
# Welcome to the IEA Task 19 Workshop!

Workshop on Performance Warranty Guidelines

for Wind Turbines in Icing Climates

3th February 2019, Åre – Sweden

Hosted by:
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IEA Wind Task 19 members

# Agenda

14:00 Welcome!

14:15 About Task 19

14:20 Background

14:30 Warranty basics

**15:00 Coffee Break** 

15:15 Workshop

- Workshop Intro
  - Block 1
  - Block 2
  - Block 3

17:30 Short break

17:35 Wrap-up

**Total duration: 4 h (14:00-18:00)**

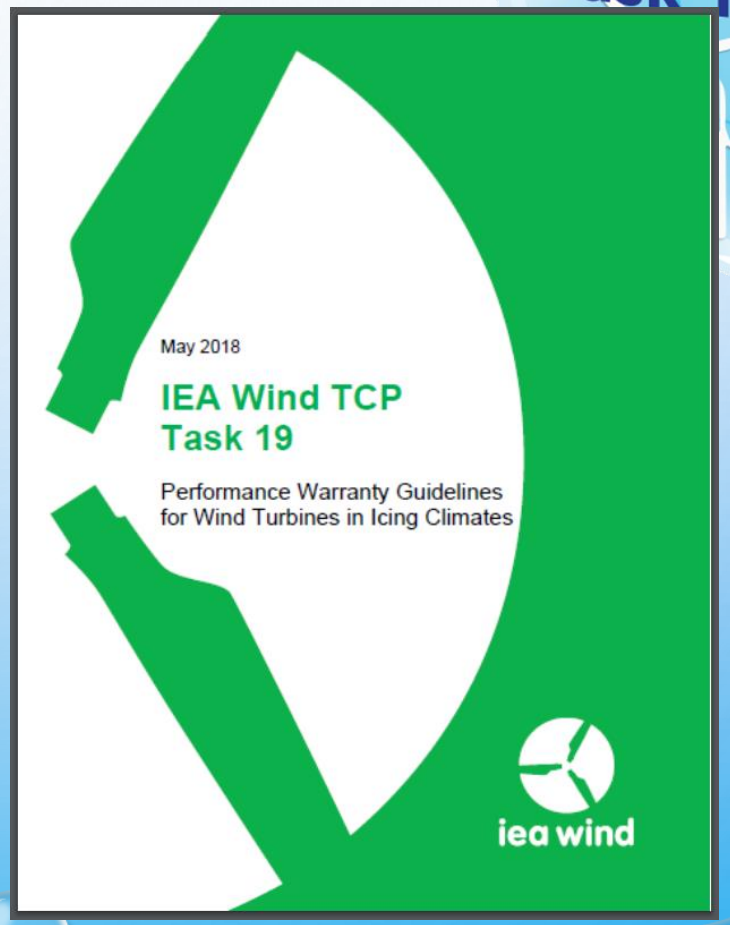
# ABOUT TASK 19

# IEA Wind Task 19
# Wind energy in cold climates

- Task 19 – Wind Energy in Cold Climates – expert group
- Mission: *Enable large scale deployment of cold climate wind power in a safe and economically feasible manner*
- Working group for
  - International research collaboration
  - Acquaring information on the cold climate wind energy topic
  - Writing recommendations
  - Disseminating information
- Task worked since 2002
- Current term 2019-2021
- https://community.ieawind.org/task19/home

# Warranty Guidelines deliverable

- The 1st version of the warranty guidelines was released in May 2018
- 2nd version will be published Q4 2020
- The results from the workshop will be used in the updated 2nd version
  - More experience
  - More details



# BACKGROUND

# The challenge: Icing

# Benefits of a warranty

Task 19 wants to enable the wind industry to **develop wind projects in Cold Climates at a reduced risk**

The  principle objective of a warranty is to ensure that there is **liability coverage** if a turbine do not meet the stated performance.

