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Office of Rail and Road

#33582 – Scope 1 & 2 Carbon Emissions

Independent Reporter Review of Network Rail's response to the Stage 1 Report

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EXECUTIVE SUMMARY

Introduction

The Office of Rail and Road (ORR) and Network Rail are seeking to understand if Network Rail's Strategic Business Plan (SBP) forecasts of Scope 1 and 2 carbon emissions are realistic and supported by robust benchmarks, management and operational approaches for the period from April 2024 to March 2029, known as Control Period 7 (CP7).

In the role of Independent Reporter (IR), an AMCL-led team comprising AMCL, AQC, CPCS, and Eracura was appointed by ORR and Network Rail to undertake a two-stage review of Network Rail's Scope 1 and 2 carbon emissions forecasts for CP7.

The IR carried out Stage 1 of the review to identify whether Network Rail's plans and forecasts for decarbonisation of Scope 1 and 2 emissions in CP7 are robust, consistent, well evidenced and sufficient to meet the requirements of the High-Level Output Specifications (HLOSs) for England & Wales and Scotland and milestones set out in the Department for Transport (DfT) Rail Environment Policy Statement and the Transport Scotland (TS) Rail Services Decarbonisation Action Plan. These requirements and milestones are set out in the DfT Rail Environment Policy Statement and the TS Rail Services Decarbonisation Action Plan for England & Wales and Scotland respectively.

Stage 1 Findings

The IR reported Stage 1 findings in July 2023. The IR found that Network Rail's Scope 1 and 2 carbon emissions plans and forecasts for CP7 are sufficient to meet the core requirements of the HLOSs, DfT's Rail Environment Policy Statement and TS's Rail Services Decarbonisation Action Plan.

The IR found that the Region's forecasts of CP7 carbon emissions lacked consistency and would achieve carbon emissions reductions well in excess of the formal targets set within the SBPs. Inconsistencies and the degree to which forecasts were predicted to exceed the target were dependent on the methodologies applied by Regions to estimate carbon emissions reductions and the range of measures and initiatives included in each Region's forecasts. The IR additionally found a number of areas for improvement or development in the forecasts for Network Rail and ORR to consider in order to achieve best practice.

The IR Stage 1 report set out eight key findings and 15 recommendations, and assigned a priority level (Low, Medium, High) for each recommendation.

Stage 2 Response

During August and September, Network Rail reviewed the Stage 1 findings and developed a response in the form of an Action Plan setting out the proposed approach to address each of the Stage 1 recommendations. Network Rail additionally provided updated CP7 emissions forecasts for review by the IR which were designed to improve the consistency of presentation and reporting, in particular with respect to the range and types of measures and initiatives included in each Region's forecast.

The IR reviewed the updated forecasts and presented findings of this review to Network Rail and ORR in a workshop.

The IR subsequently reviewed Network Rail's Action Plan to address the full suite of recommendations.

Stage 2 Findings

The Stage 2 review has involved the IR reviewing updated Scope 1 and 2 carbon emissions forecasts provided by the Regions and an Action Plan produced by Network Rail to set out the procedures and approaches that will be undertaken to address the Stage 1 recommendations.

Updated Forecasts

The IR has found that the updated trajectories provided by the Regions for review provide a more consistent set of forecasts of CP7 decarbonisation than available for Stage 1 review, but variance and inconsistency still remain. The IR's main findings in relation to the updated forecasts are:

- the revised forecasts all predict potential carbon reductions that well exceed the SBP targets, in particular when Power Purchase Agreements (PPAs) and grid decarbonisation are included;
- variance in the Regions' forecasts relate to a range of factors including the contribution of emissions sources to each Region's baseline footprint, the methodologies and assumptions made in the forecasts, the funding secured for CP7, uncertainty in baseline energy consumption and emissions, and the success of decarbonisation during CP6; and
- the result of this is, while there is a good level of detail in each of the forecasts, it is the opinion of the IR that the forecast savings have sufficient inconsistency and uncertainty to limit the ability to set fair Region-specific updated targets or stretch targets at the time of writing.

The IR's review of the updated forecasts has led to three additional recommendations, which are described below. These recommendations are numbers 1, 4 and 5.

Action Plan

Overall, the IR has found Network Rail's response to the recommendations in the form of an Action Plan sets a robust and appropriate process for addressing the IR Stage 1 recommendations, with clearly defined timescales, ownership and accountability.

The Action Plan is though quite high-level and limited in detail. The Action Plan and workshops held with Network Rail during the Stage 2 review have identified to the satisfaction of the IR that Network Rail understand the Stage 1 recommendations, the reasons for each and the work required to adequately address them. However the IR's opinion relies on Network Rail carrying out the processes and workstreams described within the timescales set out in the Action Plan in a way which addresses the issues the recommendations relate to.

Provided the work set out in the Action Plan is well planned, robustly completed and implemented, it is the IR's opinion that it will place Network Rail in a strong position to deliver on the requirements of the HLOSs, DfT's Rail Environment Policy Statement and TS's Rail Services Decarbonisation Action Plan, achieve large reductions in Scope 1 and 2 emissions during CP7,

keep Network Rail ahead of its Science Based Targets Initiative (SBTi) trajectory, and place it in a robust position for PR28 and CP8.

Stage 2 Recommendations

In reviewing Network Rail's Action Plan and updated forecasts during this Stage 2 review, the IR makes the following further recommendations for Network Rail to consider in addressing the Stage 1 recommendations and developing its Delivery Plans for CP7:

- **Stage 2 – Recommendation 1**: Future revisions to CP7 forecasts should include the year-on-year trajectories recommended in Stage 1, following guidance set out in the guidance framework as described in the Action Plan.
- **Stage 2 – Recommendation 2**: The approach to forecasting Route Services Scope 1 and 2 carbon emissions in CP7 should be aligned with the Regions' approaches as far as practicable.
- **Stage 2 – Recommendation 3**: Network Rail must define whether to divide fuel from rail-based machines between the Regions' forecasts or keep it all within Route Services' forecast at an early stage as this will affect work being done to address other recommendations such as re-baselining (Stage 1 recommendation 4.1), updated forecasts (Stage 1 recommendation 1.2) and performance indicators and targets (Stage 1 recommendations 6.1 and 6.2).
- **Stage 2 – Recommendation 4:** Work on the ZEV rollout plan should be accelerated to deliver a strategy prior to CP7 commencement to maximise the prospects for successful accomplishment of the ZEV rollout by the December 2027 target date.
- **Stage 2 – Recommendation 5:** Work on the ZEV rollout plan should focus in the near term on development and installation of infrastructure, for which all Regions have secured substantial funding for CP7, as the infrastructure must come ahead of vehicle procurement in order to successfully achieve the ZEV rollout target.
- **Stage 2 – Recommendation 6**: Network Rail and ORR should agree clear boundaries for any revised or stretch targets, (e.g., inclusive or exclusive of grid decarbonisation and/or PPAs) at an early stage as this may influence the process with respect to other recommendations including re-baselining (Stage 1 recommendation 4.1) and updated forecasts and trajectories (Stage 1 recommendation 1.2).
- **Stage 2 – Recommendation 7**: Revision to targets or setting of stretch targets should be based on the updated forecasts produced following Network Rail guidance developed in response to Stage 1 recommendation 1.1 and not using the updated forecasts provide to the IR for Stage 2 review. This is due to residual inconsistencies found by the IR review of the updated forecasts.
- **Stage 2 – Recommendation 8:** The materiality of SF6 emissions should be considered in the context of the forecast CP7 exit/CP8 start position as part of the Network Rail review.

- **Stage 2 – Recommendation 9:** The materiality of refrigerant emissions should be considered in the context of the forecast CP7 exit/CP8 start position as part of the Network Rail review.

The following table provides a summary of the IR's Stage 2 review.

Stage 1 Recommendation		Network Rail Stage 2 Response	IR Stage 2 Finding
1.1	Network Rail should develop a guidance framework to support and assist Regions and central functions in the forecasting and reporting of CP7 Scope 1 and 2 carbon emissions.	Network Rail plans to develop a carbon emissions forecasting and reporting guidance framework to assist Regions in preparation of CP7 Delivery Plans. Network Rail plan to produce the guidance framework ahead of Delivery Plan preparation and periodically review and update it through CP7.	The IR finds that Network Rail's proposed approach if enacted is sufficient to address the recommendation.
1.2	Regions should develop updated CP7 decarbonisation forecasts to include year-by-year carbon emissions trajectories for CP7 to show the anticipated glide path for decarbonisation through CP7 and allow better monitoring of progress towards the decarbonisation target.	Network Rail provided updated forecasts of CP7 carbon emissions reductions for CP7, following a proforma produced by the Technical Authority (TA) and agreed with Regions to enable consistency between Regions. Network Rail plans to include guidance on developing year-by-year trajectories in its guidance framework for inclusion in final Delivery Plans.	The IR finds that the updated trajectories provided for Stage 2 review do not fully satisfy the recommendation as inconsistencies in forecasts remain and year-on-year trajectories have not yet been produced. The approach outlined by Network Rail to address this further during development of CP7 Delivery Plans is appropriate. **Stage 2 Recommendation 1:** Future revisions to CP7 forecasts should include the year-on-year trajectories recommended in Stage 1, following guidance set out in the guidance framework as described in the Action Plan.
2.1	Route Services should develop a CP7 carbon emissions forecast and decarbonisation plan.	Network Rail plans to develop and agree a methodology and then develop a forecast and trajectory for Route Services Scope 1 and 2 emissions over FY23/24 and FY24/25.	The IR finds that Network Rail's proposed approach is sufficient to address the recommendation. **Stage 2 Recommendation 2:** The approach to forecasting Route Services Scope 1 and 2 carbon emissions in CP7 should be aligned with the Regions' approaches as far as practicable.

Stage 1 Recommendation		Network Rail Stage 2 Response	IR Stage 2 Finding
2.2	Route Services should quantify Scope 1 carbon emissions from rail-based machines and include these in its baseline carbon footprint and future decarbonisation plans.	Network Rail has quantified its rail-based emissions and outlined a plan to analyse these to develop a baseline and decarbonisation plans looking at reduction options for CP7 and beyond during FY24/25.	The IR finds that Network Rail's proposed approach if enacted is sufficient to address the recommendation. **Stage 2 Recommendation 3:** Network Rail must define whether to divide fuel from rail-based machines between the Regions' forecasts, or keep it all within Route Services' forecast at an early stage as this will affect work being done to address other recommendations.
2.3	Route Services should develop or demonstrate the existence of a process of reporting and governance of its Scope 1 and 2 carbon emissions.	Network Rail plans to a develop a governance process for the Decarbonisation Programme in CP7 aligned to Route Services' sustainability goals, resources and regulatory obligations during FY23/24 for implementation in FY24/25.	The IR finds that Network Rail's proposed approach if enacted is sufficient to address the recommendation.

Stage 1 Recommendation		Network Rail Stage 2 Response	IR Stage 2 Finding
3.1	Network Rail should undertake a detailed review of the ZEV transition programme and implement a strategy for successful delivery of the required infrastructure across Network Rail, which will allow for setting of appropriate leading and lagging performance indicators to track success or identify delay in the ZEV transition, setting the focus on infrastructure delivery before vehicle procurement.	Network Rail has set out a process to develop a comprehensive plan and strategy for the transition to ZEV including engagement with the Regions through forums and workshops and approval by the Executive Leadership Team (ELT) and Board. The plan will be developed through FY23/24 and FY24/25. Plan development extends into FY24/25 but Network Rail has stated it will continue the ZEV transition during Plan development to avoid delays to overall implementation.	The proposed plan and strategy are sufficient to address the recommendations. They should provide adequate detail in relation to the ZEV Transition Plan which can then be scrutinized both within Network Rail and ORR. The proposed timescales for completion of the plan represent a risk to delivery as the plan is programmed for completion in FY24/25, leaving less than 2 years before the 2027 target date to implement and deliver the plan. **Stage 2 – Recommendation 4:** Work on the ZEV rollout plan should be accelerated to deliver a strategy prior to CP7 commencement to maximise the prospects for successful accomplishment of the ZEV rollout by the December 2027 target date. **Stage 2 – Recommendation 5:** Work on the ZEV rollout plan should focus in the near term on development and installation of infrastructure, for which all Regions have secured substantial funding for CP7, as the infrastructure must come ahead of vehicle procurement in order to successfully achieve the ZEV rollout target.

