Network Output Measures Rebasing Methodology

SPT Issue 3.5: Final

VERSION CONTROL

VERSION HISTORY

Date	Version	Comments
05/12/2019	SPT 3.5	Final SPT Version

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PURPOSE

Ofgem has instructed the Transmission Owners (TO's) to develop a methodology that will enable the existing RIIO-T1 replacement priority targets (as set out in Special Licence Condition 2M) to be expressed in a format that is consistent with the latest version of the NOMs methodology, Issue 18. This will then allow the TOs to report, and the Authority to assess, performance at the end of the price control and facilitate the objective implementation of the incentive methodology.

This methodology documents the process which SP Transmisison (SPT) has followed to meet this request.

OFGEM DIRECTION AND FURTHER INSTRUCTIONS

The requirements for rebasing were established in the 2016 Ofgem Direction[1] and in their Further Instructions issued on 8th June 2017[2]. These require rebased monetised risk targets to be submitted to the authority and a methodology outlining the approach (this document) by the TOs to be submitted in advance of this, which would allow the rebased targets to be submitted.

The high level requirements for the methodology are as set out in Sections 13 and 14 of the Further Instructions.

The Rebasing Direction set out by Ofgem requires the TOs to rebase their RIIO-T1 volume based targets into Monetised Risk targets in which each category of Lead asset, split by voltage is assigned a monetised value. The fundamental principle of rebasing is that the TOs can demonstrate how their Monetised Risk targets are as equally challenging as the original volume based target.

REBASING METHODOLOGY

This section outlines the general principles and approach that SPT has adopted in carrying out the rebasing exercise.

1.1. BACKGROUND

The original targets (or Network Replacement Outputs within Special Condition 2M) were specified as an asset distribution at 31st March 2021. These were split by lead asset category, by voltage level and arranged by Replacement Priority (RP). The RP was determined by the former NOMs methodology Issue 4[3] and was based on the mapping of an asset's Asset Health index (AH) and its criticality (C). These values were then mapped onto a matrix which determines that particular assets RP. The matrix used to determine RPs is shown below.

[1] https://www.ofgem.gov.uk/system/files/docs/2016/04/160429_et_noms_direction_subsid_3.pdf
[2] https://www.ofgem.gov.uk/system/files/docs/2017/06/et_noms_instructions_for_further_development_final_2.pdf
[3] ..\Proposed Network Output Measure Methodology - Issue 4_Ofgem.pdf

	AH1	AH2	AH3	AH4	AH5
C1	RP4	RP4	RP4	RP1	RP1
C2	RP4	RP4	RP4	RP2	RP1
C3	RP4	RP4	RP4	RP3	RP2
C4	RP4	RP4	RP4	RP3	RP2

Figure 1 – Replacement Priority Matrix

1.2. GENERAL APPROACH

The current NOMs methodology (Issue 18) proposes to calculate a Probability of Failure (PoF) and Consequence of failure (CoF) for each asset, and these will then be multiplied together to establish a monetised risk value.

The former and current versions of the methodologies are not directly comparable due to the different inputs and calculations of probability used and the variances in the assessment of consequence.

For the purposes of rebasing the consequence of failure values have been fixed at the 2018/19 values for the RIIO-T1 Price Control. This was agreed by the TOs to prevent any benefit or detriment as a result of material change to system, safety or environmental factors.

To derive a value of network monetised risk which represents the forecasted end of RIIO-T1 period condition after intervention a number of steps have to be followed. The steps are outlined as follows:

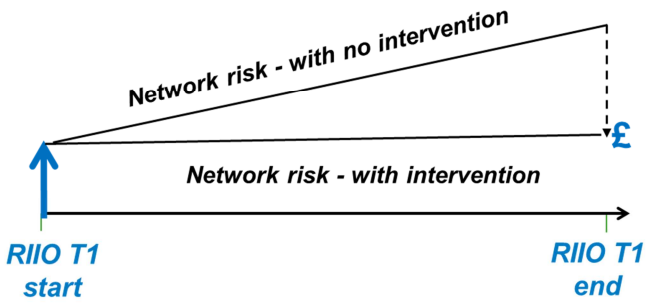
1. **TOs will calculate the Network Monetised Risk at the start of the RIIO-T1 period.**

   Each TO will define the value of Monetised Risk on their network at the start of the RIIO-T1. The method to be used to do this is different for NGET, SPT and SHET. The processes carried out to achieve this are set out in Appendix 1 and 2 at the end of this document.

