

Megatrends of Wind Turbine Blade Heating

Winterwind 2020

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WICETEC
Ice Prevention Systems

What is Wicetec



- World's leading independent third party blade heating technology provider
- Over 25 years of experience on cold climate wind power
- Offering
 - Blade heating for new turbines
 - Blade heating retrofit



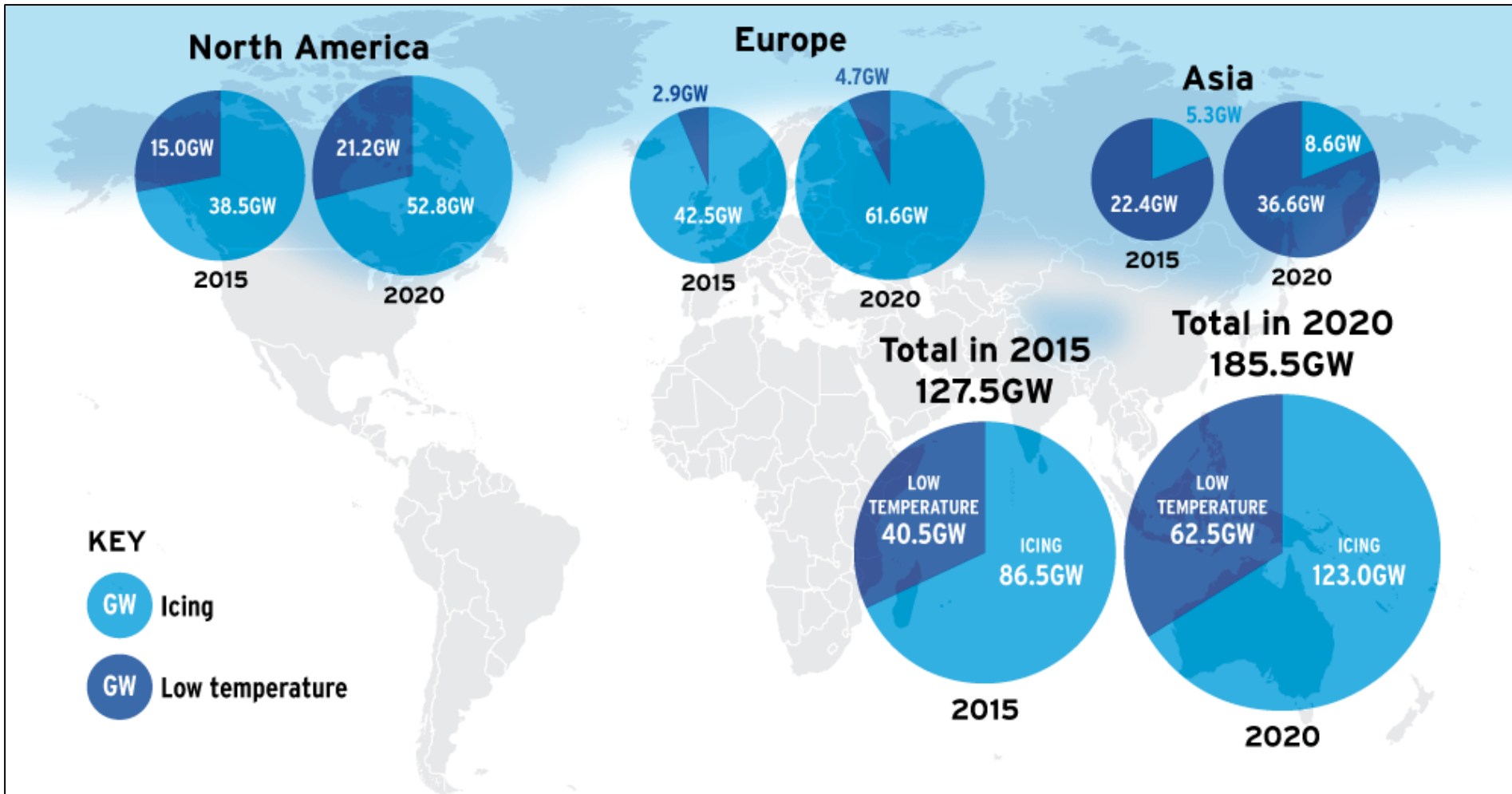
THE MEGATRENDS

1. More Turbines are Build to Cold Climate Areas
2. Critical to Keep Turbines Operating During the Winter
3. Bigger Turbines are Build
4. Wicetec Ice Prevention System