Stage 1 Recommendation		Network Rail Stage 2 Response	IR Stage 2 Finding
4.1	Network Rail should consider re-baselining its Scope 1 and 2 carbon emissions prior to CP7 to take into account data cleansing in CP6.	Network Rail plans to develop guidance for Regions to assure its baseline against and plan to develop updated baseline footprints alongside CP7 Delivery Plans.	The IR finds that Network Rail's proposed approach if enacted is sufficient to address the recommendation.
4.2	Network Rail should agree a consistent approach to treatment of tenants' energy within the carbon emissions reporting, in the event that further sub-metering of energy occurs during CP7.	Network Rail plans to provide guidance to Regions on treatment of tenants and sub-metered energy in the guidance framework developed in response to Recommendation 1.1.	The IR finds that Network Rail's proposed approach if enacted is sufficient to address the recommendation.
5.1	Network Rail should set out a clear process to assure the Region and Route Services plans and delivery.	Network Rail plans to provide guidance on assurance of plans in the guidance framework developed in response to Recommendation 1.1.	The IR finds that Network Rail's proposed approach if enacted is sufficient to address the recommendation provided assurance and governance is carried out by competent persons and overseen with sufficient commitment.
6.1	Network Rail should develop additional performance indicators to track key decarbonisation measures in CP7, in particular the ZEV transition and planned and costed energy efficiency measures.	Network Rail plans to develop additional performance indicators to track CP7 performance including costed energy efficiency measures and ZEV rollout.	The IR finds that Network Rail's proposed approach if enacted is sufficient to address the recommendation.

Stage 1 Recommendation		Network Rail Stage 2 Response	IR Stage 2 Finding
6.2	Network Rail should consider the development of a further ambition target for Scope 1 and 2 carbon emissions. This should be linked to the level of ambition set by the Regions and the degree to which CP7 carbon emissions are forecasts and may be Region or function specific. To focus any such target on measures over which Network Rail has control, grid decarbonisation (other than via direct wire PPAs) should be discounted from the target.	Network Rail intends to carry out re-evaluation of the waterfalls and develop Delivery Plan forecasts during FY23/24, which is linked to Network Rail's plans for the guidance framework (recommendation 1.1) which includes guidance on consistency and deliverables for the Delivery Plans.	The IR finds that Network Rail's proposed approach if enacted is sufficient to address the recommendation. **Stage 2 Recommendation 6:** It would be beneficial to define the boundaries of any revised or stretch targets, (e.g., inclusive or exclusive of grid decarbonisation and/or PPAs) at an early stage as this may influence the process with respect to other recommendations including re-baselining (recommendation 4.1) and updated forecasts and trajectories (recommendation 1.2). **Stage 2 Recommendation 7:** Revision to targets or setting of stretch targets should be based on the updated forecasts produced following Network Rail guidance developed in response to recommendation 1.1 and not using the updated forecasts provide to the IR for Stage 2 review. This is due to residual inconsistencies found by the IR review of the updated forecasts.
6.3	Network Rail should define how to equitably divide the carbon emissions benefits of non-traction PPAs between the Regions and central functions.	Network Rail plans to define the process for equitable apportionment of energy and carbon emissions savings from PPAs, test the process in Business as Usual (BAU) reporting within Regions and amend the process as required before formal implementation.	The IR finds that Network Rail's proposed approach if enacted is sufficient to address the recommendation.

Stage 1 Recommendation		Network Rail Stage 2 Response	IR Stage 2 Finding
7.1	Network Rail should develop a policy on the role of offsetting and how this can be investigated and used by Regions to offset residual Scope 1 and 2 emissions for CP8.	Network Rail plans to develop guidance on offsetting as part of the guidance framework produced in response to recommendation 1.1.	The IR finds that Network Rail's proposed approach if enacted is sufficient to address the recommendation.
8.1	Network Rail should commission a study to assess SF6 use and emissions on the network and undertake an optioneering study to identify potential strategies to reduce or eliminate SF6 gas use and release.	Network Rail plans to define the scope for assessing SF6 use and emissions, carry out an initial review and assessment, identify strategies to reduce or eliminate emissions and embed findings into decarbonisation plans.	The IR finds that Network Rail's proposed approach is sufficient to address the recommendation. **Stage 2 Recommendation 8:** The materiality of SF6 emissions should be considered in the context of the forecast CP7 exit/CP8 start position as part of the Network Rail review.
8.2	Network Rail should work to assess and quantify refrigerant use in Network Rail assets, estimate annual emissions from refrigerant leakage and include these emissions in ongoing Scope 1 and 2 carbon emissions reporting.	Network Rail plans to define the scope for assessing refrigerant use and emissions, carry out an initial review and assessment, identify strategies to reduce or eliminate emissions and embed findings into decarbonisation plans.	The IR finds that Network Rail's proposed approach is sufficient to address the recommendation. **Stage 2 Recommendation 9:** The materiality of refrigerant emissions should be considered in the context of the forecast CP7 exit/CP8 start position as part of the Network Rail review.

1 INTRODUCTION

The Office of Rail and Road (ORR) and Network Rail are seeking to understand if Network Rail's Strategic Business Plan (SBP) forecasts of Scope 1 and 2 carbon emissions are realistic and supported by robust benchmarks, management and operational approaches for the period from April 2024 to March 2029, known as Control Period 7 (CP7).

In the role of Independent Reporter (IR), an AMCL-led team comprising AMCL, AQC, CPCS, and Eracura was appointed by ORR and Network Rail to undertake a two-stage review of Network Rail's Scope 1 and 2 carbon emissions forecasts for CP7.

The IR carried out Stage 1 of the review to identify whether Network Rail's plans and forecasts for decarbonisation of Scope 1 and 2 emissions in CP7 are robust, consistent, well evidenced and sufficient to meet the requirements of the High-Level Output Specifications (HLOSs) for England & Wales and Scotland and milestones set out in the Department for Transport (DfT) Rail Environment Policy Statement and Transport Scotland (TS) Rail Services Decarbonisation Action Plan.

Network Rail has set a target to reduce Scope 1 and 2 carbon emissions by 46% by the end of CP7 in 2029 compared to a 2018-19 (CP5 exit) baseline position, aligned to Science Based Targets to meet net zero by 2050 (2045 in Scotland). ORR is also keen to understand if Network Rail's forecasts are sufficiently ambitious in relation to this target.

The IR reported Stage 1 findings in July 2023. During August and September, Network Rail reviewed the findings and developed a response. During Stage 2 the IR has reviewed this response and the findings are summarised in this report. The work sits within Phase 2 of the ORR Periodic Review 23 (PR23). PR23 consists of three Phases:

- Phase 1 of PR23 occurred in 2022 with Network Rail developing CP7 funding and outputs and DfT and TS producing HLOSs and Statements of Funds Available (SOFAs);
- Phase 2 occurred throughout 2023 and involved ORR scrutiny of Network Rail's detailed CP7 plans, leading to a Final Determination (FD) in autumn 2023;
- Phase 3 of PR23 is the implementation phase, which will take place in 2024 and in relation to Scope 1 and 2 carbon emissions will incorporate recommendations from the Stage 1 and Stage 2 IR reviews.

1.1 Stage 1 findings

The IR found that Network Rail's Scope 1 and 2 carbon emissions plans and forecasts for CP7 are sufficient to meet the core requirements of the HLOSs, DfT's Rail Environment Policy Statement and TS's Rail Services Decarbonisation Action Plan.

Each of the Regions has developed a robust plan for decarbonising non-traction Scope 1 and 2 emissions, which focusses on replacement of road vehicles (cars and vans) with electric or other Zero Emission Vehicles (ZEVs) by 2027, and a range of energy efficiency and renewable energy schemes to reduce energy consumption and carbon emissions. These plans have been allocated funding for CP7. At a national level, Network Rail is planning to deliver direct wire Power

Purchase Agreements (PPAs) for renewable non-traction electricity, the first of which is due to come online during the first year of CP7 in 2024/25.

The IR did not see evidence that Route Services has developed a CP7 decarbonisation plan in the same level of detail as the Regions, but it has a key function in the delivery of the transition to ZEVs by 2027. Route Services is also responsible for a fleet of rail-based machines, and the IR has found that emissions from fuelling these machines did not appear to be captured in Network Rail's carbon reporting and decarbonisation plans.

Network Rail has set a target for a 21% reduction in Scope 1 and 2 carbon emissions during CP7, which coupled with a predicted 25% reduction during CP6 would keep Network Rail on track to reduce carbon emissions by 46% compared to a CP5 exit (2018-19) baseline. This is aligned with a Science Based Target trajectory aligned to the 1.5 degree global warming pathway, (i.e., 2050 net zero).

All of the Regions have produced more detailed analysis of forecast CP7 decarbonisation than presented in their SBPs, and many of these have forecasted a CP7 carbon emissions saving well above the 21% target.

The IR found that Network Rail's decarbonisation plans and strategies are aligned to the requirements of the HLOSs and sufficient to achieve the carbon reduction targets set in the SBPs. However, there are a number of areas for improvement or development identified by the IR in relation to the CP7 Scope 1 and 2 carbon emissions forecasting for Network Rail and ORR to consider in order to achieve best practice.

The IR set out eight key findings and 15 recommendations, and assigned a priority level (Low, Medium, High) in the Stage 1 report. These are set out in Section 2.

1.2 Stage 2

Network Rail has reviewed the Stage 1 report and provided a response to each recommendation via a proforma which was then discussed in a workshop. In relation to recommendations 1.2 and 6.2, the Regions did further work to present revised forecasts and trajectories which were provided to the IR. The IR reviewed this information and liaised with the Regions to seek clarification where necessary. The findings of this review were presented to Network Rail and ORR in a workshop (see Section 2.1).

Network Rail subsequently provided an Action Plan to address the full suite of recommendations (see Section 2.2). These responses have been reviewed by the IR and our findings are set out in Section 2.3.

2 REVIEW OF NETWORK RAIL RESPONSE TO STAGE 1 FINDINGS

2.1 Network Rail Updated CP7 Forecasts

This section provides analysis by the IR of the Regions' CP7 forecasts of Scope 1 and 2 carbon emissions. The analysis is informed by revised CP7 carbon forecasts provided by Network Rail to the IR for the purposes of the Stage 2 review.

The analysis is intended to provide an overview of the potential carbon emissions reductions that are expected by Network Rail Regions during CP7 to inform discussions and decision making on the part of Network Rail and ORR in relation to targets and performance monitoring of Scope 1 and 2 decarbonisation during CP7. This section is supported by further technical detail in Appendix A.

2.1.1 Structure of Updated CP7 Forecasts

Following the Stage 1 report, Network Rail Technical Authority provided a template for the Regions to complete with the aim of providing a more consistent forecast of Scope 1 and 2 carbon emissions reductions during CP7.

The template included two parts; the first part invited the Regions to provide their CP5 exit[1] Scope 1 and 2 carbon emissions baseline (in tonnes of carbon dioxide equivalent (TCO_2e)), the forecast CP6 exit emissions[2], and the expected percentage emissions reduction achieved in CP6.

