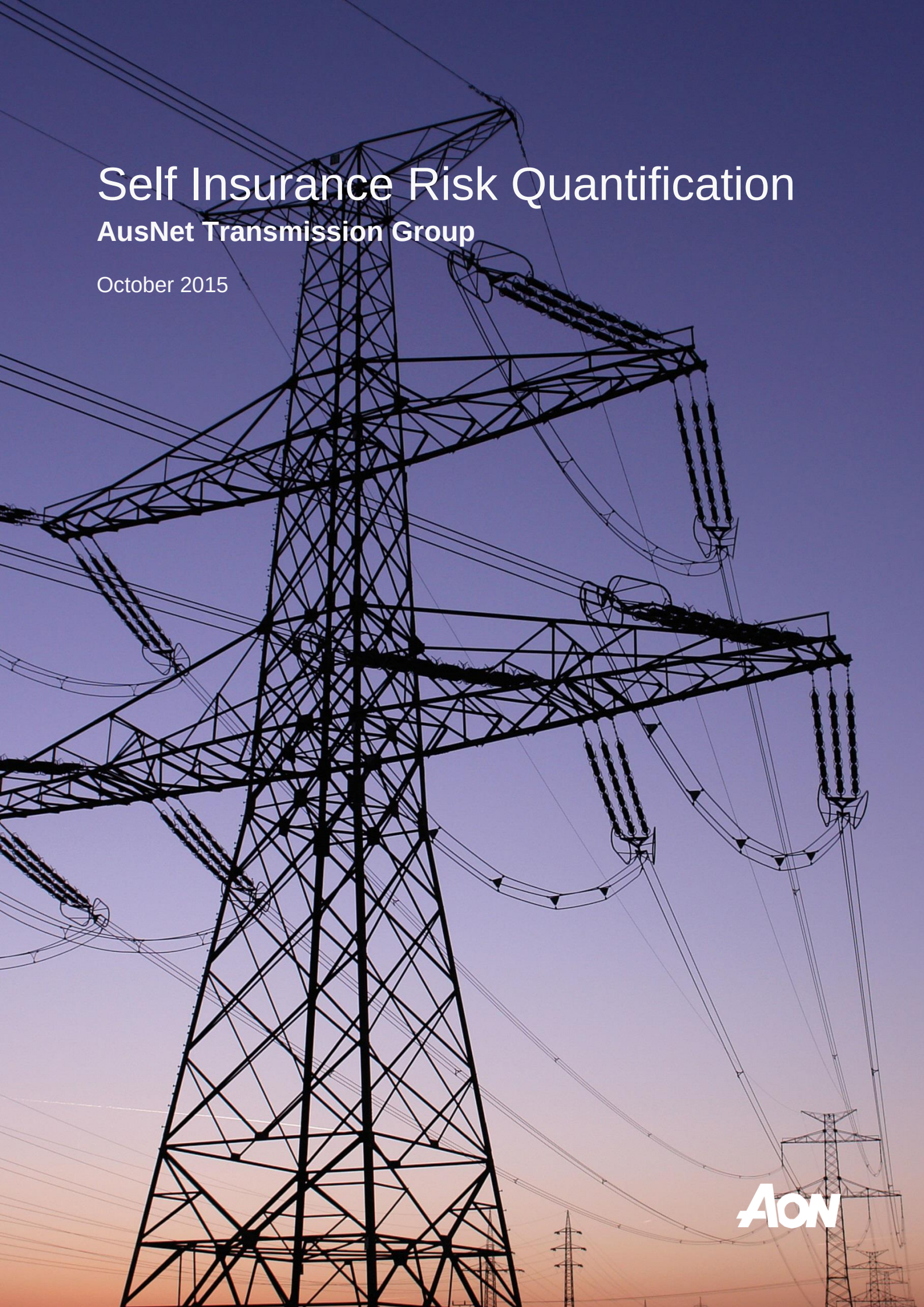
AusNet Transmission Group Pty Ltd

Transmission Revenue Review 2017-2022

Appendix 5B: Aon Self - Insurance Report

Submitted: 30 October 2015



Self Insurance Risk Quantification

AusNet Transmission Group

October 2015

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Executive Summary

Aon Risk Solutions ("Aon") has been engaged by AusNet Transmission Group ("AusNet Services") to undertake a self-insurance risk quantification for the upcoming regulatory period, 1 April 2017 to 31 March 2022.

The scope of this consultancy is to calculate the estimated cost of AusNet Services' self-insured risks for the regulatory period 1 April 2017 to 31 March 2022 to assist with their application to the Australia Energy Regulator ("AER") for a revenue determination. This analysis will look at both the under-deductible component of insured risks, and the self-insured exposures faced by AusNet Services.

Methodology and Approach

In order to quantify AusNet Services' self-insured risk, the following steps are undertaken:

- For risks that were selected to be financed by self-insurance, quantitative techniques were applied to historical losses and additional loss scenarios in order to determine appropriate frequency and severity distributions that reflect the underlying risk.
- Using those distributions, a simulation model was run to forecast self-insured losses for the upcoming regulatory period.
- The results will also display the volatility of expected losses, allowing AusNet Services to articulate the need for appropriate margins to account for the uncertainty and volatility in the estimates.
- An estimate of appropriate self-insurance premiums that correspond to the estimated self-insurance costs is also provided.

The complete list of the Qualifications and Assumptions used for this exercise are supplied in the respective appendices attached to this report.

Results

Four risk categories were selected for the risk quantification. Table 1 shows the average loss forecast for each year, split by the included risk categories, of the upcoming regulatory period.

Table 1 – Average Loss Forecast For The Year Ending 2018 To 2022 ($'000)

Risk Category	2018	2019	2020	2021	2022	Total
Tower Failure	1,099	1,135	1,158	1,190	1,219	**5,802**
Machinery Breakdown	746	756	768	776	784	**3,830**
Property	405	413	422	431	439	**2,111**
Fire Liability	64	66	62	64	67	**323**
Average Loss Forecast *(Nominal)*	**2,315**	**2,370**	**2,411**	**2,460**	**2,509**	**12,066**

To prevent overlap within normal operating expenditure, these results have been produced excluding the following:

- **Property** – excludes losses below $100,000 for Property, and minor property damage losses that are reflected in base year operating expenses;
- **Tower Failure** – excludes non-major events for Tower Failure;
- **Machinery Breakdown** – excludes losses below $250,000 for Power Transformers and $10,000 for all other equipment.

On this basis, the average loss forecast across the period of 1 April 2017 to 31 March 2022 is **$12.1m** (nominal).

Theoretical Premiums

The average loss forecast does not include margins for uncertainty, expenses or profit. These can be categorised in the following way:

- **Risk margin:** a margin relating to the inherent uncertainty in the central estimate of the loss forecast;
- **Expense margin:** a margin relating to the costs of administering the policy such as underwriting, marketing and claims management; and
- **Profit margin:** a margin relating to a reasonable return for shareholders, including the opportunity cost of holding regulatory capital.

As such, the average loss forecast is expected to be below the cost of commercial insurance (if it was available).

We have provided an estimate of the theoretical premium that corresponds to the estimate of self-insurance costs. This has been based on industry accepted margins typically applied by commercial insurers. Further details are provided in Section 4.

Table 2 outlines the estimated theoretical insurance premiums, based on those reasonable industry accepted margins.

Table 2 – Estimate Of Theoretical Premium For The Year Ending 2018 To 2022 ($'000) (Nominal)

	2018	2019	2020	2021	2022	Total
Average Self Insured Cost *(Nominal)*	2,315	2,370	2,411	2,460	2,509	12,066
Risk Margin [1] *(18.8% of Average Cost)*	435	445	453	462	471	2,266
Sub Total	**2,750**	**2,815**	**2,863**	**2,922**	**2,980**	**14,331**
Expense Margin *(10% of Premium)*	344	352	358	365	373	1,791
Profit Margin *(10% of Premium)*	344	352	358	365	373	1,791
Theoretical Premium	**3,437**	**3,519**	**3,579**	**3,653**	**3,725**	**17,914**

Notes:
1. The source of selected margins is explained in detail in Section 4.

Using these assumptions, the theoretical premium corresponding to the average loss forecast is $17.9m.

AusNet Services incurs average self-insured costs and the risk margin, and components of the expense margin are usually included in base year operating expenses. Therefore, the forecast of total self-insured costs to be incurred by AusNet Services across the period of 1 April 2017 to 31 March 2022 is **$14.3m**.

1. Introduction and Background

1.1 Background

Aon have been engaged by AusNet Transmission Group ("AusNet Services") to undertake an analysis of their self-insured risks for the upcoming regulatory period 1 April 2017 to 31 March 2022.

The purpose of this analysis is to provide a loss estimate of AusNet Services' self-insured risk for the regulatory period 1 April 2017 to 31 March 2022 to assist with their application to the Australia Energy Regulator ("AER") for a revenue determination.

1.2 Scope of Services

The scope of this consultancy is to:

- Calculate a loss estimate for the period 1 April 2017 to 31 March 2022 associated with the risks selected to be self-insured by AusNet Services.
- Utilising Aon Benfield's dynamic financial analysis modelling tool, ReMetrica®, these distributions form the basis of a simulation that forecasts expected future losses for the upcoming regulatory period.
- The results also articulate the volatility of expected losses and appropriate risk margins to accommodate this uncertainty.
- An estimate of appropriate self-insurance premiums that correspond to the estimated self-insurance costs will also be provided.

Self-insured risks fall into two categories:

- **Uninsured risks** – risks where the insurance market does not have the capacity or appetite to offer coverage, or risks that AusNet Services has elected to self-insure.
- **Insured risks (within deductible losses)** – this covers risks where insurance coverage is utilised and losses fall within AusNet Services' deductible (or self-insured retention).

