

IEA Task 43 WRA Data Model

Task 52 'Wind Lidar' General Meeting 2023

Stephen Holleran, Brightwind

2023-06-14



WIND ENERGY
DIGITALIZATION
IEA WIND TASK 43

Mission

"Our mission is to make the energy yield assessment process more efficient, transparent and reproducible through digitizing and automation."



Contributors

Contributing member	Organization
Amit Bohara	Altosphere
Jason Fields	NREL
Leon Hailstones	NRG Systems
Stephen Holleran	BrightWind
Jared Kassebaum	EDF RE
Gibson Kersting	RWE
Joseph Lee	NREL

Contributing member	Organization
Marco Milanesi	Vestas
Jordan Perr-Sauer	NREL
Mike Purdue	NRG Systems
Florian Roscheck	EDF RE
Clara St. Martin	GE
Heiko Westermann	Deutsche WindGuard
Isabel Drews	TransAlta

...and many more



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Progress

- We have delivered a fully implementable, working data model (and database schema)
 - Jan 2021 first release
 - Jan 2022 version 1 released (including the Digital Calibration Certificate)
 - Jun 2022 version 1.1 released
 - Jan 2023 version 1.2 released (includes floating lidar sensors, measurement types and units)
- The Digital Calibration Certificate included in the version 1 release
- Users workshop Feb 2022.
 - 176 signed up and 91 attended
- Next one June 29th, 2023. [Sign up!](#)



Industry adoption activities (that we know of)



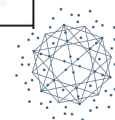
Task

Installation report
as a PDF

Sensor	Sensor 1	Sensor 2
Channel	1	2
Type	Anemo.	Anemo.
OEM / Model	Thies 4.3351	Thies 4.3351
Serial	9183000	9183001
Height	80.1	80.2
Orientation	315	135
Logger Slope	0.045	0.045
Logger Offset	0.25	0.25
Calibration slope	0.04573	0.04568
Calibration offset	0.2419	0.2487

```
[  
  {  
    "channel": "1",  
    "type": "Anemo.",  
    "OEM Model": "Thies 4.3351",  
    "Serial": "9183000",  
    "Height": 80.1,  
    "Orientation": 315,  
    "Logger Slope": 0.045,  
    "Logger Offset": 0.25,  
    "Calibration Slope": 0.04573,  
    "Calibration offset": 0.2419  
  },  
  {  
    "channel": "2",  
    "type": "Anemo.",  
    "OEM Model": "Thies 4.3351",  
    ...  
  }  
]
```

JSON
representation



Task

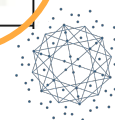
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    "Logger Offset": 0.25,  
    "Calibration Slope": 0.04573,  
    "Calibration offset": 0.2419  
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  {  
    "channel": "2",  
    "type": "Anemo.",  
    "OEM Model": "Thies 4.3351",  
    ...  
  }  
]
```

JSON
representation

But what does
this JSON look
like?



WRA Data Model Demo File