The second part of the template invited the Regions to provide forecast CP7 carbon emissions reductions in a number of consistent categories:

- **BAU energy savings:** this category is used to aggregate a suite of potential measures, all of which will deliver small carbon benefits, e.g., upgrades to electrical equipment, asset renewals, training and cultural policies, non-traction from traction energy, asset management, business practices.
- **Transition to ZEV (fuel reduction):** reduction in diesel and petrol fuel consumption as a result of the ZEV rollout.
- **Transition to ZEV (electricity use):** increase in electrical energy consumption as a result of EV charging.
- **Buildings interventions:** specific energy efficiency improvements in buildings and managed assets.
- **Solar:** solar energy projects such as photovoltaic (PV) panel installations on building roofs.
- **Data validation/R&D/Utilities:** data management, research and development of practices to reduce emissions from materials and waste, utilities upgrades and major stations (Southern Region only).
- **Offsetting:** Carbon offsetting schemes (Scotland's Railway only).

[1] CP5 exit is defined as the financial year 1st April 2018 to 31st March 2019.
[2] CP6 exit is the current financial year from 1st April 2023 to 31st March 2024.

Not all Regions have forecast emissions savings in CP7 in every category, but the framework allows for some improvement in consistency and comparability of reporting compared to the forecasts during the Stage 1 review.

All Regions have provided forecast savings from building interventions. However, Scotland's Railway has split these into two separate categories (funded and unfunded) which are reported separately in the following sections.

2.1.2 CP6 Exit Forecasts

The CP5 exit emissions and CP6 exit forecasts provided by the Regions are summarised in Table 2.1 below.

The CP5 exit forecasts are consistent with those provided for the Stage 1 review, with the exception of Scotland's Railway and Southern, which have provided updated baseline CP5 exit emissions.

Table 2.1 – Region Forecasts of Scope 1 and 2 Carbon Emissions at CP6 Exit and CP6 Reductions.

Region	CP5 Exit Baseline Emissions (TCO_2e)	CP6 Exit Forecast Emissions (TCO_2e)	Forecast CP6 Scope 1 & 2 Carbon Emissions Reduction (%)
Scotland's Railway	20,248	15,186	25.0%
Southern	45,268	33,951	25.0%
Eastern	56,286	42,500	24.5%
Wales and Western	36,763	24,767	32.6%
North West and Central	52,253	38,272	26.8%

The CP6 exit forecasts and percentage reductions can be compared to the CP6 Scope 1 and 2 carbon emissions reduction target of 25%. All Regions forecast achievement of this target, with the exception of a slight shortfall (0.5%) for Eastern Region. The IR understands this to be due to a work bank of energy efficiency measures for CP6 being delayed to CP7.

The forecast CP6 performance for Wales and Western (32.6%) is above the 25% target. The IR understands that a large contribution to this performance is related to CrossRail construction works west of Paddington, for which energy consumption and associated carbon emissions are included in Wales and Western's CP5 exit baseline, but no longer contribute since the Elizabeth Line is now complete and operational. The high reduction in emissions in CP6 could leave Wales and Western with a greater challenge in terms of achieving a comparable emissions reduction to other Regions in CP7.

2.1.3 Updated CP7 Forecasts

Network Rail invited Regions to provide updated forecasts as percentage savings relative to the forecast CP6 exit position. In addition to providing these percentage reductions, most Regions also provided the expected absolute reductions in emissions as TCO_2e.

The updated forecasts for CP7 provided by the Regions are summarised in Table 2.2 (as a percentage of CP6 exit) and Table 2.3 (as absolute carbon emissions in TCO_2e).

Table 2.2 – Region Forecasts of Scope 1 and 2 Carbon Emissions for CP7 as % of CP6 Exit

Name of Scheme/Category	Scotland's Railway	Southern	Eastern	Wales and Western	North West and Central
BAU Energy Savings [a]	1%	12.5%	5.4%	n/a	8%
Transition to ZEV (fuel reduction)	30%	13.2%	31.7%	13.2% [c]	32%
EV Charging (electricity use)	−5%	−1.4%	−9.5%	n/a	−5%
Buildings interventions (funded)	4%	12.6%	3.4%	6.8%	6%
Buildings interventions (unfunded)	3%	n/a	n/a	n/a	n/a
Solar	3%	0.2%	0.3%	Unknown [d]	n/a
Data Validation / R&D / Utilities	n/a	1.1%	n/a	n/a	n/a
Offsetting	Unknown [b]	n/a	n/a	n/a	n/a
Notes	[a] BAU assumptions vary greatly, e.g., no estimate (Wales and Western), 2% energy reduction during whole CP7 period (Scotland's Railway), 2% energy reduction per annum (Eastern), 4% energy reduction per annum (Southern). [b] Scotland's Railway has secured funding to mobilise local carbon offsetting schemes in CP7, which may not realise benefits until CP8. Estimate of CP7 carbon savings at funding stage was 1,314 TCO_2e, equivalent to a 9% saving vs. forecast CP6 exit position. [c] Wales and Western ZEV forecast includes net change in emissions from reduction in fuel and increase in electricity consumption. [d] Wales and Western solar project emissions savings included in building interventions (funded).				

Table 2.3 – Region Forecasts of Scope 1 and 2 Carbon Emissions for CP7 as TCO_2e

Name of Scheme/Category	Scotland's Railway	Southern	Eastern	Wales and Western	North West and Central
BAU Energy Savings [a]	181	4,950	2,301	No mass emissions savings provided by Wales and Western Region, only percentage savings.	No mass emissions savings provided by North West and Central Region, only percentage savings.
Transition to ZEV (fuel reduction)	4,620	5,256	13,465		
EV Charging (electricity use)	−710	−539	−4,018		
Buildings interventions (funded)	567	4,988	1,442		
Buildings interventions (unfunded)	454	n/a	n/a		
Solar	518	95	Unknown [c]		
Data Validation / R&D / Utilities	n/a	437	n/a		
Offsetting	Unknown [b]	n/a	n/a		
Notes	[a] BAU assumptions vary greatly, e.g., no estimate (W&W), 2% energy reduction during whole CP7 period (Scotland), 2% energy reduction per annum (Eastern), 4% energy reduction per annum (Southern). [b] Scotland's Railway has secured funding to mobilise local carbon offsetting schemes in CP7, which may not realise benefits until CP8. Estimate of CP7 carbon savings at funding stage was 1,314 TCO_2e, equivalent to a 9% saving vs. forecast CP6 exit position. [c] Eastern provided a forecast percentage emissions reduction from solar projects, but not a mass emissions saving.				

The IR notes that the final SBP's Scope 1 and 2 carbon emissions reduction target of 21% and existing Network Rail SBTi carbon target of 46% reduction for CP6 and CP7 combined are both linked to the CP5 exit baseline. The percentage reductions provided by the Regions and summarised in Table 2.2 relate to the CP6 exit figures and are therefore greater than if they were calculated against the CP5 exit baseline emissions.

2.1.4 IR Analysis of Updated CP7 Forecasts

The following section provides a summary of IR analysis of the Regions' CP7 Scope 1 and 2 carbon emissions forecasts (in relation to Stage 1 recommendation 1.2 (see Section 2.3.2). The analysis examines the potential carbon emissions reductions being forecast by the Regions to provide a guide to targets and performance indicators related to Stage 1 recommendation 6.2 (see Section 2.9.2).

The analysis examines the measures and initiatives included in the Regions' updated forecasts as described in Section 2.1.1, but also analyses two further decarbonisation measures not considered in the Region forecasts; PPAs and electricity grid decarbonisation.

To deliver a number of the measures such as the ZEV rollout and building interventions, the Regions have secured specific funding as part of SBP development. Other measures will be funded through budgets or projects that lie outside of environmental sustainability. Within this analysis, decarbonisation measures have therefore been grouped into three categories:

- **SBP Primary Carbon Benefits** – measures with funding secured from the SoFA where the primary purpose is carbon emissions reductions and where funding is controlled within Environmental Sustainability (ZEV rollout, funded building interventions, solar projects, data validation/R&D/utilities and offsetting).
- **SBP Secondary Carbon Benefits** – other measures for which funding is allocated primarily for purposes other than carbon emissions reduction, but which may also result in carbon emissions reductions. Funding is not directly seen, or controlled within, Environmental Sustainability. For example where equipment is replaced as part of upgrade or renewal and is more energy efficient.
- **Other measures and levers**: PPAs and grid decarbonisation.

As explained in Section 2.1.3, the Scope 1 and 2 carbon emissions targets presented in the final SBPs and Network Rail's CP6 and CP7 SBTi carbon target are all referenced to a CP5 exit baseline position. The updated forecasts summarised in Table 2.2 are referenced to the CP6 exit forecast position. It is the IR's view that focus should remain on the CP5 exit baseline for consistency with the existing SBTi and SBPs and the summary data provided in this section is in relation to CP5 exit. Further analysis showing the reductions relative to both the CP5 and CP6 exit positions is provided in Appendix A.

The Regions' updated CP7 Scope 1 and 2 carbon emissions forecast, including IR estimation of savings from PPAs and grid decarbonisation are summarised in Table 2.4. The table shows the savings from each category of measures and initiatives relative to the CP5 exit baseline, which is consistent with the CP7 targets described in the Regions' SBPs and the ORR Draft Determination. Further detailed analysis of the forecast savings from each individual measure/initiative is provided in Appendix A.

Table 2.4 – Summary CP7 Forecast CO_2e Reductions

Measures/Initiatives		Scotland's Railway w/Carbon Offset	Scotland's Railway w/o Offset	Southern	Eastern	Wales and Western	North West and Central
SBP Primary	ZEV Rollout	19.3%	19.3%	10.4%	16.8%	13.2%	19.8%
	Energy and Solar	5.4%	5.4%	11.2%	2.8%	4.6%	4.4%

Measures/Initiatives		Scotland's Railway w/Carbon Offset	Scotland's Railway w/o Offset	Southern	Eastern	Wales and Western	North West and Central
Carbon Benefits	Other Measures	6.5%	0.0%	1.0%	n/a	n/a	n/a
SBP Primary Carbon Benefits Total		**31.2%**	**24.7%**	**22.6%**	**19.6%**	**17.8%**	**24.2%**
SBP Secondary Carbon Benefits		3.1%	3.1%	10.9%	4.1%	0.0%	5.9%
SBP Primary + Secondary Carbon Benefits Total		**34.3%**	**27.8%**	**33.5%**	**23.7%**	**17.8%**	**30.0%**
PPA Overlay		6.4%	6.4%	6.4%	5.5%	5.8%	6.4%
SBP Primary + Secondary Carbon Benefits + PPA Total		**40.6%**	**34.2%**	**40.0%**	**29.2%**	**23.6%**	**36.5%**
Grid Decarb Overlay		14.6%	14.6%	14.0%	14.2%	13.8%	14.9%
Total Including Grid Decarb		**55.3%**	**48.8%**	**54.0%**	**43.4%**	**37.4%**	**51.3%**
Region SBP Forecast Reduction		*21.2%*	*21.2%*	*11.0%*	*20.0%*	*20.0%*	*21.0%*

2.1.4.1 IR Findings

The data in Table 2.4 demonstrates that when considering only the measures with funding primarily for decarbonisation, Scotland's Railway, Southern and North West and Central Regions all forecast emissions savings above their SBP target reduction. When SBP secondary carbon benefits and PPAs are included, (i.e., measures which are within Network Rail's control or influence), all Regions forecast emissions savings above their SBP target. For most Regions the forecasts far exceed the target.

When the effect of grid decarbonisation is layered into the forecasts, all Regions except Wales and Western are forecast to achieve emissions savings over double their SBP target.

