ARUP

Network Rail and Office of Rail and Road

Independent Reporter - Costs and Benefits of Safety Interventions

Final Report

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1. Executive Summary

1.1 Disclaimer

The scope of this review is to assess the Network Rail processes for reviewing the costs and benefits of safety interventions for particular safety-related projects and initiatives, what drives decisions, and how these projects are governed and monitored. This review does not assess levels of safety, whether or not safety is satisfactory or has been improved, or whether money has been effectively spent. Instead, it assesses what processes have been used to inform costs and benefits of safety decision making on projects.

In preparing this report the Independent Reporter have relied on information provided by the Office of Rail and Road (ORR) and Network Rail, and Independent Reporter do not accept responsibility for the content, including the accuracy and completeness, of such information. In no circumstances do Independent Reporter accept liability in relation to information provided in this report.

Findings are time-sensitive and relevant only to the situation at the time the information was collected. This report will not be updated to reflect any changes in facts or circumstances, or further developments related to the events in the review, that occur after the date of this report.

1.2 General

Arup, supported by Winder Phillips Associates and Value Added Engineering Services, has been appointed by the ORR and Network Rail under the Independent Reporter framework to undertake a review titled 'Costs and Benefits of Safety Interventions'. This report contains recommendations for future improvement to the process of costs and benefits of safety decision making.

The purpose of this review was:

- To assess Network Rail's approach to safety interventions, specifically to understand how Network Rail assesses value for money and whether reasonable practicability is systematically tested by Network Rail;
- To review an agreed set of five case studies (covering Electrical Safety Delivery, Level Crossings, Track Worker Safety, Public Safety – Dawlish Sea Wall and response to Rail Accident Investigation Branch (RAIB) recommendations - Tibberton Level Crossing accident) for common themes and whether they are supported by clear assessments of costs and the range of intended benefits, be they: compliance, health and safety management improvement beyond compliance, performance, capacity or other business objectives or a blend of these and the extent to which effective project management was used to monitor and control costs, and ensure that intended benefits are realised;
- To review and assess Network Rail's historical context, testing of, and governance of SFAIRP (So Far As Is Reasonably Practicable);
- To review how ORR monitors the implications (i.e. quantum and efficiency of associated costs and deliverability of planned improvements) when Network Rail does not challenge reasonable practicability of an ORR Health and Safety intervention; and
- To review how ORR safety priorities / ongoing discussions are factored into the Periodic Review process.

1.3 Main Findings

The findings from the Independent Reporter's review and assessment have been categorised into eight key topic areas and are summarised as follows:

1.3.1 Network Rail's approach to applying good practice in safety decision making

Network Rail's decision making on major safety programmes and Network Rail's approach to considering what is good practice (good practice being key to establishing what is reasonably practicable).

Overview of findings

The Independent Reporter's review found elements of Network Rail's approach to decision making on major safety programmes for several of the case studies represented good practice when determining what is reasonably practicable. The good practice approach was not consistently observed across all case studies reviewed, based on the information and evidence received.

Positive Indicators

Overall Network Rail demonstrates very good practice in the approach to managing safety interventions in the Level Crossings case study. There was evidence of a structured and mature approach to level crossing risk assessment that includes explicit risk estimation based on quantitative and qualitative assessment. This is supported by structured processes, data, tools, resources, National Standards, and guidance founded on risk management principles, and considered proportionate to the hazard and risks being assessed.

The Dawlish Sea Wall case study evidence was found to represent good practice in terms of approach to explicit risk estimation. Reasonable practicability is well understood for this case study based on the appointed specialist's analysis.

For the case study in response to the RAIB recommendation for the Tibberton Level Crossing accident, the approach taken was found to be structured and consistent. The response included adopting a first principles approach, which was appropriate to the complexity of the safety issue, which was seen to be adopted into National Standards and passive level crossing risk assessments.

For the Level Crossings case study, the overall approach is particularly good and includes consideration of the relevant codes of practice to understand available risk reduction options for managing hazards. These measures are well understood and embedded in Network Rail's risk assessment standards and Level Crossing Guidance (LCG), which are periodically updated. The qualitative narrative risk assessment (supported by the quantitative analysis) is an essential aspect of the decision-making process, enabling consideration of relevant good practice and other local factors to be applied to each crossing.

Areas for improvement

The good practice approach was not consistently observed across all the case studies reviewed, based on the information and evidence received. The Electrical Safety Delivery (ESD) case study process was found to be less mature than other case studies; there is not a similar set of mature risk assessment standards and guidance setting out a clear process for determining SFAIRP – although this is within the context that this programme is subject to the Electricity at Work Regulations 1989 which set out absolute legal compliance duties which have driven, and continue to drive, the overall approach for the programme.

Based on the limited information reviewed, the Track Worker Safety (TWS) case study was found to be the area where there is most opportunity for improvement in the approach to risk assessment and determining what is reasonably practicable.

A new Network Rail guidance is expected in 2025, the Independent Reporter has sighted a draft copy of the Network Rail guidance document 'SFAIRP – A practical guide to support safety-related decision making', which will help establish a common and more consistent approach to demonstrating SFAIRP.

Recommendations (Refer to Table 1)

REC001

REC005

1.3.2 Application of First Principles

If the situation is unusual/complex was there evidence of Network Rail working from first principles to consider options with quantified costs and benefits?

Overview of findings

The review found examples of Network Rail working from first principles to consider options with quantified costs and benefits within the case studies, and in some areas this is embedded within the governing standards for risk assessment. This approach was not consistently observed across all case studies reviewed, based on the information and evidence received.

Positive Indicators

The Level Crossings case study indicates that the use of first principles analysis is embedded within the level crossing risk assessment process, with each level crossing being subject to an explicit risk estimation to determine what is reasonably practicable to manage the safety risk. The All-Level Crossings Risk Model (ALCRM) risk quantification is supported by the Rail Safety Standards Board (RSSB) Safety Risk Model (SRM) incident data, which in turn is supported by qualitative structured expert judgement in the narrative risk assessments to present the overall risk evaluation for each crossing, capturing some hazards/factors that are not accounted for within the quantitative assessment. This is considered an appropriate method to inform decision making.

Furthermore, the Network Rail response to the RAIB recommendation (Tibberton Level Crossing) case study reviewed followed a first principles approach, which was subsequently adopted into National level crossing risk assessment standards. The Dawlish Sea Wall case study also followed a first principles approach and explicit risk estimation based on the example provided, thus indicating a robust approach to complex situations.

Areas for Improvement

There was some evidence of working from first principles assessment within the ESD case study review. While it wasn't evident that measures being taken in the programme were supported by an overall risk-based framework for determining SFAIRP, as set out above, some of the measures taken were based on compliance with absolute duties set out in legislation (i.e. Electrical Safety at Work Regulations, parts of which are absolute and not subject to the reasonable practicability test). The use of a risk-based, structured approach to assess costs and benefits was not evident from the Tracker Worker Safety (TWS) case study, with a difference of opinion for stakeholders involved as to what drove the decisions of what actions to pursue.

Recommendations (Refer to Table 1)

REC001

REC005

1.3.3 Cost Benefit Analysis

The extent to which each case study was supported by clear assessments of costs and the range of intended benefits (compliance, health and safety management improvement beyond compliance, performance, capacity or other business objectives). What costs are included and are they directly related to the safety issue in question?

Overview of findings

The review found examples of risk assessments and evaluation being supported by clear assessments of costs and benefits within the case studies. However, there is a notable inconsistency in how costs and benefits are assessed across the different case studies (i.e. there is no common approach) and the types of costs considered.

Positive Indicators

Use of a Cost Benefit Analysis (CBA) tool is embedded within the level crossing risk assessment process, with case study examples clearly showing the range of costs and benefits considered. The Dawlish Sea Wall case study example was also supported by a clear assessment of costs and benefits, although it was unclear whether this is a representative approach for evaluating interventions to similar assets. There was also evidence that quantified costs and benefits have been considered within the ESD case study, with the realisation of time/cost savings an apparent driver.

Areas for Improvement

In contrast, a standard approach to CBA was not evident within the TWS case study. It was also noted during the case study review that (except for level crossings) there appeared to be no clear view of what Gross Disproportion Factors (GDFs) are appropriate for a safety-related CBA. The Independent Reporter understands Network Rail has recently commissioned a report to establish consistency in GDF, and this will feature within the updated Network Rail CBA tool. The document "General CBA Tool - User Guidance v2" provides clear scenarios of when to use specific values for the general CBA tool - and has been informed by a recent piece of work with external advisors.

The HSE has issued several expert guidance documents on risk management collectively titled 'Principles and guidelines to assist HSE in its judgements that duty-holders have reduced risk as low as reasonably practicable', setting out the approach that HSE inspectors use to evaluate risk. Whilst there is no authoritative guidance from the courts as to what factors should be considered in determining whether cost is grossly disproportionate, HSE's Expert Guidance on Risk Management refers to some rules of thumb, followed by HSE's major hazard divisions, that range from a GDF of 2 for low risks to members of the public and GDF of 10 for high risks to members of the public. It is noted that the HSE rule of thumb values apply across different hazardous sectors and takes into consideration a range of factors in relation to both low risks from minor incidents, and that from major accidents. The HSE guidance also states the greater the risk: the higher the proportion may be before being considered 'gross', and the judgment as to whether measures are grossly disproportionate should reflect societal risk (because society has a greater aversion to high consequence accidents than to several lower consequence accidents).

As part of this review, the Independent Reporter undertook a comparison of several GDFs used/referenced by organisations within the railway and other hazardous sectors in the UK, and internationally where as low as reasonably practicable (ALARP) principles are used (HSE's expert guidance regards ALARP and SFAIRP as interchangeable, at their core is the concept of "reasonably practicable").

Within the Network Rail level crossing CBA tool, the method for calculating a cost-benefit ratio considers the potential performance savings (e.g. operational and maintenance cost savings) associated with introducing a safety measure as a benefit i.e. cost-benefit ratio = costs of introducing a safety measure / (safety benefits + cost savings). This differs from the RSSB industry guidance where cost-benefit ratio = (costs of introducing a safety measure - cost savings) / safety benefits. However, it should be noted that a new CBA tool has been developed by Network Rail which is better aligned with RSSB guidance. This is due to be rolled out across the organisation in March 2025.

Recommendations (Refer to Table 1)

REC001

REC005

1.3.4 Testing and governance of SFAIRP

Was there evidence of testing of, and governance of SFAIRP (So Far As Is Reasonably Practicable)?

Overview of findings

The review found examples of established methods and processes in place for governance and testing of SFAIRP. However, there are notable inconsistencies across the different case studies reviewed (i.e. there is no common approach).

Positive Indicators

The established National level crossing risk assessment standards, guidance documents, Technical Authority function, and resource provide governance, with evidence of sharing of good practice provided by the Technical Authority through several forums. Moderation of outputs of SFAIRP decisions is done, but more so are Regional level. During the interviews, plans to implement a narrative risk assessment assurance checking process in future was discussed.

Areas for Improvement

Aside from level crossings, there was limited evidence of the measures in place for the governance and testing of SFAIRP. The Dawlish Sea Wall case study provided a clear assessment of how SFAIRP was determined, but it is unclear how this is linked to a National Technical Authority, or standardised and monitored approach. Whilst the ESD programme strategy has a 3-Control Period horizon, with the improvements being prioritised based on safety risk, a clear criterion for doing so was not observed. Similarly, evidencing of governance of the steps to demonstrate SFAIRP is not explicitly clear within the review undertaken for the TWS case study.

Recommendations (Refer to Table 1)

REC001

REC005

1.3.5 Project Management

Was there effective project management in place to monitor and control costs and ensure that intended benefits are realised (including at what point do Network Rail re-examine original decisions)? Evidence on i) how long the intervention/initiative took compared to what was expected; ii) extent of costs incurred (compared to what was expected)

Overview of findings

For the case studies reviewed, the Independent Reporter found that elements of Network Rail's approach to project management, monitoring and controlling costs to ensure intended benefits are realised represented good management and governance, but there is potential for improvements in the progressive monitoring of costs and evaluation of how the intended benefits have been realised.

Positive Indicators

For the Level Crossings case studies (which included the response to RAIB recommendation for the Tibberton Level Crossing accident), effective project management was in place, risk assessments were periodically reviewed as governed by standards. After changes such as an incident or cost increase, this triggered re-examination of decisions. For the ESD and TWS case studies, internal Network Rail governance plus external review (by ORR and others) of the programme delivery were evidenced to be mature. There is some clear monitoring of progress at Regional level. There is also evidence of consideration of costs.

Areas for Improvement

Whilst the governance arrangement for ESD and TWS were evidenced to be mature at a programme / National level (including that the TWS Programme Board was attended by ORR's Chief Inspector of Railways – as an observer), there was also a lack of evidence of more granular details on the progressive monitoring of costs, the evaluation of how long the intervention/initiative took compared to what was expected, and the costs incurred (compared to what was expected). However, the new draft Network Rail internal guidance document 'SFAIRP – A practical guide to support safety-related decision making', (expected to be implemented across Network Rail in 2025), does contain an intent to provide more clarity on the governance arrangements needed to be in place to monitor the development and implementation of safety investments.

Recommendations (Refer to Table 1)

REC002

REC005

1.3.6 Engagement with ORR and other bodies

Network Rail's engagement with ORR and where applicable, other bodies (including Rail Safety and Standards Board (RSSB) and Rail Accident Investigation Branch (RAIB)) prior to and following an intervention.

Overview of findings

Network Rail engagement with ORR and other relevant bodies such as RSSB and RAIB was found to be positive overall based on the case studies reviewed. However, there is potential scope for improvement to further refine the current ways of working to enhance the synergy and engagement between the ORR and Network Rail.

Positive Indicators

Evidence of strong engagement with ORR and RAIB was found for the Level Crossings case study, where structured responses to enforcement actions and recommendations have been effective. The use of RSSB SRM data in the All Level Crossing Risk Model (ALCRM) also indicate engagements with RSSB. For the ESD programme, a joint strategy was agreed between ORR and Network Rail based on the ALARP principles, and updates are reported to internal governance forums in Network Rail and shared with the ORR through the quarterly electrical safety strategy meetings.

Areas for Improvement

Based upon the scope of the commission, which is limited to the information that was made available during the course of the review, the TWS case study was found to be the area where there is most opportunity for improvement in the engagement between Network Rail and ORR, in particular in advance of notices being served and across the Network Rail Regions. Whilst the Network Rail Standard, Network Rail/L3/INV/3001 Module 904: Reporting of and Responding to Enforcement Actions sets out the Network Rail process for engagement with the ORR, there is a lack of evidence from the case studies reviewed that the process was followed by Network Rail, specifically on TWS or ESD, where enforcement actions apply. Therefore, there is scope for both organisations to further refine the current ways of working to enhance the synergy and engagement between the ORR and Network Rail.

Recommendations (Refer to Table 1)

REC002

REC003

1.3.7 Regional and National Approaches

Is there evidence of both Regional and National approaches to reasonable practicability and the use of cost benefit analysis?

Overview of findings

There is some evidence of established National approaches and processes to determining reasonable practicability within the case studies, with some variation in outputs at Regional level. There is no overarching guidance in use to govern a consistent National approach to demonstrating SFAIRP across all areas.

Positive Indicators

There is a standardised National approach to risk assessment of level crossings, supported with guidance from the Technical Authority. There is a clear National strategy for reducing risk at level crossings (Enhancing Level Crossing Safety 2019-2029), in which the priority is risk reduction at passive crossings, followed by automatic crossings. Due to the devolution within Network Rail, some decision making occurs within Routes, and there is some freedom for Routes to prioritise differently based on their own portfolio. Based on the interviews conducted, there is evidence that by and large Routes are aligning their business plans for the Control Period with this overall strategy. However, there is some freedom for Routes to prioritise differently based on their own portfolio. Moderation of outputs of SFAIRP decisions is done, but more so at Regional level than National level (see Section 1.3.4).

Areas for Improvement

The potential for Route variation in the approach to determining what is reasonably practicable was noted in the ESD case study review, indicating the need for the introduction of the planned guidance to provide more clarity and synergy in determining SFAIRP at National level. Similarly, based on the information received in the TWS case study, it was apparent that there are National strategies in place but there may be variation in implementation at Regional level.

Recommendations (Refer to Table 1)

REC004

1.3.8 Escalation of Issues

How issues are escalated within the company and what engagement it has with ORR colleagues.

Overview of findings

The evidence from the review has shown that issues were escalated within Network Rail in accordance with well embedded processes, governance structures are in place, and they are relied upon. Appropriate levels of ORR engagement are also incorporated into the Network Rail governance structure, however the effectiveness of the engagement requires more evidence for some case studies based on the information reviewed.

Positive Indicators

The devolution of Network Rail poses challenges in engagement with ORR, requiring interaction with multiple individuals. The Technical Authority plays a central role, particularly the National Level Crossing Safety team, in the development of the response to ORR interventions, and implementation of improvement plans with local Route level crossing managers. The ESD Programme showed good engagement with ORR once established, including quarterly electrical safety strategy meetings with ORR. The Network Rail standard regarding reporting of and responding to Enforcement Actions sets out the Network Rail process for engagement with the ORR.

Areas for Improvement

Whilst the Network Rail process for engagement with the ORR is set out in the Network Rail Standard, Network Rail/L3/INV/3001 Module 904, the findings highlighted differences in approach across the case studies and a significant improvement could be made to track, monitor and communicate progress on regulatory safety issues (i.e. significant health and safety compliance issues) in some cases. This was particularly evidenced in Network Rail's initially reactive approach to responding to ORR engagement on the TWS case study.

Recommendations (Refer to Table 1)

REC002

REC003

1.4 Summary and Recommendations

The Independent Reporter was only provided with five case studies and had limited time to evaluate the evidence provided for this scope of review. It has therefore been difficult to conclusively comment on the robustness and consistency of the approach adopted beyond the evidence provided for this review and evaluate in further depth on some of the key topic areas. Considering the findings above, it is recommended that future improvement in Network Rail's safety investment decision making should consist of standardisation of approach, enhanced governance and testing of SFAIRP, and better formalisation and synergy of Network Rail's engagements (e.g. Technical Authority at working and director level, and Regional and Route Managing Directors at working and director level) with ORR.

As part of the review, positive steps to standardise best practice were seen to have been initiated across several areas by Network Rail, such as the new Network Rail CBA tool, an independent report on CBA and GDF application in Network Rail, and draft of the Network Rail SFAIRP guidance for decision making. The need for better synergy on strategic engagements between Network Rail and ORR has also been acknowledged by the Network Rail and ORR teams involved in this review.

The recommendations from this review have been summarised below in Table 1 - grouped by the key theme areas. The Independent Reporter has not provided prioritisation for these recommendations given the positive steps noted above, although it is assumed that Network Rail and the ORR may choose to agree priorities and assign ownership accordingly.

