Network Output Measures Rebasing Methodology

Issue A3.4: Draft for review

VERSION CONTROL

VERSION HISTORY

Date	Version	Comments
31/07/2018	A3.4	Draft Authorised for Issue

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PURPOSE

Ofgem have 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 the TOs intend to follow 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 will outline the general principles and approach that the TOs will adopt 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

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 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 will have to be followed. The steps are outlined as follows:

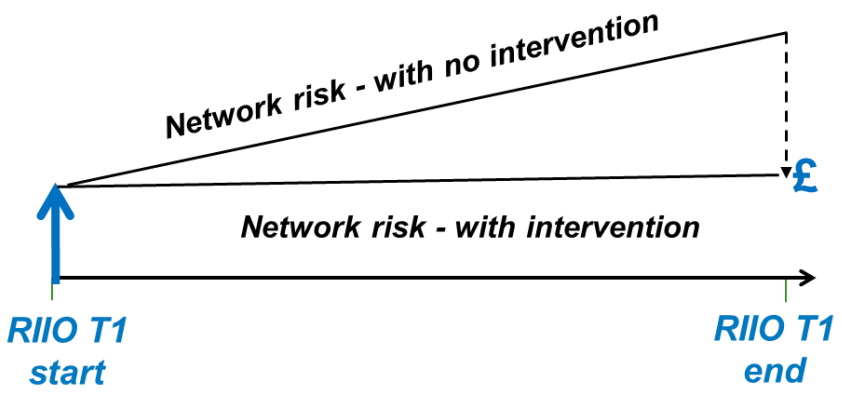
1. **TOs will calculate the Network Monetised Risk at the start of the RIIO-T1 period.**

   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.**

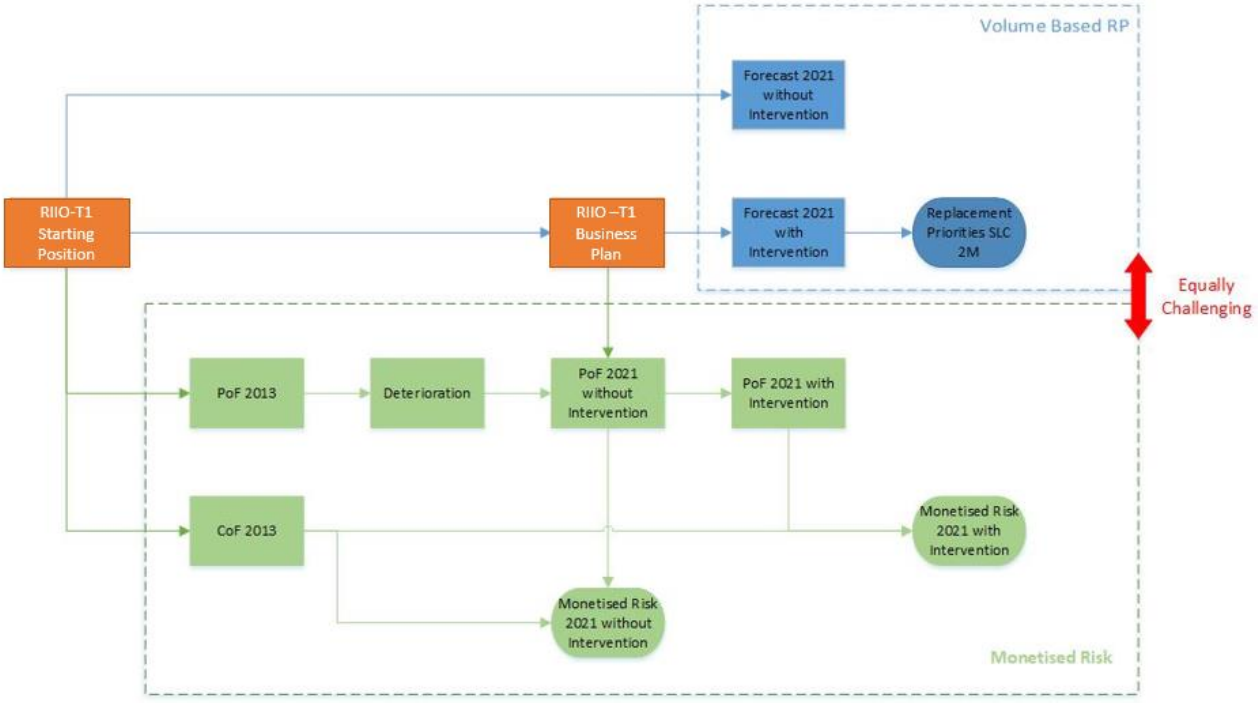
   TOs will then allow the Monetised Risk position to deteriorate, as set out in the methodology, to a forecast value representative of the end of the RIIO-T1 period without interventions. TOs will then apply adjustments to this Monetised Risk position to reflect the work that was set out in their RIIO-T1 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

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



EQUALLY CHALLENGING

It is intended that 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 Methodology is equally challenging, a volume test 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
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, refurbishment or reconditioning) based on a measure of its PoF and CoF.
TO	(Onshore) Transmission Owner

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

SHE-T and SPT have adopted a roll back method to determine the asset data corresponding to the starting point of the T1 price control. This will enable 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 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 T1 and those which are still remaining. Assets which have been added, since the start of 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 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 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 methodology 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.