The SBPs do not define which measures are included in the target, but based on the way success against the CP6 Scope 1 and 2 carbon emissions targets have been monitored and reported, it is the IR's opinion that Network Rail intends to include all potential benefits and reductions including grid decarbonisation. There is though scope to review this during the delivery plan development stage.

There is uncertainty in the forecasting of all benefits, which rely on various assumptions regarding the timing, cost, and performance of each of the measures and therefore some degree of uncertainty or risk is embedded in all stages of each forecast. In particular grid decarbonisation carries particular risk as it is outside of Network Rail's control as described in Section 6.5 of the Stage 1 report.

The variance in the Regions' forecasts relate to a range of factors including the contribution of emissions sources to each Region's baseline footprint, (i.e., the relative proportions of fuel and energy emissions), the methodologies and assumptions made in the forecasts, the funding secured for CP7, uncertainty in baseline energy consumption and emissions, and the success of decarbonisation during CP6. The result of this is, while there is a good level of detail in each of the forecasts, it is the opinion of the IR that the forecast savings in Table 2.4 have sufficient inconsistency and uncertainty to limit the ability to set fair Region-specific updated targets or stretch targets at the time of writing. Network Rail sets out in its Action Plan in response to the Stage 1 recommendations that a guidance framework will be developed and published to feed into further work as part of the Delivery Plan development that will allow a review of targets and ambition to be undertaken at that time.

The IR review of the updated forecasts has led to the three further recommendations, which are described in relation to relevant Stage 1 recommendations at Section 2.3.2.3 (Stage 1 recommendation 1.2) and 2.9.2.3 (Stage 1 recommendation 6.2).

2.2 Network Rail Action Plan

In addition to the provision of updated CP7 forecasts for review by the IR in Stage 2, Network Rail reviewed the key findings and recommendations from the Stage 1 report and responded, accepting the key findings and all 15 recommendations with proposed variations to five of the recommendations and setting out the process Network Rail will take going forward to address the recommendations.

The overall process Network Rail will take going forward is:

1. To develop a guidance framework for the Regions and Central functions in relation to Scope 1 and 2 emissions;
2. Embed the guidance into the CP7 Delivery Plan guidance and Business as Usual (BAU) business planning processes;
3. Include action on Scope 1 and 2 emissions in draft Delivery Plans in FY2023/24; and
4. Include action on Scope 1 and 2 emissions in final Delivery Plans by the end of FY2023/24.

Network Rail has produced an Action Plan which has been shared with the IR for this Stage 2 review which provides further detail and information on the proposed approach to address the recommendations of the Stage 1 review.

The Action Plan was presented to the IR and ORR as a Microsoft Excel™ workbook which provided details of the approach to addressing the Stage 1 recommendations, broken down into a number of separate components. The Action Plan column headings and content are as follows:

- Key Finding: The 'Key Finding' column sets out the Stage 1 Key Finding with reference to the IR Stage 1 report.
- Recommendation: The 'Recommendation' column presents the relevant recommendations related to each Key Finding from the IR Stage 1 report.
- Accept/Decline: The 'Accept/Decline' column confirms whether Network Rail accept the Stage 1 recommendations. For all recommendations, these are either recorded as *"Accept"* or *"Recommendation accepted with variation"*. Where variations are proposed they are included in the 'Comment' column.
- Comment: In the 'Comment' column Network Rail has set out the suggested variation to recommendations where relevant (the specific variations are detailed in later sections of this report). Network Rail also include in the 'Comment' column a brief summary of key points and tasks considered relevant to the achievement of the recommendation. The input typically extends to a few sentences and some bullet points. The level of detail provided is light, but nonetheless clear in demonstrating understanding of the point of each recommendation.
- Action Plan: In the 'Action Plan' column Network Rail describes the key processes, steps and deliverables required to address each recommendation. Similar to the 'Comment' column, the level of detail is relatively light, but nonetheless clear in setting the process and framework for achievement of the recommendations.
- Completion Date: The 'Completion Date' column provides details of the programmed delivery date for key deliverables, input and review/approval processes for addressing each recommendation. In the main, specific target dates have been proposed, but these are generally aligned to key process milestones such as Draft and Final Delivery Plans, CP7 commencement, and ends of calendar or financial years.
- Accountable: The 'Accountable' column provides details of specific individuals within Network Rail who assume accountability for each of the recommendations.
- Supporting: The 'Supporting' column provides details of specific individuals within Network Rail who will not be accountable for a recommendation, but will have a key role in supporting the accountable person. The Action Plan does not include detail of the particular roles and responsibilities of the supporting individuals.
- Status: The 'Status' column provides a single-word summary of the progress on each of the recommendation, which can be used to track progress with the Action Plan. At the time of IR review, all recommendations were marked as *"In Progress"* in the 'Status' column.

Overall, the Action Plan is a high-level document describing Network Rail's response to the Stage 1 recommendations and programme for achievement of the recommendations. Despite being light in detail, the Action Plan does set out a clear pathway and set of milestones and deliverables for addressing each of the recommendations which the IR has reviewed in this

Stage 2 report. Where relevant, specific content from the Action Plan is described in subsequent sections of this report when reviewing the response to individual recommendations.

Following an initial review of the Action Plan, the IR provided some comments and clarifications for Network Rail and hosted a workshop to discuss these points. Subsequently, Network Rail responded to these points and added a "NR Response" column to the Action Plan table to add further details of clarification where helpful.

The following sections summarise Network Rail's response to the recommendations and the IR's opinion of the adequacy of that response. Where relevant, further recommendations are provided.

2.3 Key Finding 1

There is inconsistency in approach to CP7 forecasting between Regions, but they are all likely to deliver the target.

2.3.1 Recommendation 1.1

Network Rail should develop a guidance framework to support and assist Regions and central functions in the forecasting and reporting of CP7 Scope 1 and 2 carbon emissions.

Priority: High

2.3.1.1 Network Rail Response

Network Rail accepted this recommendation. The Action Plan has committed to developing a guidance framework to support and assist the Regions and Central functions in the forecasting and reporting of CP7 Scope 1 and 2 carbon emissions addressing the issues raised by the IR in the Stage 1 review. The Action Plan states that the guidance framework will include the following key content:

- Agreed carbon emissions factors for energy and fuels;
- Guidance on accounting for PPAs and grid decarbonisation;
- Guidance on assumptions for forecasting BAU energy efficiencies/reductions;
- Guidance on forecasting energy consumption for Electric Vehicles (EVs) and ZEV fleet rollout;
- Advice on treatment of sub-metered energy, (e.g., tenants' energy) within energy consumption data;
- Guidance on the treatment of uncertainty in forecasting; and
- An agreed set of deliverables for CP7 Delivery Plans, (e.g., waterfall charts, year-by-year decarbonisation trajectories, written plan and supporting evidence).

The Network Rail Action Plan sets out a timescale for the development and implementation of the guidance to align with the production of Delivery Plans. In the short-term following submission of the Stage 1 report Network Rail Technical Authority provided a template for the Regions to complete with the aim of providing a more consistent forecast of Scope 1 and 2 carbon emissions reductions during CP7 (see Section 2.1.1).

2.3.1.2 IR Observations

Network Rail has described the key stages of development of the guidance framework, the main stages of which are to take place in FY23/24 to allow the guidance to be used in the development and production of Delivery Plans. Network Rail's plans also go beyond the Delivery Plan stage and outline the intention to review and improve the guidance regularly through CP7 to align with each business planning round in order to reflect learning and developments in best practice.

2.3.1.3 IR Findings

The proposed guidance framework for the forecasting and monitoring of Scope 1 and 2 carbon emissions appears sufficient to satisfy recommendation 1.1 of the Stage 1 report.

Network Rail's Action Plan aims to complete the guidance framework by the end of 2023 for use during development of CP7 Delivery Plans in Q1 2024. The timescales appear to the IR to be adequate and appropriate both in relation to the work required to develop the framework, and timetable ahead of CP7 commencement.

Network Rail has identified within the Action Plan, that the guidance framework would also be developed to address a number of other IR recommendations, which are recommendation 4.2 (treatment of tenants' energy), recommendation 5.1 (develop a framework for assurance), recommendation 6.3 (define how to equitably apportion the benefits of PPAs) and recommendation 7.1 (develop a policy on carbon offsetting).It is the opinion of the IR that the guidance framework is an appropriate vehicle to guide the achievement of these recommendations.

2.3.2 Recommendation 1.2

Regions should develop updated CP7 decarbonisation forecasts to include year-by-year carbon emissions trajectories for CP7 to show the anticipated glide path for decarbonisation through CP7 and allow better monitoring of progress towards the decarbonisation target.

Priority: Medium

2.3.2.1 Network Rail Response

Network Rail accepted the recommendation with a variation pointing to the work done in Stage 2 of this review to produce revised trajectories. The Regions developed revised trajectories between Stage 1 and Stage 2 and these have been provided to the IR for review. An IR analysis of the revised trajectories provided by the Regions is presented in Section 2.1 and Appendix A.

Network Rail's Action Plan states that this work will be updated to align with the guidance developed under recommendation 1.1 as part of the development of final Delivery Plans (see Section 2.3.1.1). The framework will include guidance for Regions on updated CP7 carbon forecasts using consistent approaches and assumptions, and the deliverables expected to be provided with final Delivery Plans.

2.3.2.2 IR Observations

The revised trajectories are more consistent and aligned than the trajectories provided for IR review during the Stage 1 review. The updated forecasts therefore provide a more robust comparison of the predicted CP7 Scope 1 and 2 emissions reductions between Regions.

The analysis in Table 2.4 (Section 2.1.4) shows that the predicted reductions all have the potential to exceed the relevant SBP targets (as identified in the Stage 1 review), but there is a relatively wide range in forecasts between Regions. Whilst a range in forecasts is expected due to differences in the geographies and asset portfolios of the Regions and the level of success in reducing Scope 1 and 2 emissions in CP6, the current breadth of predictions also reflects inconsistencies in the approaches to emissions forecasting. As such whilst the forecasts can now be more equitably compared, further refinement would be required to robustly allow individual Regional carbon targets to be assigned.

Network Rail's Action Plan for addressing the Stage 1 recommendations sets out the production of a guidance framework which will help reduce or eliminate many of the inconsistencies in the forecasting. Further development of CP7 forecasts and trajectories is planned for Delivery Plan development.

The updated trajectories only provide the CP7 exit view and do not include year-by-year trajectories as suggested in the recommendation. Network Rail's Action Plan sets out that these will be worked up as part of Delivery Plans following development of the guidance framework (Section 2.3.1.1).

2.3.2.3 IR Findings

The IR finds that the updated trajectories provided by the Regions for review provide a more consistent set of forecasts of CP7 decarbonisation than available for Stage 1 review. The revised forecasts all predict potential carbon reductions that well exceed the SBP targets, in particular when PPAs and grid decarbonisation are included, which have not been formally presented by Regions in the updated trajectories but have been estimated in IR analysis.

Network Rail's Action Plan approach that year-on-year trajectories will be developed during Delivery Plan stage, and form part of further refinement of the CP7 forecasts is sufficient to address recommendation 1.2.

The timescales for addressing the recommendation fit with delivery of the guidance framework and the development of Delivery Plans and therefore appear appropriate.

The IR recommends that future revisions to CP7 forecasts include the year-on-year trajectories recommended in Stage 1, following guidance set out in the guidance framework as described in the Action Plan.

2.4 Key Finding 2

The IR has not seen evidence that Route Services has fully quantified its Scope 1 and 2 emissions, developed a CP7 decarbonisation plan or have confidence that Route Services can meet the CP7 carbon reduction target.

2.4.1 Recommendation 2.1

Route Services should develop a CP7 carbon emissions forecast and decarbonisation plan.

Priority: High

2.4.1.1 Network Rail Response

Network Rail accepted the recommendation. The Action Plan sets out the intention to develop and agree a methodology and then develop a forecast and trajectory for Route Services Scope 1 and 2 emissions over FY23/24 and FY24/25 with deliverables, (e.g., waterfall charts) to be agreed.

