



Wind. It means the world to us.

High Performance Computing at Vestas Wind Systems A/S

Anders Rhod Gregersen

agreg@vestas.com

Senior specialist, Vestas Wind Systems A/S

Presentation Outline

- Introduction to Vestas
- Finding a good site and HPC
- Forecasting
- Usability
- Building HPC capability
- Road ahead



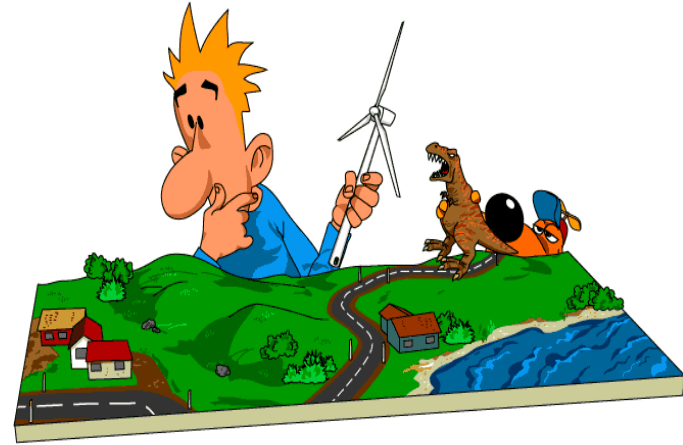
Finding a good site

Traditional process:

Point measurements (met mast)

Point estimate of wind resource

Point estimate of turbulence



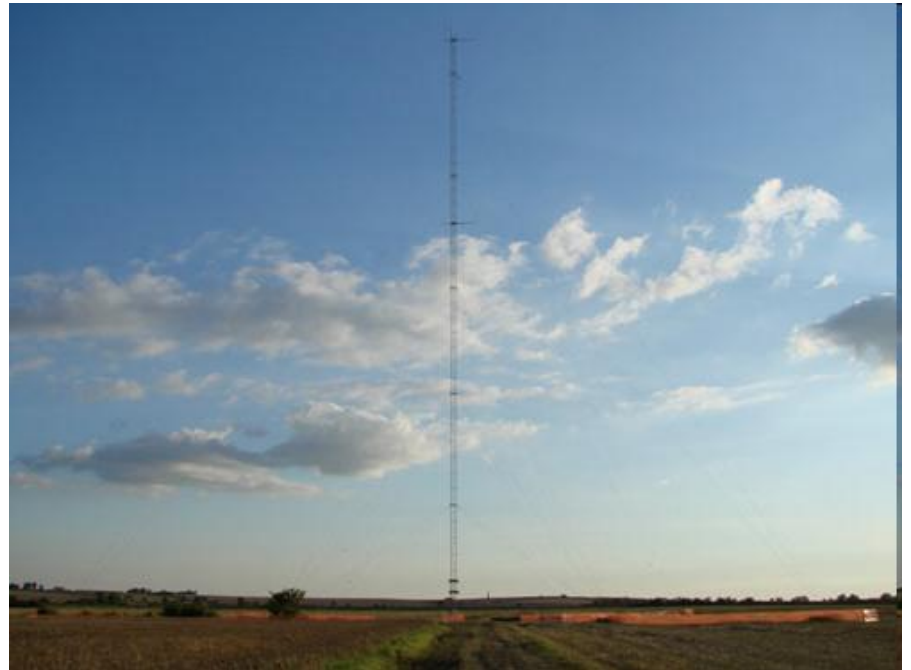
Drawbacks:

Costly

Time consuming

Point measurement of flow

No weather context

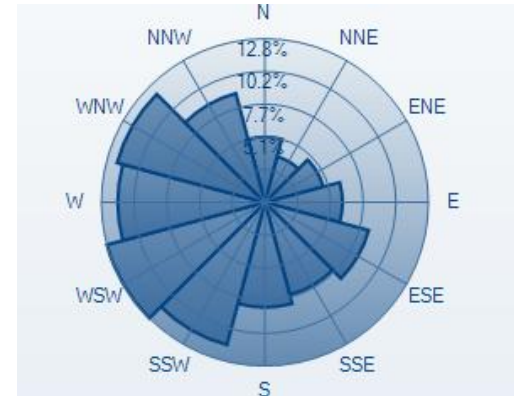


Finding a good site (II)

HPC aided process:

Better understanding of flow over terrain:

- Turbulence
- Wind shear
- In flow angles...



