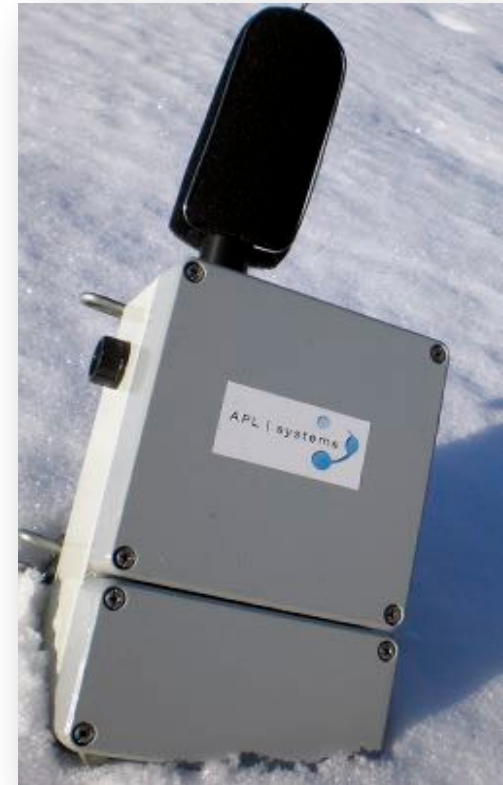# APL Systems Ltd

Leader in long term noise monitoring services

On-line full –spectrum -monitoring services

Reports & Analyses

We have worked with private and public industries (Sweden, Finland, France, Russia, UK and Turkey) for 10 years, giving us a very good perspective   on sound challenges   in   different industries.

APL | systems

Value of Online Monitoring

- Are the blades in good shape?

- **Do the sound levels fluctuate in different weather conditions?**

- How turbine sound change in cold conditions?

- **Is there ice build up on the blades?**

- Does wind park fulfil requirements of environmental permit in all weather and operational conditions?

- **Can year round online monitoring work in harsh Nordic weather conditions?**

APL | systems

How do we normally evaluate soundscape in wind parks –before investment ?

Local Soundscape – Background Noise Evaluation
long term weather data and sound

Studies show that local soundscape effects on local acceptance of the wind park .
Soundscape should be monitored in different wind bins and directions to get accurate results.
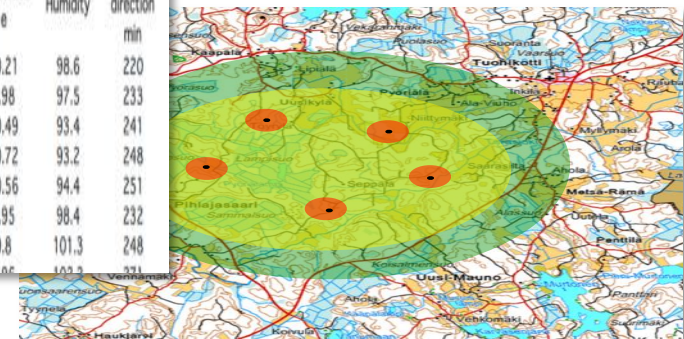This can be done **with long term monitoring, which includes low frequencies**.

Background noise LFN
Analysis

Background noise and
wind speed correlation

Noise Mapping

APL | systems

How do we normally evaluate soundscape in wind parks – after investment ?

Comparison to background noise measurements
- Several wind bins
- Hundreds of data pairs

Guaranteed noise levels.

During development process guaranteed noise values close to turbines (**emission**) and in noise sensitive areas (**immission**) are accepted by turbine manufacturer and park developer.

Emission and Immission – long term monitoring

Long term monitoring produce valid **emission** and **immission** data from different wind bins and wind directions.

