

**Siemens WP
in
Cold Clima**

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Siemens WindPower in Cold Clima

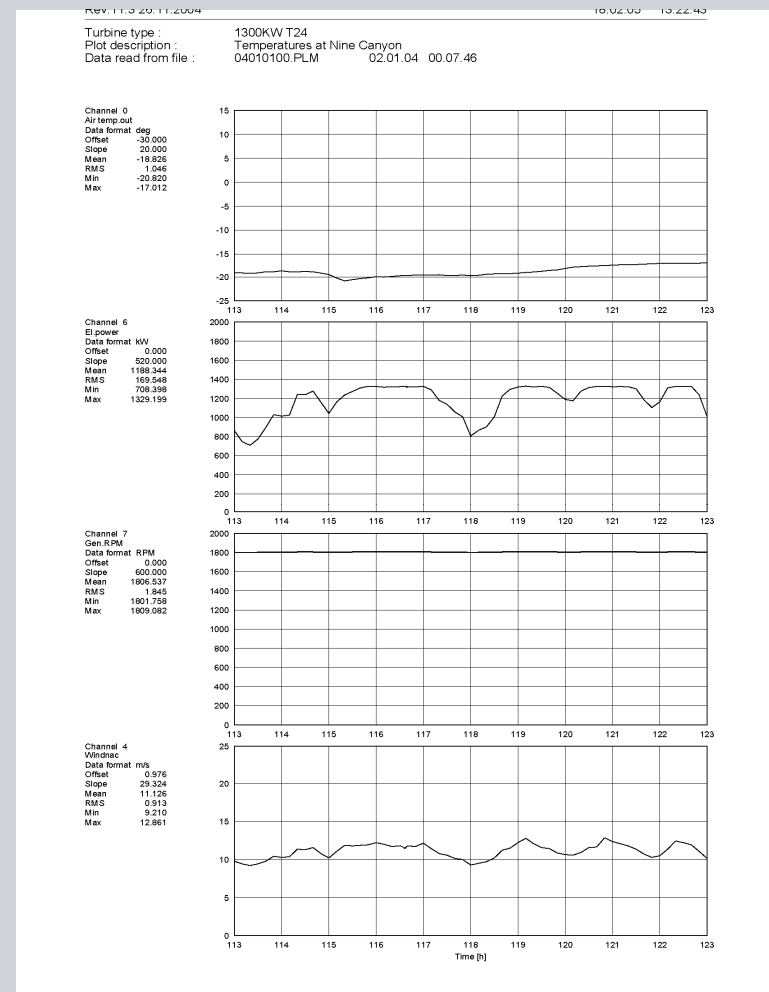
Long experience with turbines in cold clima with and without De-icing

First Cold Weather Package in Quebec 1986:

Operation - 25 deg.
Stand still - 45 deg.



Headed gearbox, hydraulic oil & anemometers



Detect and Remove Snow & Ice

Challenge is:

Detect ice & snow on the blades quickly and efficiently.

Remove ice & snow and avoid downtime.



Remove Snow & Ice

Long track record on turbines with deicing
 Started in Yukon Canada in 1994 1x150 KW



Figure 4. Bonus 600 kW wind turbine provided with the blade heating system on the top of Lammasoivi Fell in the most Northern parts of Finland.

3	Lammasoivi	2 x 450 kW 1 x 600 kW	Bonus Bonus	96 98
4	Olos	2 x 600 kW 3 x 600 kW**	Bonus Bonus	98 99
5	Vemhån	1 x 600 kW	Bonus	98
6	Suurva	1 x 600 kW	Bonus	98
7	Pori	4 x 1 MW**	Bonus	99
8	Kotka	2 x 1 MW***	Bonus	99

* The turbine modified to include the blade heating system in 1994.

** Project under construction

*** Project under planning



We have taken it a step further - and named it:

SWP - BDI (Blade De-icing)

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Siemens BDI system:

- Built on experience from the old Bonus Energy A/S system.
- Robust and proven technology.
- No wiring in the blade. Power connections at the root end.
- Blade heating integrated at factory.
- Low risk of transport damages of the system.
- Control system based on existing sensors.

Heat test at the Blade factory

Distribution of heat
in a test setup.



Test site in Sweden

Generation 1.

Kyrkberget	1 x SWP 2,3 101	Start up W 3 - 2011
Brahehus	1 x SWP 2,3 101	Start up W 7 - 2011

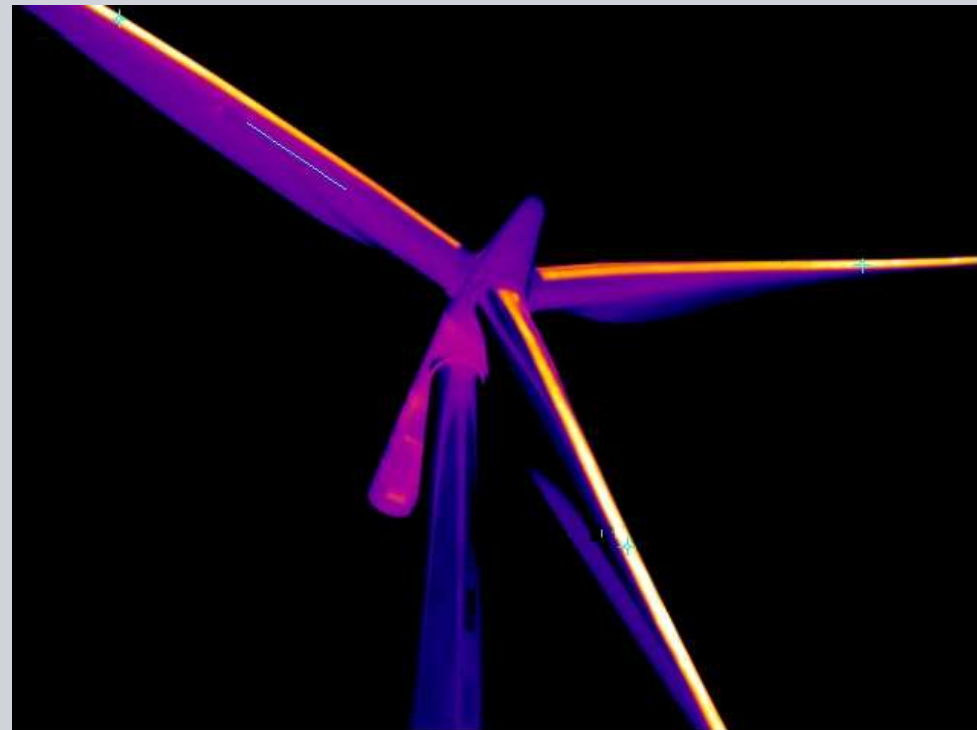
Generation 2.

Next generation and will be ready before winter 2011 - 12

Test turbine with BDI in Kyrkberget

SWP BDI Generation 1

We are testing
evaluating result
and adjusting software.



Siemens BDI

With a Siemens BDI system, down time after icing will be reduced and paid back after few icing days per year.