→ The Need of Blade Heating is Increasing



More Turbines are Build to Cold Climate Areas



Based on market study by IEA Wind Task 19

Total 123 GW in 2020

More Turbines are Build to Cold Climate Areas

Markbygden area in Sweden

- Up to 1101 wind turbines will be build on the area
- What happens if severe icing occurs on the area?
 - Can grid handle it?
 - What happens to electricity price?
 - Energy demand?
 - ...



Picture source:
<https://svevind.se/Markbygden>

More Turbines are Build to Cold Climate Areas

Finland

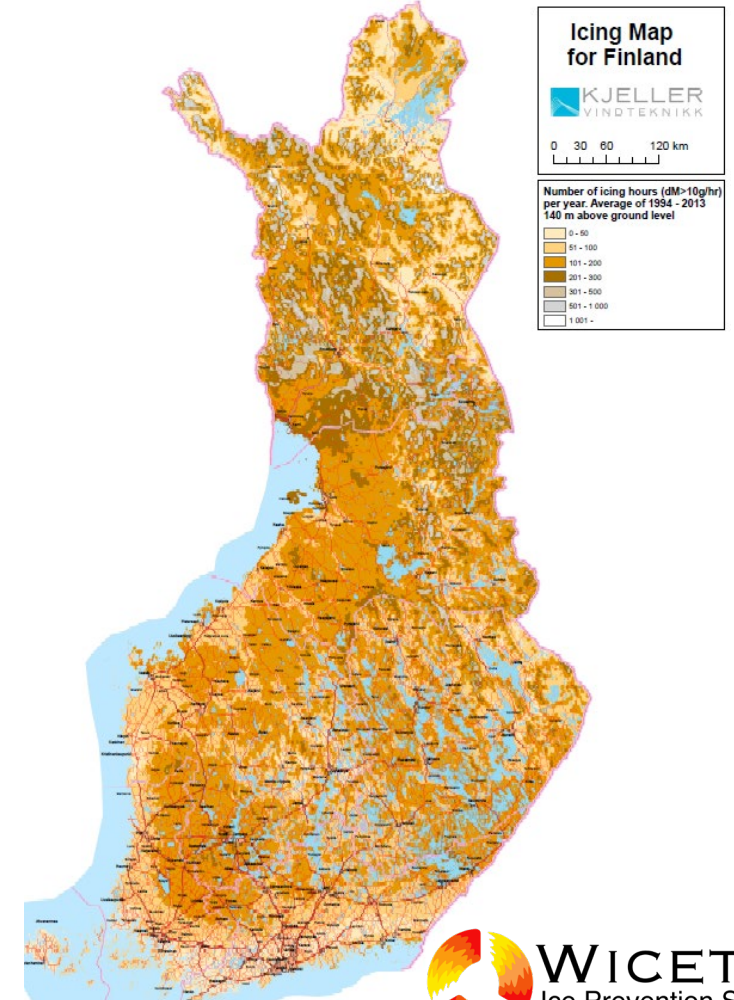
In Production



Development



Icing Map



Source: <https://ethawind.com/map/>

THE MEGATRENDS

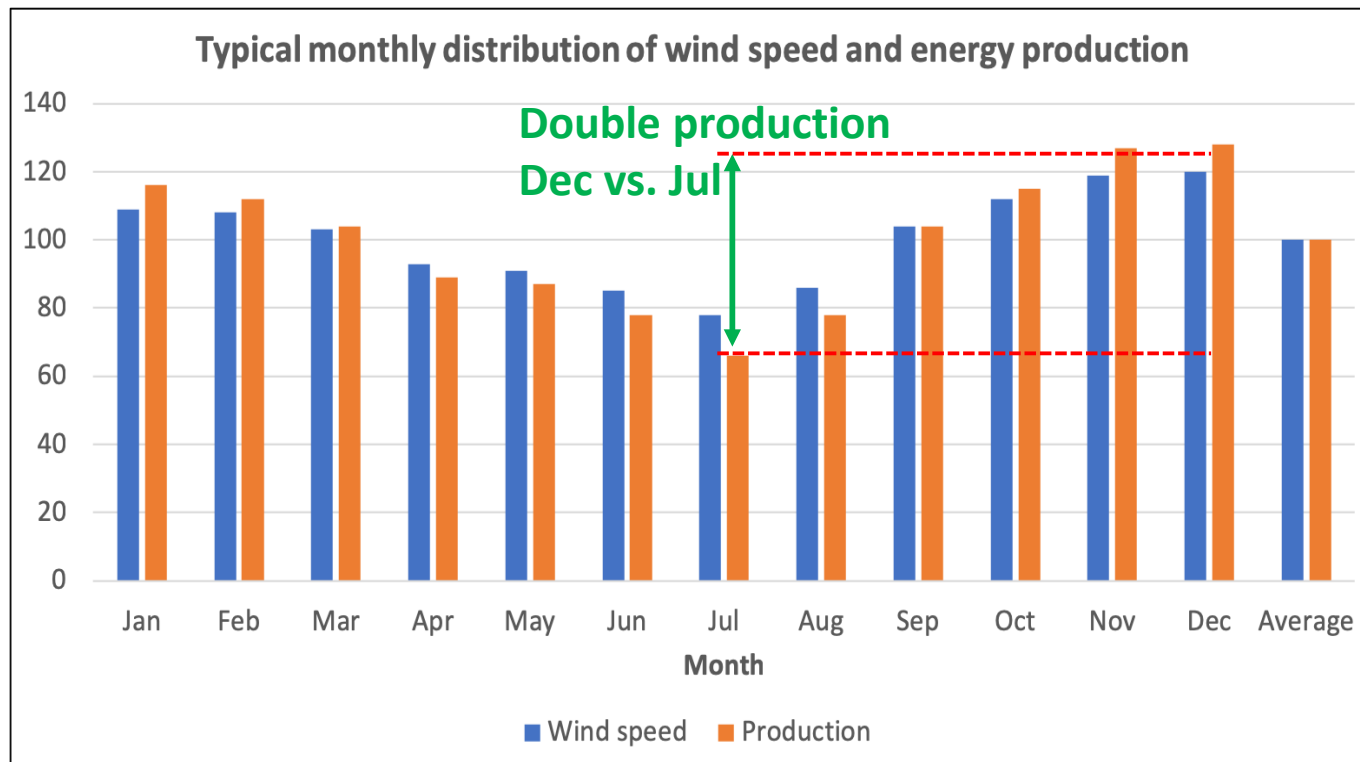
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Critical to Keep Turbines Operating During the Winter

Finnish Wind Power Association vision

- In year 2030 wind power covers 30 % of the electricity production in Finland
- Year 2017: 4,8 TWh



