AusNet services

Supplementary information on Likelihood of Failures

2023-27 Transmission Revenue Reset - Revised Proposal

Appendix 3A

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1 Background

The AER's Draft Decision stated [1]

> "AusNet Services has not provided us with the underlying data and statistical calculations for these formulas, or otherwise provided supporting information to show that the resulting failure rates reflect the realistic likelihood that an asset will fail.
>
> This makes it difficult for us to be wholly satisfied that the underlying modelling is producing an outcome that realistically reflects the risk and consequences of asset failure. We have not identified the need for an adjustment to AusNet Services' methodology or inputs at this stage, based on the information available. However, we propose to revisit this issue in AusNet Services' revised proposal and work with AusNet Services on the specific information we need to make an informed final decision in regard to AusNet Services' proposed capex."

In this context, the AER provided the following question to AusNet.

> "AusNet Services' uses the probability of asset failure to assess the optimal timing of its major stations renewals and asset replacement program. Asset Risk Assessment Overview (AMS 01-09) explains its approach to estimating the probability of asset failure. The asset failure rates for each asset are based on an assessment of an asset's condition-based age and a failure distribution curve (using Weibull distribution) to derive annual failure rates. Appendix M contains the Weibull rates for different assets. Please provide the underlying statics and models used to derive the probability of asset failure for each asset types. This includes the underlying derivation and statistics (e.g., goodness of fit) used to estimate the Weibull parameters (e.g., beta values) for each asset type, and the spreadsheets that calculate the asset failure distribution for each asset type."

This Appendix provides further supporting information around the Weibull failure rate parameters and demonstrates the robustness of these assumptions. It should be read in conjunction with AMS 01-09 (Asset Risk Assessment Overview) submitted as part of this Revised Proposal.

2 Our Approach

Table 22 below (reproduced from AMS 01-09 Appendix M) shows the Weibull failure rate parameters used for key assets. These parameters have been used to derive the failure rate assumptions underpinning our capex forecast.

Table 22: Weibull Rates by Asset

Asset	Weibull Rate - Eta	Beta
Insulators	46 years	6.6
Structures	71 years	6.5
Conductor	70 years	7
Circuit Breakers	45 years	3.5
Instrument transformers	45 years	3.5
Surge Arresters	45 years	3.5
Transformer	50 years	3.5

1 Page 19, DRAFT DECISION AusNet Services Transmission Determination 2022 to 2027 Attachment 5 - Capital expenditure, AER

Our failure rate assumptions are derived by:

- Adopting the 2 parameter (beta and eta) Weibull distribution pattern of failure distribution for life cycle analysis for various asset classes;
- Using a five-point condition scale C1 to C5 to set a conditional age; and
- Calibrating the results with the sum of replacements in each year.

Our approach at previous transmission resets, which the AER has accepted, has been to continue to apply the Weibull parameters shown in Table 22 of AMS 01-09, unless the available data demonstrates that there has been significant deviation from these values. We have maintained this approach when developing our capex forecast for the 2023-2027 regulatory period.

To support this approach, our Beta and Eta assumptions for both station and lines assets have been validated against available underlying statistics. As set out in this Appendix, this analysis demonstrates that these values remain fit for purpose.

2.1 Failure rate Behaviour - Beta

Weibull parameters are a common reliability engineering way to express deteriorating assets. The rate of deterioration with time is expressed through the beta value. The higher the beta value, the faster the wear out rate of deterioration.

As shown in Table 22, for Station assets with multiple failure modes and more complexity, a beta of 3.5 is used to reflect a normal failure distribution pattern. A Beta of 3.5 is a typically used value for wear out in engineering manufactured products.

For Lines assets, where a dominant failure mode through corrosion is the failure cause, a higher Beta is used. These values are supported by the analysis described in the 'Transmission Line Assets' section below.

2.2 Characteristic Life - Eta

The typical characteristic life has, in part, been informed by an evaluation as per attached document ANT-TRR 2023-27 Technical AMS 10-101 Asset Life Evaluation 01 Sept. 2021 with the assistance of asset subject matter technical specialists for various asset classes, taking into consideration technology type and asset category.

The length of useful asset life depends on many factors such as: its operating conditions (different to specified conditions by the manufacturer such as environmental & operating stresses), maintainability and manufacturer support, among other factors.

3 Station Assets

3.1 Switchgear

Figure 2 of ANT-TRR 2023-27 Technical AMS 10-101 Asset Life Evaluation 01 Sept. 2021 provides the summary of asset lives of key station switchgear. The Weibull eta parameters used in switchgear modelling, as listed in Appendix M of AMS 01-09, are consistent with the AMS 10-101 assessment.

Using the Weibull parameters and condition scores, the calibration results for the Transmission circuit breakers are shown in Table 1 below.

			AGE	45					Weibull		0	1	2	3	4	
Condition	Count of ASSET	Cause	Condition	RSP%	Remaining Life	Age	Useful Life	BETA	PBF	Failures	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Total
C1	295	Circuit Breaker Failure	1	95	42.75	2.25	45	3.5	0.004%	0.01	0.004%	0.01%	0.02%	0.04%	0.06%	
C2	245	Circuit Breaker Failure	2	70	31.5	13.5	45	3.5	0.38%	0.94	0.383%	0.46%	0.54%	0.63%	0.73%	
C3	229	Circuit Breaker Failure	3	45	20.25	24.75	45	3.5	1.74%	4.00	1.745%	1.93%	2.12%	2.32%	2.54%	
C4	164	Circuit Breaker Failure	4	25	11.25	33.75	45	3.5	3.79%	6.21	3.789%	4.08%	4.38%	4.69%	5.01%	
C5	234	Circuit Breaker Failure	5	15	6.75	38.25	45	3.5	5.18%	12.12	5.181%	5.53%	5.88%	6.26%	6.64%	
	1167								Estimated failures per year:	**23.28**	**23.28**	**25.18**	**27.19**	**29.31**	**31.54**	**137**

Table 1- Circuit Breaker Calibration Model

AusNet proposes to replace 131 circuit breakers in the next regulatory period – this is lower than the results of the CB calibration model, which is about 137 circuit breakers, as shown in the Total column, in Table 1 above.