AIKA	W@MP	W@WT1@10M	LAeq	Lfree	Lcorr
17:04	3,6	4,6	38,5	32,5	29,5
17:10	3,6	5,6	37,9	31,9	28,9
17:25	3,6	5,4	37	31	28
17:26					
17:32					

AIKA	W@MP	W@WT1@10M	LAeq	Lfree	Lcorr
17:54	5,8	6,2	41,5	35,5	32,5
17:57	4,9	5,7	38,4	32,4	29,4
17:58	4,9	7,0	42,9	36,9	33,9
18:19	4,9	4,9	38,9	32,9	29,9
18:21	4,9	6,5	42	36	33

IEC

IEC 61400-11
Edition 3.0 2012-11

INTERNATIONAL STANDARD

Wind turbines –
Part 11: Acoustic noise measurement techniques

APL | systems

Online Results: A- weighting vs. Linear values

A-Weighting

- The most commonly used curve in the measurement of sound pressure levels
- widely adopted for environmental noise measurement
- standard in many sound level meters
- cuts out low frequencies

Linear Values

- No curve applied to measurements
- also known as Z- or ZERO frequency-weighting
- low frequencies represented as they were measured
- **Key factor in finding out what is really going on in the lower frequencies**
  - **Wind park operation**
  - **Surroundings of the wind park**

APL | systems

How can we evaluate soundscape in wind parks – during energy production?

LFN ANALYSIS OF WIND PARK SOUND

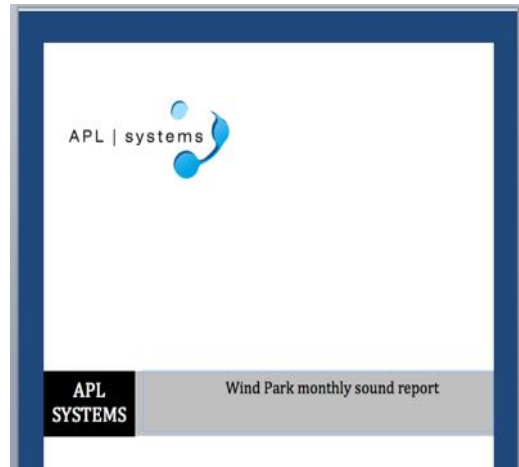APL SYSTEMS — Wind Park monthly sound report
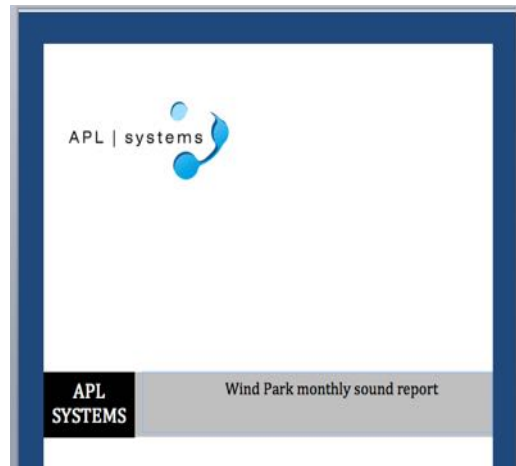
TREND ANALYSIS A-WEIGHTED
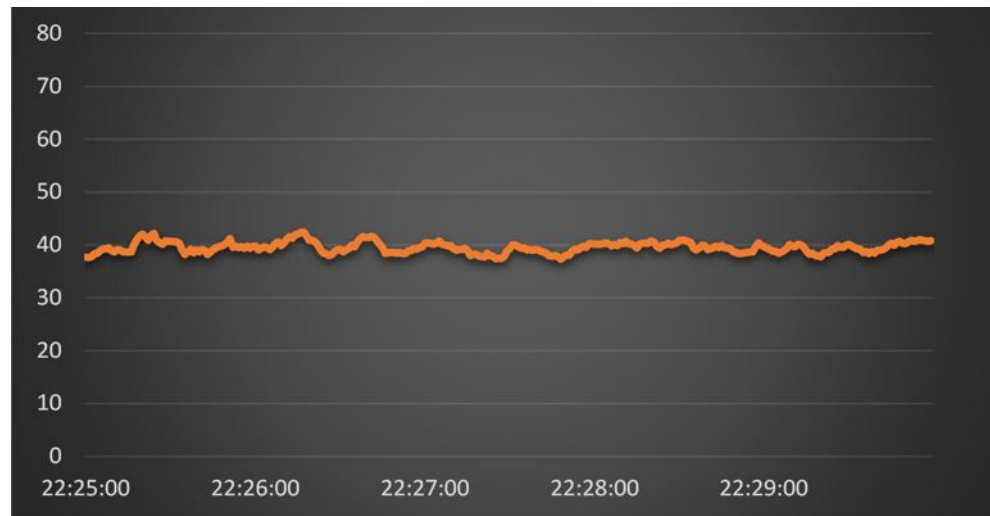
How can we evaluate soundscape in wind parks – during energy production ?