Table 1: Summary of Recommendations

Ref.	Recommendation	Key Theme Areas
REC 001	Standardisation of approach for safety investment decision making	Network Rail should continue to develop and implement a common approach and guidance for determining Reasonable Practicability (e.g. the draft document 'SFAIRP – A practical guide to support safety-related decision making'), which should include use of Good Practice first, in accordance with the HSE guidance Risk management: Expert guidance - Good practice. The common approach should describe when it would be appropriate to use Cost Benefit Analysis. The following are suggested areas of improvement: • Consistency and Guidance: The review noted there is no overarching Network Rail guidance in use yet to govern a consistent National approach to demonstrating SFAIRP, although Network Rail are in the process of developing this. Developing guidance at both project and corporate levels will enable a consistent approach to determining and testing reasonable practicability (RP). The guidance should also include the need to provide explicit rationale to support steps taken to determine RP (this includes the rationale for GDF). • CBA Tool: Network Rail should standardise the approach to the application of CBA across all Regions and projects, including the situations where it might be proportionate to apply it, based on a risk-based approach. Network Rail engaged with RSSB regarding the new General CBA tool, set to be rolled out in March 2025, which should be accompanied by comprehensive guidance, governance, and training to ensure consistent use and outputs. This approach could be applied in discussions between Network Rail and the ORR for 'significant and / or unusual safety related investments where SFAIRP may need testing' as referred to in the ORR Enforcement Management Model (EMM). The guidance should align CBA practices with updated RSSB guidance, ensuring that performance benefits are separated from safety benefits. • GDF Factors: Where cost benefit analysis has been used in support of a SFAIRP assessment, consider adopting a common approach to the use of gross disproportion factors (GDFs) for a safety-related CBA, reviewed against the rules of thumb within the HSE's Expert guidance on risk management. • Industry-level collaboration: The formation of Great British Railways (GBR) should present the industry with greater opportunities for industry-level collaboration, providing a directing mind and access to information, including data sharing, which may support the establishment of joint rail

Ref.	Recommendation	Key Theme Areas
		industry CBA criteria and collated industry best practice to safety investment decisions.
REC 002	Progressive monitoring of cost and realisation of intended benefits	Progressive monitoring of cost and realisation of intended benefits should be implemented by both Network Rail and ORR. The following are suggested areas of improvement: • Network Rail should implement progressive monitoring of cost and project outcomes to ensure that costs are controlled and intended benefits are realised. This includes re-evaluating reasonable practicability when there are significant changes in costs and/or the means to realise safety benefits (such as products, technology, or project scope). • The introduction of the Delivery Plan Lead, a new dedicated role within the ORR Railway Safety Directorate (RSD) that monitors Network Rail's Delivery Plan for Health and Safety is positive. It is understood that the scope of this role is evolving and the more proactive/forward looking reviews by ORR into safety interventions maybe attributed to the ORR Railway Safety Team, with Network Rail sharing appropriate information on costs and delivery outcomes with ORR to enable these reviews to be fully informed.
REC 003	Engagement	Enhanced engagement should be implemented between ORR and Network Rail regarding safety initiatives, as well as other industry stakeholders, allowing a more collaborative approach for discussion particularly for novel or contentious issues. The following are suggested areas of improvement: • Joint strategic safety workshop events facilitated by independent parties, such as RSSB, presenting good practice uses of CBA, GDF and SFAIRP, would help illustrate what is required across the industry. These examples of good practice could be collated into a library for use by Network Rail and ORR, and a community of practitioners established within Network Rail. • ORR and Network Rail should strengthen their engagement on longer-term risks and priorities. Such engagement would also be important in the context of business planning updates and more strategic conversations around planning for future Control Periods.
REC 004	National/Regional Integration	Network Rail should consider ways of enhancing National and Regional integration. The following are suggested areas of improvement: • National Strategy with Regional Flexibility: While there is a clear National strategy for certain areas like level crossings, Regional variations in the output of the risk assessment processes exist. Network Rail should review how Regional approaches to safety enhancement are aligned with National strategies, while allowing for flexibility based on local priorities. • Cross-Region Sharing: Enhancing Cross-Regional sharing of information and best practices can help in achieving more consistent outcomes. • Safety Decision Making: Clarity on how the Regional and National approaches are managed to enable effective decision making at corporate level and addressing emerging risks (e.g. conflicting new and existing safety risk priorities across ESD, TWS, Level Crossing). • Management of safety regulatory risks: Network Rail should develop a more robust process to capture and manage safety regulatory risks. This process should be dynamic and include regular updates based on insights from the wider environment, such as ORR enforcement actions and from RAIB recommendations.
REC 005	Governance	Improved governance, and documentation of decisions would improve transparency. The following are suggested areas of improvement: • Evidence and Documentation: In some case studies, there was limited evidence of the measures in place for the governance and testing of SFAIRP. Network Rail could document and test Reasonable Practicability

Ref.	Recommendation	Key Theme Areas
		decisions more rigorously, particularly at the Regional level, to ensure a common approach across the organisation. • Governance should focus on outcomes rather than just compliance. For example, the Track Safety Improvement programme highlighted the need for better understanding of the implications of decisions before implementation.

1.5 Acknowledgements

The Independent Reporter Team would like to thank ORR and Network Rail staff for their assistance with this study.

2. Abbreviations

Table 2: Abbreviations

Abbreviation	Definition
AHBs	Automatic Half Barrier Crossings
ALARP	As Low As Reasonably Practicable
ALCRM	All Level Crossing Risk Model
CBA	Cost Benefit Analysis
CP	Control Period
ELT	Executive Leadership Team (Network Rail)
EMM	Enforcement Management Model (ORRs)
EPS	Enforcement Policy Statement (ORRs)
ESD	Electrical Safety Delivery
FOC	Freight Operating Company
FWI	Fatalities and Weighted Injuries
GDF	Gross Disproportionate Factor
GBR	Great British Railways
HLOS	High-Level Output Specification
HSE	Health and Safety Executive
LCG	Level Crossing Guidance
LED	Light-Emitting Diode
NRRP	National Recommendations Review Panel
NW&C	North West & Central
OLE	Overhead Line Equipment
ORR	Office of Rail and Road
PR23	Periodic Review 2023
RAIB	Rail Accident Investigation Branch
RLCM	Rail Level Crossing Management
ROGS	The Railways and Other Guided Transport Systems (Safety) Regulations (ROGS)
RP	Reasonable Practicability
RSD	Railway Safety Directorate
RSSB	Rail Safety and Standards Board
SCADA	Supervisory Control and Data Acquisition

Abbreviation	Definition
SFAIRP	So Far As Is Reasonably Practicable
SoFA	Statement of Funds Available
SRM	Safety Risk Model
STF	Safety Task Force
TA	Technical Authority
TfL	Transport for London
TOC	Train Operating Company
TPCMS	Traction Power Centralised Management System
TWS	Track Worker Safety
UK	United Kingdom
VoSL	Value of Statistical Life
VPF	Value of Preventing a Fatality

3. Introduction

3.1 General

Arup, supported by Winder Phillips Associates and Value Added Engineering Services, has been appointed by the Office of Rail and Road (ORR) and Network Rail under the Independent Reporter framework to undertake a review titled 'Costs and Benefits of Safety Interventions'. This review assesses Network Rail's approach to safety interventions, specifically how Network Rail assesses value for money and whether reasonable practicability is systematically tested by Network Rail. The review also explores how the ORR monitors costs and deliverability associated with Network Rail's safety interventions. This report contains recommendations for future improvement to the assessment of costs and benefits of safety decision making.

3.2 Background

The concept of 'reasonable practicability' is a key part of the general duties of the Health and Safety at Work etc. Act 1974. Ensuring that a risk has been reduced as far as is reasonably practicable is about weighing the risk against the trouble, time and money needed to control it. CBA can be used as part of the safety decision making process to determine what is reasonably practicable. However, CBA cannot and should not be the sole determinant of a decision on reasonably practicable, nor should it be used as the sole justification for removing existing control measures or good practice. Based on HSE's expert guidance on risk management, the first step when making a judgement on Reasonable Practicability must always be, what is good practice, and only if there is no good practice or it applies to only a limited extent, should you move on to the use of CBA. You should not use CBA to justify not following good practice. When safety measures are being considered by Network Rail and:

- the cost is less than the monetary value of the safety benefit, the ORR would expect the improvement to be implemented.
- the cost is more than the monetary value of the safety benefit, ORR expects duty holders should make a professional judgement.
- the cost is grossly disproportionate to the safety benefit, then it is not reasonably practicable to implement the improvement on safety grounds alone.

Making changes beyond what is required may result in duty holders spending more than is necessary, and that matters in the current fiscal environment.

Network Rail has recently carried out an internal review on its approach to making safety investment decisions, drawing on different case studies and key learnings, and how these can be applied to inform development of a common assessment framework for future strategic safety investment decisions. Network Rail has initiated work on developing this framework.

3.3 Purpose of the Review

This review explores five case studies (3.4.1) and whether they are supported by clear assessments of costs and the range of intended benefits, be they: compliance, health and safety management improvement beyond compliance, performance, capacity or other business objectives or a blend of these and the extent to which effective project management was used to monitor and control costs, and ensure that intended benefits are realised. In assessing Network Rail's approach, the review considers the historical context, testing of, and governance of SFAIRP (So Far As Is Reasonably Practicable).

While both Network Rail and ORR have agreed to commission this work to provide an independent assessment of Network Rail's approach, ORR has also discussed its application of the Enforcement Management Model (EMM). The EMM aids ORR's decision making when carrying out its enforcement responsibilities, to ensure consistency and transparency, and to help maintain a level of consistency with the Health and Safety Executive as the principal enforcing authority for the Health and Safety at Work etc. Act 1974.

The ORR and Network Rail have also requested that the Independent Reporter reviews how ORR monitors costs associated with Network Rail's safety interventions.

3.4 Requirements of Review

Using the case studies listed below (3.4.1), the independent report provides an assessment of the following areas and provides recommendations for future improvement as relevant:

- Network Rail's decision making on major safety programmes, drawing on an agreed set of case studies for common themes for all areas listed, including how reasonable practicability, good practice and gross disproportion are tested (and Network Rail's governance around this).
- Network Rail's approach to considering what is good practice and if the situation is unusual/complex then working from first principles to consider options with quantified costs and benefits, how issues are escalated within the company and what engagement (if any) it has with ORR colleagues.
- How other intended benefits (performance, capacity, efficiency) are explored, assessed, optimised and prioritised.
- The timing / duration before decisions are re-examined.
- How Network Rail takes account of the impact on the wider rail industry and whether there is risk transfer to other parties i.e. Train Operating Companies (TOCs) and Freight Operating Companies (FOCs).
- Interaction with ORR and where applicable, other bodies (including RSSB and RAIB) prior to and following an intervention.
- What costs are included and are they directly related to the safety issue in question.
- Whether there are both Regional and National approaches to reasonable practicability and the use of cost benefit analysis.
- How projects are managed to ensure costs are controlled, change is managed and intended benefits are realised.

The Independent Reporter has also been asked to:

- Discuss with ORR how its EMM is applied by its Inspectors when making judgements about a duty holder's compliance with Health and Safety legislation. While changes to the EMM process are not within scope of this review, ORR can explain the process to the Independent Reporter with examples to show how it aids decision making on enforcement.
- When Network Rail does not challenge reasonable practicability of an ORR Health and Safety intervention, the Independent Reporter is asked to review how the ORR monitors the implications (i.e. quantum and efficiency of associated costs and deliverability of planned improvements) and how ORR safety priorities / ongoing discussions are factored into the Periodic Review process.

It should be noted that this work does not seek to change or dilute the roles, responsibilities, or fetter the discretion of ORR Health and Safety Inspectors when making enforcement decisions based on their opinion under the Health and Safety at Work etc Act 1974.

This work also does not seek to alter the interpretation of 'so far as is reasonably practicable' (SFAIRP), which is provided in case law. The approach of ORR's Health and Safety Inspectors will remain aligned to that of other health and safety regulators who enforce the same legislation.

3.4.1 Case Studies being undertaken

The following 5 case studies have been jointly selected by Network Rail and the Office of Rail and Road for this study:

- Electrical Safety Delivery (ESD);

- Level Crossings;
- Track Worker Safety (TWS);
- Public Safety (Dawlish Sea Wall); and
- Response to RAIB recommendation (Tibberton Level Crossing).

3.5 Structure of Report

This report is structured to answer the objectives set out in the Statement of Works, under the following headings:

- Section 4: Approach.
- Section 5: Network Rail Case Study – Findings.
- Section 6: Office of Rail and Road – Findings.
- Section 7: Conclusions.

Together, these topics set out a remit to explore the current approach to managing safety in Network Rail and ORR. For each case study, both evidence and discussions have been documented individually within this report. The findings from the case studies and overarching themes directly lead into the recommendations, with all points summarised as a conclusion in Section 7.

4. Approach

The Independent Reporter's review of Network Rail's approach to safety intervention is structured into four stages; initiate, discover, analyse, and report. These stages are summarised below.

4.1 Stage 1 – Initiate

The initiate phase included an Inception Meeting with Network Rail and the ORR to:

- Clarify review objectives and deliverables;
- Confirm internal resources & roles/responsibilities;
- Confirm arrangements for engagement with Network Rail and ORR;
- Confirm arrangements for engaging key stakeholders;
- Identify and agreed the case studies to be reviewed, in conjunction with Network Rail;
- Agree the documentation to be submitted for each case study to support the desk-based reviews;
- Confirm programme and timescales;
- Review and agree methodology and approach;
- Agree who the key points of contact will be between Arup, ORR and Network Rail - relationship to be maintained for the duration of the review;
- Identify Network Rail participants for each case study review;
- Identify ORR participants for the cost monitoring review;
- Establish open & honest communication; and

- Agree arrangements for communications and engagement plan to support assessment rollout.

Arup assessors held a pre-start briefing to establish a consistent assessment approach and coordinate planned interview activities to support the most efficient use of Network Rail and ORR time in the subsequent review phases.

4.2 Stage 2 – Discover

Pre-assessment activity included the receipt of documentation from Network Rail on nominated case studies and from ORR on monitoring costs associated with Network Rail safety interventions, identifying any specific issues that required follow-up before the formal interview/review process began.

Discovery meetings were set up with the ORR and a review of the ORR Inspector training was undertaken to understand the application of EMM by its inspectors to aid decision making for enforcement.

For the case study review, focus was placed on evidence of how Network Rail followed their relevant safety decision making policies, processes, and procedures in assessing value for money and whether reasonable practicability, good practice and gross disproportion were systematically tested. This included Network Rail's governance of SFAIRP; the use of first principles to consider options with quantified costs and benefits for unusual/complex cases; how issues are escalated within the company and what engagement (if any) it has with ORR colleagues; how other intended benefits (performance, capacity, efficiency) are explored, assessed, optimised and prioritised; how the timing / duration before decisions are re-examined; how Network Rail takes account of the impact on the wider rail industry and whether there is risk transfer to other parties i.e. TOCs and FOCs; whether interaction with ORR and where applicable, other bodies (including RSSB and RAIB) was made prior to and following an intervention; what costs are included and are they directly related to the safety issue in question; whether there are both Regional and National approaches to reasonable practicability and the use of CBA; and how projects are managed to ensure costs are controlled, change is managed and intended benefits are realised.

For the review of cost monitoring by the ORR, focus was placed on understanding how the EMM is applied by its Inspectors when making judgements about a duty holder's compliance with Health and Safety legislation (i.e. decision making on enforcement) and when Network Rail does not challenge reasonable practicability of an ORR Health and Safety intervention, how the ORR monitors the implications (i.e. quantum and efficiency of associated costs and deliverability of planned improvements) and how ORR safety priorities / ongoing discussions are factored into the Periodic Review process.

4.3 Stage 3 – Analyse

In this stage, the Independent Reporter undertook an in-depth analysis of the Network Rail case studies and ORR's approach to monitor the implications associated with Network Rail's safety intervention via a series of desk-based document reviews and assessment interviews with nominated Network Rail and ORR individuals, respectively.

4.3.1 Desk-based review

The Independent Reporter's initial review focused on documentary evidence provided by Network Rail and ORR. A secure SharePoint site was used to manage and disseminate these documents to the assessment team. An Initial Findings and Recommendations Summary Report was issued following the Independent Reporter's review of the documentation received, and in advance of commencing the assessment interviews to outline the emerging findings and escalate any risks.

4.3.2 Assessment interviews

Assessment interviews were carried out using a structured narrative to investigate, appraise, and evaluate across all the defined review requirements of the commission. The assessment interviews were shared in advance with the Network Rail and ORR participants. The interview agenda for specific case studies or roles was refined following completion of the desk-based reviews to support substantiation of relevant emerging issues or concerns.

To deliver the assessment within the schedule timeframe and being mindful of Network Rail (and ORR) limited availability, all interviews were conducted via Microsoft Teams. This supported open, two-way dialogue, enabling a full and frank discussion. A video recording and transcript was created for each interview and stored for review until project close. This data collected from the Network Rail case studies and ORR assessment teams enabled the creation of Power BI graphics and graphs to demonstrate ratings or scores for the different assessments.

4.3.3 Moderation process

It was important that a consistent assessment approach was established and maintained throughout the delivery lifecycle of the review. This process began by establishing a common understanding of the review requirements at the internal pre-start briefing during the initiate stage. As part of the interview process, the assessors recorded their findings and video recorded each interview.

Upon completion of the interviews, the emerging findings and scoring for each Network Rail case study and ORR's approach to monitoring the implications of Network Rail safety intervention, a moderation process has been undertaken, chaired by the Lead Independent Reporter. Through this, any inconsistencies across the findings were identified, and moderated based on the evidence received. This resulted in specific findings or scorings being updated.

The Lead Independent Reporter acted as the lead moderator for all sessions to provide consistency and clear unbiased views/opinions. The final assessment findings were reviewed by the Lead Independent Reporter and Independent Reporter Team.

4.4 Stage 4 – Report

Following completion of the assessment interviews, an Interview Report was produced, summarising the discussions held in the interviews for each case study, and highlighting any findings at that stage. It also summarised the Independent Reporter's discussions with ORR on EMM and the periodic review, and general safety and cost management discussions with Network Rail.

An Emerging Findings presentation was produced and presented to both ORR and Network Rail, inviting feedback, discussion, and clarifications. This final report, was prepared and shared in draft for Network Rail and ORR comment prior to formal issue.

4.4.1 Emerging Findings Review Meeting

An initial emerging findings meeting was held with both ORR and Network Rail on 21st November via Teams. In this meeting, Arup shared its initial findings and recommendations, sought clarity on specific areas of focus or concern, and established the high-level messaging of findings that followed through the subsequent issue and cascade of the Assessment Report.

4.4.2 Report Production

This report has been prepared by the Arup team and issued as a draft and then final report, incorporating comments received after review by Network Rail and ORR.

4.4.3 Post-Assessment Feedback & Final Closeout

Arup will provide separate post-assessment feedback on the review process to Network Rail and ORR.