year 2030: 30 TWh

Graph source: Suomen kuvalehti 1/2019

Critical to Keep Turbines Operating During the Winter

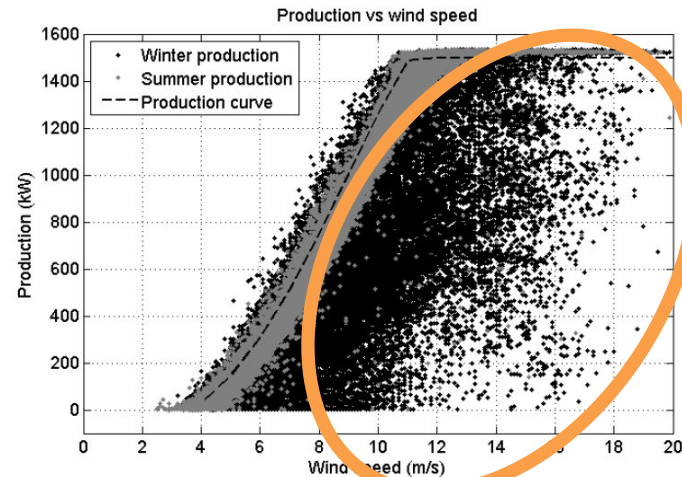
Problems caused by icing

- » Reduced power/ AEP
- » Increased noise
- » Increased loading/ imbalances
- » Ice throw