1.3 Values in the Report

Unless otherwise stated, all values in this report are nominal, i.e. values are expressed in the monetary terms associated with each future year.

Values in this report are rounded, and therefore may not total exactly across each category.

1.4 Categories for Revenue Determination

In its Revenue Proposal, AusNet Services must forecast both capital expenditure and operating expenditure. Relating to insurable risk, associated costs fall into three categories:

- Insurance premiums;
- Self-insurance costs; and
- 'Business as usual' costs (or maintenance costs).

AusNet Services may also be eligible for a cost pass-through if costs relating to a particular event meet the agreed eligibility criteria and exceed 1 % of the Annual Revenue Requirement ("ARR").

To ensure that there is no double counting within operating expenditure, we have excluded any insurance premiums, any risks that are covered by an insurance policy, any risks that are eligible for a cost pass-through; and any claims that are:

- **Property** – excludes losses less than $100,000 for Property, including any minor property damage losses that are reflected in base year operating expenses;
- **Tower Failure** – excludes non-major events for Tower Failure;
- **Machinery Breakdown** – excludes losses that are less than $250,000 for Power Transformers, including other equipment losses that are less than $10,000.

These losses fall under the 'business as usual' costs.

1.5 Self-insurance Costs

For all organisations, the aim of setting an insurable risk financing strategy is to optimise the costs associated with insurable risk, taking into account the organisation's risk appetite and tolerance and the costs associated with transferring the risk. These aims are equally applicable to regulated and non-regulated entities. Specifically for AusNet Services, these aims are consistent with the AER's objective of utilising the most efficient technique of managing risk.

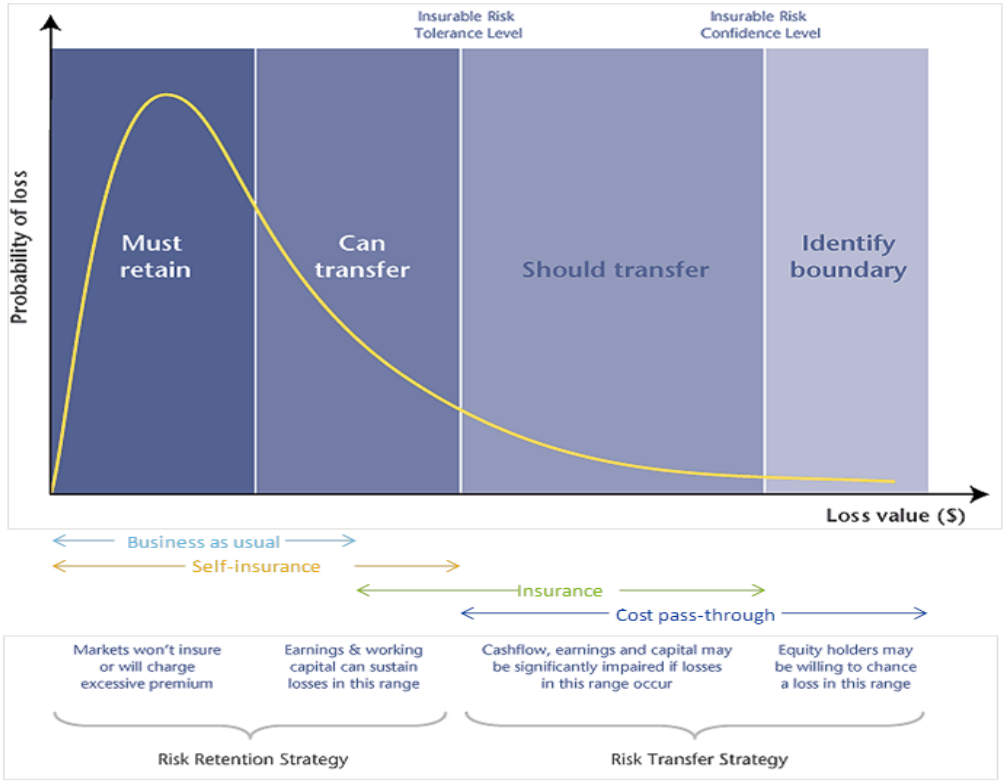
Costs associated with insurable risk are typically measured by the Total Cost of Insurable Risk ("TCOIR"), which is the sum of the following categories:

- **Insurance premiums;**
- **Retained costs:**
  - 'Business as usual' costs;
  - Self-insurance costs; and
  - Cost pass-through.
- **Risk management costs:**
  - Salaries and staff on-costs;
  - Consulting fees to external professionals

To optimise TCOIR, it is important to understand the relationship between the various categories. For example, increasing the insurance policy deductible for a specific class of risk will provide a reduction in insurance premiums, but an increase in retained costs. The aim is to find the optimal balance between risk retention and risk transfer, such that TCOIR is at its lowest.

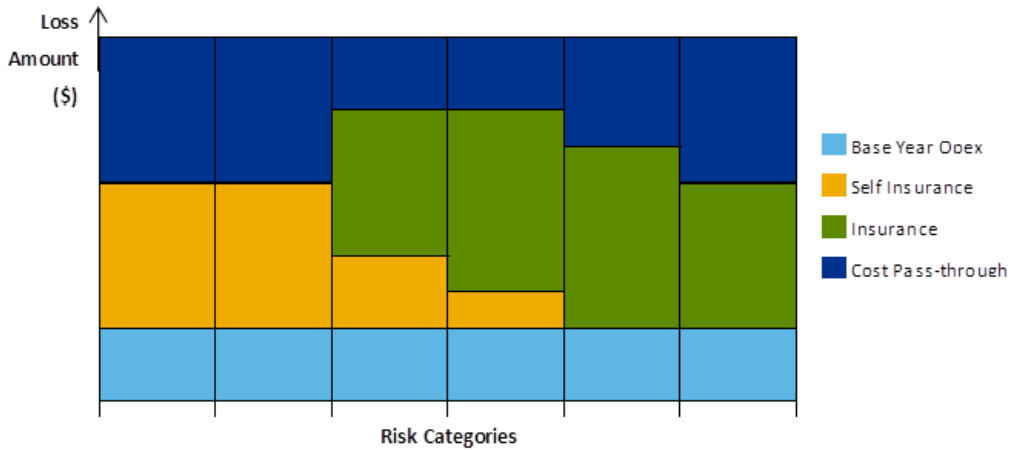
For AusNet Services, it is also important to determine and define what portions of retained costs are suitable for 'business as usual' costs, self-insurance costs and cost pass-through. The three categories for a revenue determination fit within the insurable risk financing framework, as outlined in Chart 1 below.

Chart 1 – Insurable Risk Financing Framework



If the insurable risk financing framework is applied across all risks, then there will be overlaps between categories, as the risk financing strategy will be different for each risk class. However, if you look at each risk class separately, then there will be no overlap. An example of this is in Chart 2 below.

Chart 2 – Insurable Risk Categories Risk Financing Chart



Firstly, where insurance is available and cost-effective, then it will be utilised. However, for some risk classes, such as tower failures, insurance capacity is not readily available in the market at a cost-effective price. In other cases, such as bushfire liability, insurance premiums at low deductibles are not cost-effective. Due to this, AusNet Services chooses to retain that risk at higher levels.

Several events are specified in the Rules as cost pass-through events. In addition, AusNet Services is able to nominate cost pass through events to apply over the regulatory period. This provides protection to AusNet Services regarding very low likelihood and very high severity risks.

This leaves AusNet Services with some levels of residual risk that are predictable and some levels of risk that are significantly less predictable. The predictable risks that occur each year are classified as 'business as usual' costs and are included in the base year operating expenses. The remaining self-insurance risks are more uncertain and volatile (typically lower likelihood and higher severity, for example, the 2009 bushfires). Due to this uncertainty, the costs in base year operating expenses are not a suitable representation of the average annual cost associated with self-insurance risks. Similarly, even over an entire regulatory period, the historical costs will not be a suitable representation of the average cost expected over the next regulatory period, as some self-insurance risks may only have a likelihood of occurrence equal to, say, once every 10 regulatory periods.

The quantification of self-insurance costs is best suited to an actuarial analysis. A process of stochastic modelling can be used to estimate the full range of potential outcomes in the upcoming regulatory period. From this, an average expected cost of self-insurance risks can be determined from which to build the associated premiums that correspond with this risk.

1.6 Actuarial Opinion

In addition to conducting the self-insurance risk quantification analysis, an actuarial review of the results was also carried out. This was undertaken by Andrew Hulme of Aon Benfield. As a result of his review, we include below a statement regarding his actuarial opinion.

I, Andrew Hulme FIAA, have reviewed the following:

- The methods for suitability in the circumstances and against current actuarial practice.
- The assumptions for consistency with available experience and trends.
- The judgements made by Aon Global Risk Consulting for reasonableness and materiality.
- Whether the key risks, sensitivities and uncertainties, and their implications, have been identified.

Having carried out the review, nothing has come to my attention that would lead me to believe that the results are unreasonable.

Andrew Hulme - Fellow of the Institute of Actuaries of Australia

Aon Benfield Analytics

2. Data

2.1 Available Data

The following information was considered and referenced for the purpose of this analysis:

- Individual loss listing for each risk category.
- Historical exposure information, i.e. number of transformers, revenue relating to the Transmission business, etc., as was suited and available for each risk category for historical years as well as a forecast for the upcoming regulatory period, where available.
- For tower failures, the average recovery cost and replacement cost of a tower as at 2015.
- A summary of insurance program details, including premiums, deductibles, limits and sub-limits.
- AusNet Services' 2012 insurable risk register.
- Reports and information from the following sources:
  - Risk Margins Industry Report, APRA, November 2008 ("APRA Report");
  - Safety Performance Report on Victorian Electricity Distribution and Transmission Businesses 2012, Energy Safe Victoria, Tables 9 and 10;
  - Insurance Risk Study, Ninth Edition 2014, Aon Benfield ("Aon Benfield Report");
  - AER Final Decision SP AusNet Transmission Determination 2014–15 to 2016–17, 31 January 2014;
  - The Insurance Council of Australia – Historical Disaster Statistics;
  - Romsey Australia, Summary of Major Bushfires in Australia Since 1851, which was sourced from Year Book Australia, 2004;
  - Victoria Bushfire Royal Commission Report;
  - Analysis of Transformer Failures, William Bartley, 2003;
  - National Inquiry on Bushfire Mitigation and Management, Ellis, Kanowski & Whelan 2004;
  - Transmission Connect Planning Report, Victorian Electricity Distribution Businesses, 2008.