APPENDIX 2 – NGET JUMP BACK TO T1 STARTING POSITION

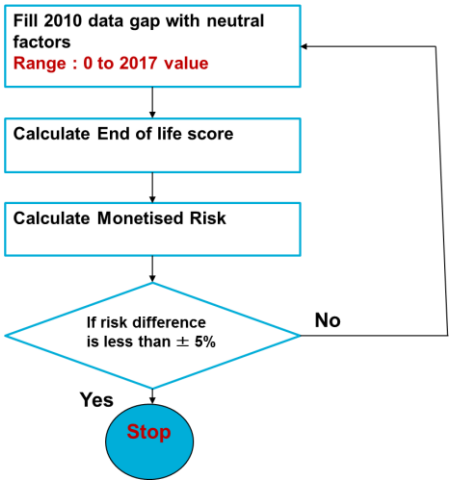
NGET will derive the value of Monetised Risk on their network at the start of the RIIO-T1 period by applying the new NOMs methodology. It will populate their respective data models based upon the information available to them as at the start of the period (2013). The target was set based on the asset information (e.g. inventory, condition) known at November 2010. This information was 'frozen' to set the target. The details of 2010 data preparation is explained in detail below.

Data gap and need for Neutral factor (NF) in 2010 data: During RIIO-T1 period, asset health is scored from 1 to 5 (OFGEM) & 1 to 4 (NGET) based on available asset health information as well as with best engineering judgement. In new NOMs model, asset health score is calculated based on end of life modifier (EoL) which uses parameters from asset health condition. Some of these parameters are not recorded/used in 2010 and it creates a data gap. Neutral factors (NF) are introduced into 2010 assets wherever the data gap exists and it is used to calculate the end of life modifier score for 2010 assets. Data gap is schematically represented below:

EoL (2010) Data	**EoL (2017) Data**
a1	a2
b1	b2
c1	c2
??	d2

For calculating 2010 EoL, missing data d1 is needed. The missing data is replaced with a neutral factor, which may vary from 0 (min) to 2017 (max) value. Note that 2017 data value could be considered maximum provided that the asset is not replaced from 2010.

Acceptance criteria for NF: The acceptance of the neutral factor as "data" could be based on the impact of these factors on monetized risk as shown in the schematic diagram. If the difference in monetised risk between with and without neutral values on the assets is less than ±5%, then the neutral factor can be considered as a data for 2010.



Neutral factor in 2010 data: Data gap for 2010 asset is determined for all six lead assets with reference to the current condition (2017) and is given in Table. Cables have no data gap with respect to 2017 position. Overhead lines have no data gap as we are considering only preliminary score for health score calculations. Transformer, reactors and switchgear have data gap which need to be replaced with neutral factors.

Asset	Data gap
Cable	0%
Conductor*	0%
Fitting*	0%
Transformer	25%
Reactor	25%
SWG	19%

*Only preliminary score is considered

Effect of neutral factors in Transformer, Reactor and Switchgear:

Transformer and Reactor: Neutral factor is introduced to the missing Other Component Score (OCS) data in 2010. Compared to 2017 data, 75 transformers and 5 reactors not having OCS value which are filled with their corresponding 2017 data as neutral factors. Since all these assets are not replaced after 2010, we can use 2017 value as the maximum value reached for OCS at 2010. Note that 88 transformers have tap changer score which is observed only in 2015 and is not counted for 2010 OCS.

End of life modifier (EoL) score is calculated for all transformers and reactors with (2017 values) and without OCS data and probability of failure (PoF) is derived for all assets. The differences between with and without neutral factor for EoL and PoF are tabulated below. PoF change for these assets is within 5% and hence it is expected that monetised risk will be within 5% and we can use 2017 values as neutral factor for 2010 data gap.

Switchgear: Neutral factor is introduced to the missing Fault duty current data in 2010. Compared to 2017 data, 1236 SWGs are not having fault current value which are filled with their corresponding 2017 data as neutral factors. By using 2017 values as neutral factors, EoL and PoF are derived for all assets with and without NF as shown in the table below. Note that, mechanical operations and fault current are only applicable when they

relate to the end of failure mode. Air and oil breakers have these components remedied by maintenance and are therefore excluded from the EOL equation in both 2010 and 2017 data.

Around 16 SWGs are replaced after 2010. Out of 16, 2 SWGs are considered as old R in 2010 and its EoL = 0 and 7 SWGs are having EoL 80-100 based on age. Only 7 SWGs need to use NF close to replacement year which will be taken care in monetised risk calculations. PoF change is negligible for these assets and hence it is expected that there will be no change in monetized risk and we can use 2017 values as neutral factor for 2010 data gap.

Asset	**Neutral factor (NF)**	**EoL change with & without (NF)**	**PoF change with & without NF**	**Remarks**
Transformer	2017 values for OCS (75 Tx)	10%	1%	2017 values can be used as NF
Reactor	2017 values for OCS (5 Rx)	3.4%	0.1%	2017 values can be used as NF
Switchgear	2017 values for fault current (1236 SWG)	0.1%	0%	2017 values can be used as NF

Conclusions:

- NGET uses RIIO T1 starting data for rebasing.
- Cables and overhead lines have all necessary data to calculate the monetized risk.
- Transformers, reactors and switchgear have data gap which are filled with neutral factors.
- The effect of PoF change is used as an indicative measure for the risk change. The calculated PoF change is less than +5% for transformer, reactor and switchgear, we can use 2017 values as neutral factors.