

BLAIKENVIND

co-owned by Skellefteå Kraft and Fortum

Mikael Lindmark

CEO and PM

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Blaiken Large-scale wind power in cold climate

Photo montage

11-01-18

Agenda

BlaikenVind AB

General site information

General project information

Climate conditions

Risk assessment due to cold climate

- Operation and maintainance

- Cable damage

Questions



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BlaikenVind AB

Two leading powers in the industry
join forces

Skellefteå kraft

Fortum

Leading development in the field of
renewable energy



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General site information

The windfarm is situated in Northern Sweden in the border between Storuman and Sorsele municipalities



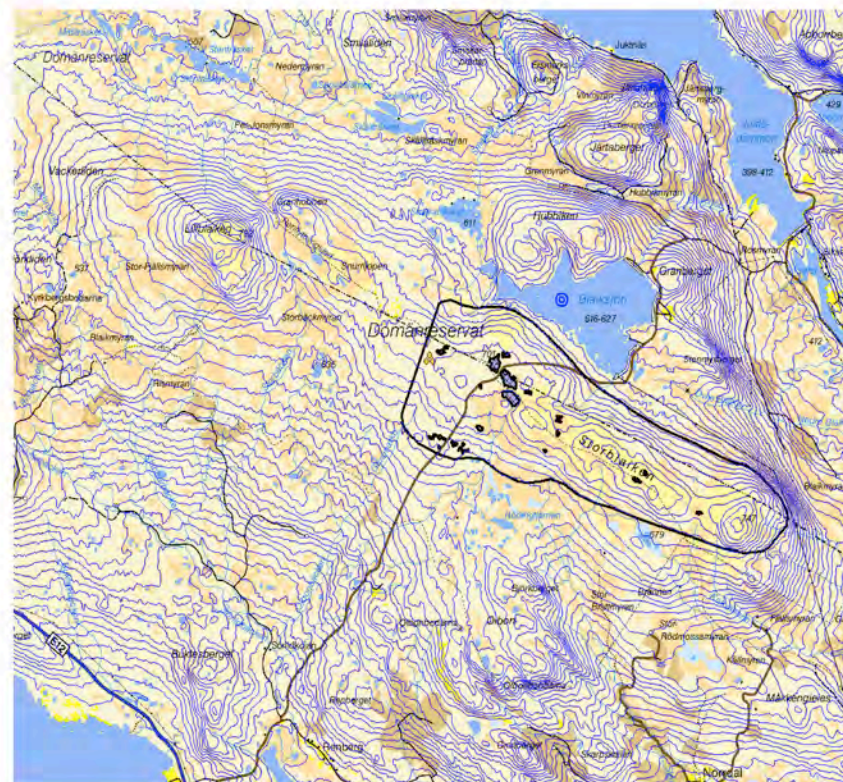
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Site information

High-ground area

- Sub-mountainous area (lågfjällsområde)
- Wind Power Area (WPA) 640 – 747 meter above sea level



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Site information

Terrain

- Very flat area
- No significant variations or gradients in the terrain
- Low vegetation in the Wind power area

