HEALTH & SAFETY BEST PRACTICES FOR WIND FARM O&M IN COLD CLIMATE

An Overview of the Complete Document

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CANADIAN WIND ENERGY ASSOCIATION | ASSOCIATION CANADIENNE DE L'ÉNERGIE ÉOLIENNE

WinterWind 2018
Are, Sweden

Canadian Wind Industry Preoccupations

Picture from East Coast Wind

- Access to turbine
  - Risk of ice shed
  - Increased down time
  - Significant monetary losses
- Worker safety
  - Risk assessment procedures
  - Cold related injuries
- Lack of consensus on best practices

CANWEA O&M Mission

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O&M Caucus

"*Bring together stakeholders to address key challenges facing Canadian wind farm operators*"

Operational Health and Safety sub-committees

Confined Space
Fall Arrest PPE
Suspension Trauma
Icing and Cold Climate

Acknowledgments

O&M Caucus
Cold Climate Health and Safety Sub-committee

Phil McKay, CanWEA

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Brock John, AltaGas

Don Hallam, AltaGas

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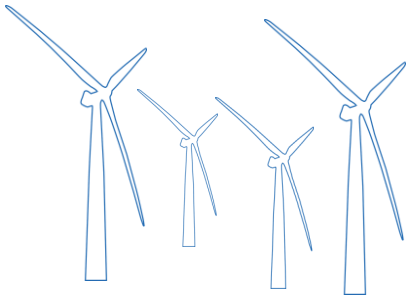
Kevin Bernier, engie

Best Practices Document



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Cold Climate H&S Subcommittee

Mandate

TechnoCentre éolien
Wind Energy TechnoCentre

Revisions

Best Practices for Cold Climate Health & Safety

Content

Best Practices for Cold Climate Health & Safety

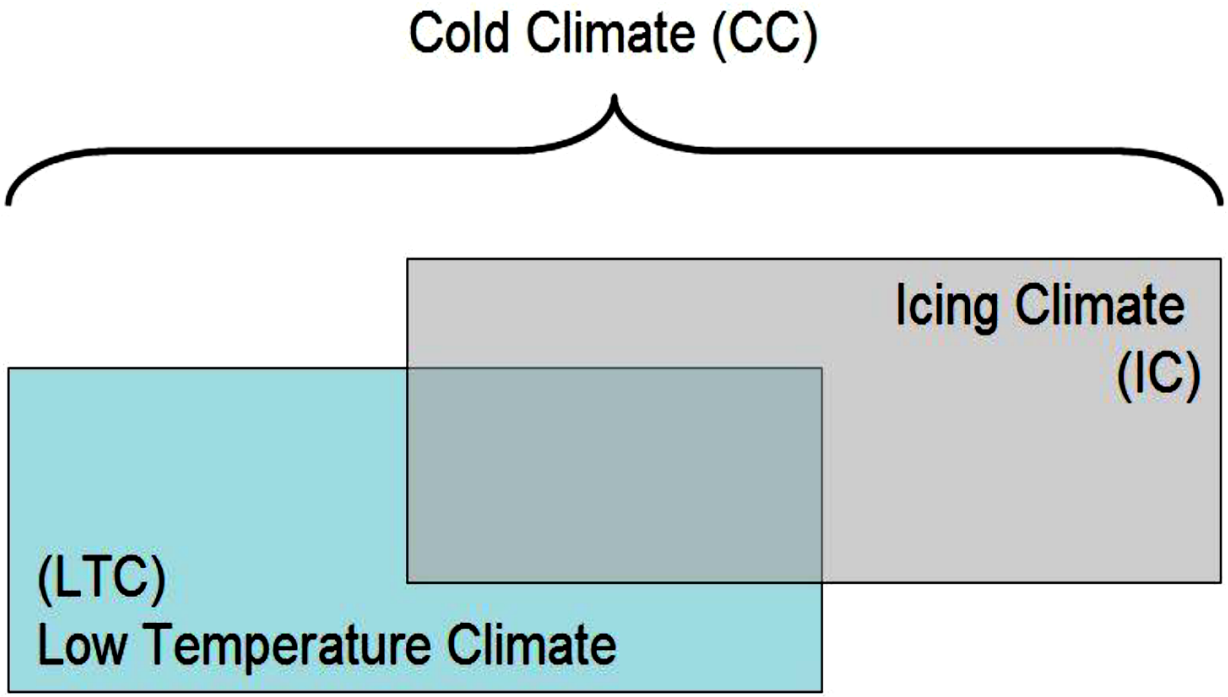
- 34 pages
- Content
  - Definitions
  - Physical Conditions
  - Hazards Definitions
  - Best Practices
  - Best Practices Decision Tree
- Available freely on the web:
  - http://bit.ly/2BAlH0y

