Die Vaisala Familie ist gewachsen: SecondWind und 3Tier sind mit an Bord

Michael Kalkum

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Vaisala ist weltweiter Marktführer auf dem Gebiet der Umwelt und Industriemesstechnik.

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Markets We Serve

Weather

Controlled Environment

by Vaisala

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Vaisala auf dem MARS: Rover Curiosity

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Triton Sodar Measurement and its Worldwide Applications

/ Brian Alves / November 2014

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Triton® Sonic Wind Profiler

- Triton Sonic Wind Profiler is a wind industry–specific remote sensing system designed to add value at all stages of development and operation
  - Reliable hub-height data
  - Unattended operation
  - Full SkyServe support program
  - Cost-effective

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Triton at Five

- Over 500 units shipped worldwide
- About 12 million hours of data collected
- Over 2,500 deployments
- Uptime remains very high – better than 97%
- Continuous improvements to hardware and firmware

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Global Reach

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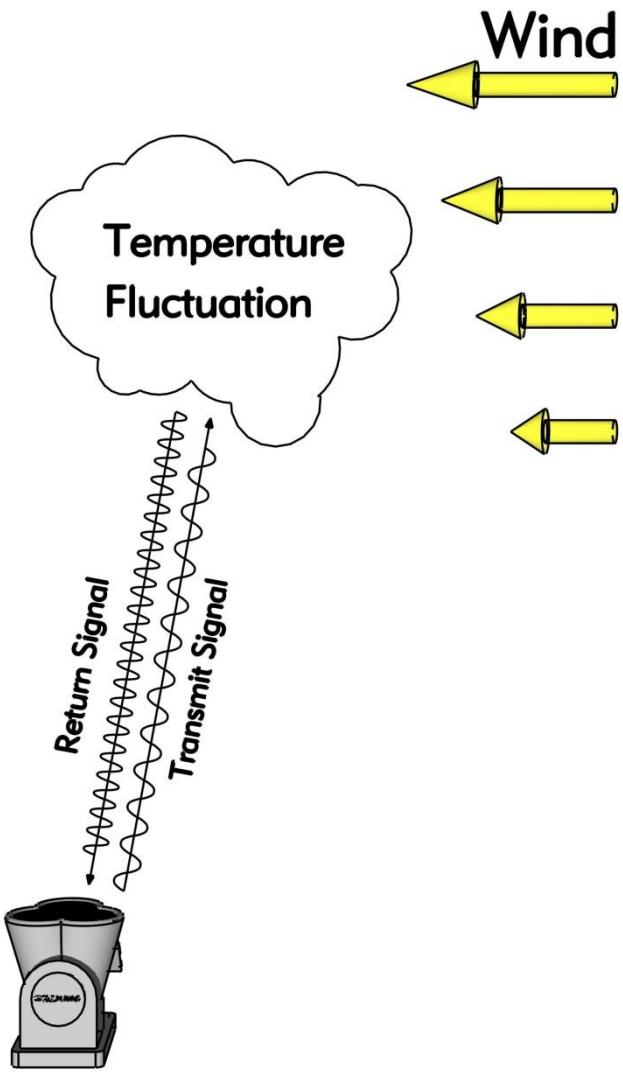
Triton Customers

- Triton is used by about 200 companies in over 30 countries and include developers, owner operators, and service providers. Customers include:

Wind Developers	*Electric Utilities*	*Service Providers*

How SoDAR Works

- Sonic Detection And Ranging (SoDAR) measures the scattering of sound waves by atmospheric turbulence and the thermodynamic structure
- Sends an audible chirp (4,500 Hz) into the air
- Upon return of signal, records changes and calculates wind speed, direction, in-flow angle, shear, and turbulence



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Remote Sensing Applications

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Wind Industry-specific Remote Sensing System

- Triton® is designed to add value at all stages of wind industry development and operation