2. **Each TO will then produce a forecast of the end of RIIO-T1 period Monetised Risk before interventions and after all interventions specified in their respective business plans have been applied. Note that the 2021 with intervention Monetised Risk position provides the 'Rebased Targets'.**

   TOs will then allow the Monetised Risk position to deteriorate, as set out in the methodology, to a forecast value representative of the end of the RIIO-T1 period without interventions. TOs will then apply adjustments to this Monetised Risk position to reflect the work that was set out in their RIIO-T1 business plan. This will allow each TO to derive a Monetised Risk position which defines their end of period forecast position after intervention.

   Please see the graph below which illustrates how the TOs will acquire their 2M condition target.



£ = Licensed condition 2m expressed as Monetised Risk

Figure 2 – Illustration of how the TOs will acquire their 2M condition target

A high-level diagram outlining the general process is shown below. This will apply to all lead asset categories.

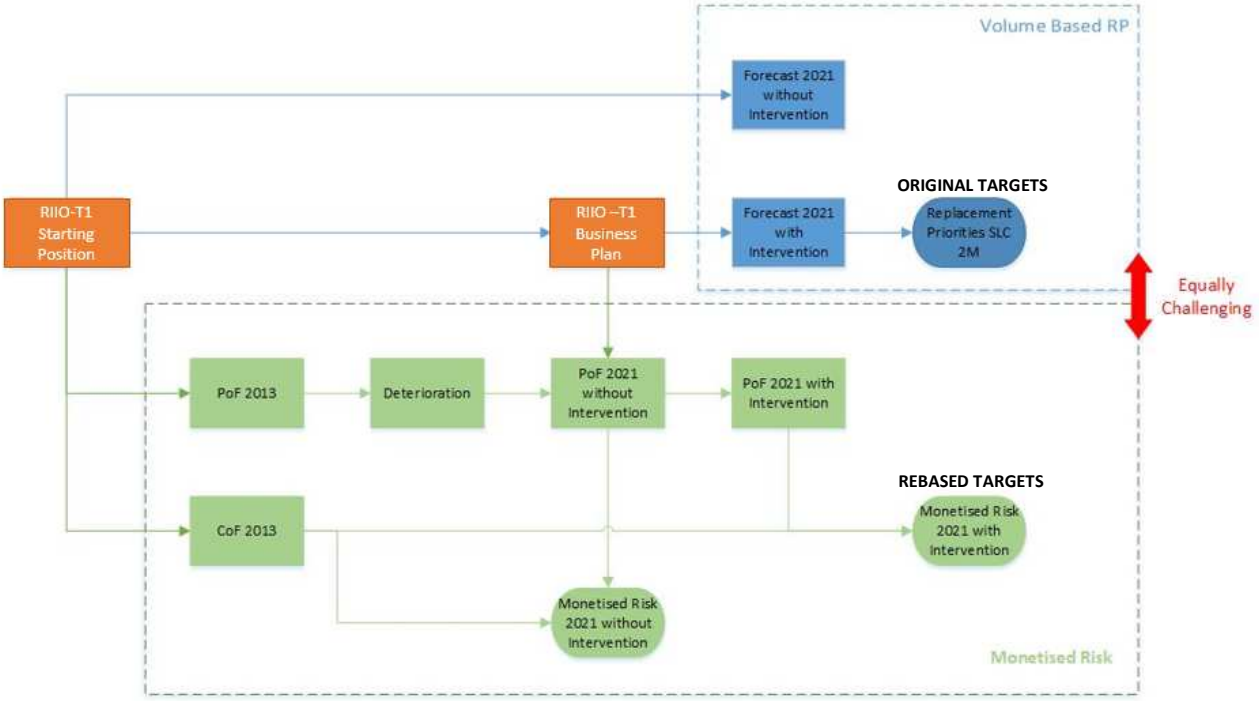


Figure 3 – Overview of Rebasing Process

EQUALLY CHALLENGING

The newly derived monetised risk targets will be as 'equally challenging' as the Network Output Replacement targets which they are being translated from.

As the interventions in this approach are the same as the RIIO-T1 Business Plan that set the original targets, the effect of translating these interventions into monetised risk will result in targets which are considered equally challenging.

To confirm that the Rebasing Targets are equally challenging, volume tests will be applied. This will confirm that the same volumes that are in the RIIO-T1 Business Plan equal the same volumes to achieve the rebased target.

GLOSSARY

Consequence	Outcome of an event affecting objectives
Consequence of Failure (CoF)	A consequence can be caused by more than one Failure Mode. This is monetised values for the Safety, Environmental, System and Financial consequences
Equally Challenging	'Equally Challenging' means that the rebased targets are neither harder nor easier to outperform than the original targets.
Monetised Risk	A financial measure of risk calculated as a utility function
Network Output Measures or NOMs	The measures defined in paragraph 2L.4 of Special Condition 2L (Methodology for Network Output Measures).
Failure Mode	A distinct way in which a component can fail
Network Replacement Outputs	The Replacement Priority profile that the licensee is required to deliver on its Transmission System by 31 March 2021 that has been approved as part of the Price Control Review and funded in its Opening Base Revenue Allowance, as measured by the Network Output Measures. Specified in Special License Condition 2M
