WIND POWER

RESEARCH & INNOVATION

WINTERWIND 2019

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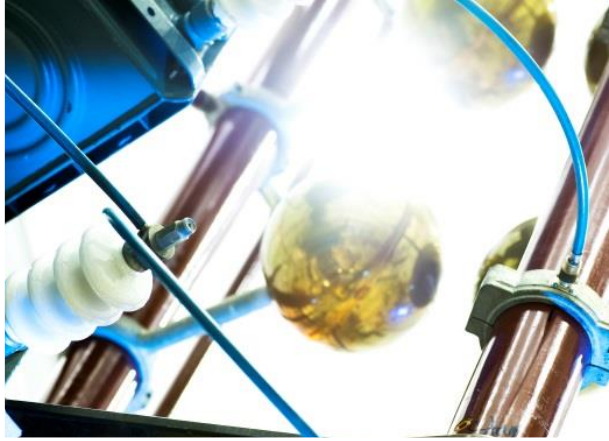
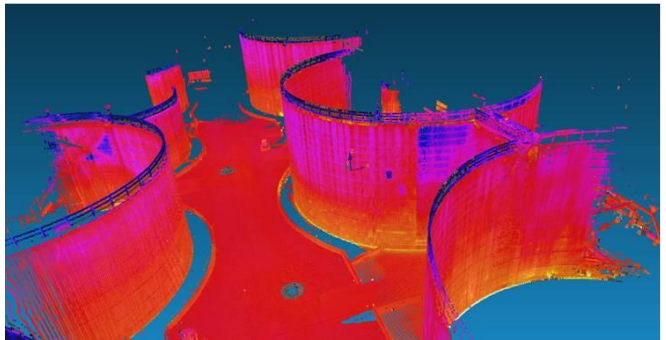
Research Institutes of Sweden

Renewable Energy
Wind Power





About the speaker

Name: Martin de Maré

- Feb 2018 – present: Senior Research Scientist at **RISE**
- Feb 2013 – Jan 2018: As Wind Energy Analyst at **Ørsted** (formerly known as DONG Energy) I performed yield calculations and layout optimizations of planned wind farms.
- Sep 2010 – Sep 2015: Industrial PhD at Risø **DTU**, while being an employee of first Vestas Wind Systems A/S and, as of February 2013, DONG Energy A/S.
- Aug 2007 – Sep 2010: As Power Performance and Loads Engineer at **Vestas** Wind Systems A/S I organized measurement campaigns on prototype turbines, mainly for the purpose of verification and turbine certification.

Cold Climate Test Centre

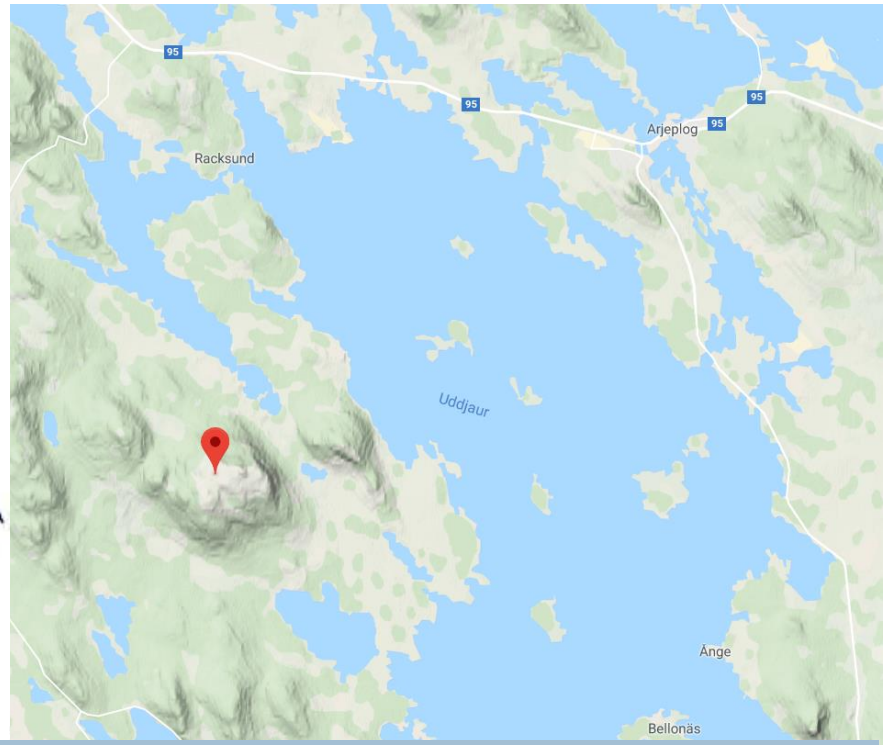
Full scale test and validation
for the wind industry

