



Supporting Documentation How Ergon Energy Compares



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To ensure we manage the distribution network efficiently, Ergon Energy is regulated under the National Electricity Rules (NER) by a national regulator, the Australian Energy Regulator (AER). It is the AER's role to set the amount of money we're allowed to collect for the use of our electricity network. These network charges make up approximately half of the retail 'price' of electricity in Queensland.

To assist the AER in making the decisions it needs in determining our revenue allowance for 2015 to 2020, we have provided them with our future investment plans as a Regulatory Proposal. After considering our proposal and public submissions, the AER will publish a draft Distribution Determination. This will be available for further consultation in May 2015.

We have engaged with our customers to help inform our proposal and are confident, with the AER's support, that our investment plans will enable us to deliver the best outcome for regional Queensland into the future.

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How to read our Regulatory Proposal

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Ergon Energy's Regulatory Proposal is presented in a number of documents to make it easier for our different stakeholders to access the information they need.

The document, An Overview Our Regulatory Proposal, provides the context for the proposal and an overview of the price impacts and the broader customer benefits, along with the highlights of how we plan to deliver them. The overview document is supported by a number of documents.

One of these supporting documents is this document, **How Ergon Energy Compares**. It details Ergon Energy's operating environment, specifically the drivers of cost and performance.

The document, Ergon Energy Regulatory Proposal 2015 to 2020, fully addresses the regulatory requirements of the proposal for the AER.

These and a suite of other documents are available at www.ergon.com.au/futureinvestment

Contents

1. Introduction and aim of the document.....	2
2. Our organisation has evolved with the customer base	2
2.1 Our network services an area with a very low customer density	2
2.2 The network must transmit over large distances.....	4
2.3 We face significant challenges in managing the network	7
3. A harsh environment for assets	9
3.1 Extreme exogenous factors	9
3.2 An environment that is harsh on physical assets	11
3.3 A highly variable environment.....	11
3.4 Significant termite risk	15
4. Significant cost drivers.....	16
4.1 Building and maintaining the network	17
4.2 Operating and supporting the network.....	19
5. Benchmarking to compare Australian DNSPs.....	20
5.3 Key findings from the Huegin Report	21
6. Conclusion.....	23

1. Introduction and aim of the document

Ergon Energy is situated within a challenging environment, providing services to customers, the needs and requirements of which Ergon Energy is working hard to understand. The way the network is developed, operated and managed is strongly driven by the expectations of customers and the community.

The current cost and performance are a result of these expectations and the challenging conditions we face as a network operator. Forecast costs have been developed taking into account the drivers of cost and performance, including the needs and expectations of stakeholders.

At a high level, the cost to develop, operate and maintain the network can readily be compared and contrasted with the industry average and peers. However, cost differentials (and the drivers of these) cannot be meaningfully compared and explained simply by using information available through the Regulatory Information Notices (RINs).

The aim of this document is to provide an appreciation of the way that the design and operation of the Ergon Energy network has been shaped, over time, in direct response to both the needs of our customers and the challenges of our network area. Specifically, this document seeks to highlight those drivers of cost that affect Ergon Energy more (or in a different way) when compared to other Distribution Network Service Providers (DNSPs).

This document also explains the degree in which assets are affected by our operating environment, and how this compares to other DNSPs.

As a result of the network design, operations and environment, there are a number of cost drivers that impact Ergon Energy in the service of customers. Many of these drivers cannot be altered in the short or medium term.

Finally, this document discusses the degree to which standard benchmarking tools and approaches are likely to provide a reliable and meaningful explanation of the way in which Ergon Energy compares with peers. In particular, section 5 of this document summarises the outcomes of some recent work undertaken by Huegin Consulting at Ergon Energy's request in relation to both the challenges associated with benchmarking DNSPs in the National Energy Market (NEM) generally, as well as the issues and limitations in using comparative benchmarks to assess Ergon Energy's performance in particular against rural and non-rural DNSPs in the NEM.

2. Our organisation has evolved with the customer base

Our network and supporting infrastructure and organisation is driven by our ongoing commitment to meet the needs of our customers within the constraints imposed upon us. The following section explains the network and customer attributes that have driven the way in which the network and organisation have evolved.

2.1 Our network services an area with a very low customer density

The Ergon Energy network covers 97% of the area of Queensland. Our focus is on customers who live in rural and regional Queensland. With such a large network area it is inevitable that we experience varying levels of customer density and must distribute electricity across large distances.

As a consequence of our rural and regional focus we have a generally low customer density, and some areas with a very low customer density. As can be seen in Figure 1 below, when compared to other DNSPs operating in the NEM our average customer density is very low.

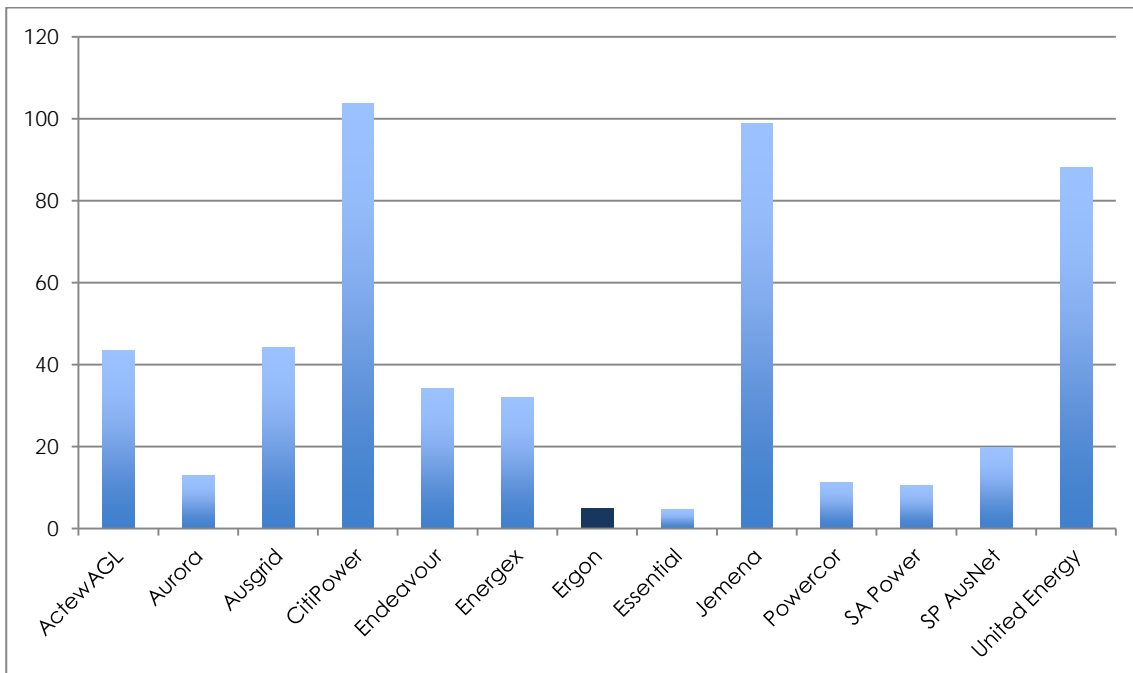


Figure 1: Customer densities (customers per km route line length; source: Australian RIN data 2013)

Population density (measured at the weather stations relevant to each DNSP as provided in the most recent RINs) is used as a proxy for customer density. This is because customer density data is not available at a sufficient level of granularity to measure the variation.

Therefore while it has been well publicised that the overall (average) customer density for networks such as Ergon Energy is low, this doesn't fully illustrate the challenge of distributing electricity within the Ergon Energy network area. The difficulty facing Ergon Energy is more fully understood when considering both the low customer density and the significant variation in customer density.

The variation of population density is measured as the coefficient of variation, defined as the standard deviation divided by the mean, and is shown in Figure 2. It can be seen that Ergon Energy has the second highest coefficient of variation for population density among all NEM DNSPs as measured at relevant weather stations¹.

¹ Note that the value for United Energy is not provided; this is because there are insufficient data points to determine the coefficient of variation for this DNSP.

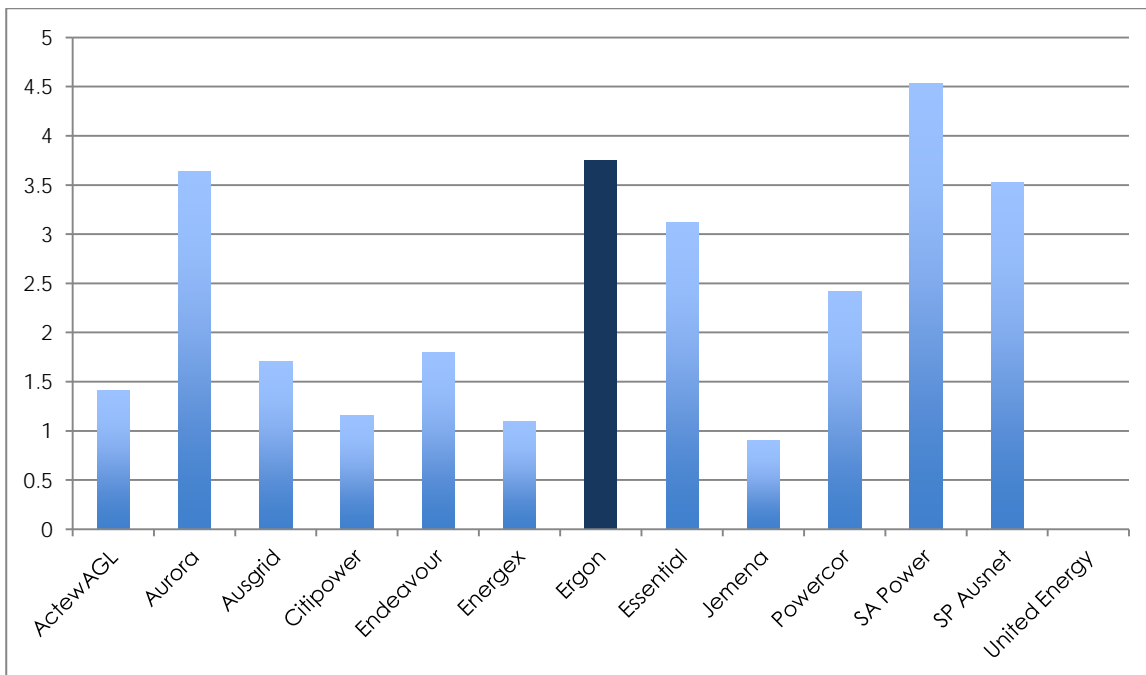


Figure 2: Coefficient of variation (standard deviation of population density divided by the mean; source: ABS and Australian RIN data 2013)

This variation in population illustrates that in addition to low overall density across the network, there are significant parts of the Ergon Energy network that are likely to have very low customer density. It is servicing these areas that provides significant challenges and can attract a cost premium. As will be explained in the next section, the limitations of the Powerlink transmission network also provide challenges in providing bulk supply to more isolated network areas.

2.2 The network must transmit over large distances

The Ergon Energy network has been designed in direct response to the customer base being served. In brief, supplying a service to our customers involves the distribution (and sometimes transmission) of electricity over large distances to often lightly populated areas. In response to these challenges, there are two specific features that set the Ergon Energy network apart from other Australian DNSPs. The first of these is the relatively large amount of sub-transmission network that Ergon Energy has had to build and manage. The second factor is the relatively large proportion of the network that is radial (rather than meshed) in design, in this case the proportion of the network that is rural and long rural has been used as a reasonable proxy.