Neutral Factor	A factor required to complete the risk calculation where the data required does not exist.
Probability of Failure (PoF)	The likelihood that a Failure Mode will occur in a given time period
Replacement Priority	The category assigned to an asset to prioritise the requirement for intervention (replacement or refurbishment) based on a measure of its PoF and CoF.
TO	(Onshore) Transmission Owner

APPENDIX 1 – SHE-T & SPT ROLL BACK TO RIIO-T1 STARTING POSITION

SHE Transmission (SHE-T) and SPT have adopted a roll back method to determine the asset data corresponding to the starting point of the RIIO-T1 price control. This enables the rebasing approcach to be carried out and is necessary because the new NOMs methodology has added data points which did not exist back at the start of RIIO-T1, so these need to be determined as robustly as possible.

The assets will be divided into two subsets, those that have been decommissioned and removed from the Network over the course of RIIO-T1 and those which are still remaining. Assets which have been added, since the start of RIIO-T1, for Load Related Investment are not considered.

Assets which are still on the Network will have condition data corresponding to today's date. Running the CBRM model in reverse, asset health can be extrapolated back down the degredation curve, effectively predicting the condition of the asset at a point back in time corresponding to the start of RIIO-T1.

Assets that have been decommissioned do not have condition data corresponding to today's date, therefore it will be necessary to use the condition data that was available prior to replacement to determine their starting condition.

Combining the decommissioned asset and remaining asset subsets gives the overall network risk at the start of RIIO-T1, this then becomes the starting point for the rebasing analysis.

During the RIIO-T1 period it has been generally accepted that as a result of various factors, such as outage constraints, it is not reasonably practical for each intervention in the agreed business plan to be carried out. Where this has been the case TOs may have carried out comparable work on a like for like basis under the previous replacement priority methodology. The new methodology is likely to assign different monetised risk to substitutions that were previously considered like for like. Given the change in methodology implemented it has been accepted by Ofgem that TOs should be neither advantaged nor disadvantaged as result of this change.