5. Network Rail Case Study - Findings

The following sections detail the findings from reviewing evidence and conducting interviews for each case study, in the areas listed in the review scope. There has been more information available for some case studies than others, and the timeframe of the project has limited interview times, some information was also made available late in the review process. Therefore, it should be noted that these findings are representative only of the information made available within the short timescales of the review.

Scores have been provided for each case study against the scope of the review, as defined in Appendix B. The categories used are those provided by ORR on 15th November 2024.

5.1 Electrical Safety Delivery (ESD)

5.1.1 Case Study Context

This case study is a programme looking at compliance with legislation with the benefit of improving workforce safety and productivity gains when working on or near traction power. A number of incidents and irregularities led to an external review, and Network Rail isolation procedures and related technologies had not kept pace with other sectors.

The aim of the ESD Programme is to deliver a step-change in compliance for the rail industry with a single approach to isolations, and the introduction of the best available technology, culture, tools, and processes, that will ensure compliance with the Electricity at Work Regulations (some of these regulations are absolute in nature and not subject to the test of reasonable practicability), reduce workforce electrical safety risk to as low as reasonably practicable, enable improvements to track worker safety and give productivity benefits. The programme used benchmarks from other sectors for working near high voltage systems, and looking at how new technology solutions can be used to deliver safer and faster isolations.

It should be noted that the ESD Programme only funds the step change element of the electrical safety strategy (Note, the electrical safety strategy applies to the whole rail industry). Other funding sources link to new electrification and incremental safety improvements.

5.1.2 Findings

Table 3: ESD Findings

Key finding requirement	Evidence	Even better if	Score
1. Is there evidence in this case study of Network Rail using and sharing good practice of what is reasonably practicable?	The programme runs over several Control Periods. There were several overall initiatives developed, particularly the single approach to isolation (one for Overhead Line Equipment and one for third rail) and the use of technology. Regions were also encouraged to develop their own good practice to help achieve the overall programme aims.	Network Rail should continue to develop and implement a common approach and guidance for determining Reasonable Practicability (across all case studies – see REC 001). Network Rail's scope to assess what is reasonably practicable is limited by the need for compliance with Electricity at Work regulations (part of which are absolute), which is a key driver for the programme.	**3**
2. If the situation is unusual/complex was there evidence in this case study of Network Rail working from first principles to consider options with	There is evidence that costs and benefits have been considered. There also appears to have been challenge and review throughout the programme on the costs and benefits. Some of the actions were mandated by legislation the Electricity at Work Regulations and Health and Safety at Work Act which limited the options that could be considered.	Additional detail available on the approach to estimation of benefits. As above, noted that there are naturally some limitations given the need for legal compliance.	**3**

Key finding requirement	Evidence	Even better if	Score
quantified costs and benefits?			
3. In this case study, is there evidence of assessment of costs and the range of intended benefits (compliance, health and safety management improvement beyond compliance, performance, capacity or other business objectives)? Are suitable costs included and are they directly related to the safety issue in question?	As above, there is evidence that costs and benefits have been considered. A key driver of benefits appears to be the time / cost savings when taking a possession and removing the power, rather than a direct safety benefit or cost of a new control measure. This time saving was estimated to be 30 minutes per possession. There appears to have been challenge and review throughout the programme on the costs and benefits.	Further detail on safety benefits in addition to the benefits around isolation time savings.	**3**
4. Was there evidence in this case study of testing of, and governance of SFAIRP (So Far As Is Reasonably Practicable)?	Limited evidence of this as the main drivers are around regulatory compliance rather than SFAIRP.	Network Rail should continue to develop measures in place for the governance and testing of SFAIRP (across all case studies – see REC 005). The study does recognise a need to consider ALARP for enhancement schemes, although the inclusion of clear criteria for doing this would be beneficial.	**3**
5.In this case study, was there effective project management in place to monitor and control costs and ensure that intended benefits are realised (including at what point do Network Rail re-examine original decisions)? Evidence on i) how long the intervention/initiative took compared to what was expected; ii) extent of costs incurred (compared to what was expected)	An ORR Targeted Assurance Review in March 2021 concluded that the ESD programme governance was robust and set out a clear roadmap for delivery. These arrangements include a clear Terms of Reference for the Programme Board with a Sponsor review meeting providing oversight and a Business Plan Change Panel.	Whilst governance structure seems to be mature and there is some clear monitoring of progress at Regional level as well as evidence of consideration of unit costs, there was no evidence of granular progressive monitoring.	**4**
6. In this case study, was Network Rail's engagement with ORR and where applicable, other bodies (including Rail Safety and Standards Board (RSSB) and Rail Accident Investigation Branch (RAIB)) suitable and effective prior to and	Regular meetings, steering groups and periodic reviews to assure delivery of the programme. This includes Quarterly electrical safety strategy meeting with ORR.	There is good engagement with the ORR and with other bodies. This programme should be used as a exemplar for other National initiatives.	**4**

Key finding requirement	Evidence	Even better if	Score
following the intervention?			
7. In this case study, Is there evidence of both Regional and National approaches to reasonable practicability and the use of cost benefit analysis?	A benefit calculator was developed with Regional stakeholders and group finance, and shared with the ORR, to inform CP6 Control Period planning. The calculator continued to be used for CP7 and enables Regions to use a common method of calculating hours saved and the associated benefit opportunity, whilst utilising local values for variables and documenting their assumptions.	Additional evidence of Regional approach vs National.	**3**
8. In this case study, are issues escalated effectively within Network Rail, and is there suitable engagement with ORR colleagues?	Regular meetings, steering groups and periodic reviews to assure delivery of the programme. This includes: Monthly Programme Board. Quarterly TA Route services fund review. Quarterly deep dive with an Executive Leadership Team (ELT) sponsor. Quarterly electrical safety strategy meeting with ORR.	This programme is still ongoing, and ORR confirmed that Network Rail must continue to provide oversight of the ESD funding during CP7 and CP8 to monitor progress against delivery of commitments in the electrical safety strategy and to embed the step change required.	**4**

In this case study, there was a quantification of performance and safety benefits as part of a cost-benefit analysis (CBA), and these have been reviewed through the duration of the programme.

At the start of the programme, Network Rail engaged the electrical industry and looked at their cultural programme to try to learn from it. The safety benefits of the programme have been quantified through 'lagging indicators' and measured using workforce injuries, incidents and irregularities in the isolation of traction power. These are used to monitor the effectiveness of the programme. There was a clear understanding of the existing levels of safety risk for both the Overhead Line Equipment and conductor rail areas, and a clear goal for the programme in that Network Rail is looking for a 93% reduction in workforce injuries and an 84% reduction in isolation irregularities.

The operational benefits from the programme will be realised through reducing the time taken to effect an isolation of the traction power, with the average saving being around 30 minutes per isolation. The value of this depends on the situation and the work being undertaken. There is a direct relationship between the level of technology and the financial savings from having more time available for carrying out engineering work, but it is noted that the value of the time saved can differ between the 'business case view' of the benefits, compared to the 'on the ground' consideration of what one can do with the time saved, which will also be dependent on the work being carried out.

Programme and Cost

The scope of the ESD programme was developed bottom-up with input from industry stakeholders, including ORR, and is regularly reviewed. Generating bottom-up requirements was considered to be the most appropriate approach for ESD due to the challenges associated with balancing between compliance with absolute requirements and qualified duties in legislation.

The programme runs across three Control Periods (CP): CP6, CP7 and CP8; i.e. it spans a period of 15 years. In CP7, Regional funding is to improve deliverability and financial benefit realisation from technology, which represents a change compared to CP6 when funding was held centrally. Funding is retained centrally for the development and deployment of key enablers to achieve the CP7 legal, safety and compliance scope.

Whilst the strategy has a three Control Period horizon the improvements are being prioritised based on improvements in compliance and on safety risk. A Decision Support Tool (DST) was developed for CP6 and the tool was re-run in the early part of the CP7 planning process. The DST was used to produce a structured evaluation of the benefits (financial, safety and reputational) against the cost of each improvement. For CP6 the DST was key in evidencing that Network Rail should be targeting risk levels within corporate risk appetite as opposed to the lowest feasible risk.

The Strategic Business Plan allocated £361 million for CP7; within this there is a large allocation for safer electrical technology. Due to there being a productivity benefit as well as safety, the team are frequently asked to validate those benefits.

Due to wider financial challenges in Network Rail that emerged during the 2023 Periodic Review (PR23) process, ESD funding was reduced in the CP7 delivery plan reducing coverage of phase 2 Safer, Faster Isolations (SFI) funding in CP7 and increasing the risk of not meeting the previously made CP8 commitments in the electrical safety strategy.

Network Rail agreed with ORR that it would continue to provide a network view of ESD funding during CP7 to monitor progress against delivery of commitments in the electrical safety strategy and suitable arrangements are in place for CP7.

Based on evidence provided, ESD was targeted to deliver a financial investment return of c.£1 billion on the multiple Control Period investment through safer, faster isolations technology by end CP9. However, the estimated return will be lower as a result of the CP7 financial context, resulting in some initiatives being deferred to CP8.

Governance

The project appears to be well monitored, with a clearly defined programme of reviews and meetings, including:

- Monthly Programme Board;
- Quarterly Technical Authority Route services fund review;
- Quarterly deep drive with an Executive Leadership Team (ELT) sponsor; and
- Quarterly electrical safety strategy meeting with ORR.

An ORR Targeted Assurance Review in March 2021 concluded that the ESD programme governance is robust and sets out a clear roadmap for delivery. Network Rail also voluntarily bring in an independent reviewer every second year or so to ensure that they are challenging themselves from a technical perspective.

There are CSM leads at workstream level, and transfers of risks are agreed between them where it is appropriate. The Network Rail team interviewed could not identify a situation where risk has been transferred outside of Network Rail.

The delivery plan is a managed document subject to change controls. Updates are reported to internal governance forums in Network Rail and shared with the ORR through the quarterly electrical safety strategy meetings.

The quality assurance process for the CBA depends on the lifecycle of the programme. Initially there were multiple independent reviews and audits undertaken. The quality assurance process for CP7 included:

- Assurance by Technical Authority (TA) of Regional and Central plans;
- Assurance by Route Services of the ESD plan;
- Assurance by planning and regulation of all National programmes; and
- Independent review.

The CP7 process differed from CP6 because of the involvement of Network Rail's Technical Authority (Network Rail's centre of expertise, accountable for setting technical guidance, which was established in

2020, during CP6) – the Technical Authority undertook the first review and then there were subsequent reviews from others. Separately, there was a process for reviewing Regional business plans where they committed to annual benefits – there are quarterly sponsor reviews for this, where the Regions provide an update on volume delivery and benefit realisation.

At the quarterly electrical safety strategy meetings leading indicators and safety benefits are also reported; these are also reported to the Network Rail Safety, Health and Environmental Compliance Committee. The financial benefits are reported to separate parts of the organisation.

Challenges and Opportunities

- The technology deployment and remote earthing is the element of the programme where there is the most challenge from outside, because that is the one that could be a target for reduction. However, some of the rollouts in the Regions are being delayed because the new Traction Power Centralised Management System (TPCMS) technology is not in place. (TPCMS is the new National SCADA platform for Network Rail that will allow Network Rail to monitor and control its traction power network.).
- Learning has been incorporated into the implementation of the programme from previous experience. The North West & Central (NW&C) operational trial lesson learnt of the new isolation standard NR/L3/ELP/25000 was that it involved 'too much change at once'. This feedback, combined with the challenge from Network Rail Safety Health and Environmental Compliance Committee in November 2021 to accelerate delivery of safety improvements resulted in development of the phased implementation of Single Approach to Isolations on Overhead Line Equipment.
- The current programme would have been easier to implement and monitor if data had previously been collected within Network Rail (e.g. through an e-permit system), to provide the base data needed at the start for analysis. This would have improved what Network Rail could have done, whereas this data had to be collected manually and collated at the start of the programme. However, going forward improving this data collection will allow benefits to be measured much more easily.
- The view of the benefits comes from the Regions and then is assured centrally – this helps give Network Rail credibility and support with what they are delivering. This is different from the way that some National programmes are delivered.

Feedback and next steps

- There is a push to keep challenging the Regions on what could be delivered as a result of the extra 30 minutes per isolation that they save. Although their view will sometimes differ it is important because the extra time widens the scope of work that can be undertaken in a possession. Having a view from each Region can help in terms of understanding best practice and then using that to challenge other Regions.
- Some of the benefits are less quantifiable, e.g. the benefits of cultural engagement with and adoption of the programme.
- Where possible within the context of needing to ensure legal and regulatory compliance with the absolute parts of the Electricity at Work Regulations, Network Rail should ensure all the solutions are focused on what is reasonably practicable.

5.1.3 Case Study Conclusions

There is clear evidence that costs and benefits have been assessed for this case study. There appears to be strong governance of the programme within Network Rail, with regular assurance of the programme delivery from within Network Rail and outside, such as the ORR and ORR-appointed Independent Reporter reviews.

ESD is a good example of a Network Rail strategy agreed that has been discussed with the ORR at a strategic level based on ALARP principles.

5.2 Level Crossings

5.2.1 Case Study Context

This case study looked at a number of level crossing risk assessments, including passive level crossings (Broad Oak, Bosley and Widmeads). This included a review of the following:

- Gross Disproportion and Cost Benefit Research;
- Application of gross disproportion to Level Crossings Guidance document (LCG24);
- All Level Crossing Risk Model (ALCRM);
- Gross Disproportionate Factor (GDF) Tool, CBA Tool;
- Introduction into the Level Crossing Risk Assessment Process (Fisherman's Path case study);
- NSSC110321_2.3 Fisherman's path case study;
- Level crossing costs in enhancement schemes Ely case study;
- NR/L3/XNG/003 (Module describes the process for risk assessing operational level crossings on Network Rail's managed infrastructure); and
- NR/L2/XNG/001 (Provision and risk management of level crossings).

5.2.2 Findings

Table 4: Level Crossing Findings

Key finding requirement	Evidence	Even better if	Score
1.Is there evidence in this case study of Network Rail using and sharing good practice of what is reasonably practicable?	The Level Crossing risk assessment process and governance is structured and mature, with dedicated processes, standards and tools such as the All Level Crossings Risk Model (ALCRM). There are resources assigned to the level crossings, with dedicated managers for each Route and level crossing managers assigned to a number of these. Each level crossing has an explicit risk estimation to determine if the risks have been reduced SFAIRP. This approach is considered proportionate to the expected hazards and level of risk, and the data available to support decision making. There are National Standards and guidance documents that govern the risk assessment process for level crossings, including the mix of quantitative and qualitative explicit risk estimation for each crossing. The Route level crossing managers can interface with the Technical Authority and each other to share best practice.	Based on LCG24, defined GDFs are proposed to be used for level crossings. Based on sample risk assessments reviewed and anecdotally from interviews, the use of the highest value would be only in exceptional circumstances. These GDF factors were developed based on an external review by an independent consultancy (AD Little) on behalf of Network Rail. HSE's expert guidance on risk management refers to rules of thumb of 2-10 for risks to the public, recognising that the higher the risks, the higher the degree of disproportion (i.e. the ratio costs to benefits) can be before being judged 'grossly disproportionate'. The current range of GDF factors used by Network Rail could be reviewed against the rules of thumb listed in the HSE's expert guidance on risk management.	**4**
2. If the situation is unusual/complex was there evidence in this case study of Network Rail working from first principles to consider options with	Each individual level crossing is risk assessed using ALCRM, a narrative risk assessment is prepared for each crossing. The narrative risk assessment considers the ALCRM assessment and considers other factors and data specific to each crossing when considering costs and benefits and enables an overall structured judgement to be made. Within the overall approach there is particularly good consideration of the relevant good practice	During interviews it was indicated that the central business view or intent is that the tool should allow the decisions around reasonably practicable to become more automated, i.e. the CBA/GDF tools should be used increasingly to make decisions. Level crossing managers when they make decision should be informed by	**4**

Key finding requirement	Evidence	Even better if	Score
quantified costs and benefits?	available to understand risk reduction options for managing hazards. These measures are well understood and embedded in Network Rail risk assessment standards and LCGs, which are periodically updated. The ALCRM risk quantification is supported by qualitative structured expert judgement (evidence-based justification is required) in the narrative risk assessments for a crossing to present the overall risk evaluation for the crossing. This captures some hazards/factors that are not accounted for within the quantitative assessment. Based on the Independent Reporter's review/discussion of some examples of the narrative risk assessment to explore how this is applied and managed to determine SFAIRP, across Routes and/or Region, this is considered an appropriate method to inform decision making.	the CBA tool outputs, but the tool should not make the decisions. The level crossing managers need to take account of all of the factors not just those in the CBA tool. It was indicated that applying a GDF should account for some of the unmeasured factors or remove the need for qualitative aspects of the assessment. There were mixed views of this in the interviews whether the qualitative aspect is still considered essential. The Independent Reporter considers that the qualitative analysis should remain as an essential aspect of decision making, with the quantitative analysis as a key supporting input for level crossings. This is in accordance with the HSE, Common Safety Method for Risk Evaluation and Assessment (CSM RA) risk acceptance principles, and RSSB guidance where the CBA is only one part of the safety decision-making process, application of relevant good practice should always be considered as the first step.	
3. In this case study, is there evidence of assessment of costs and the range of intended benefits (compliance, health and safety management improvement beyond compliance, performance, capacity or other business objectives)? Are suitable costs included and are they directly related to the safety issue in question?	The sample of risk assessments provided clearly shows the range of costs and benefits considered, which includes performance benefits and safety benefits. Within the Network Rail level crossing CBA tool, the method for calculating a cost-benefit ratio considers the potential performance savings (e.g. operational and maintenance cost savings) associated with introducing a safety measure as a benefit i.e. Cost-benefit ratio = costs of introducing a safety measure / (safety benefits + cost savings). This differs from the RSSB industry guidance, where operational and maintenance cost savings are subtracted from the cost of introducing the safety measure, i.e. Cost-benefit ratio = (costs of introducing a safety measure - cost savings) / safety benefits.	The finding of this review noted the difference between the Network Rail method for calculating a cost-benefit ration and the RSSB guidance. However, it should be noted that a new CBA tool has been developed by Network Rail which is intended by Network Rail to be better aligned with RSSB guidance. This is due to be rolled out across the organisation in March 2025.	**3**

