

A new type of anti icing system – development/application/demonstration

Presentation at Winterwind 2020
by
Jonas Sundström, Kjell Lindskog, Sven-Erik Thor



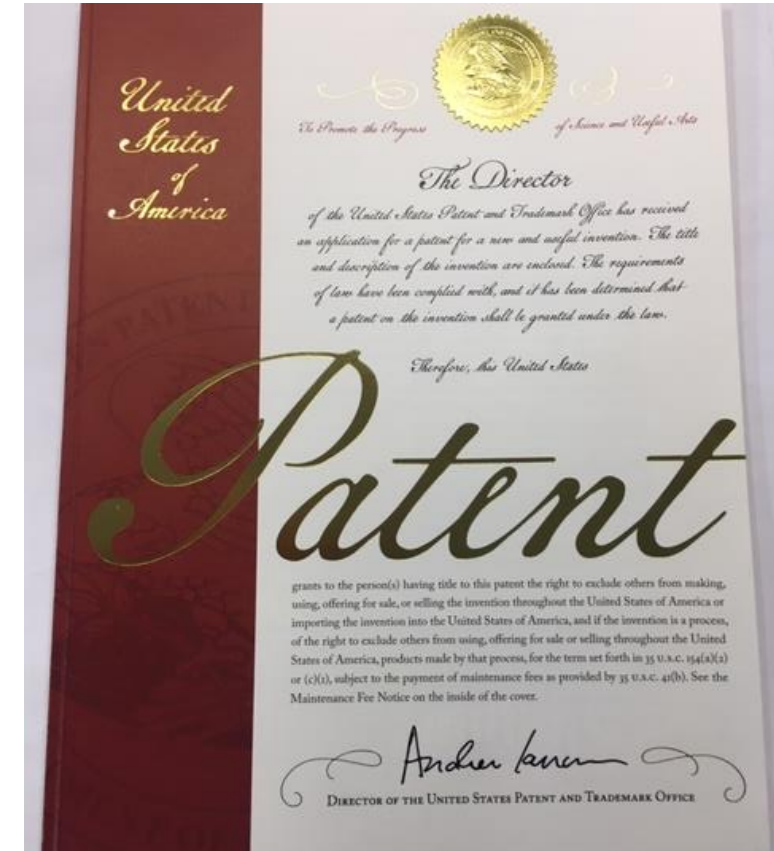
This presentation:

- Background
- System characteristic and layout
- Mounting on wind turbine blades
- Operational experiences
- Next steps

