FY23/24 Carbon Inventory, Progress Against the Baseline & Net Zero Roadmap

East Midlands Rail

June 2024

Quality Control and preface

Project: 70102969 - East Midlands Rail FY23/24 GHG Footprint and Scenario 6

Project Task: Carbon baseline, Net zero modelling across all three scopes based on specific assumptions for EMR and societal trends, SBTi tracker

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Date: 28/06/2024

Scope of this project:
WSP worked with EMR to calculate their greenhouse gas emissions for the reporting period 01/04/2023 to 31/03/2024. The calculations were carried out in alignment with the Greenhouse Gas Protocol Corporal Accounting Reporting and Standard and Science Based Targets Initiative (SBTi). Additionally, updates to the net zero modelling was undertaken to model an updated trajectory based on information obtained from Network Rail. We have also provided EMR with a tracker to understand their progress on reaching their SBTi targets.

Aims of this report:
- To provide an overview of work undertaken to date, the project outcomes, and the context for the project.
- To provide EMR with an understanding of their carbon footprint
- To provide EMR with an understanding of the net zero modelling that represents a true and fair trajectory of EMR's emissions and societal trends up to 2050.
- To provide EMR with an update on their progress to reaching net zero, and a tool to track their progress again in the future.

WSP EMR

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Introduction to the report and project

Introduction

This report is a development of the presentation '*EMR Carbon Inventory and Net Zero Roadmap*' WSP compiled for EMR. WSP submitted the previous report to EMR on the 28th March 2024 as part of the previous commission.

Included in this report is:

- An **overview of the work we have completed with EMR to date**, including a summary of the methodology and outputs of each project.
- The **importance of companies aiming for net zero** and reducing greenhouse gas emissions.
- An **explanation of the criteria for developing Science Based Targets** (SBTs) and **EMR's progress on submitting SBT's** to the Science Based Target initiative (SBTi).
- A summary of **EMR's carbon inventory for the most recent financial year** (FY2023/24), including a breakdown of EMR's emissions by scope.
- A visual of **EMR's net-zero roadmap**, highlighting the key dates and commitments EMR have agreed to in order to reach net-zero.
- Based on EMR's most recent carbon inventory, WSP have also analysed the **progress EMR have made against their net zero targets**, and whether EMR are currently aligned with their net-zero trajectory.
- The **assumptions used in the net zero model** and the key dates in the different scenarios are also included for information.

Overview of the commission

In 2021, as a part of the Transport Decarbonisation Plan, The Department for Transport issued a contractual obligation for Train Operating Companies (TOC's) to reach net zero by 2050. As a result, WSP was commissioned by EMR in October 2023 to support in this transition. Over the following six months, WSP completed carbon footprint calculations, developed a net zero model and assisted with the SBTi submission process. In May 2024, EMR re-commissioned WSP to assist with the calculation of their carbon footprint for their most recent financial year and provide an update to the net zero model following contradictory anecdotal information provided by Network Rail regarding their renewable energy ambitions. WSP also provided EMR with a tracking facility to assess their progress on meeting their net zero targets and ensuring they remain on the correct trajectory. A summary of the methodology and output of both these projects can be found below:

Project 1 (October 2023 – April 2024): Development of EMR's carbon baseline, net zero model and SBTi submission

Methodology:

- Calculate a representative and accurate GHG footprint of EMR's emissions for FY2021/22 and FY 2022/23 (baseline).
- Conduct workshop with key EMR stakeholders to understand potential opportunities for decarbonising and reducing emissions.
- Develop net zero model comprising of five different scenarios to establish when EMR can reach net-zero.
- Develop near-term and net-zero targets based on the net-zero model created by WSP and the SBTi online resources and tools.
- Support EMR submit commitment letter and targets to the SBTi.

Outputs:

- ✓ FY2021/22 GHG Footprint
- ✓ Baseline FY2022/23 GHG Footprint
- ✓ Net Zero Model comprising of five different scenarios
- ✓ Net Zero Roadmap PowerPoint
- ✓ Completed SBTi submission form

Project 2 (May 2024 – July 2024): Calculation of EMR's FY2023/24 carbon footprint and Scenario 6 net-zero modelling

Methodology:

- Kick-off call with EMR to discuss any changes to the methodology for FY2023/24 (inclusion of refrigerant gas emissions in footprint).
- Calculate a representative and accurate GHG footprint of EMR's emissions for FY2023/24.
- Expand the net zero model to include 'Scenario 6' . Scenario 6 is based on the same rolling stock replacement actions as Scenario 5. They key difference is Scenario 6 assumes traction electricity will decarbonise in line with the national grid, instead of relying on the implementation of REGO backed traction electricity.
- Addition of a facility to track EMR's annual performance against the proposed science-based target pathway.