Sub-transmission network

Ergon Energy has more overhead sub-transmission lines than any other Australian DNSP; due to the significant potential for voltage drop over the vast distances to be covered, and the boundaries of the Powerlink Transmission network. As can be shown in Figure 3, Ergon Energy has a significant proportion of sub-transmission network when compared to other Australian DNSPs.

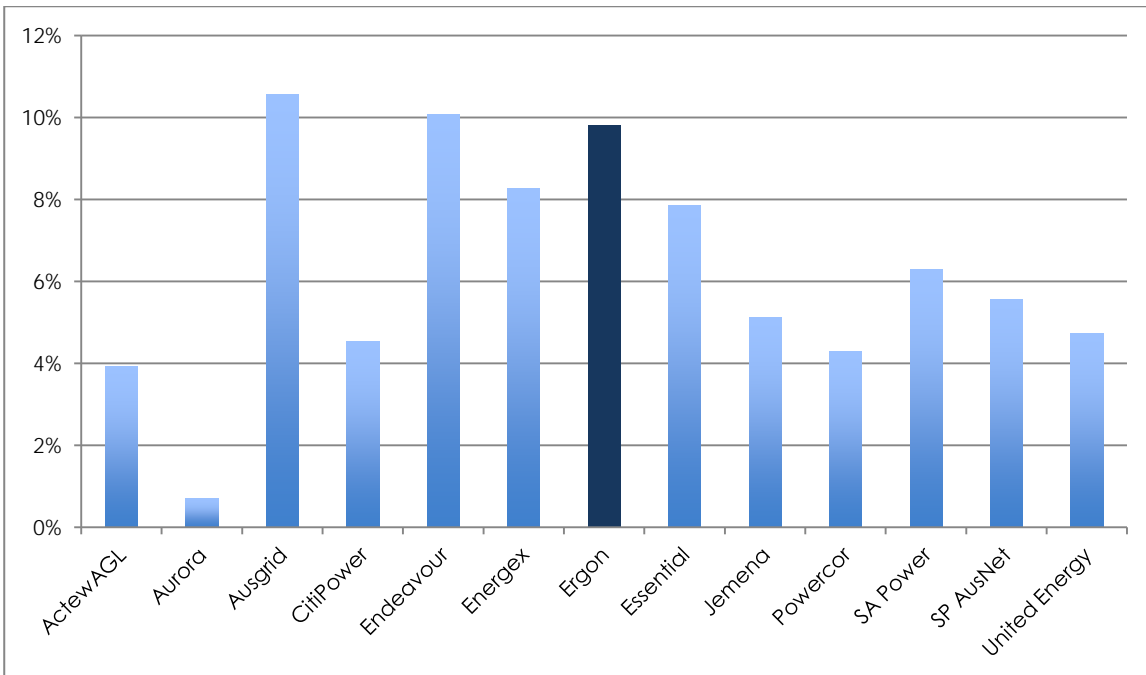


Figure 3: Percentage of circuit length that is sub-transmission (33kV and above; source: Australian RIN data 2013)

The accompanying map shows the Powerlink Network (in mauve and predominantly near the coast) as well as the Ergon Energy sub-transmission feeders (shown in red). This map shows that most of the Ergon Energy network area is not supplied by Powerlink.



The 2012 Huegin Benchmarking Report² shows that network design is a significant driver of network cost. High voltage networks cost considerably more to build than low voltage networks. Table 1 below shows the cost (on a per kilometre basis) of high and low voltage versus both overhead and underground assets.

	Overhead	Underground
>110kV	\$535,894	\$3,544,925
33-66kV	\$145,660	\$1,323,158
11-22kV	\$74,956	\$546,625
LV	\$55,580	\$218,783

Table 1: Average unit cost per kilometre for various voltages and locations (source: Australian RIN data)

There are two salient points in this analysis for Ergon Energy. The first is that being forced to use high-voltage lines is inherently more expensive. The second is that the significant distances to be covered (and the associated uplift in cost) practically restrict the use of undergrounding; this then drives a relatively higher maintenance workload.

Single Wire Earth Return

There is a significant amount of Single Wire Earth Return (SWER) network; this is because SWER represents a low cost way of distributing electricity over long distances. Figure 4 shows the proportion of the overhead network that is SWER. Ergon Energy has the highest proportion of SWER among all Australian DNSPs.

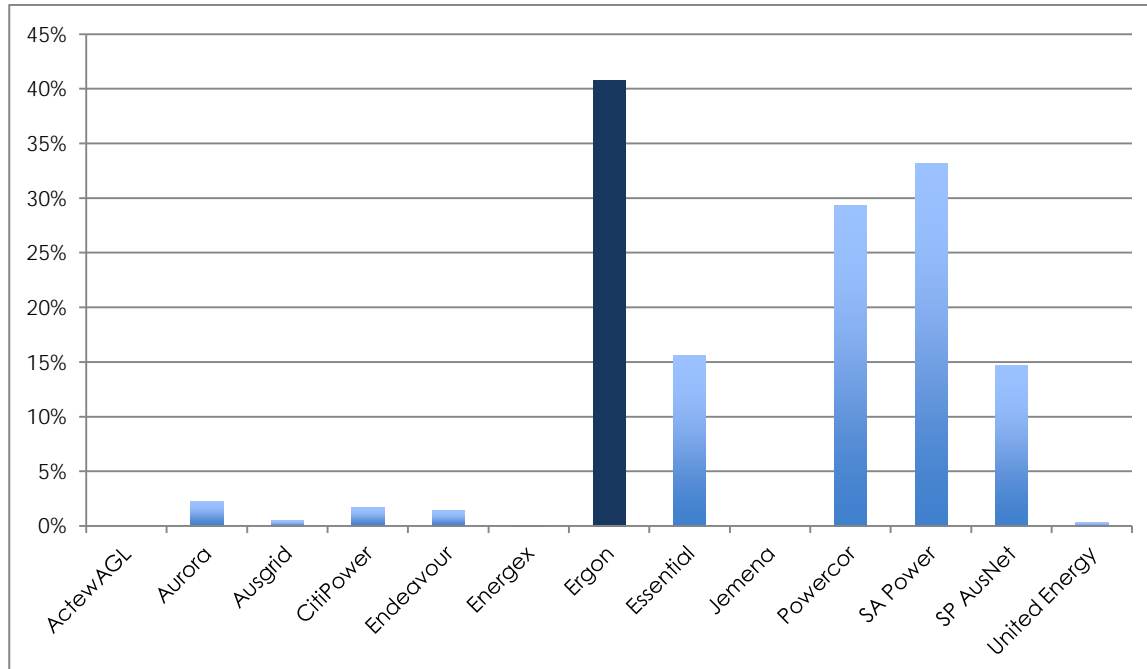


Figure 4: Percentage of circuit length that is SWER (source: Huegin Analysis - Australian RIN data)

² 2012, Huegin Consulting Group. Distribution Benchmarking Study

SWER is very useful for servicing areas of low customer density, as it is relatively inexpensive to install. Unfortunately, due to a lack of redundancy, SWER can be more susceptible to reliability issues driven by conductor failure. Coupled with the radial design of large amounts of the network the SWER installation can provide reliability challenges. The rural portion of the Ergon Energy network (it can be assumed that most rural, both short and long, is serviced by SWER network) has relatively poor outage performance. That is, a high number of outages and poor on-time performance for planned outages. This is shown in Figure 5

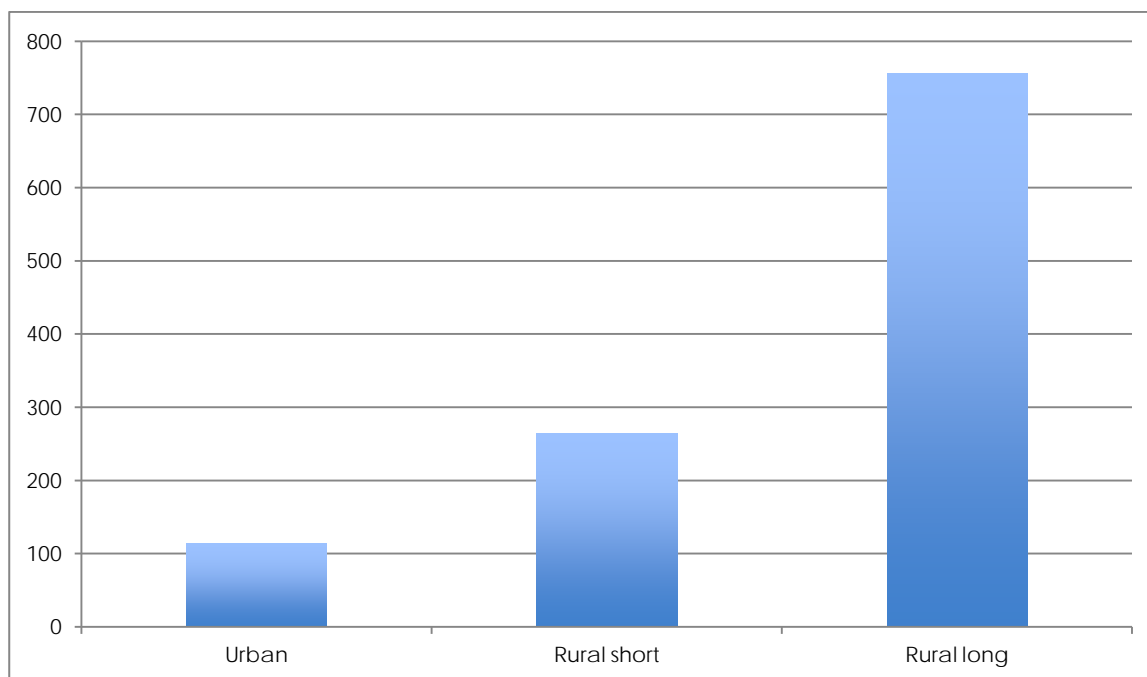


Figure 5: Unplanned SAIDI (duration) for Ergon Energy (total after removing excluded events; source: Ergon Energy RIN 2013)

2.3 We face significant challenges in managing the network

As has been explained, the Ergon Energy network has been designed, and continues to evolve, to best meet the needs of our customers. This includes the challenges of significant distances and low customer density, and with this comes the need for a specialist approach to the way in which the network is constructed, maintained, operated and supported.

2.3.1 Construction challenges

The Ergon Energy network area represents a challenging environment in which to construct an electricity network. Specific challenges include:

- the significant distances over which assets must be constructed
- the rural nature of the network requires significant additional work ensuring access to construction sites
- only seasonal access to different parts of the network due to very significant levels of rainfall.

There are also transient challenges such as the recent shortage of skilled personnel caused by the strong resources sector.

2.3.2 Maintenance challenges

Given the asset-centric nature of both construction and maintenance activities, many of the challenges are the same. There are, however, specific challenges for maintenance including the:

- lower inherent reliability of radial SWER networks due to the lack of redundancy
- significant number of extreme weather events that require us to maintain a significant emergency response capability.

2.3.3 Operational challenges

For the purpose of retaining sufficient network control during and following extreme weather events, Ergon Energy has two geographically separated network control centres. Each of these centres is capable of providing management for the entire network. The cost associated with providing this level of redundancy is a necessary part of meeting the expectations of, and commitment to, our customers.

