WICETEC
Ice Prevention Systems

Retrofit Ice Prevention System

Petteri Antikainen

Winterwind 2018

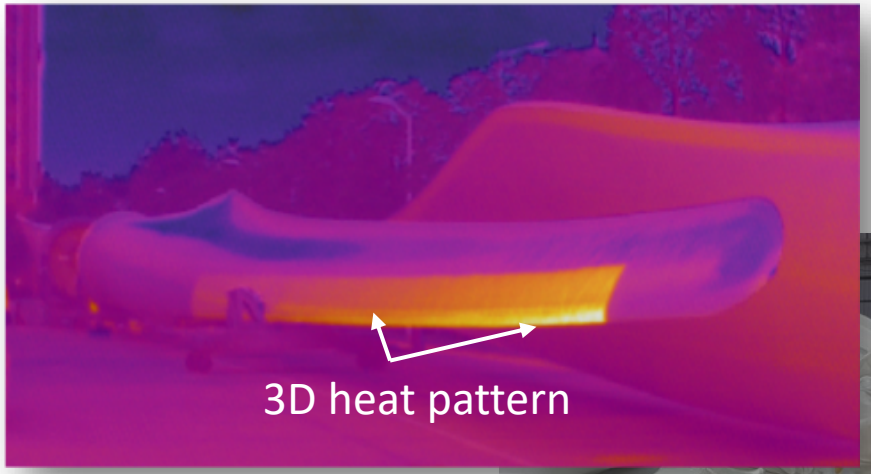
What is Wicetec

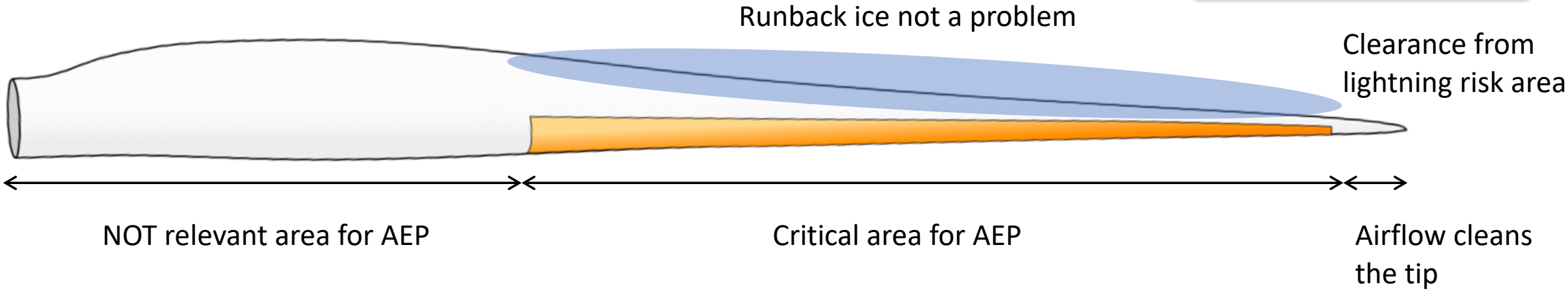
- Founded in 2014 by Petteri Antikainen (CEO) and Tomas Wallenius (CTO).
  - Together more than 30 years of experience in cold climate wind power
- Supplies Ice Prevention Systems (WIPS) for any wind turbine worldwide
- Wicetec owns the IPR for IPS-technology
  - Technology developed in research institute (VTT) since early 90’s
  - Technology in use for 20 years
- Expert organization with network of trusted partners and suppliers