Better understanding of the wind resource

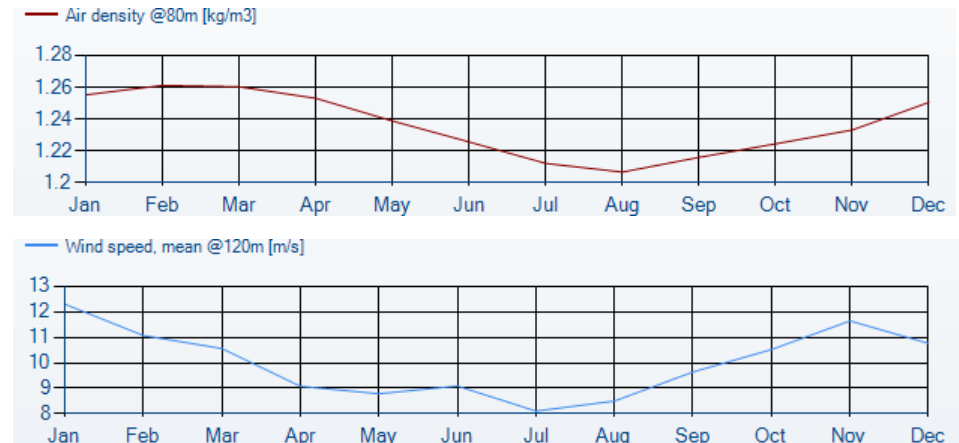
Better insight into extreme events (lightning, icing...)

Enables:

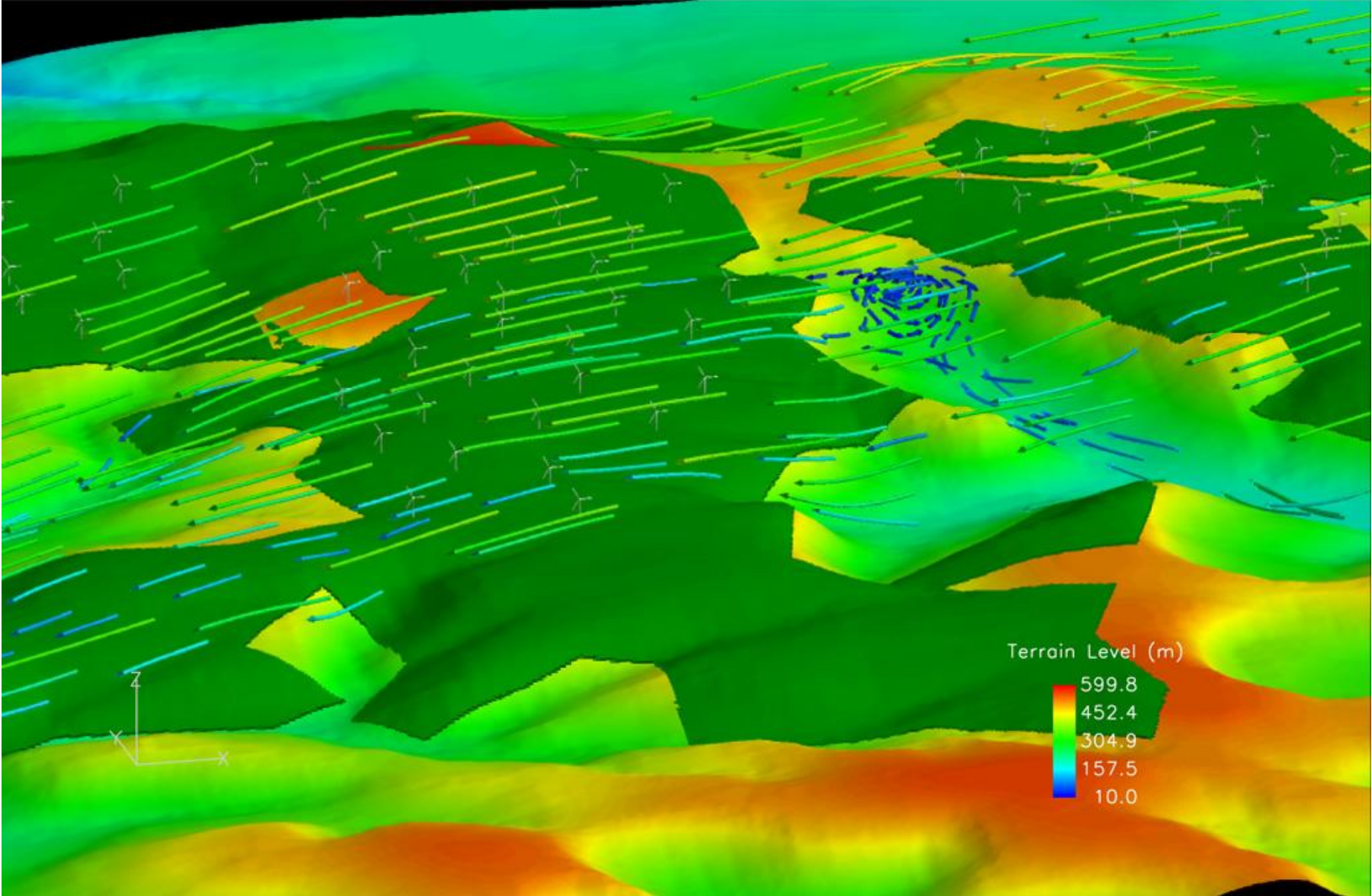
Virtual siting

Business case certainty

Cost of energy map



Flow over terrain



Map layers

Cost of Energy

Wind Resource

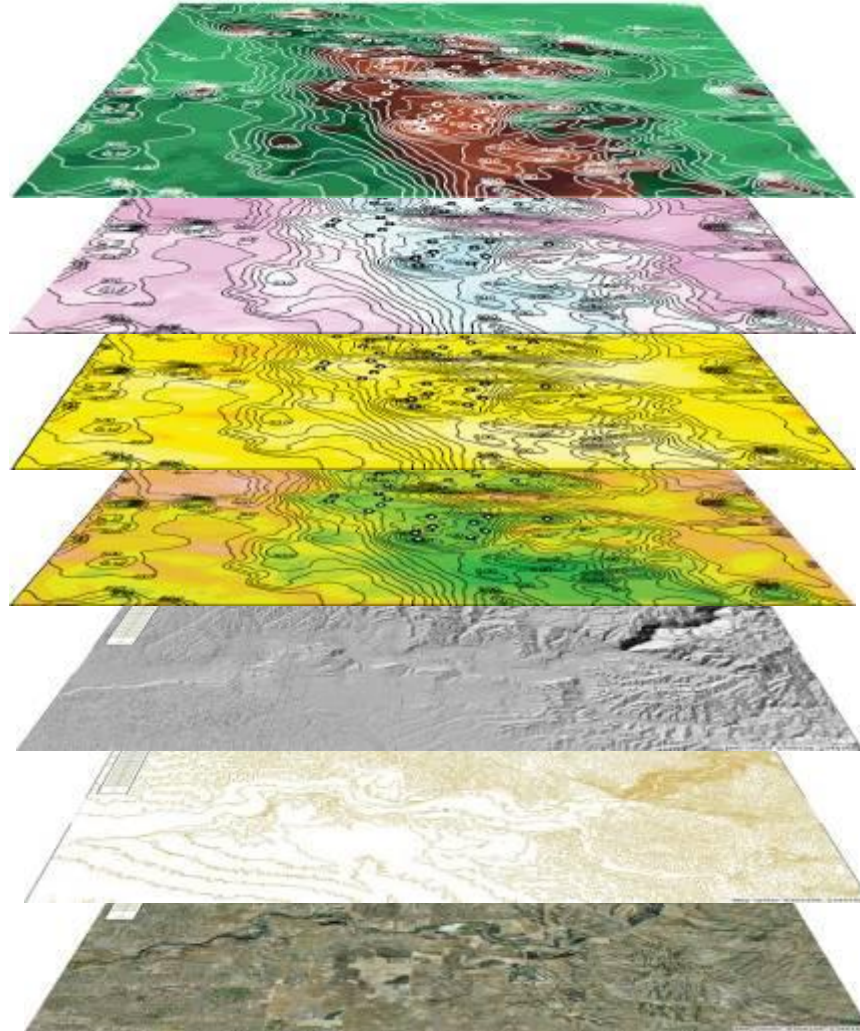
Service Cost