2.2 Data Investigations and Suitability

As Aon has not independently audited the data provided, we are relying on the completeness and accuracy of this data.

Consequently, we can take no responsibility for the accuracy or otherwise of this data and its impact on the results, recommendations or conclusions in this report.

2.3 Exposure Data

AusNet Services have provided data for numbers of transformers and revenue relating to the Transmission Business to use as exposure measures for this analysis. The exposure data is a mix of historic (up to and including year ending 2016) and indicative forecast numbers (year ending 2017 and beyond). Table 3 below shows the exposure data used in this analysis.

Table 3 – Exposure Data

Year Ending	Number Of Transformers	Revenue
2008	257	N/A
2009	246	N/A
2010	235	N/A
2011	225	N/A
2012	214	N/A
2013	203	N/A
2014	205	N/A
2015	205	548,312,509
2016	205	544,609,503
2017	*208*	*536,832,008*
2018	*210*	*549,718,425*
2019	*212*	*557,025,279*
2020	*212*	*522,141,793*
2021	*212*	*540,829,200*
2022	*212*	*560,185,428*

3. Approach and Methodology

3.1 Methodology

In order to forecast the self-insured losses for the upcoming regulatory period for AusNet Services, the following steps are undertaken:

- For risks that were selected to be financed by self-insurance, quantitative techniques were applied to historical losses and additional loss scenarios in order to determine appropriate frequency and severity distributions that reflect the underlying risk.
- Using those distributions, a simulation model was run to forecast self-insured losses for the upcoming regulatory period.
- The results will also display the volatility of expected losses, allowing AusNet Services to articulate the need for appropriate margins to account for the uncertainty and volatility in the estimates.
- An estimate of appropriate self-insurance premiums that correspond to the estimated self-insurance costs is also provided.

3.2 Loss Estimates

Typically, the forecast of self-insured losses has been based on AusNet Services' historical loss data, however, where applicable, additional scenarios that have a reasonable likelihood of occurrence have been considered and included in the forecast.

The forecast of self-insured losses has been estimated on the basis that it takes into account:

- Changes to exposure (i.e. number of transformers); and
- Changes to inflation.

The loss estimates do not contain any allowances for volatility, expenses or profits, and as such, are expected to be lower than the cost of commercial insurance (if it were available). However, we have included estimates of insurance premiums that correspond to the forecast loss estimates.

The simulation model was run over 500,000 trials with a starting seed of 0 and a latin hypercube strata size of 1,000. Given the profile of AusNet Services' self-insurance costs, we believe that this amount of trials is considered an acceptable amount to gain reasonable certainty around the results for higher percentiles.

3.3 Uninsured Risks

For risks without insurance coverage, the self-insurance costs reflect AusNet Services' unlimited exposure to these risks.

Uninsured risks relate to the property damage for uninsured assets, i.e. cost associated with damage to towers located outside of a terminal station boundary. This risk category has been classified as Tower Failures.

3.4 Insured Risks (Within Deductible Losses)

For all risks with insurance coverage, the self-insurance costs only reflect loss amounts up to the relevant deductible level.

This analysis assumes that the current insurance policy deductibles will remain the same for the entire regulatory period, i.e. from 1 April 2017 to 31 March 2022. Any changes to insurance policy deductibles will have an impact on AusNet Services' self-insurance costs. However, the corresponding change in insurance premiums is likely to reasonably offset any change to self-insurance costs.

This insured risk has been classified into the following:

- Other Property Damage
- Machinery Breakdown
- Bushfire Liability (Fire Liability)

3.5 Cost Pass-Through Events

AusNet Services proposed nominate following pass-through events will include:

- Natural Disaster Event;
- Terrorism Event; and
- Liability Above Insurance Cap Event.
- Insurer Credit Risk Event

Subject to AER approval, AusNet Services is eligible to lodge a cost pass-through application if the cost associated with these events exceeds the 1% Annual Revenue Requirement ("ARR") threshold, which translates to about $5.5m per annum for the purpose of this analysis.

This analysis assumes that AusNet Services' nominated pass-through events will be accepted by the AER.

4. Results Summary

4.1 Loss Estimates

Table 4 below summarises the risk categories considered in this analysis and whether or not they were included as part of the self-insurance calculation.

Table 4 – Risk Categories Considered For The Self-Insurance Calculation

Risk	Risk Category	Insurance	Included In Self-Insurance Calculation
Property	Machinery Breakdown	Insured	Yes
	Other/General Property	Insured	Yes
	Tower Failures	Uninsured	Yes
Liability	General Liability	Insured	No
	Bushfire Liability (Fire Liability)	Insured	Yes
Minor Classes	Motor Vehicle	Insured	No
	Key Person	Uninsured	No
	Insurer Default	Uninsured	No
	Fraud	Insured	No
	Income Protection	Insured	No

For each risk category included in the self-insurance review, a loss estimate was forecast for the upcoming regulatory period. Table 5 shows the average loss forecast for each year, split by risk category.

Table 5 – Average Loss Forecast For The Year Ending 2018 To 2022 ($'000)

Risk Category	2018	2019	2020	2021	2022	Total
Tower Failure	1,099	1,135	1,158	1,190	1,219	**5,802**
Machinery Breakdown	746	756	768	776	784	**3,830**
Property	405	413	422	431	439	**2,111**
Fire Liability	64	66	62	64	67	**323**
Average Loss Forecast *(Nominal)*	**2,315**	**2,370**	**2,411**	**2,460**	**2,509**	**12,066**

The average loss forecast across the period of 1 April 2017 to 31 March 2022 is **$12.1m** (nominal).

These estimates are central estimates (i.e. they are the mean or average value of a range of potential outcomes). Table 6 shows the average self-insurance costs for the entire regulatory period, as well as loss estimates at higher percentiles to give an indication of the volatility of self-insured risks.

Table 6 – Loss Forecast For The Year Ending 2018 to 2022 – Including Volatility ($'000) (Nominal)

Risk Category	Average Losses	Standard Deviation	80th Percentile	90th Percentile
Tower Failure	5,802	7,668	9,775	14,853
Machinery Breakdown	3,830	1,221	4,840	5,443
Property	2,111	749	2,690	3,097
Fire Liability	323	1,720	0	0
Total	**12,066**	**7,988**	**16,541**	**21,638**

Notes:
1. The 80th percentile and 90th percentile values do not total across each risk category as each risk category is independent of each other. As such, there is a diversification benefit of retaining risk over multiple risk categories.
2. Detailed results are provided in Appendix 1

These estimates do not include margins for uncertainty, expenses or profit. These can be categorised in the following way:

- **Risk margin:** a margin relating to the inherent uncertainty in the central estimate of the loss forecast;
- **Expense margin:** a margin relating to the costs of administering the policy such as underwriting, marketing and claims management; and
- **Profit margin:** a margin relating to a reasonable return for shareholders, including the opportunity cost of holding regulatory capital.

As such, the average loss forecast is expected to be below the cost of commercial insurance (if it was available).

In addition, these estimates are not discounted, meaning they do not take into account expected payment patterns or the time value of money.

4.2 Theoretical Premiums

To demonstrate the efficiency of AusNet Services' current insurance structure, we have provided an estimate of the theoretical premium (if AusNet Services was able to obtain commercial insurance) that corresponds to the estimate of self-insurance costs. In order to achieve this, we have incorporated accepted industry margins derived from those used by Australian commercial general insurers.

Firstly, a risk margin has been incorporated to cater for the volatility and uncertainty of the risk. The selected risk margin is taken from the latest APRA Report. It is based on the average of risk margins for premium liabilities used by APRA regulated insurers for Public and Product Liability, and Industrial Special Risks (ISR).

Two other sources were also considered for the purpose of selecting an appropriate risk margin. Firstly, we considered risk margins calculated based on the Aon Benfield Report, which relates to the underwriting volatility of major risks (specific to General Liability and Commercial Property in Australia). Risk margins calculated based on the actual volatility of self-insured losses retained by AusNet Services (as per Table 6) were also considered, in accordance with APRA's prudential standard GPS 310.

Table 7 shows risk margins for consideration based on the APRA Report, the Aon Benfield Report and AusNet Services' modelled volatility (from Table 6).

Table 7 – Risk Margins Considered (As A Percentage (%) Of The Central Estimate)

Risk	**APRA**	**Aon Benfield** [1]	AusNet Services[2] *50% of Std Dev*	AusNet Services[2] *75% Level of Sufficiency*	**Selected**
Liability	18.0%	27.0%	266.1%	47.4%	
Property Damage	18.8%	16.0%	41.0%	-100.0%	
Weighted Average	**18.8%**	**16.3%**	**47.1%**	**43.4%**	**18.8%**

Notes:
1. The risk margin from the Aon Benfield report is equivalent to 50% of the co-efficient of variation, as per APRA's guidelines for general insurance companies when setting loss provisions.
2. The risk margin from AusNet Services modelled volatility is shown based on a 75% level of sufficiency and 50% of the co-efficient of variation, as per APRA's guidelines for general insurance companies when setting loss provisions.
3. The weighted average is weighted according to AusNet Services' average self-insured costs from Table 6.

