Renewable energy consultants

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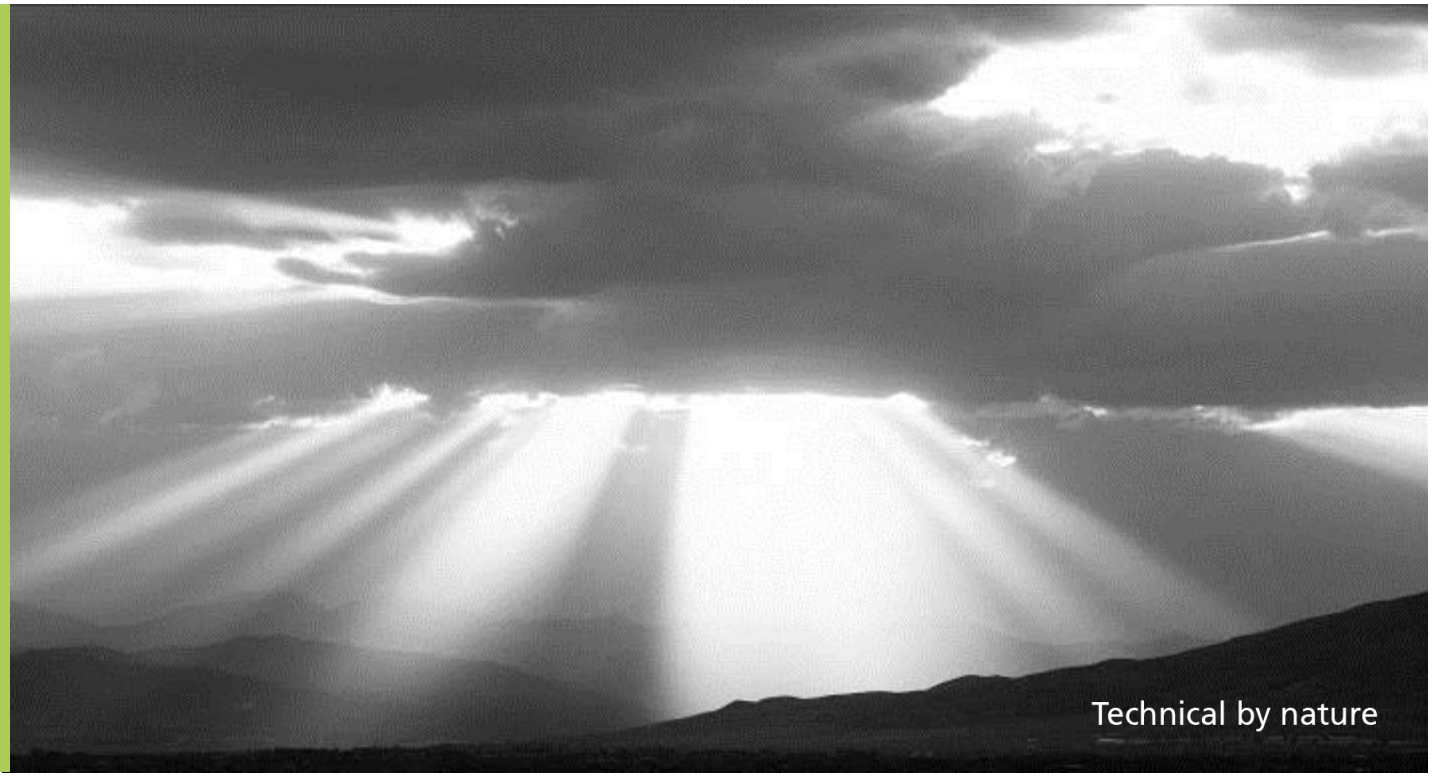
Integrating corrections into the Resource Assessment Process

12th March 2013 Andrew Tindal, SVP Head of Energy



Outcome from 4 December 2012 meeting

The working group members acknowledged that turbine performance is sensitive to the following parameters:

- Wind speed (traditional power curve variable)
- Air density (traditional power curve variable)
- Vertical wind shear
- Vertical wind veer
- Turbulence intensity
- Directional variation
- Inflow angle

How do we use this information to improve predictions?

Needs Turbine Suppliers, Developers and Analysts to work collaboratively

Needs increased information exchange

The role of the Turbine Supplier - 1

Provide energy analysts a clear starting point with a specific definition of the conditions for which a sales power curve is representative

The role of the Turbine Supplier - 2

Provide site specific sales power curve(s) when provided with additional site information

Consider providing increased access to measured power curve reports

Consider creating a “black box” power function tool

The role of the Developer / Owner

Design pre-construction measurement campaigns with Power Curve issues in mind e.g.

- Measure wind speed up to tip height – with Remote Sensing
- In complex terrain measure inflow angle

Consider including tip height Remote Sensing measurements in any contractual power curve testing which takes place on site

The role of the Energy Analyst - 1

[Whether in a consultant, developer or turbine supplier]

Undertake analysis of site wind data and undertake modelling to prepare inputs for power curve assessment

Receive Sales Power Curve with a full definition of the conditions for which power curve is representative

Review whether corrections are needed and if so apply correction models

The role of the Energy Analyst - 2

Undertake analysis of site data to prepare inputs for power curve assessment

Provide information to Turbine Supplier

Receive Site Specific Power Function

Use Site Specific Power Function to undertake energy analysis

Energy Analysis Issues

Is a time series analysis approach required?

Are Vertical Wind Shear and Turbulence Intensity more important parameters than Vertical Wind Veer, Directional Variation and Inflow Angle for most sites?

Discussion

Ways to take this forward to be explored in discussion sessions.

Questions?