To further demonstrate the robustness of the Weibull parameters, analysis was carried out on station switchgear asset replacement ages for the period 2016-2021. This considered where the asset has been replaced, either through failure or planned (suspended failure) replacement. Data was taken from our SAP enterprise data system.

Table 2 below shows the average replacement ages for circuit breakers, instrument transformers and surge arresters. The relating data used is provided in the attachment work book: ANT-TRR 2023-27 Technical Document Transmission Asset Replacement 01 Sept. 2021.

Asset class	**Average Replacement Age (years)**
Circuit Breakers	44.3
Instrument Transformers	39.8
Surge Arresters	41.7
Combined Average	**41.2**

Table 2 – Average Switchgear Replacement Age 2016-2021 Period

It is observed that the average age of replacement of station switchgear assets is about 41.2 years taking into consideration the replacements carried out in the period 2016-2021.

The Weibull study carried out on transmission circuit breakers over a longer period, 2005-2020 shows the characteristic age of about 46 years with beta 5.5 which will have a calculated average life of 42 years. The Power BI view of Weibull is shown in the chart below. The underlying data associated with this analysis is shown in the attachment containing work book: ANT-TRR 2023-27 Technical Document Transmission CB Weibull Analysis 01 Sept. 2021 **.**

Supplementary information on Likelihood of failure assumptions

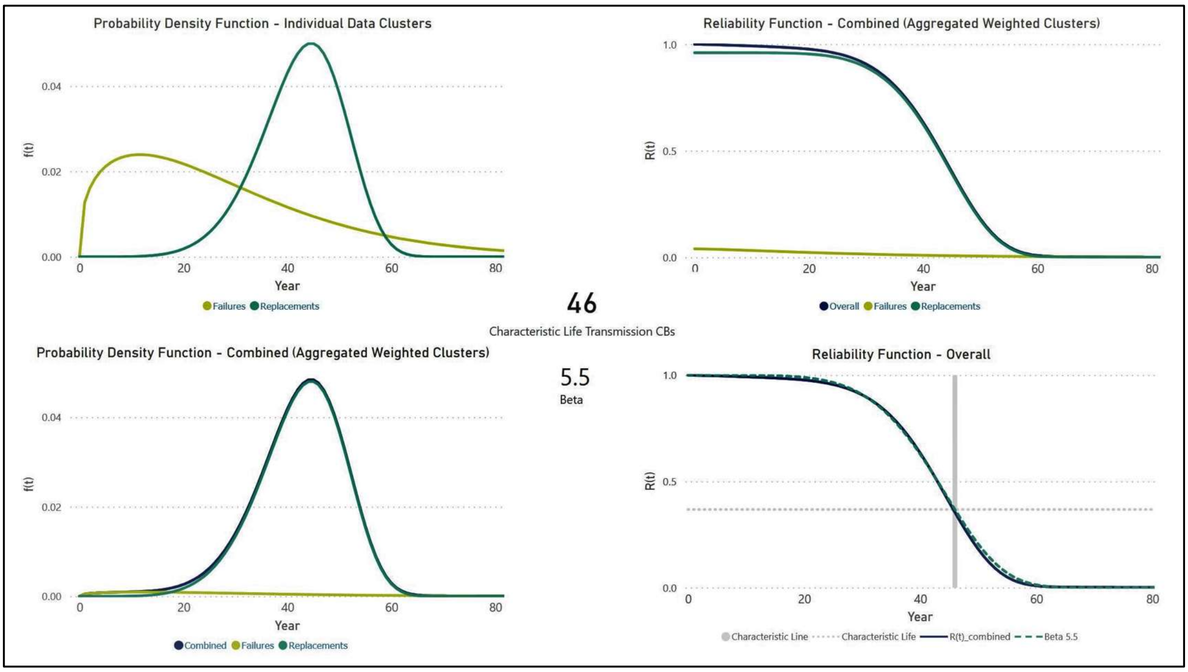

Figure 1 – Weibull analysis -Transmission Circuit Breakers

This analysis of data shows that the traditionally accepted characteristic life of 45 years is appropriate for transmission circuit breakers. The failure pattern does not demonstrate a significant change of failure rate hence the Table 22 values for CBs (in Appendix M of AMS 01-09) have been applied to develop our capex forecast for the 2023-27 regulatory period.

Similar Weibull curve fit study, using Availability Workbench commercial software, carried out for replacement ages of Transmission Instrument transformer over 2016-2021 show a characteristic age of 45.8 years with beta 3.78, (and Rho 0.96). Figure 2 below show the 2 parameter Weibull plot, and level of fit parameters on the right-hand side.

