National Grid Gas Transmission
Network Asset Risk Metric (NARMs) Submission – December 2019

Introduction

1. This narrative accompanies the final (December) submission of NARMs tables, which represent the outputs delivered through our draft Asset Health (AH) business plan submission
2. This document should be read in combination with the Justification Reports and Cost Benefit Analyses (CBAs) which form the AH submission
3. The risk values are aligned with the models used to produce the RIIO-1 rebasing analysis, which is based on a 1 in 20 scenario and uses 2021 as a demand base year.
4. Essential asset health works to manage risk at St Fergus and Bacton are included. Following completion of FEED studies, revisions to these planned works may require restatement of NARMs outputs
5. Asset health works to support emissions-driven investments are included as baseline asset heath costs and outputs
6. Cyber, Control Systems, Gas Quality, Metering & Telemetry outputs are included, although costs and volumes are not considered in the Asset Heath Business Plan Data Tables (BPDT).

Scope

7. The NARMs submission contains 37 Secondary Asset Classes as discussed with Ofgem:
   a. 16 SACs are considered to be Lead assets and should be considered in category A1 for risk trading.

A1 – Asset Health, Risk Tradable
14 - COMPRESSOR
15 - CATHODIC PROTECTION
18 - FILTER / SCRUBBERS
21 - FLOW OR PRESSURE REGULATORS
23 - GAS GENERATOR
31 - PIG TRAP
32 - ABOVE GROUND PIPE COATING
33 - BELOW GROUND PIPE COATING
34 - POWER TURBINE
35 - PREHEATERS
42 - ELECTRICAL VARIABLE SPEED DRIVE
43 - LOCALLY ACTUATED VALVES
44 - NON RETURN VALVES
45 - REMOTE ISOLATION VALVES
46 - PROCESS VALVES
47 - SLAMSHUT SYSTEM

   b. 11 further SACs have been included in NARMs tables as Consequential Interventions and are proposed as category A3 as ring-fenced asset health

expenditure. Separate Price Control Deliverables (PCDs) have been proposed for these SACs.

A3 – Asset Health, Consequential Interventions
01 - CLADDING
02 - AFTERCOOLERS
03 - AIR INTAKE
04 - EXHAUSTS
06 - CAB VENTILATION
13 - FUEL TANKS & BUNDS
16 - ELECTRICAL (INCUDING STANDBY GENERATORS)
17 - ELECTRICAL (SAFE SHUTDOWN)
20 - FIRE SUPPRESSION
40 - STARTER MOTOR
41 - VENT SYSTEM

c. 10 SACs relating to Cyber Security, Control Systems, Gas Quality, Metering and Telemetry which are not included in asset health BPDTs. These are prosed as category A2 as ring-fenced, non-asset health expenditure.

A2 – Non Asset Health, Consequential Interventions
05 - BOUNDARY CONTROLLERS
19 - FIRE AND GAS DETECTION
22 - GAS ANALYSER
27 - FISCAL METERING
28 - FUEL GAS METERING
29 - NETWORK CONTROL AND INSTRUMENTATION
30 - ODORISATION PLANT
36 - STATION PROCESS CONTROL SYSTEM
37 - UNIT CONTROL SYSTEM
38 - ANTI-SURGE SYSTEM

d. The remaining 10 SACs are considered Non Lead and were excluded from both T1 rebasing and from the T2 NARMs analysis. This is due to the indirect nature of risk associated with these assets, which makes monetised risk challenging to quantify.

B – Asset Health, Non Lead Assets (non NARMs)
07 - CIVIL ASSETS (DRAINAGE)
08 - CIVIL ASSETS (ACCESS)
09 - CIVIL ASSETS (BUILDINGS/ENCLOSURES)
10 - CIVIL ASSETS (DUCTING)
11 - CIVIL ASSETS (BRIDGES)
12 - CIVIL ASSETS (PIPE SUPPORTS)
24 - IMPACT PROTECTION
25 - RIVER CROSSINGS
26 - MARKERS
39 – SECURITY