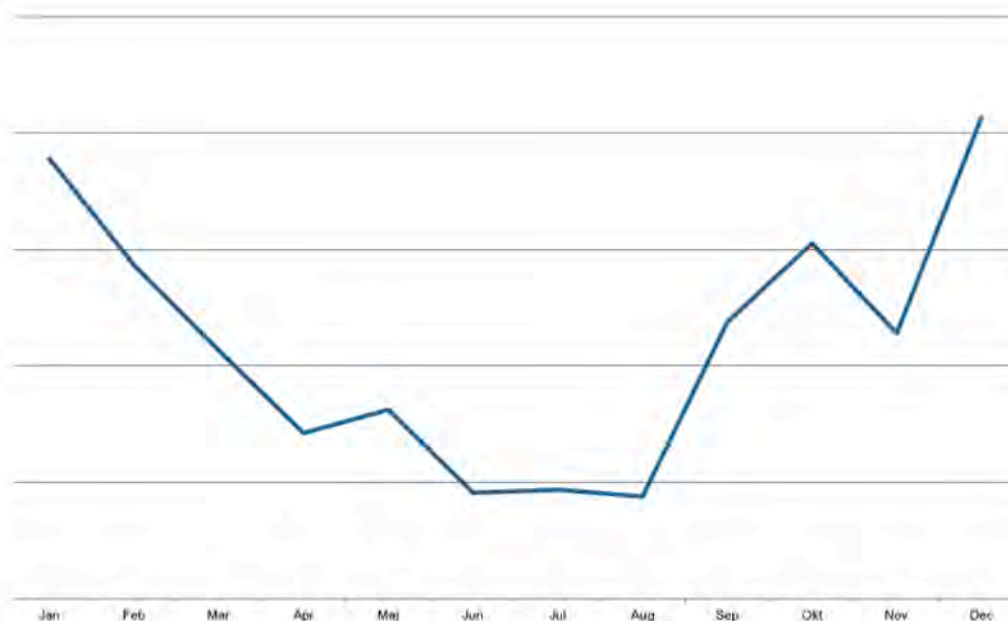


Why Blaiken?

Good wind conditions

Average wind speed: 8 m/s

Best wind conditions during autumn and winter



Estimated production

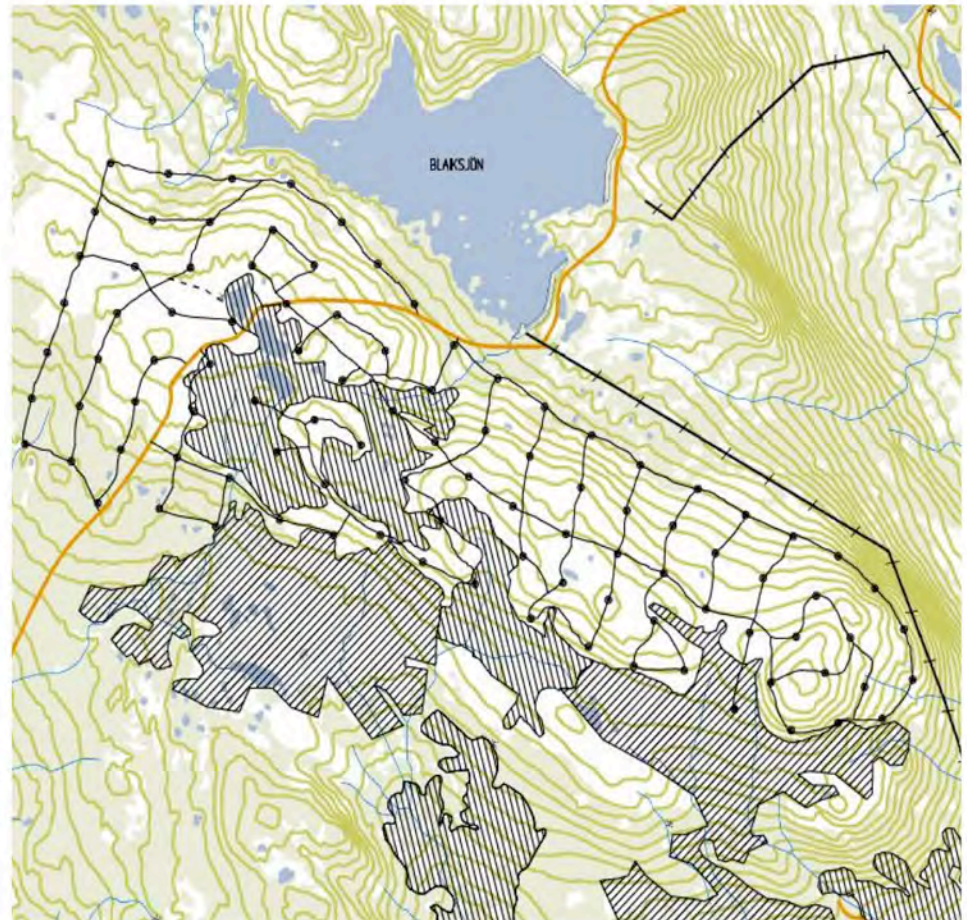
Why Blaiken?