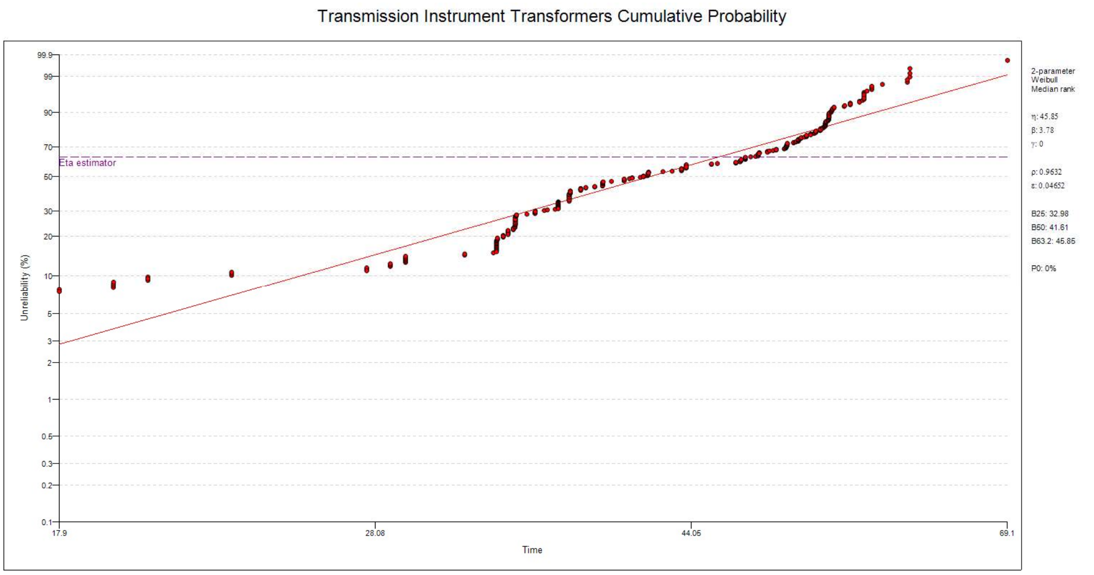

Figure 2 – Weibull chart – Transmission Instrument transformers

The Weibull study over the same period for transmission surge arresters shows a characteristic age of 45.6 years with beta 4.9 (and rho 0.92). Surge Arrester Replacements are normally carried out during asset condition replacements or rebuild projects. Figure 3 below shows the 2 parameter Weibull plot and level of fit parameters on the right-hand side.

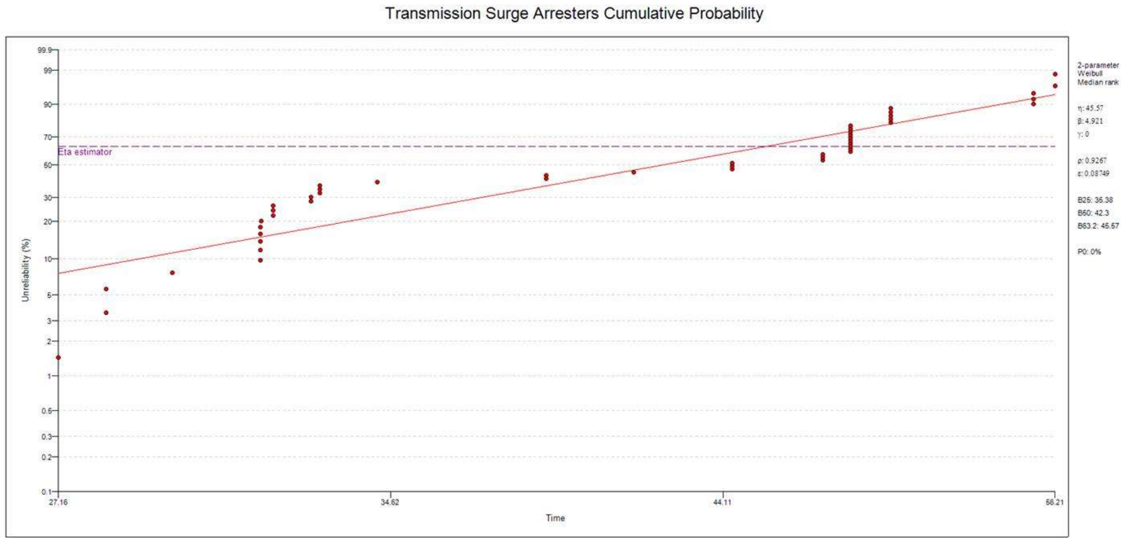

Figure 3 – Weibull chart -Transmission Surge Arresters

While the eta derived through our statistical analysis is marginally higher than the 45 years shown in AMS 01-09, we do not consider that this difference is material or warrants a departure from our existing assumptions. Furthermore, the higher beta values through the analysis suggests a faster wear out age than assumed in AMS 01-09 (beta of 3.5). On balance, the Weibull rates derived for switchgear indicate that our failure rate assumptions for this asset class are broadly reasonable.

3.2 Power Transformers

Figure 2 of ANT-TRR 2023-27 Technical AMS 10-101 Asset Life Evaluation 01 Sept. 2021 provides the subject matter expert's assessment of power transformer asset life. The Weibull eta parameters used in power transformer modelling, as listed in Appendix M of AMS 01-09, are consistent with the AMS 10-101 assessment.

To further demonstrate the robustness of the Weibull parameters, analysis was carried out on power transformer asset replacement ages for the period 2016-2021. This considered where the asset has been replaced, either through failure or planned (suspended failure) replacement. Data was taken from our SAP enterprise data system.

The average replacement age of power transformers is found to be 52.2 years. The relating data used is provided in the attachment work book: ANT-TRR 2023-27 Technical Document Transmission Asset Replacement 01 Sept. 2021.

The Weibull study carried out of transmission power transformers replacements, over 2016-2021, show a characteristic age of 53.3 years with beta 9.7 (Rho 0.953). Power Transformer statistical data includes three replacements due to end-of-life failure but is dominated by the 'suspended' failures (replacement program). The high beta indicates a narrow replacement age, which is in part due to the replacement program focus being on specific make and model designs, with similar ages and specific common condition issues.

While the eta derived through our statistical analysis is marginally higher than the 50 years shown in AMS 01-09, we do not consider that this difference is material or warrants a departure from our existing assumptions. Furthermore, the beta value of 9.7 derived through the analysis suggests a faster wear out age than assumed in AMS 01-09 (beta of 3.5). On balance, the Weibull rates derived for power transformers indicate that our failure rate assumptions for this asset class are broadly reasonable.

Figure 4 below show the 2 parameter Weibull plot for Transmission power transformers. This excludes analysis of earlier life interventions such as bushing replacements, oil replacement or tank resealing, that are used to extend life.