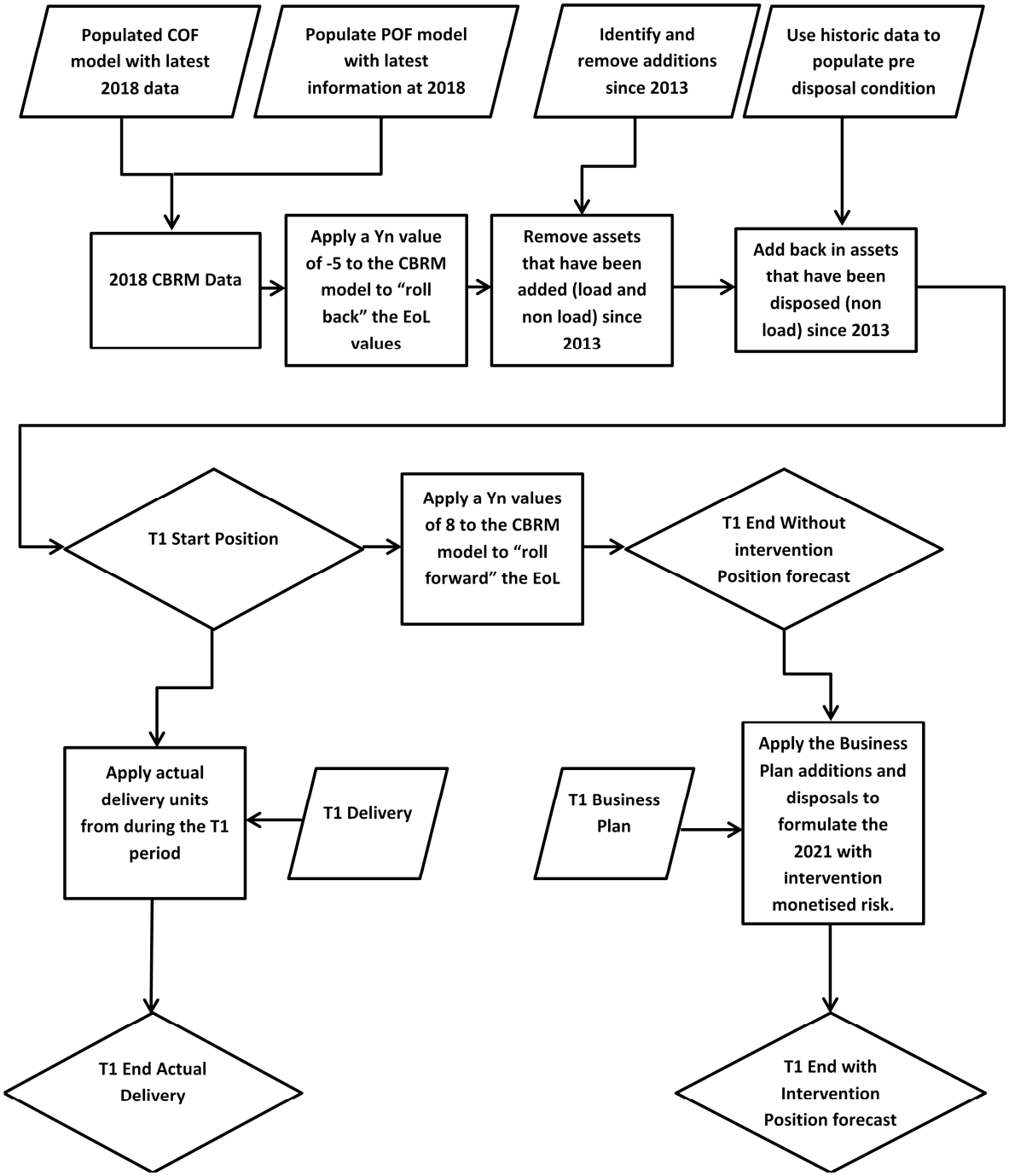


Figure A.1 – Overview of Rebasing Process

Note: The bottom left element of the Figure above ('T1 End Actual Delivery') is included for completeness and does not relate to the Rebasing exercise.