2.3.4 Our network is experiencing the most significant effects from the uptake of solar

A relatively recent challenge confronting Australian DNSPs is the widespread introduction of solar power through the installation by customers of photovoltaic cells on residential dwellings. This has a direct effect upon DNSPs through introducing an additional source of power for which, in the main, the networks were not designed. Secondly, the pattern of solar generation is such that the peak demand has not significantly dropped (and in fact continues to rise in some areas of the network), whereas overall consumption has dropped significantly. The net effect is that the DNSPs must still build networks to cater for the peak, yet there are less units of electricity being distributed. As is shown in Table 2, Queensland has experienced the greatest uptake of solar power within Australia.

	2006	2007	2008	2009	2010	2011	2012	2013
ACT	10	48	278	803	2,323	6,860	1,522	2,377
NSW	216	779	2,890	14,008	69,988	80,272	53,961	33,842
NT	23	26	88	215	637	401	513	1,021
QLD	195	475	3,087	18,283	48,697	95,303	130,252	70,864
SA	413	1,037	3,456	8,569	16,705	63,553	41,851	28,850
TAS	4	25	161	1,452	1,889	2,475	6,364	7,547
VIC	200	828	2,036	8,429	35,676	60,214	66,204	33,153
WA	54	262	2,068	11,157	22,293	51,667	42,653	21,504

Table 2: Number of solar power units installed per state per year (source: Clean Energy Regulator)

As is shown in Table 3, over the period from 2006 to 2013 Ergon Energy experienced a relatively significant decrease in energy density, and the highest increase in peak demand, but (to a greater extent than other DNSPs) is in the position of still having to build, maintain, operate and support a growing peak demand because the overall demand density and energy delivered is increasing.

	Customer Density	Customers	Demand Density (kVA/customer)	Energy Density (MWh / customer)	Peak demand (MW)	Energy delivered (GWh)	Opening RAB (\$'000's)
ActewAGL	2.82	22,745	-0.44	-1.37	0.00	145.66	241,909
Aurora	0.79	29,225	0.03	-2.57	40.00	-201.01	638,412
Ausgrid	-0.47	88,858	-0.41	-3.37	-346.10	-3,782.17	7,527,930
CitiPower	0.02	27,764	-0.41	-1.72	110.82	6.36	495,679
Endeavour Energy	0.07	69,836	-0.68	-2.84	97.55	-1,195.19	2,453,298
Energex	-0.08	181,744	-0.29	-1.53	358.79	437.00	5,104,666
Ergon Energy	0.48	94,757	0.07	-2.61	536.45	9.36	3,995,622
Essential Energy	0.45	45,216	-0.38	-0.42	-128.51	326.30	3,427,015
Jemena	7.18	25,654	0.27	-1.25	179.40	-24.00	355,847
Powercor	1.03	89,947	-0.07	-1.28	322.50	408.08	992,848
SA Power Networks	0.84	68,927	-0.25	-1.08	153.61	53.60	643,087
SP AusNet	1.23	75,891	0.00	-1.21	278.36	103.10	1,180,138
United Energy	5.60	43,788	0.26	-0.95	303.00	-59.07	478,777

Table 3: Change in outputs between 2006 and 2013 (source: Huegin analysis: Australian RIN data)

3. A harsh environment for assets

3.1 Extreme exogenous factors

Ergon Energy builds, operates and maintains a distribution (and sub-transmission) network over a vast area of Queensland. The area over which this network is situated is subject to both extreme and variable climatic conditions. The Ergon Energy network is built, maintained, operated and supported within an area that has a harsh environment and climate.

Areas within the Ergon Energy network are subject to extreme environmental conditions in comparison with other DNSPs. This is demonstrated in Figure 6, in which Ergon Energy is seen to exhibit the highest temperature, largest annual rainfall and rainfall variability, as well as the third highest average relative humidity of the Australian DNSPs. Additionally, Attachment 1 includes a comparison of the impacts and incidence of extreme weather events and natural disasters impacting Australia over the 1 July 2000-17 October 2014 period drawn from Swiss Re's CatNet Database and Sigma Loss Event records that highlight the challenging and very different conditions Ergon Energy faces compared with distribution networks in other parts of Australia.

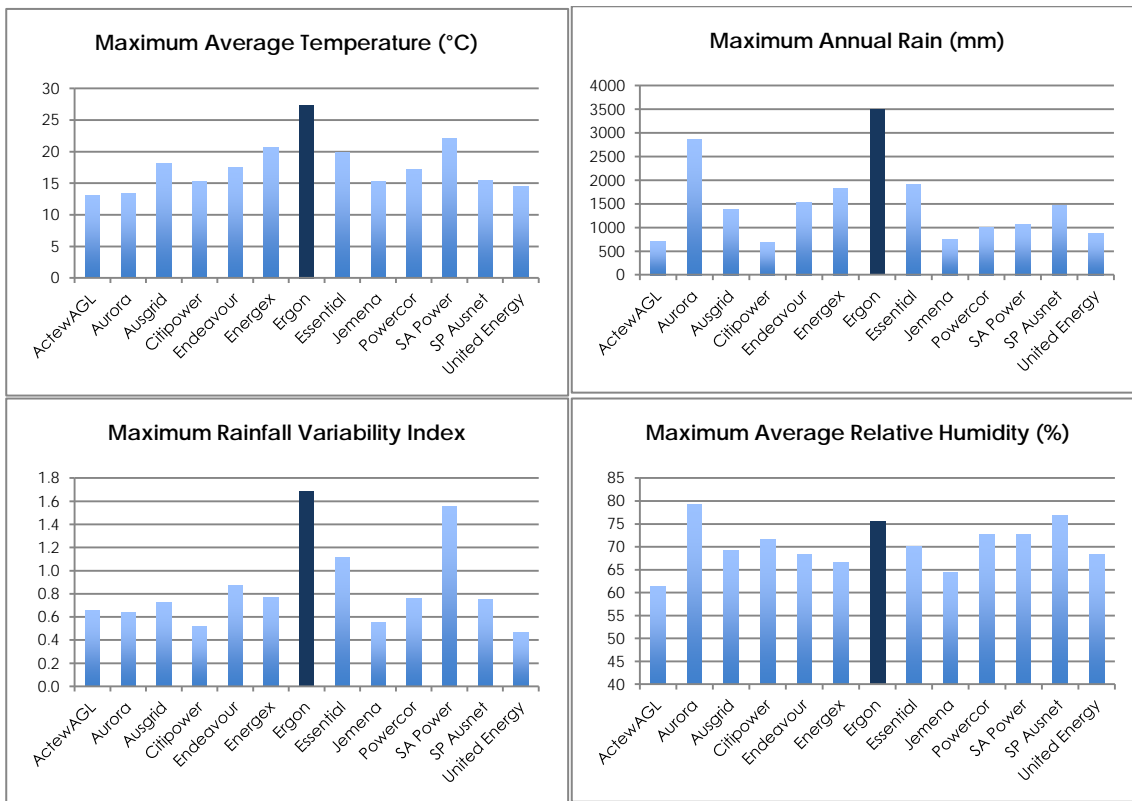


Figure 6: Maximum values of key environmental factors in each network³ (source: Huegin analysis - Australian RIN data and Bureau of Meteorology)

There is significant evidence to relate the rate of wood pole degradation to, among other things, environmental factors. Whereas wood poles are not the only example of network assets that are affected by the environment, they do provide a useful case study when examining the degree to which the environment affects network performance and, ultimately, cost.

Broadly, it can be assumed that most poles that fail or are condemned because the inherent strength of the pole is insufficient. This might be assessed as insufficient against either a standard or the prevailing conditions imposed upon the pole.

These failures can then be further categorised as rapid or gradual in onset. For example, rot would be considered the gradual penetration of a pathogen, whereas a lightning strike, vehicle impact or cyclone would be considered to be rapid.

In order to better understand the way in which various exogenous factors affect the failure rate (both structural failure and functional failure, including pre-failure condemnation) Ergon Energy (with the assistance of Huegin Consulting) developed a state-based model to understand the change in probability of failure in different areas within the network.

³ Rainfall variability index is defined as (90th percentile of annual rainfall minus 10th percentile of annual rainfall) divided by the 50th percentile (median) of annual rainfall; this index shows how much rainfall varies from year to year.

The model was also used to derive those factors to which the performance of poles (structural performance) is most sensitive. These factors include:

- factors affecting gradual deterioration
- factors affecting rapid deterioration.

The following sections cover the results of this model following application across the NEM for wooden poles.⁴

3.2 An environment that is harsh on physical assets

It can be shown (Figure 7) that the climate within which Ergon Energy manages the pole population is likely to cause wood poles to deteriorate at a greater rate than the climate for almost all other DNSPs.

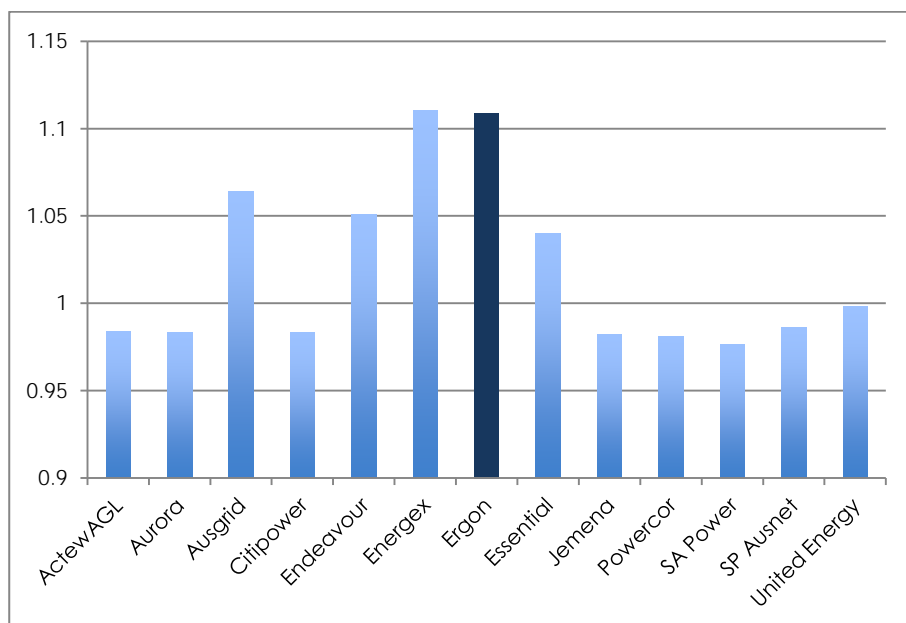


Figure 7: Average network effect upon wood pole degradation⁵ (source: Huegin analysis Australian RIN data and Bureau of Meteorology)

Effective maintenance of a pole population with a greater rate of deterioration requires greater rates of refurbishment and replacement; all else equal, this alone raises the equivalent cost of network maintenance. As a result, Ergon Energy faces a cost penalty for the pole maintenance program with respect to other Australian DNSPs.

3.3 A highly variable environment

Further to its extremity, Ergon Energy's climate displays significant variability. The variability of environmental parameters within each DNSP's network is shown in Figure 8. Ergon Energy is, overall, subject to the most varied climate.

⁴ It should be noted that the results for South Australia are included for completeness only. They are not particularly applicable to South Australia as the majority of the pole population is Stobie poles, a composite structure of steel and concrete.

⁵ The wood pole degradation factor is calculated using the sensitivity values that were determined for the pole model calibrated to Ergon Energy data. The factor is calculated at each weather station listed in the RIN for each DNSP.