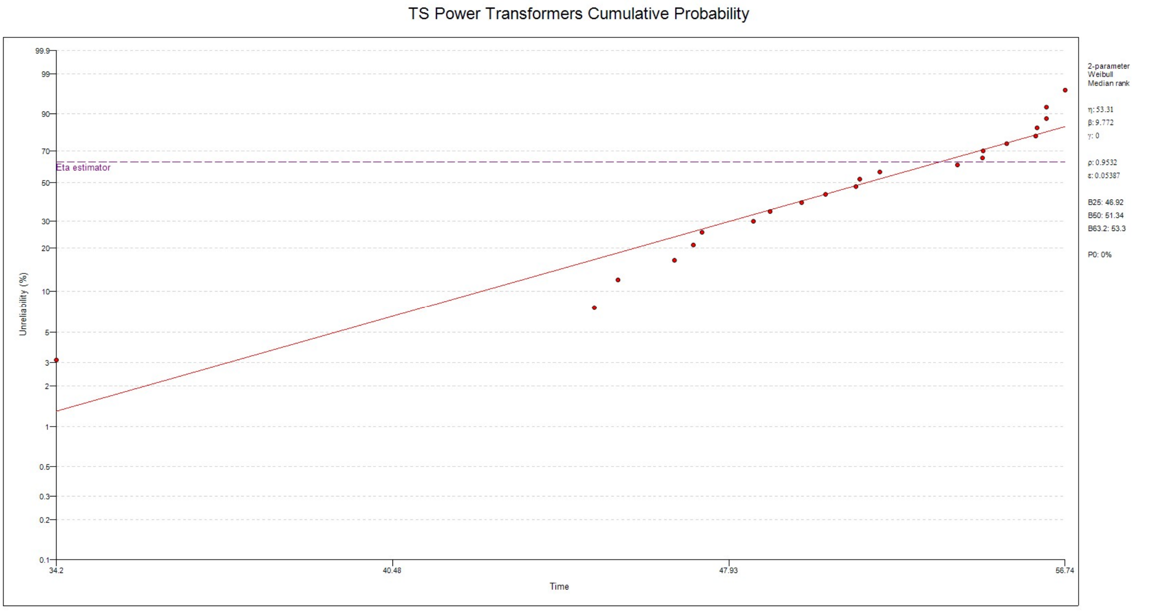

Figure 4 – Weibull chart -Transmission Power Transformers

4 Transmission Line Assets

ANT-TRR 2023-27 Technical AMS 10-101 Asset Life Evaluation 01 Sept. 2021 provides the summary of asset lives of key Transmission line assets based on subject matter technical expertise.

Further analytical studies were carried out for Transmission Line equipment to confirm the wear out parameters. For transmission line assets, with a wear out mode dominated by corrosion, lives are affected by environmental corrosivity. As such separate Weibull parameters have been derived and are used for 3 regions, namely low, medium and high corrosivity areas.

4.1 Transmission Insulators

Studies were carried out for Transmission Insulator failures for low, medium, and high corrosivity areas rather than applying one value of Eta and beta for Transmission insulators.

The Eta and Beta values were obtained using Availability Workbench (AWB) using historical failures of the glass and porcelain insulator fleet (requiring replacement). These were entered to the software to determine these failure characteristics. These were taken from across different corrosivity zones. The Figure 5 and 6 below shows the 2 parameter Weibull plot and level of fit parameters on the right-hand side.