```
iea43_wra_data_model.json
New Open Save Options Share
</>
>
  logger_measurement_config : [ 2 items
    0 : {
      slope : 0.04573
      offset : 0.2419
      sensitivity : null
      measurement_units_id : m/s
      height_m : 80
      serial_number : 09183000
      connection_channel : CH1
      date_from : 2020-04-12T12:00:00
      date_to : 2020-04-15T00:00:00
      notes : I can write anything I want here.
      update_at : 2020-04-18T18:13:00
    }
    column_name : [ 4 items
      0 : {
        column_name : CH1Avg
        statistic_type_id : avg
        is_ignored :  false
        notes : I can write anything I want here.
        update_at : 2020-04-18T18:13:00
      }
      1 : { 5 props }
      2 : { 5 props }
    ]
  ]
```

- Demo file using a tree viewer

<https://jsoneditoronline.org/#left=cloud.72060377d4d34b348384c7d55bfe3bda&right=cloud.90441e7aff6f418cafb783a68760e9b7>



WRA Data Model Demo File

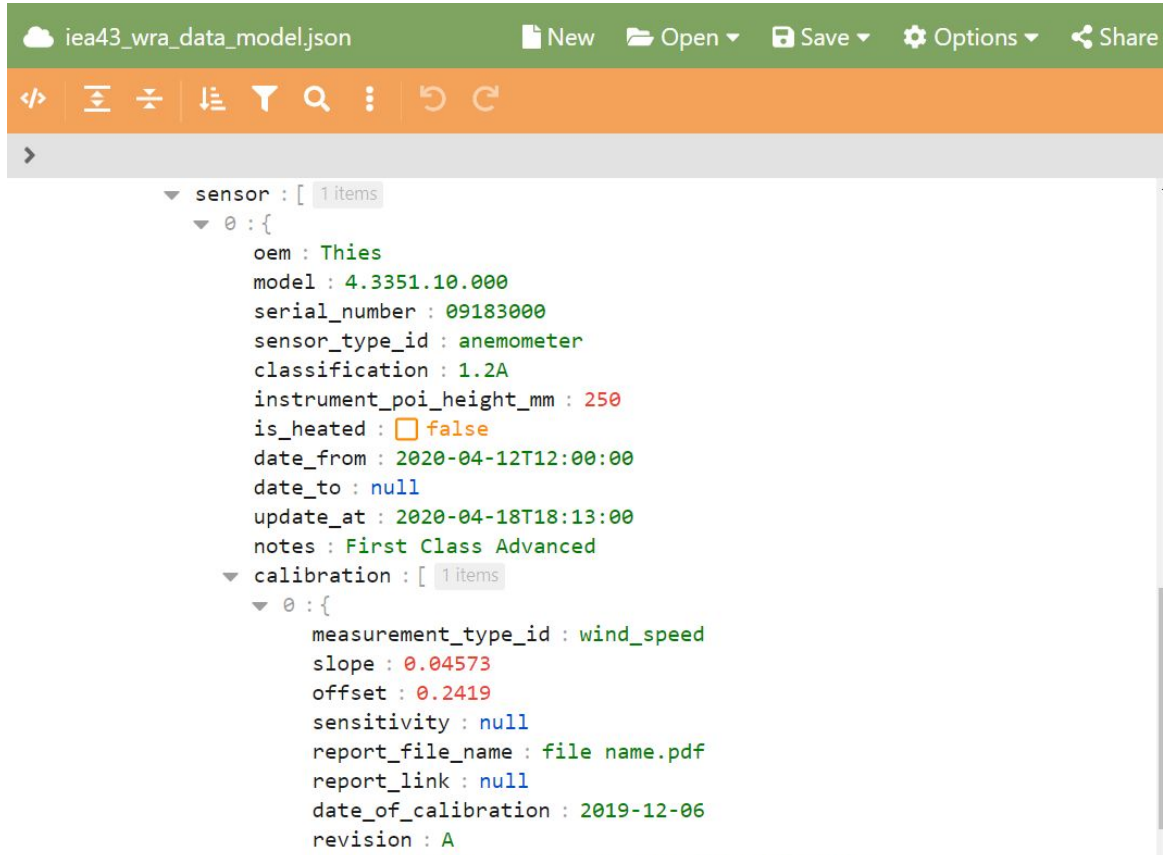
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iea43_wra_data_model.json
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  logger_measurement_config : [ 2 items
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WRA Data Model Demo File



```
iea43_wra_data_model.json  New  Open  Save  Options  Share

</>  [Icons]  [Refresh]

