Overview of Atmospheric Icing of Power Networks: State of our Knowledge and Future Challenges

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In many parts of the world, overhead power lines and outdoor substations are affected by atmospheric icing, sometimes causing serious failures and damage with major socioeconomic consequences. The disruptive effects of icing are mainly the result of the accumulation of large amounts of ice or snow, and the subsequent jumping of cables and conductors as the accumulations shed. Other potential sources of failure are dynamic phenomena such as galloping and bundle rolling, or electrical faults like flashovers across insulators or between phase conductors and the ground or ground wires.

Major icing events in the last decades sparked sustained and substantial research and development projects in several countries, many in collaboration with academia and industry. Above all, this resulted in considerable advancement of knowledge in many areas of atmospheric icing, bringing innovation and improvement to overhead power network design, including construction and operation.

With the involvement of several international institutions such as CIGRÉ, EIC, IEEE and ISO, as well as national organizations responsible for the design of overhead power lines, considerable efforts have been deployed to improve standards for better handling of atmospheric icing events.

Recent and severe ice storms in the USA and Europe show that, in spite progress made, the knowledge base on this complex and unpredictable phenomenon is still lacking. All the more when considering the increase in extreme meteorological events likely caused by climate change. Further, continuous increase in energy consumption and the need for upgrading existing networks, and constructing more reliable transmission lines, call for innovative solutions to icing issues.

In response to an invitation from the organizers of the joint COST / IWAIS 2009 Workshop on Atmospheric Icing of Structures, this keynote address aims to describe the present state of knowledge and practices relative to atmospheric icing of power networks, and give an overview of expected progress for the future.