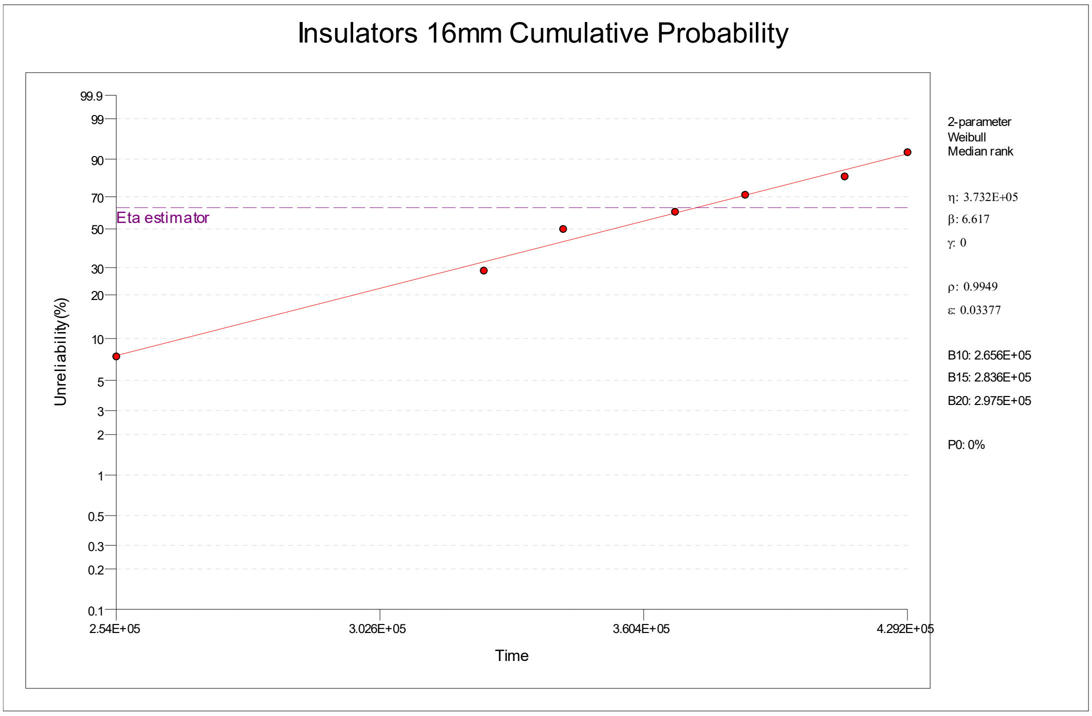

Figure 5 – Weibull chart -Transmission Insulators -16 mm

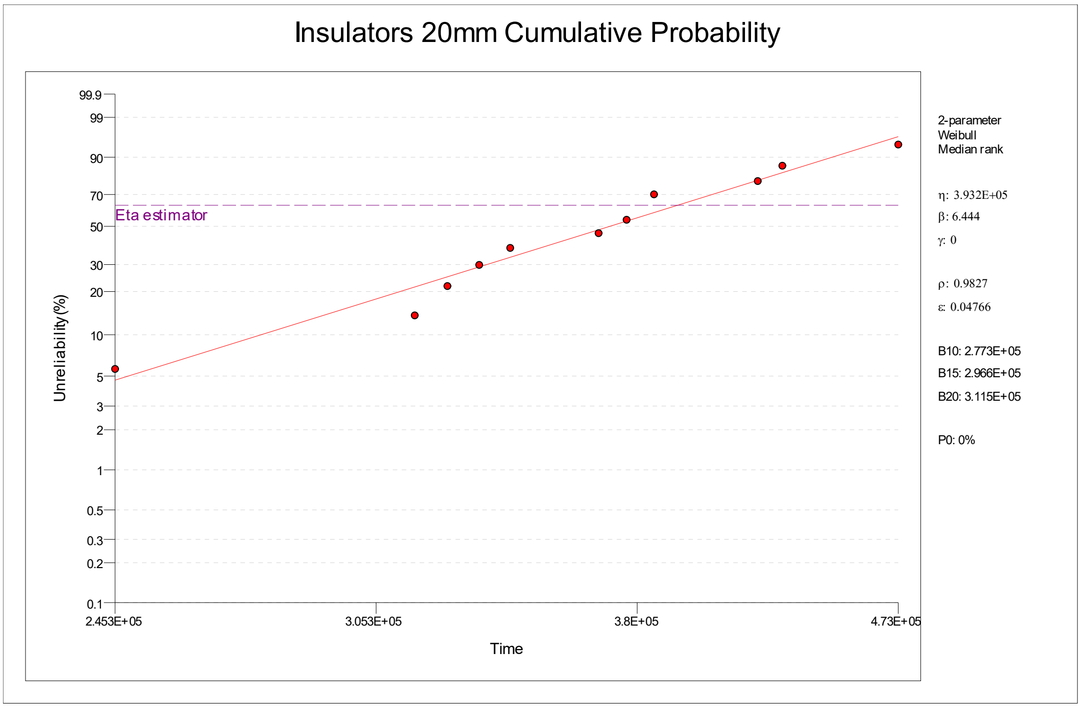

Figure 6 – Weibull chart -Transmission Insulators -20mm

Eta and beta values for each type of insulator are shown in the Table 3 below. The level of correlation, measured by rho is greater than 0.98

Equipment	Eta	Beta	Gamma	Fit Distribution
Insulators 16mm	3.73E+05	6.617	0	2 Parameter Weibull
Insulators 20mm	3.93E+05	6.444	0	2 Parameter Weibull

Table 3 – Weibull parameters for failed insulators

The underlying data associated with this analysis is shown in the attachment containing work book: ANT-TRR 2023-27 Technical Document Transmission Lines 01 Sept. 2021**.**

Calibration was then undertaken to adjust and confirm that the life values are reasonable, i.e., close to real-life situations for the different corrosivity areas. Calibration was done to review the values provided above, taking into consideration the population of the assets in each Condition Category and Corrosivity Zone, then looking at the "predicted" failures (suspended) per Corrosivity Zone.

The calibration analysis and determination of eta for the glass/porcelain type insulators in each corrosivity area is shown below. The medium corrosivity Weibull parameters values, for glass and porcelain insulators, are those shown in Appendix M of AMS 01-09. The majority of current and proposed replacements are focussed on glass and porcelain insulators in corrosivity 2 regions. The insulators in the high corrosivity region have been replaced in previous regulatory periods.

Low corrosivity: (eta -70 yrs., beta 6.6)

From The Asset Health Report			AGE Characteristic	70					Weibull	
Condition	Number of String	Cause	Condition	RSP%	Remaining Life	Age	Useful Character	BETA	PDF	Failures
C1	3783	Insulator failure	1	95	66.5	3.5	70	6.6	0.000%	0.00
C2	22689	Insulator failure	2	85	59.5	10.5	70	6.6	0.00%	0.05
C3	8811	Insulator failure	3	60	42	28	70	6.6	0.06%	4.91
C4	1488	Insulator failure	4	25	17.5	52.5	70	6.6	1.88%	28.02
C5	144	Insulator failure	5	15	10.5	59.5	70	6.6	3.79%	5.46
	36915								Estimated failures per year:	38.44
									Percentage of Fleet:	0.10%

Medium corrosivity (eta 46 yrs., beta 6.6)

From The Asset Health Report			AGE Characteristic	46					Weibull	
Condition	Number of String	Cause	Condition	RSP%	Remaining Life	Age	Useful Character	BETA	PDF	Failures
C1	3783	Insulator failure	1	95	43.7	2.3	46	6.6	0.000%	0.00
C2	22689	Insulator failure	2	85	39.1	6.9	46	6.6	0.00%	0.08
C3	8811	Insulator failure	3	60	27.6	18.4	46	6.6	0.08%	7.47
C4	1488	Insulator failure	4	25	11.5	34.5	46	6.6	2.87%	42.63
C5	144	Insulator failure	5	15	6.9	39.1	46	6.6	5.77%	8.32
	36915								Estimated failures per year:	58.50
									Percentage of Fleet:	0.16%

High corrosivity (eta 35 yrs., beta 6.6)

From The Asset Health Report			AGE Characteristic	46					Weibull	
Condition	Number of String	Cause	Condition	RSP%	Remaining Life	Age	Useful Character	BETA	PDF	Failures
C1	3783	Insulator failure	1	95	43.7	2.3	46	6.6	0.000%	0.00
C2	22689	Insulator failure	2	85	39.1	6.9	46	6.6	0.00%	0.08
C3	8811	Insulator failure	3	60	27.6	18.4	46	6.6	0.08%	7.47
C4	1488	Insulator failure	4	25	11.5	34.5	46	6.6	2.87%	42.63
C5	144	Insulator failure	5	15	6.9	39.1	46	6.6	5.77%	8.32
	36915								Estimated failures per year:	58.50
									Percentage of Fleet:	0.16%

The medium corrosivity eta derived through our statistical analysis is consistent with subject matter experts' assessment and experience. As stated above, the majority of the glass/porcelain type insulator assets proposed to be replaced in the next period are located in medium corrosivity zones. On balance, the Weibull rates derived for glass/[porcelain line insulators indicate that our failure rate assumptions for this asset class are broadly reasonable.

