Australian Government
Geoscience Australia

Geoscience Australia Submission

Senate Select Committee into Resilience of Electricity Infrastructure in a Warming World

JANUARY 2017

Geoscience Australia

Geoscience Australia is Australia's pre-eminent national public sector geoscience organisation. We are the nation's trusted advisor on the geology and geography of Australia. We apply science and technology to describe and understand the Earth for the benefit of Australia.

We deliver a wide range of products that address important national challenges to assist government and the community to make informed decisions about the use of natural resources, the management of the environment, and community safety.

One of Geoscience Australia's key priorities is *Ensuring Australia's Community Safety.* The objective of the Community Safety strategy is that Australian communities are more resilient to natural hazards.

Geoscience Australia has a well-established community safety science capability with expertise and knowledge relating to natural hazards, impact and risk assessments in Australia and the Asia-Pacific region.

Geoscience Australia supports the Australian Governments disaster resilience agenda through the delivery of authoritative high quality data and information essential for hazard, impact and risk assessments.

GA is recognised as an authoritative source of hazard and risk information, applications and data for severe wind, earthquake, tsunami and other natural hazards. We apply leading edge science to develop robust hazard and risk models, and use those models to deliver high quality information and data products to enable evidence-based decisions on risk mitigation and adaptation.

More information on disaster impact and risk modelling at Geoscience Australia is given in the box below.

Disaster Impact and Risk Modelling at Geoscience Australia

To capture the impact severity for an event, the model integrates the following components for any event (see figure):

- Hazard, e.g. tropical cyclone or earthquake,

- Exposure, i.e. the assets at risk, be it infrastructure, houses or people, and

- Vulnerability, the model that quantifies how badly the exposure is damaged by a certain intensity of the hazard.

The impact of an individual natural disaster event is represented as the triangle where the three components of impact overlap: the severity of the hazard, the exposure or assets exposed to the hazard, and the vulnerability of those assets to the hazard. Quantifying disaster impacts involves modelling the interaction between those components.

Natural hazard risk models are based on a large 'event set' comprising scenarios of events that could potentially happen and those that have already happened. Each of those events is linked with a probability or likelihood. Natural disaster risk considers all probable events, their impacts, and their probabilities.

The average cost of an event is given by the sum of the products of all event costs and probabilities. Mitigation actions reduce the effective size of any of those components. Benefits of mitigation can be quantified by evaluating reduced impacts across the entire population of possible events.

Natural hazards and electricity infrastructure resilience

Natural hazards are and will continue to be a part of the Australian landscape. Natural disasters have a significant impact on Australia's economy, environment and society. Australia has experienced a number of large scale and devastating natural disasters.

Communities need resilient critical infrastructure as has been highlighted by recent natural disasters. Recent examples include blackout in South Australia in September 2016, the 2013 outages in South East Queensland caused by a severe wind event, the 2011 outage in North Queensland caused by Cyclone Yasi, the 2007 outages in Victoria due to bushfires.

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Integrity and reliability of electricity supply depends on the availability and continued functioning of generation, switching, and transmission assets after disruptive natural hazards.

In the process of identifying actions to reduce risk to the grid in its current state, or in the context of planning for developing the networks, it is crucial to understand the hazard profile in the areas where key network assets are placed or planning to be placed. It is also crucial to understand the vulnerability of these critical infrastructure assets to hazard events likely to impact those assets over their lifetime.

Geoscience Australia has developed, and continues to refine, methods and applications to help governments and infrastructure operators understand the impacts of natural hazards on electric power infrastructure. We have applied these methods as part of our work in Southeast Asia sponsored by Australian Aid – DFAT, and are in the process of initiating projects to apply that capability within Australia.

Geoscience Australia have developed modelling to assess the vulnerability of transmission towers and lines to severe cyclonic wind events, taking into account specific design information, distribution of different tower types, local terrain effects, cascade and parallel line failure modes. The work also included assessment of line recovery times and probability of number of tower failure for specific wind hazard scenarios.

Nationally, there is an increasing shift of focus from emergency response to mitigation which requires a broader understanding of the likely disruption and costs associated with infrastructure failure.

Summary

Geoscience Australia has a well-established science and engineering capability with expertise in modelling the impacts of natural hazards on infrastructure including transmission lines and more broadly power systems.

Geoscience Australia's work has been particularly directed at severe cyclone events but can also be used for thunderstorm and frontal weather system events as the wind hazard modelling capability advances over time.

There are opportunities to utilise and advance this capability within governments to understand electricity infrastructure vulnerability and the opportunities to address these.

By better understanding the consequences of hazard events, governments, industry and the community are able to make informed decisions on optimal mitigation measures that can contribute to more resilient infrastructure and communities.