



Digitalization Barometer for Wind Power Operators

Evaluation of the digitalization degree

current status | target status in three years | sector average

6th November 2019



VGB PowerTech | Wind

... is the first address for all operators of wind power plants regarding technical, environmental as well as strategic issues and acts as hub for the wind energy sector in Europe.

Dr Mario Bachhiesl
*Head of Renewables and
Distributed Generation*

Individual success through exchange of experience

Digitalization as an important future key issue

Digitalization a key challenges

Companies are more or less intensively involved in a variety of digitalization issues and are facing different challenges including:

- Which digitalization strategy can be pursued and which degree of digitalization can be achieved within the company in individual fields of action?
- Which products, tools and apps can be used in digital transformation?
- Can digitalization measures reduce operating costs?
- Which cognitive methods and self-learning algorithms can be used for the analysis?
- Which possibilities arise with the advanced use of data?
- ...

Key trends in European industries

- Digital transformation of energy system from global perspectives
- Leveraging power of IIoT and big data analytics for effective decision making to enhance wind power plant performance
- Real time analysis of Digital Twins, optimizing performances using design, simulation, and analytics software
- Concept of digital workforce management within the organization
- Advanced condition monitoring and predictive maintenance for wind power O&M optimization
- AI, machine learning and blockchain's role in wind power industry
- Potential cyber threat and mitigation strategies within wind power industries
- ...

Digitalization Barometer for Wind Power Operators



VGB PowerTech | Wind is facing the challenges of energy transition in Europe and has therefore developed a “**Digitalization Barometer for Wind Power Operators**” to support the wind operators in the pathway on “Windpower 4.0”.

➤ **Self-check of your digital transformation**

The present “Digitalization Barometer for Wind Power Operators” allows companies to evaluate

- their current status of digitalization and
- their intended target status in digitalization in three years

in comparison to the sector average. Thus, the companies can gain a comprehensive insight into their digitalization degree.

➤ **Benefits**

- Knowledge of the digitalization degree compared to the sector average
- Possible digitalization activities in individual fields of action

Digitalization Barometer for Wind Power Operators



- Tool will be online in 2020
- Receive access link by email
- Free of charge!

Main fields and fields of actions

The Digitalization Barometer for Wind Power Operators consists of 5 main fields and 25 sub-action fields.

A) Digital orientation of the company

- Organization
- Communication management
- Digitization strategy
- Digitization budget
- Co-operation
- Agile project management

E) Electricity Market

- Forecasting systems
- Automatic trading systems
- Artificial intelligence methods

D) Documentation

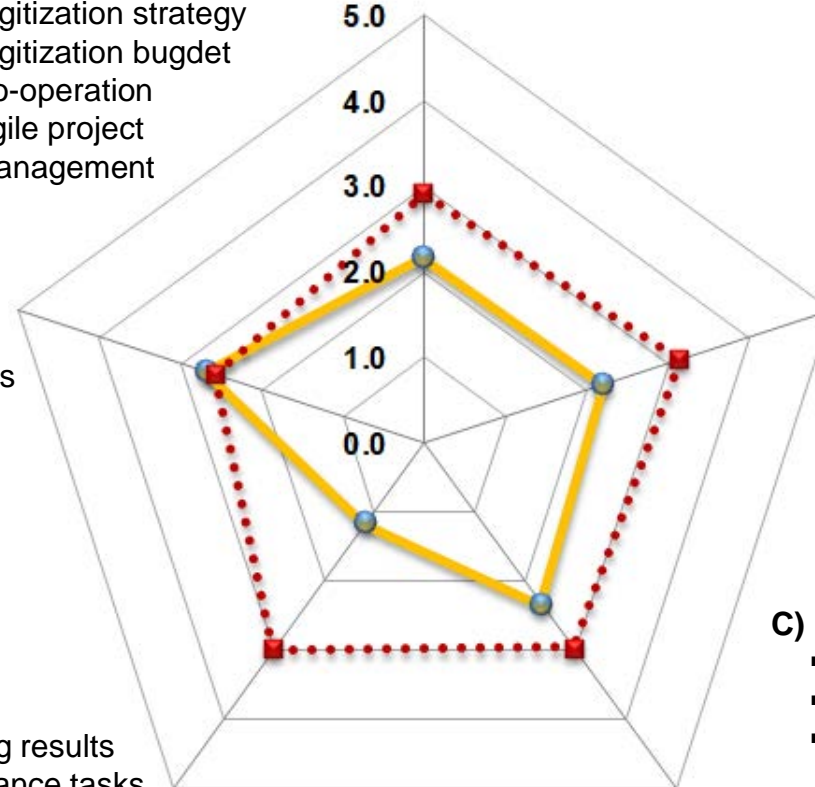
- Digital documents
- Reporting of operating results
- Reporting of maintenance tasks
- Digital spare parts management
- Designation of the components
- RDS-PP VGB-S-823-32