2.4.1.2 IR Observations

The approach set out in the Action Plan appears appropriate, although the proposed timescales for completion run into FY24/25 and the start of CP7. It is understood the process for forecast development will be consistent with the process followed by the Regions. It is also understood that Route Services emissions will be reported with the existing "National" emissions category.

The Action Plan does not make clear whether the approach to forecasting of the Route Services carbon emissions will follow a consistent approach to that of the Regions.

2.4.1.3 IR Findings

The action set out in the Action Plan will address recommendation 2.1.

In terms of timescales, the proposed programme of works (which runs into FY24/25) will leave Route Services behind the Regions in terms of CP7 decarbonisation plans.

The IR recommends that the approach to forecasting Route Services Scope 1 and 2 carbon emissions in CP7 is aligned with the approach set out in guidance for the Regions as far as practicable and is delivered in a timeframe consistent with the Regions if possible.

2.4.2 Recommendation 2.2

Route Services should quantify Scope 1 carbon emissions from rail-based machines and include these in its baseline carbon footprint and future decarbonisation plans.

Priority: High

2.4.2.1 Network Rail Response

Network Rail accepted the recommendation. The Action Plan sets out the following approach to address the recommendation:

- rail-based machine emissions to be quantified by Route Services (Network Rail report this is now complete, but has not been shared with the IR for this review);
- define where these emissions will sit in Network Rail's carbon emissions baselines and reporting (i.e. within Route Services or within Regions);
- update carbon emission baselines where applicable to include emissions from rail based machines;
- undertake a high-level review of potential emissions reduction opportunities;
- progress to a detailed appraisal of opportunities including consideration to funding and research and development requirements; and
- publish a fully detailed comprehensive plan to align with publication of Final Delivery Plans.

Network Rail proposes it will complete this work in FY23/24 with a detailed plan emerging before the commencement of CP7. Network Rail has yet to define whether these emissions will

be managed centrally by Route Services or devolved to the Regions but sets out a step to do this.

2.4.2.2 IR Observations

Inclusion of the rail-based machine fuel purchased directly by Route Services in the National emissions reporting is likely to significantly increase the scale of the emissions reported as set out in the Stage 1 report. It is not clear to the IR how the targets related to these will be included in the emissions targets monitored by the ORR, i.e., whether these emissions will be divided between the Regions or owned solely by Route Services. If Network Rail choose to include these emissions in the Regions' reporting/targets, their addition would be sufficient to affect the deliverability of these targets and should therefore be carefully considered.

2.4.2.3 IR Findings

The action set out in the Action Plan will address the recommendation.

Network Rail propose to undertake the work required to quantify emissions from rail-based machines and develop a detailed plan for addressing these emissions by the start of CP7. It is the IR's opinion that these timescales are appropriate for the quantification of emissions and inclusion in CP7 forecasting and reporting, but may represent insufficient time for a detailed appraisal of decarbonisation opportunities.

It is likely that limited action will be available to Network Rail during CP7 to reduce emissions from rail-based machines given their long lifetimes (understood to be 20-40 years) and therefore the Stage 1 recommendation was intended to ensure that these emissions are appropriately reported and considered for future decarbonisation (i.e. in preparation for CP8 and beyond). Network Rail's Action Plan sets an adequate process to address this key recommendation.

The IR recommends that Network Rail must define whether to divide fuel from rail-based machines between the Regions' forecasts, or keep it all within Route Services' forecast at an early stage as this may affect work being done by them to address other recommendations such as re-baselining (recommendation 4.1), updated forecasts (recommendation 1.2) and performance indicators and targets (recommendations 6.1 and 6.2). It is the opinion of the IR that keeping these emissions all within Route Services footprint and forecast is the simplest and more appropriate approach.

2.4.3 Recommendation 2.3

Route Services should develop or demonstrate the existence of a process of reporting and governance of its Scope 1 and 2 carbon emissions.

Priority: Medium

2.4.3.1 Network Rail response

Network Rail accepted the recommendation. The Action Plan sets out an intention to a develop a governance process for the Decarbonisation Programme in CP7 aligned to Route Services' sustainability goals, resources and regulatory obligations during FY23/24 for implementation in FY24/25.

2.4.3.2 IR Observations

Network Rail's plans and procedures to address recommendation 2.3 appear well considered and thought through, with timescales aligned with other Route Services actions and recommendations.

2.4.3.3 IR Findings

The action set out in the Action Plan will address the recommendation.

In terms of timescales the Action Plan describes that the process will be developed ahead of CP7 commencement for implementation in CP7 Yr1 (FY24/25). This appears to the IR to be an appropriate and achievable timeframe for the work required.

2.5 Key Finding 3

The IR has seen insufficient detail in plans for the ZEV transition to have confidence in its success.

Recommendation 3.1

Network Rail should undertake a detailed review of the ZEV transition programme and implement a strategy for successful delivery of the required infrastructure across Network Rail, which will allow for setting of appropriate leading and lagging performance indicators to track success or identify delay in the ZEV transition, setting the focus on infrastructure delivery before vehicle procurement.

Priority: High

2.5.1.1 Network Rail Response

Network Rail accepted the recommendation. The Action Plan sets out a process to develop a comprehensive plan and strategy for the transition to ZEVs including engagement with the Regions and approval by the Executive Leadership Team (ELT) and Board.

Network Rail's Action Plan describes that the following key issues identified by the IR during the Stage 1 review will be addressed in the ZEV plan:

- Fleet rationalisation;
- Delivery of EV charging infrastructure;
- Vehicle supply/fleet transition; and
- Business change plans.

2.5.1.2 IR Observations

The Action Plan picks up the key issues and risks identified during the Stage 1 review and sets a clear framework to develop a detailed ZEV rollout strategy to address these issues and risks.

The Action Plan is light in detail on the ZEV plan, but from Stage 1 discussions with Route Services, the IR is aware that a large amount of work and preparation has been done in this area, but it is not clear that this has cascaded through to a clear centralised plan.

The timescales in the Action Plan to finalise the review stretch out to 2025 to ensure senior sign-off. It is however understood that the ZEV Transition Plan will continue whilst the review is undertaken to avoid any delays in delivery resulting from development of the plan.

2.5.1.3 IR Findings

The action set out in the Action Plan should provide the detail in relation to the ZEV Transition Plan which can then be scrutinised both within Network Rail and ORR.

It is the view of the IR that there is insufficient detail in the Action Plan or assurance on the process to remove the risks associated with the proposed timetable for the ZEV plan, which is not proposed for completion until the end of FY24/25. As the ZEV rollout target from DfT is December 2027, this would leave just over 20 months to deliver the plan and complete the ZEV rollout which is a very tight programme when taking account of the challenges to the ZEV rollout as examined in detail in the Stage 1 report.

The IR recommends that work on the ZEV rollout plan is accelerated to deliver a strategy prior to CP7 commencement in order to maximise the prospects for successful accomplishment of the ZEV rollout by the December 2027 target date.

The IR recommends that work on the ZEV rollout plan should focus in the near term on development and installation of infrastructure, for which all Regions have secured substantial funding for CP7, as the infrastructure must come ahead of vehicle procurement in order to successfully achieve the ZEV rollout target.

2.6 Key Finding 4

Network Rail's Scope 1 and 2 carbon footprint would benefit from re-baselining.

2.7 Recommendation 4.1

Network Rail should consider re-baselining its Scope 1 and 2 carbon emissions prior to CP7 to take into account data cleansing in CP6.

Priority: High

2.7.1.1 Network Rail Response

Network Rail accepted the recommendation. Network Rail plans to develop guidance for the Regions (see Section 2.3.1.1) to assure their baselines against and anticipate this to be submitted alongside draft Delivery Plans during FY23/24.

2.7.1.2 IR Observations

The plan set out by Network Rail includes consideration of the issues raised by the IR.

2.7.1.3 IR Findings

The action set out in the Action Plan will address recommendation 4.1.

In terms of timescales, the alignment of the work to the CP7 Delivery Plans in Q1 2024 is appropriate in the opinion of the IR both in terms of consistency with CP7 programme and the volume of work likely to be required.

2.7.2 Recommendation 4.2

Network Rail should agree a consistent approach to treatment of tenants' energy within the carbon emissions reporting, in the event that further sub-metering of energy occurs during CP7.

Priority: Medium

2.7.2.1 Network Rail Response

Network Rail accepted the recommendation. The Action Plan sets out that the issues raised by the IR will be addressed in the preparation of the guidance framework referred to in Section 2.2.1.1 during FY23/24 and its application in FY24/25. Network Rail plans to define the process of treating tenants' energy consumption, test the process in BAU reporting within Regions and amend the process as required before formal implementation.

2.7.2.2 IR Observations

The plan set out by Network Rail includes an appropriate procedure to address the recommendation including consideration of the issues raised by the IR in the Stage 1 review.

2.7.2.3 IR Findings

The action set out in the Action Plan will address recommendation 4.2.

In terms of timescales, the alignment of the work to the CP7 Delivery Plans in Q1 2024 is appropriate in the opinion of the IR both in terms of consistency with CP7 programme and the volume of work likely to be required.

2.8 Key Finding 5

The framework for assurance and governance of CP7 decarbonisation performance is not well developed.

2.8.1 Recommendation 5.1

Network Rail should set out a clear process to assure the Regions and Route Services plans and delivery.

Priority: Medium

2.8.1.1 Network Rail Response

Network Rail accepted the recommendation. The Action Plan sets out that the issues raised by the IR in relation to the assurance process will be addressed as part of the preparation of the guidance framework referred to in Section 2.3.1.1 during FY23/24 and will then be applied throughout CP7. The Action Plan describes the following key steps Network Rail intend to take:

- Define the process for assuring the Region and Route Services plans and delivery;
- Test assurance process arrangements with Route Services, TA and Regions;
- Amend assurance process as required; and
- Incorporate continuous review into relevant processes.

2.8.1.2 IR Observations

The Action Plan describes that an assurance framework will be developed for inclusion in the overarching guidance framework and references existing assurance processes that are carried

out, but does not provide detail on where responsibility for assurance will lie, (i.e., within the Regions, within the TA, or elsewhere).

2.8.1.3 IR Findings

The action set out in the Action Plan will address the recommendation provided assurance and governance is carried out by competent persons and overseen with sufficient commitment.

In terms of timescales, the alignment of the work to the CP7 Delivery Plans in Q1 2024 is appropriate in the opinion of the IR both in terms of consistency with CP7 programme and the volume of work likely to be required.

2.9 Key Finding 6

Additional performance indicators and targets for CP7 could be developed to assist in measuring the success of CP7 decarbonisation plans and increase ambition.

2.9.1 Recommendation 6.1

Network Rail should develop additional performance indicators to track key decarbonisation measures in CP7, in particular the ZEV transition and planned and costed energy efficiency measures.

Priority: High

2.9.1.1 Network Rail Response

Network Rail accepted the recommendation. The Action Plan sets out that additional metrics and performance indicators are being developed to track decarbonisation during FY23/24 and 24/25 and that this process will consider the issues raised by the IR, which includes indicators relevant to costed energy efficiency measures and the ZEV rollout.

The Action Plan includes relatively little detail on any additional metrics or performance indicators being considered or planned by Network Rail. The Action Plan describes a process of stakeholder engagement and agreement on metrics and performance indicators by the end of 2023, with development of a reporting process, consultation and finalisation/adoption in early in FY24/25 to fit into the regulatory reporting arrangements in line with annual data protocol updates from September to March (FY24/25).

