Power Curve Working Group 2nd Meeting Introduction

Peter Stuart
Senior Technical Manager

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res
power for good

- The power function of a wind turbine is dependent on wind speed, density, vertical wind shear, vertical wind veer, turbulence intensity, directional variation and inflow angle.

- There is a need for greater clarity on the range of conditions for which power curves are representative. This will give a clear starting point for considering corrections for 'non-standard' conditions.

Proceedings publically available at:
http://www.ewea.org/events/workshops/resource-assessment-2013

Corrections should be applied for 'non-standard' conditions which are different to those for which a power curve is representative. These corrections fall into two categories:

Type A: Adjustments made to reflect changes in the energy available for conversion across the rotor in a ten minute period due to 'non-standard conditions'.

Type B: Adjustments made to reflect changes in the conversion efficiency due to 'non-standard conditions'.

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- The corrections for wind shear, wind veer and turbulence intensity in the current working draft of the IEC Power Performance standard should be considered as candidate methods for incorporation into resource assessment methodologies (Type A corrections).

- Further collaboration between manufacturers, developers and consultants is required to improve communication of power function information and explore corrections for non-standard conditions.

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- The 1st meeting gave a clear statement of the **problem**.

- The 2nd meeting will focus on possible **solutions** e.g. power curve correction methods, integrating corrections into the resource assessment process, measurement campaigns, improving communication between stakeholders etc.

Morning Session: 10am-1pm

- 10.00 – 10.05 "Welcome & Intro" Ioannis Antoniou (SWP) + Peter Stuart (RES)
- 10.05 – 10.20 "Siemens Experience of Rotor Average Wind Speed for Power Performance" Ioannis Antoniou (SWP)
- 10.20 – 10.30 "Observed Performance in High Shear and Turbulence" Daniel Stevens (SSE)
- 10.30 – 10.50 "Rotor Equivalent Wind Speed for Power Performance Measurement and AEP Estimate" Rozenn Wagner (DTU)
- 10.50 – 11.10 "Use of 5 Distinct Power Curves as a Function of Shear and Turbulence in Time-Series Energy Capture Calculations" Dan Bernadett (AWS TruePower)
- 11.10 – 11.30 "Integrating Corrections into the Resource Assessment Process" Andrew Tindal (GLGH)

11.30 – 11.40 Tea/Coffee Break

- 12.00 – 12.20 "Experience of Rotor Averaged Power Curve Measurements in Cold Climates" Alan Derrick (RES)
- 12.20 – 12.40 "Using Machine Learning to Create Turbine Performance Models'" Andy Clifton (NREL)
- 12.40 – 1.00 "Dynamic Power Curves and the LLNL Wind Power Program" Wayne Miller (Lawrence Livermore National Laboratory)

Lunch: 13:00 – 13:45

Afternoon Presentation Session: 14.00-14:30

- 13.45 – 14.00 Measurements as a Basis for Extended use of Standard Power Curves. Thomas Blodau (REPower)
- 14:00 – 14:15 "Roadmap for Industry to More Accurately Predict the Performance of Wind Turbines", Ralph Torr, Sgurr
- 14:15 – 14:30 "Resource Assessment Methods Incorporating Rotor Equivalent Wind Speed, Density and Turbulence on a Time Step Basis" Anna Marsh, DNV KEMA

Discussion Session Part 1: 14:30 – 15:30 (Moderated by Andrew Tindal GLGH)

- Proposed Round Robin Exercise:
  - RES Data Set (Alan Derrick)
  - Discussion on round robin; who will participate?
  - Proposed 'Black Box' Power Curve Initiative
- How else can the industry move forward on this issue?

15.30 – 15.45 Tea/Coffee Break

Discussion Part 2: 15.45 – 17.00 (Moderated by Andrew Tindal GLGH)

- Further Discussion
- Wrap Up, Conclusions, Next Steps, 3rd Meeting Date and Venue (20 minutes)
- Continued Public Distribution of Minutes and Presentations (5 minutes)
- Workshop Vision Exercise (10 minutes – if time allows)

- **Reception**: 17:00 – 18:00