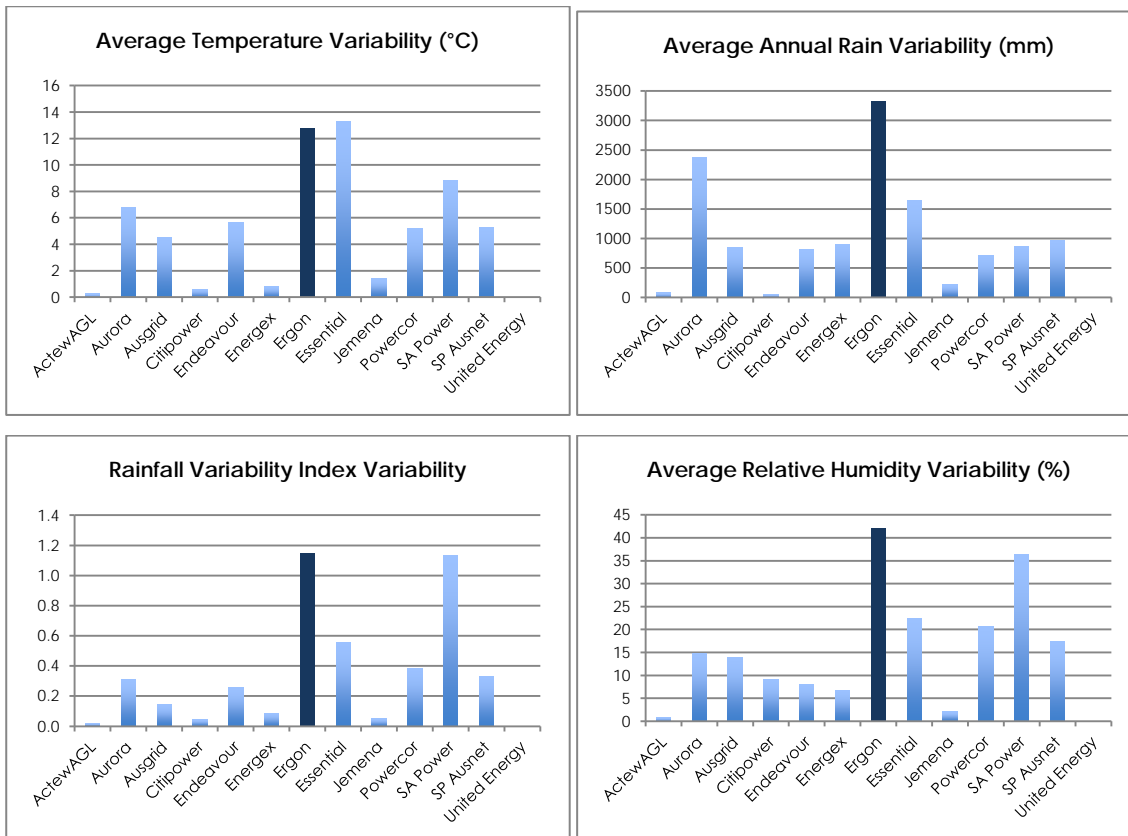


Figure 8: Variability of key environmental factors within networks (measured as the difference between the maximum and minimum values across the network; source: Huegin analysis - Australian RIN data and Bureau of Meteorology)

As a result, the variability of pole degradation conditions (as shown in Figure 9) is the highest for any Australian DNSP. Further, the Ergon Energy network contains the areas that are subject to the most intense (from a wood pole degradation perspective) environment.

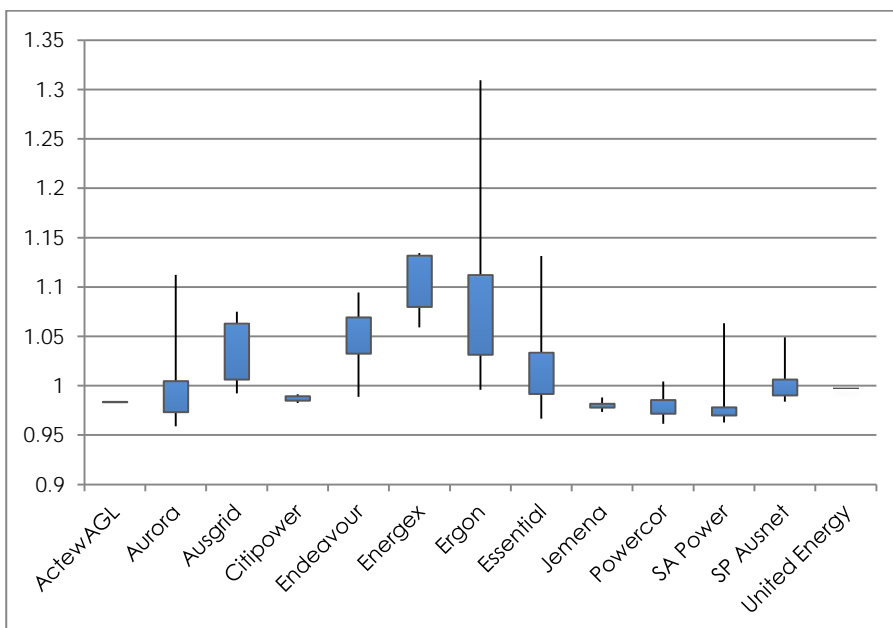


Figure 9: Variation in network effect upon wood pole degradation (source: Huegin analysis Australian RIN data and Bureau of Meteorology)

The variability of environmental effects within the network presents Ergon Energy with a set of challenges for efficient maintenance of physical assets. Specifically, when a broad range of conditions is to be considered, significant complexity is introduced for development of optimal maintenance schedules and resource allocation.

The results presented are from an abridged version of analysis undertaken across the entire Ergon Energy network, down to the level of maintenance zone. The analysis was, necessarily, abridged in order to allow comparison across all networks using publically available data. Significantly, the publicly available data covers the most significant factors believed to affect gradual degradation of wood pole assets.

Modelling the effect of climate upon pole reliability (abridged)

Background

The purpose of this investigation was to determine how the lifecycle of wooden poles is affected by environmental conditions within the Ergon Energy network, and how this compares with other Australian DNSPs. Doing so helps to develop an improved understanding of how Ergon Energy can be benchmarked against the other DNSPs.

A dynamic systems model was developed to gain insight into the factors affecting deterioration of wooden poles, and the resulting impact on failure rates and costs.

This stock-and-flow model simulates the pole life cycle, represented by the passage of poles from high through to medium and low residual strengths, as well as the effects of restoration. Assisted and unassisted failures are predicted through failure rates assigned to each residual strength category; these rates are determined based on a number of environmental and operational factors.

A sensitivity analysis was performed to determine the key parameters driving failures and costs associated with wooden poles. The current investigation employs these sensitivities to determine how local environmental conditions affect failure rates and costs.

Methodology

The methodology employed for this investigation involves analysis of pole health (as predicted by the dynamic systems model), based on the environmental factors of different locations around Australia. The aggregate environmental severity for each network was determined by calculating a relative environmental severity score for each DNSP weather station.

Model parameters were selected for inclusion in the analysis based on satisfaction of the following criteria:

- determined to be sensitive to change
- exogenous factor based on location, and beyond the control of the DNSP
- availability of consistent and reliable data for all Australian DNSP areas.

Based on these criteria, the following parameters were selected for inclusion:

- annual rainfall
- seasonality of rainfall
- temperature
- relative humidity.

A relative environmental severity cost was calculated for poles in the proximity of each DNSP weather station by extrapolating the calculated sensitivity for each parameter. The parameter values at each weather station were predicted using a geographic interpolation of weather data (source: BOM 30yr Averages)

The relative importance of each station to the network was determined based on the number of poles in its proximity. The pole density for each region was approximated assuming that it is proportional to population density (source: ABS). The relative density was used as a weight for each station. A weighted aggregate cost for each network was determined based on the local severity and the pole density.

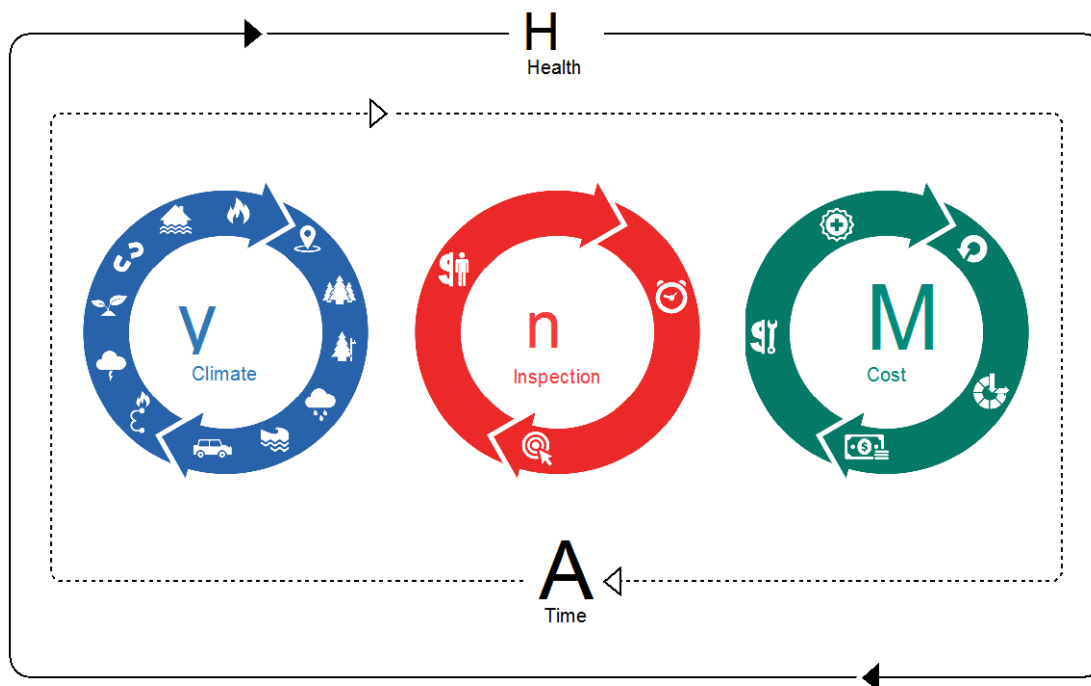


Figure 10: An overview of the pole lifecycle model

3.4 Significant termite risk

In addition to slow acting pathogens such as rot and fruiting fungal bodies, there are potentially faster acting pathogens that can affect pole longevity. A significant pathogen affecting wood poles is termites. As with other exogenous factors, the prevalence of (and therefore risk posed by) termites is not uniform across the areas in which the NEM businesses build, maintain and operate their networks. Wood poles within the Ergon Energy network are at significant risk of attack from termites. As with the environmental (weather based) factors, the complicating factor for Ergon Energy is the significant variance in risk across the network.