	Planning a Wind Farm	Operating a Wind Farm
Fixed Location	**Standard or Heater Triton** ▪ Fixed deployment 1–3 years ▪ Wind Resource Assessment	**Triton Ops (Heater or Standard)** ▪ Fixed deployment 20+ years ▪ Regulatory compliance with ISO ▪ Forecasting ▪ Curtailment management
Mobile Applications	**Standard or Heater Triton** ▪ Mobile deployment 3–6 months ▪ Turbine site suitability ▪ Wind shear validation ▪ Turbine layout optimization ▪ Spatial site characterization	**Standard or Heater Triton** ▪ Mobile deployment 1–4 months ▪ Wake analysis ▪ Turbine performance analysis ▪ Condition monitoring

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Wind Resource Assessment

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Wind Farm Development

- Early stage prospecting
- Pre-assessment ahead of met tower installation
- Wind resource assessment
- Hub-height data collection
- Shear validation
- Verification of CFD models
- Noise assessment studies

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Fixed O&M Applications

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Permanent Reference Station

- Meets ISO reporting / forecasting requirements for wind farm commissioning
- High-speed communications to wind farm SCADA
- Data capture at 2 or 3 pre-configured heights
- Data delivered at time intervals based on ISO requirements (4 sec – 10 min)

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Mobile O&M Applications

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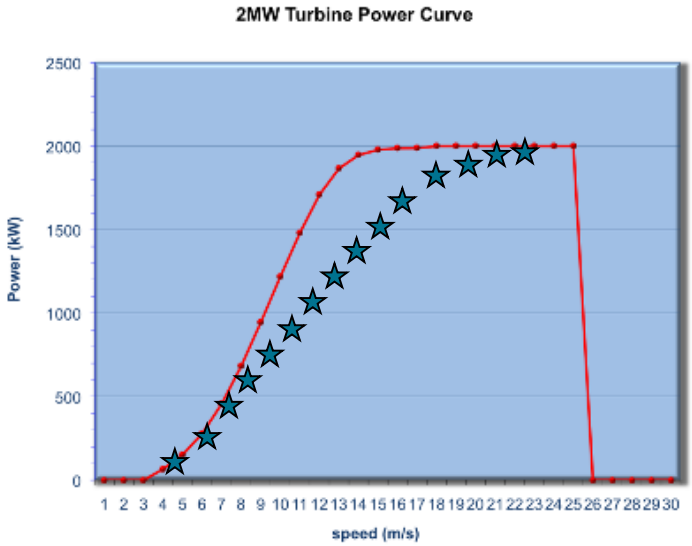
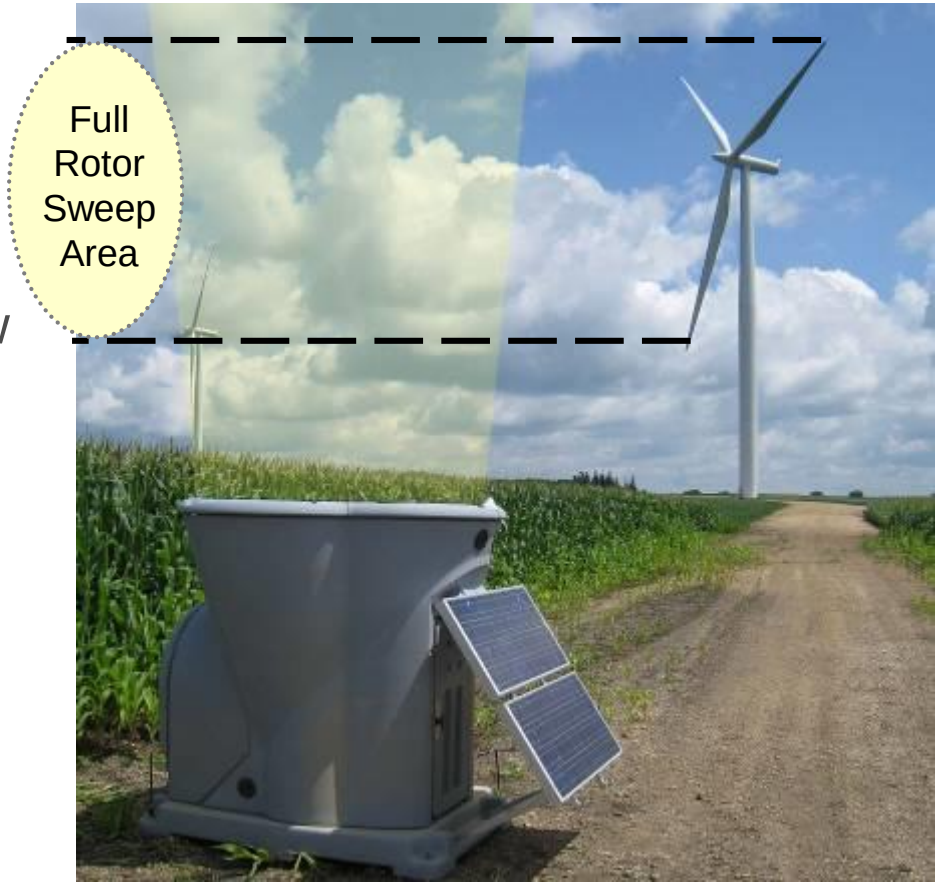
Power Performance Testing

