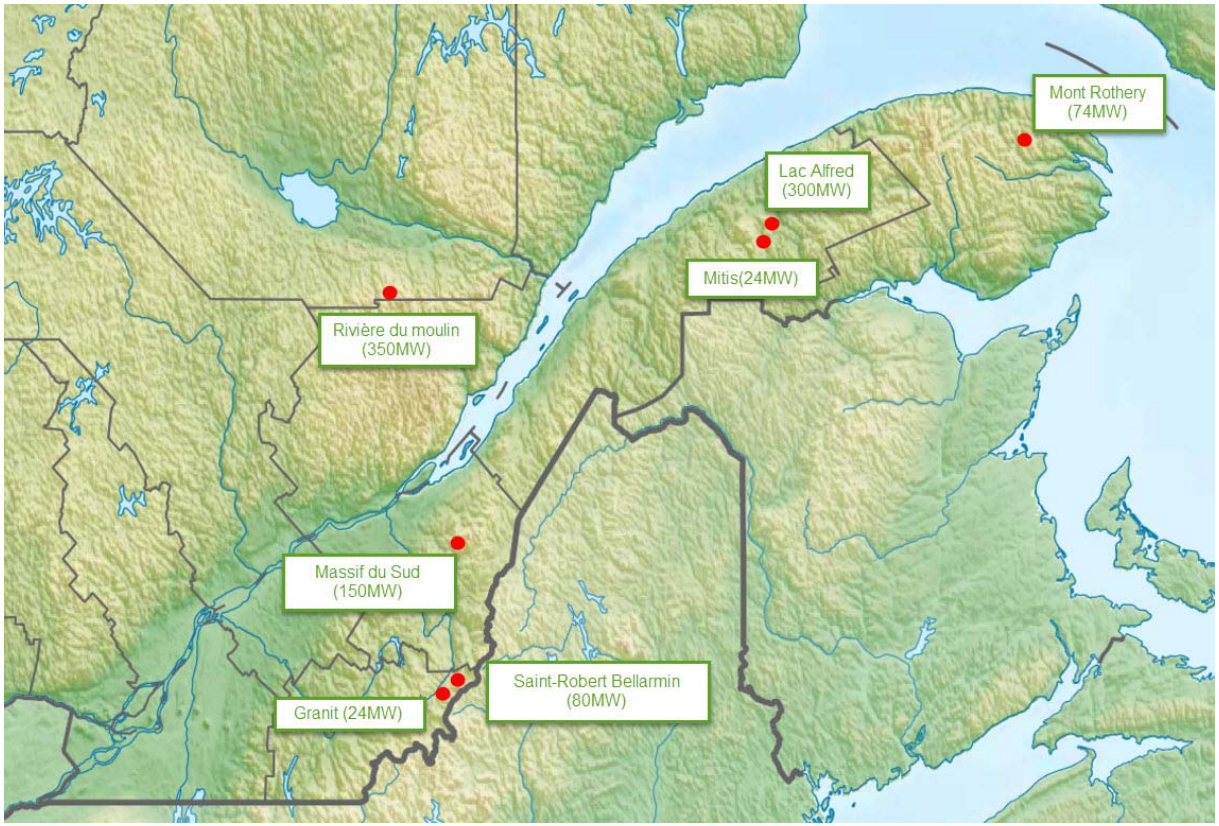
# RETROFITTING THE WICETEC ICE PROTECTION SYSTEM : OUR EXPERIENCE

February 2018
Winterwind

# Winter has arrived!




- Seven projects in eastern Canada
- From 12 to 175 turbines
- Gradually came in operation since fall 2012

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# The issues are…

- Our projects are facing annual icing losses of 5 to 16%
- Turbines are not equipped with any de-icing or anti-icing technology
- 45% of our icing losses are due to severe icing events that will stop the turbine

# The goal is …

- To retrofit a de-icing technology that will reduce icing losses by 70-80% on severely iced turbines

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# Selection of a de-icing technology