A commercial general insurer would apply similar techniques in its underwriting process when calculating the 'expected' claims cost or 'risk premium' that forms part of the premium quote. In addition to this, insurers need to recover expenses and make profit in order to budget a commercial return on capital to its shareholders. Therefore, typical margins of 10% of the premium have been included for each, leaving 80% of the premium relating to the cost of the risk (and associated volatility).

In practice, every commercial insurance company will apply different margins depending on their risk profile, risk appetite and the state of the insurance market cycle. However, the selected margins would be considered typical based on the types of risk that are self-insured by AusNet Services.

Table 8 below outlines the estimation of theoretical insurance premiums.

Table 8 – Estimate Of Theoretical Premium For The Year Ending 2018 to 2022 ($'000) (Nominal)

	2018	2019	2020	2021	2022	Total
Average Self Insured Cost *(Nominal)*	2,315	2,370	2,411	2,460	2,509	**12,066**
Risk Margin *(18.8% of average cost)*	435	445	453	462	471	**2,266**
Sub Total	2,750	2,815	2,863	2,922	2,980	**14,331**
Expense Margin *(10% of Premium)*	344	352	358	365	373	**1,791**
Profit Margin *(10% of Premium)*	344	352	358	365	373	**1,791**
Theoretical Premium	**3,437**	**3,519**	**3,579**	**3,653**	**3,725**	**17,914**

Using these assumptions, the theoretical premium corresponding to the average loss forecast is $17.9m.

AusNet Services incurs average self-insured costs and the risk margin, and components of the expense margin are usually included in base year operating expenses. Therefore, the forecast of total self-insurance costs to be incurred by AusNet Services across the period of 1 April 2017 to 31 March 2022 is **$14.3m**.

5. Detailed Results

5.1 Tower Failure Risk

5.1.1 Overview

Tower failure risk relates to the replacement cost of towers and lines that are located outside of a terminal station boundary. Typically, tower failures are caused by localised windstorm events, but in extreme circumstances could also be caused by other natural perils such as bushfire or earthquake.

The cost of recovering and replacing these towers and lines located outside of a terminal station boundary are not insured by AusNet Services. As such, AusNet Services is subject to considerable risk as a result of significant events such as a severe windstorm or bushfire. Whilst it is recognised that there is an ongoing and relatively consistent cost associated with recovering and maintaining these towers (as captured in AusNet Services' operating expenses); the purpose of this section is to isolate costs associated with significant events and forecast the self-insured tower failure losses above and beyond budgeted expenses.

The purpose of this section is to characterise the tower failure risk landscape with an overall frequency and severity distribution. This was calculated by considering:

- Historical number of towers replaced by AusNet Services' due to severe loss events; and
- Other potential number of towers to be recovered and replaced that could have a material contribution to the expected losses and a reasonable likelihood of occurrence.

The complete Tower Failure modelling outputs, including Qualifications and Assumptions used for this analysis are supplied in Appendix 2.

5.1.2 Insurance Coverage

Towers and lines located outside of a terminal station boundary are uninsured assets. As such, the cost of recovering and replacing towers as a result of a failure due to significant events such as windstorm or bushfire is completely self-insured by AusNet Services.

Insurance for these types of exposures is typically cost prohibitive or not available, therefore, self-insuring assets such as towers and lines is a prudent and efficient way of addressing this risk, and is regarded as standard industry practice for this type of business.

5.1.3 Assessment of Losses

Historical tower failure losses associated with significant events between 1958 and 2014 were provided and analysed. Over these years, there were thirteen significant loss events that impacted AusNet Services' transmission assets; with a total of 47 towers being replaced. All loss events were caused by localised windstorm, with exception of one bushfire event. For each loss event, the number of towers replaced was provided. This was used as a basis for the frequency and severity distributions.

For the current reset period (2014 – 2017), the tower failure self-insurance analysis performed in 2013 utilised an average tower cost of $350K (2013 values). In obtaining updated information for this analysis, it was determined that the previous tower cost estimates were misstated as 'replacement cost', which in fact only catered for the recovery cost of a tower and did not include the replacement cost of a tower (recovery costs representing the cost relating to labour and equipment required to reinstate the line back into service, traffic management and site security during construction, survey and inspection of conductor and site works to keep the area safe). Consequently, in this analysis, the average

cost of a tower ($874k, which is made up of $746k replacement cost and $128k recovery cost, in 2015 values) includes both the estimated replacement cost of a tower and associated recovery cost.

This average amount of $874k was used in conjunction with the selected frequency and severity distributions to calculate the self-insurance costs for the next regulatory period. However, for each future year, the replacement and recovery cost will be indexed by 2.5% per year to take into account changes to inflation.

No adjustments to exposure had been made for tower failures. In our opinion, there is no clear correlation between the size of the network and the frequency (or severity) of losses.

5.1.4 Additional Loss Scenarios

AusNet Services' transmission network covers the entire state of Victoria, including the interconnecting power lines to NSW and South Australia. The network comprises of approximately 13,000 towers and 6,500 kilometres of high-voltage powerlines throughout Victoria.

When considering additional loss scenarios that could occur for this risk, it is important to note that unlike the capped exposure of an insured risk like Fire Liability and Property/Machinery Breakdown risks, AusNet Services' exposure to tower failure risks are effectively unlimited. Also, a majority of tower failure losses are caused by severe localised windstorms events, which could eventuate without necessarily being considered as a natural disaster (i.e. multiple, simultaneous windstorms). As such, an additional loss scenario was considered for Tower Failure.

Despite the fact that AusNet Services have not experienced an event where more than 20 towers needed to be replaced over the last 58 years, it is conceivable that an event of this magnitude could occur. In fact, an event that resulted in the replacement of more than 20 towers has occurred in the last 58 years in Australia for a comparable business. For the purpose of this analysis, we have assumed that the frequency of an event causing the replacement of 20 or more towers is 0.005 times per year (i.e. 1 in 200 years).

5.1.5 Cost Pass-Through Considerations

AusNet Services plans to nominate a natural disaster event as a cost pass-through event. However, the majority of tower failure losses are caused by severe localised windstorms would not be considered a natural disaster. Therefore, it is assumed that AusNet Services' exposure to this risk is unlimited and no cost pass-through threshold has been applied.

5.1.6 Results

The self-insured loss forecast for Tower Failure risk for the regulatory period 1 April 2017 to 31 March 2022 is shown in Table 9 below.

Table 9 – Average Loss Forecast For Tower Failure For The Year Ending 2018 to 2022 ($'000)

	2018	2019	2020	2021	2022	Total
Average Loss Forecast *(Nominal)*	1,099	1,135	1,158	1,190	1,219	**5,802**

5.2 Machinery Breakdown

5.2.1 Overview

Machinery Breakdown risk is the cost of property damage to AusNet Services assets within a terminal station as a result of equipment failure.

For the purpose of this section, the Machinery Breakdown risk is categorised into four types of equipment:

- Power Transformer;
- Instrument Transformer;
- Circuit Breaker;
- Gas Insulated Switchgear.

Minor equipment failure events resulting in repair costs below a certain threshold (i.e. $250k for power transformer and $10k for all other equipment) are not captured individually by AusNet Services. The costs relating to these minor events (and that are not included in the base year operating expenses) are included in the Maintenance Costs in Section 5.3 – Other Property Damage.

This section is to characterise the Machinery Breakdown risk landscape with an overall frequency and severity distribution. This was calculated by considering:

- AusNet Services' actual loss history for the Machinery Breakdown risks, by equipment type; and
- Other potential machinery breakdown losses that could have a material contribution to the expected losses and a reasonable likelihood of occurrence.

It is important to recognise that this analysis only focuses on losses caused by AusNet Services' transmission assets, and specifically excludes losses caused by AusNet Services' distribution assets.

The complete Machinery Breakdown modelling outputs, including Qualifications and Assumptions used for this analysis are supplied in Appendix 3.

5.2.2 Insurance Coverage

Losses relating to Machinery Breakdown are insured by the Industrial Special Risks policy. The self-insurance costs only reflect the loss amounts up to the relevant deductible level.

AusNet Services has a policy deductible of $500k and a policy sub-limit for Machinery Breakdown of $10m. This means that AusNet Services has to pay the first $500k of each and every loss, and is covered up to $10m per event.

5.2.3 Assessment of Losses

5.2.3.1 Power Transformers

Historical self-insured costs incurred for each year in the current Transmission Revenue Reset ("TRR") period were analysed from 1978 to 2014, which is sourced from AusNet Services' regulated accounts. However, data from 2000 onwards appears to best represent the exposure going forward.

Over these fifteen years, there were eight significant loss events impacting AusNet Services' transmission network assets, with seven loss events totalling $16.4m (revalued for inflation, and developed for expected movements in incurred losses) and one loss event with no loss amount available. This was used as a basis for the loss severity distributions.

AusNet Services have provided exposure information (i.e. number of transformers) from 2007 and forecast numbers through to 2021. This information is used to determine the historical transformer failure rate from 2007 to 2015. Given the low sample size of four losses since 2007, this historical failure rate was compared to the expected failure rate outline in the Transmission Connection Planning Report. The average of the two was selected as a reasonable failure rate going forward. The selected failure rate was applied to the projected number of transformers for each future year to determine the loss frequency distributions for the upcoming regulatory period.

In this assessment, only power transformer losses that are greater than $250k were included, with loss amounts below $250k assumed to be included in Maintenance Cost, under Other Property Damage. The gross loss amounts are capped at $10m to represent the likely maximum cost of a Power Transformer loss. This is based on the advice provided by AusNet Services engineers and is also in line with the sub-limit on the Industrial Special Risks policy for Machinery Breakdown losses.

