

IEA Wind TCP Task 54

Task Work as Vantage Point for Standardization using the Example of Risk Assessment

Agenda

1. From best practices to guidelines and standards
2. Recommendations for Ice Fall and Ice Throw Risk Assessment
3. Standardization of Risk Assessment Procedure
4. IEC 61400-31: Siting Risk Assessment
5. Outlook



From best practices to guidelines and standards

- IEA Wind TCP Tasks are a forum for the dissemination of scientific and applied research
- Task 19 has in its course also become a forum for pushing forward common practices and terminology
- Colde climate wind power has grown in a very hands-on and fast way, practices have mostly been developed as needed
- This fast development has time and again led to issues both in commercial as well as research aspects



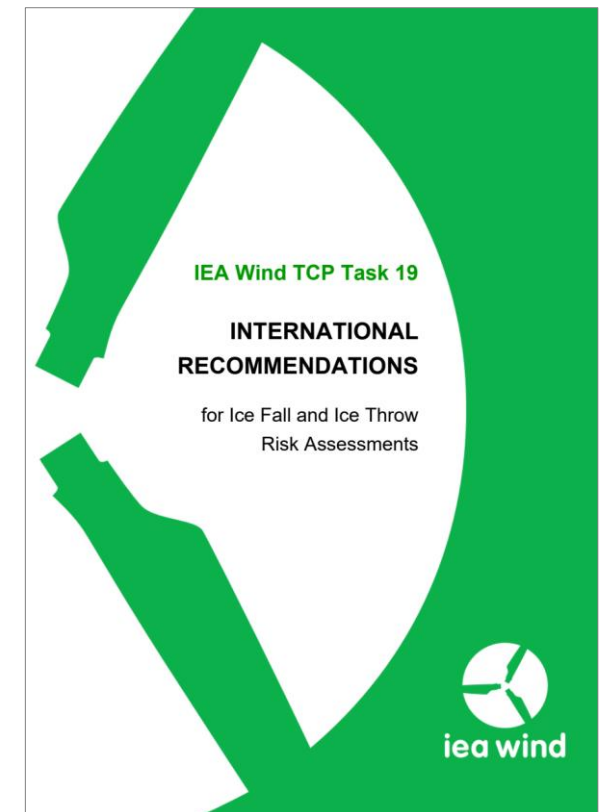
From best practices to guidelines and standards

- Commercially: Lack of standards
 - Difficulty in comparing products
- Research: Lack of common terminology
 - Difficulty in comparing results
- There was/is a clear need for some neutral body to push for standardization to solve these issues
 - Task 19 has filled and Task 54 will continue to fill this niche



Recommendations for Ice Fall and Ice Throw Risk Assessment

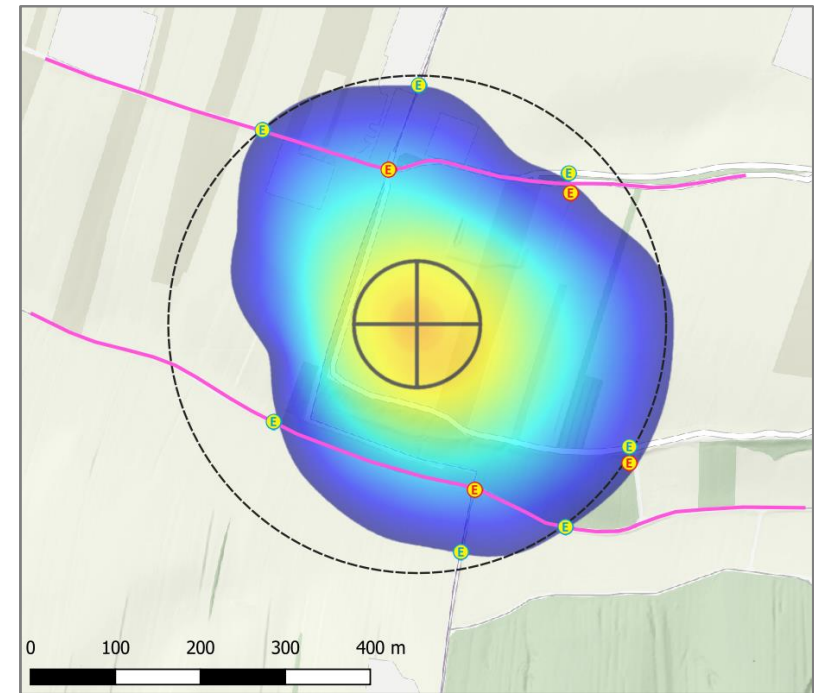
- First edition published in October 2018
- Since then widely adopted standard in wind industry
- Second edition published in September 2022
 - Effects of Ice Protection Systems and operating modes
 - Detailed discussion of background risk levels and risk acceptance criteria
- In-depth treatment of site-specific icing risks enables less excessive distance requirements
 - Opening up new opportunities



Recommendations for Ice Fall and Ice Throw Risk Assessment

Example of a site-specific ice warning plan

- Original assessment based on blue positions for signs/lamps (10^{-5} impact probability contour)
- Project owner requested re-evaluation based on fewer signs/lamps at red positions
- Re-calculation with increased usage frequencies along pink routes due to decreased warning effect
 - No exceedance of risk acceptance criteria
 - Former rule-of-thumb $1,2 * \text{tip height}$ (black circle) in most cases overly conservative



Standardization of Risk Assessment Procedure

- The societal need for an extensive increase of energy generation from wind requires development of project locations ever nearer to residential and industrial areas as well as public infrastructure
- Increased and complex efforts for manufacturers and project developers to comply with differing national and local stipulations regarding risk assessment
- Up to date there is neither a generally accepted state-of-the-art for risk analysis and evaluation nor a legal framework regulating liability etc.



Source: Google Streetview

Standardization of Risk Assessment Procedure

- Missing standardization leads to
 - Undefined, unquantified and unassessed risks
 - Potentially conservative (rule-of-thumb) risk assessments excluding potential project locations
 - Nationally/locally differing risk assessments for comparable project locations
- General trend in ISO/IEC standardization to include risk assessment procedure into the respective series of standards
 - IEC 61400 Wind Energy Generation Systems



IEC 61400-31: Siting Risk Assessment

- Technical specification on assessing the risk of harm to the general public due to hazards occurring in the operation of a wind turbine
- Covers hazards from wind turbines due to:
 - Ice pieces falling / being thrown
 - Structural damage (tower collapse, blade throw etc.)
 - Fire spreading from the wind turbine
- Direct and indirect harms included
- No differentiation with regard to internal or external causes (technical failures, human error, extreme wind conditions, ...)



IEC 61400-31: Siting Risk Assessment

- Scope does not include:
 - Risks during construction, crane operations or decommissioning
 - Risks to infrastructure or other objects
 - Risks connected to terrorist attacks or malicious actions
 - Risks related to aviation
 - Occupational risks
- 24 Participants from 13 countries started work in 2021, Energiewerkstatt Verein represents Austria in the committee
- Publication expected for 2023



Outlook

- Besides risk-related topics, T19/T54 also focusses on cold climate technology/development, societal as well as market-related aspects
- Recent publications available on:
 - Ice detection systems (IDS)
 - Ice protection systems (IPS)
 - Testing of ice-phobic coatings
- Work of the ongoing term focusses on i.a.:
 - Icing wind tunnel testing
 - Operational/performance envelopes of IPSs
 - Impact of icing on electricity markets/grid operation



Thanks for your attention!

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