NORDIC WIND TECHNOLOGY

**We enable our customers to take full control of their turbines
– we give the power back**

Company presentation
&
NWT Retrofit Software Solution
for

31. WINDENERGIETAGE
BROT UND SPIELE
8. BIS 10. NOVEMBER 2023 IN POTSDAM

The Company

- **Danish Wind heritage**
  Established in 2017.
  Employing 10 highly skilled & motivated wind enthusiasts.
  Located in Ikast, Denmark.
  We take pride in being both honest and transparent.

- **100% Software**
  Core business is Wind Turbine Controller SW.
  Focus on open & transparent SW platform.
  Allow owners to access their turbines.
  Power Performance – Improve AEP.
  Advanced Yaw & Pitch algorithms.

- **Knowledge & Competences**
  SW Engineers with +10 years of experience.
  Controller Experience from Vestas & Siemens.
  Load & Aerodynamic experience.
  Hands on experience.

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It's all about Software

- 100% focused on wind turbine controller software
- Danish Wind heritage

- Controller Knowledge & Experience

- SW development experience from Vestas & Siemens

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Technology

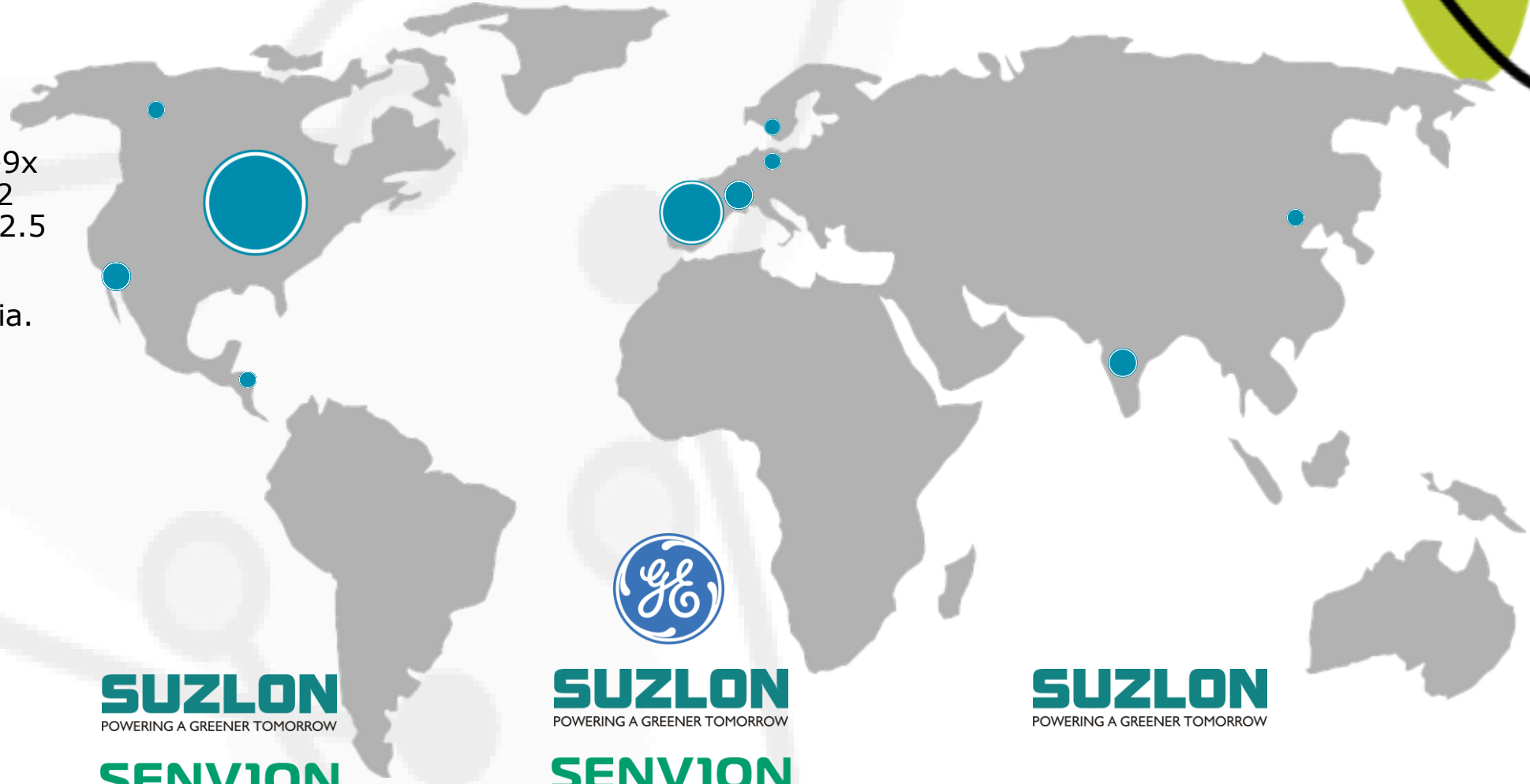# Installed software

Number of turbines:

342

Installed turbines:
Suzlon S-52, S-64, S-88 & S-9x
Senvion MM70, MM82 & MM92
General Electric GE 1.5 & GE 2.5

Primarily in US, Europe & India.

Planned to come in 2023:
PivotGen: 92 x S-64/S-88

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Software Retrofit – Bachmann Control System

Why Software retrofit?

OEM Independency

Easy Installation
Minimum Risk

Access to Service Tool

Improve AEP

Choose your own Service Provider
or manage O&M yourself

Extended lifetime & SCADA

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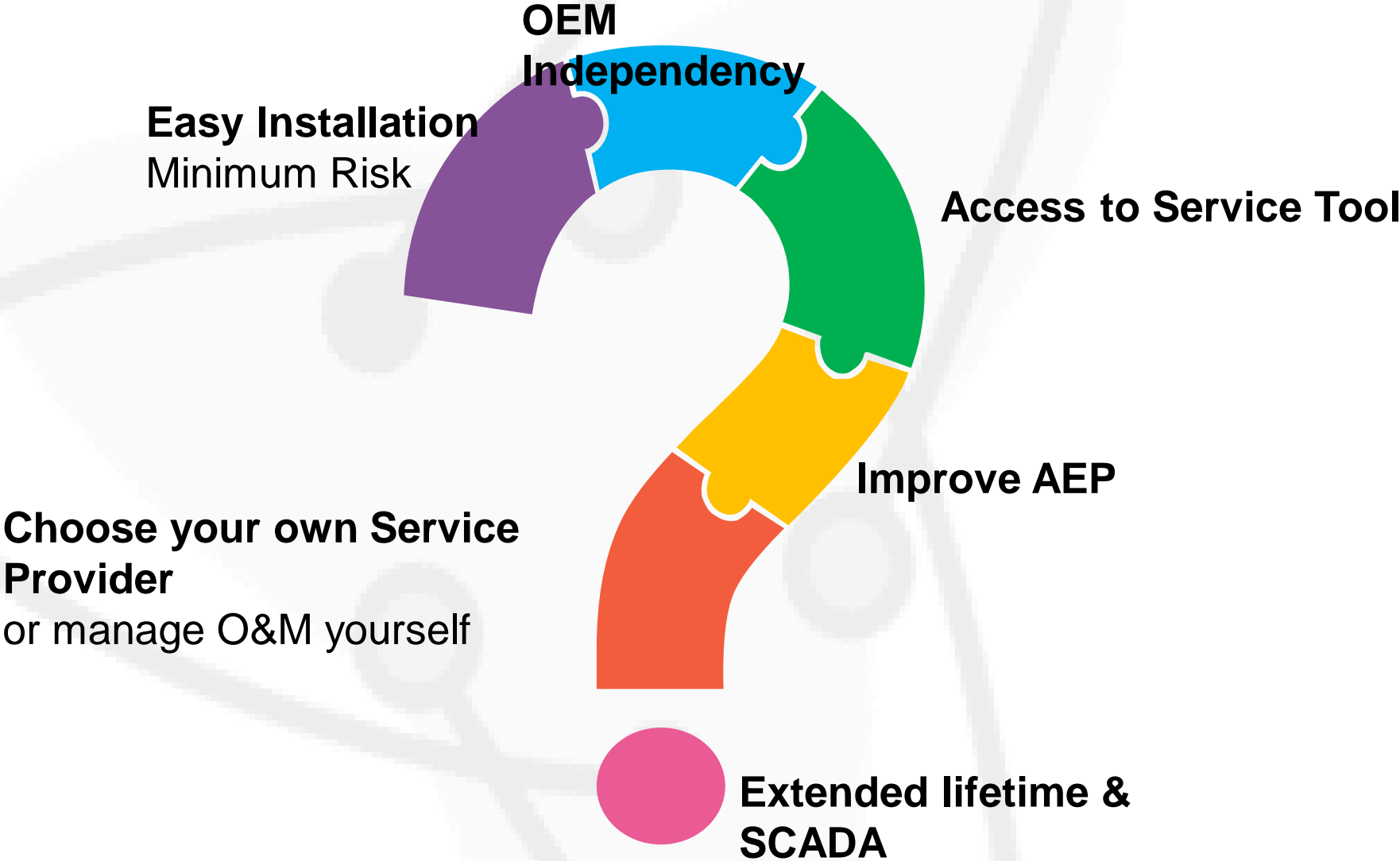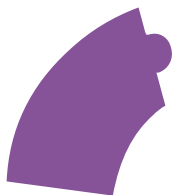
Easy Installation