Key finding requirement	Evidence	Even better if	Score
4. Was there evidence in this case study of testing of, and governance of SFAIRP (So Far As Is Reasonably Practicable)?	The National Standards and guidance documents provide governance with evidence of sharing of good practice by Technical Authority. The central Technical Authority can drive consistency by influence. For example, on the larger projects, such as the Ely capacity scheme, the Technical Authority reviewed the mitigations to see if they were considered reasonable and the response proportionate (trading off spending on introducing a bridge to improve capacity, for example). During interviews the Independent Reporter has discussed several forums where consistency can be discussed (e.g. steering group, Rail Level Crossing Management (RLCM) community of practice. Plans to implement a narrative risk assessment assurance check process in future was discussed.)	Based on interview discussions, moderation of outputs of SFAIRP decisions is done, but the Technical Authority may be more involved with larger projects. Due to the different set ups within Network Rail and devolution, the 'day to day' moderation may happen more so at Regional level (e.g. in respect of level crossings management, Eastern Region is the most devolved Region and things are done in the Routes more than the Region. Southern Region for example is less devolved and some of their decision making is done in the Routes, but there is a Regional Route level crossing manager who can make decisions.)	**4**
5. In this case study, was there effective project management in place to monitor and control costs and ensure that intended benefits are realised (including at what point do Network Rail re-examine original decisions)? Evidence on i) how long the intervention/initiative took compared to what was expected; ii) extent of costs incurred (compared to what was expected)	Level crossing risk assessments are periodically reviewed as governed by standards, and after specific triggers such as an incident. It was noted that cost estimates could be underestimated in earlier phases of the project lifecycle and then in later stages other considerations (e.g. increased power supply installation costs due to the requirement for a new distribution network operator connection) increased the cost, leading to decisions being re-examined.	The common safety enhancements for level crossings are relatively well-understood. A verification of the implementation of the recommended measures within the sample risk assessments is not within the scope of this review and was not undertaken, However, the Independent Reporter was provided with a good description of the implementation process during interviews. Further review could be undertaken to review how the outputs of a risk assessment are traced through to implementation in a work bank.	**4**
6. In this case study, was Network Rail's engagement with ORR and where applicable, other bodies (including Rail Safety and Standards Board (RSSB) and Rail Accident Investigation Branch (RAIB)) suitable and effective prior to and following the intervention?	There was evidence of strong engagement with ORR and RAIB to respond to Improvement Notices and recommendations respectively.	RSSB SRM data is built into ALCRM (noting the SRM version was not the latest).	**4**
7. In this case study, Is there evidence of both Regional and National approaches to reasonable practicability and the	There is a clear National strategy for reducing risk at level crossings (Enhancing Level Crossing Safety 2019-2029), in which the priority is risk reduction at passive crossings, followed by the automatic crossings. Based on interviews there is evidence that by and large Routes are aligning their business plans for the Control Period with this overall strategy.	Funding is a restriction on the strategy implementation– e.g. there could be a choice between closing one crossing, with the CBA process giving a significant Fatalities and Weighted Injuries (FWI) reduction at one individual crossing or making several	**3**

Key finding requirement	Evidence	Even better if	Score
use of cost benefit analysis?	However, there is some freedom for Routes to prioritise differently based on their own portfolio.	whistle board protected / passive crossings a lot safer. During interviews it was noted that the Anglia Route is mirroring the National strategy in prioritising passive crossings, This was agreed with ORR for funding in the Control Period. Further reviews could be undertaken to evaluate how each Route is adopting this National strategy, noting that it was indicated that there could be some variation across Routes in the risk assessment outputs and the portfolio. The allocation of funding to Routes could be reviewed to monitor how Routes are aligning their business cases for the Control Period against the risk-based priorities in the National strategy.	
8. In this case study, are issues escalated effectively within Network Rail, and is there suitable engagement with ORR colleagues?	There was evidence of this within various aspects of the review, such as relationship between Technical Authority and Route level crossing managers, and examples of suitable engagement with ORR provided during interview.	Based on interviews the examples provided indicated strong engagement with ORR, following a collaborative approach. It was indicated that there could be some variation across Routes, depending on the relationships, communication and clarity of strategy.	**4**

5.2.3 Case Study Conclusions

- Level crossing safety is well managed, with a clear Risk Management Framework, governed by standards. This can be used as an example of good practice in other areas of Network Rail safety management.
- Level crossing risk assessments form part of a multi-disciplinary process and routinely include the application of CBA and appropriate qualitative considerations.
- The approach to managing level crossing safety risk is considered proportionate to the hazards and risk.
- The current range of GDF factors used by Network Rail is recommended to be reviewed against rules of thumb in the HSE guidance.
- The allocation of funding could be reviewed for closer alignment against the risk-based priorities in the strategy before the Control Periods (see Table 4).

5.3 Track Worker Safety (TWS)

5.3.1 Case Study Context

This case study is a programme of initiatives implemented by Network Rail to improve Track Worker Safety. Prior to 2019, a continuing trend in trackworker accidents and near misses was identified, some of which were being investigated by RAIB, such as the fatal accident at Stoats Nest Junction, 6 November 2018. RAIB also carried out a thematic review into track worker safety because of the number of incidents to identify the trends and any underlying issues.

Network Rail implemented a Near-Miss Reduction Programme to reduce the number of incidents. Despite the programme and following over 60 near miss incidents, the situation was not improving. ORR had carried out an inspection of Network Rail's track worker safety processes in 2018 and 2019. A report on ORR's findings had been shared with Network Rail and discussions had taken place with Network Rail and the trade unions about ORR taking formal enforcement requiring improvement in the months prior to the accident at Margam. The fatal accident at Margam happened on 3 July 2019 and the ORR issued two Improvement Notices on Network Rail on 8 July 2019.

Network Rail appealed the Improvement Notices, asking for more detail on what compliance to these notices would look like, but withdrew the appeals once the scope of the Notices was agreed and there was a clear, deliverable plan to close out the Notices. That plan was agreed jointly between ORR and Network Rail, which Network Rail understood to be a joint agreement between the two organisations identifying exactly what Network Rail would deliver through the programme. Network Rail then expedited its Near Miss Reduction Programme, expanding it to the Track Worker Safety Task Force, with the scope increased to cover a range of other areas and to address the ORR improvement notices and later the RAIB recommendations from the RAIB report into the accident.

Network Rail considered that, due to the unique nature of interventions that needed to be developed, many were unable to declare measured costs and benefits until they had been piloted. Therefore, systematic assessment of these in advance of development and implementation was not always possible and this is reflected in the scoring assessments below. Network Rail and ORR, as part of the established governance group (with the Chief Inspector of Railways attending as an observer focused on ensuring timely progress and management commitment) monitored progress on the programme. Network Rail considered the cost / benefit of all proposals prior to wider rollout of key initiatives.

5.3.2 Findings

Table 5: Track Worker Safety Findings

Key finding requirement	Evidence	Even better if	Score
1.Is there evidence in this case study of Network Rail using and sharing good practice of what is reasonably practicable?	The programme involved a significant shift in working practices that affected the planning of the works, and revised timescales for maintenance tasks. It was not clear from the discussions with Network Rail how good practice or what was reasonably practicable was assessed, although it is noted that following the improvement notices, Network Rail and ORR agreed the actions that would be required to close out them out. This would have enabled joint discussion around reasonable practicability, although there was no evidence that this was done explicitly in the responses to the ORR and RAIB, or at the start of the programme.	Reasonable Practicability was not assessed in this case study, however, there were two points when it could have been considered: • At the point where Network Rail and ORR were discussing the Improvement Notices and agreeing the detail of what compliance would look like, the SFAIRP principles could have been used in discussions to identify what reasonably practicable responses were, although there was no evidence of quantified costs and benefits at this stage. • As part of responding to the RAIB recommendations, some assessment of reasonable practicability could have been undertaken to identify what solutions should be used to comply with the notice, and the timescales for doing so.	**1**
2. If the situation is unusual/complex was there evidence in this case study of Network Rail working from first principles to consider options with quantified costs and benefits?	There had been continuing trends and Network Rail had an existing Near Miss Reduction programme in place to reduce the number of incidents. This was costed and funded as part of the Control Periods at the time. The TWS programme involved a step-change in the way of working across the organisation. The situation was not technically complex, but involved changes to ways of working, new technology, and the introduction of the changes needed to be managed around the existing planning cycle for works on the railway that required months of advance planning.	Network Rail believed that following the acceptance of the Improvement Notices and agreement with ORR of the plan to deliver them, the focus could only then be on delivery. Going back to first principles with quantified costs and benefits would not have been relevant to the context at the time. The change involved a significant shift from their current ways of working, planning, etc. and that these were not considered in the timescales. The time period permitted for implementing the responses to the Improvement Notices was extended from 2 years to 3 years, a period considered acceptable by Network Rail and ORR. The timing of the Improvement Notices and associated change involved also meant that the TWS programme had not been included in CP6 plans, and therefore needed to be funded through Network Rail's CP6 risk funding (i.e. different from the ESD case study, which had been included in Network Rail's CP6 plan and therefore there was funding available for delivery of ESD in CP6). Further discussions between Network Rail and ORR prior to Network Rail developing their CP6 plans could have opened up options for compliance that may have been more effective and efficient to implement.	**2**

Key finding requirement	Evidence	Even better if	Score
3. In this case study, is there evidence of assessment of costs and the range of intended benefits (compliance, health and safety management improvement beyond compliance, performance, capacity or other business objectives)? Are suitable costs included and are they directly related to the safety issue in question?	The TWS programme had not been included in CP6 plans (see above) and required funding through Network Rail's CP6 risk funds. The safety benefits of making this change were not calculated. However, Network Rail believed that the changes were required to secure compliance with the Improvement Notices, and reflecting the action plan that had been agreed with ORR. Cost was assessed when the Routes and Regions developed plans for implementation of the Improvement Notices and resourcing them. However, these costs did not drive decisions as to whether to proceed or not.	It was understood that there would be both safety and other benefits from undertaking this programme. However, these were not specifically valued and documented, due to the focus on compliance with the Improvement Notices, as per the agreed action plan with ORR. It is noted that the safety benefits from TWS would not have justified the TWS programme on their own, and Network Rail needed to realise performance, operational and other benefits as well. It would have been better to specify what these benefits of the programme were expected to be, beyond compliance to the Improvement Notices.	**1**
4.Was there evidence in this case study of testing of, and governance of SFAIRP (So Far As Is Reasonably Practicable) ?	A structured approach to determining SFAIRP was not used in this case study, and testing and governance of SFAIRP was not evident. It was reported that it was Network Rail's understanding that once an agreed action plan was in place, Network Rail was required to comply with the Improvement Notices, and was only focused on delivery, so there was no evidence of testing of reasonable practicability undertaken.	The safety benefits alone would not have justified the TWS programme developed by Network Rail in response to the Improvement Notices, this considered Network Rail's need to realise performance, operational and other benefits as well. This should have been done at the start of the programme and in the Network Rail response to the ORR and RAIB, and/or as part of the discussions around required actions to close out the notices.	**1**
5.In this case study, was there effective project management in place to monitor and control costs and ensure that intended benefits are realised (including at what point do Network Rail re-examine original decisions)? Evidence on i) how long the intervention/initiative took compared to what was expected; ii) extent of costs incurred (compared to what was expected)	As highlighted above, the costs and benefits were not clearly articulated or available at the start of the TWS programme. This is confirmed in an independent "Lessons Learned" post implementation review of the programme. The costs for implementation of the Improvement Notice were identified bottom up by each Route and Region when plans were developed in 2020 and the full costs were established. The governance arrangements were also established, with ORR's Chief Inspector of Railways (as an observer) attending the TWS programme board. The proposals went through a series of investment panels and were shown to the safety taskforce. There were no objections to the plans through this process.	The score reflects that the costs and expected benefits should have been documented, and then monitored, from the initial response to the ORR and throughout the programme, and compared at certain stage gates to the initial estimates for both costs and benefits. However, it is noted that programme controls and governance were in place, which included monitoring programme costs once they had been established.	**1**

Key finding requirement	Evidence	Even better if	Score
6.In this case study, was Network Rail's engagement with ORR and where applicable, other bodies (including Rail Safety and Standards Board (RSSB) and Rail Accident Investigation Branch (RAIB)) suitable and effective prior to and following the intervention?	The engagement between Network Rail and the ORR appears to be disjointed. There was a continuing trend of incidents that Network Rail believed it was addressing through the Near Miss Reduction Programme. Network Rail did not seem to be aware of the Improvement Notices before they were served. There was then a statutory timescale to respond to the Improvement Notices and provide plans for improvement to address the Improvement Notices and RAIB recommendations. See *Interaction between Network Rail, the ORR and RAIB (below)* There was evidence of issues being identified, but the Independent Reporter did not see evidence of how they were necessarily acted on by Network Rail. For example, the ORR had carried out a National inspection of track worker safety and Network Rail were supplied with a copy of the report in May 2019, before the Improvement Notices were issued. See *Interaction between Network Rail and the ORR (below)*	There are clear processes within Network Rail for managing interactions with the ORR and RAIB as set out in Network Rail Standards but the review has not seen clear evidence of this being used for this case study. It is noted that the Improvement Notices from the ORR related to issues at the Regional level, but the Improvement Notices were, correctly, raised with Network Rail as the duty holder by the ORR. It is not clear if there was a failure in communication or in the escalation of the issues within Network Rail, but this should be reviewed to improve awareness of issues related to safety performance across Network Rail.	**1**
7.In this case study, Is there evidence of both Regional and National approaches to reasonable practicability and the use of cost benefit analysis?	The Regions were engaged in this National programme, with the general strategies being developed by the National team and the implementation being devolved to the Regions for implementation. The requirements for compliance to the Improvement Notices were shared with the Routes and Regions by Network Rail, and each was tasked with defining a plan for reaching compliance, which were resourced and costed. However, for reasons set out above, there was no assessment of benefits, so CBA could not be undertaken at either a Regional or National basis.	Reasonable practicability and CBA were not used in this case study, although costs were understood, documented, and approved, after April 2020.	**1**

Key finding requirement	Evidence	Even better if	Score
8.In this case study, are issues escalated effectively within Network Rail, and is there suitable engagement with ORR colleagues?	The TWS programme was instigated by Network Rail in response to ORR Improvement Notices. Network Rail had been challenging these notices because it was not clear how Network Rail should achieve compliance. The appeals were withdrawn following agreement of the compliance criteria with ORR. The ORR had also challenged Network Rail to improve track worker safety through changes to procedures and technology, although this had not been fully reflected in Network Rail's plans (which had been reviewed by ORR) for CP6. After the TWS programme was established, ORR's Chief Inspector of Railways (as an observer) attended the governance meetings for TWS and the ORR evaluated Network Rail's response to the RAIB recommendations following the Margam accident, and replied to RAIB.	Network Rail stated that once the compliance criteria had been agreed and the Improvement Notice had been accepted, they saw no option other than to comply. Therefore, no testing of reasonable practicability, or CBA was undertaken. It would have been better if these discussions on reasonable practicability had occurred between the parties both before the Improvement Notices were issued, or more explicitly in the discussions around compliance criteria, supported by risk assessment (and structured approach to determining what is reasonably practicable, see REC 001), as appropriate. If there had been more open discussions between ORR and Network Rail around timescales or how these goals fitted with the Network Rail strategy, then better planning and funding could have been put in place to enable the initiative to be implemented more effectively and efficiently.	**1**

Programme and Cost

The TWS programme was not funded through the Control Period 6 (CP6 – April 2019 to March 2024) funding process, the expenditure for the programme was funded through Network Rail's CP6 risk fund. This was different to the ESD programme.

Network Rail considered that the costs associated the TWS programme were high, and there was no clear view on the underlying level of risk to track workers, or the safety benefits the initiatives would bring. These costs were developed after the improvement plans were agreed with the ORR, following the improvement notices and the RAIB recommendations after the Margam accident. Costs were monitored by Network Rail through the TWS programme board, which ORR attended (as an observer, focused on ensuring timely progress and management commitment) to monitor progress on the programme.

The Network Rail management team for the TWS programme understood their original budget, and as of July 2022, the compliance date for the improvement notices, were under budget. It is noted that in the report "Annual efficiency and finance assessment of Network Rail 2024" that also looked back CP6 as a whole, Network Rail reported that one of the "headwinds" in CP6 were costs associated with TWS (£262 million). It is recognised that changes to the maintenance practices and realignment of the work-banks may have contributed to these headwind costs, which were outside the scope of the TWS programme.

Governance

The Safety Task Force (STF) was established in September 2019, with its remit and funding to be defined. This was also the first Nationally led portfolio program within the devolved Network Rail organisation which added to the challenge. The STF "Assurance Directive" was issued in October 2019 that defined the activities that must be delivered by Network Rail's Routes to comply with the Network Rail's overall response to the improvement notices.

The STF Programme Board that had Senior Network Rail and the ORR Chief Inspector (as an observer) for Railways representation, was formed in November 2019, and the STF governance framework was fully established by September 2020 to ensure that arrangements would be in place beyond July 2022 to perpetuate the STF activities (in line with the ORR notice requirements). The Safety Technology System Review Panel (SRP) was formed February 2021 to examine the overall system considerations associated

with the increased provision and use of new technology/safety equipment. The Track Worker Safety expert group first met in April 2021.

There were also periodic progress reviews with the Routes during the program on progress to meeting programme milestones. There was also a phased handover, starting in September 2022, from the STF to Network Rail, moving the STF to "business as usual". Network Rail commissioned a "Lessons Learned" post implementation review report.

Interaction between Network Rail, the ORR and RAIB

The interviews showed that there were differences in understanding within Network Rail about the processes being followed regarding responses to ORR. For example, the interviewees stated that 14 days were allowed for a response – in the form of an appeal – to an Improvement Notice, but this appears to be 21 days, as set out in the Regulations.

Similarly, the timescales for responding to RAIB recommendations appear to be unclear to some individuals within Network Rail. In response to RAIB recommendations, action plans must be put in place within six weeks of the recommendation being allocated and legally Network Rail must provide a response to ORR within 12 months of the RAIB report being published, which could just be an action plan but is often a progress update or closure. These timescales are set out in the Regulations.

Interaction between Network Rail and the ORR

There were instances where an issue was raised by the ORR, sometimes at a Regional level, with the subsequent Improvement Notice being raised against Network Rail as the duty holder, with the Central or Core function stating they were unaware of the issues before the Improvement Notice was issued. This is recorded in the "Lessons Learned" post implementation review report.

However, there was evidence of issues being identified and brought to Network Rail's attention (by both ORR and RAIB) prior to ORR serving an Improvement Notice. For example, it was noted that the ORR had carried out a National inspection of track worker safety and Network Rail were supplied with a copy of the report in May 2019, before the Improvement Notices were issued. RAIB published a "Trackworker Thematic Investigation" in November 2021, which was started before the Margam accident, as the RAIB felt there had not been a noticeable drop in near-misses and there were "too many incidents of trackworkers 'almost' being struck." It is also noted that the ORR had identified two items relating to track worker protection and to track worker warning systems in its strategic risk chapter on workforce safety published in 2017.

Prior to the Improvement Notices being issued by ORR, Network Rail had initiated the Near-Miss Reduction Programme aiming to address the trend of track work near miss incidents.

Challenges and Opportunities

Network Rail identified that multiple criteria needed to be considered for a programme like TWS. For example, stopping unassisted lookout and reducing "red zone" potentially affects renewals and maintenance work banks because work takes longer to arrange and is less efficient, T3 possession (line blocks) are required which can cause disruption to train services or limitations on when work can be undertaken.