8. All fixed costs (generally repair and maintenance OPEX) have been excluded from our analysis (e.g. base maintenance). Only changes to Financial Risk caused by asset deterioration are considered
9. The Ofgem NARMs table does not fully consider our current NOMs Methodology:

    - Societal Risk is not included in the Ofgem template
    - Systems Risk, as per the Ofgem template, will comprise Availability/Reliability Risk plus Societal Risk
    - Safety and Environmental Risk will be reported as per the NOMs Methodology

RIIO-1 and RIIO-2 Transition

10. To calculate NARMs benefits it is necessary to understand the start monetised risk position for each in-scope asset
11. For RIIO-1 rebasing, a whole SAC unit of measure was used (in line with our RIIO-1 asset health business plan submission). For some asset types this meant that a whole site unit of measure was adopted (e.g. Electrical, Cathodic Protection). For RIIO-2 we have developed unit costs at a much more granular level and therefore we must report volumes and risk outputs using the same unit of measure, which in many cases is only a partial SAC. Electrical assets now comprise around 70 different intervention types
12. To ensure consistency between RIIO-1 risk forecasts and RIIO-2 NARMs we have modelled risk over a 13 year period between 2014 (Year 1 of RIIO-1) and 2026 (Year 5 of RIIO-2).
13. Interventions in RIIO-1 are applied at individual asset level using a whole SAC unit of measure. Risk benefits are applied and a resulting post-intervention monetised risk value calculated for every intervened-upon asset.
14. A combination of actual (2014 to 2019) and forecast (2020 and 2021) interventions are applied to calculate the start RIIO-2 monetised risk position (2022) for every SAC category.
15. All interventions are applied in the final year of RIIO-1 (2021) as per the T1 rebasing exercise.
16. Assets are allowed to deteriorate from the 2022 to the 2026 position using the assigned deterioration profile (as per NOMs Methodology).
17. Forecast RIIO-2 interventions are then applied to this end RIIO-2 (2026) position as per NARMs guidance.
18. This produces a monetised risk position in 2026 and the start point for calculation of LTRB (See Appendix).
19. This approach provides consistency across RIIO periods and ensures that changes in asset condition (and hence PoF and monetised risk) delivered in RIIO-1 are carried through into RIIO-2 and benefits are not overstated.

Below Ground Pipework and Coating (SAC33)

20. Below Ground Pipework and Coating contributes a high proportion (31%) of long-term NTS risk, but is currently reported as a single NARMs category
21. We would recommend that this SAC is disaggregated into smaller sub-units for future risk and outputs reporting. For example:

- By Feeder
- By Operational Area

22. SAC15 Cathodic Protection (CP) intervention benefits are calculated using their modelled benefit on the pipeline the CP system protects (i.e. SAC15 investment benefit is delivered on SAC33 Below Ground Pipe and Coating. This is difficult to disaggregate from pipeline risk (corrosion and CP protection are highly correlated) and is assumed to be a delta relative to a pipeline with good CP protection.
23. AGI and pipeline CP are effectively different assets (protection of kilometres of below ground pipelines versus metres of above ground pipework) but are treated as separate populations within SAC15. They are modelled separately but recombined for reporting.
24. The Expected Asset Life of an ILI Dig and CIPs Dig has been assumed to be 25 years. These resolve a corrosion defect and cathodic protection integrity issue respectively and involve major excavation works to expose the pipeline. 25 years was selected through sensitivity testing of a range of EALs.
25. Due to the modelling approach adopted, there is an acceleration of corrosion deterioration due to the break down, and rapid deterioration of, the protecting CP system which causes Long Term Risk Benefits to increase quickly after 30 years. The actual EAL of an ILI/CIPs dig will vary considerably depending on individual pipeline characteristics and 25 years is proposed as a sensible compromise, taken from a point before LTRB begins to rise rapidly (Figure 1). This is undergoing further sensitivity testing to ensure that LTRB are not skewed by this assumption.
26. The change in monetised risk over RIIO-2 is relatively insensitive to the applied EAL assumption as monetised risk benefits delivered through ILI/CIPs investments are relatively small whilst effective CP is in place.