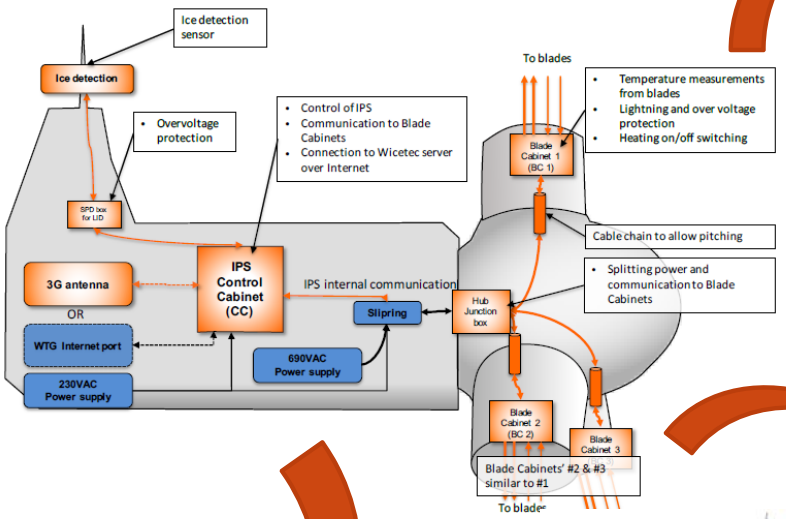
- Physical feasability
- Quality assurance plan
- Costs
- Maturity and number of systems under operation
- Expertise and experience of key personnel involved in design
- Motivated local partners

# Technology review to solve severe icing

- Hot air de-icing systems
- Electro-thermal foils
- Other « exotic » solutions
  - Helicopters
  - Rope access
  - Hot water and/or glycol sprays
  - etc.

- Wicetec Ice Protection System (WIPS)
  - Spin-off from VTT in Finland
  - Long-term experience of key personnel
  - Partnership with local East Coast Wind
  - Willing to adopt a retrofit approach

# Retrofiting Wicetec solution

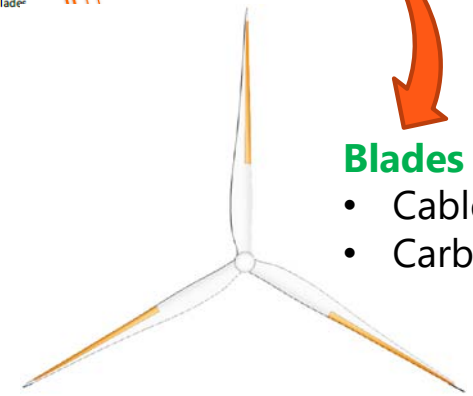



## Nacelle

- Sensors and Controls
- Cabinets and cables
- Safety interface with turbine controller
- Surge protection

