasting models for use in grid codes

Status Meeting

June, 14 2021

Subtask 3.3: Met data requirements for real-time forecasting models for use in grid codes

The most common instrumentation and their applicability in **wind forecasting**



Met Masts
cup/sonic anemometer

Nacelle instrumentation
- cup/sonic anemometer
- computation via “pressure method”

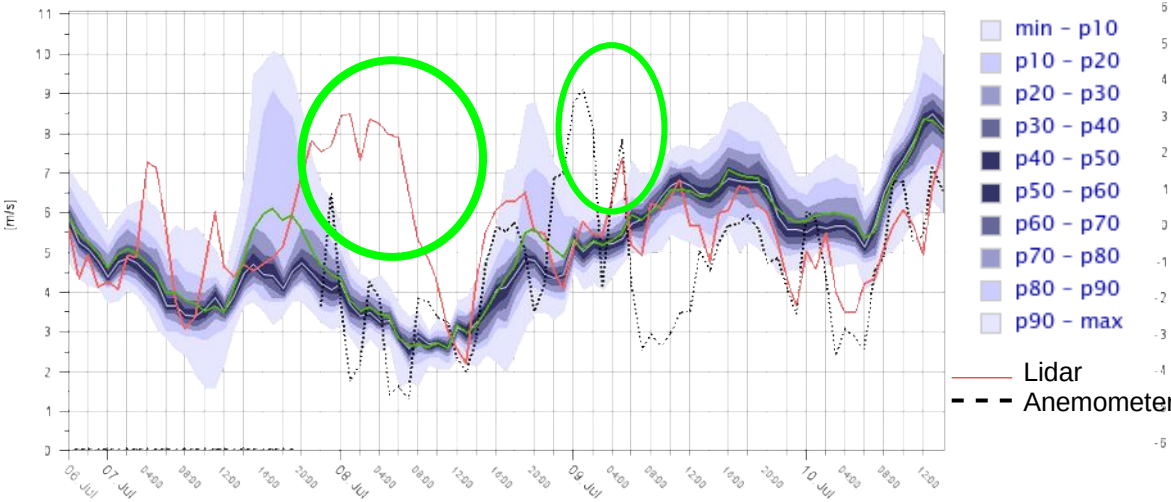
Remote Sensing
LiDAR
SODAR
RADAR

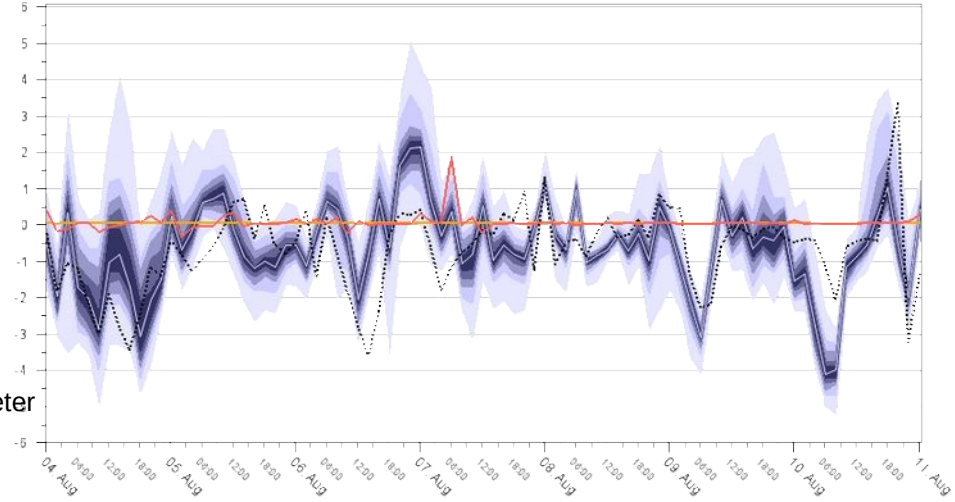
Q1: Do we have a similar measurement application challenge in PV forecasting ?

Calibration challenge of different measurement types in real-time environments

Remote sensing instruments are about to be mature
for real-time operation, but need guidelines for performance…

Just 2 typical challenging situations in a quality analysis...





Outliers on both Metmast & Lidar...