- Easily deployed at problem turbines, easily moved
- Triton measures across the entire rotor sweep
- Shear, veer, vertical speed, inflow angle…





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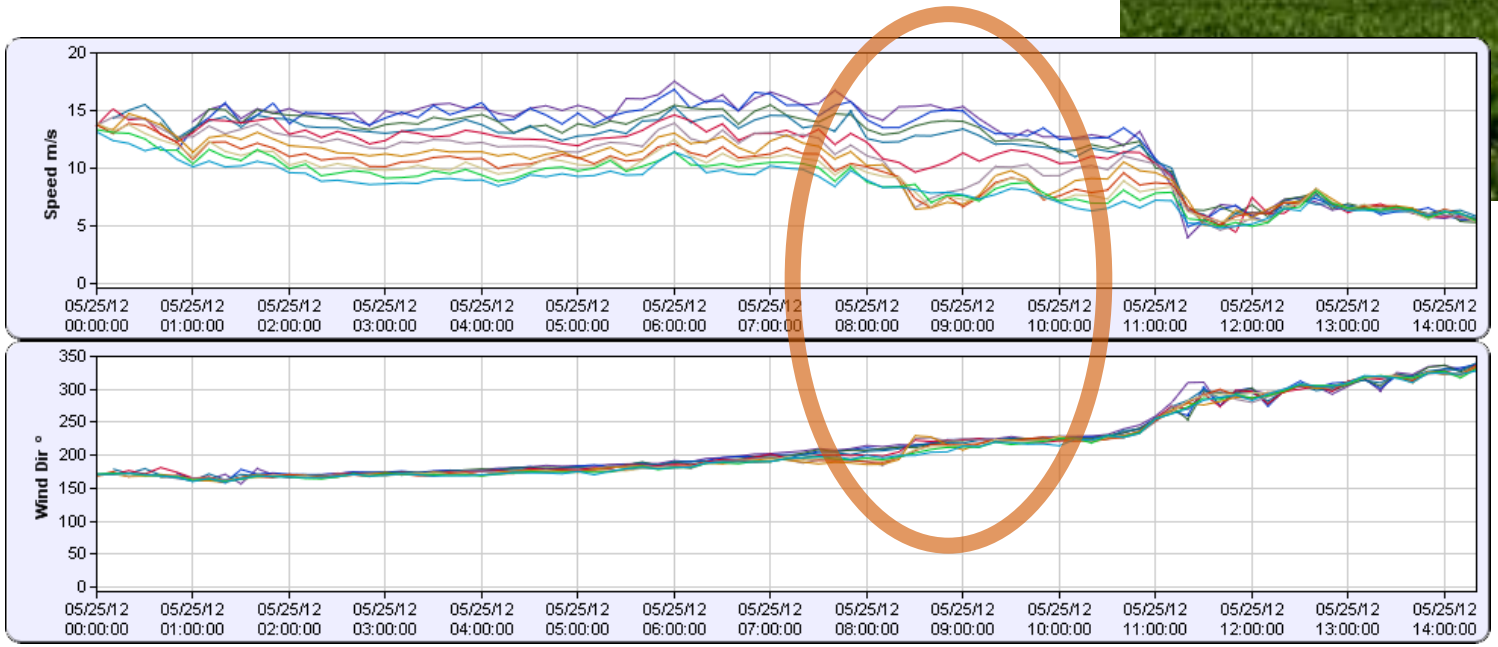
Wake Analysis – Measure or Model?