B) Operation of Wind Power Plants

- Acquisition of process data
- Use of optimization approaches
- Implementation of forecast data
- Benchmark of wind turbine platforms
- Visualization of operational data / Control room

C) Maintenance of Wind Power Plants

- Analyzation of SCADA data
- Analyzation of CMS data
- Development of predictive maintenance strategies
- Implementation of machine learning systems
- Use of drones for inspections
- Digital image processing



Legend

- Current status of your company
- - - - Average of the wind power sector

For description

Main field (MF)
 Sub-action field (SF)
 Input fields

Total points of current status (u_{CS})
 Total points of target status (u_{TS})
 Weighting of the sub-action field (w)
 Assessment of your current status (x_{CS})
 Assessment of your target status (x_{TS})

Main field Sub-action field	Weighting	Points current status	Points target status	Classification	Reasoning
B) Operation of Wind Power Plants	100 %	2.2	3.5		
B1) Acquisition of process data	20 %	3	4	Use of a data acquisition platform to analyze the development of a wind turbine condition. Monitor and analyze real-time wind farm data.	
B2) Use of optimization approaches	20 %	2	4	Detection and correction of pitch misalignment, noise reduction measures (blades), Power Performance Optimisation, and others.	
B3) Implementation of forecast data	20 %	4	5	Use of correctly forecasting ramps to increase the annual energy production as well as to optimize the maintenance periods.	
		0		Not in use	
		1		In planning stage	
		2		In test stage	
		3		Use in > 25% of wind turbines	
		4		Use in > 50% of wind turbines	
		5		Use in > 50% of wind turbines	
B4) Benchmark of wind turbine platforms	20 %	1	2	Optimization of the wind power plant operation by sharing the operational data with other operators.	
B5) Visualization of operational data / Control room	20 %	1	3	Aggregate data from a wide variety of critical sources - from SCADA data to power forecasts - in a central software platform.	

Calculation of the total points for a main field

The calculation of the total points for each main field for both the current status (CS) and the three-year targeted status (TS) results from the sumproduct of the assessing points and the weighting factors:

Calculation of the total points for current status
within a field of action:

$$u_{CS} = \sum_{i=1}^n x_{CS,i} \cdot w_i$$

u_{CS} ... Total points of current status (CS)
 $x_{CS,i}$... Your assesement [0 to 5]
 w_i ... Weighting of sub-action field [%]
 i ... Number of sub-action fields

Calculation of the total points for target status
within a field of action:

$$u_{TS} = \sum_{i=1}^n x_{TS,i} \cdot w_i$$

u_{TS} ... Total points of target status (TS)
 $x_{TS,i}$... Your assessment [0 to 5]
 w_i ... Weighting of sub-action field [%]
 i ... Number of sub-action fields

Calculation of the Cumulative Value and of the Average of the Wind Power Sector

The sector averages for each main field (MF) and for each field of actions (FA) are calculated. For the calculation of the weighted arithmetic sector average the respective plant capacity in megawatt (MW) is used. Thus, the dimension of the power plant fleet is considered.