- The software is installed by changing the CompactFlash card in the Bachmann controller.

    - Simple and Easy – Takes only 5 minutes.

    - The old CompactFlash card is kept by the owner. If the owner wants to roll back to the original configuration it can be
      re-installed.

    - After installation a new commissioning report will be comple

- Safe and Secure!

    - All parameter settings are kept "as is"

    - No wires, no hardware is changed, hence the safety chain
      and all sensors, components are left untouched.

    - All the safety features in the turbine, like overspeed guard,
      vibration protection etc. are kept as original and are NOT affected by the new software.

    Turnaround time – 30 mins.

Front

Back

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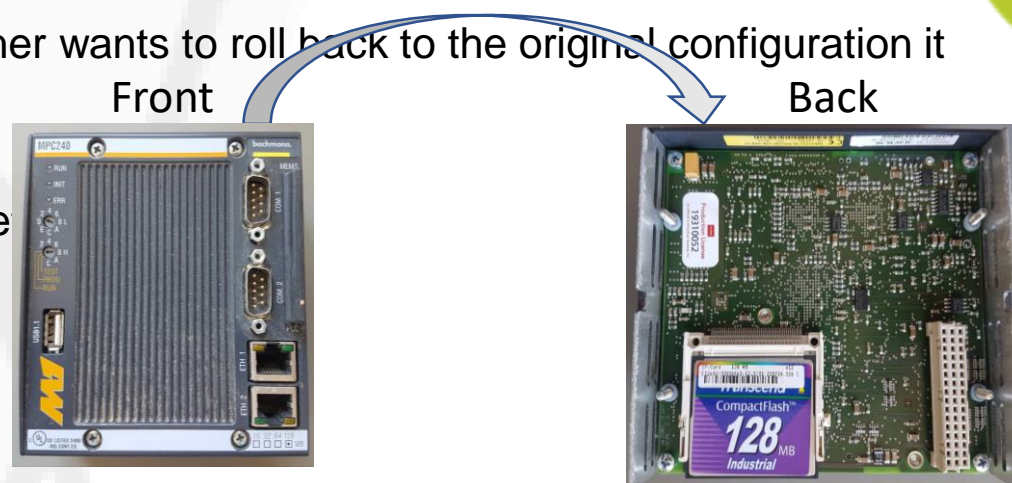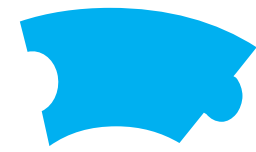
OEM Independency

- 100% independent from the OEM.