Difference between anemometer and Lidar is == difference to forecast

Subtask 3.3: Met Data Requirements for real-time wind and solar forecasting

Requirement suggestions for wind farm accuracy of measurement instrumentation

Measurement	Units	Precision for Instantaneous Measurements (to the nearest...)	Range	Accuracy	Required /Optional
Wind Speed	Meters/Second (m/s)	0.1 m/s	0 to 50	±1m/s	R
Wind Direction	Degrees from True North	1 degree	0 to 360	±5°	R
Surface Pressure	HectoPascals (HPa)	1 hPa	800-1100	± 1.0 hPa at -20 ... 45 °C	R
Temperature	Degree Celsius	0.1° C	-50 to +50	±0.2 K in the range -27 ... +50°C	R
Dewpoint	Degrees Celsius (°C)	0.1° C	-50 to +50	±0.2 K in the range -27 ... +50°C	O
Relative Humidity	Percentage (%)	1.00%	0 to 100 %	±2% RH in the range 5- 95% RH at 10-40°C	O
Ice-up Parameter	Scale 0.0 to1.0	0.1	0 to 1	n/a	O/R
Precipitation	mm/min	0.1	0-11	2% until 25 mm/h 3% over 25 mm/h	O

Requirement suggestions for Solar/PV plant measurement instrumentation based on ISO 9060

Type	Variable	Unit	Precision	Range	Accuracy	Required/ Optional	Description
Thermopile Pyranometer**	GHI	W/m2	0.1	0-4000	±3%* *Secondary Standard	R	Global Horizontal Irradiance (GHI)
	DHI	W/m2	0.1	0-4000	±3%* *Secondary Standard	R	Diffused Horizontal Irradiance (DHI)
	GHIPOA	W/m2	0.1	0-4000	±3%* *Secondary Standard	O	Global Horizontal Irradiance Plane-of-Array (GHIPOA)
	DHIPOA	W/m2	0.1	0-4000	±3%* *Secondary Standard	O	Diffused Horizontal Irradiance Plane of Array (DHIPOA)
Pyreheliometer**	DNI	W/m2	0.1	0-2000	±3%* *Secondary Standard	R	Direct Normal Irradiance (DNI)
Sunshine Duration Sensor	SSD	V	0.1	0/1	90.00%	R	Sunshine Duration
Temperature Sensor	Ambient Temperature	•C	0.1	-50 to +50	±0.2 K in the range -27 ... +70°C	R	Ambient temperature at the array average height
	Backpanel Temperature	•C	0.1	-50 to +50	±1°	R	Back panel temperature for PV type arrays at the array average height
Wind vane	wind speed	m/s	0.1	0 to 50	±1m/s	R	Wind speed and direction anemometer at the avr array height
	wind direction	deg	1°	0 to 360	±5°	R	
Precipitation sensor	precipitation	mm/min	0.1	0-11	2% until 25 mm/h 3% over 25 mm/h	R	Rain gauge or tipping bucket following WMO standard
Relative Humidity Sensor	RH	%	1%	0-100	±2% RH in the range 5- 95% RH at 10-40°C	R	Relative humidity sensor following WMO standard
Barometric Pressure Sensor	Ps	hPa	0.1	600-1100	± 1.0 hPa at -20 ... 45 °C	R	Barometric Pressure sensor following WMO standard

** DHI and DNI instrumentation should be from same manufacturer

* **ISO9060 Definitions**

Recommended instrumentation and industry Best Practice for Solar Systems

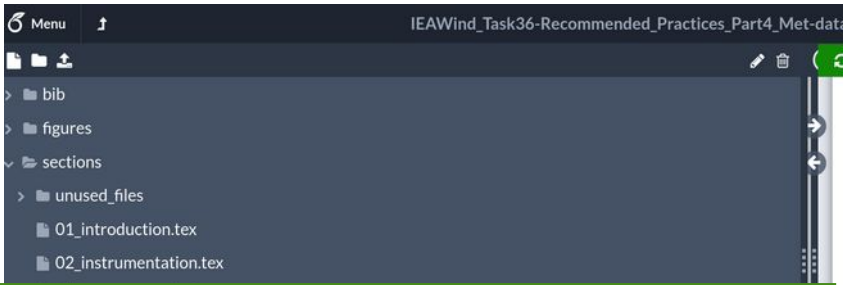
Standards and Guidelines for Solar Energy Assessment