Turbulence

Complexity

Height contours

Site picture



Virtual siting

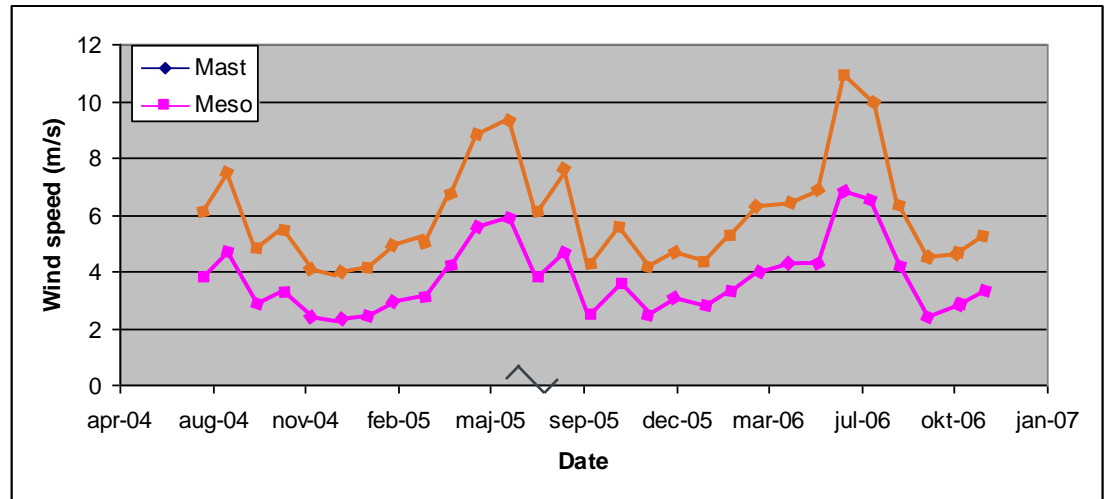
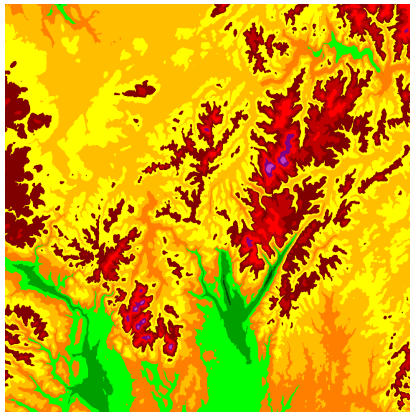
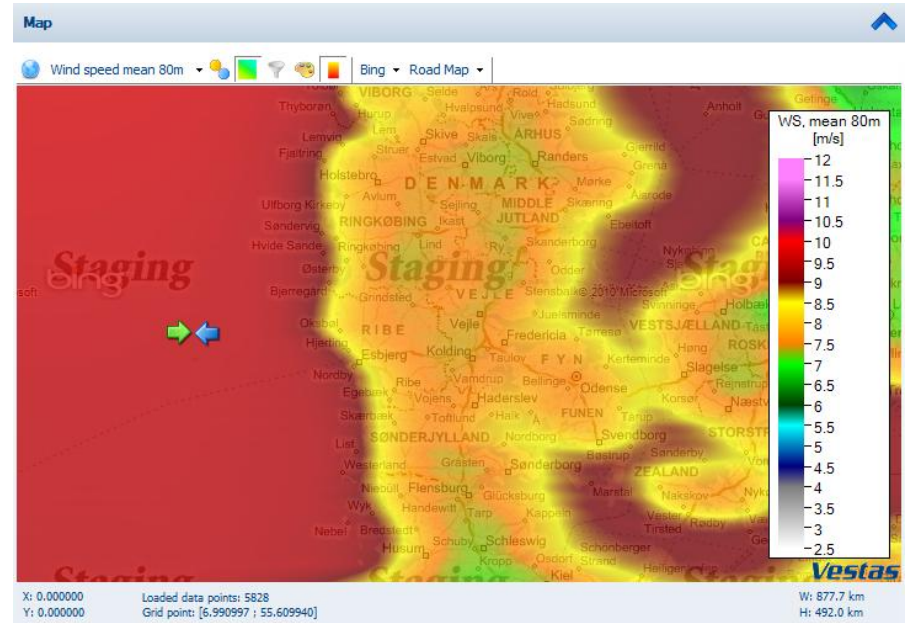
No met mast?

