Strengthening energy networks to withstand severe wind and storms

Natural Hazards Research Australia

RESEARCH TEAM

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SUPPORTING ORGANISATIONS

Energy Networks Australia (ENA)

Project duration: 18 months

Background

A common goal among all energy network service providers (NSPs) is the continued ability to provide safe and reliable electricity to their customers and communities. To achieve this effectively, electricity networks must understand the risks facing their assets, particularly that of natural hazards, so that they can be managed appropriately. Extreme weather, in particular severe wind and storm events, represents an increasing threat to electricity network resilience with the potential to catastrophically damage electricity infrastructure, causing reliability-based impacts, or power supply disruptions, to customers and the wider community. While historic experience gives NSPs some guidance on the wind and storm risk their networks are exposed to, the changing nature of weather extremes experienced over the recent past and moving into the future makes accurate quantification of this risk difficult. To ensure reliable electricity supply across both the nation's distribution and transmission networks, a thorough analysis of wind and storm hazard and risk to these networks is necessary. This project will undertake this analysis for parts of the Australian electricity network and provide the framework and tools for NSPs to assess their current and future networks under current and future climatic conditions.

Project description

This project aims to:

1. determine the types of severe wind and storm events that cause damage to the national electricity transmission and distribution networks and build an understanding of why this damage occurs
2. consistently analyse the present climate wind hazard to which transmission and distribution networks are exposed to
3. analyse how key climatic variables important for assessing wind risk to electricity networks, including frequency, intensity and directionality of extreme winds may change under future climate scenarios
4. develop a computational tool that network service providers can use to assess wind risk to their existing and future networks under current and future climate scenarios.

Storm types will be identified by linking past network outages with severe weather data. Current wind climate will be analysed using existing approaches developed by the research team utilising long-term weather station observations and network geometries. Future climate hazards will be extrapolated using similar techniques but will utilise climate projection data.

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Intended outcomes

The intended outcome of this project is to deliver NSPs with the knowledge and tools to assess current and future climate severe wind risk to their networks. This will take the form of:

- education seminars to NSPs over the life of the project

- a database of distribution and transmission network interruptions caused by wind and storms over the last few decades

- a report detailing the codes and standards used for the design of overhead distribution and transmission lines to resist severe winds, including a discussion of their limitations

- GIS layers that quantify current and future wind hazard to regions of Australia with electricity networks

- Development of the Electricity Network Wind Risk Tool to enable NSPs to assess severe wind risk to their networks.

Translation and implementation potential

This project offers three main ways to translate research into industry practice within NSPs.

1. The generation of damage/interruption databases will provide insight into the types of severe wind events that impact electricity networks around the country. This insight will enable NSPs to better manage these interruptions.

2. The GIS wind hazard layers for current and future wind climate can be used directly by NSPs to overlay over their network maps and better understand current and future hazard exposure. This will include how the frequency and intensity of events may change and also provide insight into whether future climates will change the types of wind events a given network is exposed to.

3. The Electricity Network Wind Risk Tool will be available for NSPs to apply to their own networks and quantify current and future risk to their current and/or future networks.

Further information

For full project details head to: Strengthening energy networks to withstand severe wind and storms | Natural Hazards Research Australia

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