Network Rail carried out a review of the Maintenance Standard Tasks (MST), re-planning work to use the safest form of protection, reducing the number of instances of unassisted lookouts and lookout-operated warning system. Network Rail also trialled and introduced some new technologies, including drones, Track Circuit Operating Devices, and Semi-Automatic Track Warning Systems. It is noted that there are concerns with some of these devices and there are restrictions on their use by Network Rail, and that the "lessons learned" post implementation review report suggested that the technology rollout was the weakest aspect of the STF.

Network Rail stated that there was no clear guidance for the STF on what is "reasonably practicable". In the interview this was contrasted with level crossings, where there is clear guidance of what is considered 'reasonably practicable' and 'grossly disproportionate'. However, it is understood by Network Rail as the duty holder, that Network Rail determines for itself what is 'grossly disproportionate'. Consequently, when Network Rail was asked whether a CBA had been undertaken as part of the Network Rail response to the Improvement Notices, the Network Rail view was that there was not a framework against which the benefits

could be assessed and that the activities of the STF were needed for legal compliance rather than weighing up value for money or determining if a solution was grossly disproportionate to the risk. Network Rail referenced the benefits that had been delivered over a single Control Period since implementation, indicating that there is a monitoring and evaluation process in place as part of the STF governance.

Feedback and next steps

The early stages of the STF programme appeared to be hampered by a lack of data and a lack of direction. This was addressed as the project progressed.

There should be greater clarity within Network Rail on the decision-making process for safety investments with guidance on using a CBA to support the process. This would help ensure the original requirements for the change requirement was met and to demonstrate that the safety risks associated with the investments are SFAIRP.

Through the review process it has become clear through discussions with both Network Rail and ORR that the understanding of what actually happened at the outset of the TWS programme and also what should happen, is different between each organisation. For example, there is a Network Rail understanding that once the Improvement Notices were issued and the actions in these agreed between the two organisations, and the broader context for the programme, that Network Rail had no option other than to comply. However, the ORR's understanding, which as the independent safety regulator should be regarded as authoritative, is that reasonable practicability still applies and the agreed actions should be tested against these. This review has identified that there is a difference in opinion in what happened at the outset of the TWS programme, and there is a clear opportunity for ORR and Network Rail to discuss this in more detail following this review to help capture learnings, so that in future this process can be more efficient and effective, giving the desired outcomes for both organisations.

5.3.3 Case Study Conclusions

- CBA and testing of reasonable practicability were not undertaken by Network Rail on the TWS programme, because there was an understanding within Network Rail that once the actions associated with the improvement notice had been agreed with ORR, that these could not be challenged, and the focus for Network Rail had to be on delivery. This review has shown that there is a different expectation by ORR, that Improvement Notices should still be subject to testing of reasonable practicability.
- If National change initiatives such as the TWS were specifically funded through the Control Period process with a clear scope of work, rather than driven by a reaction to ORR Improvement Notices, there would likely be better outcomes through more effective and efficient delivery by Network Rail. There is a view from ORR that Network Rail should be able to fund and manage such initiatives through the risk fund that Network Rail have as part of each Control Period.
- The evidence has indicated that Network Rail does not have a suitable mechanism in place to respond to and challenge improvement notices where necessary. There is limited evidence that Network Rail have the data available to be able to determine what would be 'reasonably practicable' to implement to comply with an improvement notice.
- Some interviews with Network Rail indicated a view that it would be useful for Network Rail to have guidance from ORR on what is considered "grossly disproportionate". However, it is understood by both Network Rail and ORR that this is a corporate decision for Network Rail that may or may not be tested by the ORR or the Courts. There is guidance from the HSE on what could be considered 'grossly disproportionate' that Network Rail, as a duty holder, should adapt for a given set of circumstances and follow when taking safety-related decisions.

5.4 Public Safety (Dawlish Sea Wall)

5.4.1 Case Study Context

This case study reviews Network Rail's approach to its ongoing decision making in regard to public safety, specifically the Dawlish Sea Wall; the Network Rail owned sea wall walkway that runs between Dawlish Warren and Teignmouth, part of the South West Coast Path. The Network Rail ownership encompasses the

vast majority of the walkway. In general, the existing walkway on the sea wall is positioned between the railway and the beach. The general public have a Right of Way along the walkway, and there is no edge protection to prevent someone from falling up to five metres directly onto the beach. This has been the case since the original construction of the railway.

The Dawlish Sea Wall in the centre of the town was rebuilt following an incident in 2014 that washed away the trackbed in the centre of Dawlish. The new Sea Wall will give greater resilience and protection from waves that used to flood the track, which in turn led to delays and closures of the line. The new section of the Sea Wall is higher than the historic sea wall and has edge protection provided as part of the works. The remainder of the wall was not replaced as part of these works.

Network Rail commissioned a report to consider risk at the Dawlish Sea Wall and any opportunities to implement additional controls to maintain this risk to SFAIRP levels

An independent report was commissioned, with a cost-benefit analysis of options. The recommendations are now being considered, with a final decision not yet reached.

5.4.2 Findings

Table 6: Public Safety Findings

Key finding requirement	Evidence	Even better if	Score
1.Is there evidence in this case study of Network Rail using and sharing good practice of what is reasonably practicable?	A risk assessment was commissioned. There is a clear strategy for carrying out the assessment, using incident data, and reference to the appropriate regulations and laws applicable to the Dawlish Sea Wall	This was a one-off study. The approach could be improved by using a Network Rail standard or guidance on safety-decision making and a CBA tool to ensure consistency and an appropriate “risk appetite” was being used.	**4**
2. If the situation is unusual/complex was there evidence in this case study of Network Rail working from first principles to consider options with quantified costs and benefits?	This is an unusual situation in that it does not involve ROGS or the other railway regulations. This is about a public right of way along the seawall and Network Rail 's duties as a landlord and under the CDM Regulations. First principles have been used to identify the areas with the most risk and what is needed to ensure that the sea wall is safe for members of the public to use it. It is noted that the part of the seawall in the centre of the town was rebuilt and raised in height with new barriers under CDM Regulations. There is strong evidence around cost-benefit analysis, based on the independent report that has been provided, clearly setting out the approach and the scope of the analysis.	This was a one-off study. The approach could be improved by using a Network Rail standard or guidance on safety-decision making and a CBA tool to ensure consistency and an appropriate “risk appetite” was being used.	**4**
3. In this case study, is there evidence of assessment of costs and the range of intended benefits (compliance, health and safety management improvement beyond compliance, performance, capacity or other business objectives)? Are suitable costs included and are they	There is a clear approach to managing the risks and using CBA. The GDF has been selected by the Region, rather than National guidance, so is not representative across Network Rail. Costs are well defined, and there are two analyses - one for the public using the wall, and another for the staff who will need to maintain it.	Network Rail could review the GDF used, but there was a considered decision to use the GDF chosen (and noting the final decision is subject to ongoing review / governance) and overall this is considered to be a well scoring area.	**4**

Key finding requirement	Evidence	Even better if	Score
directly related to the safety issue in question?			
4. Was there evidence in this case study of testing of, and governance of SFAIRP (So Far As Is Reasonably Practicable) ?	Yes, there is good evidence for the project, with a review of options and data, and legal requirements to consider whether the situation is SFAIRP.	The approach could be improved by using a Network Rail standard or guidance on safety-decision making and a CBA tool to ensure consistency and an appropriate "risk appetite" was being used.	**4**
5. In this case study, was there effective project management in place to monitor and control costs and ensure that intended benefits are realised (including at what point do Network Rail re-examine original decisions)? Evidence on i) how long the intervention/initiative took compared to what was expected; ii) extent of costs incurred (compared to what was expected)	The work to repair the seawall has been completed and the study is looking at what else could / needs to be done to make the wall safer for the public to use. The choice of solution will depend on the decisions made following the acceptance of the CBA and risk assessment.	Difficult to comment at this point as a solution has not been implemented yet, so any monitoring of costs and benefits has not happened by definition.	**3**
6. In this case study, was Network Rail's engagement with ORR and where applicable, other bodies (including Rail Safety and Standards Board (RSSB) and Rail Accident Investigation Branch (RAIB)) suitable and effective prior to and following the intervention?	There is no engagement with the ORR on the regulatory side because it is a landlord issue, not a railway issue. RSSB and RAIB are also (correctly) not involved.	N/A	**3**
7. In this case study, Is there evidence of both Regional and National approaches to reasonable practicability and the use of cost benefit analysis?	This appears to be a local approach, but may have implications for other, similar types of structures on Network Rail-owned land. The analysis reviewed showed a good approach.	The approach could be improved by using a Network Rail standard or guidance on safety-decision making and a CBA tool to ensure consistency and an appropriate "risk appetite" was being used. This is particularly true for this case study where there are a few similar locations on Network Rail-owned land, and a consistent approach should be adopted.	**3**
8. In this case study, are issues escalated effectively within Network Rail, and is	The analysis is done at the Regional level, with some input from the National level.	At the time of the review it was not clear how the final decision would be made, or the implications for the Network Rail-owned land that is not	**2**

Key finding requirement	Evidence	Even better if	Score
there suitable engagement with ORR colleagues?		associated with the railway (although subsequently confirmed that it will be the region).	

The sea wall is a public right of way and as such, there is no established legal precedent which drives Network Rail – as the landowner and not as the railway duty holder – to deploy edge protection/mitigation. SFAIRP judgements could be considered where there may be different levels of legal obligations.

The risk assessment is carried out in accordance with current good practice. This assessment recognised that although the walkway is part of Network Rail's property, and to some extent interfaces with the railway, its use is not associated with the railway and therefore the current risk assessment techniques and methodologies used for railway operations may not be strictly applicable.

Network Rail is obliged to maintain the walkway and therefore requires workers to carry out activities on the walkway which would fall under the Health and Safety at Work Act because their contractors regularly use it. It is noted that as part of a separate assessment of the risks to staff maintaining the wall, the contractor installed anchor points for staff to connect harnesses to when carrying out work, but these would be of no benefit to the public walking on the wall.

Recent incidents and the location of these are still being reviewed to determine if a section of wall represents a greater risk than others and Network Rail's position has not formally been concluded at this stage. The assessment followed the approach set out in the RSSB publication "Taking Safe Decisions" and the guidance for the Common Safety Method on risk evaluation and assessment (CSM RA). In the absence of other guidance from Network Rail on assessing the expenditure against the safety benefits, the assessment broadly followed the approach used by Network Rail for level crossings to determine the GDF for the assessment. The focus is on the assessment of cost vs benefit in relation to edge protection.

The annual safety risk for the Dawlish to Dawlish Warren section of the seawall has been assessed under the FWI framework to identify footpath use, and level of risk to the public.

The risk assessment reviewed the mitigations currently in place/proposed by Network Rail and also considered mitigations that may not have been available or that may have been discounted previously because of cost (for example, Light-Emitting Diode (LED) lighting technology is considered more cost effective than it would have been in 2015).

It is noted that Network Rail had installed barrier with a wave impact (recurve) design in the centre of Dawlish where the wall had to be completely rebuilt. However, the cost of extending this design to other parts of the sea wall was not considered to be justified, but Network Rail would revisit this, should the older parts of the wall need substantial work or rebuilding in the future.

5.5 Response to RAIB Recommendation (Tibberton Level Crossing)

5.5.1 Case Study Context

This case study considers how Network Rail responded to a recommendation made by RAIB following a fatal accident at Tibberton No.8 footpath Level Crossing. The RAIB report was the investigation of an incident where a passenger train struck and fatally injured a pedestrian at a passive footpath crossing in the village of Tibberton, Worcestershire. The weather at the time was foggy, which is what contributed to the incident. Network Rail's process for managing this type of Level Crossing did not take account of the effects of fog on the use of the crossing. The following recommendation was made in the RAIB report:

"The intent of this recommendation is for Network Rail to understand the risk to crossing users presented by fog at passive level crossings and to ensure that the risk to an individual using a passive level crossing in fog is acceptably low.

Network Rail should analyse and evaluate the risk of fog affecting the safe use of those passive level crossings where users are entirely reliant on the sighting of trains. This analysis should take into account Regional and local variation of the likelihood of fog, its potential impact on visibility and the effectiveness of any existing mitigation measures. Network Rail should then use the output of this evaluation to develop and implement a strategy to adequately mitigate the effects of fog at passive level crossings (paragraphs 114c and 115). This strategy should include the development and provision of:

- *guidance for level crossing managers on how to identify crossings at which fog is a reasonably foreseeable risk;*
- *a range of possible mitigation measures to make crossings safe to use in fog (this may involve other railway parties such as the Rail Delivery Group);*
- *a methodology for prioritising level crossings on the basis of the risk arising from fog at the crossing; and*
- *a timebound plan for the implementation of the appropriate mitigation measures at the prioritised crossings."*

5.5.2 Findings

Table 7: Response to RAIB Recommendation (Tibberton Level Crossing) Findings

Key finding requirement	Evidence	Even better if	Score
1. Is there evidence in this case study of Network Rail using and sharing good practice of what is reasonably practicable?	Network Rail provided evidence of how Recommendation 1 from the RAIB Recommendation Action Plan for Tibberton Level Crossing accident was analysed in a structured manner and accepted by the National Recommendations Review Panel. The recommendation was responded to via implementation of two process improvements: •A fog data analysis tool was developed which shall be used as an input to the narrative risk assessments •Level crossing guidance document LCG 21, Evaluating the impact of fog at passive level crossings, has been introduced to support implementation and use. The above measures have been implemented within National standards and the risk assessment process.	Both the LCG 21 guidance and the fog data analysis tool have been issued to Regions and Routes. Some limitations were noted when the implementation was discussed at interview, including the varying proximity of the specific level crossing to the nearest weather station included in the fog data analysis tool, emphasising the importance of the local level crossing manager's knowledge and specific qualitative input to the narrative risk assessment. In the RAIB Recommendation Action Plan (Tibberton Level Crossing), two controls were mentioned in terms of the engagement with the Rail Delivery group. One of those was fog whistle boards, and some signage. Active measures such as miniature stop lights were not discussed in detail, although these are included in the LCG21.	**3**
2. If the situation is unusual/complex was there evidence in this case study of Network Rail working from first principles to consider options with quantified costs and benefits?	The development of the 2 measures described above was based on first principles approach and input to the explicit risk estimation required for each level crossing.	While LCG21 contains several potential risk control measures for managing fog, the introduction of the LCG 21 and fog data analysis tool act as additional aids to support the established process for making risk-based decisions at crossings. The specific level crossing risk assessment must determine what is reasonably practicable at each individual crossing based on structured judgement. For example, miniature stop lights are a well-known mitigation, and the safety benefit from using the lights would increase if fog is weighted as a more significant factor in a particular location.	**4**
3. In this case study, is there evidence of assessment of costs and the range of intended benefits (compliance, health and safety management improvement beyond compliance, performance, capacity or other business objectives)? Are suitable costs included and are they directly related to the safety issue in question?	Three sample risk assessments were provided post-Tibberton accident. The costs and benefits are recorded in the narrative risk assessments (Bosley's Footpath, Broad Oak Footpath, and Widmeads). This is in accordance with the network rail risk assessment process for level crossings (See Table 4).	It was noted in interviews that previously, or in early phases cost estimates can be immature, but these have stabilised in recent Control Periods.	**3**
4. Was there evidence in this case study of testing of,	The level crossing National standards and guidance documents provide governance with	As is the case with the level crossing risk assessments (See	**4**

Key finding requirement	Evidence	Even better if	Score
and governance of SFAIRP (So Far As Is Reasonably Practicable)?	evidence of sharing of good practice by Technical Authority. The post-Tibberton responses have been embedded in the National standards.	Table 4), moderation of outputs of SFAIRP decisions is done but more are Regional level, so there could be some variation in the outputs of the post-Tibberton risk assessment fog risk evaluations.	
5. In this case study, was there effective project management in place to monitor and control costs and ensure that intended benefits are realised (including at what point do Network Rail re-examine original decisions)? Evidence on i) how long the intervention/initiative took compared to what was expected; ii) extent of costs incurred (compared to what was expected)	Several of the safety measures in the sample risk assessments were recommended for implementation as reasonably practicable (In the case of Bosley's Footpath level crossing, boundary to boundary improvements, installation of miniature stop lights, and closure of the crossing. In the case of Broad Oak Footpath crossing, Gate to Gate enhancements, and installation of Overlay Miniature Stop lights. In the case of Widmeads, installation of miniature stop lights and installation of Overlay Miniature Stop lights were both considered reasonably practicable options). Each risk assessment provided time bound indicators for implementation of the recommended options, and an explanation as to why discounted options were not considered to be reasonably practicable.	A verification of the implementation of the recommended measures at individual locations is not with the scope of this review and was not undertaken, However, the Independent Reporter was provided with a good description of the implementation process during interviews.	**4**
6. In this case study, was Network Rail's engagement with ORR and where applicable, other bodies (including Rail Safety and Standards Board (RSSB) and Rail Accident Investigation Branch (RAIB)) suitable and effective prior to and following the intervention?	In response to the RAIB Recommendation for the Tibberton Level Crossing accident, Network Rail provided evidence of how the RAIB recommendation 1 was analysed in a structured manner, and accepted by the National Recommendations Review Panel.	The RAIB case study review was limited to one example recommendation, although there was clear evidence of the National recommendations review process Network Rail have adopted to assess each one. Further review could be undertaken to obtain evidence of how the RAIB recommendation was evaluated prior to the intervention within this case study, including engagement with ORR and other bodies where applicable, to evaluate reasonable practicability and determine a proportionate and appropriate action plan. Further review could also be undertaken across additional case study areas to obtain evidence of how the process is consistently applied	**3**
7. In this case study, Is there evidence of both Regional and National approaches to reasonable practicability and the use of cost benefit analysis?	The post-Tibberton measures have been implemented within National standards and the risk assessment process, which should enable a consistent approach and response.	As is the case with the level crossing risk assessments (See Table 4), there is some freedom for Routes to prioritise differently based on their own portfolio and risk assessment outputs.	**3**
8. In this case study, are issues escalated effectively within Network Rail, and is there suitable engagement with ORR colleagues?	There was evidence of this within various aspects of the review such as relationship between Technical Authority and Route level crossing managers in the development of the response and implementation.	Further review could be undertaken to see evidence of how RAIB recommendations are dealt with alongside other emerging issues or risk-priorities that would be potentially competing and constrained by budget.	**4**

5.5.3 Case Study Conclusions

The RAIB recommendation was assessed by Network Rail in a structured manner, as part of a National process, with a clear action plan developed in response to the finding. The planned response to the recommendations have been demonstrated to be implemented.

The measures taken by Network Rail in response to the finding have enabled an improved evaluation of fog at passive level crossings, in the form of additional guidance for the established overall decision-making process established for managing level crossing risk.

The RAIB case study review was limited to one example recommendation, although there was clear evidence of the National recommendations review process Network Rail have adopted to assess each one.