Evaluation of sector average for an action field both for current status and target status:

$$\bar{x}_{MF} = \frac{\sum_{i=1}^n u_{MF,i} \cdot c_i}{\sum_{i=1}^n c_i}$$

\bar{x}_{MF} ... Sector average for the main field (MF)
 $u_{MF,i}$... Total points for the action field of the company
 c_i ... Total installed capacity of the company [MW]
 i ... Number of companies

Evaluation of sector average for a sub-action field both for current status and target status:

$$\bar{x}_{SF} = \frac{\sum_{i=1}^n u_{SF,i} \cdot c_i}{\sum_{i=1}^n c_i}$$

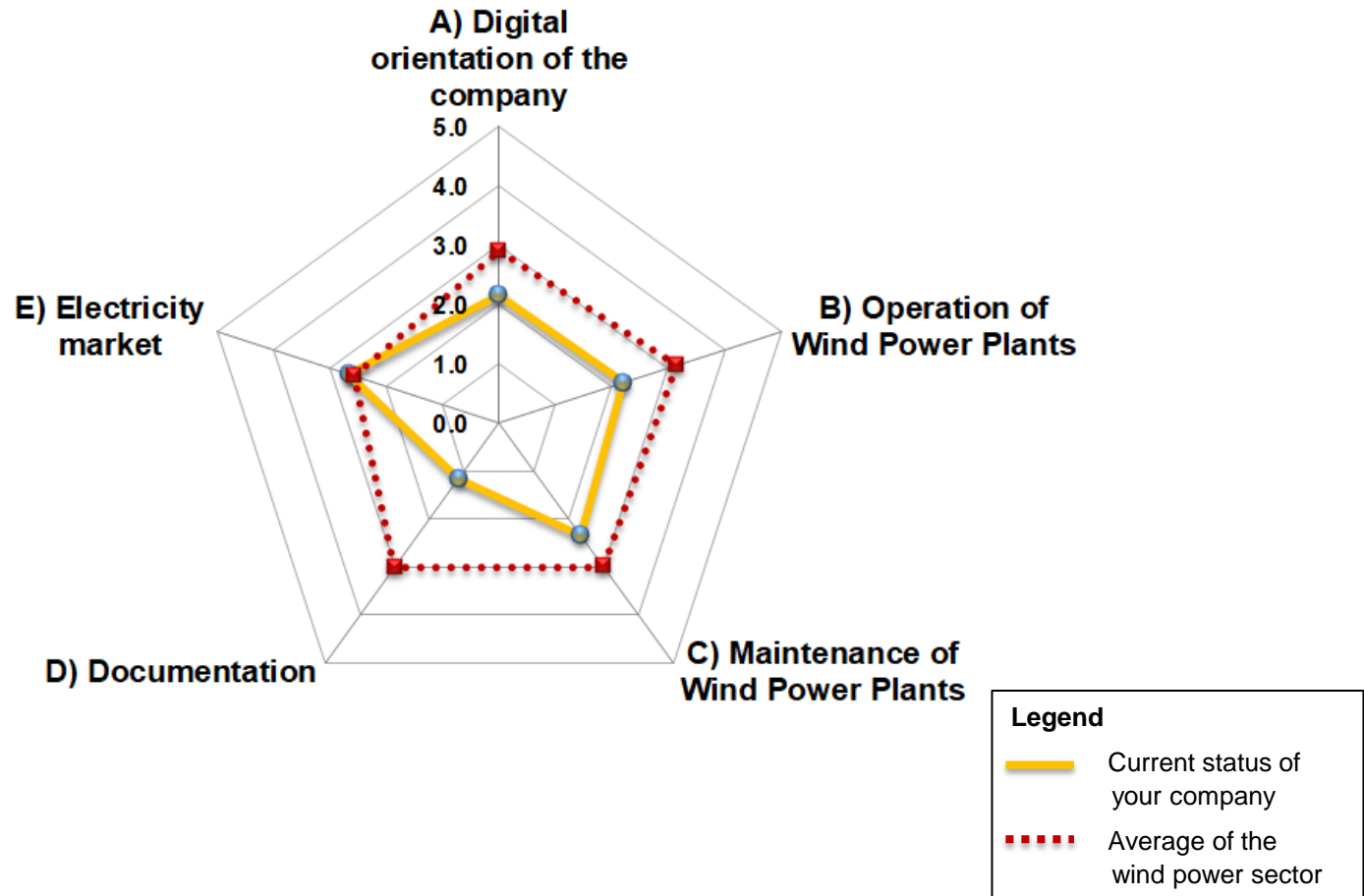
\bar{x}_{SF} ... Sector average for the sub-action field (SF)
 $u_{SF,i}$... Total points for the sub-action field of the company
 c_i ... Total installed capacity of the company [MW]
 i ... Number of companies