Outputs:

- ✓ FY2023/24 GHG Footprint
- ✓ Updated Net-Zero Model with the addition of a sixth scenario
- ✓ Net Zero Roadmap PowerPoint
- ✓ SBTi Progress Tracker

Why Net Zero?

Introduction

This section of the report provides the context as to why EMR should be committing to reducing their greenhouse gas emissions and reaching net-zero before 2050.

WSP have also compiled some key points in time which are relevant to EMR as a TOC in the UK for awareness, but also to ensure they are reaching key deadlines which are required of them.

Finally, the main drivers and benefits for EMR are provided to show there are other benefits for companies by developing emission reduction targets and net-zero targets.

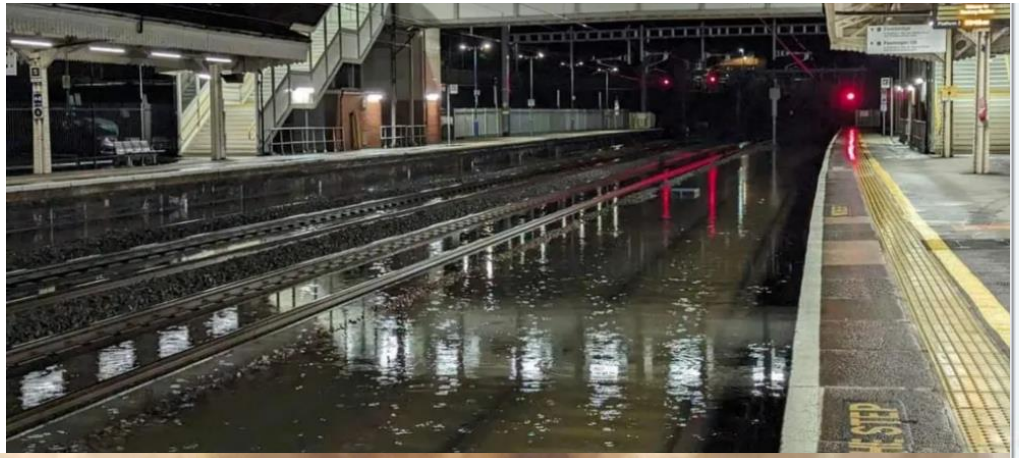
The Climate Emergency

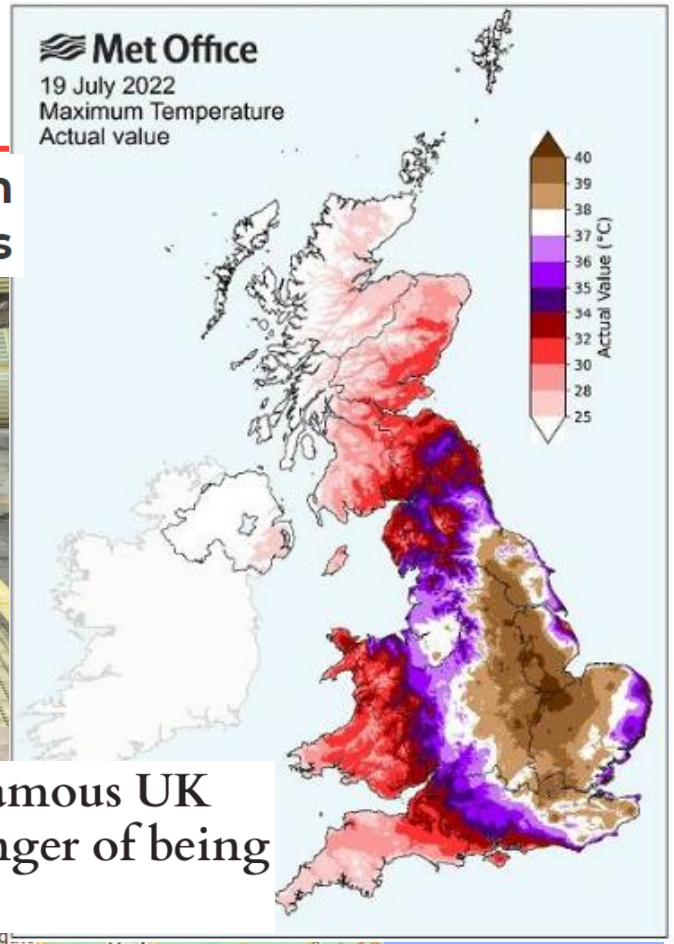
In 2019, the UK declared a national environment and climate emergency. The concentration of greenhouse gases in the earth's atmosphere has been rising steadily. Human activities have been proven to be the main cause. As a result, global temperatures have been increasing along with extreme weather events. These impacts are not only been experienced in the UK, but all over the world.