Benefits of a performance warranty for turbines in icing climate:

- Decrease uncertainties in investments in cold climate sites
- Increased understanding of the performance and limitations
- Increased incentive to ”optimize” the IPS and turbine operations

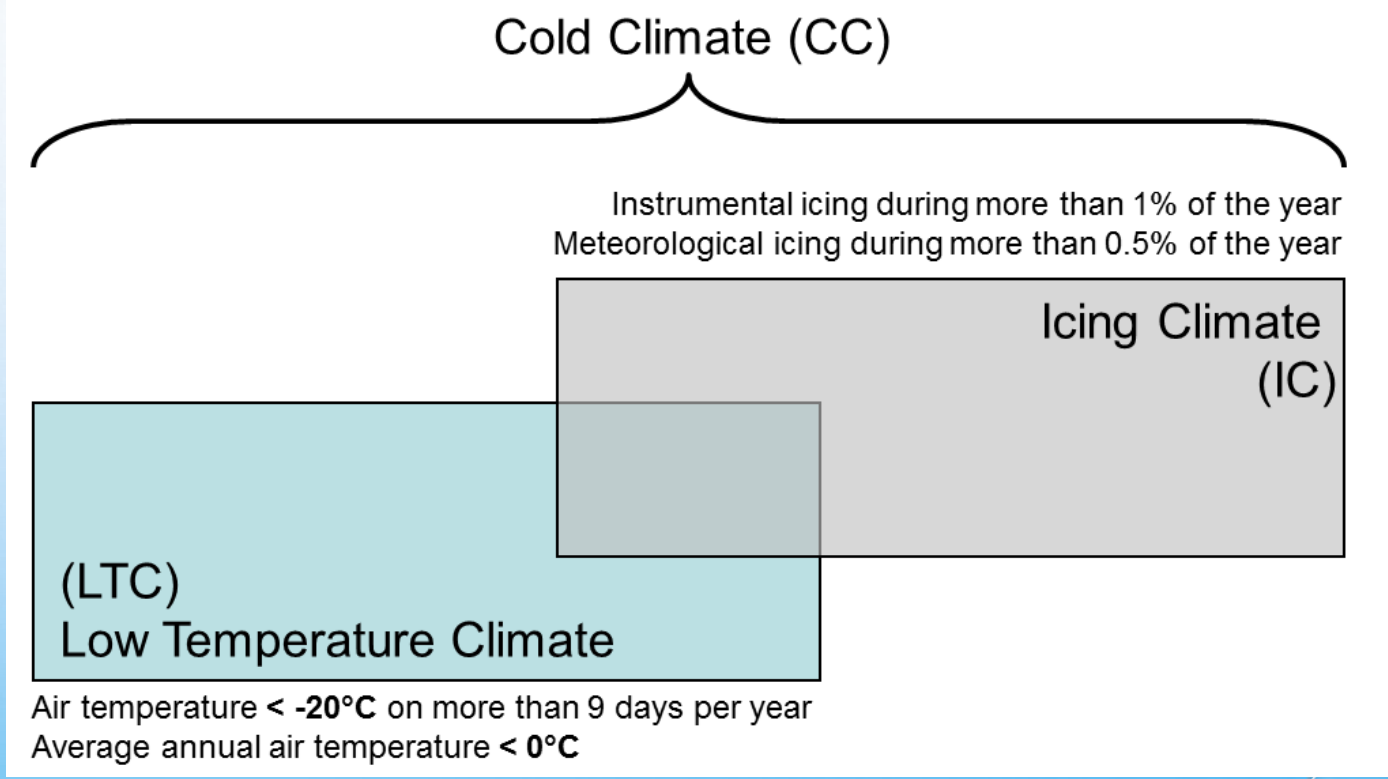
# The Workshop Objectives

- To establish a common language for Wind Turbines in Icing Climate
- To establish an outline for Performance Warranties
- To discuss Test Methods for Performance Warranties in Icing Climate and move towards fewer and standardized warranty options and test methods
- To discuss benefit of having a warranty in pre-construction energy and risk assessments
- To share experiences on both icing and ice mitigations
- To align Cold Climate industry expectations on the above