The art of hind-casting

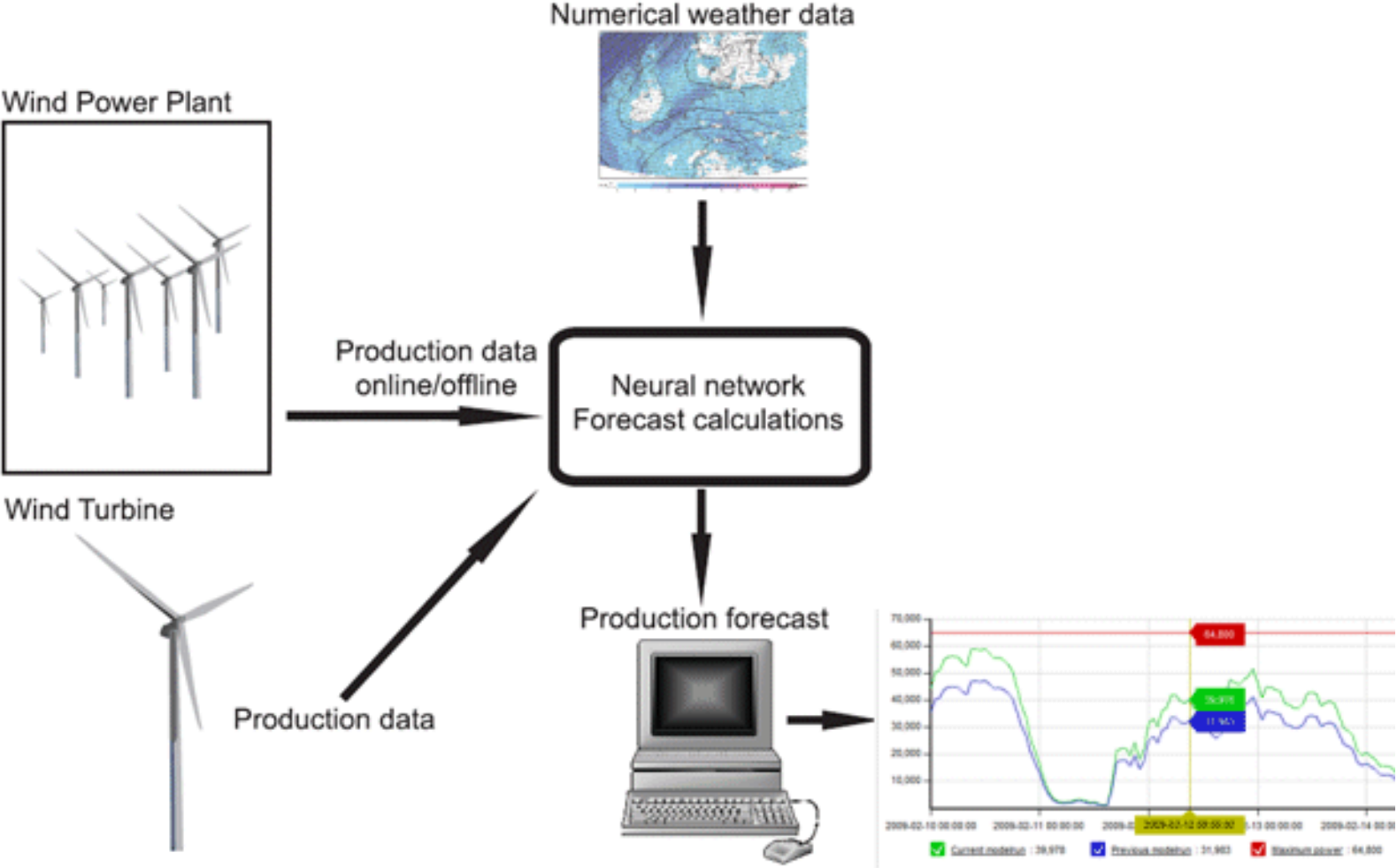
Simulated time series

CFD flow and estimate

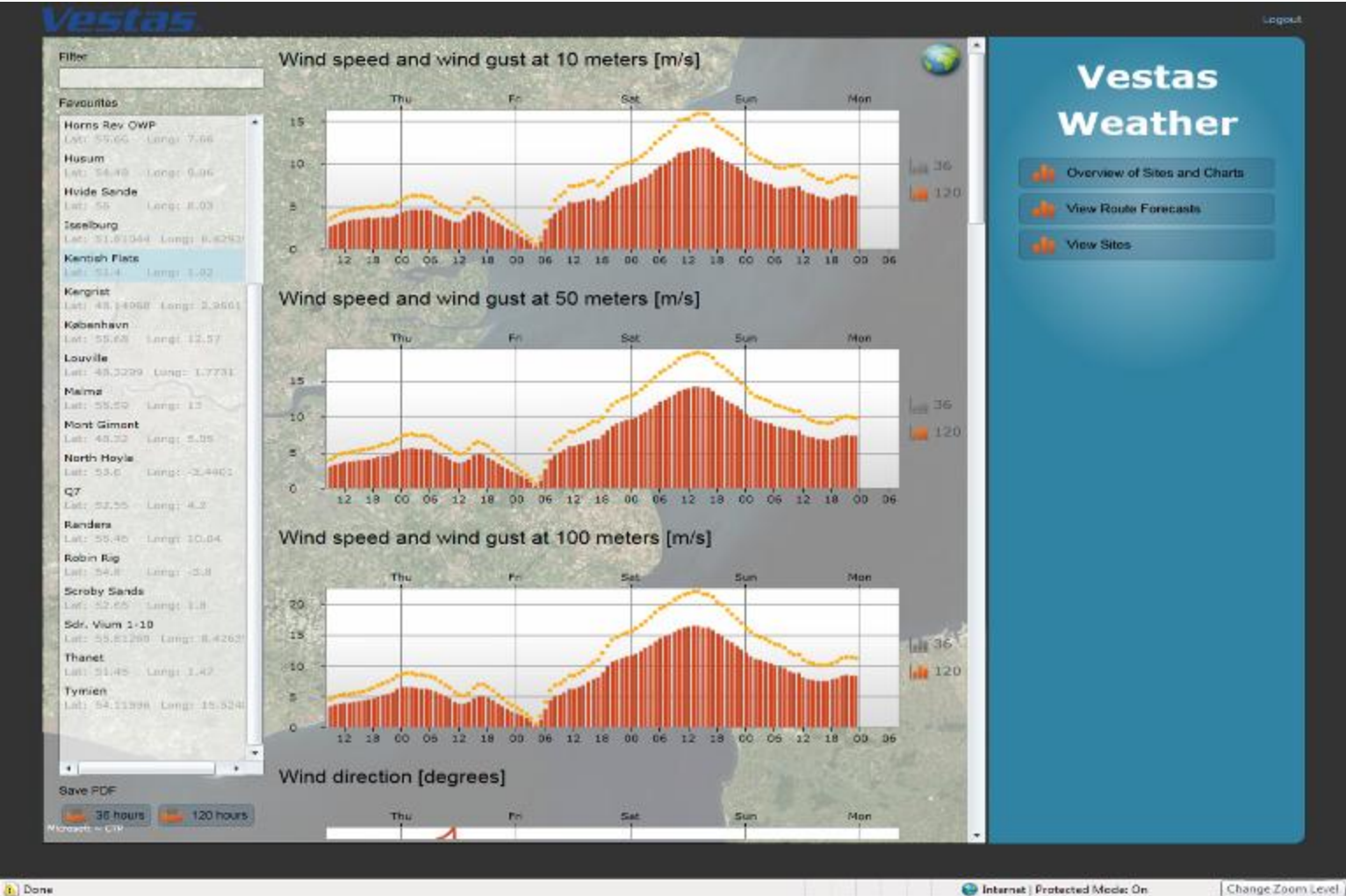
Correcting with measurements



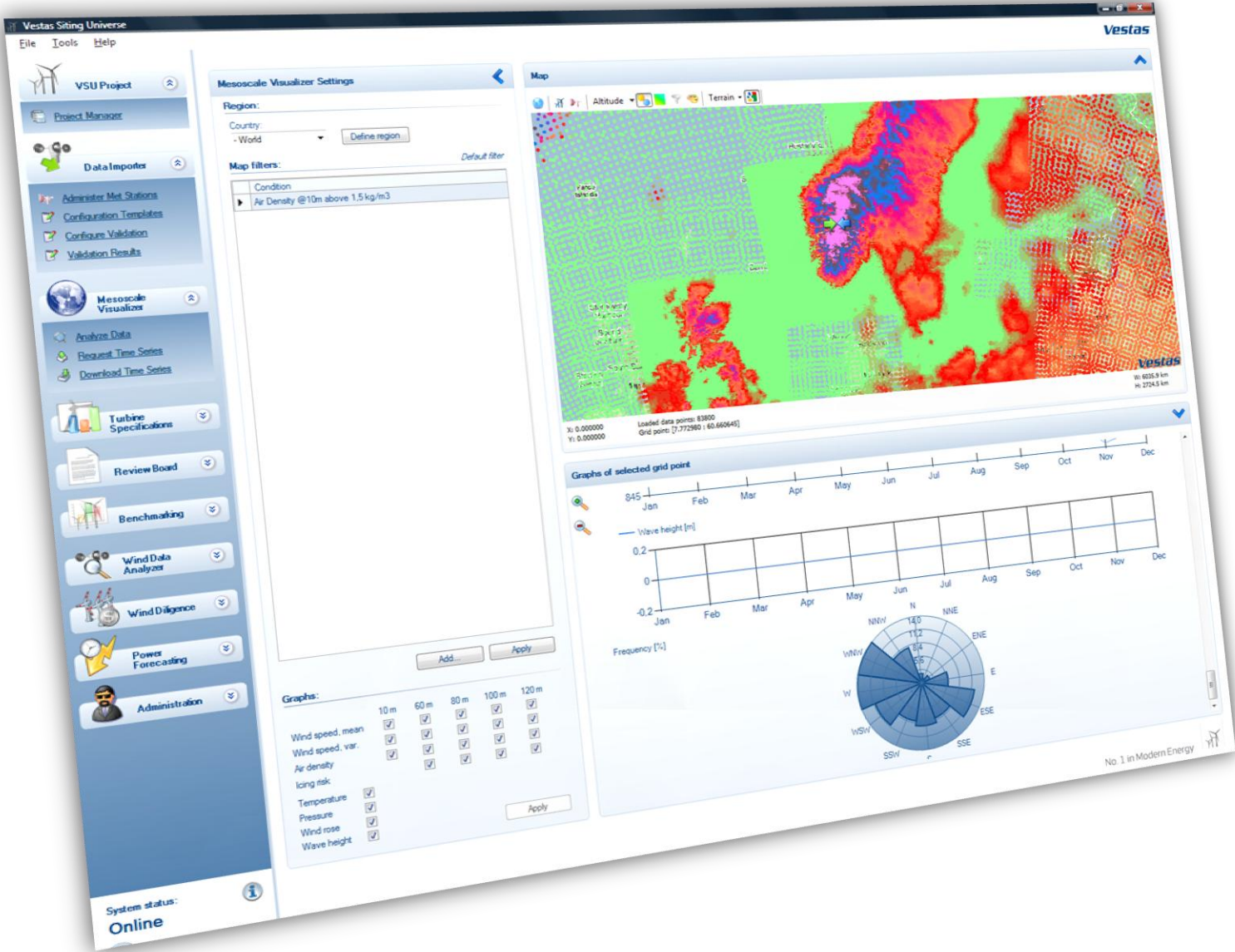
Forecasting power production



Service scheduling



Point and click HPC



Building up HPC capability

Q1/2003

First commercial license for CFD

Q4/2006

First cluster (40 cores)

Q3/2007

CFD model validated.

Q4/2008

Second cluster (15 TFLOPS, TiBs)

Q2/2011

Third cluster (TFLOPS++, PiBs)





The road ahead

From commercial to open source code

Big Data

Time vs. Space

The Vestas logo is displayed in the top left corner of the slide. It consists of the word "Vestas" in a bold, italicized, white sans-serif font, followed by a registered trademark symbol (®). The background of the top half of the slide is a blue sky with wispy white clouds, and a semi-transparent white curved shape is visible on the left side.

Wind. It means the world to us.™

Thank you for your attention

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