>

  sensor : [ 1 items
    0 : {
      oem : Thies
      model : 4.3351.10.000
      serial_number : 09183000
      sensor_type_id : anemometer
      classification : 1.2A
      instrument_poi_height_mm : 250
      is_heated :  false
      date_from : 2020-04-12T12:00:00
      date_to : null
      update_at : 2020-04-18T18:13:00
      notes : First Class Advanced
    }
  ]
  calibration : [ 1 items
    0 : {
      measurement_type_id : wind_speed
      slope : 0.04573
      offset : 0.2419
      sensitivity : null
      report_file_name : file name.pdf
      report_link : null
      date_of_calibration : 2019-12-06
      revision : A
    }
  ]
}
```

- Demo file using a tree viewer

<https://jsoneditoronline.org/#left=cloud.72060377d4d34b348384c7d55bfe3bda&right=cloud.90441e7aff6f418cafb783a68760e9b7>



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iea43_wra_data_model.json  New  Open  Save  Options  Share

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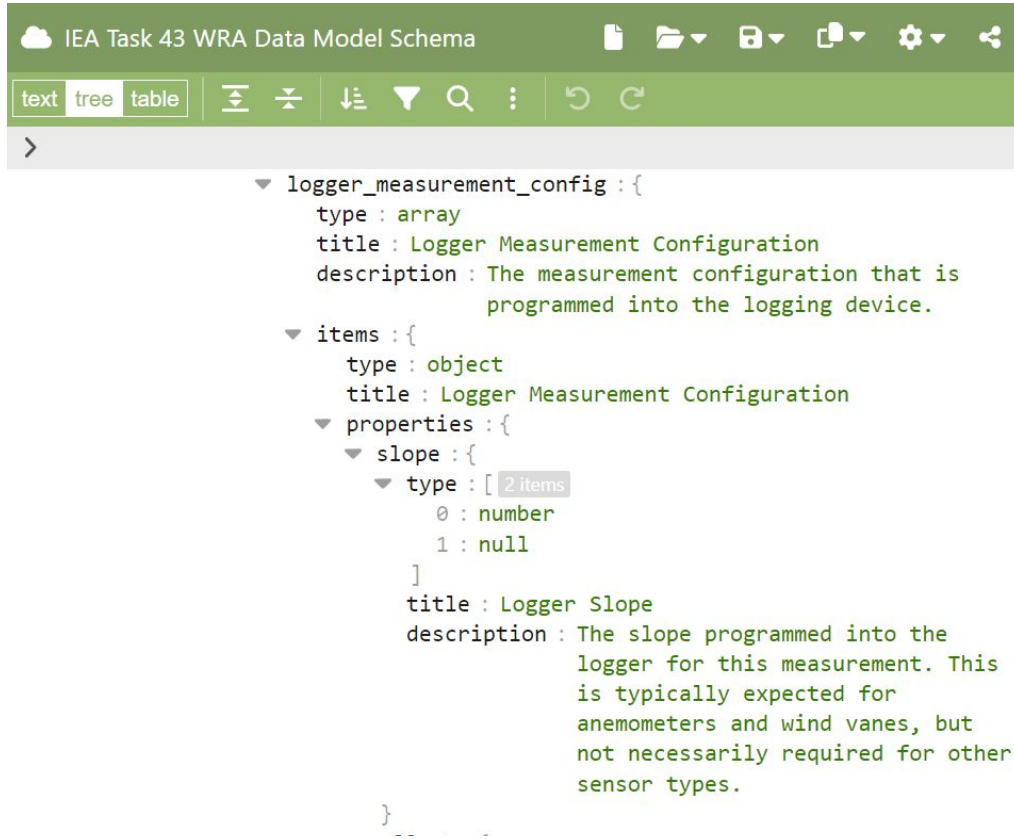
  sensor : [ 1 items
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WRA Data Model Schema

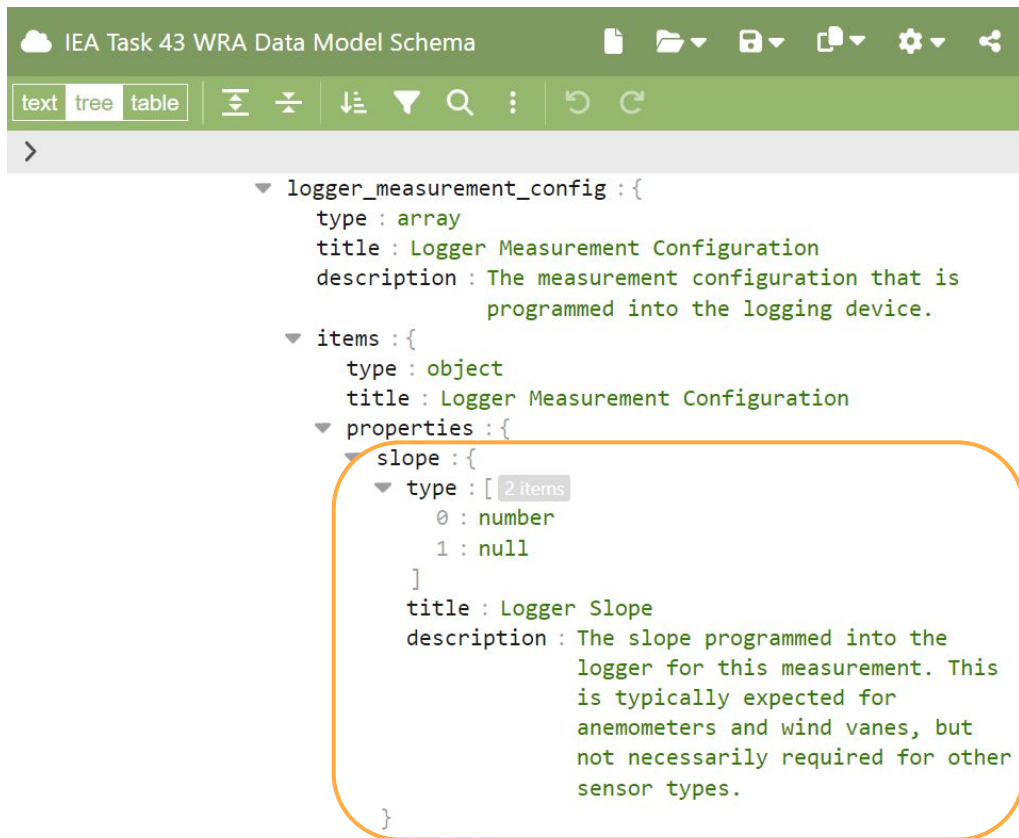


