

Siemens Wind Power Blade De-Icing

25 years of experience with turbines
in cold climate

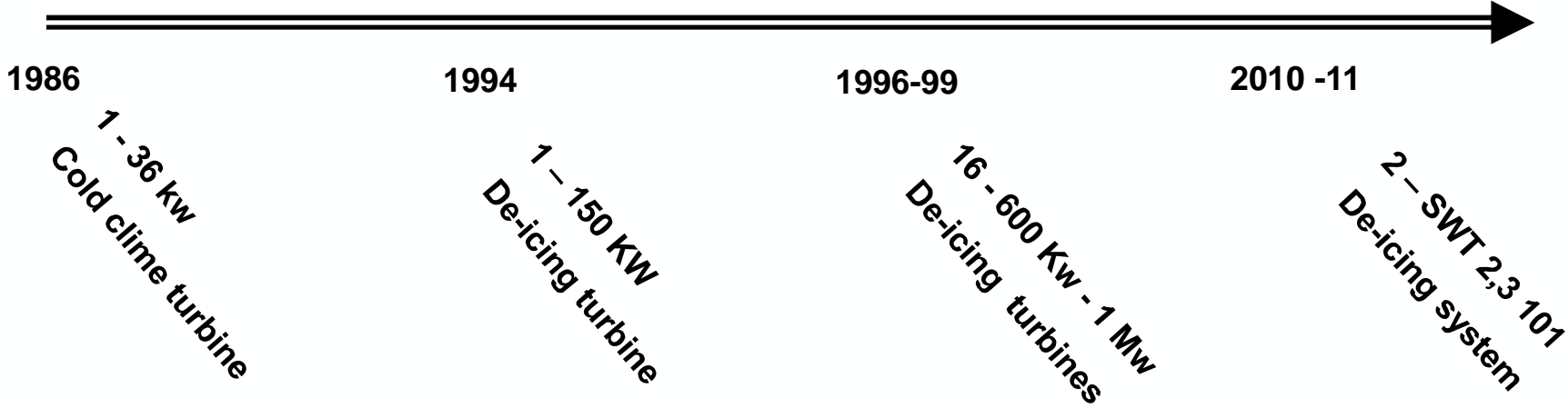
Finn Daugaard Madsen - Innovation Manager
Technology and Innovation
WinterWind 2014

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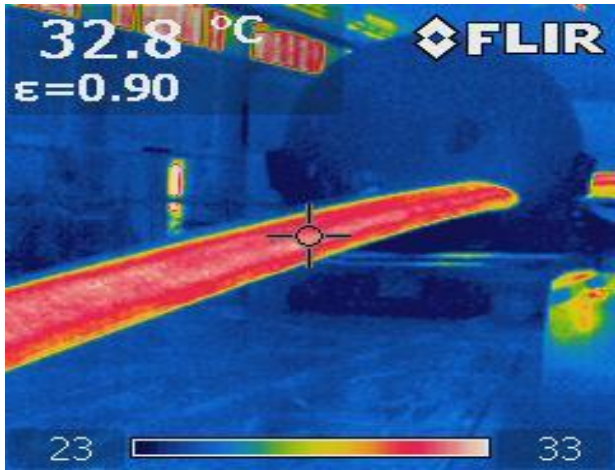
SWP - De-icing timeline

Where are we coming from



Production of a De-icing blade

Manufacturing



Electrical blades test

Blade test

Thermo-cycling test:

We are above 3000 times heat and cooling.



Lightning test:

Blade tested with heating mat.



Mechanical blades test

Blade test

Standard blade test:
Static and dynamic- edge and flap test
for 20 years life time



On-site Blade inspection:
Inspect the blades with people climbing
the blades



DNV - type certificate - De-icing.