4.2 Transmission Line Ground Wire & Conductors

As there has been limited failures and historical replacements of ground wire based purely on condition a different approach was taken to re-verify the estimated characteristic life.

4.2.1 Ground wire conductor

A Weibull study, using Availability Workbench commercial software, was performed based on the age at which a C5, i.e., a very poor condition stage of deterioration is reached. Data provided from medium corrosivity (region 2) was analysed to show a characteristic age of 59.8 years with beta 6.7 (and rho of 0.95). Figure 7 below show the 2 parameter Weibull plot, and level of fit parameters on the right-hand side. The population failure characteristic life was determined by adding 15% life onto the C5 condition Weibull study and rounded up to the characteristic life of 70 years, and beta 7 as shown in Appendix M of AMS 01-09 and used in the models. A C5 condition assessed asset is considered within the last 10-15% of useful life. Our modelling approach supports applying a characteristic life at the higher end of the technical subject matter life assessment given in AMS 10-101.

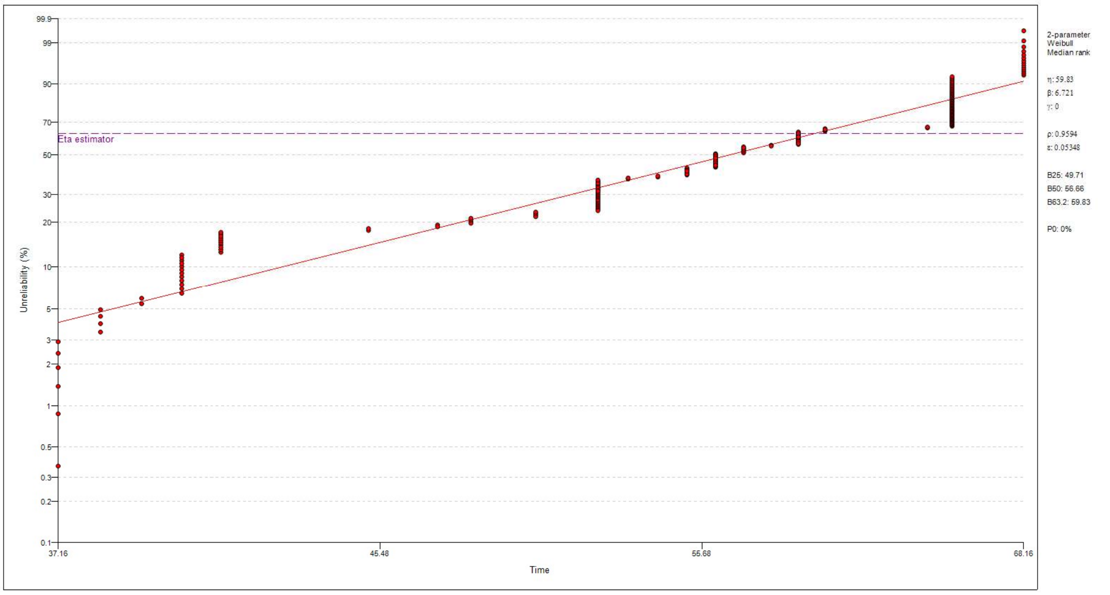

Figure 7 – Weibull chart -Transmission Ground wires

The underlying data associated with this analysis is shown in the attachment containing work book: ANT-TRR 2023-27 Technical Document Transmission Lines 01 Sept. 2021**.**

The calibration analysis and determination of eta for each corrosivity area is shown below. The medium corrosivity Weibull parameters values are shown in the Appendix M of AMS 01-09. The majority of current and proposed replacements are focussed on corrosivity 2 regions. The ground wire in the high corrosivity region has been replaced in previous regulatory periods.

Low corrosivity (Eta 85 years, Beta 7)

									Condition 1 Age	
									Condition 1 Hours	
From The Asset Health Report			AGE	85					Weibull	
Condition	Number of Spa	Cause	Condition	RSP%	Remaining Life	Age	Useful Life	BETA	PBF	Failures
C1	1970	Conductor Failure	1	95	80.75	4.25	85	7	0.000%	0.00
C2	5567	Conductor Failure	2	85	72.25	12.75	85	7	0.00%	0.01
C3	366	Conductor Failure	3	60	51	34	85	7	0.03%	0.12
C4	52	Conductor Failure	4	22	18.7	66.3	85	7	1.85%	0.96
C5	11	Conductor Failure	5	8	6.8	78.2	85	7	4.99%	0.55
	7966								Estimated failures per year:	1.6424

Medium corrosivity (Eta 70 years, Beta 7)

									Condition 1 Age	
									Condition 1 Hours	
From The Asset Health Report			AGE	70				Weibull		
Condition	Number of Spa	Cause	Condition	RSP%	Remaining Life	Age	Useful Life	BETA	PBF	Failures
C1	2507	Conductor Failure	1	95	66.5	3.5	70	7	0.000%	0.00
C2	7353	Conductor Failure	2	85	59.5	10.5	70	7	0.00%	0.01
C3	863	Conductor Failure	3	60	42	28	70	7	0.04%	0.35
C4	368	Conductor Failure	4	22	15.4	54.6	70	7	2.25%	8.29
C5	101	Conductor Failure	5	8	5.6	64.4	70	7	6.06%	6.12
	11192						Estimated failures per year:			14.7734
							Percentage of Fleet:			0.13%