Blade heating

Patent protected

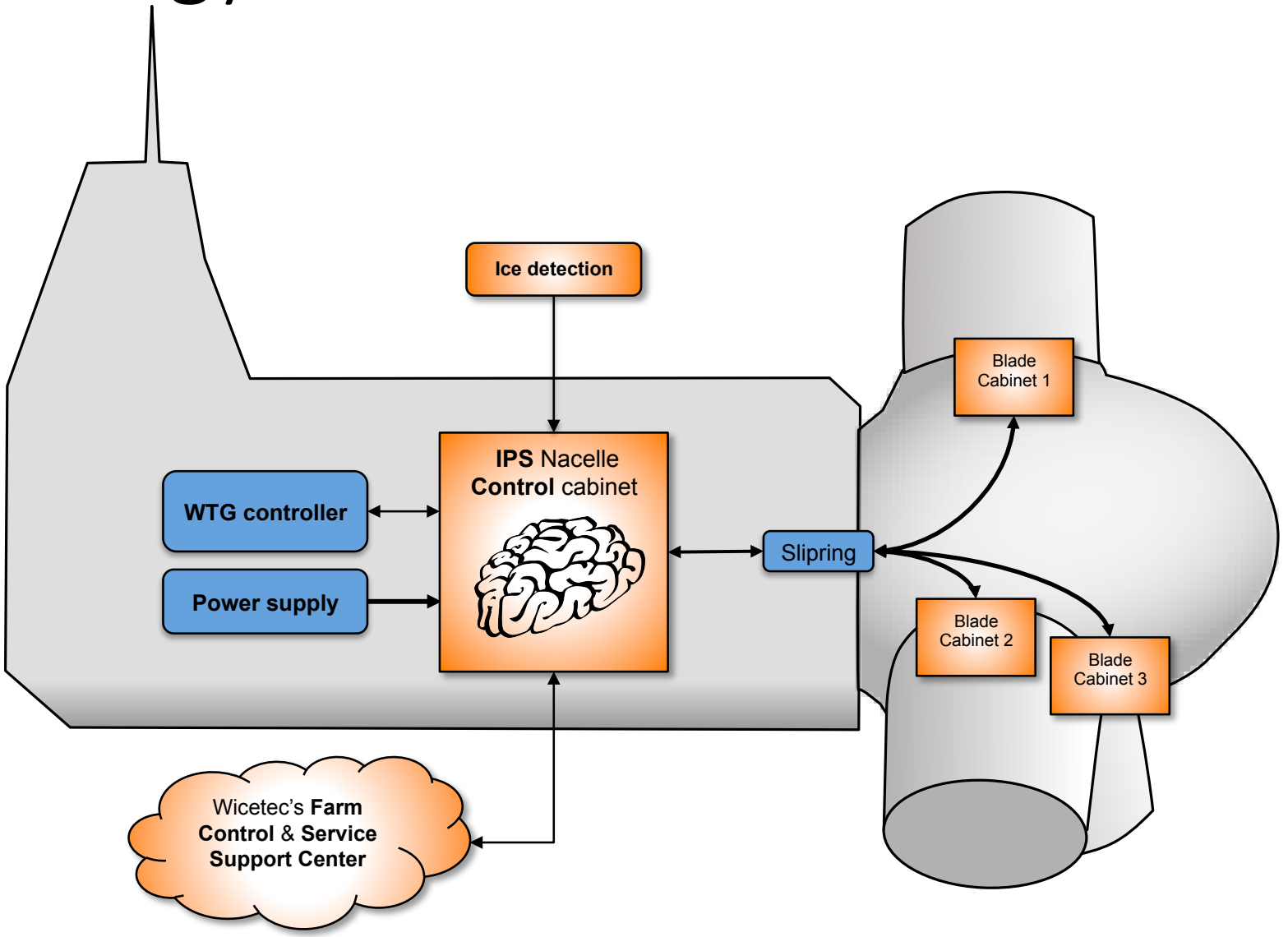
- Electro-thermal carbon fiber element
- Suitable fatigue properties
- Installation using same methods than blades are built
- Heating power on the outer surface, right where it is needed





Supporting technology

- Power supply
- Control
  - Ice detection
  - Safety
- Remote connection
  - Wind farm level control
  - Maintenance support



Why Wicetec Ice Prevention System?

- Enables continuous turbine operation, no de-icing cycles
- No stoppages due icing
- Ice losses minimized
- Less mechanical wear, tear and damages due icing
- Low operating costs
- High availability
- Reduced uncertainty for investment calculations
- No penalties for lost production
- No risk of losing PPA
- No nonsense, it is proven that it works!