5.2.3.2 Instrument Transformers

Historical losses from 2002 to 2015, which is sourced from AusNet Services' have been analysed. This assessment only includes losses that are greater than $10k, with loss amounts below $10k assumed to be included in Maintenance Cost, under Other Property Damage. Over the fourteen years, there were eight loss events impacting AusNet Services' transmission network assets, totalling $1.4m (revalued for inflation, and developed for expected movements in incurred losses). The gross loss amounts are capped at $5m to represent the likely maximum cost of an Instrument Transformer loss. This is based on the advice provided by AusNet Services engineers. This was used as a basis for the frequency and severity distributions.

5.2.3.3 Circuit Breakers

Historical losses from 2005 to 2015, which is sourced from AusNet Services' have been analysed. In this assessment, only losses that are greater than $10k is included, with loss amounts below $10k assumed to be included in Maintenance Cost, under Other Property Damage. Over these eleven years, there were thirteen loss events impacting AusNet Services' transmission network assets, totalling $1.4m (revalued for inflation, and developed for expected movements in incurred losses). The gross loss amounts are capped at $1m to represent the likely maximum cost of a Circuit Breaker loss. This is based on the advice provided by AusNet Services engineers. This was used as a basis for the frequency and severity distributions.

5.2.3.4 Gas Insulated Switchgear

Historical losses from 1983 to 2015, which is sourced from AusNet Services' have been analysed, however, data from 2002 onwards appears to best represent the exposure going forward. In addition, this assessment only includes losses that are greater than $10k, with loss amounts below $10k assumed to be included in Maintenance Cost, under other Property Damage.

Over these fourteen years, there were fifteen loss events impacting AusNet Services' transmission network assets, with thirteen loss events totalling $3.2m (revalued for inflation, and developed for expected movements in incurred losses) and three loss events with no loss amounts available. The gross loss amounts are capped at $1m to represent the likely maximum cost of a Gas Insulated Switchgear loss, which is based on the advice provided by AusNet Services engineers. This was used as a basis for the frequency and severity distributions.

5.2.4 Additional Loss Scenarios

For Machinery Breakdown risk, the recent loss experience appears to provide a reasonable comprehensive guide to the range of potential Machinery Breakdown loss events. As such, no additional loss scenarios were considered for Machinery Breakdown.

5.2.5 Cost Pass-Through Considerations

AusNet Services' maximum exposure to Machinery Breakdown risk is the $500k deductible. Assuming that the Machinery Breakdown policy sub-limit of $10m per event is sufficient, losses relating to Machinery Breakdown will not exceed 1% of the ARR, and therefore will not be eligible for a lodgement of a cost pass-through application under the insurance cap event.

5.2.6 Results

The self-insured loss forecast for Machinery Breakdown for the regulatory period 1 April 2017 to 31 March 2022 is shown in Table 10 below.

Table 10 – Average Loss Forecast For Machinery Breakdown For The Year Ending 2018 to 2022 ($'000)

	2018	2019	2020	2021	2022	Total
Average Loss Forecast *(Nominal)*	746	756	768	776	784	**3,830**

5.3 Other Property Damage

5.3.1 Overview

Other Property Damage risk is the cost of property damage to AusNet Services insured assets within a terminal station that does not relate to equipment failure or machinery breakdown.

For the purpose of the analysis for this section, we have characterised Other Property Damage risk into two levels of risk:

- Property Damage – Insured Assets;
  Significant property damage losses (i.e. greater than $100k), which could result from natural perils such as storms, lightning, bushfire, earthquake and flood, or other causes such as fire, explosion, water damage, terrorism, third party impact or major theft.

- Maintenance Costs;
  Minor property damage losses (usually less than $100k) and are not reflected in base year operating expenses, which typically results from urgent maintenance, investigatory work or repairs; can also include losses due to natural perils, third party impact or minor theft.

It is important to recognise that this analysis only focuses on losses caused by AusNet Services' transmission assets, and specifically excludes losses caused by AusNet Services' distribution assets.

The complete Other Property Damage modelling outputs, including Qualifications and Assumptions used for this analysis are supplied in Appendix 4.

5.3.2 Insurance Coverage

Losses relating to Other Property Damage are insured by the Industrial Special Risks policy. The self-insurance costs only reflect loss amounts up to the relevant deductible level.

AusNet Services has a policy deductible of $500k, which means that AusNet Services has to pay the first $500k of each and every loss.

Maintenance costs are not subject to the policy deductible as all losses are assumed to be below $500k.

5.3.3 Assessment of Losses

5.3.3.1 Property Damage (Insured Assets)

Historical property damage losses between 2008 and 2014 have been provided and analysed. Over these eight years, there were two significant loss events impacting AusNet Services' transmission network assets, totalling $1.7m (revalued for inflation, and developed for expected movements in incurred losses).

AusNet Services' historical loss frequency was used to select an appropriate distribution for loss frequency. Given the low sample size and uncertainty in this estimate, the selected loss frequency was tested against historical loss frequencies for similar organisations and found to be reasonable. For the loss severity distribution of this risk, AusNet Services' historical losses were supplemented with historical industry losses (i.e. historical losses of similar organisation) relating to this risk. The combination of both AusNet Services' and industry losses was used as a basis for the selection of an appropriate distribution for loss severity.

5.3.3.2 Maintenance Costs

Historical maintenance costs between 2008 and 2014 have been provided and analysed. Over these eight years, the aggregated loss totalling $1.8m (revalued for inflation, and developed for expected movements in incurred losses) impacted AusNet Services' transmission network assets.

Given that majority of the historical loss data was provided as an aggregated amount for a number of loss events (for example 'Urgent Maintenance Works for 2013/14'), the analysis does not forecast loss frequency for this particular risk class. Instead, loss severity has been forecasted on an annual aggregated basis, i.e. by selecting an appropriate loss severity distribution based on the annual historical losses over the last eight years.

5.3.4 Additional Loss Scenarios

For Other Property Damage risk; whilst it is recognised that there is a possibility of a gross loss exceeding $5m, the likelihood of such an event would be remote. Therefore, these events are assumed to not have a material impact on the self-insurance costs once the low level of insurance policy deductibles is taken into account. As such, no additional loss scenarios were considered for Other Property Damage.

5.3.5 Cost Pass-Through Considerations

AusNet Services' maximum exposure to the Other Property Damage risk is the $500k deductible. Assuming that the Industrial Special Risks policy limit is sufficient, losses relating to Other Property Damage will not exceed 1% of the ARR, and therefore will not be eligible for a lodgement of a cost pass-through application.

5.3.6 Results

The self-insured loss forecast for Other Property Damage for the regulatory period 1 April 2017 to 31 March 2022 is shown in Table 11 below.

Table 11 – Average Loss Forecast For Other Property Damage For The Year Ending 2018 to 2022 ($'000)

	2018	2019	2020	2021	2022	Total
Average Loss Forecast *(Nominal)*	405	413	422	431	439	**2,111**

5.4 Fire Liability

5.4.1 Overview

Fire Liability or Bushfire Liability risk is all amounts which AusNet Services becomes legally liable to pay compensation for economic loss, bodily injury and/or property damage to third parties caused by a fire arising from AusNet Services' business operations. It does not include any damages to AusNet Services' own assets.

The purpose of this section was to characterise the fire liability risk landscape with an overall frequency and severity distribution. This was calculated by considering:

- AusNet Services' actual loss history for insured fire liability risks; and
- Other potential liability losses that could have a material contribution to the expected losses and a reasonable likelihood of occurrence.

It is important to recognise that this analysis only focuses on losses caused by AusNet Services' transmission assets, and specifically excludes losses caused by AusNet Services' electricity distribution assets.

The complete Fire Liability risk modelling outputs, including Qualifications and Assumptions used for this analysis are supplied in Appendix 5.

5.4.2 Insurance Coverage

Losses relating to Fire Liability risk are insured by the Liability policy. The self-insurance costs only reflect loss amounts up to the relevant deductible level.

AusNet Services has a policy deductible of $10m for fire liability losses. This means that AusNet Services has to pay the first $10m of each and every fire liability event.

5.4.3 Assessment of Losses

There were no historical losses relating to Fire Liability risk for AusNet Services Transmission business in the last 50 years; however it is conceivable that there could be a loss in the future.

5.4.4 Additional Loss Scenarios

For the Fire Liability risk, an additional loss scenario was considered for Fire Liability. AusNet Services offsets the financial consequences of this risk by purchasing insurance, and is expected to retain the first $10m relating to any insured event. Whilst we acknowledge that from a fire liability perspective, AusNet Services transmission business have not experienced a fire liability event in the last 50 years, it is conceivable that this type of event could occur in the future. Whilst it is recognised that from a fire liability perspective, electricity transmission assets are less risky compared to electricity distribution assets; there have been multiple occasions where electricity transmission assets have been implicated in the cause of major bushfire in Australia.

In order to arrive at a frequency and severity that represents a reasonable reflection of the risk, we have utilised data from the following key sources:

- Safety Performance Report on Victorian Electricity Distribution and Transmission Businesses 2012, Energy Safe Victoria, Tables 9 and 10;
- The Insurance Council of Australia – Historical Disaster Statistics;
- Romsey Australia, Summary of Major Bushfires in Australia Since 1851, which was sourced from Year Book Australia, 2004;
- Victoria Bushfire Royal Commission Report;

Whilst we recognise that a range of assumptions (as outlined in the following sections) have been made to estimate the self-insured cost of Fire Liability risk, we believe that these assumptions provide a reasonable reflection of the risk. In addition, any assumptions made do not have a material impact on AusNet Services' overall self-insurance cost.

Frequency Distribution

In order to determine loss frequency, we had to consider a large sample of bushfire losses, as outlined in the section below.