By declaring a climate emergency in the UK, Parliament are highlighting the need for companies to instigate urgent action to address climate change and prevent potentially irreversible damage to the environment. It is a call to recognise the serious and immediate risks posed by global warming and to accelerate efforts to halt and reverse the trends of climate change.

Immediate and significant actions such as reducing greenhouse gas emissions, transitioning to renewable energy sources, and mitigating the impacts of climate change on ecosystems and human societies, should be made by companies and organisations throughout the UK to reduce the impacts of climate change on society.

Extreme UK flood levels are happening much more often than they used to, analysis shows





Maps show all the famous UK seaside towns in danger of being underwater by 2050

Climate Change Would Cause 83 Million Excess Deaths By 2100

Climate change is costing the world $16 million per hour: study

Key Sustainability Points in Time Relevant to the UK Rail Sector

WSP has conducted a review of the upcoming actions which may be relevantt to EMR as a TOC within the UK Rail Sector. These key sustainability points are likely to have some impact on EMR's business operations in the future.

2025

- Great British Railways to be set up by 2024
- UK to become first country in the world to make Taskforce for Climate related Financial Disclosures (TCFD) aligned disclosures fully mandatory across the economy
- Rail Safety and Standards Board (RSSB) launched the industry-wide sustainable rail blueprint at the end of 2023. This will be the strategic framework for sustainability in rail for the next 30 years

2030

- 50% of all trips in towns and cities to be by active travel
- 2027 - a proposal that all commercial leased buildings must be improved to an EPC Band C; and Band B from 2030 for commercial buildings
- 27.5% emissions reduction from rail traction by 2029 (TDNS)
- 10GW of low-carbon hydrogen production capacity by 2030

2035

- Phase One of HS2 to open between 2029 and 2033
- UK 78% emissions reduction target by 2035
- UK commits to decarbonise electricity system by 2035
- All new cars and vans will be required to be fully zero emission at the tailpipe by 2035
- Sales of new petrol and diesel cars to be banned from 2035

2040

- No diesel only passenger trains by 2040 *(government aspiration)*
- 79% reduction of Network Rail's global carbon emissions needed by 2039 to align with Paris Agreement goals

2050

- Net Zero society in the UK by 2050.
- Rail network electrification complete with only electric, battery-powered and hydrogen trains transporting passengers across UK *(current policy)*
- 90% reduction of Network Rail's global carbon emissions needed by 2044 to align with Paris Agreement goals
- East Midlands region to be net zero by 2050

NB: Some of these key dates may be subject to change after the general election in the UK on the 4th July 2024

WSP EMR

Why should EMR aim for Net Zero?

Working towards and achieving net zero is one of the main ways a company can do their part in reaching the UK's target of becoming net zero by 2050.

EMR's ambition is to **"create cleaner, greener railways to spearhead the nation's ambition to become a world leader in sustainable transport with a focus on decarbonisation, and air quality."** Setting a net zero target will contribute to ensuring their ambition is met.

There are several drivers for EMR to aim for net zero:

- EMR to be **'best in class'**
- Force for good – creating **cleaner and greener** railways
- **DfT contractual requirement to set a Net Zero science-based target**
- Suppliers, partners and peers committing to Net Zero and **operating responsibly**

Potential benefits for EMR

- ✓ Increased efficiencies – **reducing costs**
- ✓ **Improved reputation** and social impact
- ✓ Lower risk and **greater resilience**
- ✓ Further **new opportunities** such as future collaborations
- ✓ **Alignment with competitors**
- ✓ Further **integrated and improved relationships** with partners and suppliers

Science-based targets

Introduction

This section of the report introduces the Science Based Target initiative (SBTi) and provides information on what is required when developing net zero targets and submitting them to SBTi. EMR's industry peers who have also committed to, or submitted, SBTi's has been highlighted to provide an understanding of how EMR compare to their peer group.