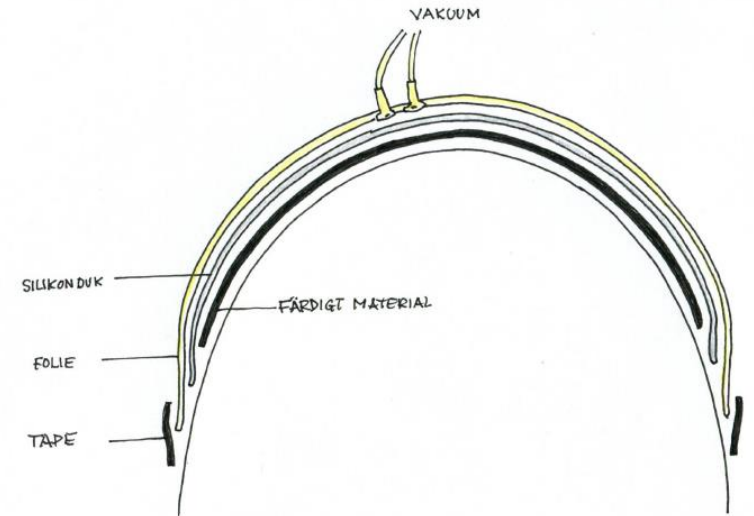
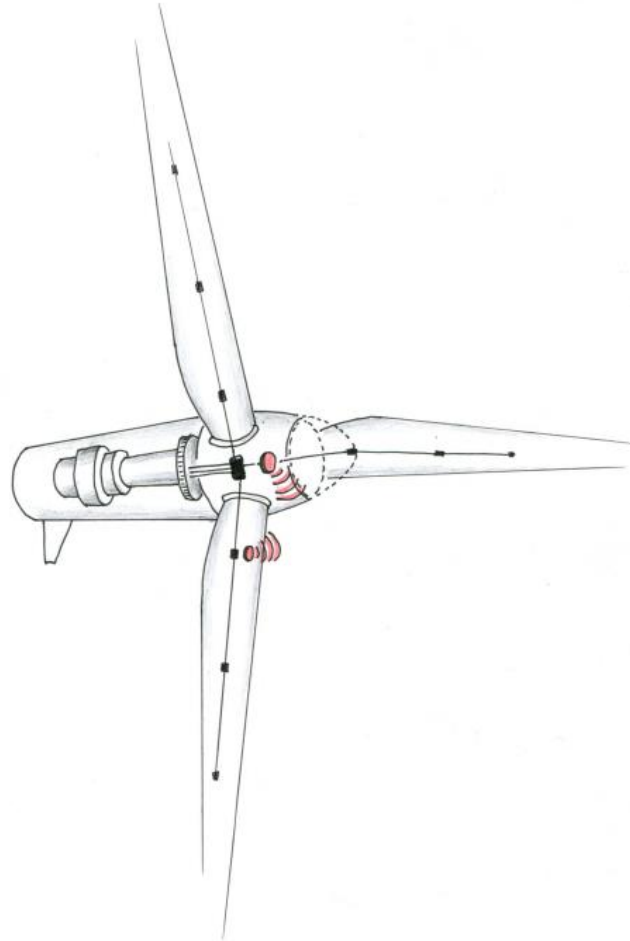
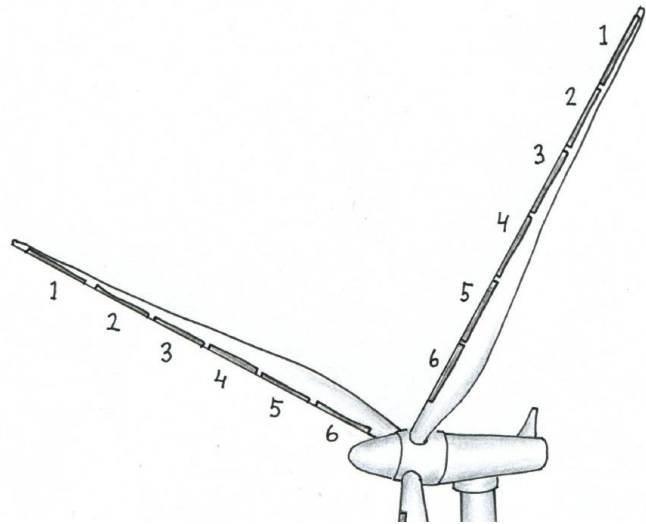


Main characteristics

- Autonomous operation
- Copper fabric for heating
- Inherent temperature measurement and control
- Main features are patented
- Technology applied in other areas