Adjustments for further changes to exposure (i.e. revenue) have been made for Fire Liability; though the size of the network remains relatively constant for the next regulatory cycle.

For losses relating to this risk, we were able to source a summary of major bushfire events from Romsey Australia and also the Insurance Council of Australia ('ICA'). The ICA's loss history goes as far back as 1967, which includes normalised insurance claims costs (typically domestic property insurance). Using the historical frequency of bushfire in Australia, the frequency is then diluted to represent bushfires in Victoria (which is AusNet Services' network area). Additionally, in order to arrive at a reasonable estimate for AusNet Services Transmission's Fire Liability frequency, this frequency was further diluted to represent Victoria's bushfire frequency of those caused by electricity transmission assets, as shown in Appendix 5.

The estimated loss frequency for losses over $2m is 0.00609 losses per year or approximately one loss every 164 years.

For loss amounts below $2m, a ratio of under $2m losses to over $2m losses was applied to estimate the frequency of losses under $2m. This is assuming that the frequency of bushfire events caused by electricity assets in Victoria, as mentioned previously, represents significant losses greater than $2m. This ratio is based on historical bushfire liability claims for the majority of electricity distribution and transmission companies in Australia. Similar to the frequency of losses over $2m, this frequency was then further diluted to represent losses caused by electricity transmission assets in Victoria.

The estimated loss frequency for losses under $2m is 0.00825 losses per year or approximately one loss every 121 years.

Severity Distribution

In order to estimate loss severity, we have considered historical losses sourced from Romsey Australia, Insurance Council of Australia and the 'National Inquiry on Bushfire Mitigation and Management' (Ellis, Kanowski & Whelan 2004).

For bushfire losses below $2m; industry losses were utilised to determine a suitable severity distribution for loss amounts below $2m. These losses were based on historical bushfire liability claims for the majority of electricity distribution and transmission companies in Australia.

As for losses over $2m, the nominalised cost of insurance claims provided in the ICA data were uses as the basis of the industry loss curve. These losses were separated in different loss bands and were diluted to represent the proportion of the overall event loss attributed to AusNet Services Transmission. For larger bushfire events, we assume that there are likely to be multiple ignition sources, of which only a small proportion of those would be caused by electricity assets. As such, a smaller proportion of the overall claim would be attributed to electricity assets. For smaller bushfire events, there are likely to be less ignition sources (perhaps only one), and therefore a larger proportion of the overall claim amount would be attributed to electricity assets.

For a reasonable loss severity curve to be selected, the industry loss curve and the dilution factors that represent bushfire implicated by electricity transmission assets is utilised. It is important to note that AusNet Services' self-insured cost is only the first $10m of each loss. Therefore, for the purpose of this analysis, the accuracy of the loss severity curve exceeding $10m is not material and does not require a significant focus.

5.4.5 Cost Pass-Through Considerations

Assuming that the Fire Liability policy limit is sufficient, AusNet Services' maximum exposure to Fire Liability risk per event is the $10m deductible. However, in the event that the Fire Liability policy limit is not sufficient, AusNet Services plans to nominate an 'insurance cap event' as a cost pass-through event. In this case, any liability exceeding the policy limit will be eligible for a lodgement of a cost pass-through application (which is subject to AER approval), for amounts of residual risk (policy deductible and above limit liability) that exceed 1% of the ARR.

5.4.6 Results

The self-insured loss forecast for Fire Liability for the regulatory period 1 April 2017 to 31 March 2022 is shown in Table 12 below.

Table 12 – Average Loss Forecast For Fire Liability For The Year Ending 2018 To 2022 ($'000)

	2018	2019	2020	2021	2022	Total
Average Loss Forecast *(Nominal)*	64	66	62	64	67	**323**

6. Aon Consultants

The Aon consultants that worked on this engagement were Ross Ivey, Corrinne Ng, and Andrew Hulme.

7. Disclaimers

Reasonableness of Approach

In our judgement, we have employed techniques and assumptions that are appropriate for the purpose of this investigation, given the information currently available. We emphasise, however, that future claims emergence may deviate, perhaps materially, from our estimates.

Variability

Unfortunately, there are many reasons why the estimation model will not be perfect. Models are only approximations to reality. There are real world features that are impossible or impractical to include in a model. In addition, models are based on the past. Because past experience is itself subject to random variation, the estimation of the model parameters is subject to random variation. Professional judgement is an invaluable aid in the estimation process, but again introduces yet another item of uncertainty. Experienced professionals can look at the same facts and draw differing conclusions.

The scientific modelling process, supplemented by professional expertise is, however, the best tool we have. The process adds value as it allows planning under conditions of uncertainty, allows the effects of particular events to be measured and reviewed, and enables the best possible decisions to be made. It remains important to understand the uncertainties in the process. The knowledge of the uncertainty itself allows planning and rational decisions to be made.

Unanticipated Changes

Unanticipated changes such as judicial decisions, legislative actions, claim consciousness amongst potential claimants, claims management, claims settlement practices, changes in inflation and economic decisions may significantly alter the report's conclusions. Our estimates make no allowance for claim types not represented in the data provided.

Appendix 1. Overall Loss Forecast

Attachment 1. Summary Average Losses By Year & Risk Category

Attachment 2. Summary Loss Forecast By Risk Category

A1.1
AusNet Services
Summary Average Losses By Year & Risk Category

Risk Categorty	Total	2018	2019	2020	2021	2022
Tower Failure	5,801,643	1,098,968	1,134,577	1,158,481	1,190,180	1,219,437
Machinery Breakdown	3,830,193	746,223	756,377	768,432	775,529	783,633
Property	2,110,630	405,437	413,275	421,959	430,543	439,417
Fire Liability	323,121	64,486	66,013	61,762	64,178	66,682
Total	**12,065,587**	**2,315,113**	**2,370,242**	**2,410,633**	**2,460,429**	**2,509,170**

Notes:

1. Selected distributions are shown in the following attachments.
2. Values are nominal, meaning that they are inflation and exposure adjusted to represent costs in future regulatory years, assuming an inflation rate of 2.5% per annum.
3. All values are in AUD ($'000).

A1.2
AusNet Services
Summary Loss Forecast By Risk Category

Risk Category	Average	Standard Deviation	80th Percentile	90th Percentile	95th Percentile	99th Percentile
Tower Failure	5,802	7,668	9,775	14,853	20,651	35,646
Machinery Breakdown	3,830	1,221	4,840	5,443	5,960	6,977
Property	2,111	749	2,690	3,097	3,471	4,290
Fire Liability	323	1,720	0	0	456	10,000
Total	**12,066**	**7,988**	**16,541**	**21,638**	**27,414**	**42,288**

Notes:
1. Selected distributions are shown in the following attachments.
2. Values are nominal, meaning that they are inflation and exposure adjusted to represent costs in future regulatory years, assuming an inflation rate of 2.5% per annum.
3. All values are in AUD ($'000).

Appendix 2. Tower Failure

Attachment 1. Self-Insurance Loss Forecast

Attachment 2. Loss Summary & Selected Distributions

A2.1
AusNet Services
Loss Forecast - Tower Failure

AusNet's Retained Losses

Regulatory Year Ending	Average	Standard Deviation	80th Percentile	90th Percentile	95th Percentile	98th Percentile	99th Percentile
2018	1,098,968	3,249,019	930,111	3,720,442	6,510,774	11,161,327	14,881,769
2019	1,134,577	3,345,306	953,363	3,813,453	6,673,543	11,440,360	15,253,813
2020	1,158,481	3,418,172	977,197	3,908,790	6,840,382	11,726,369	15,635,158
2021	1,190,180	3,526,526	1,001,627	4,006,509	7,011,391	12,019,528	16,026,037
2022	1,219,437	3,606,041	1,026,668	4,106,672	7,186,676	12,320,016	16,426,688
Total	**5,801,643**	**7,668,228**	**9,774,953**	**14,853,400**	**20,650,779**	**29,034,017**	**35,645,963**

A2.2
AusNet Services Transmission
Tower Failure Losses

	Number of Events	Number of Towers	Assumed Cost ($2016)
Total			
1958 - 2015	13	47	42,125,651
1979 - 2015	7	23	20,614,680
2005 - 2015	3	12	10,755,485
Average			
1958 - 2015	0.224	0.810	726,304
2005 - 2015	0.273	1.091	977,771

Frequency

Years	Number of Years	Number of Events	Frequency
1958 - 2015	58	13	0.224
2005 - 2015	11	3	0.273
Selected			0.250

Selected Distributions

Frequency	<=20	>20
	0.250	0.005

Severity	<=20	>20
Distribution	NegBin	NegBin
p1	1	1
p2	0.24	0.1
lower	0	
upper	19	
shift	1	20

Notes:

1. Loss severity is the number of towers replaced multiplied by the estimated replacement cost per tower of $874k.
2. Although AusNet have not experienced an event where more than 20 towers needed to be replaced in the last 58 years, it is conceivable that an event of this magnitiude could occur. For the purpose of this analysis, we have assumed that the frequency of more than 20 towers being replaced in one event is 0.005 times per year (ie. 1 in 200 years).
3. All frequency distributions assume a Poisson distribution.