5.6 General Safety, Cost Benefit Analysis and RAIB Recommendations

5.6.1 Findings

When testing a potential control measure against reasonable practicability the first step is always to follow good practice (as defined in Appendix A). Only if there is no good practice, or it is out of date, or the situation is complex should an organisation look towards using a CBA. Further, CBA should aid decision making, it cannot form the sole argument, nor can it be used to undermine existing standards and good practice.

The Independent Reporter were told that quantitative cost-benefit analysis is rarely used to test reasonable practicability, including challenging when an intervention may be grossly disproportionate. Level crossing risk assessments however (form part of a multi-disciplinary process) do routinely include the application of CBA and Gross Disproportion Factors (GDF).

Based on the Independent Reporter's review of the available case studies, the use of CBA and approach to determining reasonable practicability are not systematic within the Network Rail governance processes, however the Independent Reporter were sighted on plans to develop a common approach going forward (e.g. the draft document 'SFAIRP – A practical guide to support safety-related decision making'). Network Rail should continue to implement a common approach and guidance for determining Reasonable Practicability, which should include use of Good Practice first. The common approach should describe when it would be appropriate to use Cost Benefit Analysis in support of risk evaluation.

The Duty Holder (Network Rail) has to consider SFAIRP, and ORR's inspectors will consider what good practice should be applied. If the issue is novel or unusual and it has to be worked up from first principles, inspectors will make a professional judgement, whilst also engaging with the duty holder to get their view on whether it is Reasonably Practicable. If the duty holder produces a CBA as part of their argument then it will be considered. RAIB do not have to consider cost as part of their recommendations and therefore CBA and reasonable practicability are not a factor in RAIB recommendations, but they do discuss and then formally consult on recommendations with duty holders and the safety authority concerned prior to publication. As the Duty Holder, if Network Rail demonstrates that the recommendations are not legally required, or are above SFAIRP, then they are not obligated to go beyond that this.

A new, general CBA tool is to be rolled out by Network Rail in March 2025 which Network Rail have engaged with RSSB on. This is supported by guidance on what is considered to be SFAIRP. It should be noted that the new general CBA tool is distinct from the already existing (and well-established) Level Crossing CBA tool. An example of the tool was shared with the Independent Reporter by Network Rail. The Independent Reporter were informed that external advisors were used to support development of GDFs.

To improve the current processes, consistency and assurance of the CBA process are key and upon release of the tool and supporting guidance, there will need to be adequate governance, controls, assurance, and

training for the implementation of CBA to ensure consistency across the different areas of the business and across the Regions.

The Network Rail team responsible for the rollout of the General CBA tool is small. Another team is responsible for logging and recording formal Improvement Notices, but they don't manage the response or action plans, which sits within the relevant Technical Directorate or Region. Therefore, it is essential that a community of practitioners is established to ensure consistency of use and application across the Regions.

Decision-makers at all levels need to be educated so that they understand the concept of reasonable practicability and how it should be tested, starting with good practice. Challenging CBAs however, should be a rare occasion. This guidance should include that a CBA should be repeated if certain change criteria are triggered, such as structural changes, legislative changes, incidents, or changes in Fatalities and Weighted Injuries (FWI). For longer-term projects, especially those with significant spending, progressive monitoring of CBA is advisable. CBA also needs to be reapplied to ensure that the criteria considered and the outcomes, such as benefits realization, are still valid and that the decision to undertake or not undertake action remains correct.

There needs to be greater industry guidance regarding the fundamental use of CBA and its applicability so that the Network Rail response to RAIB recommendations and ORR enforcement decisions are driven by the same principles. The General CBA tool can be used more effectively in providing a response to RAIB recommendations that addresses the concerns in a way that is both proportionate and reasonably practicable. Network Rail should apply the same approach to interventions from the ORR, including ORR enforcement decisions.

Risk transfer is well understood within Network Rail in accordance with the Common Safety Method for Risk Evaluation and Assessment (CSM RA) framework. In terms of external risk transfer, the Independent Reporter have found evidence that Network Rail does consider risk transfer, with an example of the 'Road/Rail Partnerships' at level crossings with the Highways Authority. Furthermore, the Independent Reporter were told that Network Rail have asset protection teams who work closely with lineside property owners.

In response to RAIB recommendations, action plans must be completed within six weeks of the recommendation being allocated at the National Recommendations Review Panel (Network Rail RP), which runs every four weeks, meaning allocation could take up to four weeks. Legally, Network Rail has to provide a response to the ORR within 12 months of the report being published, which could just be an action plan but is often a progress update or closure. In terms of ORR Improvement Notices, Network Rail has 21 days to appeal.

The effectiveness of communication and escalation mechanisms (between Network Rail and ORR) could be improved. Whilst formal arrangements are in place for ORR safety dialogue (Nationally and Regions /Routes), there is currently no common approach for collectively recording all ORR views on 'live' safety risks. There is opportunity for Network Rail to better manage the sharing of information and escalations within their organisation when interacting with the ORR, especially on initiatives or enforcements that have National implications, to provide better oversight and support from and to the devolved teams.

6. Office of Rail and Road – Findings

The following section details the findings from reviewing evidence and conducting interviews regarding the ORR, covering the two final areas listed in the review scope (3.4). It should be noted that these findings are representative only of the information made available within the short timescales of the review.

6.1 Periodic Reviews & ORR Monitoring

6.1.1 Context

Periodic Reviews are one of the principal mechanisms by which ORR holds Network Rail to account and secures value for money for users and funders of the railway. Periodic Reviews are five-yearly events that take place at the end of the Control Period and determine the level of funding that Network Rail should receive and what it should deliver in return for the next Control Period. Periodic Review 2023 (PR23) established the funding and regulatory settlement for Control Period 7 (CP7), which runs from 2024 to 2029.

As part of the Periodic Review process, ORR reviews Network Rail's strategic business plans against the required High-Level Output Specifications (HLOS) (from the Secretary of State for Transport and Scottish Ministers) and the available funding (which is set out in funders' Statements of Funds Available (SoFA)). Safety, performance, asset condition and efficiency are factored in to determine what Network Rail should deliver.

Based on its review of Network Rail's plans, ORR produces a Final Determination which is the basis for Network Rail to develop a Delivery Plan before the start of the Control Period. Network Rail's Delivery Plan sets out how it plans to deliver the requirements of the determination. This is signed off by the Secretary of State and becomes the baseline for what ORR holds Network Rail to account against during the Control Period.

6.1.2 Inclusion of Health and Safety related expenditure in a Periodic Review

Safety is one of the key objectives in a Periodic Review. ORR's objective in reviewing health and safety is to help ensure that Network Rail's strategic business plans meet its legal obligations, noting that Network Rail is responsible for ensuring it is meeting its legal obligations. It is for Network Rail to identify, assess, control and manage risk regardless of whether ORR has carried out an inspection or served an improvement notice.

ORR expects, at a minimum, that Network Rail's strategic business plans will:

- clearly articulate Network Rail's health and safety priorities at Regional, System Operator and functional levels, including how those priorities were agreed upon and how the business units demonstrate that their strategic plans align with them. This should include the activities that Network Rail's Regions and other business units will undertake to achieve its priorities and how success will be measured;
- show how it will ensure compliance with all its relevant legal obligations under health and safety legislation over CP7; and
- where full legal compliance is difficult due to legacy infrastructure characteristics, describe the trajectory to improved compliance and explain how risk will be managed in the interim.

For PR23 these expectations were set out in ORR's published guidance to Network Rail on the preparation of its Strategic Business Plan.

During a Periodic Review, there may be instances where additional expenditure is proposed, for example the Lord Mair and Dame Slingo recommendations on managing rail infrastructure in more frequent extreme weather. Where this is the case, ORR expect to see a clear rationale for the additional expenditure set out in the Regions' strategic plans.

During the review of Network Rail's strategic business plan, ORR's safety experts provide their views on the strategic issues that Network Rail needs to consider for the forthcoming Control Period, such as earthworks and considers whether Network Rail's plans are sufficient. For example, funding for the ESD programme – which spans 3 Control Periods – was included for CP7.

However, there have been instances, where change programmes have taken place, such as the Track Workers Safety Programme, which were industry level changes which took place out with the Periodic Review planning process. Emerging risks can also stem, for example, from new technologies (e.g. hydrogen powered trains) or a change in the work undertaken (e.g. diversification into a new industry). It does not mean a duty holder has failed to adequately manage existing risks.

To fund health and safety programmes not included in Network Rail's strategic business plans, Network Rail has a risk fund which it can allocate to risks and additional requirements that emerge during the Control Period. For example, in CP6 it drew on the risk fund to cover additional requirements related to its Track Worker Safety programme, although it is important to note that the quantum of risk funds for CP7 is lower than CP6.

6.1.3 Changes to Network Rail's plans following start of a Control Period

In order to implement the outcomes from the Periodic Review, Network Rail publishes a Delivery Plan for the Control Period that is consistent with ORR's determination. Once in a Control Period, Network Rail updates and reforecasts its delivery plan quarterly in line with changes that occur. These updates are provided to ORR, which reviews them. A cross functional team within ORR is involved in reviewing the quarterly reforecasts, including experts from safety, finance, performance, and asset management. Any material concerns are raised and discussed with Network Rail and funders of the railway (UK and Scottish governments).

A key change for CP7 has been the introduction of a Delivery Plan Lead for safety (a new post) within the ORR railway safety team, exclusively focused on monitoring changes to Network Rail's delivery plan for priority safety topics identified throughout the Periodic Review and in the final ORR determination, and emerging risks to delivery that may require Network Rail to draw on its risk fund or reprioritise expenditure.

This will allow for a proactive and forward-looking approach, rather than reactive, and consideration of cost implications. However, ORR considers that greater transparency of costs of safety initiatives is needed from Network Rail to monitor progress, identify emerging risks to delivery, reconsider the original justification and assess whether the decisions are still valid.

6.1.4 Risk based approach

The ORR already undertakes risk profiling exercises utilising safety data, concerns, industry risks etc to ensure their planned regulation is risk-based, using their available resources to target the areas of greatest risk. The risk profiling conducted by ORR prioritises efforts on key strategic topics such as earthworks, fatigue, and overspeeding, During the review, ORR explained that further information from Network Rail is needed to ensure that emerging risks are progressively monitored and that ORR's proactive regulatory activity is appropriately focussed on key risk areas.

6.2 ORR/Network Rail engagement

Engagement between Network Rail and ORR is well embedded at all levels, with ORR's Chief Inspector attending Network Rail Health & Safety Committee meetings and quarterly meetings between ORR and Network Rail Regional Managing Directors, as well as liaison meetings at Route level and various working level meetings.

ORR has a process for capturing wider emerging regulatory risks with Network Rail's overall performance (be those financial or specifically related to the commitments that Network Rail has made in its Delivery Plan). While this is not used directly for safety matters, the register capture risks relevant to the delivery of programmes (which may, for example, involve the maintenance and renewal of the infrastructure) which may be relevant for safety.

ESD is a good example of a strategy developed by Network Rail, based on ALARP principles, which was then agreed with ORR whereby industry level consensus about how the change programme will be executed was established. Whilst ESD is related to a particular legislation context, it is still a positive example of a strategy being developed by Network Rail and agreed with industry stakeholders including ORR. The safety improvements will be implemented over 3 Control Periods, due to the scale of changes required, with an on-going focus on realisation of benefits.

Whilst it is clear that Network Rail is a duty holder and own the safety risks associated with their assets, as the economic and safety regulator, ORR inevitably has a significant role in the determining the level of

funding allocated to Network Rail as part of the final determination. Strengthening collective understanding of longer-term risks and priorities is important in the context of business planning updates and more strategic conversations around planning for future Control Periods.

A process for escalating safety regulatory risk does exist though within Network Rail (NR_L3_INV_3001_904). Network Rail has well established risk management processes although during the review there was no evidence of a single dedicated regulatory risk register for safety matters within Network Rail.

While it is not down to ORR to decide what is reasonably practicable in any particular context, ORR has published guidance on 'Assessing whether risks on Britain's railways have been reduced SFAIRP'. It is important that there is industry level consensus regarding definition of SFAIRP criteria. ORR also has a role in monitoring how CBA is applied by Network Rail and in allocation of funding required to achieve acceptable safety performance.

Industry-level agreement on the best practice case studies should be jointly achieved and industry forums exist to do this, in particular through RSSB. ORR and Network Rail have a role in contributing to a portfolio that populates a library of best practices for use at joint industry workshops. Whilst Network Rail are the duty holder in this area, ORR inevitably influence what is acceptable in the industry, and therefore, for efficacy in implementation of CBA, it is important that there is consensus regarding what good practice is and what the key criteria should be.

6.2.1 Network Rail structure

Network Rail's devolved structure could be creating inefficiencies in engagement between Network Rail and ORR, with duplicated liaison and communication necessary across the Network Rail Regions, despite Network Rail being just one legal entity. Route level liaison is beneficial; there would be merit in Network Rail reviewing its internal escalation mechanisms in case of any issues which are not being addressed efficiently.

The creation of GBR, and associated changes to industry structure, are likely to further strengthen local level decision making and industry collaboration. This could create new challenges regarding consistency across the industry, but also great opportunities for industry level change programmes and greater collaboration between all stakeholders. Unless the Periodic Review process reflects the intent of greater industry collaboration, these opportunities may not be realised.

6.3 Application of ORR's Enforcement Management Model (EMM)

6.3.1 Context

Good practice and approaches are cited in other safety regulated industries such as nuclear and aviation, and there was evidence of good practice sharing and adoption by the ORR. The ORR's EMM retains the same regulatory principles as the HSE's Enforcement Management Model, but is for use in the railway context to make it more relevant to railway specific assets and railway specific legislation. It is a decision support tool that assists inspectors when they are considering their enforcement options. More information on EMM is available in ORR's health and safety compliance and enforcement policy statement.

6.3.2 EMM Purpose

The ORR's EMM is a systematic aid to a decision-making framework and is intended to assist the ORR's Health and Safety Inspectors in judging how far from a standard a Duty Holder is (known as the risk gap), whether that be a gap from a legislative benchmark, an industry standard, or a permissioning document.

It ensures proportionate enforcement action to the health and safety risks and the seriousness of the breach of law by guiding ORR's inspectors in determining the severity of any failings and what the proportionate enforcement action might look like, which should be consistent across ORR. The ORR EMM is intended to guide and not direct enforcement action, and so, it should not restrict an inspector's discretion to exercise their own judgement as the decision maker. It should not be used in isolation and proportionate enforcement action should consider the output of the ORR EMM, the professional judgement of the Inspector and the

ORR Enforcement Policy Statement. Therefore, the Inspectors are not compelled to adopt the enforcement position indicated by the EMM.

It helps monitor the fairness and consistency of an Inspector's enforcement decisions and is part of a wider training and calibration strategy for Inspectors. This is demonstrated by the final review stage, which is built into EMM, which requires an Inspector's line manager's (the Principal Inspector) review of the proposed enforcement output (i.e. explaining the decision-making process and justifying the action). Appeals by the Duty Holder against the issue of a notice by an inspector can be made to a tribunal.

ORR's approach to regulation is risk based and it utilises a finite resource of inspectors to assess how the duty holder is managing risk. The EMM is a decision support tool which is used to guide enforcement decisions when a duty holder is not managing risk appropriately.

6.3.3 Relationship to CBA and SFAIRP

The EMM is focused on events, findings and situations where there is a potential breach of the law. For example, during an investigation it would be applied to help decide if early enforcement action is required or if there is no significant breach at which point the investigation would be curtailed. EMM would also be applied at the end of an investigation as part of the decision-making processes around authorising a prosecution.

When considering one large duty holder such as Network Rail, it has to be treated as a single entity. However careful application of 'duty holder factors' is required to take account of the duty holder's circumstances, background and activities to ensure proportionate action is taken. Network Rail has one safety management system (SMS) which covers its entire organisation. Where enforcement action is being considered against part of Network Rail, the level of enforcement action should be influenced by any similar or related incident/enforcement that has occurred previously elsewhere within Network Rail operating under the same SMS (e.g. across Routes or Regions).

The onus is on Network Rail's senior management to ensure that risk management is applied consistently across all Regions. ORR would expect that any lessons learnt from failings identified in one part of the organisation should be communicated and rectified company wide.

6.3.4 Relationship with Periodic Review

There is no link between EMM and the Periodic Review.

7. Conclusions

The purpose of this review was:

- To assess Network Rail's approach to safety interventions, specifically to understand how Network Rail assesses value for money and whether reasonable practicability is systematically tested by Network Rail;
- To review an agreed set of five case studies (covering Electrical Safety Delivery, Level Crossings, Track Worker Safety, Public Safety – Dawlish Sea Wall and response to Rail Accident Investigation Branch (RAIB) recommendations - Tibberton Level Crossing accident) for common themes and whether they are supported by clear assessments of costs and the range of intended benefits, be they: compliance, health and safety management improvement beyond compliance, performance, capacity or other business objectives or a blend of these and the extent to which effective project management was used to monitor and control costs, and ensure that intended benefits are realised;
- To review and assess Network Rail's historical context, testing of, and governance of SFAIRP (So Far As Is Reasonably Practicable);
- To review how ORR monitors the implications (i.e. quantum and efficiency of associated costs and deliverability of planned improvements) when Network Rail does not challenge reasonable practicability of an ORR Health and Safety intervention; and
- To review how ORR safety priorities / ongoing discussions are factored into the Periodic Review process.

To set the conclusions and recommendations in a clear context, the findings have been categorised into eight key topic areas (i.e. Good Practice, Application of First Principles, Cost Benefit Analysis, Testing and Governance of SFAIRP, Project Management, Engagement with ORR, Regional and National Approaches and Escalation of Issues). These topics areas have been defined based on discussions with ORR and Network Rail, and in accordance with the themes of the scope of this review. Using the evidence supplied, interview information across the case studies and further areas discussed with ORR and Network Rail, the key conclusions for the topics are as follows:

7.1 Network Rail's Decision Making on Major Safety Programmes and approach to Good Practice

Network Rail's decision making on major safety programmes, and Network Rail's approach to considering what is good practice (good practice being key to establishing what is reasonably practicable).

Overview of findings

The Independent Reporter's review found elements of Network Rail's approach to decision making on major safety programmes for several of the case studies represented good practice (as defined in Appendix A) when determining what is reasonably practicable. The good practice approach was not consistently observed across all case studies reviewed, based on the information and evidence received.

Approach to Decision Making and consideration of good practice

Overall Network Rail demonstrates very good practice in the approach to managing safety interventions in the Level Crossings case study. There was evidence of a structured and mature approach to level crossing risk assessment that includes explicit risk estimation based on quantitative and qualitative assessment. This is supported by structured processes, data, tools, resources, National Standards, and guidance founded on risk management principles, and considered proportionate to the hazard and risks being assessed.

The Dawlish Sea Wall case study evidence was found to represent good practice in terms of approach to explicit risk estimation. Reasonable practicability is well understood for this case study based on the appointed specialist's analysis.