Reference: Cattin 2007

LM WIND POWER
a GE Renewable Energy business

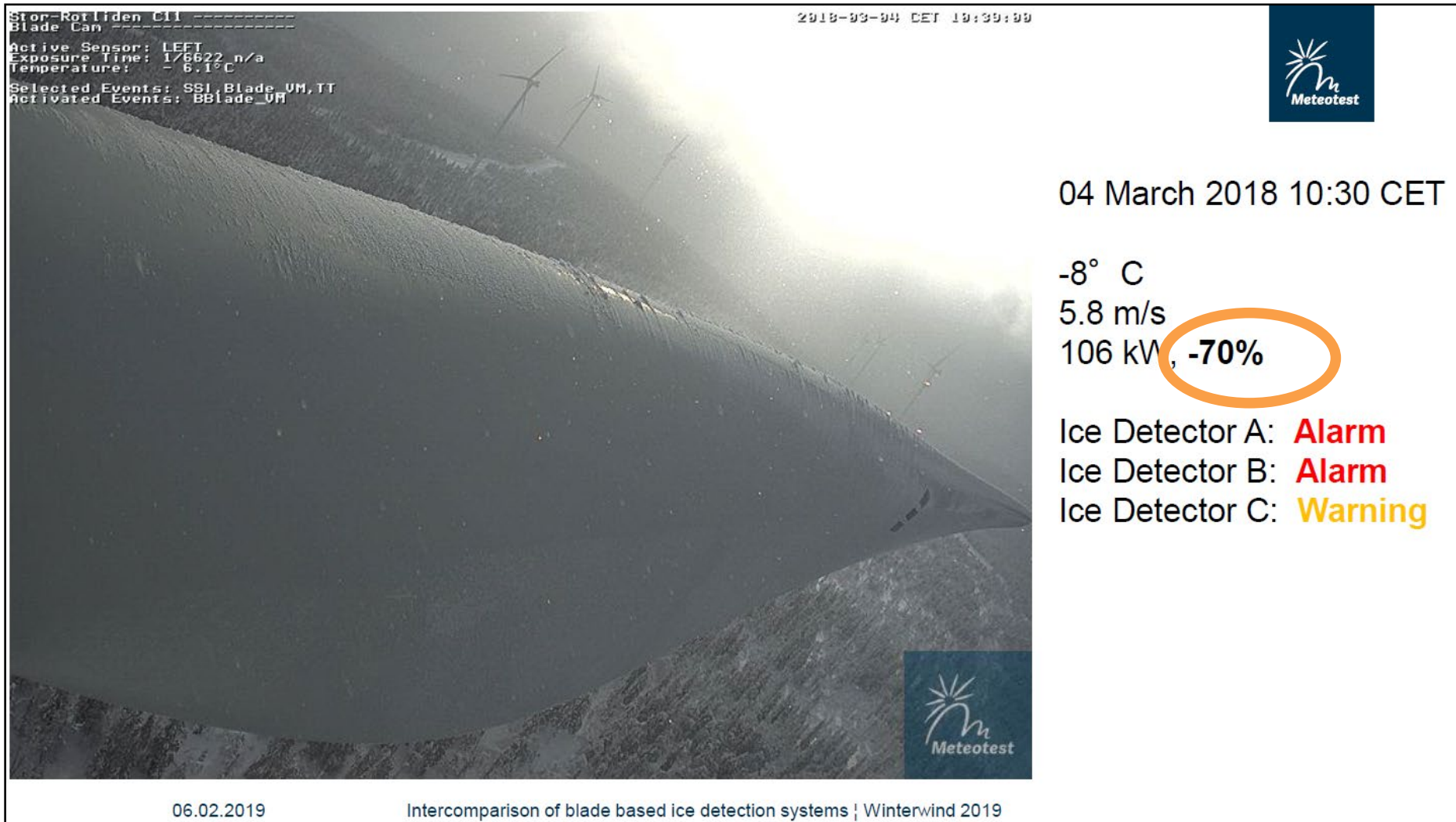


Reference: Rindeskär 2010

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13-11-2017