Definitions & Physical Conditions

- Define a common language for the industry

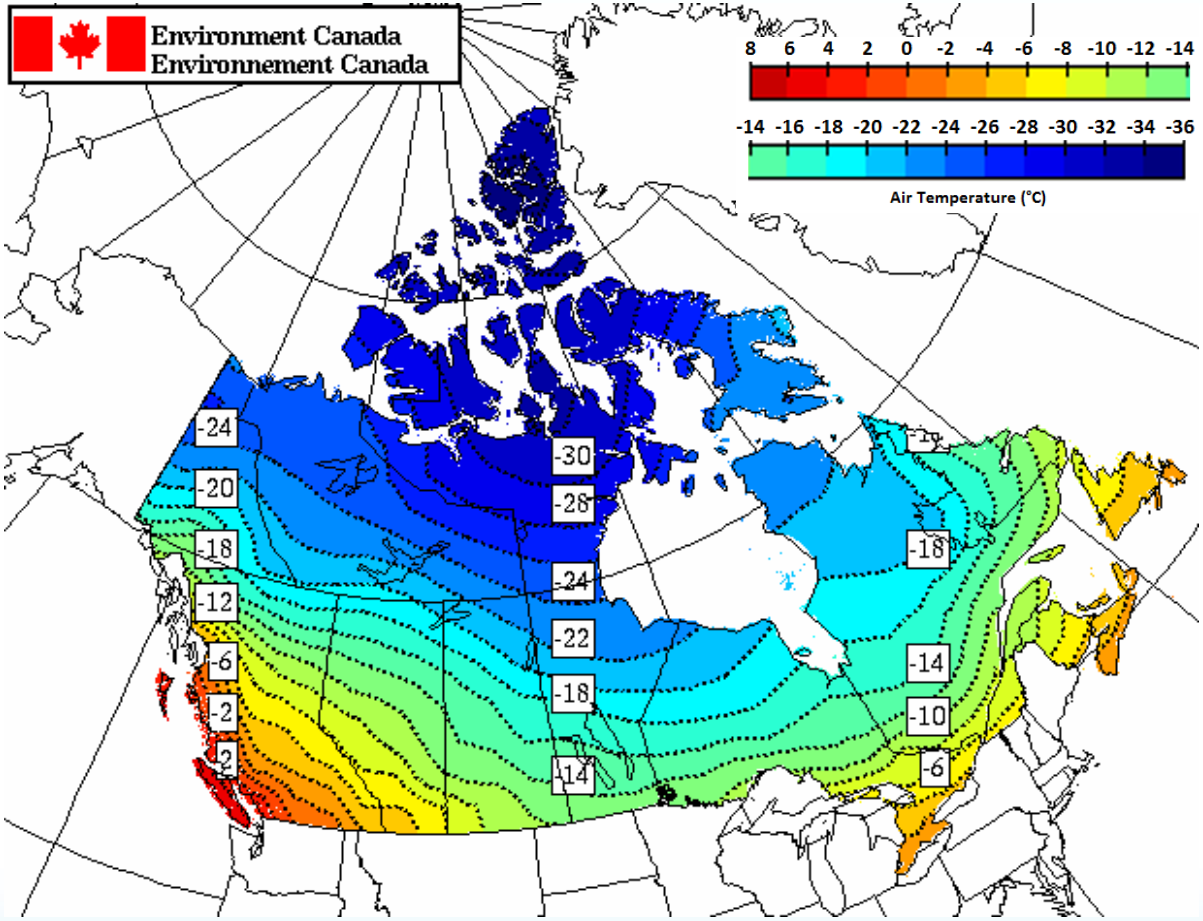
- Cold Climate
- Low Temperature & Icing Climates
- Instrumental & Meteorological Icing
- Temperature ratings
- Snow vehicles
- Ice Protections devices