# WARRANTY BASICS

# Cold Climate Wind Turbine Definitions

- A **Cold Climate wind turbine** has design adaptations to withstand **Low Temperature Climate** and **Icing Climate**



# Cold Climate wind turbine

LTC turbine adaptations

IC turbine adaptations

Focus area for the performance warranty

Ice Protection System (IPS)

Turbine operational strategy

| Ice Protection Technology (IPT) | IPS operational strategy | Ice detection | Other auxiliary equipment |
|---|---|---|---|
| i) Hot air heating systems | i) De-icing | Nacelle based | |
| ii) Electro-thermal convectional heating elements | ii) Anti-icing | Rotor based | |
| Combination of i) and ii) | Hybrid of i) and ii) | | |

# Performance Warranty Outline

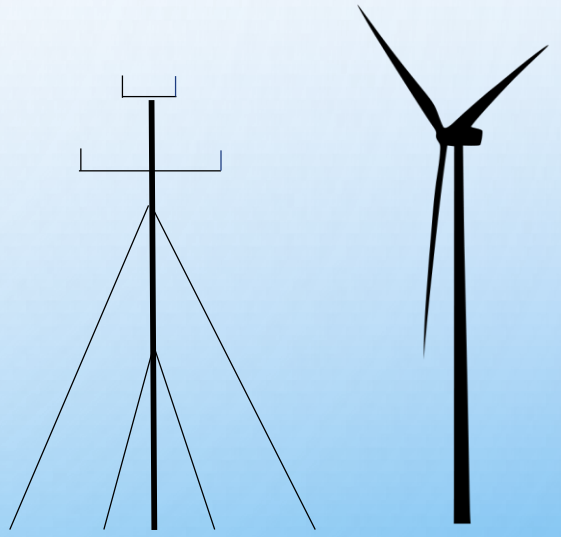
- Performance criteria
- Operational Envelope
- Test method
  - For following up if the Performance criteria is met within the Operational envelope
- Consequences
  - Based on if the test passed/failed the performance critera of the tests

# Turbine Performance Warranty Test Options

1. Power Performance Test
2. Side-by-Side Comparision Test
3. Turbine Self-Comparison Test

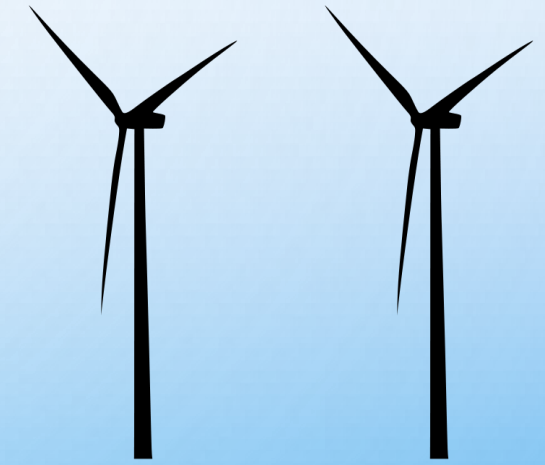
# Power Performance Test

- Use of Power Performance mast and test turbine to identify loss of production due to ice.
- Pros: IEC standards base. Remote sensing could be used?
- Cons: High Cost for masts. Anemometers are not 100% functioning and ice free



# Side-by-Side Comparision Test

- Comparison of two turbines standing side by side, one with active IPS and one without.
- Pros: Direct measure of effectivness
- Cons: Comparable and representative location, cost for lost production

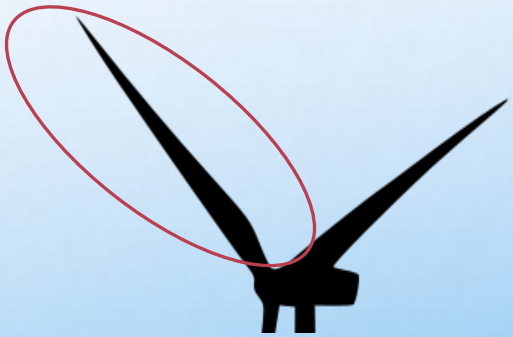


# Turbine Self-Comparison Test

- Comparison of turbine Summer vs Winter PC
- Pros: Simple Setup
- Cons: Seasonal variations may affect results