www.coldclimatetest.com

The Cold Climate Test Centre consortium

- **RISE** – the largest research institute in Sweden specialising in energy technology, material properties and safety, focusing on research, test and validation services to a variety of industries.
- **Skellefteå Kraft** – a regional developer and power utility operating more than 100 wind turbines, all in cold climate conditions, producing almost 1 TWh wind power per year.
- **Swedish Wind Power Technology Centre (SWPTC)** – a research centre formed by the technical universities of Chalmers and Luleå.
- **Vindkraftcentrum** – an organisation in the northern part of Sweden who promotes the establishment of wind power.
- **Vinnova** – the Swedish national research funding agency for innovation and sustainable growth.
- **Vattenfall** – a utility company producing 6 TWh wind power per year, operating more than 1 000 wind turbines from the cold Nordic to places further south in Europe.
- **ECN (Energy Research Centre of The Netherlands)** – the energy research institute in the Netherlands.

Uljabuouda wind farm, 15 km southwest of Arjeplog



Uljabuouda wind farm owned by Skellefteå Kraft

Temperature:
> 730 h -10 °C
> 30 h - 20 °C

Wind Speed:
7.6 m/s at 60 m (measured)
8.4 m/s at 120 m (WAsP esti.)

Icing:
> 500 h minimum of 10 g/h/m

Example layout

Typical testing at the center

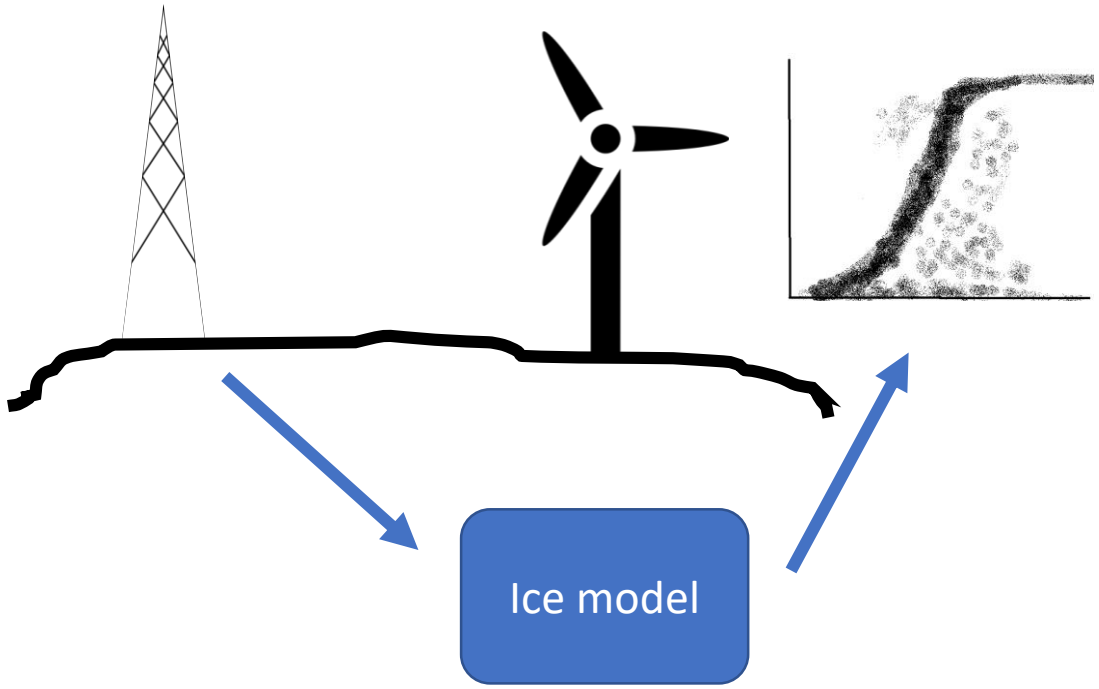
- Technology validation and demonstration