Cold Climate



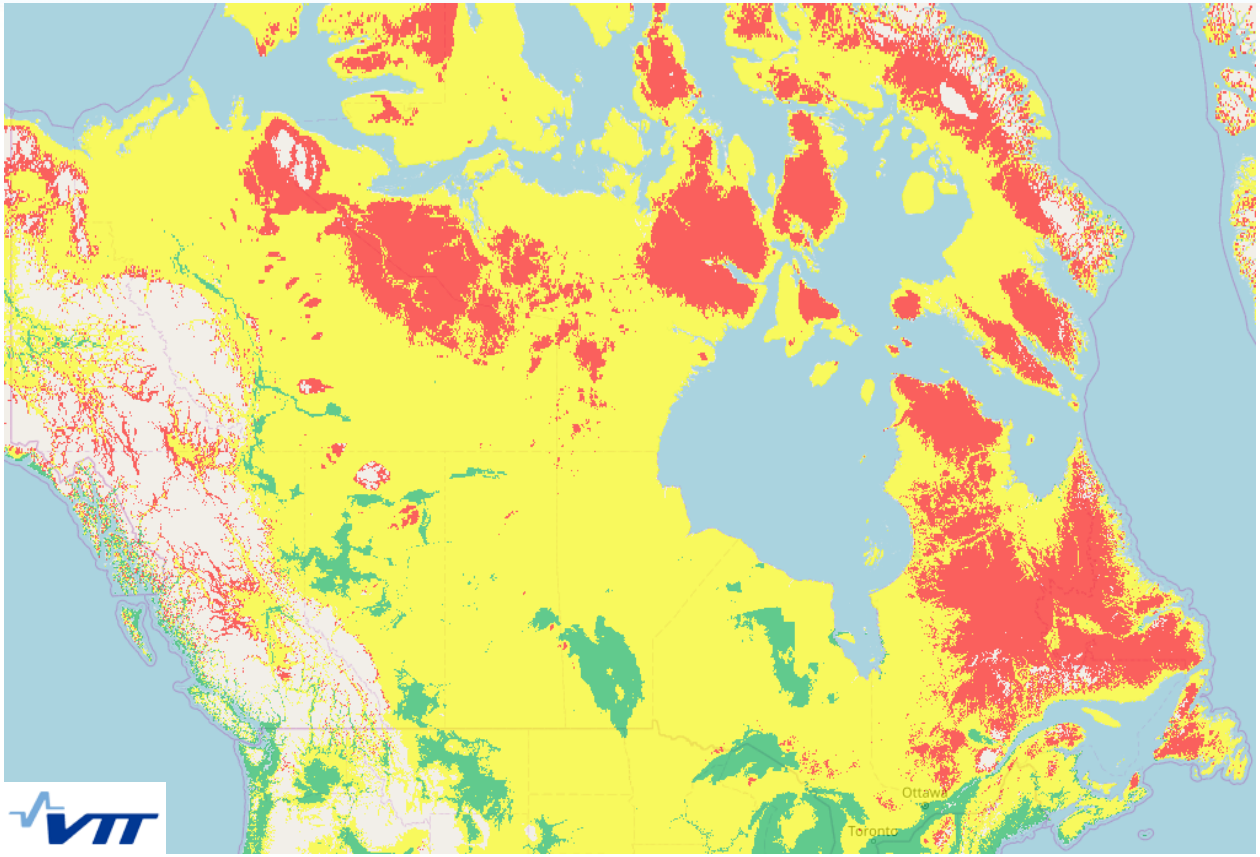
Picture from IEA Wind Task 19

Low temperatures



Picture from Environment Canada : Average air temperature dec-feb [1981-2010]

Icing



IEA Ice Class	1	2	3	4	5
Corresponding Colour					

Picture from VTT Technical Research Center of Finland Ltd

Equipment Temperature Rating

Equipment	Description / Model	Min Temp. Rating
Safety Helmet	PETZL Vertex Best	- 30°C
Harnesses	Skylotech harness G0051	- 35°C
Lanyards	PETZL Landyard	- 40°C
Cell Phones	iPhone	**- 20°C**
Headlamp	PETZL Pixa (1, 2 or 3)	-30°C
Rescue kit	PETZL Jag Rescue Kit	-40°C
Service Lift	Dolphin V CE 240 and 350	-15°C

Snow Vehicles

- **Snowmobiles**
- Snowcats
- Trucks on tracks

Snow Vehicles

Picture from Cartier Énergie Éolienne

- Snowmobiles
- **Snowcats**
- Trucks on tracks

Snow Vehicles

Picture from Cartier Énergie Éolienne

- Snowmobiles
- Snowcats
- **Trucks on tracks**

Ice Protection Devices

Picture from Vestas

- Mobile Devices
- Permanent Devices

Ice Protection Devices

Picture from Surplec

- Mobile Devices
- Permanent Devices

15 Hazard Definitions

Icing and Precipitation	Low-Temperature
Ice Fall	Frostnip
Ice Throw	Frostbite
Black Ice	Hypothermia
Snow Drifts	Human Behavior
Snow-Covered Roads	Wind Chill
Snowstorms	Cold Equipment/Tools
	Mechanical Issues
	Electrical Issues
	Oil/Grease Behavior