  - Spare parts:

  All electrical subsystems such as the Pitch module (MOOG), Soft starter (IXYS), Converter (WOODWARD/Alstrom),

  Grid Module (WOODWARD), Suzlon Flexi Slip module (Bachmann), can all be repaired, replaced or serviced directly by

  the specific producers. All software, software service tools and parameters for these modules are included in the software

  package.

- New supply-chain.

  - Nordic Wind Technology can help setup and complete your supply chain for all electrical and mechanical components.

  This ensures a cheap and fast service of your turbines.

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Access to Service Tool

- Why upgrade your existing turbine with NWT software?

  One of the most obvious reasons are that you would like to have full access to your turbine data and full access to the parameter settings.

  Through the NWT software you will get full access & control and be 100% independent from the OEM.

- Easy access and control through the NWT software:

  Start/Stop, Service,

  Production overview,

  Parameter settings, Events,

  all data is available

  from the Service Tool.


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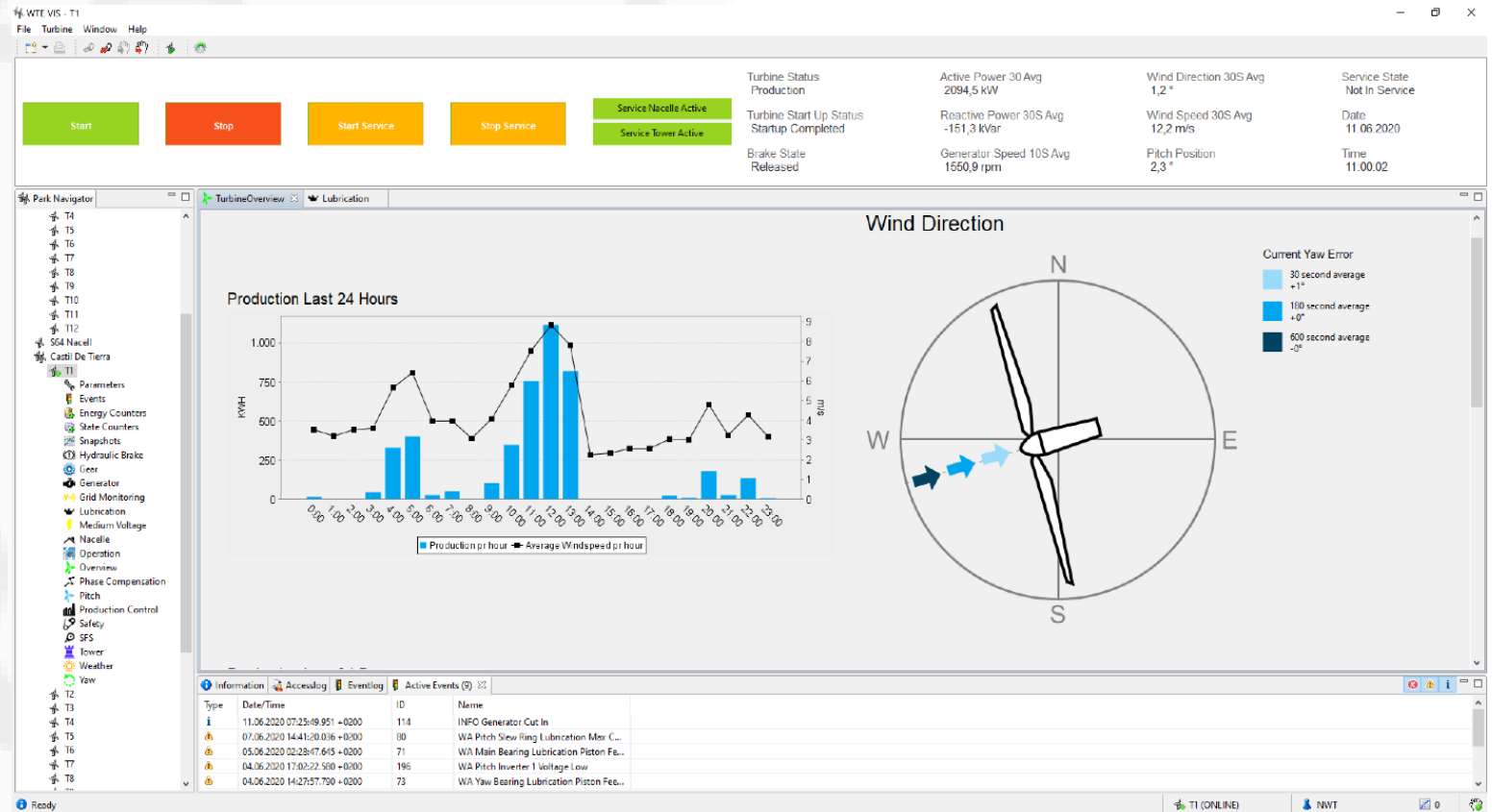
Improve AEP