Existing national grid 400kV

(Juktan hydro-power plant)

Existing infrastructure

Mining activities previously in the area



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Environment

The area is classified as an national interest for:

- Windpower produktion
- Raindeer management
- Environmental protection

Environmental-permission

Monitoring programme

Annual report to the County
Administrative Board (Länsstyrelsen)



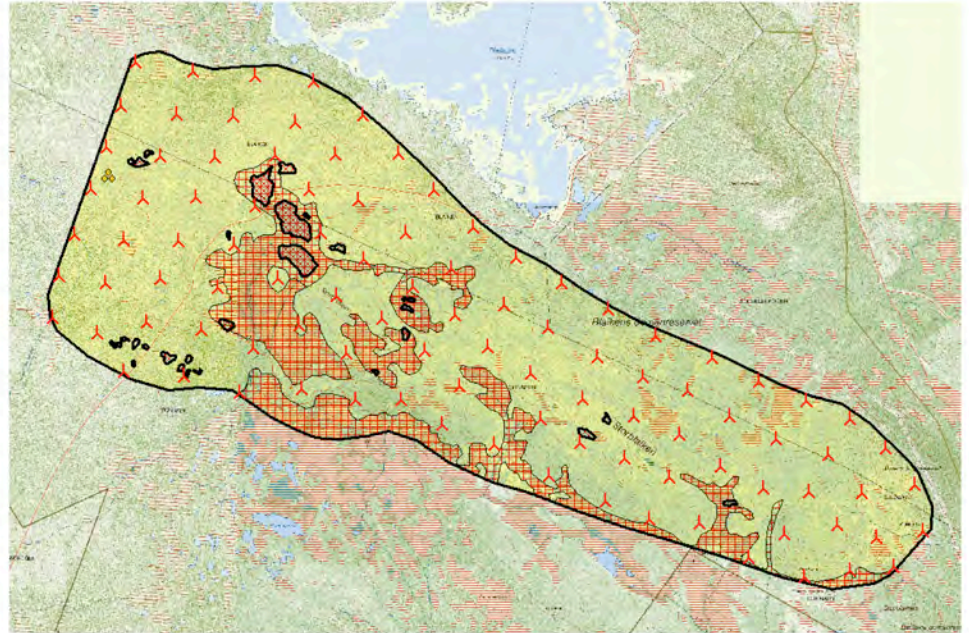
Environment

No turbines in the wet lands
(classification 1 and 2)

- Minimize the passages of roads through wet lands and streams
- Minimum 100 m from bigger lakes