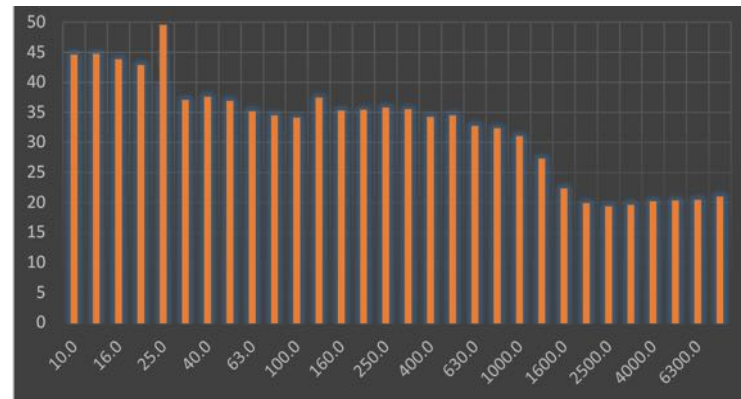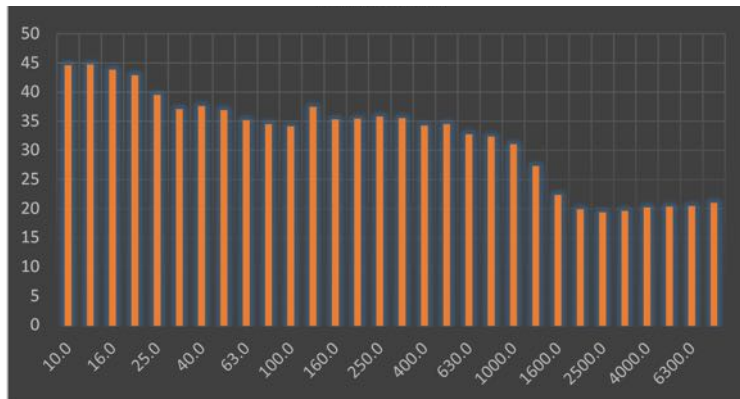**LFN ANALYSIS OF WIND PARK SOUND**

TONALITY

EFFECT OF WEATHER

EFFECT OF PRODUCTION CAPACITY

ENVIRONMENTAL PERMITS

EFFECT OF DISTANCE

How to measure in cold climate ? (1/2)

Most important ! – It has to work !

- Cold climate design
- Military grade components
- Long (Years of) experience in
  - Components
  - Microphones
  - Service and installation personnel

APL | systems

How to measure in cold climate ? (2/2)

Aures 2.0 for cold climate:

- Measurement range 35 – 125 dB
- Records PCM-coded audio
- Data delivered to Aures Server via LAN
- Analysis and calculations performed at the server
- Devices installed at fixed locations

- Aures 2.0 technology is used in loggers, online and mobile applications.
- AuresMobile is used in wind parks for year round monitoring of turbine noise.

Analysis and intelligent solutions for Wind Parks

Challenge

On-line Benefits

Do we understand noise levels in different weather conditions / production capacities ?

> Measurement point situated e.g. at the source / at a near by resident's yard
> Hourly / daily / monthly analysis

Maintenance and sound

Constant readiness (data available 24/7/365) to communicate with different stakeholders including neighbors, wind park developers, investors, public authorities

Sound data (A-level and linear) easily and quickly available

Alarms

Detailed data over long period

1/3 octave bands

Narrow band analysis available for fault detection

On-line + alarms + intelligent triggering

Icing issues

APL | systems

Thank You!
Tack !
Kiitos !
Tak !
Takk !

APL Systems Oy
www.apl.fi
antti.leskinen@apl.fi
+358-400-544 917

See us in Stand 17

APL | systems