The Australian electricity market
Risks and claims changes
## Contents

- The development of the Australian National Electricity Market electrical network, future risks and predicted changing claim landscape 2
- An alternative model 4
- The emerging cyber threat 6
- Policy interpretation 8
- How Crawford can help 9
- References 10
- Notes 11
The development of the Australian National Electricity Market electrical network, future risks and predicted changing claim landscape.

The electrical grid in Australia, managed by the National Electricity Market (NEM) is one of the world’s longest interconnected power systems. This system stretches from Port Douglas in Queensland to Port Lincoln in South Australia and across Bass Straight to Tasmania, a total distance of around 5,000 kilometres.
Western Australia (WA) and Northern Territory (NT) operate under different markets known as the Wholesale Electricity Market (in WA) and Interim Northern Territory Electricity Market (in NT) due to their relatively remote geographical location in relation to the eastern coast of Australia.

Historically, electrical grids have carried power from electricity generators to large industrial users and local electricity distributors. The NEM utilises around 40,000 kilometres of transmission lines and cables whilst transporting around 200 terawatt hours of electricity each year to 9 million customers across the five Australian states it operates within.

The nature of the grid in Australia makes it particularly susceptible to widespread failures caused by a single localised event. This is due to its extreme length in relation to its width and restriction of the grid to coastal areas. This construction limits the redundancy of the system and the ability to re-route power around damaged areas, especially on main transmission line corridors and direct current (DC) links between states.

As an example, South Australia and Victoria are connected by both the Murraylink and the Heywood interconnector using High Voltage Direct Current (HVDC) technology. These two connections allow South Australia and Victoria to transmit up to 580MW of power between each state through two independent links. As peak demand in each state occurs at different times, this allows for better utilisation of existing generation infrastructure when compared to independently operating grids.

The problem with the types of integration described above is that if an interconnector, associated transmission lines or substations on either end fail, the ability to transmit power between the states is restricted, to the detriment of both systems but will likely continue to operate. If only a single, monolithic interconnector was installed and subsequently failed this could cause the failure of both the South Australian and Victorian grids, creating large disturbances on both. Similar infrastructure exists in all states on the eastern seaboard which, if affected, could have widespread impacts on the ability of the grid to transport power from generators to consumers.
An alternative network model has been proposed to increase the overall reliability of the grid by implementing micro grids or Distributed Energy Resources (DER). These systems allow smaller, independently operated areas to quickly and effectively isolate themselves from the main grid. This can prevent failures from spreading outside a localised area, allow continued operation of areas whilst the remaining grid network undergoes repairs, and assist in redistributing generated power to minimise the impact of a failure.

Such systems are more complex in terms of the hardware infrastructure and software control environment. There is also an inherent difficulty in integrating networks owned by different parties giving rise to increasing reliance upon advanced programs to manage the operation of the system to prevent cascading failures.

A key component of the success of modern micro grids is the introduction of local storage and generation (combined photovoltaic solar, wind, and other generators) within each system, transforming it into a DER. If adequately connected and controlled, a DER would allow for energy to be quickly and accurately transported to the place of consumption and reduce the dependency and need for ever larger monolithic style transmission systems.
This type of network configuration is gaining traction in the industry and becoming more recognised. It is important to note that DER’s in some form have been around for many years. For example, Queensland, New South Wales, Victoria, South Australia and Tasmania could be considered as 4 separate DER’s that interconnect. Each state can share power with its immediate neighbour and island itself to continue operating in the event of a failure elsewhere. Micro grids in the context of this discussion relate to smaller installations across regions, towns or suburbs or even individual buildings.

A recently published electricity network transformation roadmap by the Energy Network Association (ENA) and the CSIRO suggests that the use of micro grids would defer around $16.2 billion in utility network investment by 2050 and that consumers would make $224 billion or 25% of the required system investment decisions.

Examples of micro grids active and undergoing trials in Australia include:

- **Mooroolbark near Melbourne, Victoria** is a city based micro grid trial, networking 17 homes, 14 of which are connected to solar and accompanied by 10kWh of battery storage.

- **Kennedy Energy Park in far north Queensland** is testing combined wind and solar generation, as well as battery storage for nearby townships.

- **Lakeland Solar and Storage Project** 70km south west of Cooktown, Queensland, is testing a grid including islanding (operating independently of the main grid) functionality. It is located more than 1,200km from the nearest large scale power generator and should be able to power the local community for several hours in the event of a network failure.

Western Australia in particular is in a unique position to utilise micro grids and is currently installing them instead of replacing poles and wires. Due to the remote nature of many towns on the edge of the existing grid, it is more economic and more reliable to invest in this solution rather than upgrade or repair existing infrastructure. One prominent example is the town of Kalbarri.