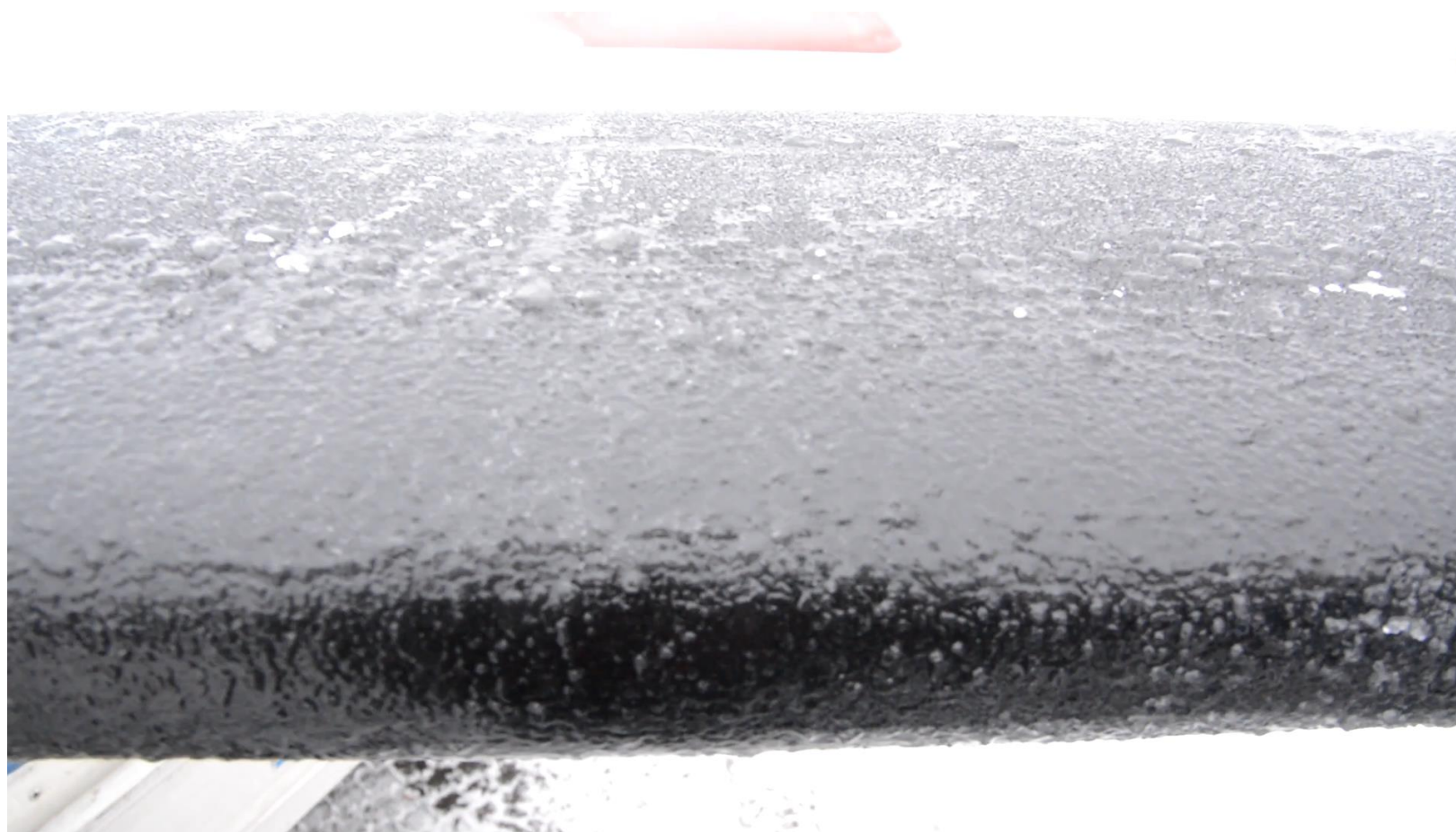
Principle layout

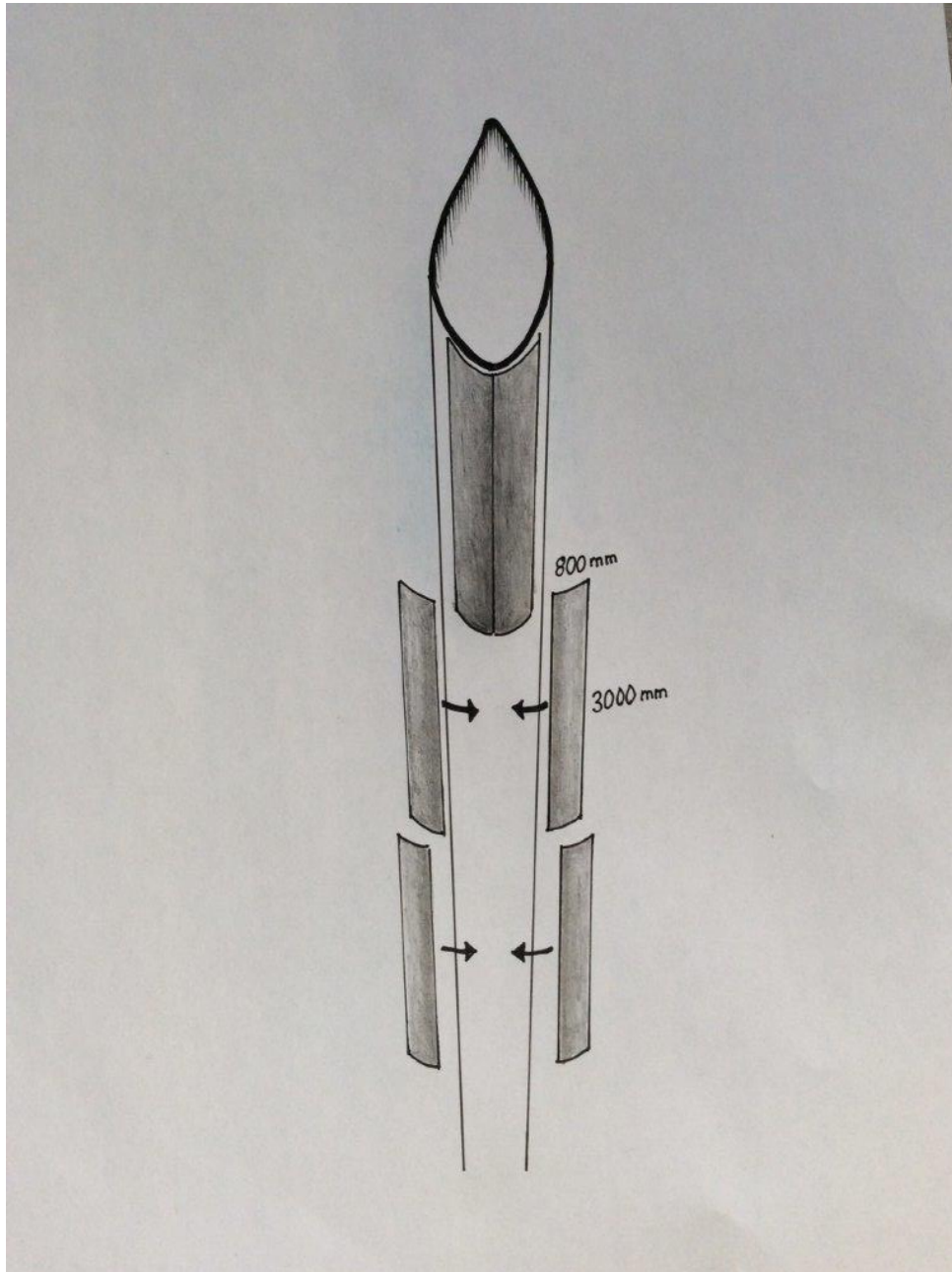


Manufacturing of heating modules



Early experiments





Mounting of heating modules

Service platform

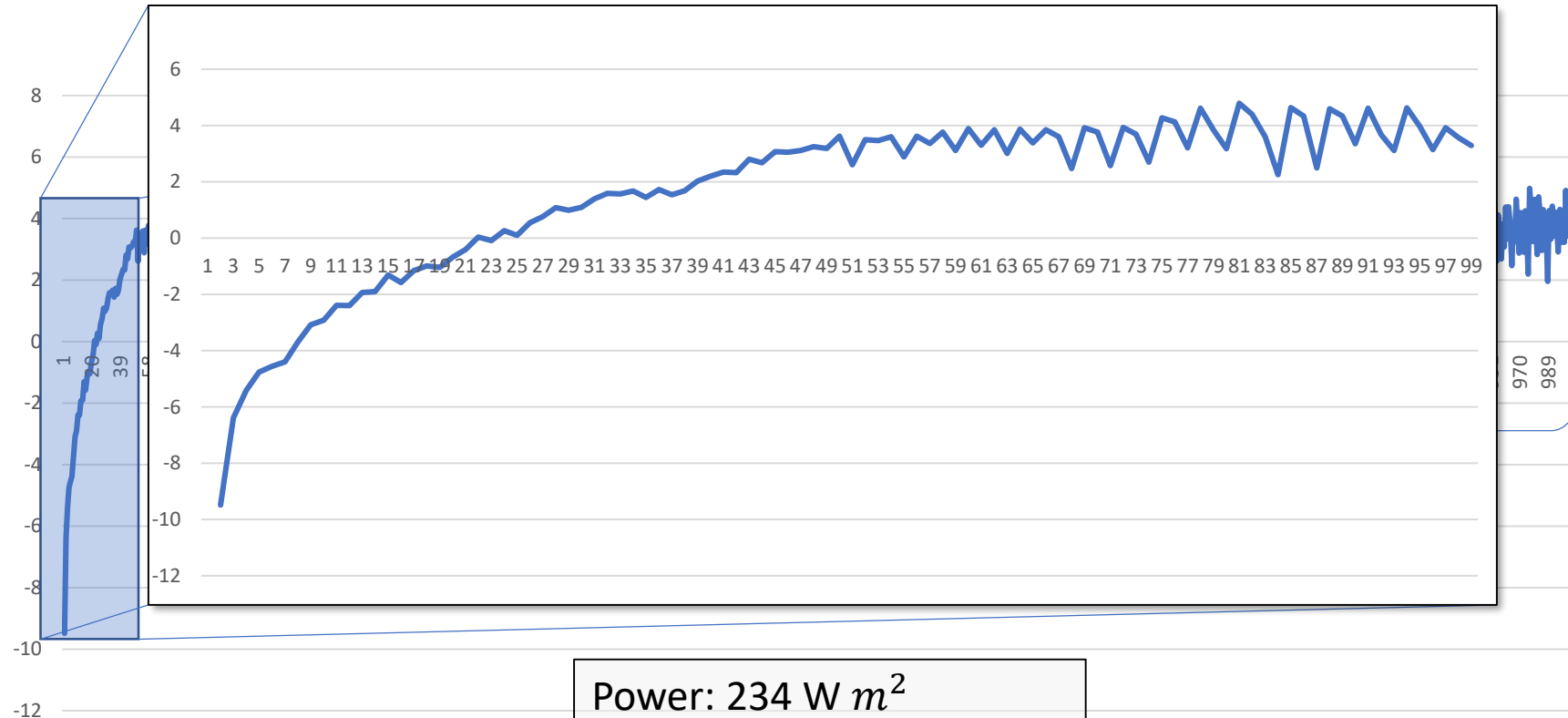


Blade work in co-operation with Roofac Wind AB

Heating modules

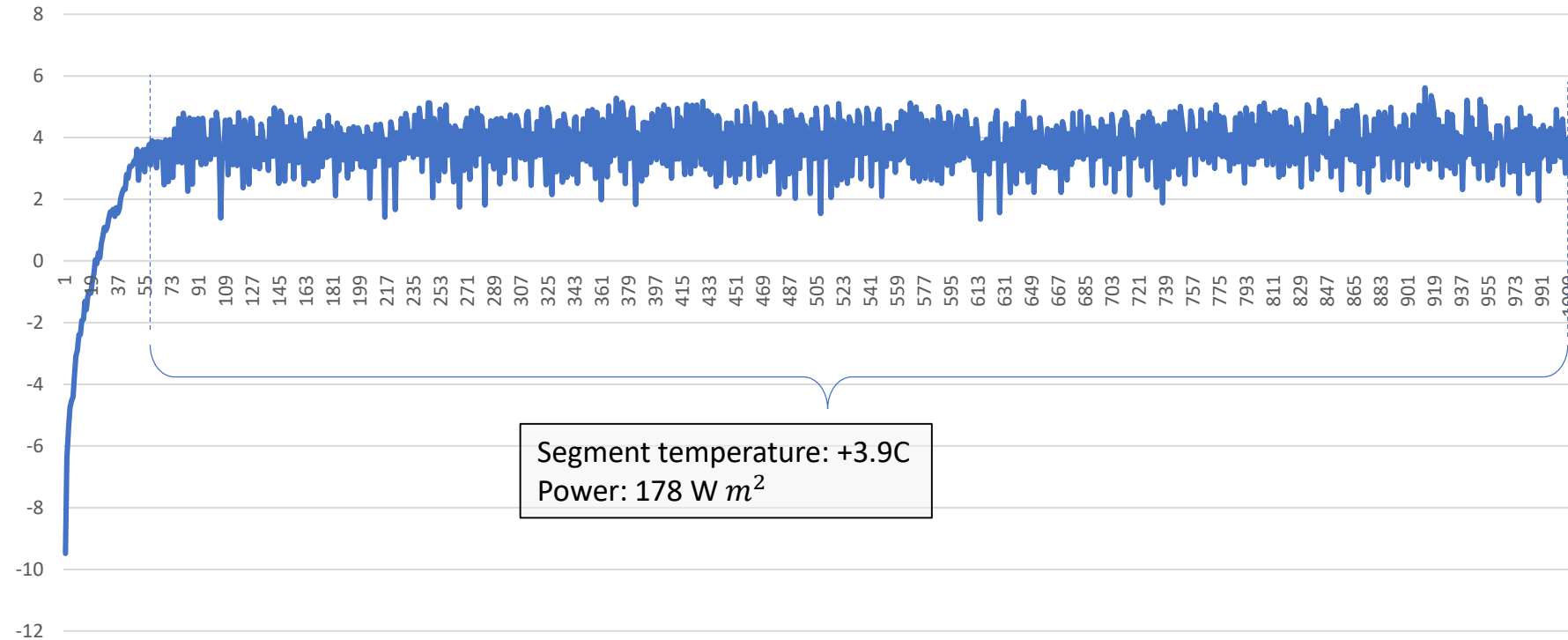


Heating Segment #2, from -9 grader to +4C



Power: 234 W m²
Heating time: ~10 minutes