High corrosivity (eta 40 years, beta 7)

									Condition 1 Hours	
From The Asset Health Report			AGE	40				Weibull		
Condition	Number of Spa	Cause	Condition	RSP%	Remaining Life	Age	Useful Life	BETA	PBF	Failures
C1	0	Conductor Failure	1	95	38	2	40	7	0.000%	0.00
C2	0	Conductor Failure	2	85	34	6	40	7	0.00%	0.00
C3	0	Conductor Failure	3	60	24	16	40	7	0.07%	0.00
C4	26	Conductor Failure	4	25	10	30	40	7	3.11%	0.81
C5	79	Conductor Failure	5	10	4	36	40	7	9.30%	7.35
	105						Estimated failures per year:			8.1570
							Percentage of Fleet:			7.77%

The medium corrosivity eta derived through our statistical analysis is consistent with subject matter experts' assessment and experience. As stated above, the majority of the ground wire assets proposed to be replaced in the next period are located in medium corrosivity zones. On balance, the Weibull rates derived for ground wire indicate that our failure rate assumptions for this asset class are broadly reasonable.

4.2.2 Phase Conductors

Similarly, a Weibull study, using Availability Workbench commercial software, was performed on Transmission line phase conductors based on the age at which a C5, i.e., a very poor condition stage of deterioration is reached from data provided from a medium corrosivity area (region 2). Figure 8 below shows the 2 parameter Weibull plot to show a characteristic age of 52.0 years with beta 4.2 (and rho of 0.91). Level of fit of parameters are shown on the right-hand side.

Transmission Line Conductors Cumulative Probability

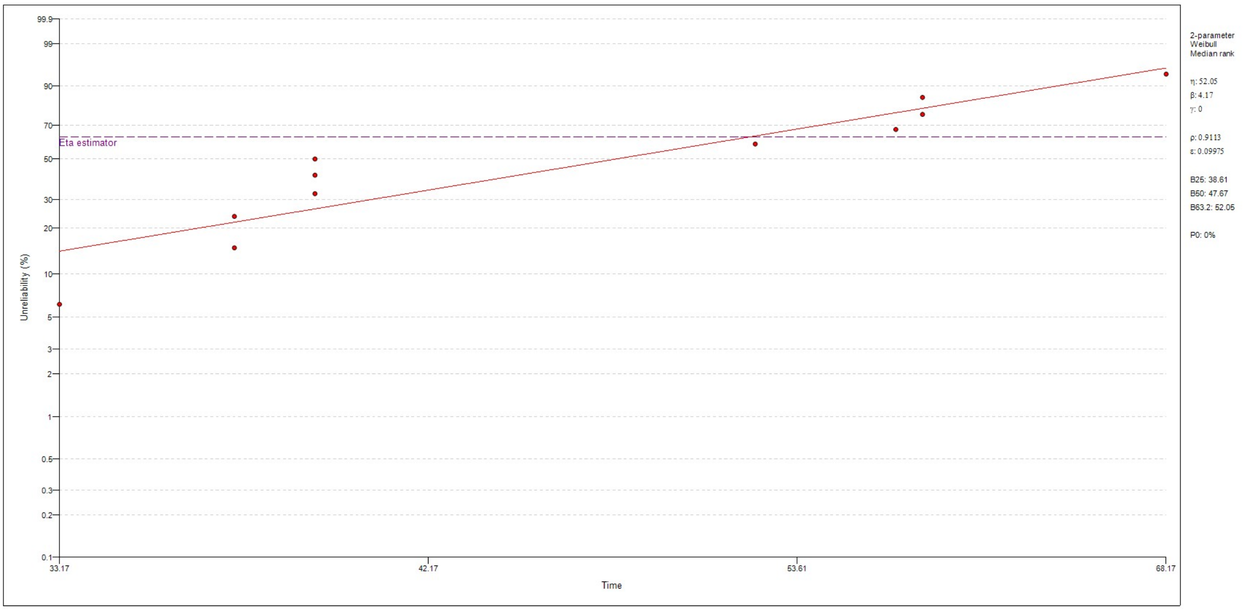

Figure 8 – Weibull chart -Transmission Line Conductors

The underlying data associated with this analysis of conductors are shown in the attachment containing work book: ANT-TRR 2023-27 Technical Document Transmission Lines 01 Sept. 2021**.**

A calibration analysis and determination of eta for the medium corrosivity area was reviewed, as the current replacements are focussed on medium corrosivity region. The Weibull parameter was assessed as eta 70 years and a beta of 3.5. The phase conductor in the high corrosivity region have been replaced in previous regulatory periods.

The medium corrosivity eta derived through our statistical analysis is consistent with subject matter experts' assessment and experience. As stated above, the majority of the phase conductor assets proposed to be replaced in the next period are located in medium corrosivity zones. On balance, the Weibull rate derived for conductor indicate that our failure rate assumptions for this asset class are broadly reasonable.

4.3 Transmission Towers

As there has been no condition-based tower failures or historical replacements of towers based on condition, a different approach was taken to re-verify the estimated characteristic life.

A corrosivity study based on loss of steel member section was performed and used to derive typical corrosion rates for each corrosivity region. Estimates of corrosion rates are shown below in Figure 9.