For the case study in the response to the RAIB recommendation for the Tibberton Level Crossing accident, the approach taken was found to be structured and consistent. The response included adopting a first principles approach, which was appropriate to the complexity of the safety issue, which was seen to be adopted into National standards and passive level crossing risk assessments.

For the Level Crossings case study, the overall approach is particularly good and includes consideration of the relevant codes of practice to understand available risk reduction options for managing hazards. These measures are well understood and embedded in Network Rail's risk assessment standards and LCG, which are periodically updated. The qualitative narrative risk assessment (supported by the quantitative analysis) is an essential aspect of the decision-making process, enabling consideration of relevant good practice and other local factors to be applied to each crossing.

Areas for improvement

The good practice approach was not consistently observed across all the case studies reviewed, based on the information and evidence received. The ESD case study process was found to be less mature than other case studies; there is not a similar set of mature risk assessment standards and guidance setting out a clear process for determining SFAIRP – although this is within the context that this programme is subject to the Electricity at Work Regulations 1989 which set out absolute legal compliance duties which have driven, and continue to drive, the overall approach for the programme.

Based on the limited information reviewed, the TWS case study was found to be the area where there is most opportunity for improvement in the approach to risk assessment and determining what is reasonably practicable.

A new Network Rail guidance is expected in 2025, the Independent Reporter has sighted a draft copy of the Network Rail guidance document 'SFAIRP – A practical guide to support safety-related decision making', which will help establish a common and more consistent approach to demonstrating SFAIRP.

Recommendations (Refer to Section 7.9)

REC001

REC005

7.2 Application of First Principles

If the situation is unusual/complex was there evidence of Network Rail working from first principles to consider options with quantified costs and benefits?

Overview of findings

The review found examples of Network Rail working from first principles to consider options with quantified costs and benefits within the case studies, and in some areas, this is embedded within the governing standards for risk assessment. This approach was not consistently observed across all case studies reviewed, based on the information and evidence received.

Positive Indicators

The Level Crossings case study indicates that the use of first principles analysis is embedded within the level crossing risk assessment process, with each level crossing being subject to an explicit risk estimation to determine what is reasonably practicable to manage the safety risk. The ALCRM risk quantification is supported by the RSSB SRM incident data, which in turn is supported by qualitative structured expert judgement in the narrative risk assessments to present the overall risk evaluation for each crossing, capturing some hazards/factors that are not accounted for within the quantitative assessment. This is considered an appropriate method to inform decision making.

Furthermore, the Network Rail response to the RAIB recommendation (Tibberton Level Crossing) case study reviewed followed a first principles approach, which was subsequently adopted into National level crossing risk assessment standards. The Dawlish Sea Wall case study also followed a first principles

approach and explicit risk estimation based on the example provided, thus indicating a robust approach to complex situations.

Areas for Improvement

There was some evidence of working from first principles assessment within the ESD case study review. Whilst it wasn't evident that measures being taken in the programme were supported by an overall risk-based framework for determining SFAIRP, as set out above, some of the measures taken were based on compliance with absolute duties set out in legislation (i.e. Electrical Safety at Work Regulations, parts of which are absolute and not subject to the reasonable practicability test). The use of a risk-based, structured approach to assess costs and benefits was not evident from the TWS case study, with a difference of opinion for stakeholders involved as to what drove the decisions of what actions to pursue.

Recommendations (Refer to Section 7.9)

REC001

REC005

7.3 Cost Benefit Analysis

The extent to which each case study was supported by clear assessments of costs and the range of intended benefits (compliance, health and safety management improvement beyond compliance, performance, capacity or other business objectives). What costs are included and are they directly related to the safety issue in question?

Overview of findings

The review found examples of risk assessments and evaluation being supported by clear assessments of costs and benefits within the case studies. However, there is a notable inconsistency in how costs and benefits are assessed across the different case studies (i.e. there is no common approach) and the types of costs considered.

Positive Indicators

Use of a CBA tool is embedded within the level crossing risk assessment process, with case study examples clearly showing the range of costs and benefits considered. The Dawlish Sea Wall case study example was also supported by a clear assessment of costs and benefits, although it was unclear whether this is a representative approach for evaluating interventions to similar assets. There was also evidence that quantified costs and benefits have been considered within the ESD case study, with the realisation of time/cost savings an apparent driver.

Areas for Improvement

In contrast, a standard approach to CBA was not evident within the TWS case study. It was also noted during the case study review that (except for level crossings) there appeared to be no clear view of what GDFs are appropriate for a safety-related CBA. The Independent Reporter understands Network Rail has recently commissioned a report to establish consistency in GDF, and this will feature within the updated Network Rail CBA tool. The document "General CBA Tool - User Guidance v2" provides clear scenarios of when specific GDFs for the general CBA tool - and has been informed by a recent piece of work with external advisors.

The HSE has issued several expert guidance on risk management collectively titled 'Principles and guidelines to assist HSE in its judgements that duty-holders have reduced risk as low as reasonably practicable', setting out the approach that HSE inspectors use to evaluate risk. Whilst there is no authoritative guidance from the courts as to what factors should be considered in determining whether cost is grossly disproportionate, HSE's Expert Guidance on Risk Management refers to some rules of thumb, followed by HSE's major hazard divisions, that range from a GDF of 2 for low risks to members of the public and GDF of 10 for high risks to members of the public. It is noted that the HSE rule of thumb values apply across different hazardous sectors and takes into consideration a range of factors in relation to both low

risks from minor incidents, and that from major accidents. The HSE guidance also states the greater the risk: the higher the proportion may be before being considered 'gross', and the judgment as to whether measures are grossly disproportionate should reflect societal risk (because society has a greater aversion to high consequence accidents than to several lower consequence accidents).

As part of this review, the Independent Reporter undertook a comparison (Appendix C) of several GDFs used/referenced by organisations within the railway and other hazardous sectors in the UK, and internationally where as low as reasonably practicable (ALARP) principles are used (HSE's expert guidance regards ALARP and SFAIRP as interchangeable, at their core is the concept of "reasonably practicable").

Within the Network Rail level crossing CBA tool, the method for calculating a cost-benefit ratio considers the potential performance savings (e.g. operational and maintenance cost savings) associated with introducing a safety measure as a benefit i.e. cost-benefit ratio = costs of introducing a safety measure / (safety benefits + cost savings). This differs from the RSSB industry guidance where cost-benefit ratio = (costs of introducing a safety measure - cost savings) / safety benefits. However, it should be noted that a new CBA tool has been developed by Network Rail which is better aligned with RSSB guidance. This is due to be rolled out across the organisation in March 2025.

Recommendations (Refer to Section 7.9)

REC001

REC005

7.4 Testing and governance of SFAIRP

Was there evidence of testing of, and governance of SFAIRP (So Far As Is Reasonably Practicable)?

Overview of findings

The review found examples of established methods and processes in place for governance and testing of SFAIRP. However, there are notable inconsistencies across the different case studies reviewed (i.e. there is no common approach).

Positive Indicators

The established National level crossing risk assessment standards, guidance documents, Technical Authority function, and resource provide governance, with evidence of sharing of good practice provided by the Technical Authority through several forums. Moderation of outputs of SFAIRP decisions is done, but more so are Regional level (see Table 4). During the interviews, plans to implement a narrative risk assessment assurance checking process in future was discussed.

Areas for Improvement

Aside from level crossings, there was limited evidence of the measures in place for the governance and testing of SFAIRP. The Dawlish Sea Wall case study provided a clear assessment of how SFAIRP was determined, but it is unclear how this is linked to a National Technical Authority, or standardised and monitored approach. Whilst the ESD programme strategy has a 3-Control Period horizon, with the improvements being prioritised based on safety risk, a clear criterion for doing so was not observed. Similarly, evidencing of governance of the steps to demonstrate SFAIRP is not explicitly clear within the review undertaken for the TWS case study.

Recommendations (Refer to Section 7.9)

REC001

REC005

7.5 Project Management

Was there effective project management in place to monitor and control costs and ensure that intended benefits are realised (including at what point do Network Rail re-examine original decisions)? Evidence on i) how long the intervention/initiative took compared to what was expected; ii) extent of costs incurred (compared to what was expected)

Overview of findings

For the case studies reviewed, the Independent Reporter found that elements of Network Rail's approach to project management, monitoring and controlling costs to ensure intended benefits are realised represented good management and governance, but there is potential for improvements in the progressive monitoring of costs and evaluation of the how the intended benefits have been realised.

Positive Indicators

For the Level Crossings case studies (which included the response to RAIB recommendation for the Tibberton Level Crossing accident), effective project management was in place, risk assessments were periodically reviewed as governed by standards. After changes such as an incident or cost increase, this triggered re-examination of decisions. For the ESD and TWS case studies, internal Network Rail governance plus external review (by ORR and others) of the programme delivery were evidenced to be mature. There is some clear monitoring of progress at Regional level. There is also evidence of consideration of costs.

Areas for Improvement

Whilst the governance arrangement for ESD and TWS were evidenced to be mature at a programme / National level (including that the TWS programme Board was attended by ORR's Chief Inspector of Railways – as an observer), there was also a lack of evidence of more granular details on the progressive monitoring of costs, the evaluation of how long the intervention/initiative took compared to what was expected, and the costs incurred (compared to what was expected). However, the new draft Network Rail internal guidance document 'SFAIRP – A practical guide to support safety-related decision making', (expected to be implemented across Network Rail in 2025), does contain an intent to provide more clarity on the governance arrangements needed to be in place to monitor the development and implementation of safety investments.

Recommendations (Refer to Section 7.9)

REC002

REC005

7.6 Engagement with ORR and other bodies

Network Rail's engagement with ORR and where applicable, other bodies (including Rail Safety and Standards Board (RSSB) and Rail Accident Investigation Branch (RAIB)) prior to and following an intervention.

Overview of findings

Network Rail engagement with ORR and other relevant bodies such as RSSB and RAIB was found to be positive overall based on the case studies reviewed. However, there is potential scope for improvement to further refine the current ways of working to enhance the synergy and engagement between the ORR and Network Rail.

Positive Indicators

Evidence of strong engagement with ORR and RAIB was found for the Level Crossings case study, where structured responses to enforcement actions and recommendations have been effective. The use of RSSB

SRM data in the ALCRM also indicate engagements with RSSB. For the ESD programme, a joint strategy was agreed between ORR and Network Rail based on the ALARP principles, and updates are reported to internal governance forums in Network Rail and shared with the ORR through the quarterly electrical safety strategy meetings.

Areas for Improvement

Based upon the scope of the commission, which is limited to the information that was made available during the course of the review, the TWS case study was found to be the area where there is most opportunity for improvement in the engagement between Network Rail and ORR, in particular in advance of notices being served and across the Network Rail Regions. Whilst the Network Rail Standard, Network Rail/L3/INV/3001 Module 904: Reporting of and Responding to Enforcement Actions sets out the Network Rail process for engagement with the ORR, there is a lack of evidence from the case studies reviewed that the process was followed by Network Rail, specifically on TWS or ESD, where enforcement actions apply. Therefore, there is scope for both organisations to further refine the current ways of working to enhance the synergy and engagement between the ORR and Network Rail.

Recommendations (Refer to Section 7.9)

REC002

REC003

7.7 Regional and National Approaches

Is there evidence of both Regional and National approaches to reasonable practicability and the use of cost benefit analysis?

Overview of findings

There is some evidence of established National approaches and processes to determining reasonable practicability within the case studies, with some variation in outputs at Regional level. There is no overarching guidance in use to govern a consistent National approach to demonstrating SFAIRP across all areas.

Positive Indicators

There is a standardised National approach to risk assessment of level crossings, supported with guidance from the Technical Authority. There is a clear National strategy for reducing risk at level crossings (Enhancing Level Crossing Safety 2019-2029), in which the priority is risk reduction at passive crossings, followed by the automatic crossings. Due to the devolution within Network Rail, some decision making occurs within Routes, and there is some freedom for Routes to prioritise differently based on their own portfolio. Based on the interviews conducted, there is evidence that by and large Routes are aligning their business plans for the Control Period with this overall strategy. However, there is some freedom for Routes to prioritise differently based on their own portfolio. Moderation of outputs of SFAIRP decisions is done, but more so at Regional level than National level (see Section 1.3.4 and Table 4).

Areas for Improvement

The potential for Regional variation in the approach to determining what is reasonably practicable was noted in the ESD case study review, indicating the need for the introduction of the planned guidance to provide more clarity and synergy in determining SFAIRP at National level. Similarly, based on the information received for the TWS case study, it was apparent that there are National strategies in place but there may be variation in implementation at Regional level.

Recommendations (Refer to Section 7.9)

REC004

7.8 Escalation of Issues

How issues are escalated within the company and what engagement it has with ORR colleagues.

Overview of findings

The evidence from the review has shown that issues were escalated within Network Rail in accordance with well embedded processes, governance structures are in place, and they are relied upon. Appropriate levels of ORR engagement are also incorporated into the Network Rail governance structure, however the effectiveness of the engagement requires more evidence for some case studies based on the information reviewed.

Positive Indicators

The devolution of Network Rail poses challenges in engagement with ORR, requiring interaction with multiple individuals. The Technical Authority plays a central role, particularly the National Level Crossing Safety team, in the development of the response to ORR interventions, and implementation of improvement plans with local Route level crossing managers. The ESD Programme showed good engagement with ORR once established, including quarterly electrical safety strategy meetings with ORR. The Network Rail standard regarding reporting of and responding to Enforcement Actions sets out the Network Rail process for engagement with the ORR.

Areas for Improvement

Whilst the Network Rail process for engagement with the ORR is set out in the Network Rail Standard, Network Rail/L3/INV/3001 Module 904, the findings highlighted differences in approach across the case studies and a significant improvement could be made to track, monitor and communicate progress on regulatory safety issues (i.e. significant health and safety compliance issues) in some cases. This was particularly evidenced in Network Rail's initially reactive approach to responding to ORR engagement on the TWS case study.

Recommendations (Refer to Section 7.9)

REC002

REC003

7.9 Summary and Recommendations

The Independent Reporter was only provided with five case studies and had limited time to evaluate the evidence provided for this scope of review. It has therefore been difficult to conclusively comment on the robustness and consistency of the approach adopted beyond the evidence provided for this review and evaluate in further depth on some of the key topic areas. Therefore, it should be noted that these findings are representative only of the information made available within the timescales of this review.

Considering the findings above, it is recommended that future improvement on Network Rail's safety investment decision making should consist of standardisation of approach, enhanced governance and testing of SFAIRP, and better formalisation and synergy of Network Rail's engagements (e.g. Technical Authority at working and director level, and Regional and Route Managing Directors at working and director level) with ORR.

As part of the review, positive steps to standardise best practice were seen to have been initiated across several areas by Network Rail, such as the new Network Rail CBA tool, an independent report on CBA and GDF application in Network Rail, and draft of the Network Rail SFAIRP guidance for decision making. The need for better synergy on strategic engagements between Network Rail and ORR has also been acknowledged by the Network Rail and ORR teams involved in this review.

The recommendations from this review have been summarised below in Table 8 - grouped by the key theme areas. The Independent Reporter has not provided prioritisation for these recommendations given the

positive steps noted above, although it is assumed that Network Rail and the ORR may choose to agree priorities and assign ownership accordingly.

Table 8: Summary of Recommendations

Ref.	Recommendation	Key Theme Areas
REC 001	Standardisation of approach for safety investment decision making	Network Rail should continue to develop and implement a common approach and guidance for determining Reasonable Practicability (e.g. the draft document 'SFAIRP – A practical guide to support safety-related decision making'), which should include use of Good Practice first, in accordance with the HSE guidance Risk management: Expert guidance - Good practice. The common approach should describe when it would be appropriate to use Cost Benefit Analysis. The following are suggested areas of improvement: • Consistency and Guidance: The review noted there is no overarching Network Rail guidance in use yet to govern a consistent National approach to demonstrating SFAIRP, although Network Rail are in the process of developing this. Developing guidance at both project and corporate levels will enable a consistent approach to determining and testing reasonable practicability (RP). The guidance should also include the need to provide explicit rationale to support steps taken to determine RP (this includes the rationale for GDF). • CBA Tool: Network Rail should standardise the approach to the application of CBA across all Regions and projects, including the situations where it might be proportionate to apply it, based on a risk-based approach. Network Rail engaged with RSSB regarding the new General CBA tool, set to be rolled out in March 2025, which should be accompanied by comprehensive guidance, governance, and training to ensure consistent use and outputs. This approach could be applied in discussions between Network Rail and the ORR for 'significant and / or unusual safety related investments where SFAIRP may need testing' as referred to in the ORR Enforcement Management Model (EMM). The guidance should align CBA practices with updated RSSB guidance, ensuring that performance benefits are separated from safety benefits. • GDF Factors: Where cost benefit analysis has been used in support of a SFAIRP assessment, consider adopting a common approach to the use of GDFs for a safety-related CBA, reviewed against the rules of thumb within the HSE's Expert guidance on risk management. • Industry-level collaboration: The formation of GBR should present the industry with greater opportunities for industry-level collaboration, providing a directing mind and access to information, including data sharing, which may support the establishment of joint rail industry CBA criteria and collated industry best practice to safety investment decisions.
REC 002	Progressive monitoring of cost and realisation of intended benefits	Progressive monitoring of cost and realisation of intended benefits should be implemented by both Network Rail and ORR. The following are suggested areas of improvement: • Network Rail should implement progressive monitoring of cost and project outcomes to ensure that costs are controlled and intended benefits are realised. This includes re-evaluating reasonable practicability when there are significant changes in costs and/or the means to realise safety benefits (such as products, technology, or project scope). • The introduction of the Delivery Plan Lead, a new dedicated role within the ORR Railway Safety Directorate (RSD) that monitors Network Rail's Delivery Plan for Health and Safety is positive. It is understood that the scope of this role is evolving and the more proactive/forward looking reviews by ORR into safety interventions maybe attributed to the ORR Railway Safety Team, with Network Rail sharing appropriate information on costs and delivery outcomes with ORR to enable these reviews to be fully informed.
REC 003	Engagement	Enhanced engagement should be implemented between ORR and Network Rail regarding safety initiatives, as well as other industry stakeholders, allowing a

Ref.	Recommendation	Key Theme Areas
		more collaborative approach for discussion particularly for novel or contentious issues. The following are suggested areas of improvement: • Joint strategic safety workshop events facilitated by independent parties, such as RSSB presenting good practice uses of CBA, GDF and SFAIRP, would help illustrate what is required across the industry. These examples of good practice could be collated into a library for use by Network Rail and ORR, and a community of practitioners established within Network Rail. • ORR and Network Rail should strengthen their engagement on longer-term risks and priorities. Such engagement would also be important in the context of business planning updates and more strategic conversations around planning for future Control Periods.
REC 004	National/Regional Integration	Network Rail should consider ways of enhancing National and Regional integration. The following are suggested areas of improvement: • National Strategy with Regional Flexibility: While there is a clear National strategy for certain areas like level crossings, Regional variations in the output of the risk assessment processes exist. Network Rail should review how Regional approaches to safety enhancement are aligned with National strategies while allowing for flexibility based on local priorities. • Cross-Region Sharing: Enhancing Cross-Regional sharing of information and best practices can help in achieving more consistent outcomes. • Safety Decision Making: Clarity on how the Regional and National approaches are managed to enable effective decision making at corporate level and addressing emerging risks (e.g. conflicting new and existing safety risk priorities across ESD, TWS, Level Crossing). • Management of safety regulatory risks: Network Rail should develop a more robust process to capture and manage safety regulatory risks. This process should be dynamic and include regular updates based on insights from the wider environment, such as ORR enforcement actions and from RAIB recommendations.
REC 005	Governance	Improved governance, and documentation of decisions would improve transparency. The following are suggested areas of improvement: • Evidence and Documentation: In some case studies, there was limited evidence of the measures in place for the governance and testing of SFAIRP. Network Rail could document and test Reasonable Practicability decisions more rigorously, particularly at the Regional level, to ensure a common approach across the organisation. • Governance should focus on outcomes rather than just compliance. For example, the Track Safety Improvement programme highlighted the need for better understanding of the implications of decisions before implementation.

