

Nordex Advanced Anti-Icing System for N149/4.0-4.5

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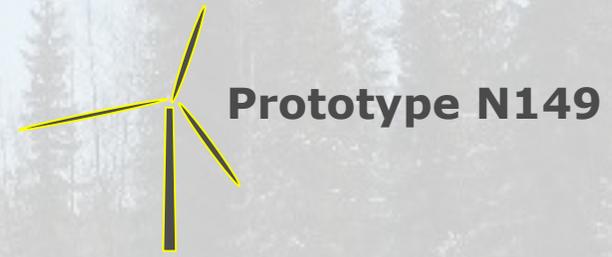
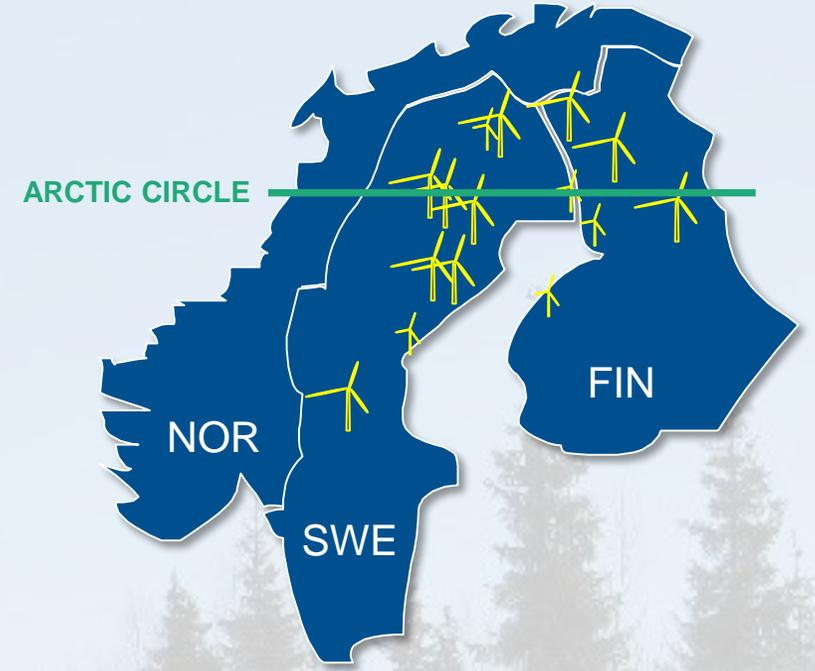
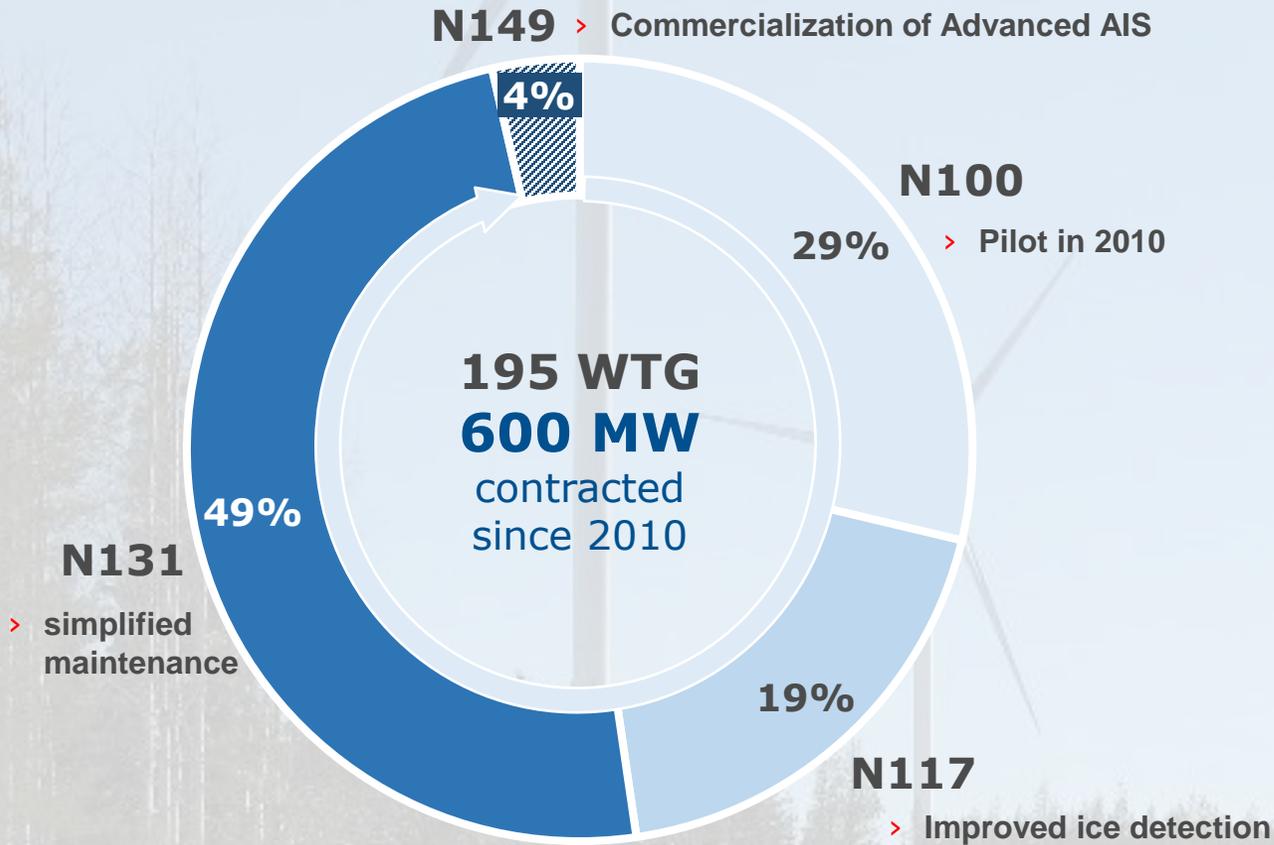
Advanced Anti-Icing System uses well proven concept of electrical resistance heating