Appendix 3. Machinery Breakdown

Attachment 1. Self-Insurance Loss Forecast

Attachment 2. Loss Summary & Selected Distributions – Power Transformer

Attachment 3. Loss Summary & Selected Distributions – Instrument Transformer

Attachment 4. Loss Summary & Selected Distributions – Circuit Breaker

Attachment 5. Loss Summary & Selected Distributions – Gas Insulated Switchgear

A3.1
AusNet Services
Loss Forecast - Machinery Breakdown

AusNet's Retained Losses

Regulatory Year Ending	Average	Standard Deviation	80th Percentile	90th Percentile	95th Percentile	98th Percentile	99th Percentile
2018	746,223	537,444	1,166,651	1,500,000	1,738,989	2,068,660	2,288,618
2019	756,377	541,687	1,178,605	1,500,000	1,756,682	2,090,338	2,311,024
2020	768,432	546,915	1,196,798	1,520,419	1,777,088	2,105,788	2,332,388
2021	775,529	550,229	1,205,192	1,530,977	1,791,765	2,121,997	2,350,476
2022	783,633	553,050	1,216,032	1,538,864	1,805,325	2,138,446	2,367,875
Total	**3,830,193**	**1,221,027**	**4,840,354**	**5,442,812**	**5,960,329**	**6,568,454**	**6,977,397**

Average Losses by Year and Loss Type

Regulatory Year Ending	Power Transformer	Instrument Transformer	Circuit Breaker	Gas Insulated Switchgear	Total
2018	313,022	72,612	122,434	238,154	746,223
2019	315,994	73,633	125,034	241,715	756,377
2020	319,007	75,181	127,961	246,283	768,432
2021	318,988	76,081	130,457	250,002	775,529
2022	318,991	77,469	133,203	253,969	783,633
Total	**1,586,002**	**374,977**	**639,090**	**1,230,124**	**3,830,193**

A3.2
AusNet Services Transmission
Power Transformer Failure

Loss History

	Number of Claims	Actual Cost ($)	Assumed Cost ($2016)	Retained Cost ($2016)
2000 - 2015				
Total	8	12,944,386	16,402,282	3,500,000

Frequency Distribution

Year of Loss	Number of Transformers	% Reported	Reported Exposure	Number of Losses
2000	257	100%	257	2
2001	257	100%	257	0
2002	257	100%	257	0
2003	257	100%	257	0
2004	257	100%	257	1
2005	257	100%	257	1
2006	257	100%	257	0
2007	257	100%	257	1
2008	246	100%	246	0
2009	235	100%	235	1
2010	225	100%	225	1
2011	214	100%	214	1
2012	203	100%	203	0
2013	205	100%	205	0
2014	205	100%	205	0
2015	205	92%	188	0
Total 2000 - 2015			3,777	8
Total 2007 - 2015			1,978	4

Failure Rate 2007 - 2015	0.202%
Failure Rate (Engineering Report)	0.400%

Year of Loss	Number of Transformers	Failure Rate 0.202%	Failure Rate 0.400%	Average Failure Rate
2016	208	0.421	0.832	0.626
2017	210	0.425	0.840	0.632
2018	212	0.429	0.848	0.638
2019	212	0.429	0.848	0.638
2020	212	0.429	0.848	0.638
2021	212	0.429	0.848	0.638

Severity Distribution

Severity	
Distribution	Lognormal
p1	2,500,000
p2	2,000,000
lower	250,000
upper	10,000,000

Notes:

1. Cost data was unavailable for one of the eight losses since 2000.
2. Exposure (i.e. number of transformers) is unknown prior to 2007, and therefore loss frequency prior to 2007 is unreliable.
3. The cost of transformer failure rate of 0.4% is assumed, based on data provided in the Tranmsission Connection Planning Report 2008 ("Engineering Report").
4. Selected failure rate is based on an average of the historical failure rate from 2007 to 2015 and the expected failure rate as outlined in the Engineering Report.
5. All frequency distributions assume a Poisson distribution.
6. Retained cost assumes a $500k deductible applies per loss.

A3.3
AusNet Services Transmission
Instrument Transformer Failure

Loss History

	Number of Events	Actual Cost ($)	Assumed Cost ($2016)	Retained Cost ($2016)
2002-2015				
Total	8	1,125,000	1,443,557	959,658
Avg Per Year	0.571	80,357	103,111	68,547

Frequency Distribution

Years	Number of Years	Number of Events	Frequency
2002-2015	14	8	0.571

Severity Distribution

Severity Distribution	Lognorm
p1	165,000
p2	900,000
lower	10,000
upper	5,000,000

Notes:

1. All frequency distributions assume a Poisson distribution.
2. Retained cost assumes a $500k deductible applies per loss.

A3.4
AusNet Services Transmission
Circuit Breaker Failure

Loss History

	Number of Events	Actual Cost ($)	Assumed Cost ($2016)	Retained Cost ($2016)
2005 - 2015				
Total	13	1,146,332	1,393,475	1,393,475
Avg Per Year	1.182	104,212	126,680	126,680

Frequency Distribution

Years	Number of Years	Number of Events	Frequency
2005 - 2015	11	13	1.182

Severity Distributions

Severity Distribution	lognormal	
p1	112,500	112,500
p2	240,000	240,000
lower	10,000	10,000
upper	1,000,000	1,000,000

Notes:

1. All frequency distributions assume a Poisson distribution.
2. Retained cost assumes a $500k deductible applies per loss.

A3.5
AusNet Services Transmission
Gas Insulated Switchgear Failure

Loss History

	Number of Events	Actual Cost ($)	Assumed Cost ($2016)	Retained Cost ($2016)
2002-2015				
Total	15	2,210,000	3,182,538	3,024,820
Avg Per Year	1.071	157,857	227,324	216,059

Frequency Distribution

Years	Number of Years	Number of Events	Frequency
2002-2015	14	15	1.071

Severity Distributions

Severity	
Distribution	lognormal
p1	380,000
p2	650,000
lower	10,000
upper	1,000,000

Notes:

1. All frequency distributions assume a Poisson distribution.
2. Retained cost assumes a $500k deductible applies per loss.

Appendix 4. Other Property Damage

Attachment 1. Self-Insurance Loss Forecast

Attachment 2. Loss Summary & Selected Distributions – Maintenance

Attachment 3. Loss Summary & Selected Distributions – Other Property Damage

A4.1
AusNet Services
Loss Forecast - Other Property Damage

AusNet's Retained Losses

Regulatory Year Ending	Average	Standard Deviation	80th Percentile	90th Percentile	95th Percentile	98th Percentile	99th Percentile
2018	405,437	324,099	640,724	827,768	1,034,730	1,291,292	1,497,202
2019	413,275	328,966	650,396	840,453	1,050,531	1,309,744	1,523,528
2020	421,959	334,193	661,063	854,672	1,069,026	1,329,644	1,546,693
2021	430,543	340,773	671,077	869,895	1,089,858	1,361,033	1,581,023
2022	439,417	346,231	682,073	884,760	1,106,594	1,377,908	1,609,552
Total	**2,110,630**	**749,341**	**2,689,747**	**3,097,419**	**3,470,609**	**3,939,255**	**4,289,644**

Average Losses by Year and Loss Type

Regulatory Year Ending	Maintenance	General Property	Total
2018	303,701	101,735	405,437
2019	311,290	101,985	413,275
2020	319,101	102,858	421,959
2021	327,102	103,440	430,543
2022	335,270	104,148	439,417
Total	**1,596,464**	**514,166**	**2,110,630**

A4.2
AusNet Services Transmission
Maintenance Costs

Loss History

Year of Loss	Actual Cost ($)	Assumed Cost ($2016)
08/09	105,007	133,019
09/10	367,614	452,119
10/11	478,016	570,776
11/12	102,053	118,308
12/13	1,173	1,282
13/14	478,608	507,755
14/15	0	0
Average		297,210
Std Dev		240,708

Selected Distributions

Severity	
Distribution	Lognormal
p1	300,000
p2	241,000

Notes:

1. Due to the nature of reporting on these types of claims (ie. lump sum amounts for multiple projects), it was decided to model this risk on an annual aggregate basis, rather than with a frequency and severity distribution for individual losses.
2. All costs are assumed to be below $250k per incident, and therefore are fully self-insured.

A4.3
AusNet Services Transmission
Other Property Damage - Insured Assets

Loss History

	Number of Events	Actual Cost ($)	Assumed Cost ($2016)	Retained Cost ($2016)
2008-2015				
Total	2	1,425,000	1,722,565	992,691
Avg Per Year	0.255	181,915	219,902	126,727

Frequency Distribution

Years	Number of Years	Number of Events	Frequency
2008 - 2015	8	2	0.255

Selected Distributions

Severity	
Distribution	lognormal
p1	1,000,000
p2	600,000
lower	100,000
upper	5,000,000

Notes:

1. All frequency distributions assume a Poisson distribution.
2. Retained cost assumes a $500k deductible applies per loss.
3. Due to the low number of data points, industry losses from similar entities have been used in addition to SP AusNet's losses to select an appropriate loss severity distribution.