Retrofit project

- 2 wind turbines 2016
- 10 wind turbines 2017
- Lac Alfred wind farm, Quebec, Canada
- In cooperation with East Coast Wind

Retrofit approach

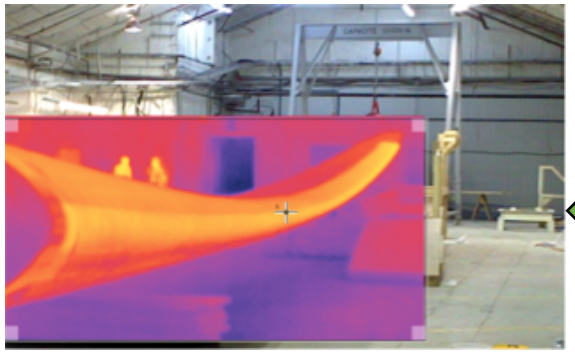
New installation vs. retrofit:

- Biggest difference is logistics and when equipment are installed
- Otherwise the technology is same as for new installations

Main reasons for indoor installation:

1. minimizes weather risk for project schedule on windy site.
2. enables high quality lamination process in controlled conditions

1-2 weeks



Some aspects of retrofitting ice prevention systems

- Standalone solution, no OEM involved
  - Electricity for the blade heaters
  - Remote control and maintenance
- Blade heater installation
  - Installation time – minimize down time of turbine
  - Cabling to blades - Limited access to blade interior
- Logistics
  - Blade lifting: down and back up vs crane utilization rate
  - Local temporary blade factory

Electricity for heaters

- Heating power to hub
- Slip-ring modifications
- UL/CSA certifications

Crane works

- Rotor drop
- Blade disassembly
- 1 day

- Blade assembly
- Rotor lift
- 1 day

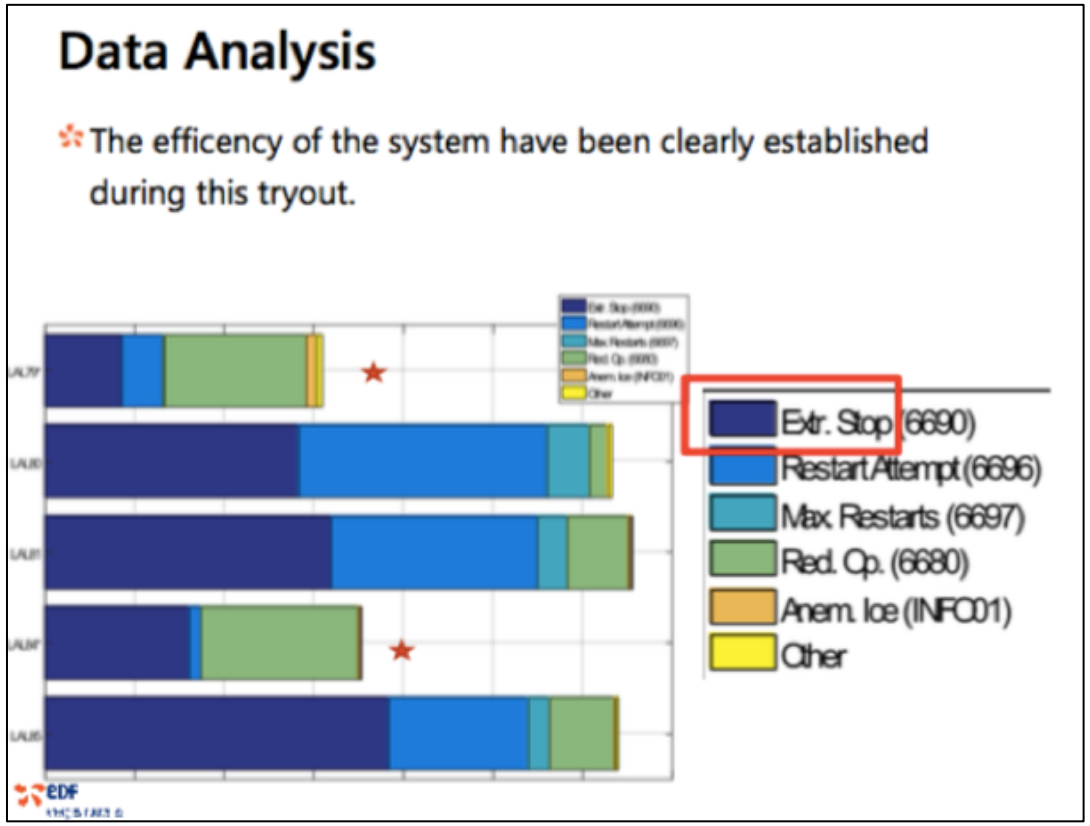
”Site factory”