Appendix A: Definition of Terms

Terms	Definition [Health and Safety Executive Guidance "Risk management: Expert guidance - ALARP at a glance – HSE]
ALARP & SFAIRP	"ALARP" is short for "as low as reasonably practicable". "SFAIRP" is short for "so far as is reasonably practicable". The two terms mean essentially the same thing and at their core is the concept of "reasonably practicable"; this involves weighing a reduction in safety risk against the trouble, time and money needed to control it, and whether there is a gross disproportion between them. SFAIRP is the term used in the Health and Safety at Work etc Act 1974 and in Regulations. ALARP is the term used by risk specialists and duty-holders. Thus, ALARP describes the level to which HSE expects to see workplace risks controlled. In HSE's view, the two terms are interchangeable except if you are drafting formal legal documents when you must use the correct legal phrase, SFAIRP.
Hazard	A hazard is something (e.g. an object, a property of a substance, a phenomenon or an activity) that can cause adverse effects. For example: • Water on a staircase is a hazard, because you could slip on it, fall and hurt yourself. • Loud noise is a hazard because it can cause hearing loss. • Breathing in asbestos dust is a hazard because it can cause cancer.
Risk	A risk is the likelihood that a hazard will actually cause its adverse effects, together with a measure of the effect. It is a two-part concept, and you have to have both parts to make sense of it. Likelihoods can be expressed as probabilities (e.g. "one in a thousand"), frequencies (e.g. "1000 cases per year") or in a qualitative way (e.g. "negligible", "significant", etc.). The effect can be described in many different ways. For example: • The annual risk of a worker in Great Britain experiencing a fatal accident [effect] at work [hazard] is less than one in 100,000 [likelihood]; • About 1500 workers each year [likelihood] in Great Britain suffer a non-fatal major injury [effect] from contact with moving machinery [hazard]; or The lifetime risk of an employee developing asthma [effect] from exposure to substance X [hazard] is significant [likelihood].
First Principles	Where the situation is complex, it may be difficult to reach a decision on the basis of good practice alone. There may also be some cases (for example, a new technology) where there is no relevant good practice. In such cases, good practice should be followed as far as it can be, and then consideration given to whether there is any more that can be done to reduce the risk. If there is more, the presumption is that duty-holders will implement these further measures, but this needs to be confirmed by going back to first principles to compare the risk with the sacrifice involved in further reducing it. Often such "first principles" comparisons can be done qualitatively, i.e. by applying common sense and/or exercising professional judgment. or experience. For example, if the costs are clearly very high and the reduction in risk is only marginal, then it is likely that the situation is already ALARP and further improvements are not required. In other circumstances the improvements may be relatively simple or cheap to implement and the risk reduction significant: here the existing situation is unlikely to be ALARP and the improvement is required. In many of these cases a decision can be reached without further analysis.
Reasonably Practicable	The definition set out by the Court of Appeal (in its judgment in Edwards v. National Coal Board, [1949] 1 All ER 743) is: "'Reasonably practicable' is a narrower term than 'physically possible' … a computation must be made by the owner in which the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) is placed in the other, and that, if it be shown that there is a gross disproportion between them – the risk being insignificant in relation to the sacrifice – the defendants discharge the onus on them." The HSE expert guidance [Health and Safety Executive Guidance "Risk management: Expert guidance - ALARP at a glance – HSE] provides the following definition: Using "reasonably practicable" allows the HSE to set goals for duty-holders, rather than being prescriptive. This flexibility is a great advantage. It allows duty-holders to choose the method that is best for them and so it supports innovation, but it has its drawbacks, too. Deciding whether a risk is ALARP can be challenging because it requires duty-holders and the HSE to exercise judgment.
Gross Disproportion	In making sure a risk has been reduced ALARP it is about weighing the risk against the sacrifice needed to further reduce it. The decision is weighted in favour of health and safety because the presumption is that the duty-holder should implement the risk reduction measure. To avoid having to make this sacrifice, the duty-holder must be able

Terms	**Definition** [Health and Safety Executive Guidance "Risk management: Expert guidance - ALARP at a glance - HSE]
	to show that it would be grossly disproportionate to the benefits of risk reduction that would be achieved. Thus, the process is not one of balancing the costs and benefits of measures but, rather, of adopting measures except where they are ruled out because they involve grossly disproportionate sacrifices.
Good Practice	Deciding whether the risks are ALARP involves a comparison between the control measures a duty-holder has in place or is proposing and the measures HSE would normally expect to see in such circumstances i.e. relevant good practice. "Good practice" is defined in the general ALARP guidance as "those standards for controlling risk that HSE has judged and recognised as satisfying the law, when applied to a particular relevant case, in an appropriate manner." The HSE decide by consensus what is good practice through a process of discussion with stakeholders, such as employers, trade associations, other Government departments, trade unions, health and safety professionals and suppliers. Good practice may include: • Industry Regulations (e.g. ROGS, CSM-REA, CDM) and Approved Codes of Practice (COPs); • Standards produced by Standards-making organisations (e.g. BS, CEN, CENELEC, ISO, IEC), Industry bodies and companies; • Guidance (such as from the HSE and other recognised/professional/governing bodies); and/or • Standard practice established and adopted within an industry sector Good practice should be kept under review and reflect changes over time, due to technological innovation, cost change, change in management practice and/or increase knowledge about the hazard and/or a change in the acceptability of the level of risk control achieved by the existing good practice. Once good practice has been determined, much of the discussion with duty-holders about whether a risk is or will be ALARP is likely to be concerned with the relevance of the good practice, and how appropriately it has been (or will be) implemented. Where there is relevant, recognised good practice, HSE expect duty-holders to follow it. If they want to do something different, they must be able to demonstrate to HSE's satisfaction that the measures they propose to use are at least as effective in controlling the risk.
Cost Benefit Analysis	There are some instances (often in high hazard industries or where there is a new technology with potentially serious consequences) where the situation is less clear-cut (beyond applying common sense and/or exercising professional judgment). In such cases, a more detailed comparison has to be undertaken. The trouble is that risk and sacrifice are not usually measured in the same units, so it's a bit like comparing apples and pears. In these instances, a more formal Cost Benefit Analysis (CBA) may provide additional insight to help come to a judgment. In a CBA, HSE convert both risk and sacrifice to a common set of units – money – so that we (HSE) can compare them. HSE represent: • Sacrifice as a cost; and • Risk, in so far as it is being reduced, as a benefit HSE then compare the sacrifice (cost) and the risk reduction (benefits). In a standard CBA, the usual rule applied is that the measure should be adopted only if benefits outweigh costs. However, in ALARP judgments, the rule is that the measure must be adopted unless the sacrifice is grossly disproportionate to the risk. So, the costs can outweigh benefits and the measure could still be reasonably practicable to introduce. How much costs can outweigh benefits before being judged grossly disproportionate depends on factors such as how big the risk is to begin with (the larger the risk, the greater can be the disproportion between the cost and risk). This looks straightforward, but it is worth noting that there are many assumptions and uncertainties involved in CBA – further discussion can be found in 'HSE principles for Cost Benefit Analysis (CBA) in support of ALARP decisions' - and indeed in many aspects of risk analysis. In any case, the outcome of a CBA is only one of several considerations that go towards the judgment that a risk has been reduced ALARP. For example, in policy work and in those parts of operational work dealing with high hazards you may also need to consider how the public feel about the risk. There is more detail about taking account of such "societal concerns" in "Reducing Risks, Protecting People". Societal concerns can arise when the realisation of a risk impacts on society as a whole. The impact may produce an adverse socio-political response (which has its origins in the public aversion to certain characteristics of the hazards concerned). The harm which results is a loss of confidence by society in the provisions and arrangements in place for protecting people and, consequently, a loss of trust in the regulator and duty-holders with respect to control of the particular hazard and hazards more generally. [Risk management: Expert guidance - Principles and guidelines to assist HSE]

Appendix B: Case Study Scoring Explained

Purpose

The Independent Reporter have used the scoring system set out below to allow comparison between case studies. Eight scores, on a scale of 1 to 5, have been assigned to each case study investigated against 8 key findings requirements as defined in the report scope.

Methodology

The 5 Case Studies investigated as part of this report have been scored against 8 key requirements as set out in the project scope; these are detailed in Table 9:

Table 9: Key Requirements

No.	Key Requirement
1	Is there evidence in this case study of Network Rail using and sharing good practice of what is reasonably practicable?
2	If the situation is unusual/complex was there evidence in this case study of Network Rail working from first principles to consider options with quantified costs and benefits?
3	In this case study, is there evidence of assessment of costs and the range of intended benefits (compliance, health and safety management improvement beyond compliance, performance, capacity or other business objectives)? Are suitable costs included and are they directly related to the safety issue in question?
4	Was there evidence in this case study of testing of, and governance of SFAIRP (So Far As Is Reasonably Practicable) ?
5	In this case study, was there effective project management in place to monitor and control costs and ensure that intended benefits are realised (including at what point do Network Rail re-examine original decisions)? Evidence on i) how long the intervention/initiative took compared to what was expected; ii) extent of costs incurred (compared to what was expected)
6	In this case study, was Network Rail’ s engagement with ORR and where applicable, other bodies (including Rail Safety and Standards Board (RSSB) and Rail Accident Investigation Branch (RAIB)) suitable and effective prior to and following the intervention?
7	In this case study, Is there evidence of both Regional and National approaches to reasonable practicability and the use of cost benefit analysis?
8	In this case study, are issues escalated effectively within Network Rail, and is there suitable engagement with ORR colleagues?

Scoring Scale

To score each key finding requirement, the Independent Reporter have adopted the terminology of the Risk Management Maturity Model (RM3) published by the ORR. To be clear, the Independent Reporter’s scoring is based on professional judgement and does not use the Risk Maturity Management Model process, only its terminology.

The definitions adopted by the Independent Reporter, from the Risk Maturity Management Model are shown below (Figure 1):

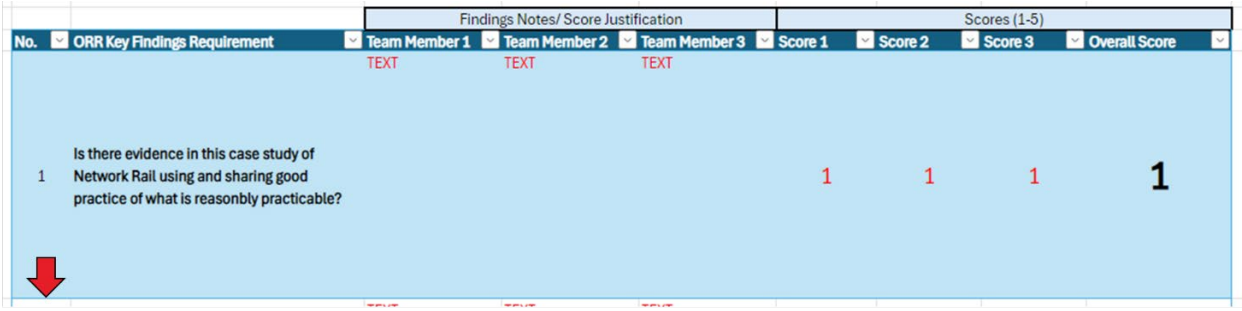
Excellence	It is characteristic of processes at this level that the focus is on continually improving process performance through both incremental and innovative technological changes / improvements.
Predictable	It is characteristic of processes at this level that, using process metrics, management can effectively control the AS-IS process (An "as is" business process defines the current state of the business process in an organisation). In particular, management can identify ways to adjust and adapt the process to particular projects, without measurable losses of quality or deviations from specifications. Process capability is established from this level.
Standardised	It is a characteristic of processes at this level that there are sets of defined and documented standard processes established and subject to some degree of improvement over time. These standard processes are in place (i.e. they are the AS-IS processes) and used to establish consistency of process performance across the organisation.
Managed	It is characteristic of processes at this level that some processes are repeatable, possibly with consistent results. Process discipline is unlikely to be rigorous, but where it exists it may help to ensure that existing processes are maintained during times of stress.
Ad-hoc	It is characteristic of processes at this level that they are (typically) undocumented and in a state of dynamic change, tending to be driven in an ad-hoc, uncontrolled and reactive manner by users or events. This provides a chaotic or unstable environment for the processes.

Figure 1: ORR Risk Management Maturity Model Scale Definitions (ORR, 2019)

Scoring Process

Each key requirement has been scored for the 5 case studies. The Independent Reporter undertook an initial scoring process, and then moderated the scores to derive the final number presented in this report. Both processes have received input from 3 team members who have investigated the material for the given case study.

Preliminary scores were collected using the table below (Figure 2). In this table, each team member has recorded their awarded integer score along with their findings/justification notes. An overall score was then calculated.



		Findings Notes/ Score Justification			Scores (1-5)			
No.	ORR Key Findings Requirement	Team Member 1	Team Member 2	Team Member 3	Score 1	Score 2	Score 3	Overall Score
		TEXT	TEXT	TEXT				
1	Is there evidence in this case study of Network Rail using and sharing good practice of what is reasonably practicable?				1	1	1	1

Repeated for each requirement (8)

Figure 2: Initial Scoring Process Table

The following table (Figure 3) has been used to present final moderated scores in this report. Finding notes and justification have been formally written, along with an 'Even better if' column for reporters to articulate missing process or evidence that is required to access higher scores. The final overall score, that has undergone the moderation process explained below (0), is presented here.

Key finding requirement	Evidence	Even better if	Score
1.Is there evidence in this case study of Network Rail using and sharing good practice of what is reasonably practicable?	Justification and evidence for awarded score	Improvements required for a higher score	3
2. If the situation is unusual/complex was there evidence in this case study of Network Rail working from first principles to consider options with quantified costs and benefits?	Repeated for each requirement (8)		3

Figure 3: Final Report Scoring Table

Moderation

To ensure a rigorous scoring process, scrutiny has taken place in the form of moderation. Each overall score given against the key finding requirements (as seen in Figure 2) has been moderated by the whole team as part of a moderation meeting conducted by the Project Manager and Project Director. The purpose of this meeting was to question both scoring and justification, placing emphasis on the testing of missing content or evidence, rather than material reviewed.

During this meeting, the following processes took place:

- Constructive debate discussing each overall score from each scoring team to arrive at a consensus rationale and moderated score.
- Ensure the recording of score justification from the initial process, with emphasis this time on recording differences in opinion in the individual evaluation scores to aid the completion of the 'even better if' column seen in Figure 3.
- Ensured the consensus discussion addresses all aspects of the evidence requirements, and that rationales are consistent with the stated evaluation criteria to provide a meaningful summary.

Appendix C: Review of Gross Disproportion Factors

Sector	Country	Organisation Type	Value for Preventing a Fatality (VPF)/Value of Statistical Life (VoSL)	Gross Disproportion Factors	Reference
General	United Kingdom (UK)	UK Health and Safety Executive (HSE)	-	**2-10** "Although there is no authoritative case law which considers the question, we (HSE) believe it is right that the greater the risk: the higher the proportion may be before being considered 'gross'. But the disproportion must always be gross" "We (HSE) believe it is right that, in all cases, the judgment as to whether measures are grossly disproportionate should reflect societal risk, that is to say, large numbers of people (employees or the public) being killed at one go. This is because society has a greater aversion to an accident killing 10 people than to 10 accidents killing one person each."	Risk management: Expert guidance - Principles and guidelines to assist HSE
Rail	United Kingdom	Non-mainline railway	Recalculated each year by RSSB.	**3**	-
Rail	United Kingdom	High speed railway	Recalculated each year by RSSB.	**3**	-
Rail	Australia	Rail Safety Regulator	VoSL $5.0m (2020 figures) AUD	**2-10** (reference to UK HSE)	Meaning of duty to ensure safety so far as is reasonably practicable
Rail	Canada	Mainline Railway Infrastructure Manager and Railway Operator	$8.5M (2020) CD	**3-8**	-
Rail	Ireland	Mainline Railway Infrastructure Manager and Railway Undertaking	A range of VPF is provided (2011 base price €2,310,500) -VPF 1 is the value of preventing a fatality used for accidents where the railway operator has prime duty of care (VPF x **3**) -VPF2 is the value of preventing a fatality used for accidents where the duty of care is shared between the railway operator and the person experiencing	No value given. Costs must be substantially greater. However, in the worked example provided in the safety management system guidance, an option with a cost benefit ratio 0.64 (or <1) was considered to support a judgement that cost is disproportionate to the safety benefit.	-

Sector	Country	Organisation Type	Value for Preventing a Fatality (VPF)/Value of Statistical Life (VoSL)	Gross Disproportion Factors	Reference
			the accident (VPF x **1**) -VPF3 is the value of preventing a fatality used for accidents where the person who suffers the accident is acting illegally. (VPF x **0.5**)		
Nuclear	United Kingdom	Independent Nuclear Safety Regulator	-	High risks suggest applying a disproportion factor of **10.**	ONR Framework Document Risk-informed regulatory decision-making: onr-rd-fw-001-risk-informed-regulatory-decision-making-rirdm.docx
Control Of Major Accident Hazards (COMAH)/offshore	United Kingdom	UK HSE	-	**1-10** "The difficulty lies in defining the upper limit of PF and the way PF increases with risk. An upper value for PF of 10 has been suggested, but the way PF changes with risk is still unclear."	Guidance on ALARP Decisions in COMAH - SPC/Permissioning/37 Annex 1; SPC Permissioning 37
COMAH/onshore/offshore installations	United Kingdom	Energy Operator	Reference to UK HSE 'Reducing Risks, Protecting People'	**1-100** "Gross Disproportion Factor is a value from 1 to 100 based on the base case Individual Risk Per Annum (IRPA) level and principle "higher the IRPA level higher GDF and, therefore, higher maximum justified spend (MJS)".	-

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