Consultations with the Sami community

- minimize the effects of the reindeer management



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Project information

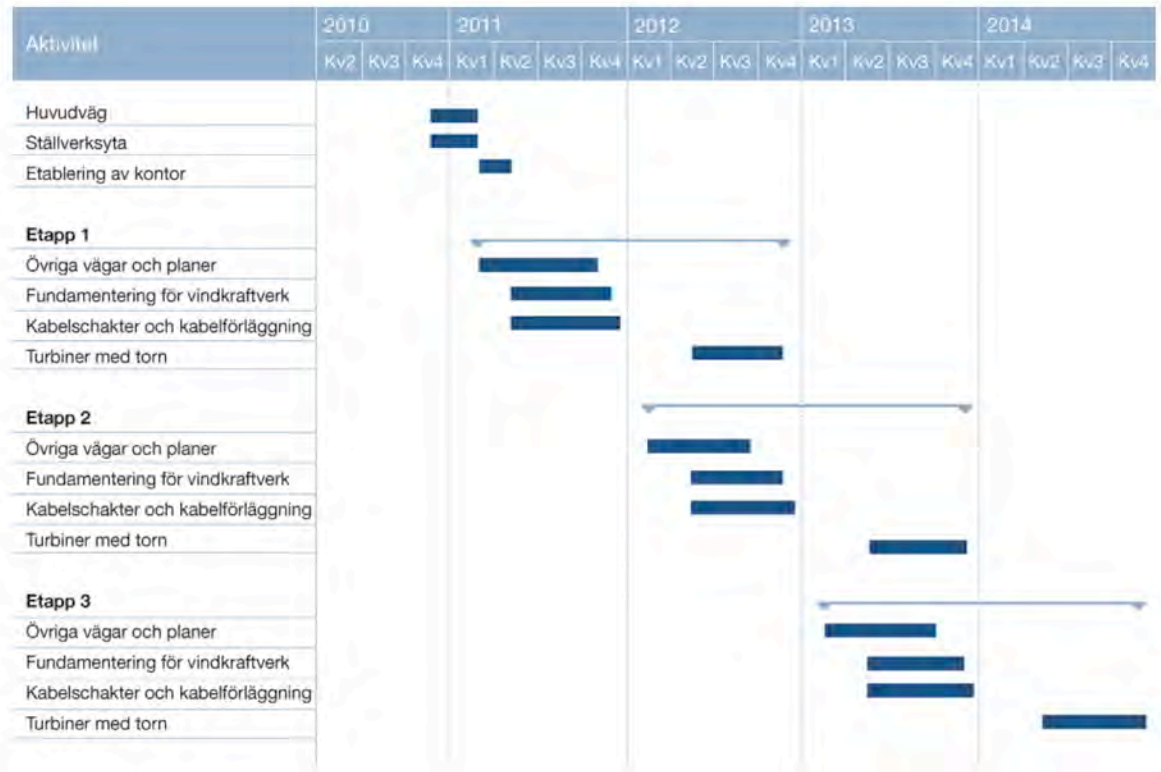
Project duration: 2010-2015

90 Wind Turbines (WTGs)

3 Batches

30 WTGs per Batch

700 GWh/year equivalent to
150 000 apartments



Graphical extent of the wind farm



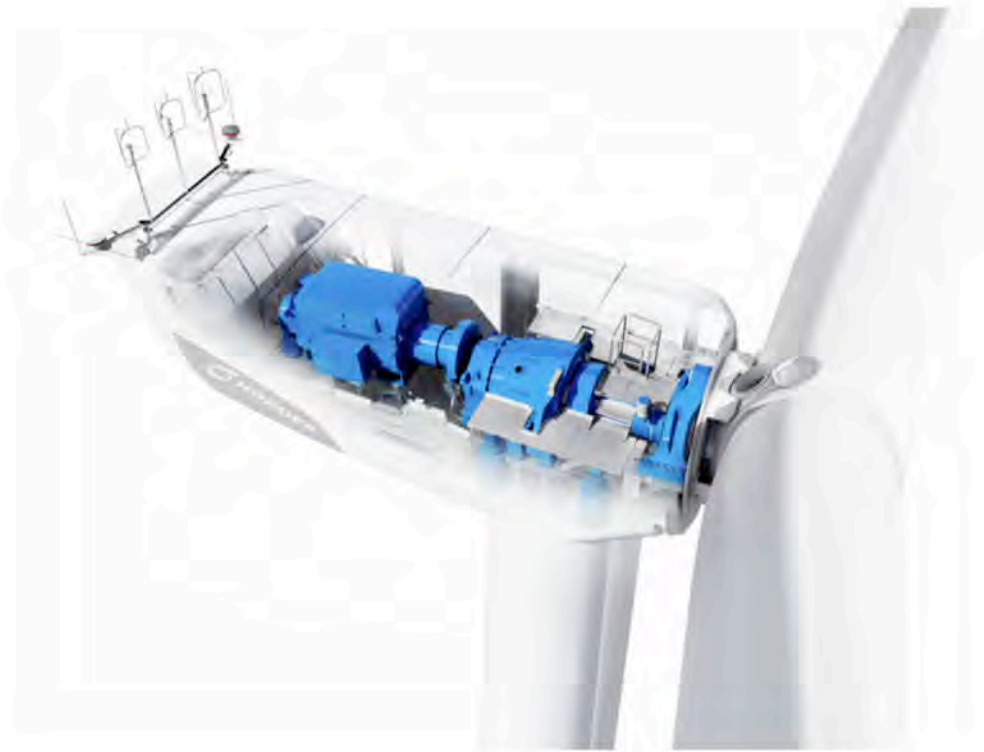
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Project information

Nordex N100 IECII – 2,5 MW

- Mast height 100 m
- Rotor diameter 100 m
- Total height 150 m



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Project information

Servicebuilding: 500 m²

- Staff room
- Workshop equipment
- Garage for service vehicles
- Storage area for spare parts



Project information

Switchgear:

- Indoor 36 kV
- Outdoor 400 kV



Project information

Two main transformers 36kV/400kV

(both will be installed before commissioning of the Wind Turbines to minimize risks)