Controlling steady temperature of +4C



Web-applikation

The screenshot shows a web application interface for a wind power plant. The top navigation bar includes the logo for "Vindkraftsystem INNOVATION" and a user profile for "SYSAdmin" with a "Log out" link. The main content area is titled "Vindkraftverk - Mala1" and is divided into two columns. The left column contains a "Generell information" section with a list of details: Id: 1, IP-adress: 213.199.126.157, Latitud: 65,28311, Longitud: 18,95315, and Temperatur: 0 °C. The right column features a map of Scandinavia with a wind turbine icon over Sweden. Below the map is a "Segment temperature sensors" section with a "Selection" header and a table of devices and segments. The bottom of the interface has a navigation bar with buttons for "Info", "Konfiguration", "Loggar", and "Väder".

Vindkraftverk - Mala1

Generell information

Vindkraftverk : Mala1

Id : 1

IP-adress : 213.199.126.157

Latitud : 65,28311

Longitud : 18,95315

Temperatur : 0 °C
Senaste mätning: 2019-11-26 14:23:21
Uppdaterat: 2020-01-16 21:34:29

Karta Satellit

Norska havet

Sverige

Norge

Finland

Östersjön

Estland

Google

Kärtdata ©2020 Google Användarvillkor

Segment temperature sensors

Selection

Devices	Segments	Date - time
225	1 2 3 4 5 6	From date/time _____
226	7 8 9 10 11 12	To date/time _____