Exemplary results of your current status in the main fields

Your wind power fleet		
Wind Power Plants	156	[-]
Installed turbine capacity	435	[MW]

Wind power sector		
Companies	16	[-]
Wind Power Plants	920	[-]
Installed turbine capacity	2,300	[MW]

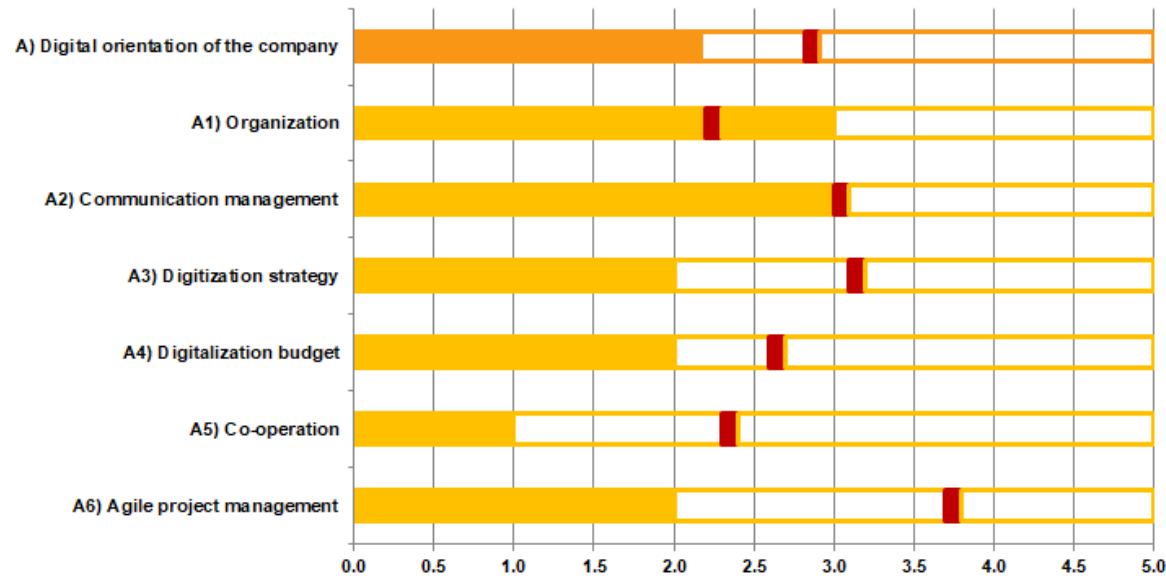
Main field	Current status		
	Points your company	Points wind power sector	[%]
A) Digital orientation of the company	2.17	2.92	74%
B) Operation of Wind Power Plants	2.20	3.14	70%
C) Maintenance of Wind Power Plants	2.33	2.98	78%
D) Documentation	1.17	3.00	39%
E) Electricity market	2.67	2.57	104%