Production Efficiency, up to 7% improvement.

- **Updated Yaw control software:**
  Compensate for measured wind direction, by using multiple sensor input to ensure the rotor is positioned correctly into the
  wind in order to increase AEP and reduce fatigue loads.

- **Updated Pitch control software:**
  Pitch Incoherence Optimizer - Eliminate pitch incoherence (avoid aerodynamic rotor imbalance) to reduce fatigue loads
  and increase AEP

- **Pitch angle optimizer:**
  Adjust pitch angle to ensure operating in optimum pitch angle and increase AEP.

- **Derating power output instead of stop:**
  Multiple sensor inputs and model prediction helps the turbine stay in production.

- **Gust And Turbulence control:**
  The turbine can run in high complex wind scenarios with high turbulence and wind conditions
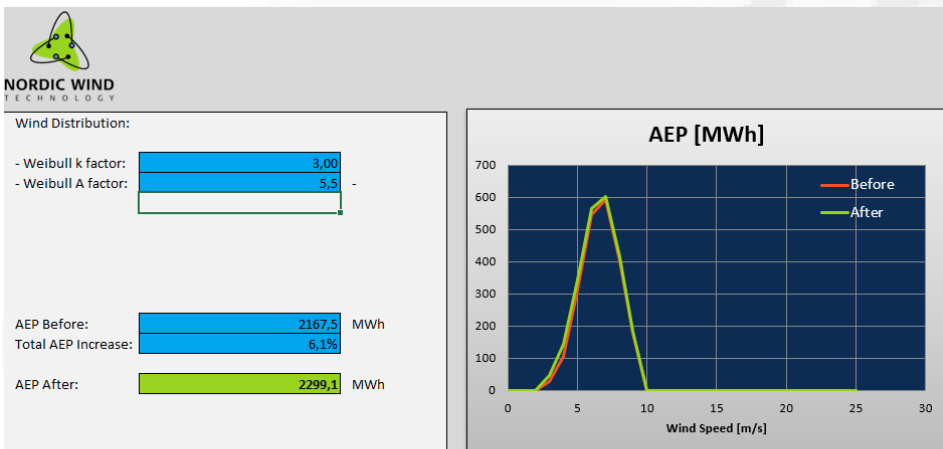