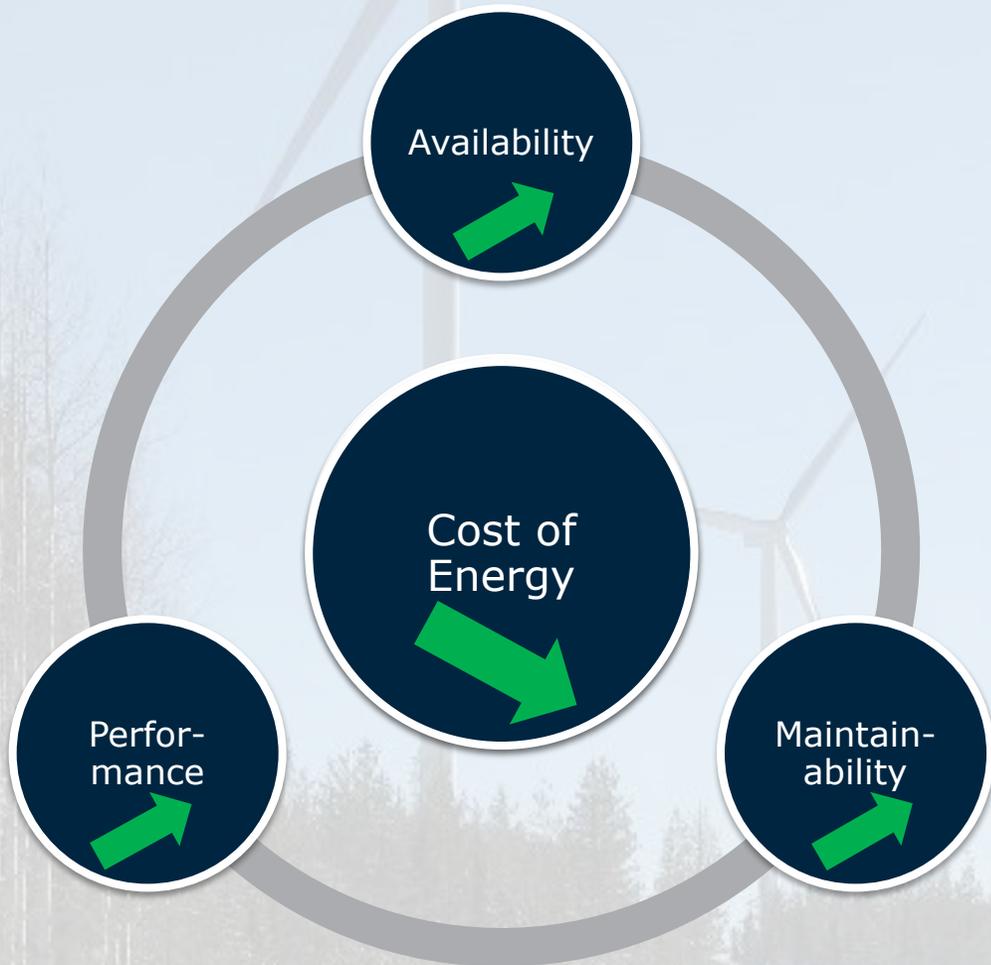
Basic features:

- Electrical resistance heaters
- Heating aerodynamically relevant surfaces (leading edge)
- Low energy consumption – heating the surface rather than blade structure
- Fully operational during turbine operation

Nordex has a LONG EXPERIENCE in developing and operating Anti-Icing Systems with different rotor sizes in severe Scandinavian icing conditions



Design goals and benefits for Advanced Anti-Icing System for N149 are always focused on reduced Cost of Energy

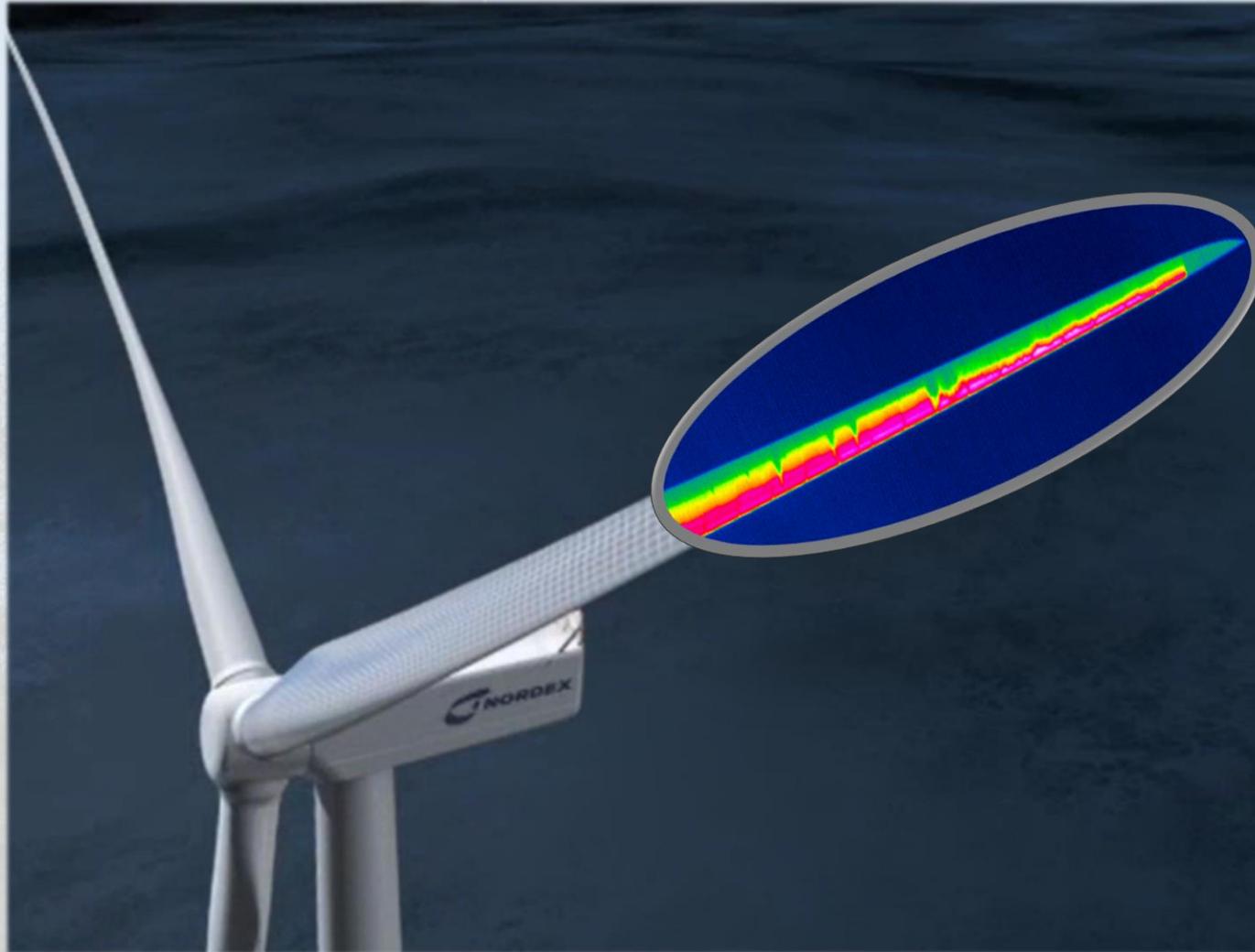


Simplification
+
New heating element

New benefits:

- Reduced complexity of electrical system
- No additional components in/on blade (except connections at blade root)
- Reduced maintenance effort
- Heating power/m² independent from geometry – optimized design for N149
- Heating element is segmented
- Manufacturing process much simpler

➤ Infrared validation took place last Thursday – still to be evaluated



Tests with new heating element:

- Since 2014: N117 in Finland
- Since 2016: N131 in Finland

Infrared picture taken during turbine operation on N117.

NR74.5 blade will be fully tested in static and dynamic tests incl. all additional loads for the AIS