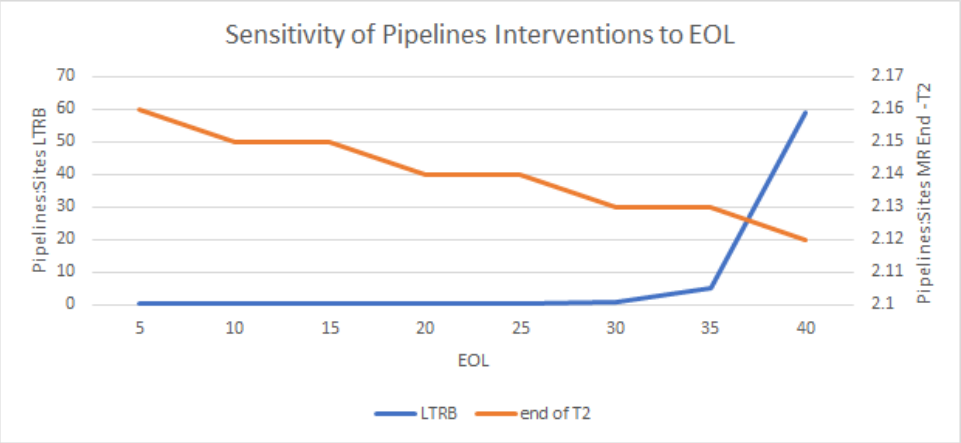

Figure 1 – Sensitivity of applied EAL assumption on LTRB (blue) and end-T2 monetised risk (orange)

Table Narrative

27. The following sections describe how each tab within the NARMs template have been populated. Only tabs requiring NGGT input data have been included in this narrative (e.g. no tabs containing calculated data).

N0.4_Related_Workbooks

28. Will contain references to the NGGT NOMs Methodology and supporting documents

N0.5_Data_Constants

29. All data constants and service risk valuations adopted have been used as per the NOMs Methodology Service Risk Framework supporting document and have not been re-listed in this tab.

N1.0_Intervention_Summary

30. Data for 2020 and 2021 is not populated as RIIO-1 interventions are not defined at the same level of detail as for RIIO-2 (whole SAC asset in RIIO-1, partial SAC in RIIO-2 to enable granular unit costing). Whole SAC asset intervention volumes and risk calculations can be provided as per our RIIO-1 rebasing submission.
31. All intervention counts are based on BPDT 3.03 and 3.03a and may include partial interventions due to phasing. For the calculation of LTRB we have assumed a whole number of interventions by rounding (e.g. 2.4 becomes 2 interventions; 6.6 becomes 7 interventions).

N1.1_Intervention_Definitions

32. These will be taken from the AH business plan Justification Reports (JR) and Data Tables (specifically Table 3.03a – Asset Health Projects). We have defined refurbishments as Major or Minor to distinguish between levels of risk reduction benefit delivered.

N1.2_Intervention_Listing

33. These will be taken from the AH business plan Justification Reports and Data Tables (specifically Table 3.03a – Asset Health Projects). These will be the same interventions as applied in the CBAs accompanying the JR.
34. There have been some changes to expected asset life (EAL) values to accommodate the new requirements for long-term risk benefits reporting, so in a limited number of cases there are differences intervention repeat period used in CBAs and expected asset life values used for NARMs. This is usually where there is no long-term risk benefit delivered through the investment (e.g. surveys).
35. Asset removals are assumed to have a life of 45 years.
36. Overhauls are assumed to have an EAL commensurate with the planned overhaul frequency.
37. Surveys are assumed to deliver zero monetised risk benefits, unless asset improvement work is carried out alongside the survey (e.g. PSSR inspections).
38. Other interventions not delivering a condition improvement are also assumed to deliver zero monetised risk benefit (e.g. A22.10.2.2 / Compressor Train Breakdown Budget).

39. We have used the provided template to include relevant information relating to the proposed investments:
    - **Asset Family**. Our Asset Health plan is built up by Investment Theme and Investment Sub Theme and these form logical groupings for aggregated reporting . There is no place for these in the current NARMs template. We have used Asset Family to record the Investment Theme. There is a JR for each Theme within our business plan submission
    - **Item / sub-component**. Our Asset Health plan is built up by Investment Theme and Investment Sub Theme and these form logical groupings for aggregated reporting . There is no place for these in the current NARMs template. We have used Item/ sub-category to record the Investment Sub Theme. It should be noted that CBA analysis is undertaken at the Sub Theme level, not for individual interventions.