Best practices

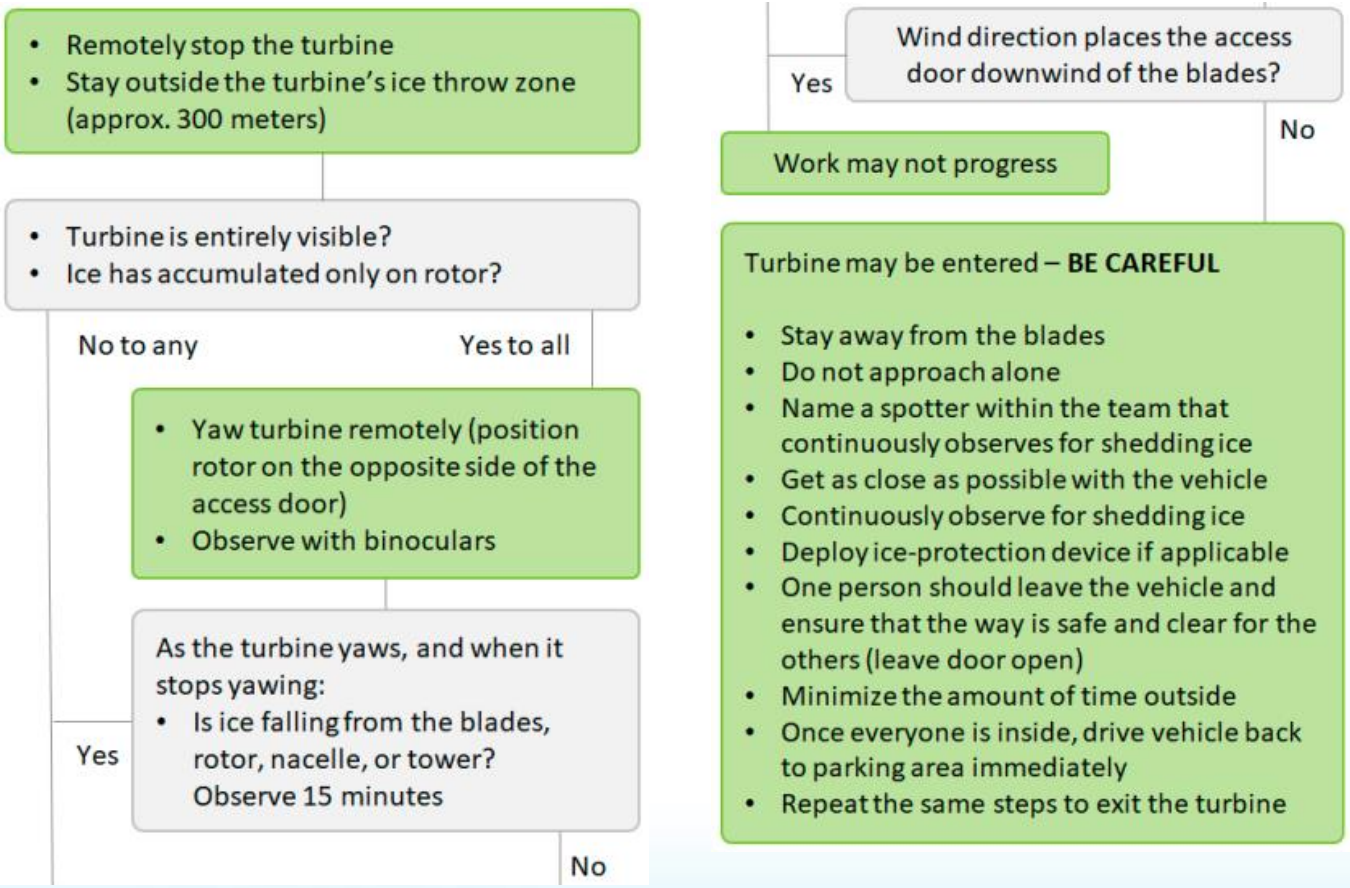
- Basic Rules of Safety
  - Employee's Rights and Responsibilities
  - Manager or Supervisor's Responsibilities
  - Employer's Responsibilities
- Risk Assessment
  - Hazard identification
  - Risk Evaluation
- Public Safety

Best practices

- Presented based on wind farm location
  - General
  - Balance of Plant
  - Transportation
  - Turbine Approach
  - Down Tower
  - Up Tower and Nacelle
  - Hub

Detailed best industry practices

Example for iced turbine approach



Example for ice fall and ice throw

Location	Related Hazards	Best Practices

Vicinity of the turbines	Ice fall and ice throw	• Evaluate the presence of ice before entering the ice throw zone
		  ○ Ice detection methods (Power deviation, double anemometry, ice detectors)
		  ○ Obtain previous meteorological conditions that might suggest that the turbine is iced (air temperature ranging from -5°C to 3°C, low cloud height, precipitation)
		  ○ Check with previous work team (logbook, calendar or equivalent)
		  ○ Watch for falling ice with binoculars
		• Document the information in a logbook, calendar or equivalent for the next work team
		• More details in the document

Conclusion

A tool to the industry for the management of health & safety in cold climate

- Consensus on the Canadian wind industry's practices
- Common definitions
- Conditions leading to cold and icing hazards
- Cold Climate hazards definition
- Best practices presented based on wind farm location
- Decision tree

Thank you !

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