```
IEA Task 43 WRA Data Model Schema
text tree table
logger_measurement_config : {
  type : array
  title : Logger Measurement Configuration
  description : The measurement configuration that is
    programmed into the logging device.
  items : {
    type : object
    title : Logger Measurement Configuration
    properties : {
      slope : {
        type : [ 2 items
          0 : number
          1 : null
        ]
        title : Logger Slope
        description : The slope programmed into the
          logger for this measurement. This
          is typically expected for
          anemometers and wind vanes, but
          not necessarily required for other
          sensor types.
      }
    }
  }
}
```

- Schema using a tree viewer

<https://jsoneditoronline.org/#left=cloud.72060377d4d34b348384c7d55bfe3bda&right=cloud.90441e7aff6f418cafb783a68760e9b7>

WRA Data Model Schema



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IEA Task 43 WRA Data Model Schema
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    }
  }
}
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- Schema using a tree viewer

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Thank you!

"Our mission is to make the energy yield assessment process more efficient, transparent and reproducible through digitizing and automation."

Reach out by:

GitHub repo,

https://github.com/IEA-Task-43/digital_wra_data_standard

join us on Slack,

ieawinddigitalization.slack.com/

or email us

michael.fields@nrel.gov

stephen@brightwindanalysis.com

github.com/IEA-Task-43/digital_wra_data_standard

IEA-Task-43 / digital_wra_data_standard Public

Code Issues 28 Pull requests 3 Discussions Actions Projects 1 Wiki Security Insights Settings

master 6 branches 3 tags Go to file Add file Code About