Critical to Keep Turbines Operating During the Winter



How much ice on the blade is too much?

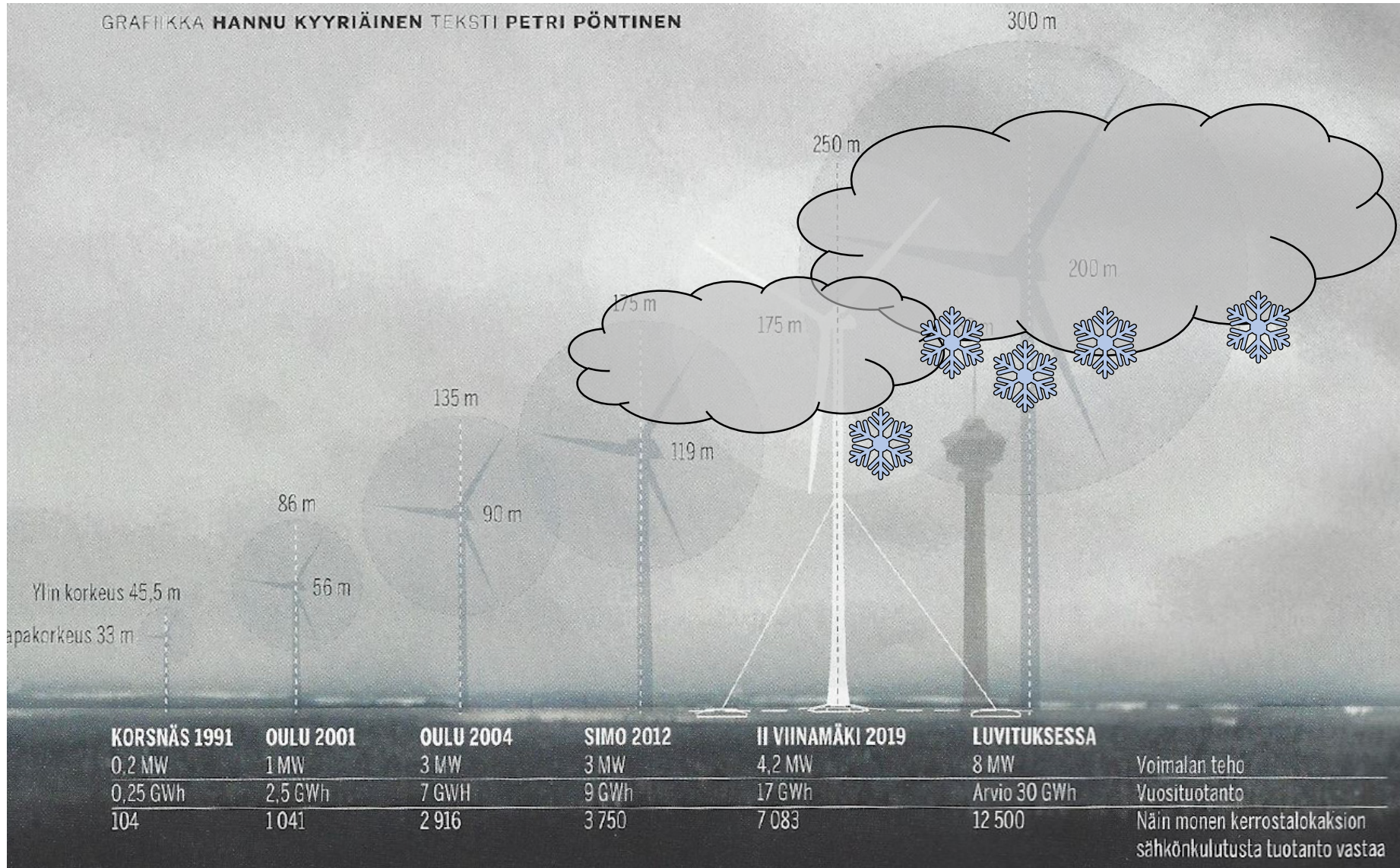
How is your PPA performing with -70% production?