NREL "Best Practice Handbook for the Collection and Use of Solar Resource Data for Solar Energy Applications" (1st Edition 2015 /63112, 2nd Edition 2017/6886, **3rd Edition 18. Feb 2021**)
The NREL handbook is a comprehensive report, which summarizes important information for all steps of a solar energy project - reaching from required measurements and the design of measurement stations to forecasting the potential solar radiation. Additionally, NREL informs about measurement instruments and its application as well as sources for solar measurement data.
Download: NREL Best Practice Handbook for the Collection and Use of Solar Resource Data for Solar Energy Applications

ISO 9060 Solar energy – Specification and classification of instruments for measuring hemispherical solar and direct solar radiation
In the ISO 9060 standard pyranometers are classified in three classes: Secondary Standard for scientific measurement quality, First Class for good measurement quality and Second Class for medium measurement quality. The ISO 9060 is accepted by the WMO (World Meteorological Organisation). See also Pyranometer.

IEC 61724-1:2017 Photovoltaic system performance – Guideline for measurement, data exchange and analysis
This standard decribes measurement system components and processes. It focuses on measurement uncertainties and defines accuracy classes. Additionally, the standard defines cleaning and calibration intervals for pyranometers.

Next Step: Development of the Recommended Practice Guideline in Overleaf



Template created

Tentative TIMELINE

Milestone 1: ~~31.03./01.04~~ **31.7** (first draft)

Milestone 2: ~~30.04./02.05~~ **31.8** (review)

Milestone 3: ~~31.05 /01.06~~ **01.09**
(finalization of work, merging into RP)

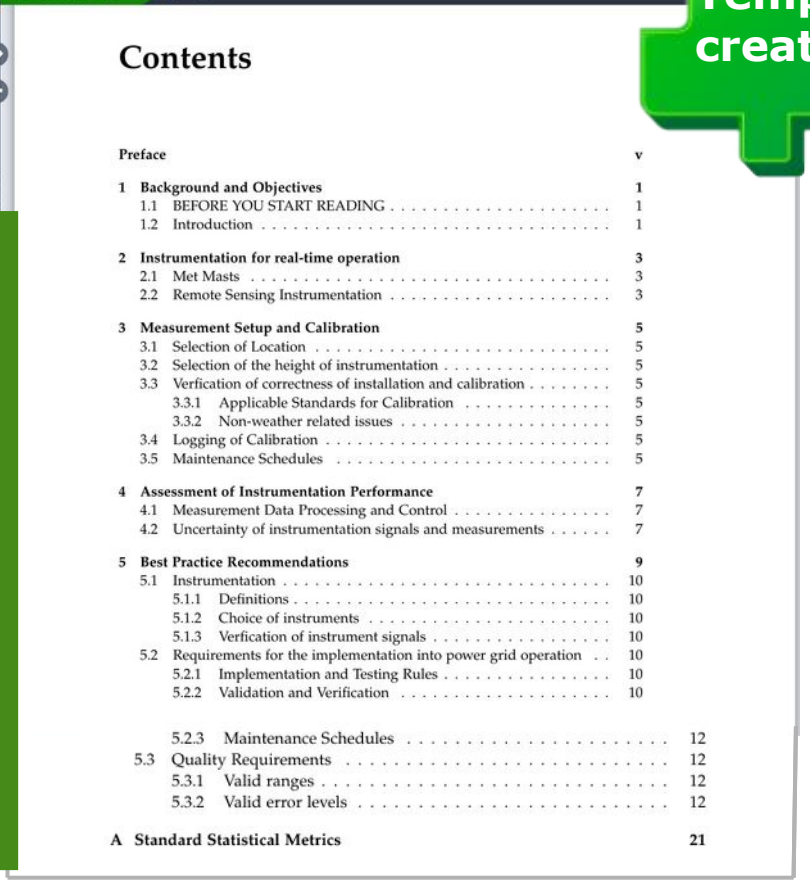
Milestone 4: ~~14.06~~ **14.09**
(sending draft to IEA Wind Community)

Milestone 5: ~~31.07 - 15.08~~ **31.10-15.11**
(implementing feedback and final review)

Milestone 6: ~~20.08.2021~~ **15.11.2021**
Submission to IEA Task 11 OA/Wind secretary

Milestone ~~78~~: 12.2021/01.2022 Acceptance Request for Publication at ExCo meeting

Milestone ~~87~~: **31.12.2021** Submission of final version for Publication at Springer Books



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