Appendix 5. Fire Liability

Attachment 1. Self-Insurance Loss Forecast

Attachment 2. Loss Summary & Selected Distributions – Losses Above $2m

Attachment 3. Loss Summary & Selected Distributions – Losses Below $2m

Attachment 4. Australian Bushfire Disasters – 1967 to 2015

Attachment 5. Analysis of Bushfire Causes – 1976 to 1996

A5.1
AusNet Services
Loss Forecast - Fire Liability

AusNet's Retained Losses

Regulatory Year Ending	Average	Standard Deviation	80th Percentile	90th Percentile	95th Percentile	98th Percentile	99th Percentile
2018	64,486	767,478	0	0	0	0	493,199
2019	66,013	776,588	0	0	0	0	515,066
2020	61,762	752,857	0	0	0	0	401,248
2021	64,178	768,140	0	0	0	0	465,259
2022	66,682	778,911	0	0	0	0	589,933
Total	**323,121**	**1,719,583**	**0**	**0**	**455,510**	**10,000,000**	**10,000,000**

A5.2

AusNet Services Transmission

Fire Liability Risk - Frequency and Severity Assumptions

Losses Above $2m

	Australia Wide						Victoria Only				AusNet Services Transmission				
Cost ($m)	Years of Data	Count	Count (Last 10 Years)	Frequency Per Year (All Years)	Frequency Per Year (Last 10 Years)	Frequency Per Year (Selected)	Vic Fires Count	Vic Fires as % of all fires	Vic Fires as % of all fires (Selected)	Vic Fires Frequency Per Year (Selected)	% chance electricity assets part of cause	AusNet Tran Fires Frequency Per Year (Selected)	% chance transmission assets implicated	AusNet Tran Fires Frequency Per Year (Selected)	% of total loss attributed to AusNet (Most Likely)
	A	*B*	*C*	*D* (B / A)	*E* (C / 10)	*F*	*G*	*H* (G / B)	*I*	*J* (F x I)	*K*	*L* (J x K)	*M*	*N* (L x M)	*O*
5 - 100	29	18	11	0.62	1.1	0.90	6	33%	35%	0.315	10%	0.03150	2%	0.00063	75%
100 - 500	39	7	1	0.18	0.1	0.15	1	14%	35%	0.053	65%	0.03413	5%	0.00171	25%
500+	49	4	1	0.08	0.1	0.10	2	50%	50%	0.050	75%	0.03750	10%	0.00375	10%
Total		**29**	**13**	**0.88**	**1.3**	**1.15**	**9**	**31%**		**0.418**		**0.10313**		**0.00609**	

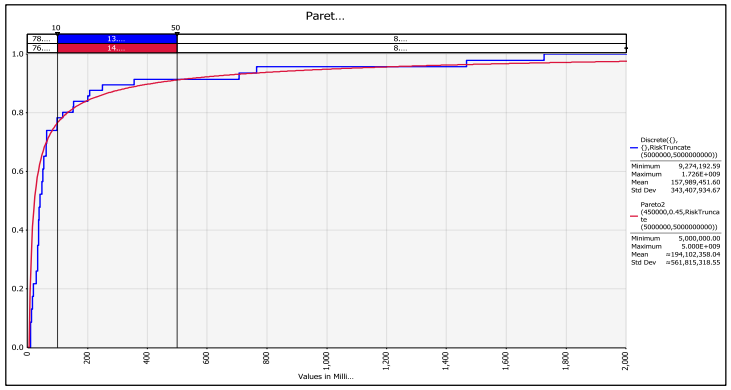


Figure 1. Weighted Industry Bushfires Curve (Blue) vs Selected Industry Curve (Red)

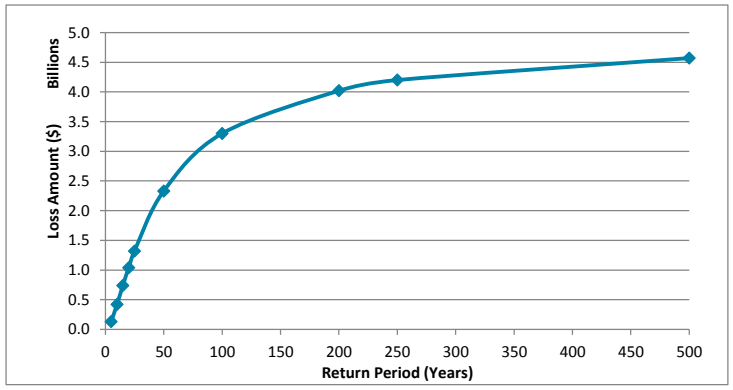


Figure 2. Selected industry loss curve - Australia-wide

Notes:

1. Column K - For Loss Band '5 - 100', it is assumed that approximately 10% of fires will be caused by an electricity asset (Source: Romsey Australia, Summary of Major Bushfires in Australia Since 1851 - Attachment 4), and most fires will have one ignition point.
2. Column K - For Loss Band '100 - 500', it is assumed that approximately 65% of fires will be caused by an electricity asset (4 out of 6 fires), and some fires may have multiple ignition points.
3. Column K - For Loss Band '500+', it is assumed that electricity assets will be implicated in approximately 75% of fires (2 out of 4 fires, but 2 out of 2 Victorian fires).
4. Column M - it is assumed that transmission assets will be implicated in approximately 2% of fires caused by electricity assets. (Source: Safety Report on Victorian Electricity Distribution and Transmission Businesses, 2011, Energy Safe Victoria, Tables 7 and 8). Tables show that there were 59 ground fires caused by electrictity assets, none of which were caused by transmission assets. As such, we have conservatively assumed a rate of 2%. For fires costs above $100m, we assume that there may be multiple ignition sources and have increased the likelihood in line with this.
5. The selected loss frequency curve for AusNet Services losses is a based on a Poisson distribution with an average of 0.00609 (column N).
6. The selected loss severity curve for AusNet Services losses is based on the Selected Industry Loss Curve (Figure 2) and was diluted according to the '% of total loss attributed to AusNet' (column O) for each loss band using a PERT Distrubution with a 'minimum' of 0%, 'maximum' of 100% and a 'most likely' of the value in column O.
7. The selected loss severity curve for AusNet Services Transmission losses is based on a Generalised Pareto distribution.

A5.3
AusNet Services Transmission
Fire Liability Risk - Frequency and Severity Assumptions
Losses Below $2m

Frequency Assumptions

			Frequency	Comments
Victorian Fires (costs > $5m)	*A*		0.41750	Attachment 1 - column J
Electricity Assets Implicated (Liability > $2m)	*B*		0.10313	Attachment 1 - column L. Assume diluted claims cost represents losses above $2m.
Electricity Assets Implicated (Liability < $2m)	*C*	*4 x B*	0.41250	Industry ratio of [<$2m claims]:[>$2m claims] is approximately 4:1.
Transmission Assets Caused Fire (Liability < $2m)	*D*	*2% x C*	**0.00825**	Assumes that 2% of electricity caused fires for amounts less than $2m will be caused by transmission assets

Severity Assumptions - Losses Below $2m

Distribution	Lognormal
p1	310,000
p2	350,000
lower	100,000
upper	2,000,000

Notes:

1. The industry ratio of [<$2m claims]:[>$2m claims] is based on an assessment of bushfire liability losses above $100k for the majority of electricty distribution and electrity transmission companies across Australia.
2. The loss severity distribution is based on industry data for bushfire losses caused by electricity assets that were between $100k and $2m.

A5.4

AusNet Services Transmission

Australian Bushfire Disasters - 1967 to 2015

Year	Fire / Location	State	Original Cost ($m)	Cost ($m) $2011	Cost ($m) $2016	Electricity Assets Implicated
1983	Ash Wednesday	VIC	138	1,489	1,726	Yes
2009	Black Saturday	VIC	1,070	1,266	1,468	Yes
2003	Canberra	ACT	350	660	765	
1967	Hobart	TAS	14	610	707	
1983	Ash Wednesday	SA	38	307	356	Yes
1994	Eastern Seaboard	NSW	59	215	249	
1984	Central & Southern	NSW	25	179	208	Yes
2013	NSW (various locations)	NSW	183		200	
1980	Adelaide Hills	SA	13	132	153	Yes
2001	Sydney & Surrounds	NSW	69	131	152	
1977	Western Districts	VIC	9	101	117	No
2013	TAS	TAS	89		97	
1991	Central Coast	NSW	12	54	63	
2011	Margaret River	WA	53	53	62	
2014	Warrandyte, Mickleham-Kilmore and Yarram fire	VIC	*50*		53	Yes
2002	Engadine & Glenorie	NSW	25	43	50	Yes
2005	Eyre Peninsula	SA	28	41	48	No
2011	Perth and surrounds	WA	35	35	41	
2013	Coonabarabran	NSW	35		38	
1990	Not available	VIC	10	32	37	
1987	Southern	TAS	7	32	37	
1997	Ferny Creek	VIC	10	29	34	No
2006	North, West & East VIC	VIC	22	28	32	
2003	Eastern Border Region	VIC	12	24	28	
2006	Widespread (NSW/VIC)	VIC	14	16	19	
2014	Perth	WA	15		16	
2015	Sampson Flat, SA	SA	*13*		13	
2009	Toodyay WA	WA	7	8	9	
1997	Menai	NSW	3	8	9	

Notes:

1. Source is Insurance Council of Australia - Historical Disaster Statistics
2. 2016 values are an inflationary increase of the 2011 values provided by ICA, assuming a future rate of inflation of 3% per annum.

A5.5
AusNet Services Transmission
Bushfire Causes

Table 24.33 - CAUSES OF BUSHFIRES IN VICTORIA — 1976–77 to 1995–96

Fire cause	Average no. of fires each year no.	Proportion of total fires %	Average area burnt ha/yr	Proportion of total area burnt %
Lightning	149	26	53,096	46
Deliberate	145	25	15,649	14
Agricultural	96	16	7,799	7
Campfires	59	10	1,466	1
Cigarettes/matches	41	7	444	<1
Cause unknown(a)	37	6	2,974	3
Miscellaneous(b)	26	5	10,009	9
Machinery/exhausts	15	3	2,551	2
Prescribed burn escapes(c)	9	2	5,274	5
Public utilities(d)	7	1	16,256	14
Total(e)	**584**	**100**	**115,518**	**100**

(a) Includes fires where investigators could not ascertain the cause, as well as fires where the cause was not investigated.

(b) Includes causes like: burning houses, burning buildings and fireworks.

(c) Management of parks and forests includes the use of planned fires for a variety of purposes such as natural fuel management and the maintenance of flora and fauna habitat. Sometimes these fires burn beyond the planned perimeter.

(d) Includes ignitions from trains and power transmission.
(e) All figures are rounded; hence may not add up to column totals.
Source: DSE 2003a.

Notes:

1. Given that the majority of fires in the above table are small, we assume that 10% of fires capable of causing over $5m in insured losses would be caused by public utilities.
2. Source is Romsey Australia, Summary of Major Bushfires in Australia Since 1851, which was sourced from Year Book Australia, 2004.

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