Comment tirer profit de l’analyse des données d’exploitation pour optimiser la performance d’un parc éolien ?

Carla Vico
Operations Director
Created in 2008, Greensolver is an independent technical expert dedicated to wind & solar assets

CONSTRUCTION MANAGEMENT
Greensolver manages, plans & supervize the construction of wind & solar parks
889 MW – 58 farms

OPERATION MANAGEMENT
From technical to commercial management, Greensolver provides you with a complete solution for your assets
688 MW – 55 farms / 75 SPVs
356MW under technical management in France

CONSULTING & ADVISORY
Greensolver team delivers high quality consulting service:
technical due diligence, wind & solar expertise, contract tendering & procurement
5.9 GW

Greensolver ISO certified 9001, 14001, 55001 and OSHAS 18001.

We currently manage assets in France, UK, Italy, Portugal, Finland & Netherlands and pursue our development through partnerships & acquisitions to offer the best quality of service in Europe
Analyzing data

• Each wind farm need to be analyzed deeply in order to understand it’s weaknesses and strengths

• What kind of data can you analyze to understand how your wind farm performs ?

• All data are extracted from one of our farm in operation and under our management from October 1\textsuperscript{st}, 2014 to September 30\textsuperscript{th}, 2015

• Main analysis to be performed on a wind farm include:
  – Downtimes (Breakdown, Preventive Maintenance, Grid Outage, Operator Downtimes, Icing, High Temperature and Other Downtimes)
  – Availability
  – Maintenance indices (MTTR & MTBF)
  – Capacity factor
Analyzing data

Downtimes

Learnings:
• Global Downtimes have increased since 2012 – 2013
• Mainly increase due to Grid Outage and Other downtimes
• Failure Downtime is slightly increasing
Analyzing data

Availability

- Technical availability is decreasing since 2012-2013
- Netherlands availability has dropped dramatically
- Germany is stable

Learnings:
Analyzing data

Maintenance indices

<table>
<thead>
<tr>
<th></th>
<th>MTBF</th>
<th>MTTR</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>France O&amp;M1</td>
<td>1357.7</td>
<td>3.1</td>
<td>98.8%</td>
</tr>
<tr>
<td>France O&amp;M2</td>
<td>571.6</td>
<td>3.5</td>
<td>98.9%</td>
</tr>
<tr>
<td>Germany O&amp;M2</td>
<td>79.1</td>
<td>1.2</td>
<td>98.2%</td>
</tr>
<tr>
<td>Germany O&amp;M1</td>
<td>376.6</td>
<td>0.4</td>
<td>99.6%</td>
</tr>
</tbody>
</table>

- These indicators enable us to evaluate the performance of the maintenance providers.
- MTBF (in hours) evaluates the quality of the preventive maintenance and wind turbine reliability.
- MTTR (in hours) evaluates the reactivity and the efficiency of the maintenance provider teams to repair the wind turbines.
- The availability displayed in this section is the O&M provider availability which takes into account only the Failure and Preventive Maintenance downtimes for the calculation of unavailable time.

Learnings
- Good availabilities in both countries for both providers. But can they improve?
- Both providers have better MTTR in Germany than in France
- The reliability of the Wind Turbines is better in France than Germany
- Even if we have large portfolios is difficult to compare. How can we improve our analysis?
The key is to know how well a wind asset is really performing
Analyzing & comparing is key to understand deeply the performance of your assets.

**Greensolver index** is an operational performance benchmarking service, allowing you to:

- Compare performance of assets over 45 Key Performance Indicators
- Identify under performance root causes

All data remain anonymous & protected
What is it?

• **Greensolverindex** is an online tool that enables market players to continuously and anonymously share operations information and in return access an online dynamic benchmarking and analysis tool.

• Information benchmarked for each WTG within a park:
  – Production of the turbine
  – Wind speed of the turbine
  – Monthly downtime
  – Number of breakdowns
  – Downtime by major categories

• Obtained direct from SCADA system via the generation of an automated report

• HIGHLY relevant to ISO55000
Dashboard stats

Main indicators
- Main figures
- Wind speed
- Capacity factor
- Indicators annual evolution

Availability
- Availability by manufacturer
- Availability by model
- Availability evolution
- Availability evolution 2

Downtimes
- Downtimes
- Downtimes evolution
- Downtimes evolution 2

Maintenance indices
- Indices by manufacturer

Performance quartiles
- Capacity factor quartiles
- Wind speed quartiles

League Tables
- League tables

Main figures
Capacity factors, availabilities...

select a period to filter
From: January, 2015  to: February, 2015

Region: All
Total production: 102 GWh

Main figures
You can compare your wind parks indicators with Benchmark indicators. For a deeper analysis, you can then specify criteria like: geographical area, time horizons and the park you want to compare.

Customer indicators
- Capacity factor: 25.13%, Benchmark: +1.20%
- Availability: 98.55%, Benchmark: +0.08%
- Wind speed: 5.93 m/s, Benchmark: -1.57%
- P50 deviation: -3.33%, Benchmark: -1.17%

select a park
select O&M suppl / manuf
O&M suppl or manuf:
select a range of hub height:
56.00  139.00

© OpenStreetMap contributors
Improving performance

Learnings:
- The Failure and Preventive Maintenance downtimes represent almost 50% of the downtimes
- The Other Downtimes category represents a quarter of the downtimes for Assets which is consistent with the benchmark
⇒ Our assets are less subject to downtimes compared to the ones signed up in Greensolver index
### Learnings:

- Availability since commissioning of the portfolios is of **97,0%** and **96,1%** for the benchmark
- Technical availability is decreasing since 2012-2013
  - Our portfolio **over-perform** compared to the benchmark values
Improving performance

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Assets</th>
</tr>
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<tbody>
<tr>
<td>MTBF</td>
<td>MTTR</td>
</tr>
<tr>
<td>MTBF</td>
<td>MTTR</td>
</tr>
<tr>
<td>France</td>
<td>OEM 1</td>
</tr>
<tr>
<td>France</td>
<td>OEM 2</td>
</tr>
<tr>
<td>Germany</td>
<td>OEM 2</td>
</tr>
<tr>
<td>Germany</td>
<td>OEM 1</td>
</tr>
</tbody>
</table>

**Learnings:**
- OEM1 & OEM2 in Germany are performing in line with the benchmark in terms of MTBF and MTTR.
- In France, OEM1 for our turbines has a better MTBF than the benchmark, but the MTTR is much higher. This means that in other wind farms the teams of OEM1 in France are being more reactive to repair failures. This is something that can be improved!
- For OEM2, in France, the MTTR is better than the benchmark for this manufacturer, but the MTBF is lower, so the wind turbines are having more problems in our portfolio than in the benchmark. Can we do something?

⇒ **Our assets are correctly handled by our O&M providers in Germany compared to the benchmark**
⇒ **In France, we have to review the O&M strategy for both OEMs compared in this example.**
Conclusions

• In order to understand it’s weaknesses and strengths of your assets it is very important to **ANALYZE YOUR DATA**

• But are **the data from one asset** enough to have a global view and get conclusions?

• Analyzing is the key but **COMPARING & BENCHMARKING** an asset with a large data base is as important

• **Greensolverindex** allows to compare and BENCHMARK any asset against a big data base of almost **2 GW** of wind projects.