APPENDIX 2 – SPT CRITICALITY AND ASSET HEALTH BANDING

The following table outlines the approach which SPT has adopted to determine the Criticality bandings (as utilised in Worksheets 2.1 and 2.2 of the Rebasing template) to express the utility value (in monetised terms) for the failure of each Lead Asset before probability of failure is considered.

While no value of overall consequence of failure is provided for within Issue 18 of the NOMs methodology it is useful to develop a measure of this for the purpose of setting out bands that are consistent and representative. The overall consequence of failure has been calculated as being the sum of all failure modes of all failure types e.g. System Defect, System Minor, System Significant, System Major, Environment Defect, Enironment Minor etc.

	Input	**Greater than,**	**And Lower than,**	**Then**
IF	Overall Consequence for a single asset **IS**	> 2.4 * (Median of the asset population)	< ∞	Criticality is 1
ELSE	Overall Consequence for a single asset **IS**	> 1.3325 * (Median of the asset population)	< =2.4 * (Median of the asset population)	Criticality is 2
ELSE	Overall Consequence for a single asset **IS**	> 0.9 * (Median of the asset population)	< =1.3325 * (Median of the asset population)	Criticality is 3
ELSE	Overall Consequence for a single asset **IS**	> 0	< =0.9 * (Median of the asset population)	Criticality is 4

Table A2.1 – Approach to Determine Criticality Bands

Different asset populations have different sized consequence ranges depending on the consequence of asset failure. For example, Circuit breakers and Transformers may have consequence ranges in the £billions, whereas a conductor or cable section may have consequence ranges in £millions. Therefore, the (rebased) Criticality bandings applied are not equivalent across all lead asset types but are instead lead asset (and voltage) specific, and based upon the monetised Consequence of Failure values for each specific asset population.

The following Criticality bandings have been applied for each lead asset: -

132kV Circuit Breaker			275kV Circuit Breaker			400kV Circuit Breaker		
	Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)
C4	£ -	£32,706,832.16	C4	£ -	£29,851,713.74	C4	£ -	£88,256,334.41
C3	£32,706,832.16	£48,333,429.75	C3	£29,851,713.74	£44,114,199.20	C3	£88,256,334.41	£130,423,249.74
C2	£48,333,429.75	£87,218,219.10	C2	£44,114,199.20	£79,604,569.98	C2	£130,423,249.74	£235,350,225.09
C1	£87,218,219.10		C1	£79,604,569.98		C1	£235,350,225.09	
Median	£36,340,924.63		Median	£33,168,570.82		Median	£98,062,593.79	
C1 factor	2.4		C1 factor	2.4		C1 factor	2.4	
C2 factor	1.33		C2 factor	1.33		C2 factor	1.33	
C3 factor	0.9		C3 factor	0.9		C3 factor	0.9	

132kV Transformer			275kV Transformer			400kV Transformer		
	Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)
C4	£ -	£31,990,362.08	C4	£ -	£45,051,406.73	C4	£ -	£54,984,347.35
C3	£31,990,362.08	£47,363,508.30	C3	£45,051,406.73	£66,701,110.52	C3	£54,984,347.35	£81,407,380.94
C2	£47,363,508.30	£85,307,632.20	C2	£66,701,110.52	£120,137,084.61	C2	£81,407,380.94	£146,624,926.27
C1	£85,307,632.20		C1	£120,137,084.61		C1	£146,624,926.27	
Median	£35,544,846.75		Median	£50,057,118.59		Median	£61,093,719.28	

132kV Reactor			275kV Reactor			400kV Reactor		
	Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)
C4	£ -	£13,213,266.02	C4	£ -	£510,588,266.68	C4	£ -	£91,980,917.33
C3	£13,213,266.02	£19,562,974.42	C3	£510,588,266.68	£755,954,294.83	C3	£91,980,917.33	£136,182,858.16
C2	£19,562,974.42	£35,235,376.06	C2	£755,954,294.83	£1,361,568,711.13	C2	£136,182,858.16	£245,282,446.22
C1	£35,235,376.06		C1	£1,361,568,711.13		C1	£245,282,446.22	
Median	£14,681,406.69		Median	£567,320,296.31		Median	£102,201,019.26	