## Power System

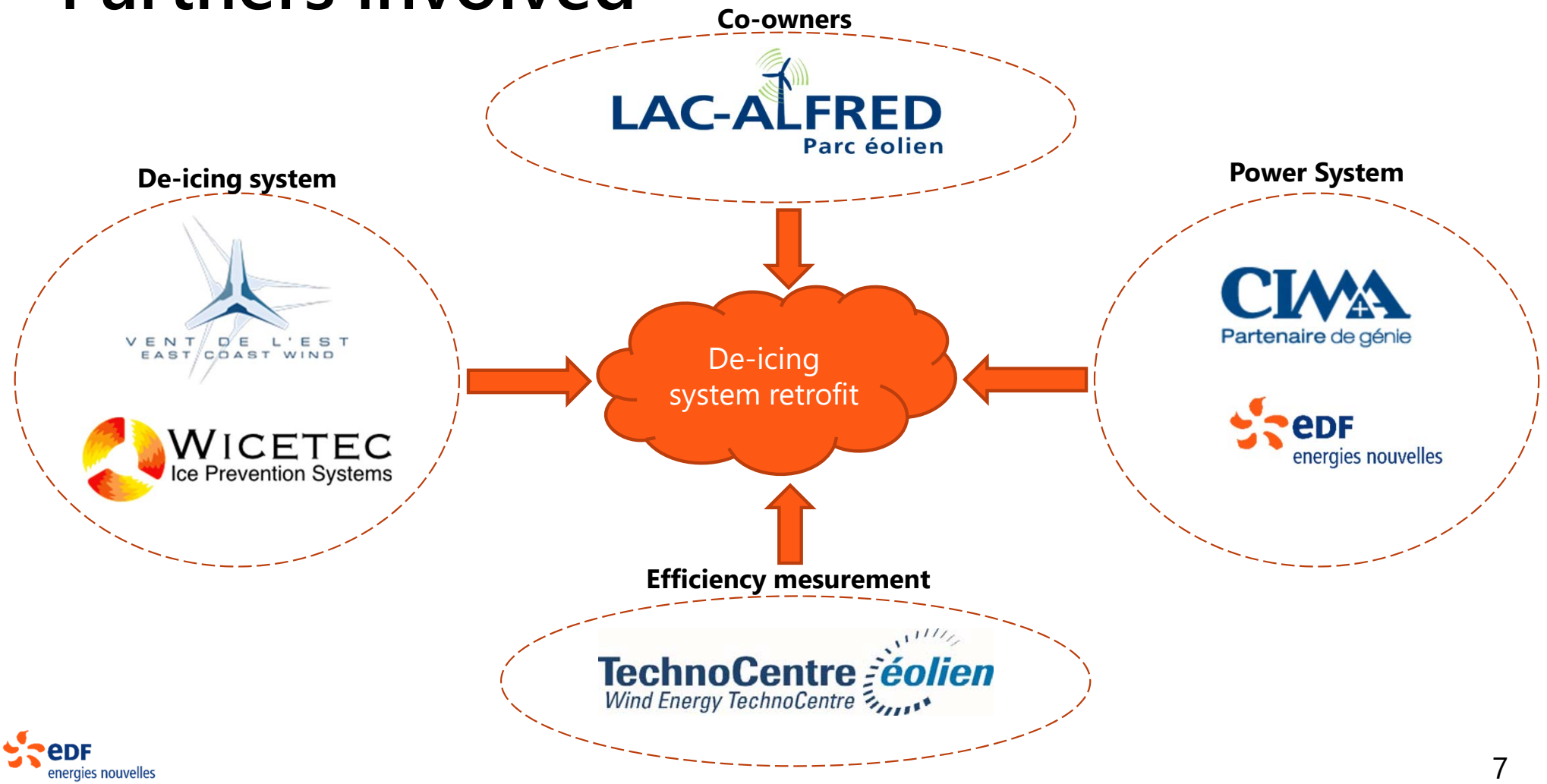
- Increase power available in the hub
- New slip ring and cables



## Blades

- Cables and connectors
- Carbon heating mats

# Partners involved



Lift down and transportation to facility

Blade preparation

Cables and heating mat installation

Refinish the blades

Test the system at the plant

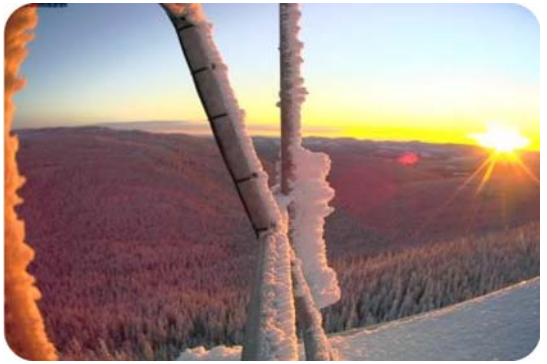

Sensors and cameras

Relifting the blades


Commissioning

# Study performed

- Tests on two (2) turbines with three (3) reference turbines
- Most heavy icing conditions
- Study conducted from December to May 2017
- Installation of hub and nacelle cameras