THE MEGATRENDS

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Bigger Turbines are Build

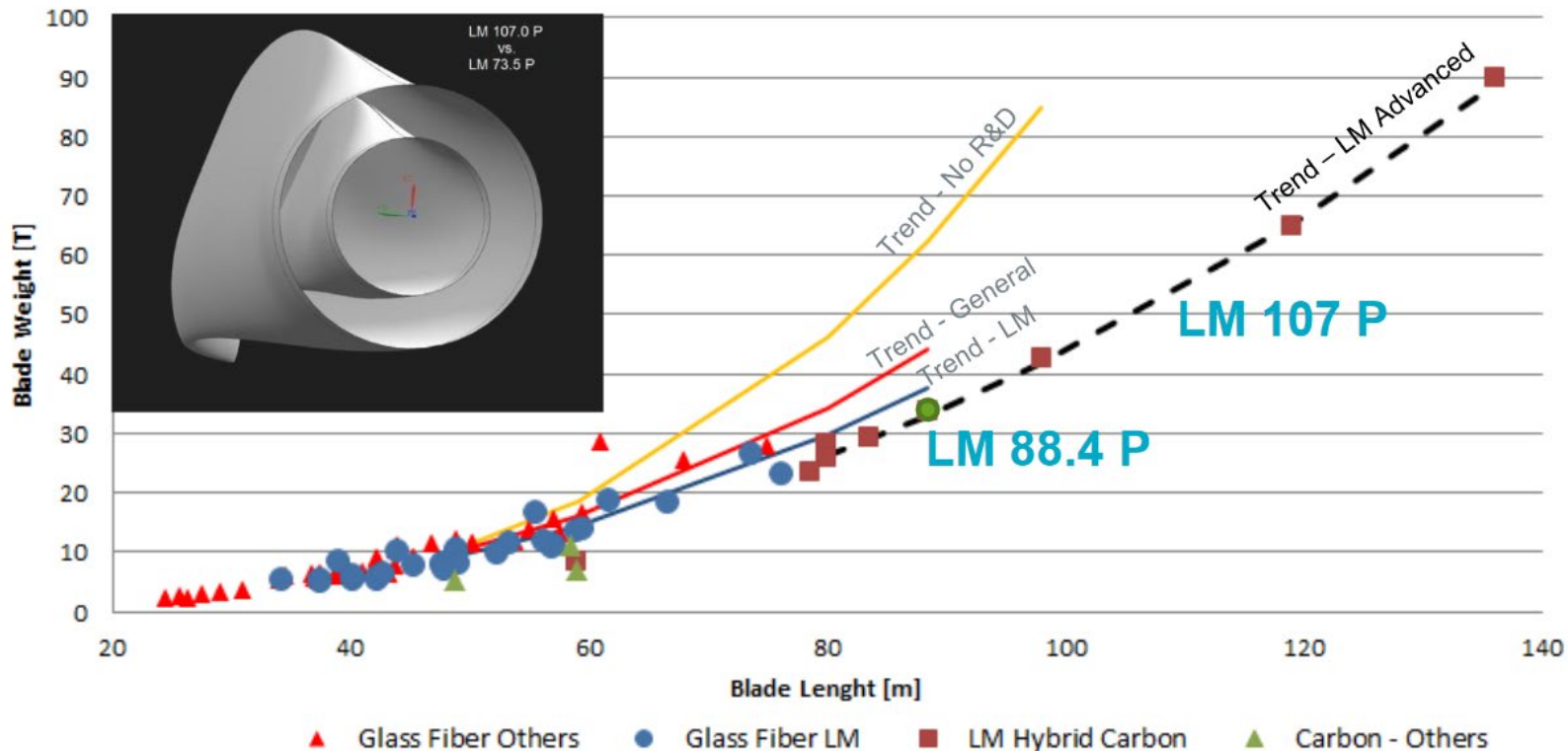


The higher the turbines are, the more often icing occurs!

Bigger Turbines are Build

Ultra long blades call for more advanced blade designs to keep blade mass down

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Bigger, but cheaper turbines require lighter structures
→ more sensitive to disturbances, like blade icing

THE MEGATRENDS

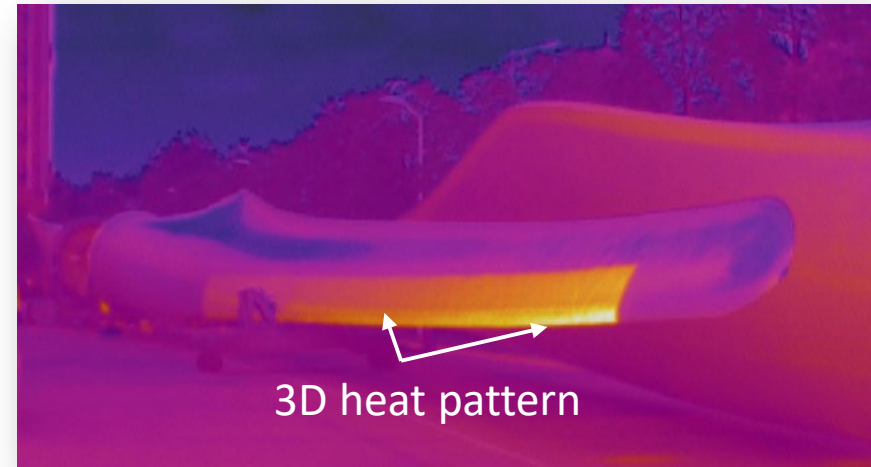
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WIPS- Blade Heating

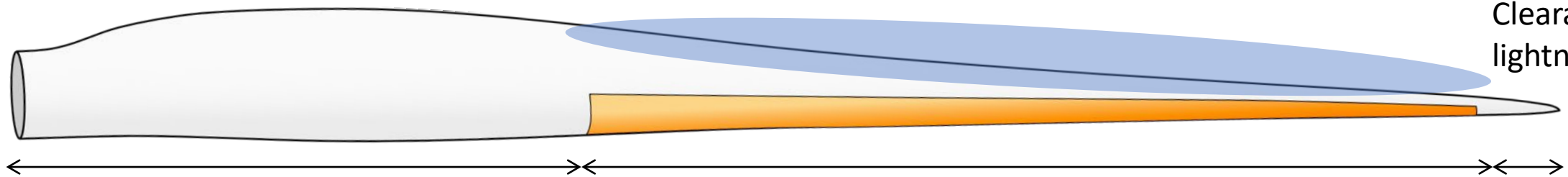
Patent protected

- Electro-thermal carbon fiber element
- Surface heating, right where it is needed
 - Very quick and efficient
- Field proven life time of 20 years