- Using both approaches whenever possible is the best practice



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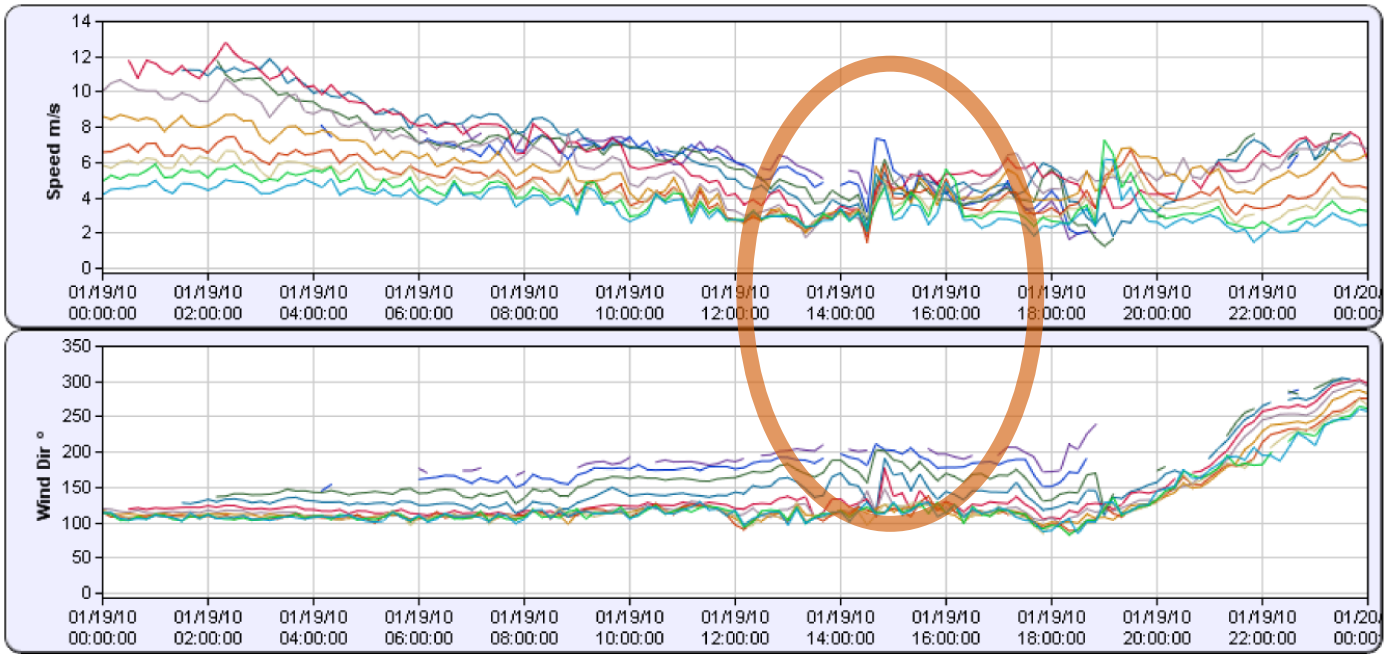
Condition Monitoring



- Rapid changes in wind speed and direction produce extraordinary stresses on wind turbines
  - Traditional condition monitoring only measures the symptoms
- Remote sensing provides understanding of the causes

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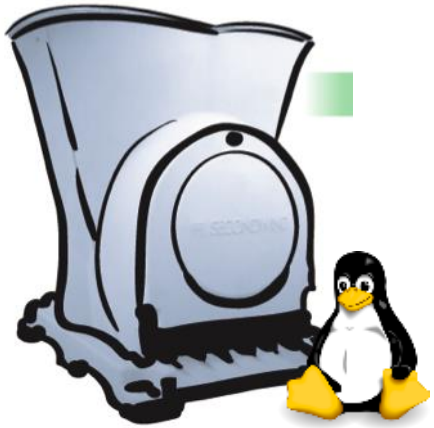
Triton Operations – Flexible Design Platform