# Data Analysis

- SCADA results

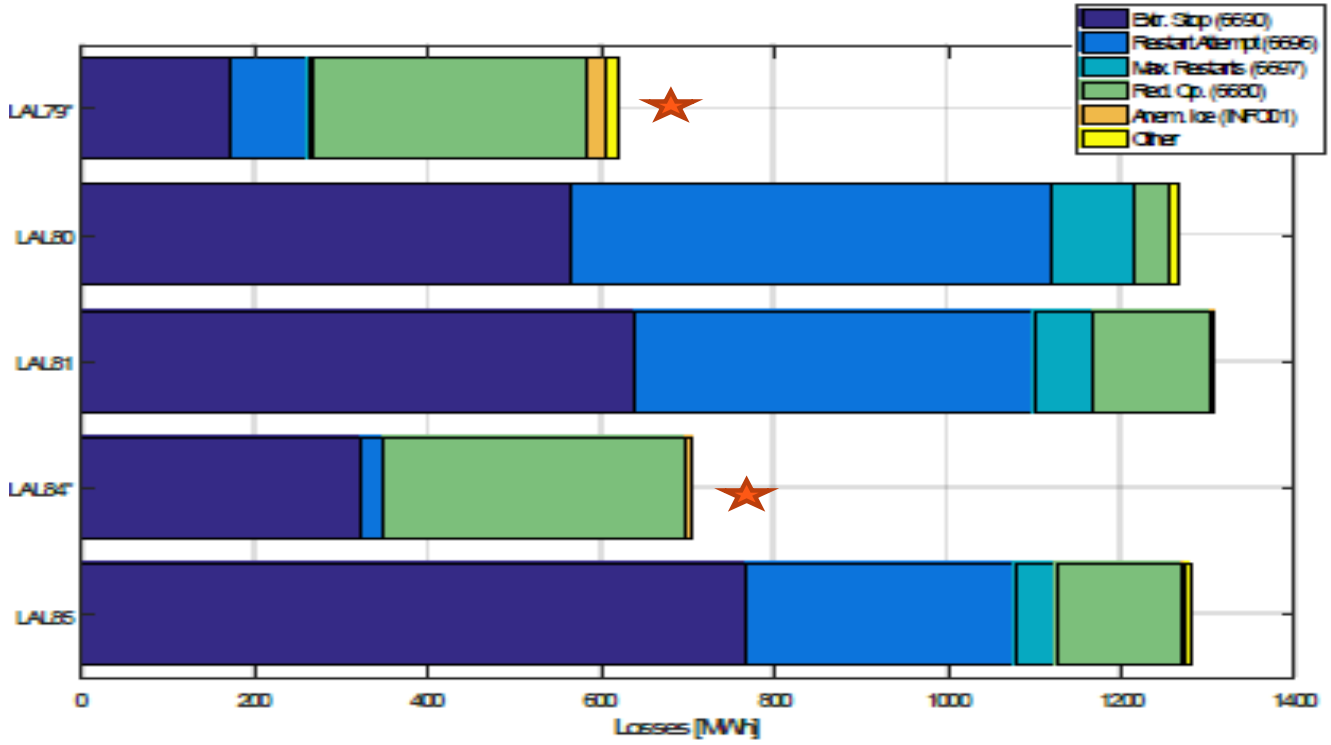
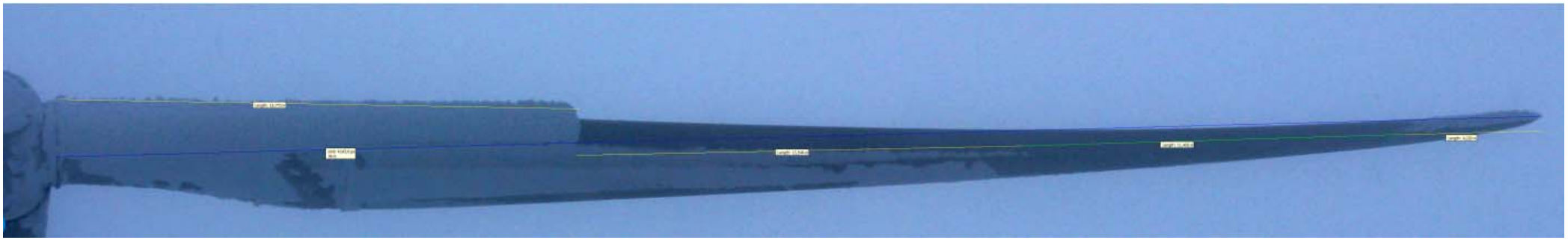



**Figure 4: Loss breakdown by status code – reference period (* = WIPS turbine)**

# Results and learnings

- Initial start-up worked perfectly, sheding ice within minutes.
- Difficult and complex path due to the number of partners and innovations required
- Some turbine and WIPS availability issues at first, normal « growing pains ».
- Some interference between the WIPS and the turbine controls indicates room for improvments
- Need to optimise position of heating mats and demonstrate safety towards lightning risks.
- Very important to get certified UL/CSA components.



# Thanks for listening!

- Thanks to all our partners!
  - Petteri Antikainen -Wicetec
  - Tomas Wallenius – Wicetec
  - Steven Fugère – East Coast Wind
  - Kristopher Maurice – EastCoast Wind
  - Gaetan Minville – EDF RS
  - Matthew Wadham-Gagnon – TechnoCentre éolien
  - Charles Gaudreau – TechnoCentre éolien
  - Francis Chartrand - EDF EN
  - Sébastien Goupil-Dumont – EDF EN
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