2.9.1.2 IR Observations

The development and agreement of any additional performance indicators is likely to be reliant upon the completion of other recommendations. The most relevant are the ZEV Transition Plan (recommendation 3.1), and updated forecasts including year-on-year trajectories (recommendation 1.2). Timelines for development of these performance indicators is therefore likely to follow achievement of these primary actions and may be developed later in the process. This is broadly in line with the indicative timeframes described by Network Rail in the Action Plan although draft metrics are planned for agreement by the end of 2023.

2.9.1.3 IR Findings

The action set out in the Action Plan will address recommendation 6.1.

In terms of timescales, the setting of metrics and performance indicators described in the Action Plan is appropriate in relation to CP7 programming, but Network Rail should be conscious that agreement of metrics and performance indicators is likely to be dependent on work to address other recommendations which may delay finalisation or implementation.

2.9.2 Recommendation 6.2

Network Rail should consider the development of a further ambition target for Scope 1 and 2 carbon emissions. This should be linked to the level of ambition set by the Regions and the degree to which CP7 carbon emissions are forecast and may be Region or function specific. To focus any such target on measures over which Network Rail has control, grid decarbonisation (other than via direct wire PPAs) should be discounted from the target.

Priority: Medium

2.9.2.1 Network Rail Response

Network Rail accepted the recommendation with a variation on the basis that a full re-evaluation of the waterfalls is conducted to include consideration of likely risks and uncertainties which could affect budget and delivery timescales and the spread of investment across their Scope 1, 2 and 3 emissions reduction. The Action Plan sets out the following steps in the process:

- Initial update to forecasts to bring consistency (completed for Stage 2 review – see Section 2.1);
- Update forecasts against new guidance (see Section 2.3.1.1); and
- Delivery Plan forecasts to represent annual phasing (including rebaselining).

The Action Plan sets out an intention to carry out this re-evaluation of the waterfalls and develop Delivery Plan forecasts during FY23/24, which is linked to Network Rail's plans for the guidance framework (Section 2.3.1.1) which includes guidance on consistency and deliverables for the Delivery Plans. Accountability for this work is to be taken by Regional sustainability leads.

2.9.2.2 IR Observations

Network Rail undertook an initial re-evaluation of the CP7 decarbonisation forecasts and waterfalls as analysed in Section 2.1 and Appendix A and will continue to develop these through preparation of Delivery Plans. The analysis of the initial waterfalls has identified that there is still some work to do in aligning the forecasts and setting appropriate and achievable targets (including defining the boundaries of the targets). Network Rail sets out that development of targets will also involve engagement and discussion with ORR through the managing change process.

The IR's review of the updated forecasts (see Section 2.1.4) has found that while there is improvement in consistency of presentation in the forecasts and waterfalls, there remains a degree of inconsistency and uncertainty which limits the use of these forecasts to fairly and equitably set revised or stretched targets for Scope 1 and 2 carbon emissions. Further updates to forecasts during Delivery Plan development, following a consistent guidance framework, will provide a good platform for target setting.

2.9.2.3 IR Findings

The action set out in the Action Plan provides a sufficient framework to address recommendation 6.2.

The timescales set out in the Action Plan are in the opinion of the IR appropriate to address the recommendation, allowing for time to complete and publish the guidance framework and time to subsequently update the Region's forecasts and set targets as appropriate.

The IR recommends that it would be beneficial to define the boundaries of any revised or stretch targets, (e.g., inclusive or exclusive of grid decarbonisation and/or PPAs) at an early stage as this may influence the process with respect to other recommendations including re-baselining (recommendation 4.1) and updated forecasts and trajectories (recommendation 1.2). This is linked to analysis in Section 2.1 and Appendix A and residual inconsistencies found by the IR in review of the updated forecasts.

The IR additionally recommends that revision to targets or setting of stretch targets is based on the updated forecasts produced following Network Rail guidance developed in response to recommendation 1.1 (Section 2.3.1.1) and not using the updated forecasts provide to the IR for Stage 2 review (Section 2.1).

2.9.3 Recommendation 6.3

Network Rail should define how to equitably divide the carbon emissions benefits of non-traction PPAs between the Regions and central functions.

Priority: Medium

2.9.3.1 Network Rail Response

Network Rail accepted the recommendation. The Action Plan sets out that the issues raised by the IR in relation to PPAs will be covered in the development and application of the guidance framework referred to in Section 2.3.1.1 during FY23/24 and will then be applied to the development of Delivery Plans. Network Rail plans to:

- define the process for equitable apportionment of energy and carbon emissions savings from PPAs;
- test the process in BAU reporting within Regions; and
- amend the process as required before formal implementation.

The Action Plan describes that the process will be aligned with the development of the guidance framework and Delivery Plans for implementation prior to CP7 start, and embedded in BAU business planning guidance throughout 2024/25.

2.9.3.2 IR Observations

The guidance is an appropriate vehicle to define the approach to treatment of PPAs, but if these are to be included in the Regions' forecasts it will have an effect on a number of other recommendations such as targets (recommendation 6.2) and forecast trajectories (recommendation 1.2).

2.9.3.3 IR Findings

The action set out in the Action Plan will address recommendation 6.3.

In terms of timescales, the alignment of the work within the guidance framework and Delivery Plans for completion by CP7 start is appropriate in the opinion of the IR both in terms of consistency with CP7 programme and the volume of work likely to be required.

2.10 Key Finding 7

Network Rail has no policy on carbon offsetting.

2.10.1 Recommendation 7.1

Network Rail should develop a policy on the role of offsetting and how this can be investigated and used by the Regions to offset residual Scope 1 and 2 emissions for CP8.

Priority: Low

2.10.1.1 Network Rail Response

Network Rail accepted the recommendation with a variation specifying that the issues raised by the IR in relation to offsetting will be dealt with through the development of a guidance note rather than a policy. The Action Plan sets out that this will be covered in the development and application of the guidance framework referred to in Section 2.3.1.1 during FY23/24 and will then be applied to the development of Delivery Plans.

2.10.1.2 IR Observations

The inclusion of guidance on carbon offsetting within the guidance frameworks appears a suitable vehicle to address the recommendation.

2.10.1.3 IR Findings

The action set out in the Action Plan will address recommendation 7.1.

In terms of timescales, the alignment of the work within the guidance framework and Delivery Plans for completion by CP7 start is appropriate in the opinion of the IR both in terms of consistency with CP7 programme and the volume of work likely to be required.

2.11 Key Finding 8

Scope 1 emissions from SF6 use in electrical switch gear and refrigerant losses from cooling systems have not been considered in Network Rail's CP7 decarbonisation forecasts.

2.11.1 Recommendation 8.1

Network Rail should commission a study to assess SF6 use and emissions on the network and undertake an optioneering study to identify potential strategies to reduce or eliminate SF6 gas use and release.

Priority: Low

2.11.1.1 Network Rail Response

Network Rail accepted the recommendation with a variation, setting out a process to assess the materiality of these emissions prior to taking forward a feasibility study. Network Rail plans to define the scope for assessing SF6 use and emissions, carry out an initial review and assessment,

identify strategies to reduce or eliminate emissions and embed findings into decarbonisation plans.

2.11.1.2 IR Observations

The approach described by Network Rail appears robust and proportionate. The Action Plan makes reference to making a judgement on the materiality of SF6 emissions and feasibility of assessing these emissions in more detail, but does not detail how materiality will be defined. In line with the IR Stage 1 findings, the materiality of SF6 emissions should be considered in the context of the forecast CP7 exit/CP8 start position.

2.11.1.3 IR Findings

The action set out in the Action Plan will address recommendation 8.1.

The timescales for completion set out by Network Rail which extend to the end of 2025 are appropriate in the opinion of the IR as the recommendation relates to preparation for CP8, therefore it is not a high priority for completion prior to CP7 commencement.

The IR recommends that the materiality of SF6 emissions is considered in the context of the forecast CP7 exit/CP8 start position as part of the Network Rail review.

2.11.2 Recommendation 8.2

Network Rail should work to assess and quantify refrigerant use in Network Rail assets, estimate annual emissions from refrigerant leakage and include these emissions in ongoing Scope 1 and 2 carbon emissions reporting.

Priority: Low

2.11.2.1 Network Rail Response

Network Rail accepted the recommendation with a variation, setting out a process to assess the materiality of these emissions prior to taking forward a feasibility study. Network Rail plans to define the scope for assessing refrigerant use and emissions, carry out an initial review and assessment, identify strategies to reduce or eliminate emissions and embed findings into decarbonisation plans.

2.11.2.2 IR Observations

The approach described by Network Rail appears robust and proportionate. The Action Plan makes reference to making a judgement on the materiality of refrigerant emissions, but does not detail how materiality will be defined. In line with the IR Stage 1 findings, the materiality of refrigerant emissions should be considered in the context of the forecast CP7 exit/CP8 start position.

2.11.2.3 IR Findings

The action set out in the Action Plan will address recommendation 8.2.

The timescales for completion set out by Network Rail which extend to the end of 2025 are appropriate in the opinion of the IR as the recommendation relates to preparation for CP8, therefore it is not a high priority for completion prior to CP7 commencement.

The IR recommends that the materiality of refrigerant emissions is considered in the context of the forecast CP7 exit/CP8 start position as part of the Network Rail review.

3 CONCLUSIONS

The Stage 2 review has involved the IR reviewing updated Scope 1 and 2 carbon emissions forecasts provided by the Regions and review of an Action Plan produced by Network Rail to set out the procedures and approaches that will be undertaken to address the Stage 1 recommendations.

3.1 Updated Forecasts

Network Rail provided a template proforma to Regions and invited them to update their CP7 forecasts in line with the template to provide greater consistency between forecasts. This was primarily in response to the Stage 1 Key Finding 1 (recommendation 1.2) regarding inconsistency in forecasts and the need for updated forecasting. The IR finds that the updated trajectories provided by the Regions for review provide a more consistent set of forecasts of CP7 decarbonisation than available for Stage 1 review, but variance and inconsistency still remain. The IR's main findings in relation to the updated forecasts are:

- the revised forecasts all predict potential carbon reductions that well exceed the SBP targets, in particular when PPAs and grid decarbonisation are included as they were during CP6 (PPAs and grid decarbonisation have not been formally presented by Regions in the updated trajectories but have been estimated in IR analysis);
- variance in the Regions' forecasts relate to a range of factors including the contribution of emissions sources to each Region's baseline footprint, the methodologies and assumptions made in the forecasts, the funding secured for CP7, uncertainty in baseline energy consumption and emissions, and the success of decarbonisation during CP6; and
- the result of this is, while there is a good level of detail in each of the forecasts, it is the opinion of the IR that the forecast savings have sufficient inconsistency and uncertainty to limit the ability to set fair Region-specific updated targets or stretch targets at the time of writing.

The IR's review of the updated forecasts has led to three recommendations, which are described in Section 3.3. below. These recommendations are numbers 1, 6 and 7.

3.2 Action Plan

Network Rail provided the IR with an Action Plan for review which sets out the proposed approach to addressing the Stage 1 recommendations.

Overall, the IR has found Network Rail's response to the recommendations in the form of an Action Plan sets a robust and appropriate process for addressing the IR Stage 1 recommendations, with clearly defined timescales, ownership and accountability.

The Action Plan is though quite high-level and limited in detail. The Action Plan and workshops held with Network Rail during the Stage 2 review have identified to the satisfaction of the IR that Network Rail understand the Stage 1 recommendations, the reasons for each and the work required to adequately address them, however the IR opinion on the Action Plan relies on the assumption that Network Rail will carry out the processes and workstreams described within the timescales set out in the Action Plan.

Provided the work set out in the Action Plan is well planned, robustly completed and implemented, it is the IR's opinion that it will place Network Rail in a strong position to deliver on the requirements of the HLOSs, DfT's Rail Environment Policy Statement and TS's Rail Services Decarbonisation Action Plan, achieve large reductions in Scope 1 and 2 emissions during CP7, keep Network Rail ahead of its SBTi trajectory, and place it in a robust position for PR28 and CP8.