- Custom measurements and reporting to understand your operations problems



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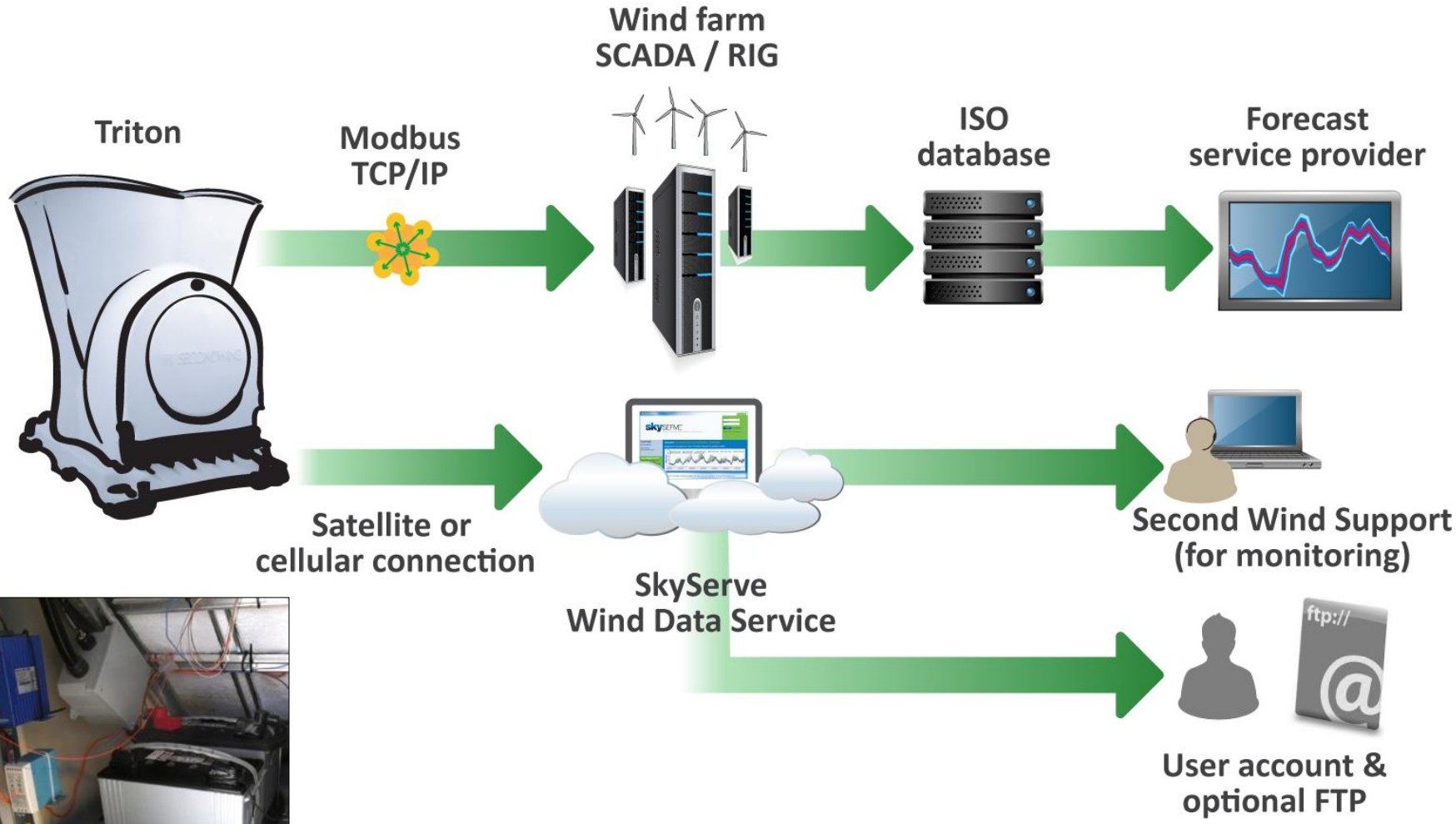
CAISO Example



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Continuous Development

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Thank You

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