N1.3_Project_Listing

40. The list of interventions we propose to carry out during RIIO-2 is listed in Table 3.03a, along with their associated volumes. The unit costs to deliver each intervention is listed in Table 3.04. These interventions are not projects. They are groups of similar interventions undertaken on a specific SAC (e.g. Process Valve Replacement; Slamshut Valve Refurbishment).
41. These will be grouped into deliverable projects through our ND500 investment management process. This project grouping has not yet happened. For the review undertaken to test the deliverability of our proposed programme of work we have made assumptions as to the sites and assets that will be intervened upon, but this cannot be confirmed until survey work is undertaken prior to full project sanctioning.
42. We have excluded all investments not delivering any outputs in RIIO-2 (but these are contained in BPDT 3.03 and 3.03a)
43. The order of interventions has been defined as follows:
    - Interventions delivering the greatest LTRB are selected first for each SAC (i.e. the interventions with the largest Expected Asset Life)
    - If EAL is the same then we assume minor refurbishments will be undertaken before major refurbishments and major refurbishments before intervention
44. For In Line Inspection (ILI) interventions on SAC33 Below Ground Pipework & Coating, we have modelled the specific pipelines that will be intervened upon
45. For other SACs, where specific assets to be invested upon are currently not known, awaiting completion of a condition survey, then we have assumed that we would prioritise investment based on upper quartile monetised risk
46. Where multiple interventions take place on the same asset, modelling risk reductions is complex. Due to time limitations, we have assumed that the risk benefit[1] of the first intervention includes the benefit of subsequent interventions (i.e. subsequent interventions have zero risk benefit).

N2.2_Risk_Bandings

1. [1]Risk benefit includes LTRB and the risk benefit incurred over the T2 period due to one-off reductions in probability of failure

47. Risk bandings have been applied using a similar approach as deployed for the RIIO-1 rebasing exercise. Risk banding is carried out for

    - Probability of Failure (P)
    - Monetised Risk (R)

48. Where a low banding reflects a low failure probability / MR and a high banding represents a high failure probability / MR.
49. This process incorporates any P and R outliers into the R1/P1 and R10/P10 ends of the defined R/P bands. First any assets belonging to the top and bottom 10th percentiles are separated out, then the remaining values divided into 10 equal bandings. The bottom and top percentiles are then included in R1/P1 and R10/P10 bands, respectively.
50. Banding is carried out independently for each SAC and banding is **relative** to other assets in the SAC population (i.e. no interference of absolute risk can be inferred from the position of an asset in a R/P band, nor comparisons between assets in similar bands but belonging to different SACs can be made).
51. Cathodic Protection systems on AGIs (Sites) and Pipelines are included in SAC15 Cathodic Protection although they are fundamentally different assets (the former protects metres of above ground pipework; the latter kilometres of below ground asset). This is a limitation of our existing SAC asset classifications

N2.3.1_Total_Risk_WO_Int_2021
N2.3.2_Total_Risk_WO_Int_2026
N2.3.3_Total_Risk_W_Int_2026
N2.4.1_Risk_Comp_WO_Int_2021

52. The values in these tables are taken directly from the SAC specific tabs (N3.021). Intervention volumes are consistent with Tables 3.03 and 3.03a.

N2.4.1_Risk_Comp_WO_Int_2021
N2.4.2_Risk_Comp_WO_Int_2026
N2.4.3_Risk_Comp_W_Int_2026

53. The breakdowns of Monetised Risk into the following service risk categories have been carried out as per the population of tabs N3.01-N3.47

    - Safety Risk
    - Environmental Risk
    - Systems Risk (Availability/Reliability Risk + Societal Risk)
    - Financial Risk

54. Probability of failure (P) values are consistent across all service risk categories. Monetised risk values have been calculated in accordance with the NOMs Methodology.