3.3 Stage 2 Recommendations

In reviewing Network Rail's Action Plan and updated forecasts during this Stage 2 review, the IR makes the following further recommendations for Network Rail to consider in addressing the Stage 1 recommendations and in developing its Delivery Plans for CP7:

- **Stage 2 – Recommendation 1**: Future revisions to CP7 forecasts should include the year-on-year trajectories recommended in Stage 1, following guidance set out in the guidance framework as described in the Action Plan.
- **Stage 2 – Recommendation 2**: The approach to forecasting Route Services Scope 1 and 2 carbon emissions in CP7 should be aligned with the Regions' approaches as far as practicable.
- **Stage 2 – Recommendation 3**: Network Rail must define whether to divide fuel from rail-based machines between the Regions' forecasts or keep it all within Route Services forecast at an early stage as this will affect work being done to address other recommendations such as re-baselining (Stage 1 recommendation 4.1), updated forecasts (Stage 1 recommendation 1.2) and performance indicators and targets (Stage 1 recommendations 6.1 and 6.2).
- **Stage 2 – Recommendation 4:** Work on the ZEV rollout plan should be accelerated to deliver a strategy prior to CP7 commencement to maximise the prospects for successful accomplishment of the ZEV rollout by the December 2027 target date.
- **Stage 2 – Recommendation 5:** Work on the ZEV rollout plan should focus in the near term on development and installation of infrastructure, for which all Regions have secured substantial funding for CP7 as the infrastructure must come ahead of vehicle procurement in order to successfully achieve the ZEV rollout target.
- **Stage 2 – Recommendation 6**: It would be beneficial to define the boundaries of any revised or stretch targets, (e.g., inclusive or exclusive of grid decarbonisation and/or PPAs) at an early stage as this may influence the process with respect to other recommendations including re-baselining (Stage 1 recommendation 4.1) and updated forecasts and trajectories (Stage 1 recommendation 1.2).
- **Stage 2 – Recommendation 7**: Revision to targets or setting of stretch targets should be based on the updated forecasts produced following Network Rail guidance developed in response to Stage 1 recommendation 1.1 and not using the updated

forecasts provide to the IR for Stage 2 review. This is due to residual inconsistencies found by the IR review of the updated forecasts.

- **Stage 2 – Recommendation 8:** The materiality of SF6 emissions should be considered in the context of the forecast CP7 exit/CP8 start position as part of the Network Rail review.
- **Stage 2 – Recommendation 9:** The materiality of refrigerant emissions should be considered in the context of the forecast CP7 exit/CP8 start position as part of the Network Rail review.

A APPENDIX A – UPDATED FORECASTS BY REGIONS

A.1 Introduction

This appendix provides further technical analysis by the IR of the Regions' CP7 forecasts of Scope 1 and 2 carbon emissions to support the review provided in Section 2.1.

This appendix provides a breakdown of the updated forecasts and carbon emissions savings for each of the categories included in the Network Rail template, and additional analysis to include PPAs and grid decarbonisation. The analysis is grouped for SBP Primary Carbon Benefits, SBP Secondary Carbon Benefits and Other measures and levers as described in Section 2.1.4.

The review is structured into the following categories:

- SBP Primary Carbon Benefits - ZEV Rollout: fuel reduction and electricity use;
- SBP Primary Carbon Benefits - Energy measures and interventions: including solar;
- SBP Primary Carbon Benefits – Other measures: data validation/R&D/utilities and offsetting;
- SBP Secondary Carbon Benefits: BAU energy savings;
- PPAs; and
- Grid decarbonisation.

As explained in Section 2.1.4, the Scope 1 and 2 carbon emissions targets presented in the final SBPs and Network Rail's CP6 and CP7 SBTi carbon target are all referenced to a CP5 exit baseline position and it is the IR's opinion that analysis of CP7 forecasts should therefore focus on performance relative to the CP5 exit position. Throughout this analysis, data are tabulated in relation to both the CP5 and CP6 exit positions for transparency, but data relevant to the CP5 exit baseline is highlighted in green for emphasis.

A.1.1 SBP Primary Carbon Benefits – ZEV Rollout

The ZEV rollout will reduce Scope 1 carbon emissions through the reduction in diesel and petrol fuel consumption associated with Network Rail's vehicle fleet. It will, though, lead to some increase in Scope 2 emissions associated with electricity needed to charge the electric vehicles.

The Regions' forecasts of the emissions savings from reduced fuel consumption due to the ZEV rollout are summarised in Table A1.1.

Table A1.1 – Forecast CO_2e Reduction from Fuel Savings Associated with ZEV Rollout

Region	Baseline Emissions CP5 Exit (TCO_2e)	Baseline Emissions CP6 Exit (TCO_2e)	Emissions Reductions (TCO_2e)	Emissions Reductions (% CP5 Exit)	Emissions Reductions (% CP6 Exit)
Scotland's Railway	20,248	15,186	4,620 [a]	22.8%	30.4%
Southern	45,268	33,951	5,256 [a]	11.6%	15.5%
Eastern	56,286	42,500	13,465 [a]	23.9%	31.7%
Wales and Western	36,763	24,767	6,551 [b]	17.8%	26.5%

Region	Baseline Emissions CP5 Exit (TCO_2e)	Baseline Emissions CP6 Exit (TCO_2e)	Emissions Reductions (TCO_2e)	Emissions Reductions (% CP5 Exit)	Emissions Reductions (% CP6 Exit)
North West and Central	52,253	38,272	12,247 [c]	23.4%	32.0%
Notes	[a] CO_2e reductions provided directly by the Region (see Table 2.3). [b] CO_2e reduction estimated based on data provided for Stage 1 review, which predicted circa 6,400 TCO_2e saving from fleet fuel and 2,400 TCO_2e increase from EV charging. The ratio between these values has been applied to the total net change calculated using the forecast percentage change in Table 2.2 (13.2% relative to CP5 exit). [c] CO_2e reduction calculated based on percentage reduction provided by Region (see Table 2.2).				

Scotland's Railway, Eastern and North West and Central Regions all forecast carbon emissions savings in the order of 23 to 24% (relative to the CP5 exit baseline) from reductions in fleet fuel due to the ZEV rollover. The forecast savings for Wales and Western and Southern are lower, which is related to high baseline energy consumption/emissions for both Regions, which results in fleet fuel contributing a smaller proportion of total baseline Scope 1 and 2 emissions.

The Regions' forecasts of the emissions increases from additional electricity consumption for EV charging are summarised in Table A1.2.

Table A1.2 – Forecast CO_2e Increases from Electricity for EV Charging Associated with ZEV Rollout

Region	Baseline Emissions CP5 Exit (TCO_2e)	Baseline Emissions CP6 Exit (TCO_2e)	Emissions Reductions (TCO_2e)	Emissions Reductions (% CP5 Exit)	Emissions Reductions (% CP6 Exit)
Scotland's Railway	20,248	15,186	-710 [a]	-3.5%	-4.7%
Southern	45,268	33,951	-539 [a]	-1.2%	-1.6%
Eastern	56,286	42,500	-4,018 [a]	-7.1%	-9.5%
Wales and Western	36,763	24,767	-1,698 [b]	-4.6%	-6.9%
North West and Central	52,253	38,272	-1,914 [c]	-3.7%	-5.0%
Notes	[a] CO_2e increases provided directly by the Regions (see Table 2.3). [b] CO_2e increase estimated based on data provided for Stage 1 review, which predicted circa 6,400 TCO_2e saving from fleet fuel and 2,400 TCO_2e increase from EV charging. The ratio between these values has been				

Region	Baseline Emissions CP5 Exit (TCO_2e)	Baseline Emissions CP6 Exit (TCO_2e)	Emissions Reductions (TCO_2e)	Emissions Reductions (% CP5 Exit)	Emissions Reductions (% CP6 Exit)
	applied to the total net change calculated using the forecast percentage change in Table 2.2 (13.2% relative to CP5 exit). [c] CO_2e increase calculated based on percentage increase provided by the Region (see Table 2.2).				

Forecast increases in emissions from EV charging range between 1.2% (Southern) and 7.1% (Eastern) relative to the CP5 exit baseline. The increases broadly reflect the relative fleet sizes. However, the range is also likely to be somewhat an artefact of different assumptions adopted by Regions in estimating the energy consumption from EVs and associated carbon emissions. Nonetheless, the increase in emissions is far outweighed by the forecast reductions from fleet fuel consumption shown in Table A1.1.

The net forecast reductions in CO_2e emissions from the ZEV rollout are summarised in Table A1.3. This combines the data in Table A1.1 and Table A1.2.

Table A1.3 – Net Forecast CO_2e Reductions Associated with ZEV Rollout

Region	Baseline Emissions CP5 Exit (TCO_2e)	Baseline Emissions CP6 Exit (TCO_2e)	Emissions Reductions (TCO_2e)	Emissions Reductions (% CP5 Exit)	Emissions Reductions (% CP6 Exit)
Scotland's Railway	20,248	15,186	3,910	19.3%	25.7%
Southern	45,268	33,951	4,717	10.4%	13.9%
Eastern	56,286	42,500	9,447	16.8%	22.2%
Wales and Western	36,763	24,767	4,853	13.2%	19.6%
North West and Central	52,253	38,272	10,333	19.8%	27.0%

Table A1.3 – Net Forecast CO_2e Reductions Associated with ZEV Rollout

Overall, the Regions are forecast to achieve carbon reductions of 10 to 20% in CP7 (relative to the CP5 exit baseline) as a result of the ZEV rollout. The range in performance relates to the relative size of each Region's vehicle fleet, the dominance of fleet fuel emissions in each Region's Scope 1 and 2 carbon footprint and the specific assumptions adopted by the Regions in forecasting the carbon benefits.

A.1.2 SBP Primary Carbon Benefits – Energy Measures and Interventions

The SBP primary carbon benefit energy measures and interventions include projects directed at improving building and asset energy efficiency and performance which are funded via the SBP with the main aim of decarbonisation. In some cases, these budgets remain in the control of Environmental Sustainability, (e.g., Southern) whereas in others, funds are distributed to route level. In relation to the updated forecasts provided by the Regions (Section 2.1.3) this includes funded buildings interventions and solar projects.

A summary of the forecast Scope 1 and 2 carbon emissions savings from these SBP primary carbon benefit energy measures and interventions is provided in Table A1.4.

Table A1.4 – Forecast CO_2e Reductions from SBP Primary Carbon Benefit Associated with Energy Measures and Interventions

Region	Baseline Emissions CP5 Exit (TCO_2e)	Baseline Emissions CP6 Exit (TCO_2e)	Emissions Reductions (TCO_2e)	Emissions Reductions (% CP5 Exit)	Emissions Reductions (% CP6 Exit)
Scotland's Railway	20,248	15,186	1,085 [a]	5.4%	7.1%
Southern	45,268	33,951	5,083 [a]	11.2%	15.0%
Eastern	56,286	42,500	1,573 [b]	2.8%	3.7%
Wales and Western	36,763	24,767	1,684 [c]	4.6%	6.8%
North West and Central	52,253	38,272	2,296 [c]	4.4%	6.0%
Notes	[a] CO_2e reduction for funded building interventions and solar (see Table A2.3). [b] CO_2e reduction for funded building interventions (Table 2.3) and reduction from solar calculated from percentage reduction (Table 2.2). [c] CO_2e reductions calculated from percentage reductions from funded building interventions (Table 2.2).				

Scotland's Railway, Wales and Western and North West and Central Regions forecast emissions savings of 4 to 5% of the CP5 exit baseline through SBP primary carbon benefit energy measures and interventions. Southern Region forecasts a much higher saving (11%) which, to some degree, reflects the fact that Southern Region has the largest current day energy consumption, thus has the biggest potential for savings.