Type certificate

Type certificate:

- SWT 2.3 -101
- SWT 2.3 -113 DD
- SWT 3.0 -101 DD
- SWT 3.0 -113 DD

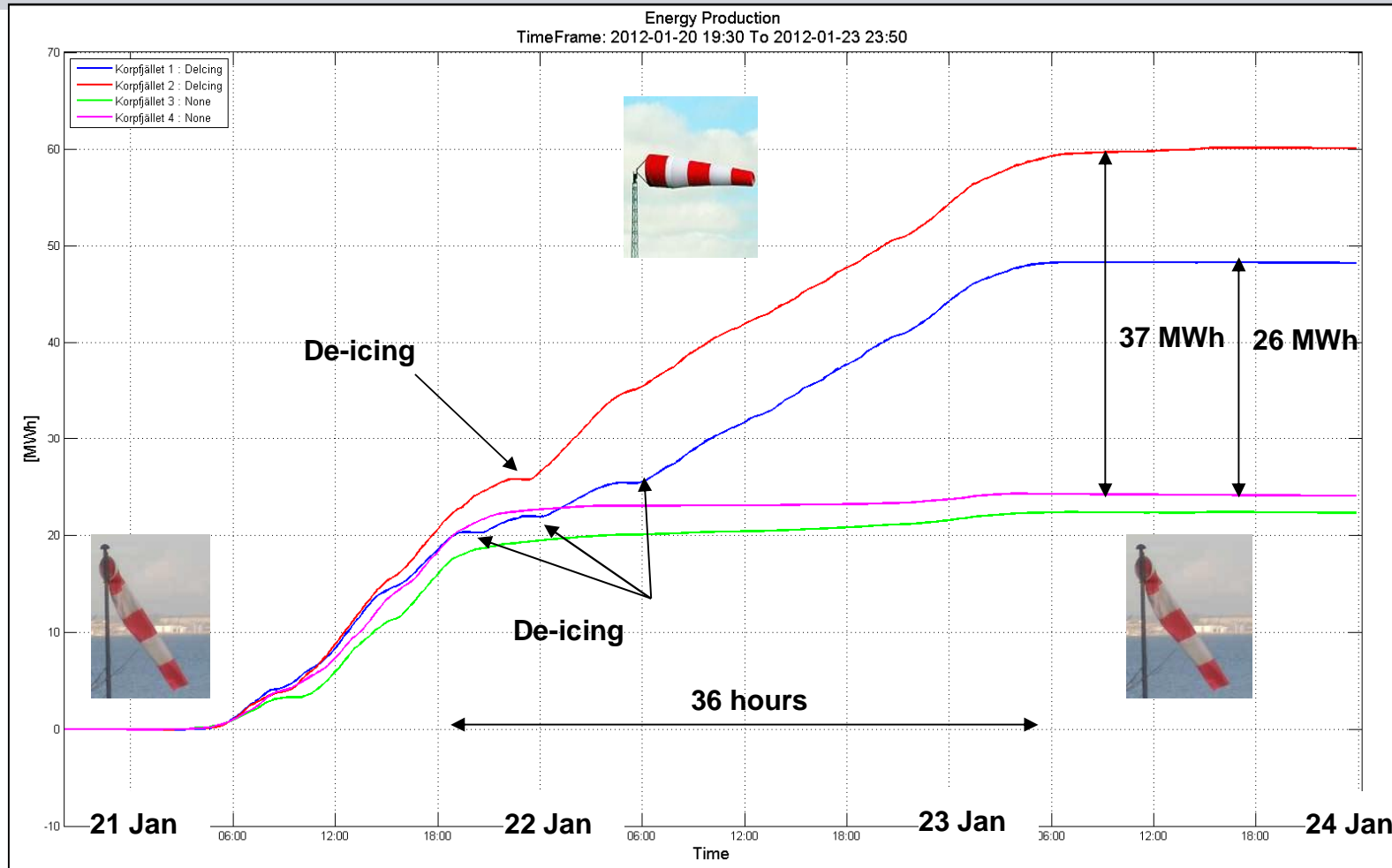
The image displays four overlapping DNV Type Certificate documents. The most prominent one is for **DET NORSKE VERITAS TYPE CERTIFICATE** for **SWT-2.3-113 DD**. It is issued to **Siemens Wind Power A/S** on **2014-01-30**. The certificate number is **TC-225504-A-5**. The manufacturer's address is **Industrivej 16, DK-7330 Brande**. The valid until date is **2017-09-17**. The certificate states that conformity evaluation has been carried out according to **IEC 61400-22:2010 "Wind Turbines - Part 22: Conformity Testing and Certification"**. Reference documents include **Final Evaluation Report: PD-642255-12U19QN-55 rev. 6**, **Design Basis Conformity Statement: DB-225504-A-5**, **Design Evaluation Conformity Statement: DE-225504-A-5**, **Type Test Conformity Statement: TT-225504-A-5**, and **Manufacturing Conformity Statement: MC-225504-A-5**. The certificate is signed by **Christoffer Eriksson** (Management Representative) and **Trine Bjerre Pedersen** (Project Manager) for **DANAK** (DNV Det Norske Veritas, Danmark A/S).