# IPS System Performance,
## ”TIME TO DE-ICE”

- Requirements/criteria & method of evaluation related to the efficiency of the IPS system only.
- ”Time to de-Ice”
- Pros: Simple-ish.
- Cons: Only considers IPS performance, measurements may be challenging, de-icing..



# Risk sharing

- What is a reasonable level of risk sharing?
- Manufacturers have more knowledge of their systems
- Developers/Consultants should have more knowledge of the site
- Optimum is to work together to minimise risk and maximise production

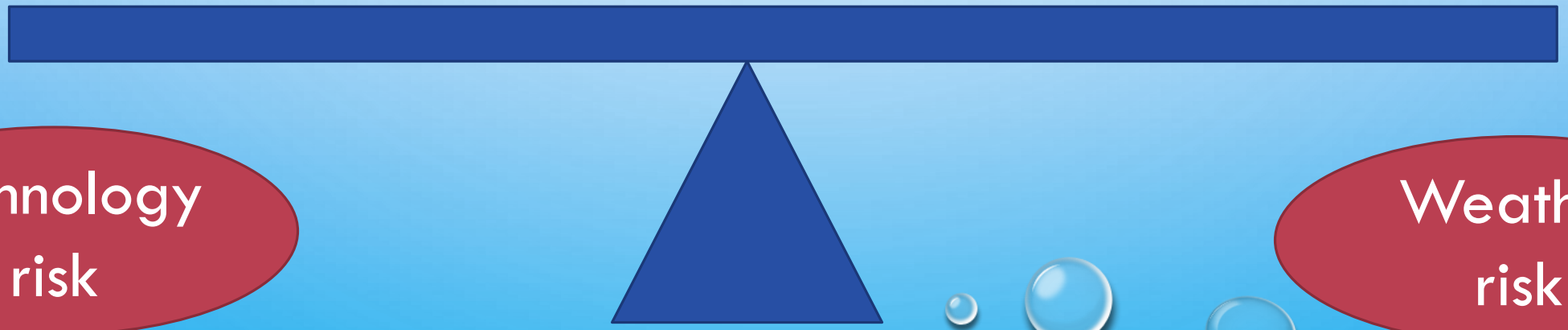
# Idea of task 19 Guarantee guidelines (1st ed)

We all want turbines to perform as expected in icing conditions

Turbine manufacturer risk

GOAL:
Fair risk 50/50

Developer or financier risk



Technology risk

Weather risk

# WORKSHOP

# Workshop intro

The task is to develop a warranty for a wind farm in three steps!

