Vaisala Remote Sensing Update

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About Vaisala

- Vaisala is a leading weather instrumentation and systems company
- 1900+ employees, 30+ offices worldwide
- €348.8 Million ($396.3 Million) net sales in 2018
  - 67% Weather and Environment
  - 33% Industrial Measurements

Vaisala Acquires Leosphere – October 2018

- Adds four key Remote Sensing offerings for wind energy:
  - **Windcube** vertical profiler provides accurate wind measurements up to 200 meters.

  - **Windcube 100S/200S/400S** scanning wind Doppler Lidar offer a range from 100m to 3.5 km, 6 km or 10km as well as multiple scanning patterns choices.

  - **Wind Iris** is designed to be mounted temporarily on the nacelle of a turbine for power performance testing.

  - **Wind Iris Turbine Control** (TC) Lidar sensor enabes turbine manufacturers to integrate nacelle-mounted Lidar for efficient turbine control.

Leosphere Updates – Windcube v2.1 launched Q4

Windcube v2.1 uses "Vector Averaging" – why the change, what exactly does that mean, and how is it different from the v2.0?

- Wind has both direction and speed, so by nature it is a vector element
  - But "Scalar Averaging" of wind data can be used when speed and direction are independently measured as with a cup/vane or an RSD

- Windcube post-processing was originally designed with Scalar averaging
  - Windcube v2.0 will continue to use Scalar averaging, but it is possible to re-process 1Hz data (we can provide the tool)

- Vector averaging reduces the IEC uncertainty for Windcubes used in Power Performance Testing as shown by Deutsche WindGuard earlier in 2018. All studies available upon request.

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Leosphere Updates – FAQs

I am a current Leosphere customer – how does this acquisition affect me?
- If you purchased your equipment from NRG Systems, they will continue to support you. Vaisala staff is not trained to maintain or repair the Windcube v1.0 or v2.0
- Vaisala will be able to deliver power supplies and field support for the Windcube v2.1, Scanning Lidars and Wind Iris Lidars

Are there advantages to the remote sensing community, since the merger brings together complementary skill sets and resources?
- Together we have more field experience than any other vendor, but there is always more to learn
- Vaisala brings a lot of specialized manufacturing experience for high-mix, low-volume products
- Our sales team is specializing to focus on applications for RSD's

Leosphere Updates – FAQs

What's going to happen with the online wind data servers?
- The Leosphere "WindWeb" and the Vaisala "Observations Platform" both have similar user interfaces, but significantly different underpinnings
- At this time, we have decided not to use our resources to merge the platforms, but we will continue to review this as we go forward

What about field support for my Lidars?
- Vaisala has completed training and will support Windcube v2.1 vertical profilers, Windcube 100S/200S/400S scanning systems, and Wind Iris power optimization systems
- Older systems can be serviced at any of the Leosphere repair depots
- Vaisala support can be reached at: **windenergy.support@Vaisala.com**

Leosphere Updates – expanding our capacity

- **January** – New Leosphere factory opened in Saclay, France

- **Q4, 2019** – New Leosphere factory opening in Shanghai, China

Triton Updates

New "SoDAR 3.0" firmware is a major upgrade to Triton's algorithms

- Triton accuracy AND data recovery have been significantly improved (using advanced outlier rejection and machine learning techniques).

- New Turbulence Intensity metric

- New Quality Factor metric

- Echo Rejecter improvement

- Precipitation methodology (see below)

> *Method for Measuring Precipitation and Wind in Sodar Systems*
> - Patent filed July 2018 (Appl No. 16/027,187 V1935.10025US01)
> - Uses a robust clustering algorithm to filter out radial wind speeds (RWS) generated by ambient noise from any source and RWS generated by precipitation

Questions?

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