We have also provided an update on EMR's progress since the previous Net-Zero Roadmap report was issued.

Science Based Target Initiative - introduction

What is a Science Based Target (SBT)?

- In line with a 1.5 °C pathway
- Reflect a company's share of required global emissions reductions

Key characteristics of SBTs include:

Scientific: A greenhouse gas emissions target aligned with the latest science

Quantitative: Defines how much and how quickly companies need to cut their emissions to ensure they contribute their part of the global effort to prevent climate change

Transparent: Gives companies a clear vision of where they need to be in the future, challenging them to transform their business and help create a low-carbon economy where they can thrive.

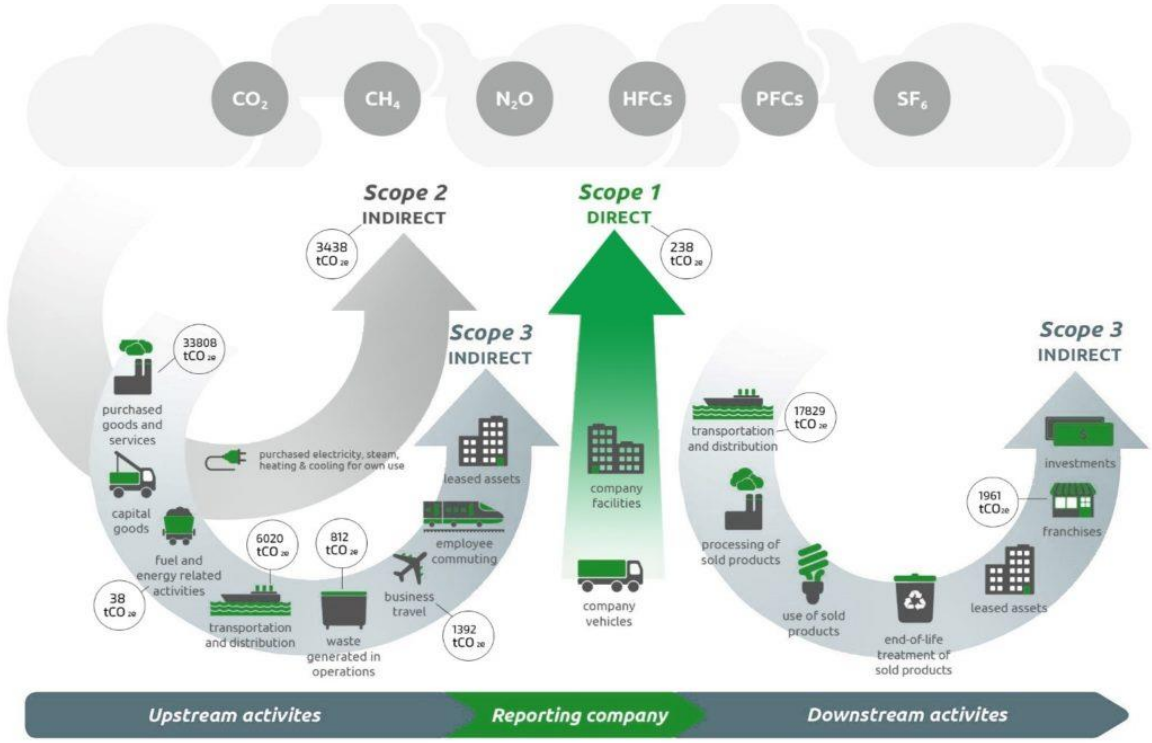
Science Based Targets initiative (SBTi) Methodologies:

- **Absolute Contraction**
- Sectoral Decarbonisation Approach (SDA)

Scope 1 & 2

- **Absolute Contraction**
- Economic intensity contraction
- Physical intensity contraction

Scope 3



SBTi - minimum requirements

The minimum reduction targets are (applying an absolute contraction method):