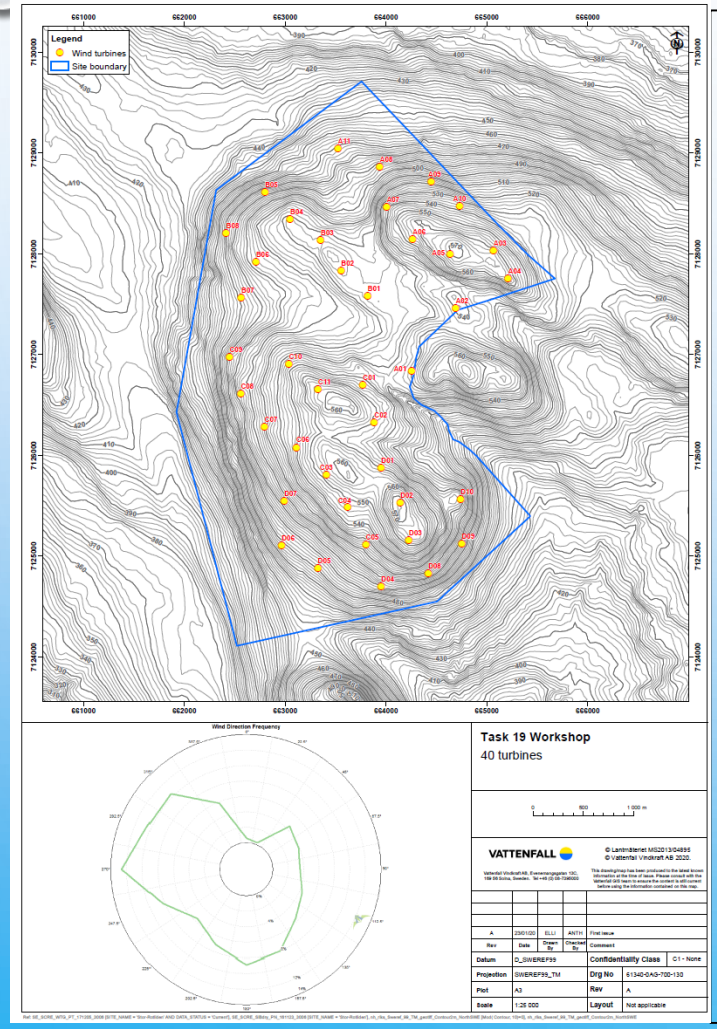
You will be divide into 5 group, each group will have it’s own wind farm/test case

The work will be dived into three working blocks (30 min thinking+10 min sharing)

- Block 1 – Choice of test method and test turbines
- Block 2 – Defining valid data and test conditions
- Block 3 – Look at different perspectives

Please note down your conclusions on paper!

# Test cases




Site info*

- Hub height: 95m
- Rotor diameter: 90m
- Tip height: 140m
- Ice class: 3
- Region: Nordics
- IPS operational strategy: hybrid (anti/de-cing)

- Existing site with **no IPS**, want to install **retrofit**
  - 40 turbines (Group 1)
  - 4 turbines (Group 2)
  - 8 turbines (Group 3)
- New site with **OEM IPS** on all turbines
  - 40 turbines (Group 4)
  - 4 turbines (Group 5)
  - 8 turbines (Group 6)

* Fictitious test case info

# Introductions

- Your name
- Your company and position
- Icing experience

# Block 1

30 min thinking+10 min sharing by Group 1 and 5

**Choice of test method and test turbines**

- Describe the practicalities of your test method!
- Which test method do you choose and why? Pros, Cons?
- What data do you need to collect in the test? Do you need to install additional instrumentation (met mast/remote sensing/sensors on the turbine etc)? What and where?
- What are your Performance Criteria (pass/fail criteria)? How is it calculated? How well does it represent the performance of your turbine?
- Which turbine(s) will be tested and why? On what basis do you select them? How well do they represent your wind farm?

# Block 2

30 min thinking+10 min sharing by group 2 and 6

## Define valid data and test conditions

- What is your Operational Envelope? How do you define it? How well does your envelope represent your conditions of the site?
- How do you filter the data? Under which conditions are data valid?
- What conditions needs to be met to consider the test valid?
- When is the test considered complete? How long does the test need to be? When do you have enough data?
- Are there any circumstances that would make the test not valid?
- Do you need any data before starting the test (for example to base your reference curve on if Task 19 ice loss method is used), how do you get/ choose that data?

# Block 3

20 min thinking+ 10 min notes + 10 min sharing by group 3 and 4

**Look at different perspectives**

- What would an owner/OEM/investor think is important in this warranty?
- Are there any regional differences?
- Where do you need to compromise?
- How is the risk shared?
- Who pays for what?
- What are reasonable consequences for a failed test? Retesting?

# Workshop Wrap-up

- Workshop follow up email from Task 19
  - Did you find the workshop relevant?
  - Was there a questions/elements that we missed?
- Volunteers for draft review
  - During spring/summer 2020
  - Your involvment: Comments and edits **Requires time!!**
- Email Helena.Wickman@vattenfall .com