132kV Tower / Pole			275kV Tower / Pole			400kV Tower / Pole		
	Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)
C4	£ -	£ 15,055,712.25	C4	£ -	£ 19,531,794.30	C4	£ -	£ 62,173,995.47
C3	£ 15,055,712.25	£ 22,248,997.00	C3	£ 19,531,794.30	£ 28,863,651.57	C3	£ 62,173,995.47	£ 91,879,348.86
C2	£ 22,248,997.00	£ 40,148,566.01	C2	£ 28,863,651.57	£ 52,084,784.79	C2	£ 91,879,348.86	£ 165,797,321.25
C1	£ 40,148,566.01		C1	£ 52,084,784.79		C1	£ 165,797,321.25	
Median	£ 16,728,569.17		Median	£ 21,701,993.66		Median	69,082,217.19	

132kV Fitting			275kV Fitting			400kV Fitting		
	Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)
C4	£ -	£ 33,395,900.51	C4	£ -	£ 3,021,173.93	C4	£ -	£ 7,944,929.32
C3	£ 33,395,900.51	£ 49,351,719.64	C3	£ 3,021,173.93	£ 4,464,623.69	C3	£ 7,944,929.32	£ 11,740,839.99
C2	£ 49,351,719.64	£ 89,055,734.69	C2	£ 4,464,623.69	£ 8,056,463.80	C2	£ 11,740,839.99	£ 21,186,478.18
C1	£ 89,055,734.69		C1	£ 8,056,463.80		C1	£ 21,186,478.18	
Median	£ 37,106,556.12		Median	£ 3,356,859.92		Median	8,827,699.24	

132kV Conductor			275kV Conductor			400kV Conductor		
	Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)
C4	£ -	£ 7,364,109.88	C4	£ -	£ 15,504,216.11	C4	£ -	£ 68,382,083.01
C3	£ 7,364,109.88	£ 10,882,517.93	C3	£ 15,504,216.11	£ 22,911,786.04	C3	£ 68,382,083.01	£ 101,053,522.67
C2	£ 10,882,517.93	£ 19,637,626.35	C2	£ 22,911,786.04	£ 41,344,576.31	C2	£ 101,053,522.67	£ 182,352,221.35
C1	£ 19,637,626.35		C1	£ 41,344,576.31		C1	£ 182,352,221.35	
Median	£ 8,182,344.31		Median	£ 17,226,906.79		Median	75,980,092.23	

132kV Cable			275kV Cable			400kV Cable		
	Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)		Min £r (>)	Max £r (=<)
C4	£ -	£ 19,292,226.12	C4	£ -	£ 25,467,796.71	C4	£ -	£ 31,652,509.32
C3	£ 19,292,226.12	£ 28,509,623.04	C3	£ 25,467,796.71	£ 37,635,744.03	C3	£ 31,652,509.32	£ 46,775,374.88
C2	£ 28,509,623.04	£ 51,445,936.32	C2	£ 37,635,744.03	£ 67,914,124.56	C2	£ 46,775,374.88	£ 84,406,691.52
C1	£ 51,445,936.32		C1	£ 67,914,124.56		C1	£ 84,406,691.52	
Median	£ 21,435,806.80		Median	£ 28,297,551.90		Median	35,169,454.80	

Table A2.2 – Criticality Bandings

The following Asset Health bandings have been utilised for each lead asset in Worksheets 2.1 and 2.2 of the Rebasing template: -

> EoL_Min	<= EoL_Max	Asset Health Band
0	3.99	1
3.99	5.49	2
5.49	6.49	3
6.49	7.99	4
7.99	15	5

Table A2.3 – Asset Health Bands