Info **Konfiguration** **Loggar** **Väder**

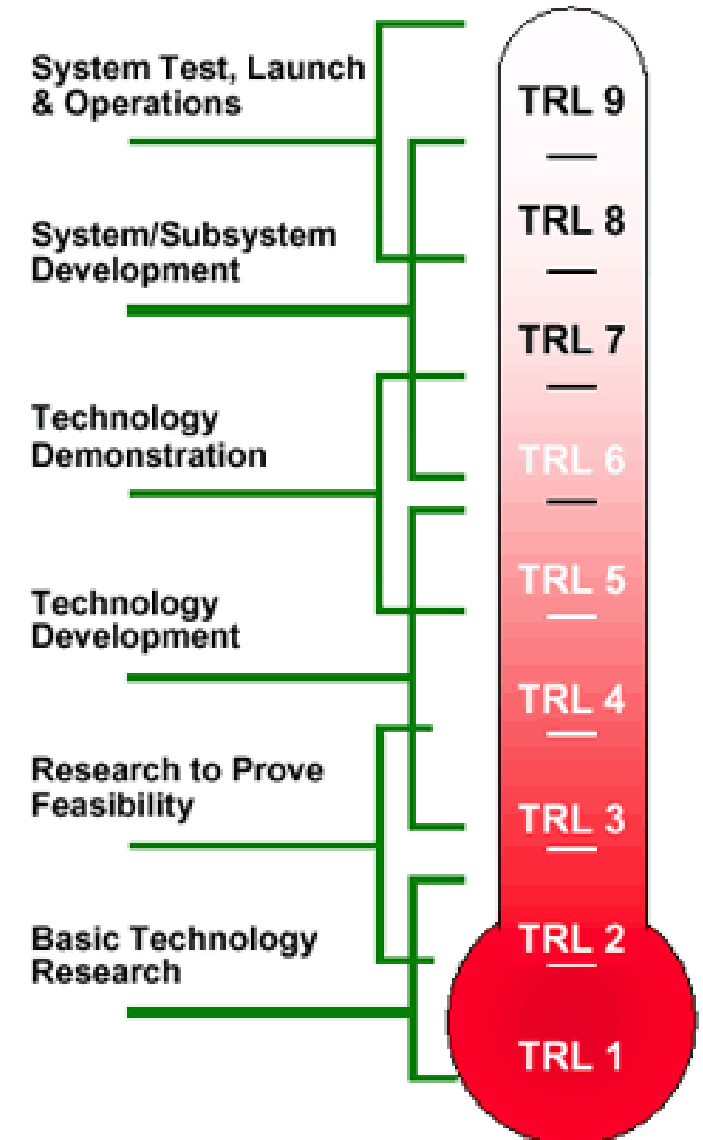
Lightning tests



Summary

- The system works as expected
- The Technology Level has been increased to at least 7
- Next step - introduction to the market

- Miscellaneous
 - Improved service platform is needed, in order to minimize downtime

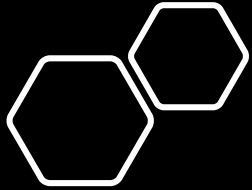




This project was financially supported by Skellefteå Kraft AB and the Swedish Energy Agency

Blade work in co-operation with Roofac Wind AB





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DET KREATIVA SKELLEFTEA



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Luft under vingarna för stans meste innovatör

Lindskog Innovation och Skellefteå Kraft ska i vinter göra en ny typ av luftkraftsdrivna vingar för flygplan. Teknikerna bakom är Kjell Lindskog, en man som har varit i branschen i över 40 år och som har varit med om att bygga upp flera av Sveriges största flygplanfabriker. Han har också varit med om att bygga upp flera av Sveriges största flygplanfabriker. Han har också varit med om att bygga upp flera av Sveriges största flygplanfabriker.

... (The rest of the article text is partially obscured and difficult to read due to the image quality and layout.)

From newspaper Norran

Extra pictures – will not be shown

Background

- To deice or not? Yes we need to anti/de-ice in cold climate
- Phase 1 of project developed the basics
- Phase 2 (this project) continued the development
- Increased TRL of the system



Other applications

- Deicing wind turbine nacelle roofs
- Improved service platform
- Heated stretchers
- Heated lorry containers for transportation of iron ore