N3.99_Long_Term_Benefit_Summary

55. A detailed summary of our Long Term Risk Benefit calculation approach can be found in the Appendix.

N3.01-N3.47

56. These tables contain the monetised risk and probability of failure bandings, by RIIO period, for the 37 SACs discussed in the 'Scope' section.
57. Intervention volumes are consistent with Tables 3.03 and 3.03a. In many cases these are not defined at a whole SAC unit of measure (e.g. whole site for Above Ground Pipe and Coating).
58. For RIIO-2, interventions have been defined at a level of granularity to accurately define unit costs, which in many cases is at a sub-SAC level of detail. **When comparing RIIO-1 and RIIO-2 volumes it is important to note that RIIO-1 uses a whole SAC unit of measure and volumes are not directly comparable**.
59. All no-regrets asset health works at St Fergus, Kings Lynn and Bacton are included. Further asset health work may be proposed through the proposed uncertainty mechanism submissions strategy. This may require an adjustment to NOMs targets
60. Asset health works to be delivered alongside Emissions driver investments are included. These are still asset health investments and as such are included in relevant A1 or A3 investment categories.
61. Cyber, Control Systems, Gas Quality, Metering & Telemetry outputs are included assuming a whole SAC unit of measure (as per BPDT 3.06).
62. As discussed in the Rebasing Overview Report (Section 2.4), our new NOMs Methodology is developed at asset equipment level (120,000 Sites assets and 700,000 Pipelines assets) and to aggregate these into SACs (c. 26,000 assets, excluding Marker Posts) requires us to make assumptions.
63. This is because the aggregated SAC (e.g. Valve SAC = Valve + Actuator + Vent/Sealant Line) does not exist as an identifiable entity within our company asset register. In some cases, it is not possible to find the equivalent SAC in our new risk modelling systems and we have had to apply a gap-filling process.
64. This gap filling process is described in Step 2 of the Rebasing Overview Report (Section 2.6). The same gap filling process as used for RIIO-1 rebasing has been adopted, ensuring consistency.
65. Benefits of investment were applied using the same principles as the CBAs accompanying the Justification Reports and as per the Rebasing Overview Report (Section 2.7).
66. All benefits are discounted using a discount rate of 3.5% to account for uncertainty associated with benefits delivered in the future.
67. It should be noted that for RIIO-1 rebasing a whole SAC unit of intervention was assumed (as per Table 6.6 of RRP), but for RIIO-2 in some cases a sub-SAC unit of measure has been adopted, and intervention benefits reduced accordingly (e.g. Valve Stem Seal Replacement).
68. As per T1 rebasing, we have set all intervention benefits to be claimed in the final year of T1.
69. The 2018/19 start position, RIIO-1 Additions, Disposals, Deterioration, Replacements, Refurbishments and Volumes impacted have all then been back-calculated using a linear profile derived from the start and end RIIO-1 Total Network Risk values.
70. This is necessary as NARMs tables start in 2018/19, not 2013/14 (Year 1 of RIIO-1). No interference should be made that the stated 2018/19 values are our current levels of performance.

Template Changes

71. Some minor issues were identified with v1.4 of the Ofgem NARMs template. The following modifications have been made to facilitate accurate and timely completion of the tables.

N1.3_Project_Listing

72. Cell Z16 changed from Monetised Risk (R£) to Monetised Risk (R£m). This also contains Long Term Benefit which according to the guidance should be (LR£m).
73. Columns Z to AC adjusted to 5 decimal places.

N2.1_Network_Risk_Summary

74. Monetised Risk adjusted to 5 decimal places.
75. Average Risk adjusted to 5 decimal places.
76. PoF (Failure Rate) adjusted to 3 decimal places.

N2.2_Risk_Bandings

77. Risk Bandings for 15 Below Ground Pipe Coating have been calculated collectively at the km level and asset level.
78. Monetised Risk bandings changed to 5 decimal places.