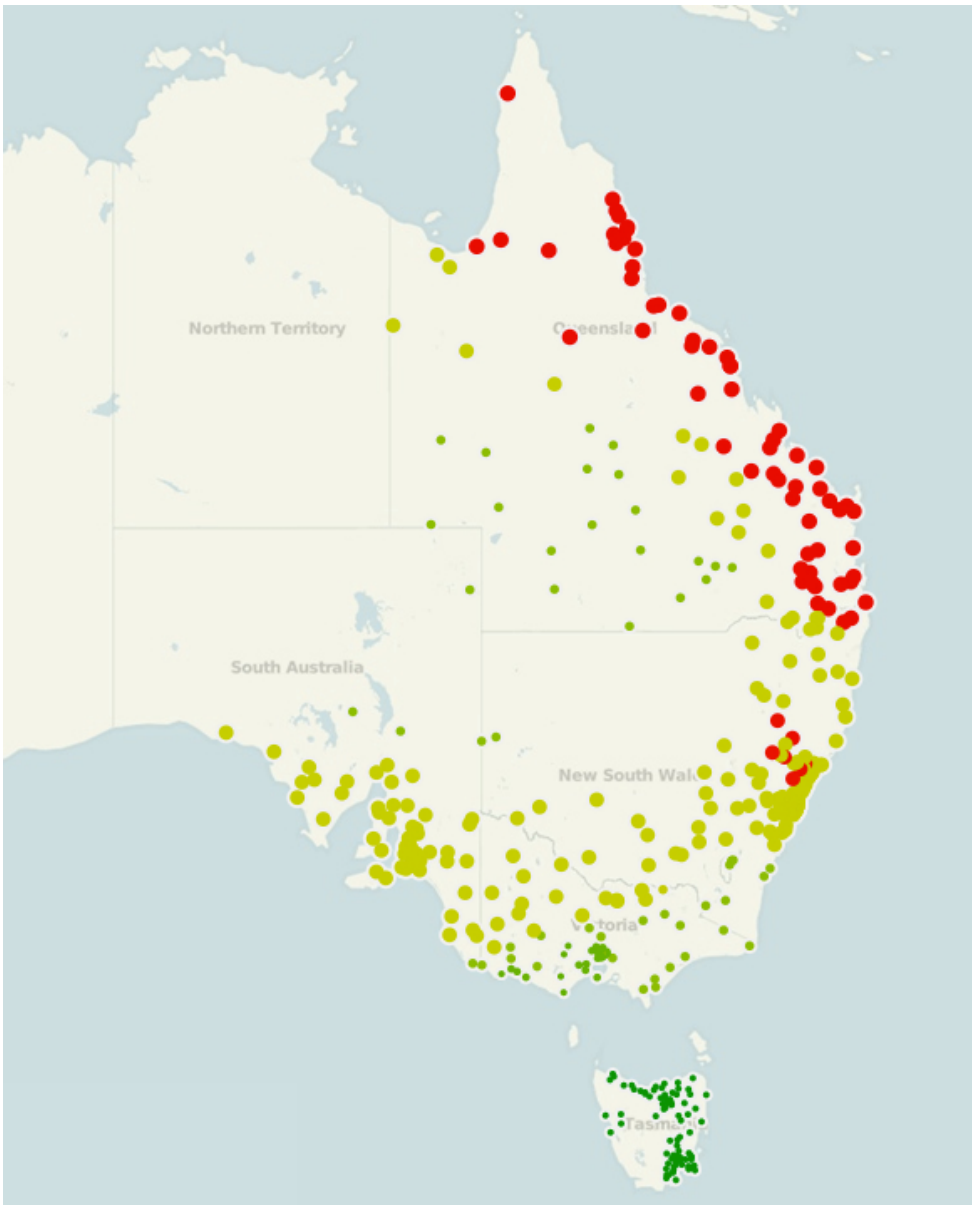


Figure 11: Relative termite risk within NEM networks, locations with high risk are marked in red, low risk in green and intermediate risk levels in lighter shades

4. Significant cost drivers

As a result of the way the network has evolved, and the operating environment being both harsh and varied, Ergon Energy experiences a number of additional cost drivers that affect both network and non-network expenditure. These drivers are examined in the following sections covering building and maintaining the network and operating and supporting the network.

4.1 Building and maintaining the network

Building and maintaining the network covers both capital works and maintenance spend.

4.1.1 Capital works

The Ergon Energy capital works program (including augmentation and major replacement) is a significant annual program. Completing this program of work provides challenges from the perspective of both schedule and cost. The schedule can be significantly impacted by the harsh weather conditions. In those network areas subject to a wet-season, large works cannot be completed on a year-round basis. Costs for capital works can be affected by the rural nature of the network, which can increase costs for both personnel and material.

4.1.2 Maintenance

There are three major areas where the maintenance cost-drivers for the Ergon Energy network are significant compared with those of other networks.

Pole inspections

Due to the harsh environment within which the network is located, poles can be shown to degrade more rapidly than in other networks. The highly varied nature of the Ergon Energy environment is such that the rate of degradation and risk of pole failure varies considerably.

Figure 12 shows the relative risk (wood poles only) across the entire NEM from both slow pathogens and termites – as opposed to rapid forces from storms or the effect of bushfires. The areas of high risk (marked in red) drive increased maintenance costs for inspection, treatment and replacement, while the heterogeneous spread of risk for similar assets drives increased management costs.

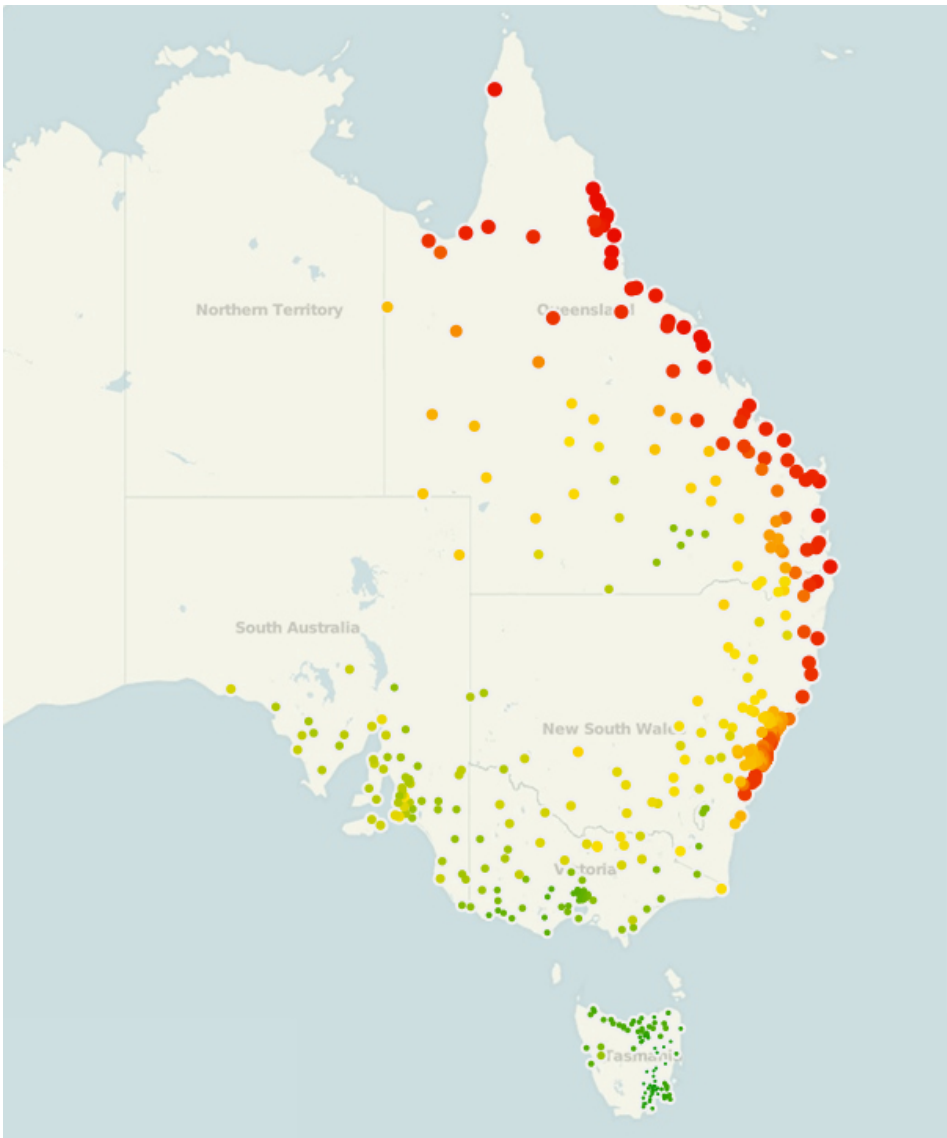


Figure 12: Relative risk for wooden poles in the NEM; locations with high risk are marked in red, low risk in green and intermediate risk levels in lighter shades (source: Ergon Energy RIN data 2013 and Bureau of Meteorology)

Emergency response

Due to a combination of the harsh network environment, and the size and design of the SWER network (linear as opposed to radial), Ergon Energy has a significant requirement to respond to emergencies. As can be seen in Figure 13, the proportion of emergency maintenance cost to total maintenance cost for Ergon Energy is among the highest for the NEM participant DNSPs.

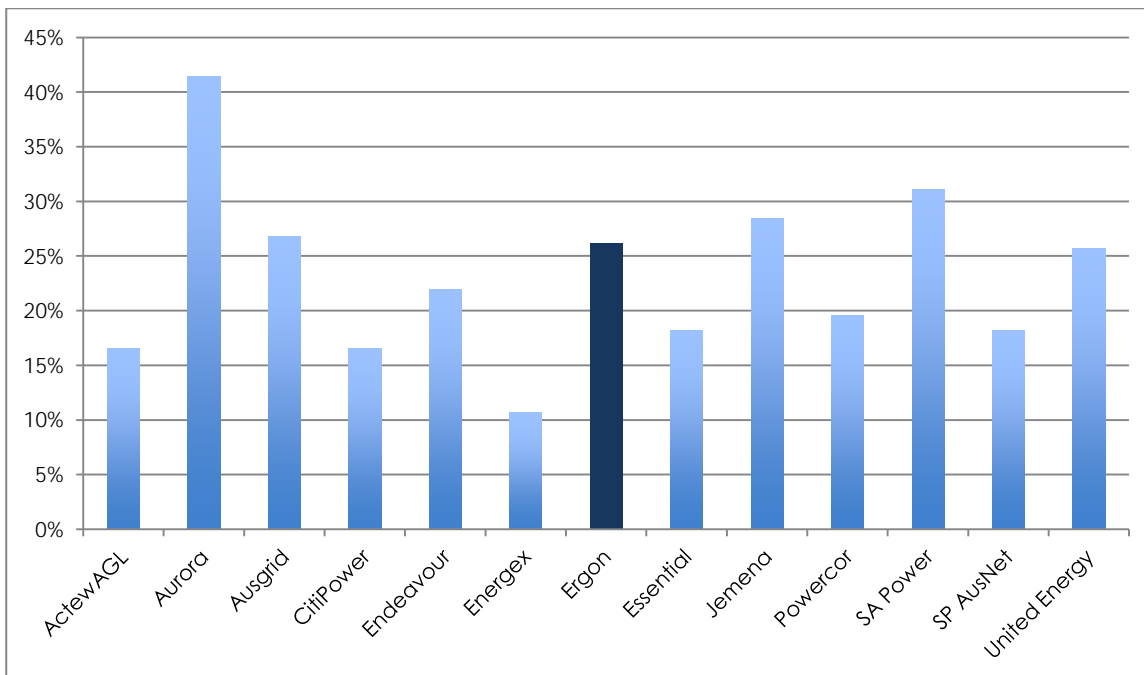


Figure 13: Ratio of Emergency Response opex to Maintenance opex (source: Australian RIN data)

Vegetation management

In response to the challenging environment, vast distances and varied climate, Ergon Energy launched the ROAMES initiative. Ergon Energy developed ROAMES – short for Remote Observation, Automated Modelling Economic Simulation – to provide a more cost effective way of managing its 150,000 km of overhead powerlines in Queensland. Using GPS and other technology, it enables Ergon Energy to capture and automatically produce accurate three-dimensional models of an electricity distribution network and surrounding vegetation from the air.