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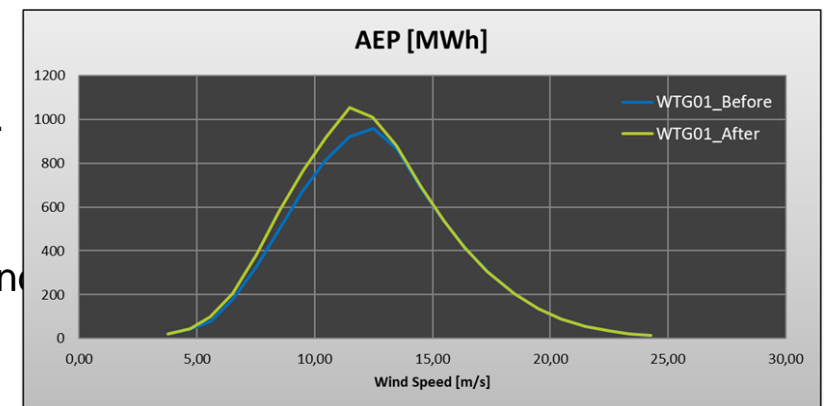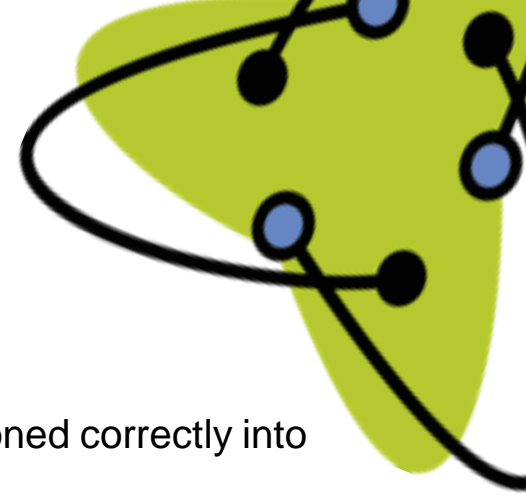
Improved AEP, Senvion example.
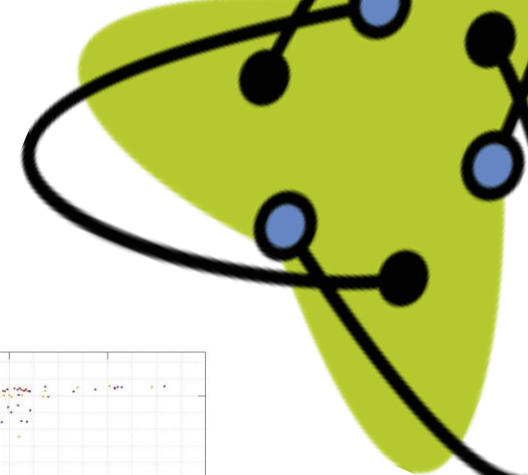
Production Efficiency, up to 6% improvement.

Side by side comparison. Load measurement campaign.
No indicators for higher dynamic loads by using the NWT controller sw.