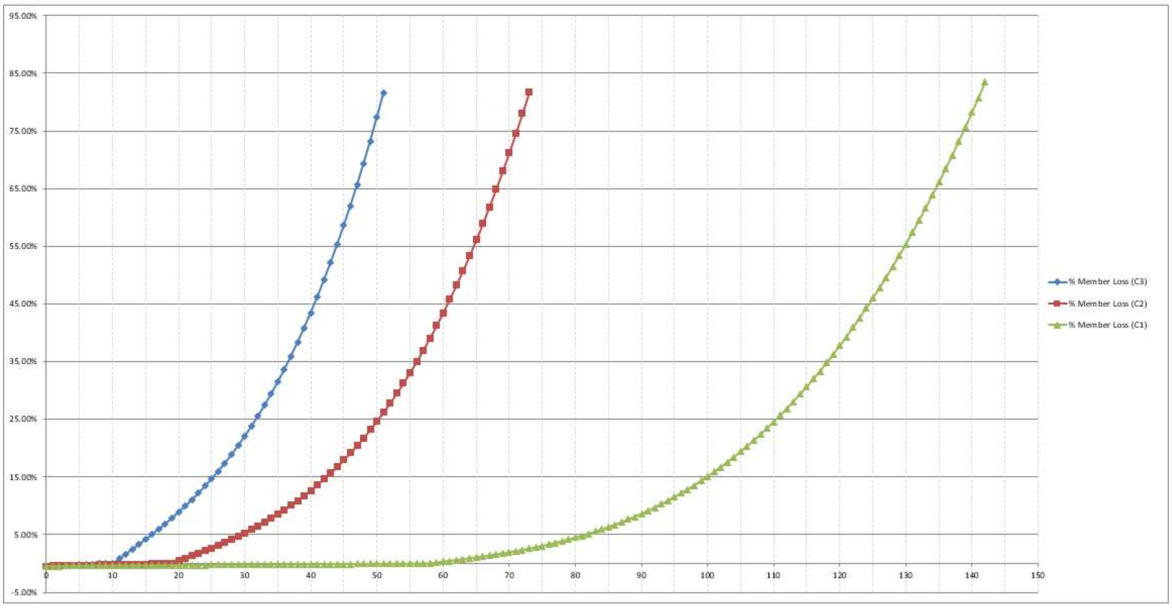

Figure 9 - Rates of corrosion in corrosivity regions 1 (low) to 3 (high)

A calibration was done to consider the values provided above, taking into consideration the population of the assets in each Condition Category and Corrosivity Zone, then looking at the "predicted" failures (suspended) per Corrosivity Zone and adjusting the eta values until the result makes reasonable sense in terms of the predicted quantity of suspended failures.

The calibration analysis and determination of eta for the medium and high corrosivity area is shown below. The medium corrosivity Weibull parameters values are shown in the Appendix M of AMS 01-09. The current replacement plans are only focussed on the high corrosivity regions.

Medium Corrosivity (eta 71, beta 6.5)

									Condition 1 Hours	
From The Asset Health Report			Characteristic Life (Eta)	71					Weibull	
Condition	Number of Towers	Cause	Condition	RSP%	Remaining Life	Age	Characteristic Life	BETA	PDF	Failures
C1	628	Tower failure	1	95	67.45	3.55	71	6.5	0.000%	0.00
C2	4400	Tower failure	2	85	60.35	10.65	71	6.5	0.00%	0.01
C3	900	Tower failure	3	60	42.6	28.4	71	6.5	0.06%	0.53
C4	31	Tower failure	4	25	17.75	53.25	71	6.5	1.88%	0.58
C5	0	Tower failure	5	15	10.65	60.35	71	6.5	3.75%	0.00
	5959						Estimated failures per year:			1.13
							Percentage of Fleet:			0.02%
							Sanity Check (Asset Fleet/Usful Life):			83.93

High Corrosivity (eta 49 years, beta 8)

									Condition 1 Hours	
From The Asset Health Report			~~AGE~~ Characteristic L	49					Weibull	
Condition	Number of Towers	Cause	Condition	RSP%	Remaining Life	Age	~~Useful~~ Characteri	BETA	PDF	Failures
C1	0	Tower failure	1	95	46.55	2.45	49	8	0.000%	0.00
C2	0	Tower failure	2	85	41.65	7.35	49	8	0.00%	0.00
C3	23	Tower failure	3	60	29.4	19.6	49	8	0.03%	0.01
C4	7	Tower failure	4	25	12.25	36.75	49	8	2.18%	0.15
C5	0	Tower failure	5	15	7.35	41.65	49	8	5.23%	0.00
	30						Estimated failures per year:			0.16
							Percentage of Fleet:			0.53%
							Sanity Check (Asset Fleet/Usful Life):			0.61

The eta derived through our statistical analysis is consistent with subject matter experts' assessment for high and medium corrosivity. On balance, the Weibull rates derived for towers indicate that our failure rate assumptions for this asset class are broadly reasonable.

5 Conclusion

The Weibull wear out parameters used in the likelihood models are provided in Appendix M of AMS 01-09. Further analysis of the underlying statistics for station and Lines assets shows reasonable fit to the assumptions used for the models. The small variances between statistics and assumptions, in particular for station assets are explained due to individual replacement ages varying from year to year and is influenced by many factors and particularly end of life condition assessment with specific make and models of assets. For each asset type, it is sound asset management practice to maintain consistent Weibull parameters over time, unless the available data suggests that, in practice, assets are demonstrating materially different asset lives. The above analysis demonstrates that our actual asset lives align broadly with the AMS 01-09 Appendix M parameters and, therefore, these parameters remain fit for purpose and reasonable.

6 Supporting documents

The following supporting documents referred to in this Appendix have been provided as part of our Revised Proposal.

Number	Document Name
1	ANT-TRR 2023-27 Technical AMS 10-101 Asset Life Evaluation 01 Sept. 2021
2	ANT-TRR 2023-27 Technical Document Transmission CB Weibull Analysis 01 Sept. 2021
3	ANT-TRR 2023-27 Technical Document Transmission Asset Replacement 01 Sept. 2021
4	ANT-TRR 2023-27 Technical Document Transmission Lines 01 Sept. 2021