Internal 36 kV cable network: 150 000 m

Redundant fiberoptic net



Project information

Rock anchored foundations

Gravitation foundations

Internal roads: 60 km



Climate conditions

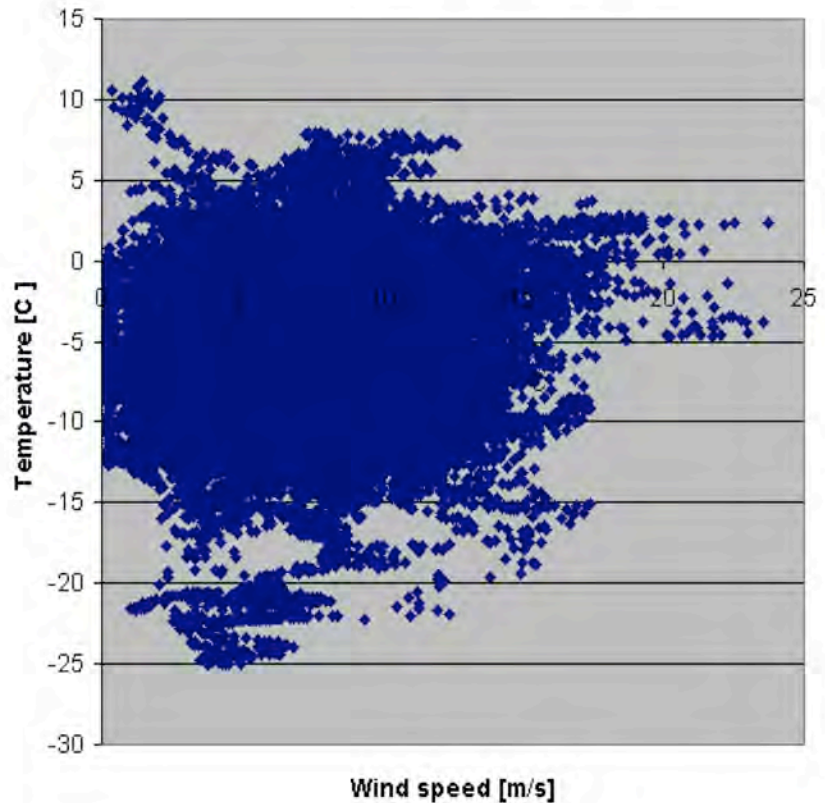
Temperatures 20070830 – 20100228

- Lowest temp -27, 63 °C
- Highest temp. + 25, 51 °C
- 300 h below -20 °C
- 42 h -25 °C

Icing

- Icing expected for a period of about 5 months
- The area can be affected by heavy icing in short periods

Winter 2008-2009



Windpower in cold climate

Climate-adapted engineering

- Heated systems (ex. gearbox)