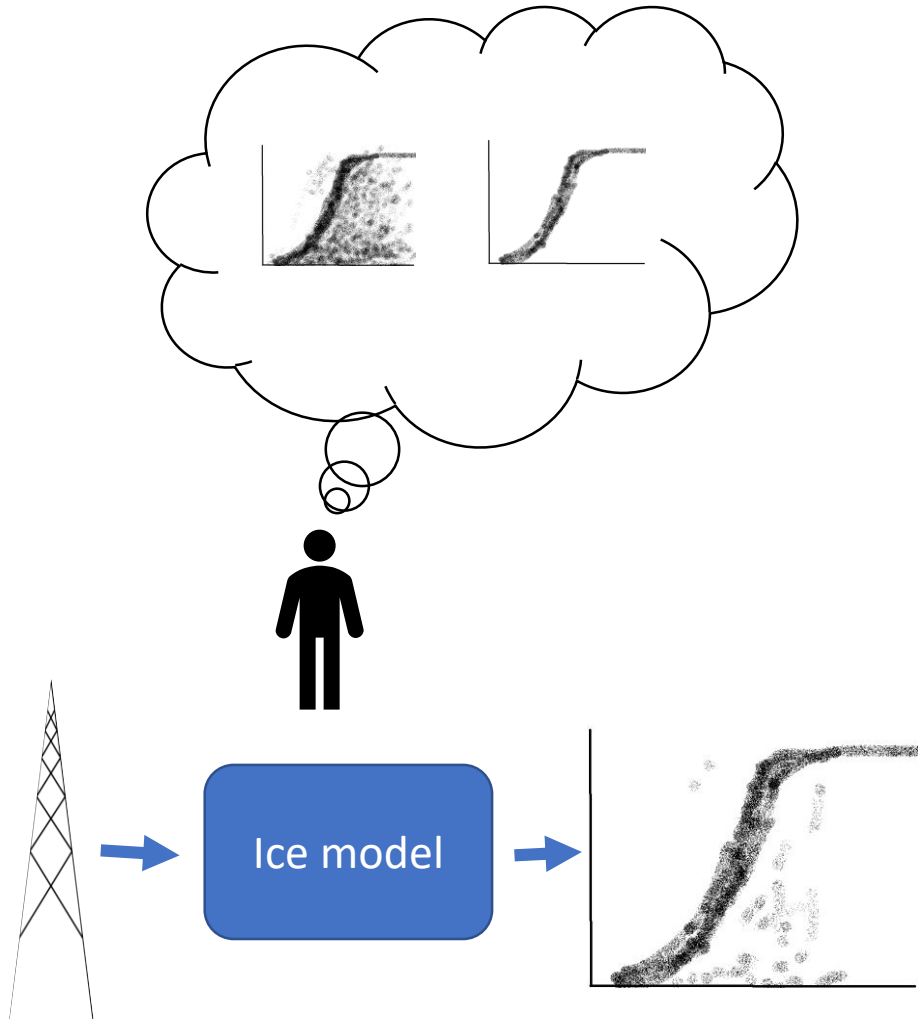
  From DNVGL-RP-0175:

  > For anti-icing and de-icing the activation cycle (start/stop parameters) need to be defined. It should be shown by in field tests covering at least two winter seasons that the anti-icing or de-icing system is functional in certain limits (e.g. min/max ambient temp, atmospheric pressure, ice thickness, pre-conditions like heating etc.).

- Evaluate technology early in the development cycle
- Certification testing
- …

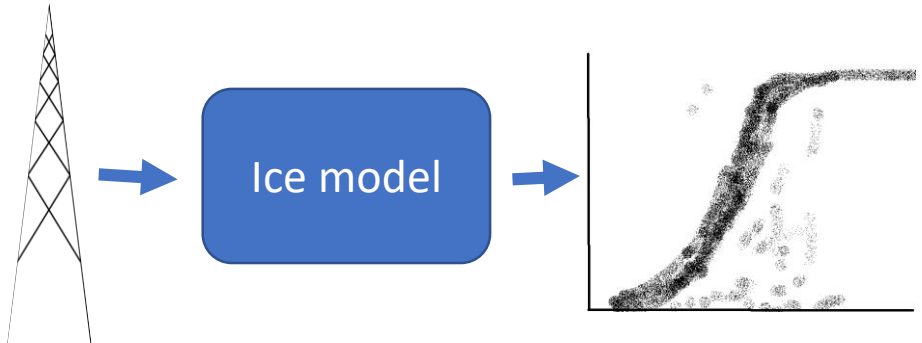
Cold Climates (with an s)





Ice model verification

- A model describing how the WTG responds to relevant conditions (e.g. wind speed, temperature, meteorological icing, droplet size) is developed
- The model is verified for a range conditions that are likely to occur during field tests.
- The model can be used to
  - evaluate the impact of icing for a site specific climate/time series
  - evaluate cases that are hard to validate in the field
- In terms of standardization, the following could for example be standardized:
  - Which measurements should be included in the verification time series and what operational situations should minimally be covered.
  - How should the uncertainty of the ice model be assessed
  - Define standard climates / time series



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- Evaluate concepts early in the development cycle
- Certification testing
- Ice model verification
- Sensor testing
- Testing new materials and coatings
- …

Uljabuouda

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Get in touch!

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Courtesy of Blade Solutions

THANK YOU

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