4.2 Operating and supporting the network

4.2.1 Fleet

Due to a combination of significant distances and low asset density, Ergon Energy is forced to procure some specialist items of equipment even though the utilisation can be quite low. That is, the logistics cost associated with moving key items of equipment makes ownership the only viable alternative. As a consequence of these factors, Ergon Energy benchmarks poorly when compared to other networks without the same drivers of cost.

4.2.2 Property

Despite having significantly reduced property capex (down from \$77 million in 2011 to \$29 million in 2013), Ergon Energy still has the second highest capex when using the following metrics:

- property capex
- property capex / system capex
- property capex / FTE.

There are a number of factors that drive Ergon Energy property costs when compared to other networks; these include the:

- difficulty in obtaining property economies of scale with such a dispersed network
- need to have (relatively) more properties, especially depots
- need to sustain regional offices, even using the hub and spoke model, results in a significant property portfolio
- need for full redundancy in controlling the network, resulting in two complete control centres.

Each of these factors contributes toward a significant requirement for property expenditure. This is borne out by benchmarking where Ergon Energy has the highest expenditure property per customer and the fourth highest expenditure per employee.

5. Benchmarking to compare Australian DNSPs

Included as a stand-alone attachment to this document is a benchmarking report prepared by Huegin Consulting.⁶

The Huegin Report concludes that Ergon Energy has few organisations in the NEM that could genuinely be considered peers for the purposes of benchmarking. This Report also compares the population of electricity distribution companies from Great Britain to the DNSPs in the NEM; this comparison is undertaken because the techniques likely to be applied by the Australian Energy Regulator (AER) bear significant similarities to the techniques that were explored by Ofgem.

A significant element of the Huegin Report is the further refinement of a model that was developed covering the explanatory variables driving DNSP cost within the NEM. When Huegin originally developed, tested and presented this model there were 12 drivers used, this has been refined to eight.

The model supports the hypothesis that there are significant differences in the fundamental drivers of cost of Australian DNSPs. A further refinement to the current model is the alignment of drivers with the degree to which they can be reasonably influenced by DNSPs. The three categories of drivers are inherent, inherited and incurred. For the purposes of clarity the inherited costs have been further defined as either internal or external. These driver categories are defined as:

- inherent factors - these are beyond the control of the distribution business.
- inherited factors (external) - these can be influenced by the distribution business, but not controlled. The level of influence is not usually significant.
- inherited factors (internal) - these can be directly influenced by the distribution business, but any material change in these factors generally takes much longer than a regulatory period to take effect.
- incurred factors - these are mostly the outcome of management decisions, and are more readily influenced, although the changes may not be significant.

⁶ Refer supporting document 0A.02.01 Huegin: Ergon Benchmarking

The accompanying table illustrates the alignment between the different drivers and the assigned category and is drawn from Huegin’s latest study⁷.

	Inherent	Inherited		Incurred
		External	Internal	
Drivers	Network Location	Customer Demographics	Asset Age	Activity Cycles
	Climate & environment	Legislative & Statutory	Network Design	Business Management

The conclusions outlined above by Huegin regarding the usefulness of the AER’s benchmarking methods as an indicator of efficiency are also consistent with other external studies and reports in relation to the appropriateness of benchmarking utility businesses, including the 2013 study undertaken by the Productivity Commission on Electricity Network Regulatory Framework (see Chapter 4) and recent analysis of benchmarking tools undertaken by the three NSW DNSPs in the context for their 2014-19 regulatory proposals (see Attachment 5.4 ‘The Benchmarking Factor’ to each NSW DNSP proposal).

As the Productivity Commission noted in Chapter 4 of the above 2013 study:

Benchmarking is a demanding quantitative (and qualitative) task. As in many other cases of firm-based modelling, the results are often fragile to data errors, statistical assumptions and variable choices.” , and

“Benchmarking is not about identifying a single number denoting the efficiency of a business, but rather the potential range of likely numbers. Any benchmarking exercise must take into account the consequences of being wrong.”

5.3 Key findings from the Huegin Report

This section covers some of the key findings from the Huegin Report aligned to the model of cost drivers.

5.3.1 Challenging location

The location of the Ergon Energy network results in high exposure to termite risk and also a significant bushfire risk. Magnifying the effect of these location-based (and therefore inherent) cost drivers is the large network area. Whilst it is recognised that the large network area (the largest in the NEM) does not necessarily affect all costs, it does have a significant effect upon corporate overheads such as fleet and property. As with all Inherent drivers, the degree to which Ergon Energy can influence these drivers is quite limited.

⁷ Refer page 6 supporting document 0A.02.01 Huegin: Ergon Benchmarking

5.3.2 Harsh and variable climate

Similar to the findings of this document, the Huegin Report finds that the climate over the Ergon Energy network area is more severe than for other DNSPs, specific mention is made of severe thunderstorms, temperature and rainfall.

5.3.3 Customer Demography

The Huegin Report found that the Energy Density and Demand Density for Ergon Energy are the highest within the NEM. This finding is significant as, particularly when coupled with the low customer density, it highlights Ergon Energy has relatively fewer customers demanding relatively more energy.

5.3.4 Network Age

Ergon Energy, due largely to legacy issues, is still tackling the challenge of supplying high veracity age data for all network asset types. Despite this, Huegin found that while Ergon Energy does not have the oldest network, there is however a variation across different asset types. One of the challenges for Ergon Energy is that (as was shown by the pole degradation results in this report) some asset types deteriorate at a faster rate than similar assets managed by other DNSPs in the NEM.

5.3.5 Network Design

As has been shown in a succession of reports, including the 2012 Benchmarking study by Huegin, the design of the network is a significant driver of cost. Overhead lines are less expensive to install and more expensive to maintain than underground lines. In all cases, costs increase as voltage levels rise.

The Huegin Report finds that the Ergon Energy network has the highest proportion of overhead lines in the NEM and the second lowest proportion of undergrounding. In an attempt to explain the radial nature of the network, Huegin studied the variation in Circuit Density. This shows that Ergon Energy has significant variation Circuit Density. This variation is a significant driver of maintenance operating expenditure and Network Control costs.

5.3.6 Activity Scheduling

The Huegin Report found that Ergon Energy has relatively short inspection cycles for most asset types. This has a direct impact upon maintenance operating expenditure. The pole inspection cycle in particular is relatively short when compared to other DNSPs. This is as a direct consequence of the application of wood poles in, what has been shown to be, the harshest environment for wood degradation in the NEM.

6. Conclusion

The Ergon Energy network has been designed and is maintained and is operated in a way that is appropriate to the unique customer base. This document has described the ways in which the context of the Ergon Energy network is significantly different to that of any other DNSP; salient differences include scale, climate and customer density. As such, the resulting network has been shown to be different in design and operation.

The conclusions outlined above about the usefulness of benchmarking as an indicator of efficiency are also consistent with other external studies and reports in relation to the appropriateness of benchmarking utility businesses, including the 2013 study undertaken by the Productivity Commission and recent analysis of benchmarking tools undertaken by the three NSW DNSPs in the context for their 2014-19 regulatory proposals.

Rather than simply highlight the differences between the context (and resulting network) this document, supported by the Huegin Consulting Group Report, has shown that the differences affect the drivers of cost. As such, this report has shown that significant care must be taken when using standard comparisons, including benchmarking, for the purposes of understanding costs and performance for Ergon Energy.

Additional information

For further information go to:

www.ergon.com.au/futureinvestment

Ergon Energy Corporation Limited ABN 50 087 646 062

ergon.com.au



Summary of Natural Catastrophes, TC and Wildfire

2000-2014, including Sigma Loss

Map Content

- Tropical Cyclone Tracks
- All Basins (1970-2012)
- Atlantic Ocean (1891-2012)
- Indian Ocean (1945-2012)
- Pacific Ocean (1945 - 2012)
- Wildfire
 - Fires > 600 MW (2000-2011)
 - 0-1
 - 1 - 2
 - 2 - 5
 - 5 - 10
 - 10 - 25
 - 25 - 50
 - 50 - 100
 - 100 - 200
 - 200 - 500
- Recent Events
 - Jammu & Kashmir Flood September 2014
 - Earthquake M 6.0 California August 2014 (USGS)
 - TC Hayan - Nov 2013
 - Earthquake M 8.2 Chile April 2014 (USGS)
 - Alberta Flooding - June 22nd 2013
 - Central Europe Flooding
 - Moore Tornado 20 May 2013 (USA) (Wunderground NWS)
 - TC Sandy 2012
 - FL Thailand, Oct Nov 2011
 - TC Irene, Aug 2011
 - EQ M 9.0 Japan, Mar 2011
 - EQ M 6.3 New Zealand, Feb 2011
 - TC Yasi, Feb 2011
 - Yasi_track
 - EQ M 7.0 New Zealand, Sep 2010
 - EQ M8.8 Chile, Feb 2010
 - EQ 7.0 Haiti, Jan 2010
- Sigma Losses (1970ff.)











Dates: 01/07/2000 - 18/10/2014

Category: Natural Catastrophes

Display: Economic Loss

Events loaded: 1000

Events available: 1027

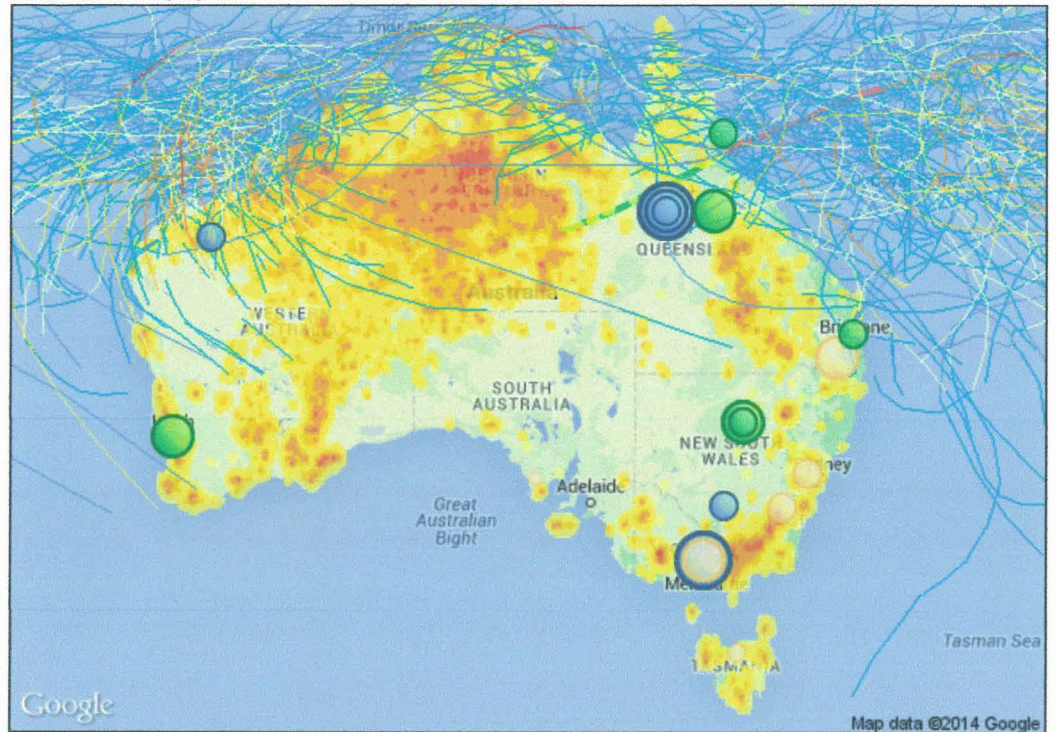
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-  5'000m USD - 25'000m USD
-  1'000m USD - 5'000m USD
-  250m USD - 1'000m USD
-  100m USD - 250m USD
-  50m USD - 100m USD
-  < 50m USD
-  Earthquake, Tsunami, Volcano
-  Extreme Weather
-  Flood
- Other Natural Catastrophes
- Storm, Hail