N2.3.1_Total_Risk_WO_Int_2021

79. Monetised Risk values adjusted to 5 decimal places.

N2.3.2_Total_Risk_WO_Int_2026

80. Monetised Risk values adjusted to 5 decimal places.

N2.3.3_Total_Risk_W_Int_2026

81. Monetised Risk values adjusted to 5 decimal places.

N2.4.1_Risk_Comp_WO_Int_2021

82. Monetised Risk values adjusted to 5 decimal places

N2.4.2_Risk_Comp_WO_Int_2026

83. Monetised Risk values adjusted to 5 decimal places.

N2.4.3_Risk_Comp_W_Int_2026

84. Monetised Risk values adjusted to 5 decimal places.

N3.00_Asset_Cat_Risk_Summary

85. Monetised Risk values adjusted to 5 decimal places.

N3.99_Long_Term_Benefit_Summary

86. Long term Risk adjusted to 3 decimal places.

N3.XX

87. As per the requirement in the rebasing methodology NGT has set all NOMs to be claimed in the final year of T1. The 2018/19 start position, RIIO-1 Additions, Disposals, Deterioration, Replacements, Refurbishments and volumes impacted have all then been calculated on a linear profile from the End of RIIO-1 Total Network Risk back to the Start of RIIO-1 Total Network Risk. All units in column F updated from R£ & LR£ to R£m & LR£m

88. All Monetised Risk values adjusted to 5 decimal places.

Comparisons with Cost Benefit Analysis (CBA)

89. When comparing LTRB within these tables and CBA outputs it should be noted that, although the benefits are taken from the same source (our risk trading model, or Decision Support Tool) and identical interventions are modelled, results will not be directly equivalent for the following reasons:

    - CBA calculates benefits at the whole population level, whereas LTRB is calculated at individual SAC asset level

    - CBA assumes all interventions are carried out in isolation for direct comparison between options, whereas LTRB considers both the order, and interaction between interventions (i.e. the second intervention delivers less benefit than the first because starting risk is lower)

    - CBA uses the asset life extension by the investment delivered to calculate benefits, whereas LTRB uses Expected Asset Life (EAL). In most cases these are equivalent, but in some cases EAL has been modified to avoid inflating, or understating, LTRB (e.g. below ground pipeline interventions).

Appendix - Long Term Risk Benefits

- The purpose of this note is to outline the proposed NGGT approach for calculating the Long Term Risk Benefits (LTRB) for the December 2019 NARMs submission.
- We are largely supportive of the proposed approach presented to the Cross Sector Working Group, but have further questions concerning the use of the End of Life (or Expected Asset Life) assumption This is to ensure LTRB are calculated consistently by networks operating similar assets

General

1. We have reviewed the suggested Ofgem approach and are broadly comfortable with the suggested approach. Our responses to the questions raised at Cross Sector Working Group meetings are provided below:

Do you agree that when setting outputs, we should assume that all interventions take place at the end of RIIO-2?

2. Generally, we are comfortable with this approach. Applying the interventions at the end of the RIIO period will output largest benefit value (as assets will have deteriorated to a higher level of monetised risk compared to all other years in the RIIO period).
3. If we are to set targets assuming an RIIO intervention, then when we record the actual intervention benefits (through RRP) we must assume these all occurred at the end of the RIIO period, regardless of the actual year of intervention.
4. If we use the actual year of intervention, the benefit claimed will always be less than the end-RIIO value used in the target and the actual/target LTRB values would be inconsistently defined.

Do you agree that only the benefit delivered by interventions in RIIO-2 should count for setting outputs?

5. It is sensible to assume that only monetised risk (MR) benefits delivered through current RIIO period investments will contribute to the LTRB target
6. It is reasonable to assume that the End of Asset Life (or Expected Asset Life (EAL)), when the subsequent intervention will take place on a repairable asset, is used to cap the benefits period delivered by an investment This could potentially accrue over multiple, subsequent RIIO periods (i.e. an asset with an EAL of 50 years will contribute benefits up until 2075).
7. It is important that EAL should be clearly stated for each asset intervention, which will vary by asset and intervention type and should not change unless better information exists and through consultation.

Should discounted or undiscounted long term risk values be used for setting outputs?