- Dynamic flapwise
- Dynamic edgewise

- Static flapwise
- Static edgewise

- Heating element

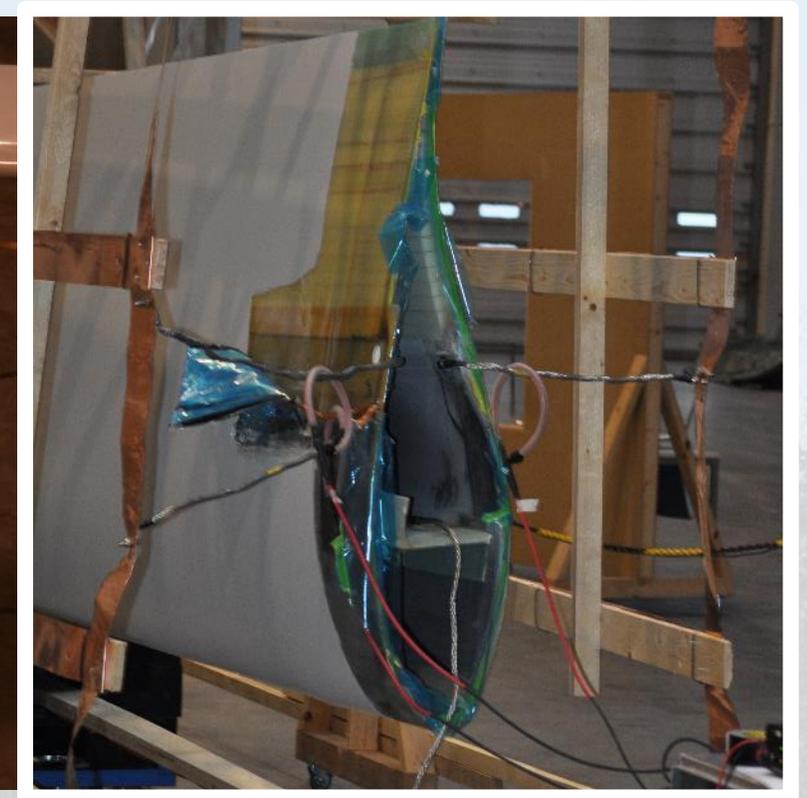
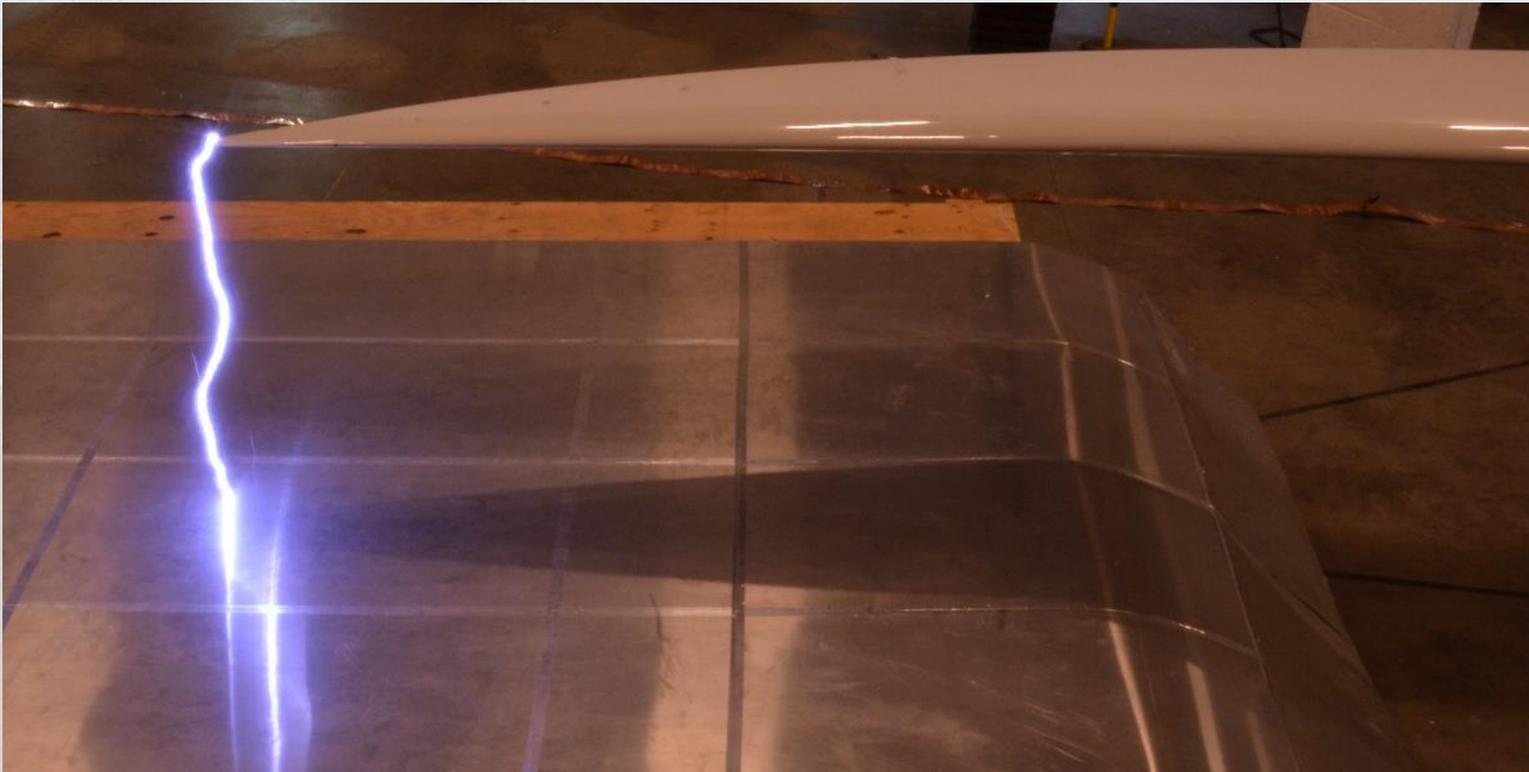




Lightning protection system of Advanced Anti-Icing System is fully tested by third party

- Initial leader attachment test
- High current coupon tests

- Current distribution test



➤ Transport to difficult sites is possible due to the use of self driving blade lifter



➤ Transport of blades very challenging – use of self driving blade lifter



Single blade assembly is the standard erection method for N149





Single blade assembly is the standard erection method for N149



> The final result...



➤ Prototype of N149 with Advanced Anti-Icing System in winter scenery



> Summary



NORDEX Advanced Anti-Icing System for N149 ...

- ... has maximized robustness
- ... has minimized maintenance effort
- ... has been successfully tested in the field and in the lab
- ... is up and running

**> Thanks for
your attention**

> Together on the same course

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