Search Results

User Places

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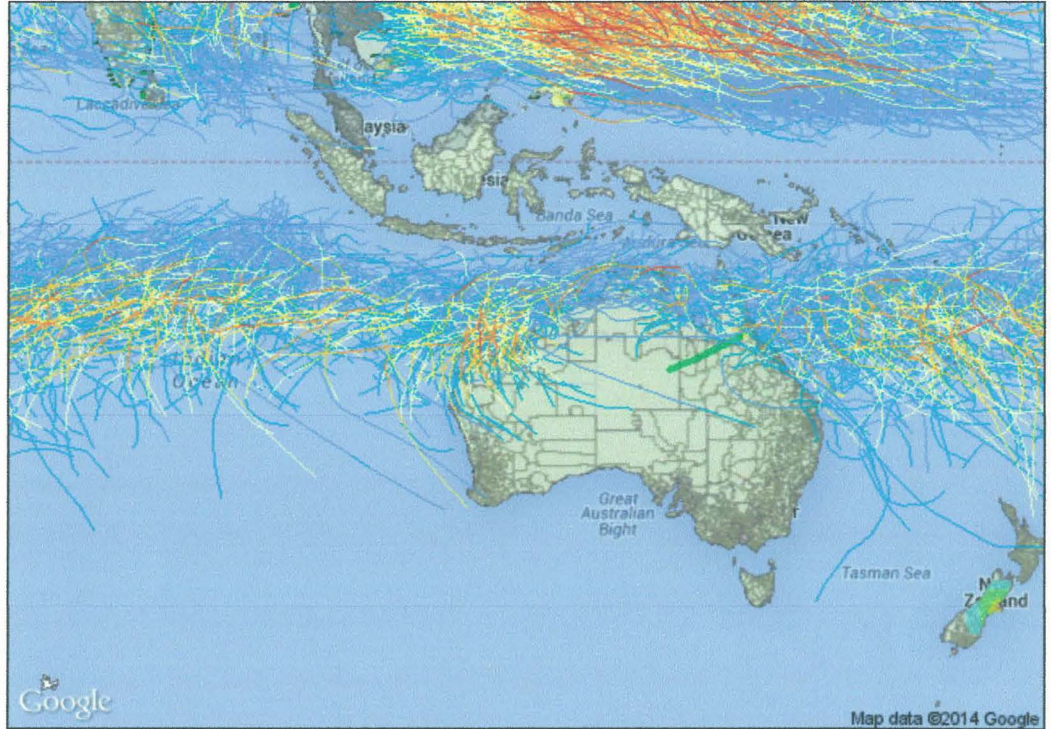


Cyclone Track Maps

Catnet output September 2014

Map Content

- Tropical Cyclone Tracks
 - All Basins (1970-2012)
 - Atlantic Ocean (1891-2012)
 - Indian Ocean (1945-2012)
 - Pacific Ocean (1945 - 2012)
 - Recent Events
 - Jammu & Kashmir Flood September 2014
 - Earthquake M 6.0 California August 2014 (USGS)
 - TC Hayan - Nov 2013
 - Earthquake M 8.2 Chile April 2014 (USGS)
 - Alberta Flooding - June 22nd 2013
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 - Moore Tornado 20 May 2013 (USA) (Wunderground NWS)
 - TC Sandy 2012
 - FL Thailand, Oct Nov 2011
 - TC Irene, Aug 2011
 - EQ M 9.0 Japan, Mar 2011
 - EQ M 6.3 New Zealand, Feb 2011
 - TC Yasi, Feb 2011
 - Yasi_track
 - SAFFIR_SIMPSON
 - SS 0
 - SS 1
 - SS 2
 - SS 3
 - SS 4
 - EQ M 7.0 New Zealand, Sep 2010
 - EQ M 8.8 Chile, Feb 2010
 - EQ 7.0 Haiti, Jan 2010
 - CRESTA HighRes
 - CRESTA_HighRes
 - Cresta Zones
 - CRESTA Zone
 - People at Risk per Scenario
 - Hurricane/ Storm
 - 8'600'000
 - People potentially affected by wind
 - City Area
 - Cities
 - Sigma World Insurance
 - GDP per capita
 - Search Results
 - User Places
- Copyright
www.weather.unisys.com/hurricane
www.cresta.org
www.swissre.com/sigma

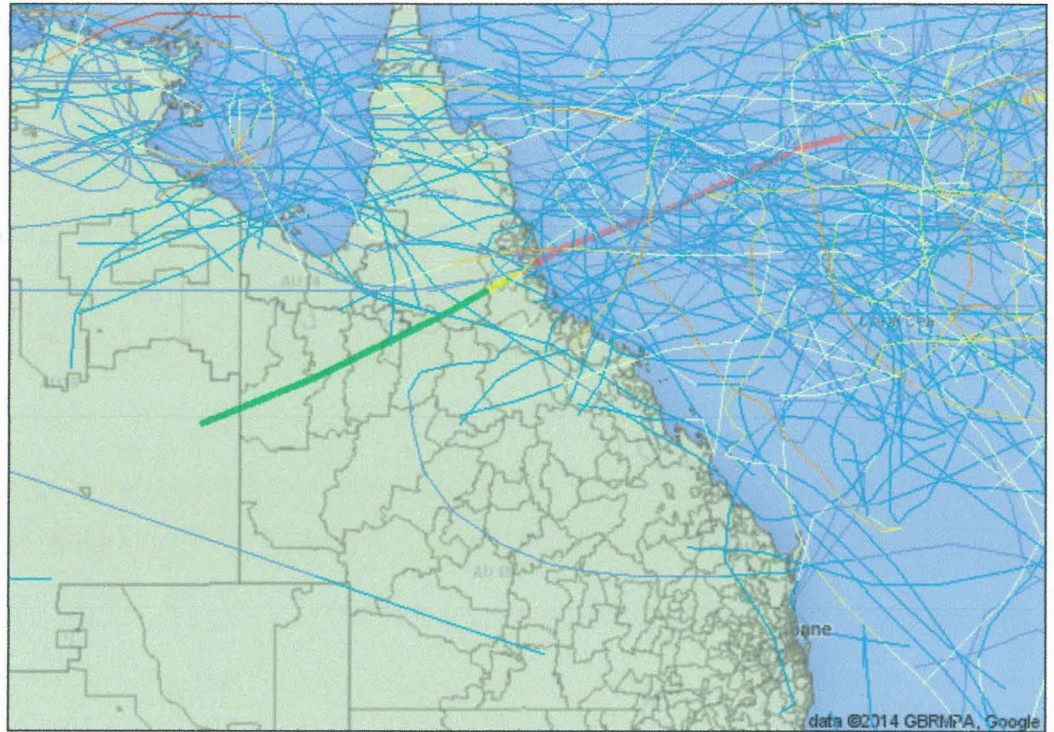


Catnet Qld Map

October 2014

Map Content

- Tropical Cyclone Tracks
 - All Basins (1970-2012)
 - Atlantic Ocean (1891-2012)
 - Indian Ocean (1945-2012)
 - Pacific Ocean (1945 - 2012)
 - Recent Events
 - Jammu & Kashmir Flood September 2014
 - Earthquake M 6.0 California August 2014 (USGS)
 - TC Hayan - Nov 2013
 - Earthquake M 8.2 Chile April 2014 (USGS)
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 - FL Thailand, Oct Nov 2011
 - TC Irene, Aug 2011
 - EQ M 9.0 Japan, Mar 2011
 - EQ M 6.3 New Zealand, Feb 2011
 - TC Yasi, Feb 2011
 - Yasi_track
 - SAFFIR_SIMPSON
 - SS 0
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 - SS 2
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 - EQ M 7.0 New Zealand, Sep 2010
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 - CRESTA HighRes
 - CRESTA_HighRes
 - Cresta Zones
 - CRESTA Zone
 - People at Risk per Scenario
 - Hurricane/ Storm
 - 8'600'000
 - People potentially affected by wind
 - City Area
 - Cities
 - Sigma World Insurance
 - GDP per capita
 - Search Results
 - User Places
- Copyright
- www.weather.unisys.com/hurricane
www.cresta.org
www.swissre.com/sigma



Sigma Map

Storms from 2000

Map Content

- Tropical Cyclone Tracks
 - All Basins (1970-2012)
 - Atlantic Ocean (1891-2012)
 - Indian Ocean (1945-2012)
 - Pacific Ocean (1945 - 2012)
- Recent Events
 - Jammu & Kashmir Flood September 2014
 - Earthquake M 6.0 California August 2014 (USGS)
 - TC Hayan - Nov 2013
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 - EQ M 9.0 Japan, Mar 2011
 - EQ M 6.3 New Zealand, Feb 2011
 - TC Yasi, Feb 2011
 - Yasi_track
- SAFFIR_SIMPSON
 - SS 0
 - SS 1
 - SS 2
 - SS3
 - SS 4
- EQ M 7.0 New Zealand, Sep 2010
- EQ M8.8 Chile, Feb 2010
- EQ 7.0 Haiti, Jan 2010

Sigma Losses (1970ff.)

Dates: 01/07/2000 - 17/10/2014

Category: Storm, Hail

Display: Economic Loss

Events loaded: 473

Events available: 473

-  > 25'000m USD
-  5'000m USD - 25'000m USD
-  1'000m USD - 5'000m USD
-  250m USD - 1'000m USD
-  100m USD - 250m USD
-  50m USD - 100m USD
-  < 50m USD