This town is located on the end of a 140km long rural feeder line that regularly experiences outages due to weather interference. A wind and residential solar 5MW micro grid, supplemented by a 4.5MWh battery will augment the main electricity network and provide power during outages. This is expected to provide the town with a more reliable power supply at a fraction of the cost of upgrading the 140km long feeder lines.

Whilst micro grids are expected to improve the reliability of network supply and limit the number of consumers affected by a failure, it is unclear how these systems will be managed, operated, funded and owned.

A recently published electricity network transformation roadmap by the Energy Network Association (ENA) and the CSIRO suggests that the use of micro grids would defer around $16.2 billion in utility network investment by 2050 and that consumers would make $224 billion or 25% of the required system investment decisions.

This suggests the current infrastructure ownership profile will swing toward a more distributed arrangement than currently exists to one where smaller companies own parts of the distribution network and generation assets. In the event of damage this will likely result in many smaller insurance claims involving several parties.
The emerging cyber threat

One of the biggest emerging risks of operating electrical grid networks is the cyber threat. Each new system introduces potential attack vectors (i.e. more computers available to hack) that, once under third party control can be used to damage other secure equipment.

In 2015 hackers managed to successfully access a Ukrainian utility network and switch off power to electrical substations, resulting in blackouts to part of the grid for several hours. A later attack in 2016 used an automated process to achieve the same result. This has demonstrated direct control is no longer necessary and could lead to more widespread attacks.

Whilst this attack did not cause any damage, forensic investigators discovered that safety systems could be disabled that would normally protect the grid from damage and that the virus used in the attack could easily be adapted to apply to any network in the world.

If skilfully performed, an attack on an electrical network could result in a cascade failure across a large area. The implementation of micro grids along with their associated complexity simultaneously increases the number of targets available to hackers and provides protection against widespread cascade failure, as unaffected parts of the network can Island themselves to maintain power in a local area.

Investigating and managing insurance claims involving micro grids is also expected to become more common as businesses and communities are increasingly installing their own generation systems.
Knowledge about how micro grids interact with the distribution network and neighbouring micro grids will be essential to the successful resolution of such claims. The assessment of claims arising in these circumstances will likely prove complex to navigate and it will be more difficult to quantify any interruption claim due to the number of parties likely to be involved.

There will be benefits to the investigator arising from the use of micro grids which will typically include multiple monitoring systems and logging facilities which can assist forensic enquiries, validate available data and support investigations into the cause of any damage.

One example highlighting the potential complexity of assessing business interruption losses on the main grid, when an area is supported by a micro grid is the Kalbarri township. Should the main incoming line fail for an extended period of time the township could likely continue to enjoy the use of power, using its micro grid and islanding facilities.

The use of micro grids means the likelihood and frequency of a claim due to a power outage is significantly reduced. However the benefit is relatively short term as, at some stage the micro grid will likely run out of power if the main grid is not restored or no restrictions on power consumption are imposed.
Policy interpretation

The question then arises “Who suffers a loss?” If power is cut to residential customers, the established industry and essential services (hospitals, etc.) might be able to run indefinitely and vice versa. It is not clear who would make the decision to allocate power, and it is possible to imagine a scenario where only people who are insured have their power cut.

Clearly worded contracts, governmental oversight and state or federal guidelines would be useful to manage this type of situation and it will be essential that, upon placing a risk, insurers understand whether their policy is expected to respond first or last, or somewhere in between.

In our view, micro grids, or DERs will continue to develop and are anticipated to play a major role in the future of the Australian electrical grid. They will both increase the resilience of the grid against disturbances and failures, whilst increasing the complexity of the network itself.

Claims involving micro grids will likely increase in difficulty when compared to traditional power claims due to the increased network integration and the more distributed ownership profile likely to be encountered in the coming years.
How Crawford can help

When businesses suffer financial losses due to insured events, proper evaluation of the impact can be extremely complex. Such losses often demand collaboration amongst a host of experts, including forensic accountants that possess strong analytical skills, as well as knowledge and experience in a given enterprise or industry.

Crawford Forensic Accounting Services is part of our Global Technical Services group. Not only do we offer extensive coverage around the globe, but our experienced forensic accountants can work hand-in-hand with our traditional loss adjusting services to drive efficiencies through the overall claims process.
References


For more information about the changing claim landscape, please contact:

Alex Radcliffe
ACII, ACILA
Executive General Adjuster (EGA)
T: +61 7 3230 440
M: +61 477 723 439
E: alex.radcliffe@crawco.com.au

Andrew Bott
BEng (Hons), BSc
Engineering Adjuster
T: +61 8 8378 4602
M: +61 457 833 802
E: andrew.bott@crawco.com.au

www.crawco.com