8. We understand that discounting is applied to consider the fact that benefits delivered in the long-term could be less certain than benefits delivered in the short-term. We believe that enhancing NARMs analysis to

Are there any other questions that we need to answer?

9. Our most significant concern is how the EAL is set and controlled.
10. From an asset management perspective, an asset remains serviceable until risk increases to a level that justifies investment.

11. The concept of EAL will hardcode a repeat investment over a fixed period, regardless of risk. The stated EAM will be sensitive for the setting the LRMT and needs to be consistently applied for networks operating similar assets. Otherwise, an advantage could be gained for operators with poor maintenance regimes which will reduce the EAL[2].
12. The EAL values to used do not directly arise from NOMs Methodology but can be derived using an approach that is consistent with applied deterioration rates (see below)
13. The EAL should be consistent with the repeat intervention assumed within CBAs

Long Term Risk Benefit Calculation Approach

14. The LTRB calculation can be derived directly from our NOMs Methodology with minimal adaptations, except for the estimation of the EAL (see above). The approach is expressed diagrammatically in Figure 1.

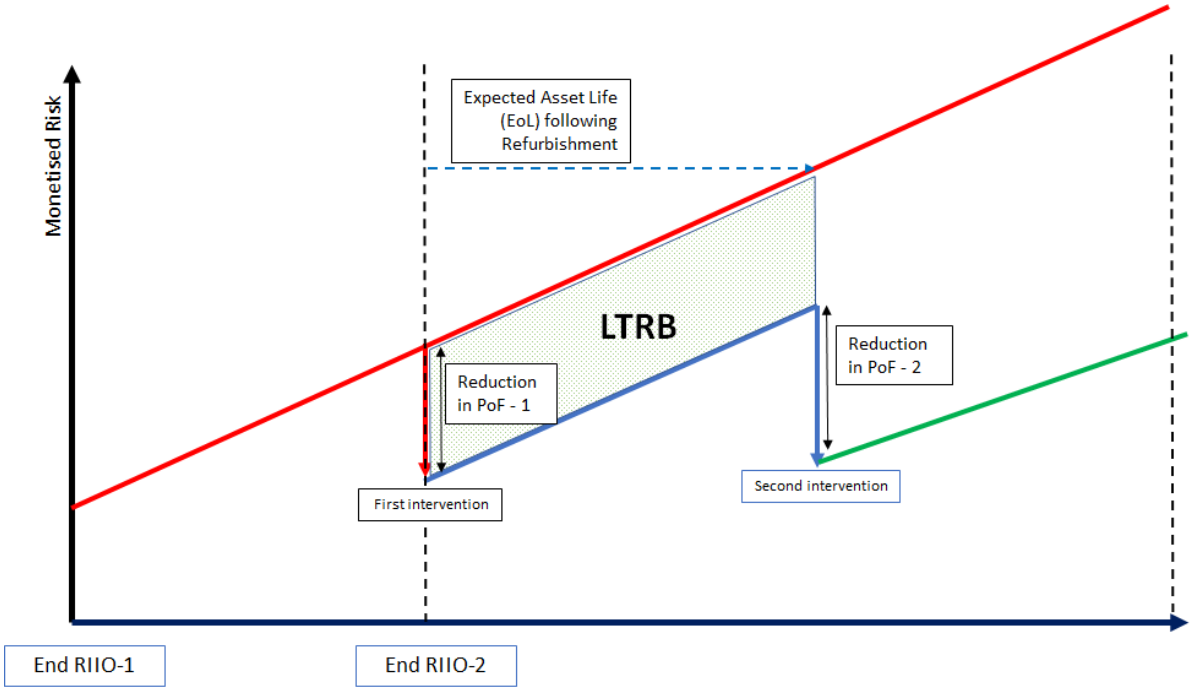

Figure 2 – Conceptual diagram showing LTRB approach

15. Figure 1 is simplified to demonstrate the LTRB concept and actual deterioration curves are based on Weibull relationships and are not linear as represented here. A discussion of each key stage, and associated assumptions, is provided below.
16. Each SAC asset and intervention type (replace, refurbishment etc.) has a unique LTRB calculation.