Anti-icing system

Operation and maintenance - risks



Risks and problems during operation and maintenance in cold climate

Safe access

- Ice throw
- Falling snow and ice
- Cold climate

Accessibility – choice of service vehicle

Road maintenance – snow clearance

Communication – mobile coverage

Repairs to cable damage



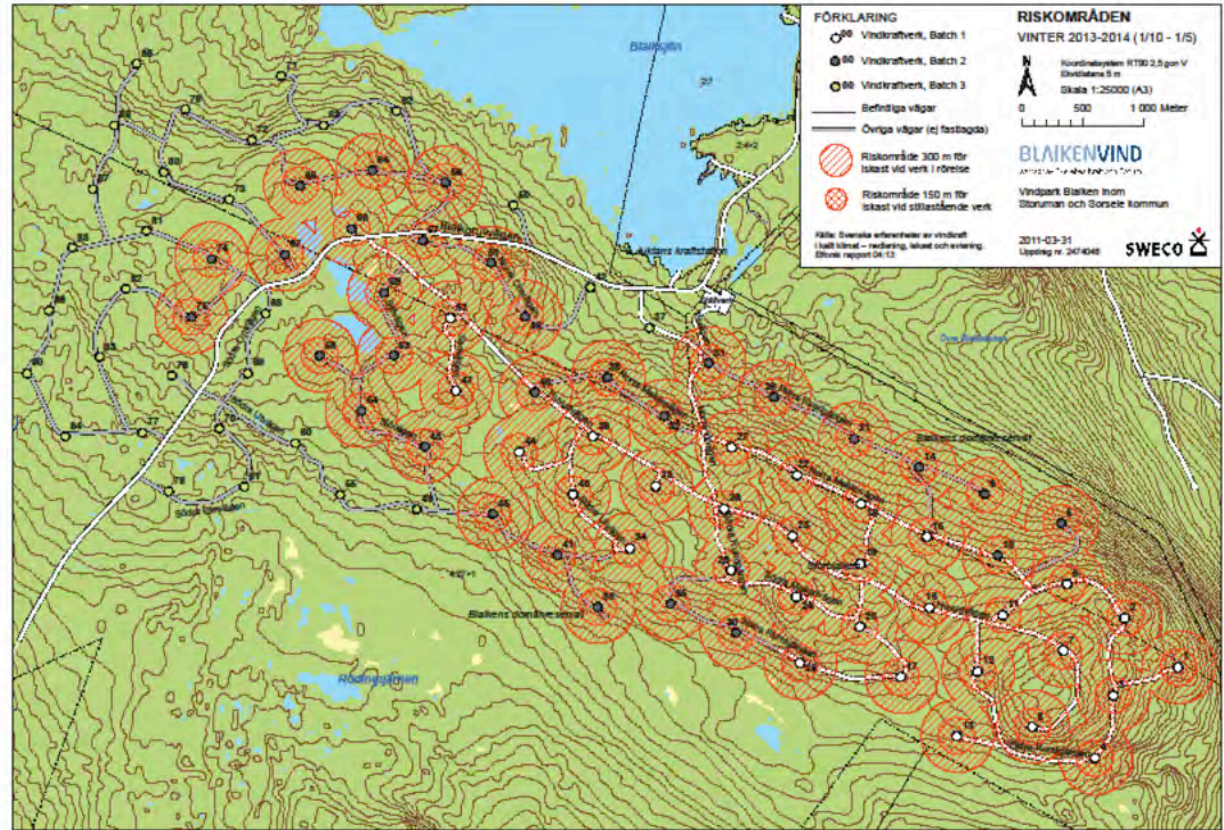
Ice throw

Risks for third party in the area:

- Hunters
- Snowmobile riders
- Berry pickers
- Raindeer herders

The hazard area for ice throw will be signposted

Existing snowmobile trails will be moved outside the risk area



Ice throw

Health and safety procedures for personnel and visitors

- Health and safety information for all
- Risk assessment prior to access in winter
- Operation centre informed on arrival and when leaving the wind farm
- Wind turbine shut down before entering the hazard area (300 m)
- Visitors only if authorised by wind farm manager
- However, wheeled or tracked vehicles with roof can drive through the wind farm without any need to shut down the wind farm
- Hard hat



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Falling snow or ice

Risk of falling snow and ice on access

- Personal injury
- Risk of blocked exit

Health and safety procedures

- Risk assessment prior to access
- Operation centre informed
- Wind turbine shut down before and during access
- Hard hat
- Mobile phone or two-way radio



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Snow clearance

Procurement of maintenance contractor is ongoing

Choice of snow clearance method

- Wheel loaders on site
- Snow-thrower
- Apex plow (spetsplog)
- Excavator

Snow poles-reinforced and extended

Risk of cable damage

No snow clearance in the switch gear area



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Communications

Mobile coverage for staff safety
(local reinforcement of the signals)

Alternative communications
system



Consequences of cable damage in winter

Expensive repairs and reduced income due to downtimes (driftavbrott)

- Locate the damage
- Snow clearance
- Ice-melting and excavation
- Putting up assembly tent
- Splicing and testing
- Reinstatement with frost free backfill materials

Risk of damage to adjacent cables



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Risk for cable damage

Handling cable drums

- Risk of sheathing damage

Cable laying

- Excavation of cable trench
 - rock or boulders in the trench
- Material requirements
 - Trench bed
 - Fill material

Risk also of frost damage if the work is incorrectly performed



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Reduce the risk of cable damage

BlaikenVind requirements:

- Training to Swedish BB3 level for cable layer staff and excavator drivers

Contractors carry out own inspections

BVAB engages inspectors and works managers

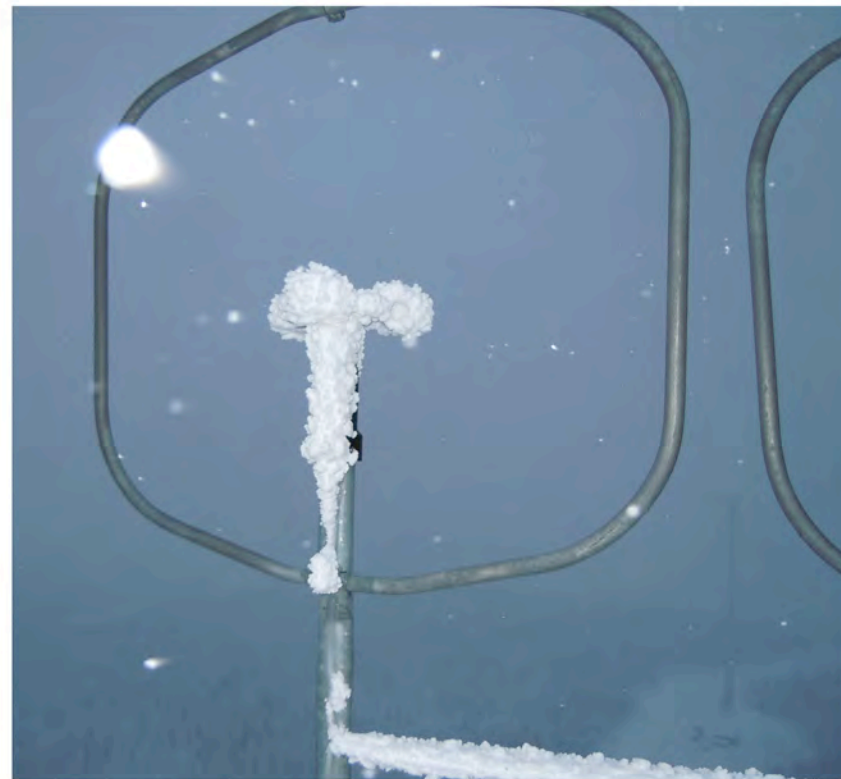


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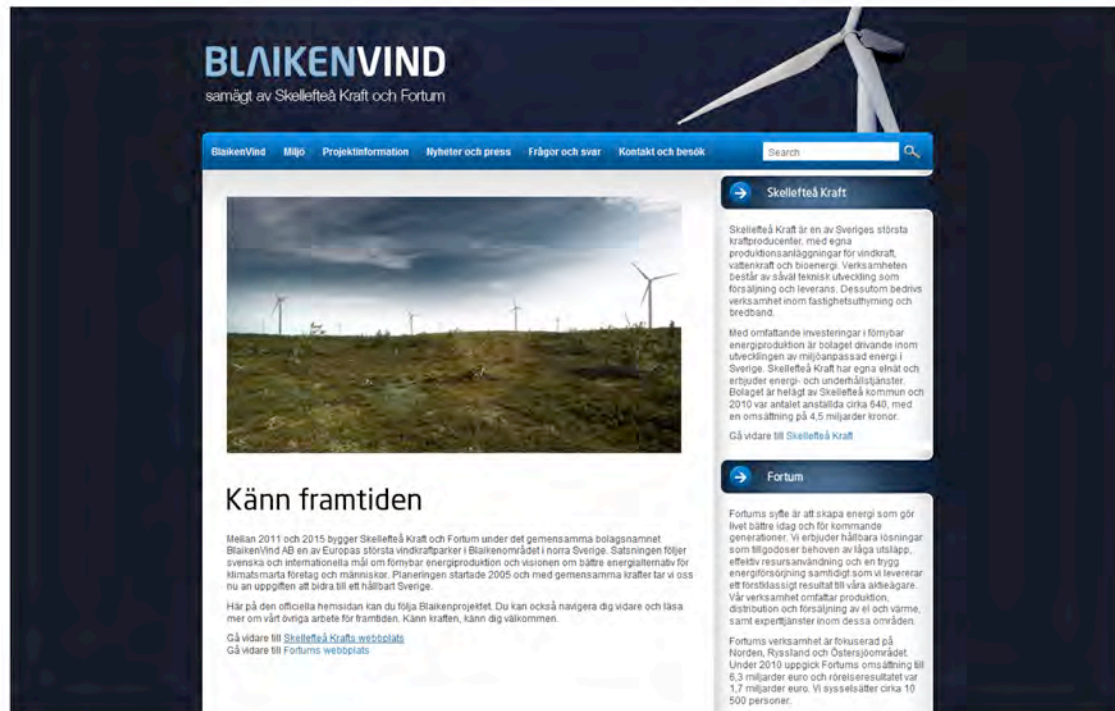
Measuring equipment