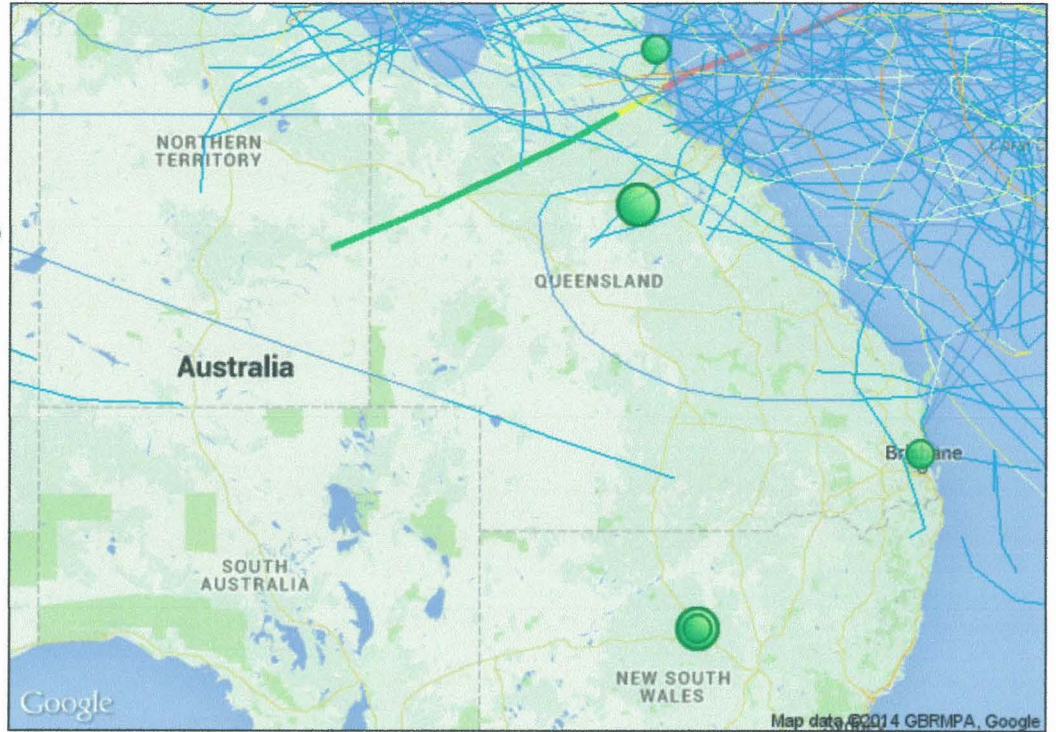
 Storm, Hail

Search Results

User Places

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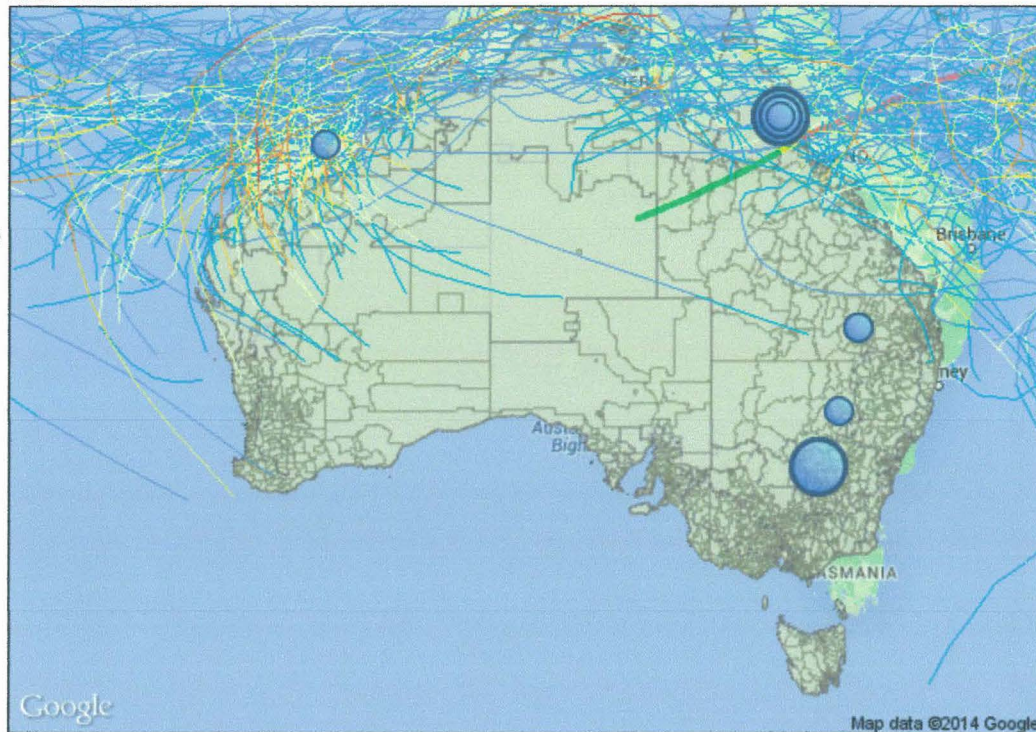


Sigma Map

Floods from 2010

Map Content

- Tropical Cyclone Tracks
 - All Basins (1970-2012)
 - Atlantic Ocean (1891-2012)
 - Indian Ocean (1945-2012)
 - Pacific Ocean (1945 - 2012)
 - Recent Events
 - Jammu & Kashmir Flood September 2014
 - Earthquake M 6.0 California August 2014 (USGS)
 - TC Hayan - Nov 2013
 - Earthquake M 8.2 Chile April 2014 (USGS)
 - Alberta Flooding - June 22nd 2013
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 - TC Yasi, Feb 2011
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 - SS 0
 - SS 1
 - SS 2
 - SS 3
 - SS 4
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 - People potentially affected by wind
 - City Area
 - Cities
 - Sigma World Insurance
 - GDP per capita
 - Sigma Losses (1970ff.)
- Dates: 01/07/2000 - 17/10/2014



Category: Flood

Display: Economic Loss

Events loaded: 355

Events available: 355



Search Results

User Places

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www.cresta.org

www.swissre.com/sigma

Sigma Loss Event Map

All Events

Map Content

Sigma Losses (1970ff.)

Dates: 01/07/2000 - 17/10/2014

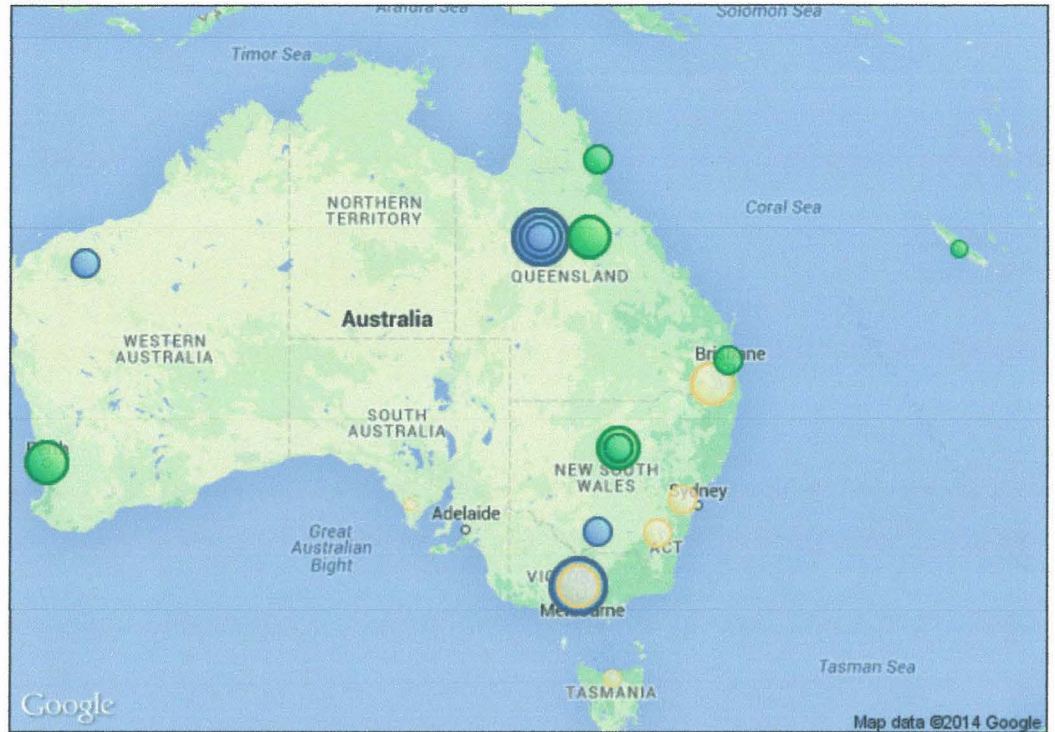
Category: Natural Catastrophes

Display: Economic Loss

Events loaded: 1000

Events available: 1027

-  > 25'000m USD
 -  5'000m USD - 25'000m USD
 -  1'000m USD - 5'000m USD
 -  250m USD - 1'000m USD
 -  100m USD - 250m USD
 -  50m USD - 100m USD
 -  < 50m USD
 -  Earthquake, Tsunami, Volcano
 -  Extreme Weather
 -  Flood
 -  Other Natural Catastrophes
 -  Storm, Hail
- Search Results
- User Places

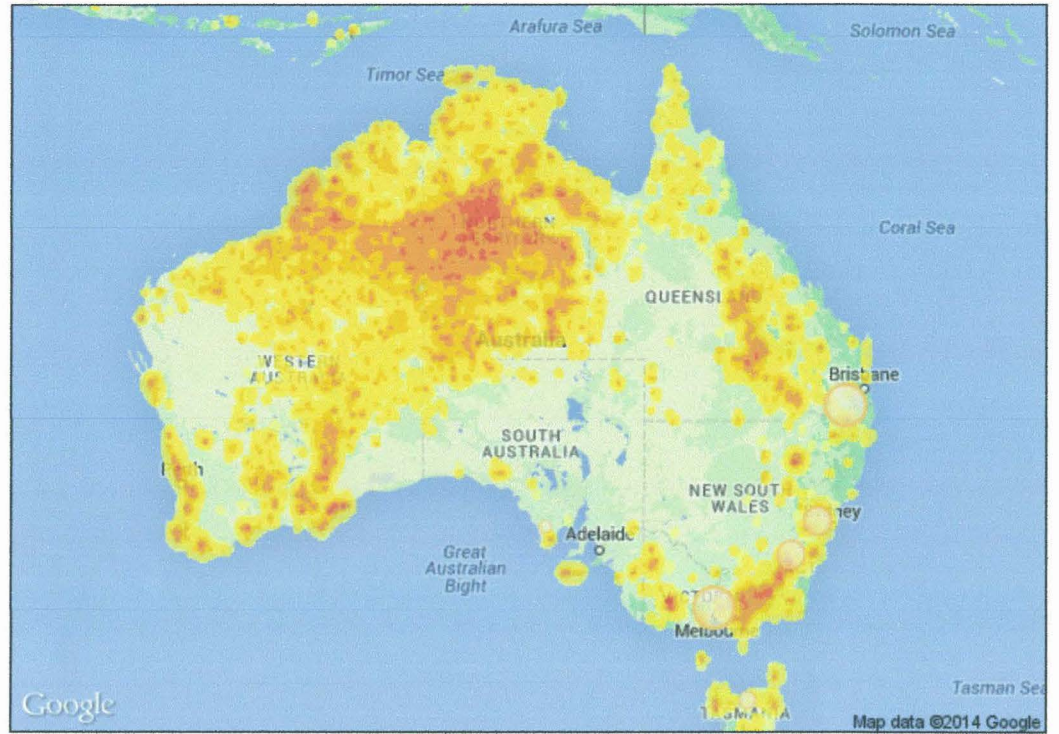


Extreme Weather and Fires

Sigma Losses 2000-2014

Map Content

- Wildfire
 - Fires > 600 MW (2000-2011)
- | | |
|---|-----------|
| | 0-1 |
| | 1 - 2 |
| | 2 - 5 |
| | 5 - 10 |
| | 10 - 25 |
| | 25 - 50 |
| | 50 - 100 |
| | 100 - 200 |
| | 200 - 500 |
- Sigma Losses (1970ff.)
- Dates: 01/07/2000 - 18/10/2014
- Category: Extreme Weather
- Display: Economic Loss
- Events loaded: 93
- Events available: 93
- | | |
|---|--------------------------|
| | > 25'000m USD |
| | 5'000m USD - 25'000m USD |
| | 1'000m USD - 5'000m USD |
| | 250m USD - 1'000m USD |
| | 100m USD - 250m USD |
| | 50m USD - 100m USD |
| | < 50m USD |
- Extreme Weather
- Search Results
- User Places



18th of October 2014