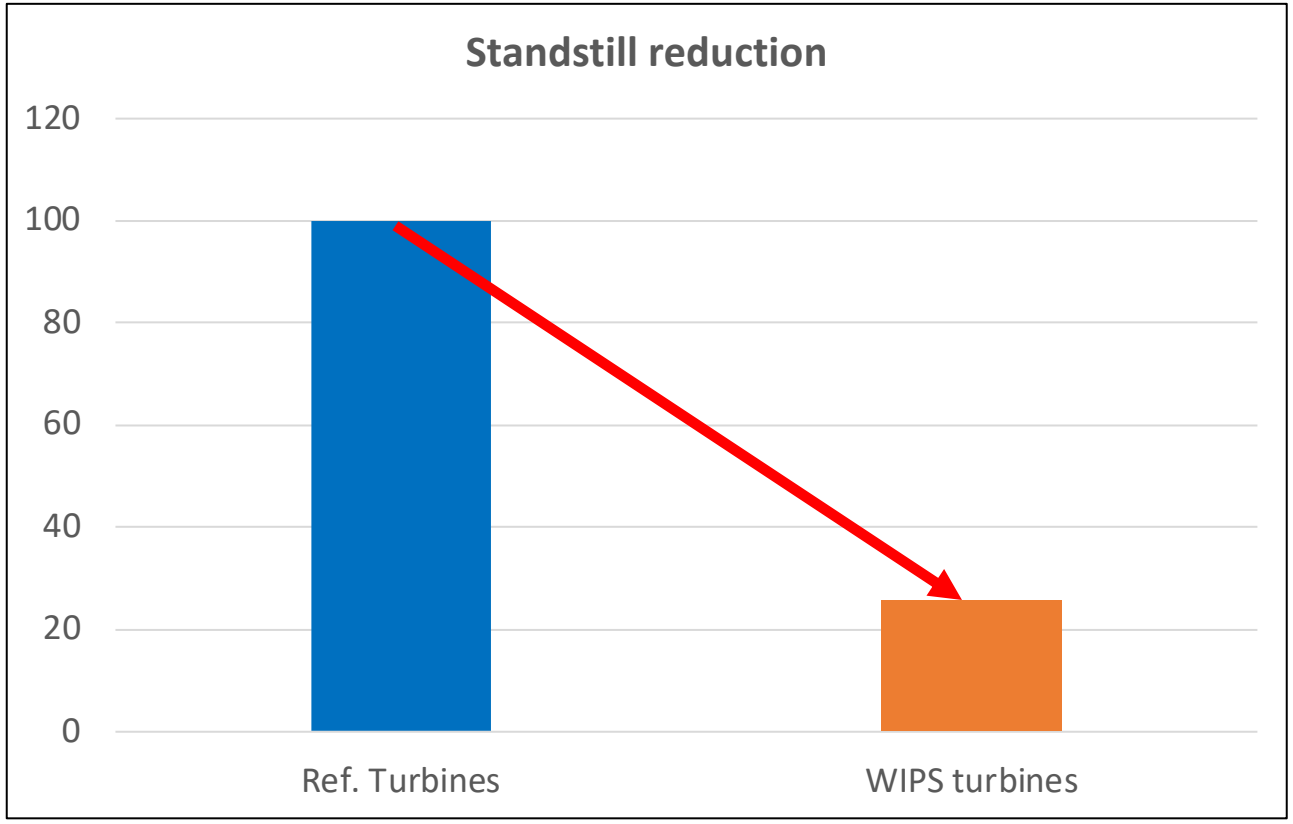
- Near by old factory
- Renewed electricity
- Air conditioning
- Compressed air
- Working platforms
- Doors
- Blade turning devices

Blade heater installation

- Surface sanding
- Possible repairs
- Heating element lamination
- Cabling
- Blade cabinet installation
- Surface finishing
- Testing

Results


Data Analysis
The efficency of the system have been clearly established during this tryout.
Extr. Stop (6690)
Restart Attempt (6696)
Max. Restarts (6697)
Red. Op. (6680)
Anem. Ice (INFC01)
Other


Standstill reduction
120
100
80
60
40
20
0
Ref. Turbines
WIPS turbines

WIPS in operation:

Meanwhile next door ->


Thank you for listening!
Check out our new web site:
wicetec.com