Mitigating network costs by mapping potential risk

Western Power

Priority infrastructure investment is crystal clear at Western Power with a tool capable of quantifying and modelling the risk and potential cost of asset failure.

Project overview

Critical to Western Power's business and reputation is the health of the 7.1 million assets in its network. Asset failure and subsequent outages have the potential to create safety hazards and leave customers without power.

To meet its major infrastructure goals while working within a strict budget, the utility needed a robust, evidence-based approach to its network management to make transparent, auditable, repeatable and defendable investment decisions. This is why the Network Risk Management Tool was developed.

The tool enables Western Power to accurately quantify and model the risk of individual assets, and from there gauge the impact and cost of failure. Advanced location-based analytics plays a crucial role in terms of processing the data – to understand geographical and topological relationships – and as a powerful visualisation tool.

Armed with improved location awareness and a connectivity-based understanding of risk, the organisation can now prioritise asset maintenance and upgrades, and safely and efficiently refurbish its ageing network.

Western Power in focus:

A state government-owned corporation responsible for building, maintaining and operating the electricity network throughout most of south Western Australia, Western Power services over a million customers across more than 250,000 square kilometres. It provides an essential service through the transmission and distribution of electricity across its vast infrastructure network – which includes 7.1 million managed assets such as poles, wires, substations and depots.

Unlike all other major urban areas of Australia, which are covered by a series of interconnected networks, the Western Power network is part of an isolated, self-contained network without outside support or back up.

By staying across the latest technology trends, the utility can continue providing a safe, reliable and affordable electricity supply to West Australians.

" It's all about geography and location. Taking into consideration where an asset is located electrically in the network, or in the environment, reveals how likely failure may be and the number of potentially impacted customers. For our management team, funding is finite, and this tool helps us make the right choice about which maintenance to prioritise with the limited funding we have. "

David Klein, Principal GIS Strategist, Western Power

The challenge:

The vastness of Western Power's network means maintenance and upgrading is an ongoing challenge. Because of this, the utility is constantly investigating efficient and innovative ways to reduce risk associated with network or asset failure.

With certain assets requiring attention more urgently than others, Western Power needed to understand which work took priority under its replacement and maintenance program – to improve efficiencies in maintaining high levels of safety and reliability across the network.

However, to justify spending against a tight fiscal backdrop, a robust, evidence-based solution was needed to ensure decision-making was transparent, auditable, repeatable and defendable.

Adding to the challenge were the disparate locations and environments the assets were placed in, making risk assessment a complex task. More specifically, Western Power required a tool that would:

+ Enable them to model and analyse assets to determine which ones had the highest risk of failure, as well as understand the consequences of failure for the community, workforce, customers and environment.

+ Account for a range of variables, such as the age of assets, location, existing faults and local environmental conditions – including wind, humidity, sunlight and proximity to the coast (salt).

+ Allow the analysis of risk in several ways, including total risk, risk by location and risk per carrier.

+ Provide the necessary information to show that the utility has adequately met regulatory requirements – and to justify investment decisions.

The solution:

The Network Risk Management Tool uses a large amount of spatial data to help determine the risk of asset failure.

Doing so uncovers the insight Western Power needs to make robust investment decisions – solving challenges by:

Simplifying spatial representation
The system provides spatial information as easily consumable location and topological attributes. These include distance from the coast or a pollution source, and surrounding vegetation types, as well as where an asset's electricity is sourced from and distributed to. The GIS component of the Network Risk Management Tool helps Western Power manage and visualise these attributes for assessment.

Determining risk scores for assets
By taking into consideration a range of variables, such as pollution source proximity, annual days of rain, the presence of acid sulphate soils and surrounding vegetation – in addition to identifying how many customers are downstream and who those customers are – the Network Risk Management Tool can more accurately quantify the risk of failure associated with an asset. The system also performs analytics to forecast which assets should be prioritised for maintenance.

The innovations:

+ The Network Risk Management Tool considers a range of previously unknown, under-used or difficult-to-predict factors – such as wind modelling, humidity, sunlight and pollution – and delivers an unprecedented level of accuracy in determining risk.

+ For the first time, the incorporation of information from Landgate provides Western Power with land parcels and house locations. This allows the utility to identify assets located on a residential property, commercial farm or school, and adjust risk and priority of maintenance accordingly.

Western Power's ongoing commitment to efficiently supplying safe and reliable power over a vast network is why the utility has turned to advanced location-based technology to gauge the risk of its assets failing.

The outcomes: ⊖

✦ **Improved productivity.** Western Power can now manage risk better than ever before – reducing the threat of risk to the business and ensuring every maintenance dollar is spent wisely. The tool also allows the utility to model maintenance and replacement, illustrating the benefit of the spend.

✦ **Prioritised maintenance expenditure.** By building a comprehensive understanding of those assets with the highest risk of failure and the largest consequences of failure, Western Power can prioritise their replacement and maintenance ahead of less vulnerable assets. This ensures money is being spent in the most effective way possible.

✦ **Regulatory compliance.** The system enhances Western Power's ability to meet industry regulatory compliance and conduct cost-benefit analysis to deliver proof that a proposal reduces risk significantly and thus justifies investment.

✦ **Visual representation of risk.** Mapping the levels of risk in the network based on location illustrates which areas in the network are most vulnerable to potential failures. This valuable insight can also inform future capital works planning.

Solution mix:

✦ **ArcGIS for Desktop**

✦ **ArcGIS for Server**

✦ **ArcFM**

✦ **Geoprocessing tools**

✦ **Geocortex**

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