Exemplary results of the current status in the main fields and sub-action fields

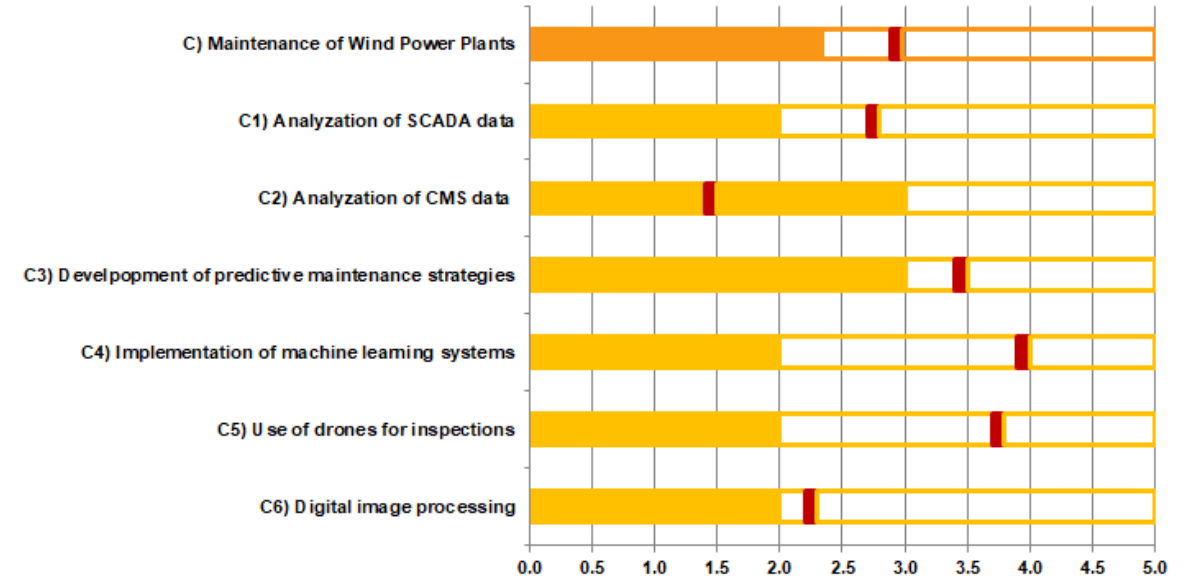
Main field Sub-action field	Points your company	Points wind power sector	[%]
A) Digital orientation of the company	2.17	2.92	74%
A1) Organization	3.00	2.30	130%
A2) Communication management	3.00	3.10	97%
A3) Digitization strategy	2.00	3.20	63%
A4) Digitalization budget	2.00	2.70	74%
A5) Co-operation	1.00	2.40	42%
A6) Agile project management	2.00	3.80	53%

Current status: Main field "Digital orientation of the company"



Main field Sub-action field	Points your company	Points wind power sector	[%]
C) Maintenance of Wind Power Plants	2.33	2.98	78%
C1) Analyzation of SCADA data	2.00	2.80	71%
C2) Analyzation of CMS data	3.00	1.50	200%
C3) Development of predictive maintenance strategies	3.00	3.50	86%
C4) Implementation of machine learning systems	2.00	4.00	50%
C5) Use of drones for inspections	2.00	3.80	53%
C6) Digital image processing	2.00	2.30	87%

Current status: Main field "Maintenance of Wind Power Plants"



Evaluation report

You will only receive an evaluation report if you make an entry for each sub-action field for your current status as well as for your target status in three years.

Additionally, in order to provide a valid benchmark for the sector average, your assessments will be weighted with your specified installed turbine capacity of wind power plants.

The evaluation report contains:

- your current status of digitalization in comparison to the sector average
- your intended target status in digitalization in three years in comparison to the sector average
- the total number of companies
- the number of power plants
- the total installed capacity

On top of that, with each new data set added, the sector average will adjust. Therefore, it will be also interesting for you to follow how the degree of digitalization evolves in the sector.



Use of the Digitalization Barometer for Wind Power Operators

Profound experiences on topics regarding digitalization including latest findings and examples of implementation are part of the discussions in the VGB Technical Committee “Wind Power Plants”.

Our special thanks go to the VGB PowerTech | Wind members, particularly to the members of the Strategic Forum „Wind“, for the co-development and evaluation of the „Digitalization Barometer for Wind Power Operators“.



... is the first address for all operators of wind power plants regarding technical, environmental as well as strategic issues and acts as hub for the wind energy sector in Europe



- **Performs as the collective European platform for operators and suppliers of wind power plants.**
- **Be the first address for interested parties in technical, environmental and strategic issues concerning wind.**
- **Functions as the information platform for the wind community in Europe.**

**Networking
throughout
Europe**

52

Operators

21

Suppliers

31

Consultants

38

GW installed capacity

17

Countries

Individual success through exchange of experience