stephenholleran Merge pull request #167 from IEA-Task-43/adding_image_nu... 487179d on May 10 422 commits

.github/workflows	Update compile_cert_docs.yml	10 months ago
app	Bump color-string from 1.5.3 to 1.9.0 in /app	5 months ago
demo_data	updated sample sql data	5 months ago
digital_calibration_certificate	Update anemometer_calibration_certificate.json	5 months ago
docs	Compile documentation	5 months ago
images	Add files via upload	2 months ago
schema	update version number to 2022.01	5 months ago
tools	update to version 1	6 months ago
.gitignore	Remove docs folder from gitignore	2 years ago
CHANGELOG.md	update version number to 2022.01	5 months ago
README.md	Merge branch 'master' into dev	6 months ago
contributing.md	Make source branch for creating feature branch more explicit	2 years ago
license.txt	actual license language	2 years ago
requirements.txt	restrict pandas version to less than 1.0	2 years ago

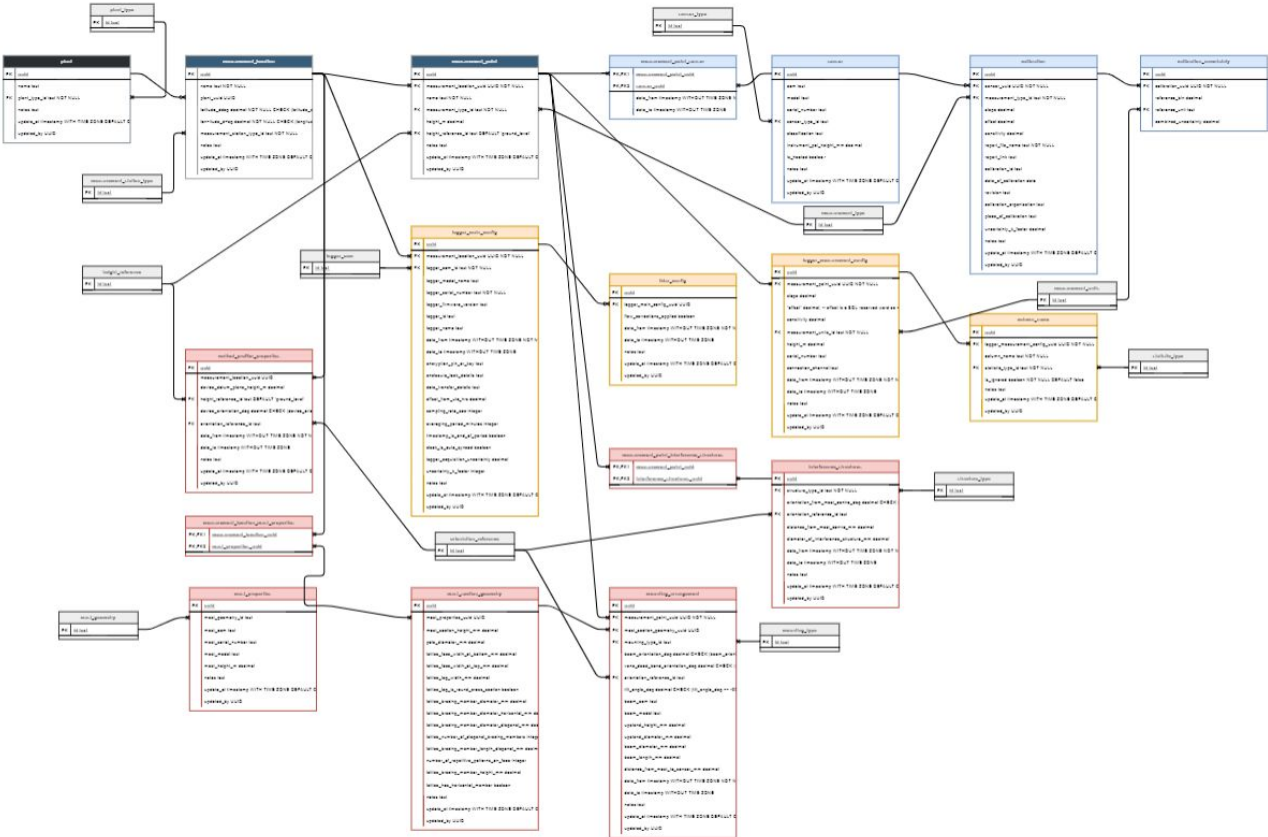
README.md



**WIND ENERGY
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Lessons Learned

It is comprehensive!



Lessons Learned

- The industry is “hoping” that this happens again and again for similar projects
- Relying on dedicated volunteers
- This is not proactive or productive
- We need to help these volunteers justify their valuable time commitment to their company
- Can the industry provide funding? Who? How?



Lessons Learned

- **A LOT** of work!
 - At least 88 different attributes to consider, name, define and structure
 - Met weekly
 - Tedious, detailed consideration
- Successful due to the people
 - Requires significant time commitment from a core group of volunteers
 - These are the champions
 - Requires even more significant time commitment from a team lead
 - E.g. Heiko was the lead contributor for the DCC
 - We delivered a comprehensive data model in a relatively short timespan
 - We were lucky