Runback ice not a problem

Clearance from lightning risk area



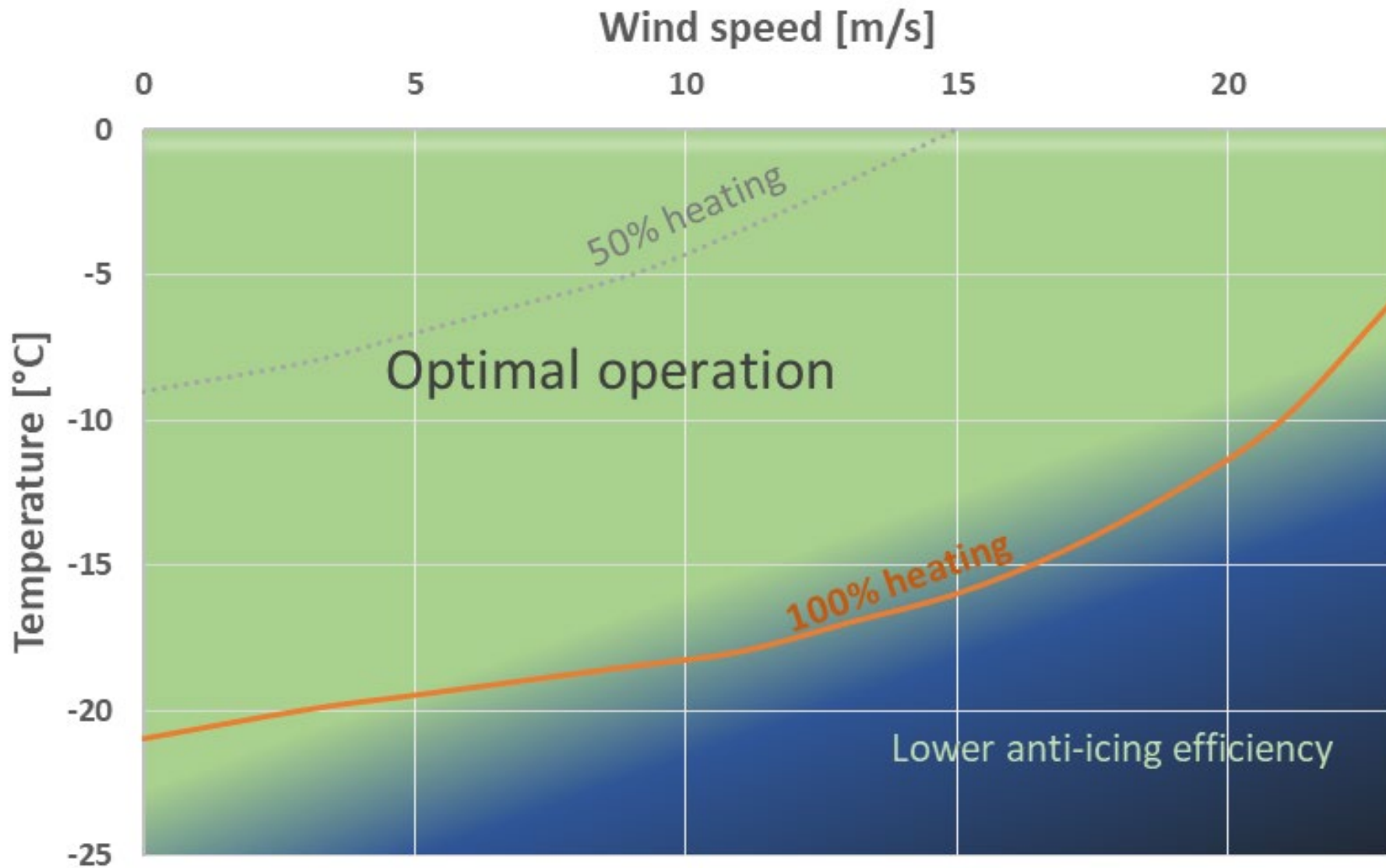
NOT relevant area for AEP

Critical area for AEP

Airflow cleans the tip



WIPS Operational Envelope



Wicetec vs. non-heated

Now available also as an
up-tower installation

With: **BLADEFENCE®**