Eastern Region forecasts slightly lower savings in CP7 (3%). It is the opinion of the IR that this is not materially lower than other Regions and is likely to reflect a number of variables including baseline energy consumption, nature of asset portfolio and forecasting assumptions.

A.1.3 SBP Primary Carbon Benefits – Other Measures

Two Regions (Scotland's Railway and Southern) have secured funding through the SBPs for other decarbonisation measures and initiatives that have not been explored by other Regions. For Southern, this relates to a suite of projects around data validation, R&D into reducing materials, and waste and utilities upgrades. For Scotland's Railway, funding is secured to kick start some local carbon offsetting projects.

Southern Region has provided an estimate of the carbon savings from its funded measures, but Scotland's Railway has not provided an estimate of the carbon savings from offsetting as there is considerable uncertainty and any reductions may not even be realised until CP8. For the purposes of this analysis, the estimated carbon saving for Scotland's Railway that was used to inform the SBP funding allocation (1,314 TCO_2e) has been assumed to provide indicative analysis. In the Summary table in the main body of this report (see Table 2.4 in Section 2.1.4), the forecast CP7 carbon emissions performance for Scotland's Railway is provided with, and without, offsetting for comparison.

A summary of the forecast Scope 1 and 2 carbon emissions savings from these SBP primary carbon benefit other measures is provided in Table A1.5.

Table A1.5 - Forecast CO_2e Reductions from SBP Primary Carbon Benefit Associated with Other Measures

Region	Baseline Emissions CP5 Exit (TCO_2e)	Baseline Emissions CP6 Exit (TCO_2e)	Emissions Reductions (TCO_2e)	Emissions Reductions (% CP5 Exit)	Emissions Reductions (% CP6 Exit)
Scotland's Railway	20,248	15,186	1,314 [a]	6.5%	8.7%
Southern	45,268	33,951	437 [b]	1.0%	1.3%
Eastern	56,286	42,500	n/a	n/a	n/a
Wales and Western	36,763	24,767	n/a	n/a	n/a
North West and Central	52,253	38,272	n/a	n/a	n/a
Notes	[a] CO_2e reduction for offsetting is estimate from data provided by Scotland's Railway for the Stage 1 review. There is considerable uncertainty about this value so it should be reviewed indicatively only. [b] CO_2e reduction for data validation/utilities/R&D (see Table 2.3).				

Southern Region forecasts small carbon savings (1.0% of CP5 exit) from these other measures. The forecast saving from offsetting for Scotland's Railway (6.5% of CP5 exit) is sizeable, but has a very high degree of uncertainty associated with it.

A.1.4 SBP Secondary Carbon Benefits

In addition to Scope 1 and 2 carbon emissions savings that can be achieved through projects and initiatives funded primarily for carbon reduction, such as the ZEV rollout and building energy efficiency projects, the Regions also expect some level of carbon reduction from Network Rail projects where the primary purpose for funding is not carbon reductions, but through which carbon reductions are likely to be a secondary benefit. Such measures include upgrades to electrical equipment, asset renewals, training and cultural policies, non-traction from traction energy, asset management, and business practices.

A summary of the forecast Scope 1 and 2 carbon emissions savings from these SBP secondary carbon benefit measures is provided in Table A1.6.

Table A1.6 – Forecast CO_2e Reductions from SBP Secondary Carbon Benefit Measures

Region	Baseline Emissions CP5 Exit (TCO_2e)	Baseline Emissions CP6 Exit (TCO_2e)	Emissions Reductions (TCO_2e)	Emissions Reductions (% CP5 Exit)	Emissions Reductions (% CP6 Exit)
Scotland's Railway	20,248	15,186	635 [a]	3.1%	4.2%
Southern	45,268	33,951	4,950 [b]	10.9%	14.6%
Eastern	56,286	42,500	2,301 [b]	4.1%	5.4%
Wales and Western	36,763	24,767	0 [c]	0.0%	0.0%
North West and Central	52,253	38,272	3,062 [d]	5.9%	8.0%
Notes	[a] CO_2e reduction for BAU energy savings and unfunded building interventions (see Table 2.3). [b] CO_2e reduction for BAU energy savings (see Table 2.3). [c] No secondary carbon benefits estimated. [d] CO_2e reductions calculated from percentage reductions from BAU energy savings (Table 2.2).				

Forecast carbon savings range considerably between not being included in the forecast at all (Wales and Western) and 10.9% (Southern Region) relative to the CP5 exit position.

The IR has discussed these BAU carbon reductions with all Regions and it is clear that there are significant differences in the assumptions adopted by the Regions in forecasting these emissions savings, but also a large degree of uncertainty about the level of reduction that might be seen.

The savings relate to a very large number of projects across the network and schemes all contributing very small improvements in energy performance and reduction in carbon emissions. As such, it is not practical or possible for the Regions to forecast the carbon savings

in detail, and therefore they have used high-level approximations. The assumptions are understood by the IR to be as follows:

- Scotland's Railway: assume 2% reduction in total energy consumption for the whole CP7 period;
- Southern: assume 4% reduction in energy consumption per annum during CP7;
- Eastern: assume 2% reduction in energy consumption per annum during CP7;
- Wales and Western: no estimate due to uncertainty; and
- North West and Central: assume 8% reduction in carbon emissions relative to CP6 exit.

It is the opinion of the IR that there can be confidence that some carbon reductions will be achieved through SBP secondary carbon benefit measures, however the level of benefit carries considerable uncertainty. Whilst there appears to be some justification for a range in performance between Regions depending on specific geographies and asset portfolios, for the purposes of forecasting, it would seem most equitable for Regions to adopt a consistent assumption in relation to reductions in energy consumption and emissions related to these measures. Network Rail has made clear in its Action Plan that guidance to ensure consistent and equitable assumptions on BAU energy efficiencies and reductions will be included in the guidance framework developed in response to recommendation 1.1. (see Section 2.3.1.1).

The IR considers that Wales and Western's approach to exclude these measures from the forecast due to uncertainty, whilst having some justification, is overly conservative, whilst the assumption adopted by Southern appears very optimistic. The middle ground adopted by Scotland's Railway, Eastern and North West and Central that leads to around 3 to 5% reductions in emissions being forecast appears the most reasonable.

A.1.5 Power Purchase Agreements

In addition to the carbon savings attributed directly to the Regions, Network Rail has recently signed a solar power agreement with EDF Renewables UK, which will provide 49.9 megawatts of renewable energy. As set out in Network Rail's National (England and Wales) SBP, it is anticipated that this PPA will contribute approximately 15% of Network Rail's annual non-traction energy demand.

The carbon benefits of this PPA have not been included in any of the Regions' CP7 carbon forecasts and trajectories and therefore has the potential to realise additional carbon reductions to those presented in the forecasts. To provide an indication to ORR of the potential reductions this will bring, the IR has estimated the potential carbon savings from the PPA agreement for all Regions[3].

The estimation is based on a 15% reduction in the latest year (Year 4 of CP6) carbon emissions from electricity, (i.e., Scope 2 emissions), which are presented in Appendix A of the Stage 1 report.

The calculation is summarised in Table A1.7; this approach is considered to provide a reasonable approximation of the likely emissions savings for indicative purposes, but will not be entirely accurate. The estimate is based on a 15% saving in current emissions and therefore does not

[3] Whilst the announcement relates to England and Wales, it is assumed that Scotland's Railway will also benefit from the PPA.

include the additional electricity demand associated with the ZEV transition. This is because the National (England and Wales) SPB is not explicit about the baseline against which the estimate of a 15% reduction in non-traction energy has been made, and given the PPA is due to commence in 2024, it seems appropriate to discount electricity for EV charging as the majority of the ZEV rollout will post-date the introduction of the PPA. This is another reason why the estimate by the IR is indicative, but a more accurate estimate of carbon savings from PPA can be made by Network Rail as part of work towards the CP7 Delivery Plans and addressing the recommendations of the Stage 1 report.

Whilst the IR understands that Network Rail are continuing to explore PPA agreements for later Control Periods, the analysis has not forecast continued savings beyond the PPA announced in the National (England and Wales) SBP.

Table A1.7 – Forecast CO_2e Reductions from PPA

Region	Baseline Emissions CP5 Exit (TCO_2e)	Baseline Emissions CP6 Exit (TCO_2e)	CP6 Yr6 Scope 2 Emissions (TCO_2e)	Emissions Reductions (TCO_2e)	Emissions Reductions (% CP5 Exit)	Emissions Reductions (% CP6 Exit)
Scotland's Railway	20,248	15,186	8,578	1,287	6.4%	8.5%
Southern	45,268	33,951	19,460	2,919	6.4%	8.6%
Eastern	56,286	42,500	20,673	3,101	5.5%	7.3%
Wales and Western	36,763	24,767	14,164	2,125	5.8%	8.6%
North West and Central	52,253	38,272	22,425	3,364	6.4%	8.8%

The Regions are forecast to achieve carbon reductions of around 6% in CP7 (relative to the CP5 exit baseline) as a result of the PPA. The range in absolute carbon emissions reductions relates to the electricity consumption currently associated with each Region; for example, Southern, Eastern and North West and Central have greater electricity consumptions than Scotland's Railway and Wales and Western, due to their relative sizes and asset portfolios.

It should be noted that it is not clear to the IR if Scotland will be included in the PPA, as this is announced in the National (England and Wales) SBP. However, for comparative purposes it is assumed the energy would also be shared with Scotland's Railway.

A.1.6 Grid Decarbonisation

The Government has published energy and emissions projections[4] for 2021 to 2040 in line with its trajectory toward net zero for the power sector. For CP7, the projections estimate a 37% reduction in carbon intensity from the grid.

The IR has estimated the carbon savings from the decarbonisation of the grid for all Regions based on a 37% reduction[5] in the latest year (Year 4 of CP6) of carbon emissions from electricity, (i.e., Scope 2 emissions) available from the Regions, as summarised in Appendix A of the Stage 1 report. The calculation is summarised in Table A1.8. Given that the grid decarbonisation will take place over several years, the calculation takes into account the additional electricity demand as a result of the ZEV rollout, as well as the 15% reduction brought about by the PPA in 2024.

Table A1.8 – Forecast CO_2e Reductions from Grid Decarbonisation

Region	Baseline Emissions CP5 Exit (TCO_2e)	Baseline Emissions CP6 Exit (TCO_2e)	CP6 Yr6 Scope 2 Emissions (TCO_2e)	Emissions Reductions (TCO_2e)	Emissions Reductions (% CP5 Exit)	Emissions Reductions (% CP6 Exit)
Scotland's Railway	20,248	15,186	8,578	2,960	14.6%	19.5%
Southern	45,268	33,951	19,460	6,320	14.0%	18.6%
Eastern	56,286	42,500	20,673	7,988	14.2%	18.8%
Wales and Western	36,763	24,767	14,164	5,083	13.8%	20.5%
North West and Central	52,253	38,272	22,425	7,761	14.9%	20.3%

The Regions are forecast to achieve carbon reductions of 14 to 15% in CP7 (relative to the CP5 exit baseline) as a result of grid decarbonisation. The range in absolute carbon emissions reductions relates to the electricity consumption currently associated with each Region; for example, Southern, Eastern and North West and Central have greater electricity consumption than Scotland's Railway and Wales and Western, due to their relative sizes.

[4] Department for Energy Security and Net Zero (2023) Energy and emissions projections: 2021 to 2040: https://www.gov.uk/government/publications/energy-and-emissions-projections-2021-to-2040

[5] In the Stage 1 report it was identified that some Regions had applied a higher grid decarbonisation forecast (58%). The analysis has therefore applied the lower value to be conservative.