Starting Position

17. This is the starting monetised position, as per the forecast at the end of RIIO-1, for each SAC asset category.
18. The monetised risk value increases over time under a no-intervention scenario. The rate of deterioration is defined by the NOMs Methodology (see Section 5.4 of Probability of Failure Supporting document).

1.

[2] Lower EAL will result in a lower LTRB target which is easier to achieve through risk trading

19. For Pipelines, we assume that all corrosion defect repairs (following ILI surveys) are proactive interventions and do not form part of the without-intervention monetised risk profile. This avoids hard-coding expensive repair costs into baseline financial risk and allows the decision to repair, or not repair to be based on risk rather than policy
    - We treat this intervention as proactive because there is a choice as to the extent of corrosion that would necessitate a dig and repair
    - We choose to intervene at 80% of remaining wall thickness, but this is a risk-based decision
    - We could choose to intervene at 90% (less risk tolerance) or 70% (more risk tolerance). Our models allow us to test this
    - If we just assume that we repair at 80% regardless of risk then this effectively becomes a reactive repair and forms part of baseline Financial Risk
    - The baseline becomes a “do-minimum as per policy” rather than a “do-nothing” option. By including the ILI dig and repair in the baseline it is no longer possible to do a CBA on the intervention
    - To evaluate the benefit of an intervention we need to know the risk associated with no doing the intervention. Presently, we assume the baseline is “do nothing” and the dig and repair is a proactive decision subject to CBA
    - If we treat an ILI dig/repair as reactive this would 1) increase baseline risk 2) reduce long-term benefits 3) effectively hard-code significant £ of investment into our AH plan without CBA justification (we would just say has to be done based on policy)
20. As with T1 rebasing, monetised risk is calculated at Asset Equipment level and aggregated to SAC assets. Some gap-filling is required (see Rebasing Overview Report Section 2.6)

Expected Asset Life (EAL)

21. For this method we have assume that the EAL is equivalent to the expected life of an intervention, which is clearly SAC asset and intervention type specific.
22. The EAL is assumed to be equivalent to the intervention repeat period accompanying our Asset Health Business Plan (AHBP) Justification Reports. However, where the intervention repeat period delivers an excessive LTRB (below ground pipelines) the EAL value has been reduced accordingly (see para. 34) in main document
23. The EAL has been estimated, per SAC asset and intervention type, using two sources
    - Subject Matter Expert (SME) judgement as to the life extension delivered by an investment
    - Where SME opinion is not available, the elicitation models used to estimate PoF deterioration curves have been used (Repairable Failure versus Age Model). See Probability of Failure Supporting Document, Appendix D)
24. Assumed EAL values for each SAC asset and intervention are shown in Appendix B

Intervention 1

25. As per Ofgem guidance, the MR benefits of all interventions proposed to be delivered in .RIIO-2 are applied at the end of RIIO-2 (Intervention 1).
26. As per CBAs, the intervention benefit is calculated, for each SAC asset intervention type, using:
    - A reduction in the PoF
    - An extension in asset life (which corresponds to the EAL, or life of an intervention)

27. Further information on how benefits are calculated is provided with the assumptions document accompanying AHBP CBA submissions.
28. If the EAL value falls before the end of the RIIO period, we assume that the asset will last until the end of the RIIO period.
29. If multiple interventions occur on the same asset during a single RIIO period these are aggregated for the purposes of NARMs. The intervention delivering the largest EAL value is used. This is possible for large assets, with multiple potential interventions (e.g. Pipelines).
    - Cathodic Protection is probably a good example of where multiple interventions can take place on a single asset
    - The cathodic protection system can cover several kilometres and have many CP test posts. If you replace 10 CP test posts and undertake a CP dig following a survey to repair the same CP system, this is multiple interventions on the same CP system
    - In this case we would use the EOL derived from the CP dig/repair not from the 10 CP test posts. It's because using SAC assets the unit of measure is quite large in some cases (e.g. 1 per site for electrical assets)

Long Term Risk Benefit

30. The LTRB is the cumulative MR benefit between the first and second intervention Further LTRB arising from the second intervention are not considered for NARMs but are modelled within CBAs accompanying the AHBP.