Wind Speed [m/s]	Wind Speed Distribution Weibull	Before Power [kW]	Before AEP [MWh]	After Power [kW]	After AEP [MWh]	Increase AEP [MWh]
0	0,00%	0,00	0	0,00	0	0,00
1	1,79%	0,00	0	0,00	0	0,00
2	6,87%	0,00	0	0,00	0	0,00
3	13,80%	23,38	28	37,17	45	16,66
4	19,64%	61,13	105	83,91	144	39,18
5	21,27%	167,83	313	184,10	343	30,30
6	17,72%	352,09	547	363,47	564	17,66
7	11,24%	600,18	591	612,08	603	11,73
8	5,32%	863,43	402	890,13	415	12,44
9	1,83%	1134,65	182	1157,55	185	3,66
10	0,44%	0,00	0	0,00	0	0,00
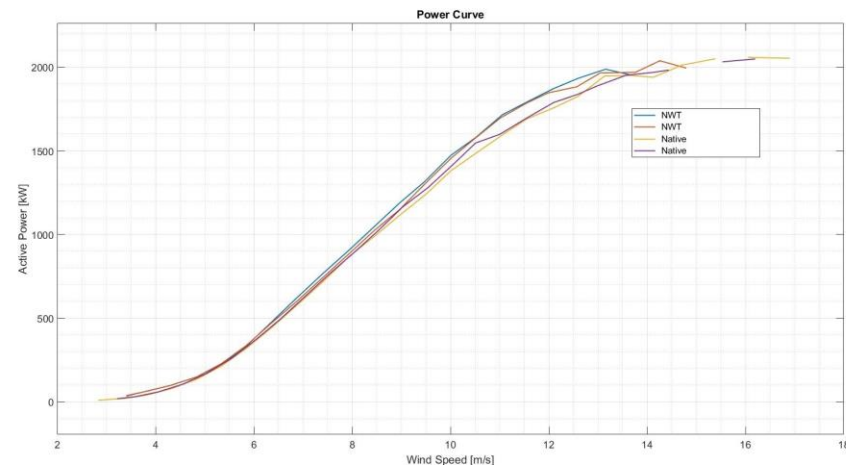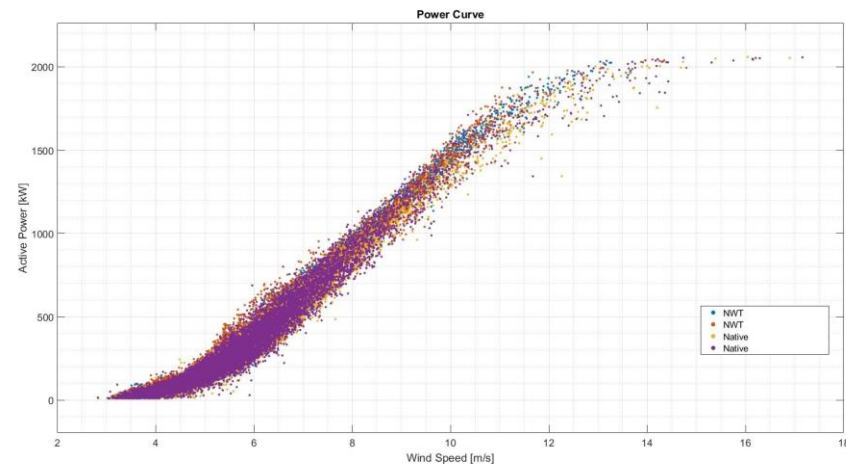
Choose your own Service Provider

- 100% independent from the OEM's Service Contract.

- Choose your own ISP or manage the O&M yourself.
  - They will have easy access through the Service Tool.

- Full transparency and open Service Tool.
  - You own the Data and can easily create Access Levels.
  - More user-friendly Service Tool.
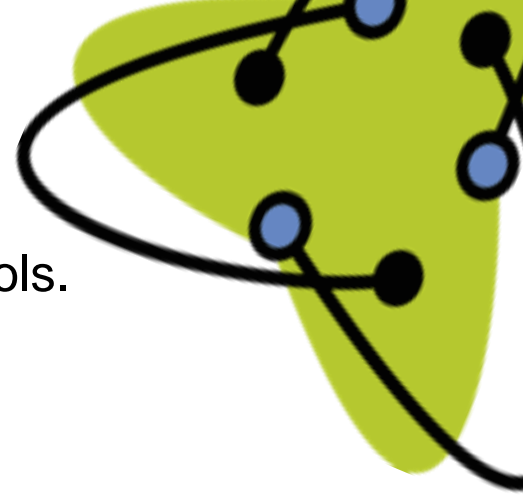
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Extended lifetime & SCADA

The NWT software provides a gentler control algorithm for the pitch- and yaw controls. The advantages are:

- Less wear & tear.
  - Optimized software reduces the wear & tear on the pitch & yaw components.

- Increased lifetime of the yaw- and pitch systems.
  - Eliminate pitch incoherence (avoid aerodynamic rotor imbalance) to reduce fatigue loads.

SCADA:

- The software follows the **IEC 61400-25** standard.
  - The software is designed to be flexible and can be adjusted to other standards and communication forms.

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Company References

Thank you for your attention!

Please do not hesitate to contact us for further information

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