Other certificates shown include **SWT 3.0 -101 DD** (issued 2013-11-08) and **SWT 3.0 -113 DD** (issued 2013-12-16), both also issued to Siemens Wind Power A/S and signed by Trine Bjerre Pedersen.

Korpfjället 20 – 23 jan 2012

Power production in icy conditions

3 days of production with de-icing



Analysis of de-icing system – Kjeller vindteknik

Analyses of Siemens Deicing system

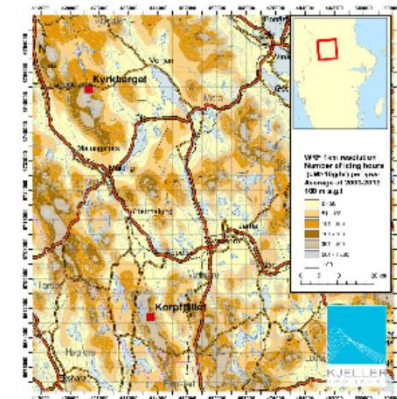
Data from 2011 to 2013

Kyrkberget & Korp fjället - SE



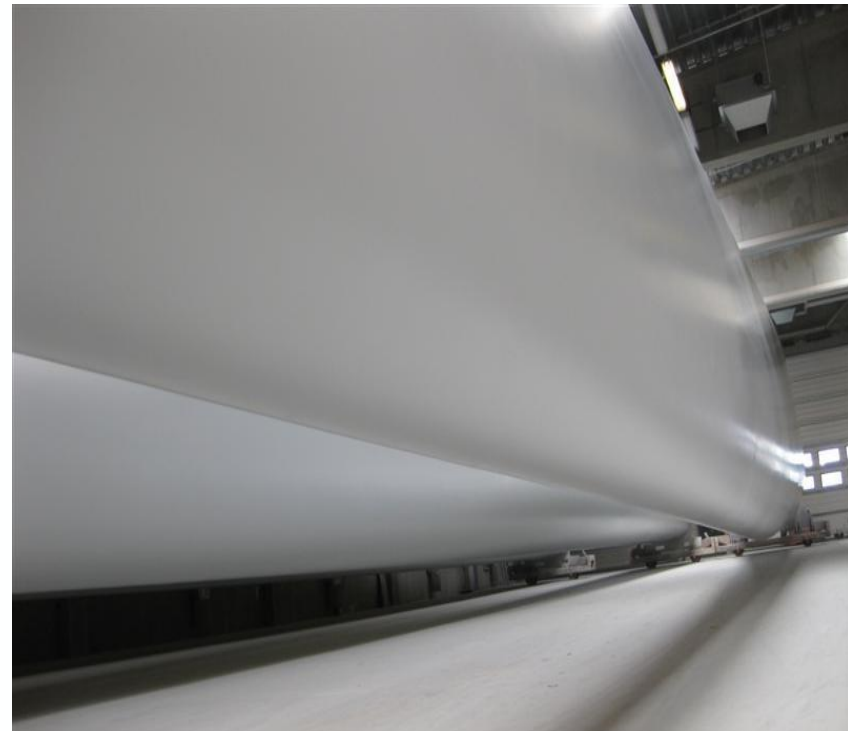
Kyrkberget and Korp fjället,
Dalarnas län, Sweden
Analysis of de-icing system

Report no: KVT/HS/2013/R064



Siemens Blade De-icing system

- Robust and proven technology.
- Power connections at the root end.
- Full retention of the aerodynamic profile.
- No effect on noise levels.
- Control system based on existing sensors.



Finished blade with De-Icing

Thank you for your attention!