Low temperatures and icy conditions affect the measuring equipment



Bowl-pox anemometer out of order

Visit us on site or at www.blaikenvind.se



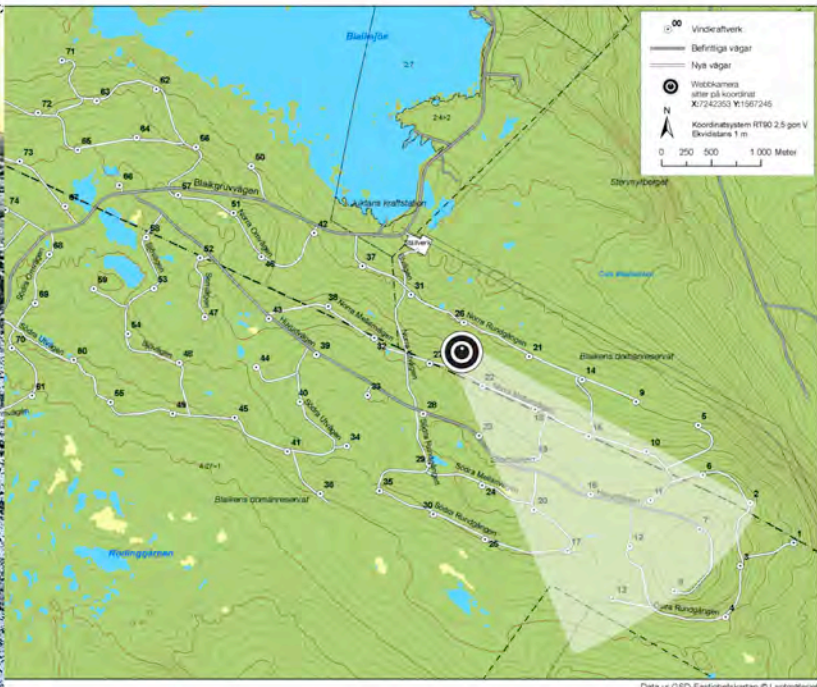
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Webcam at www.blaikenvind.se

1001.ROBOT 1.2.CDR

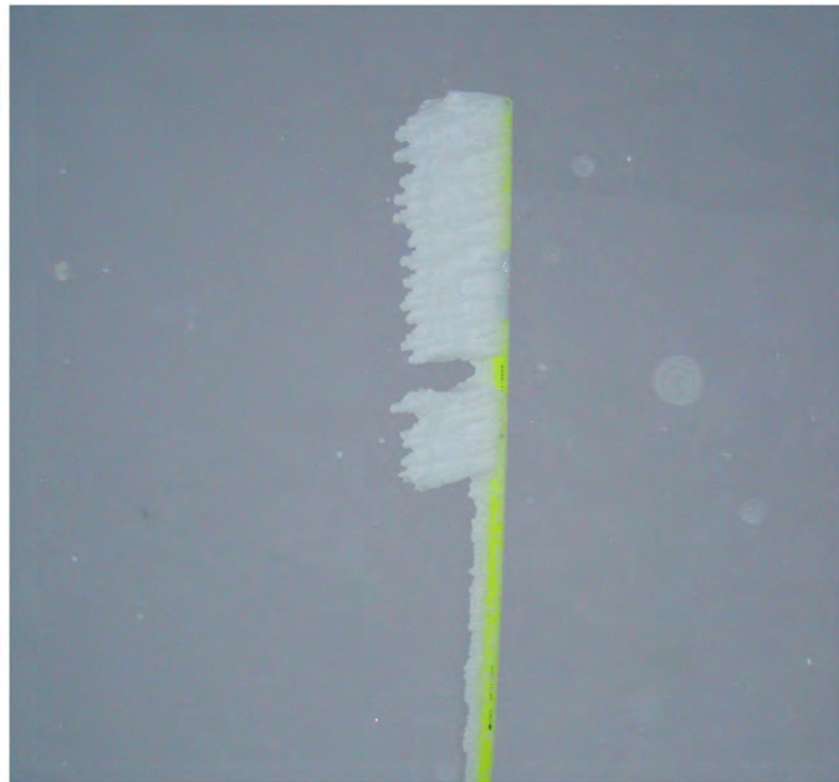
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Any questions?



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Thank you!



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