Short-term targets

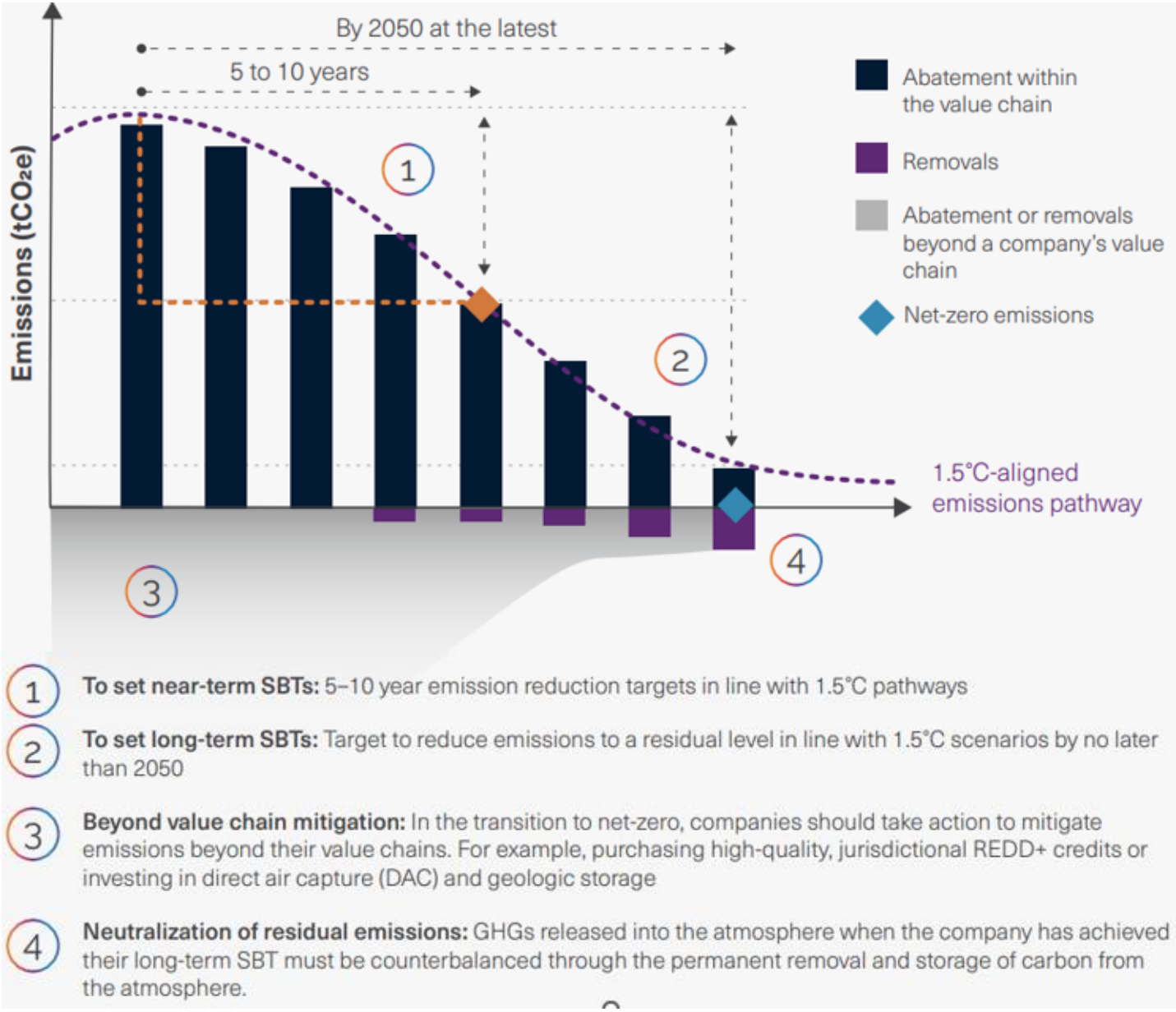
- Minimum of 4.2% per annum for Scope 1, 2 & 3 to align with the 1.5°C pathway

Net Zero targets

- Minimum 90% reduction across all Scopes

The targets boundaries must include:

- 95% of Scope 1 & 2
- 90% of Scope 3 in the long term



SBTs in the Industry

Industry peers who have committed to, or already submitted, SBTi's are listed below:

Near Term Target

First
EMR
GTR
c2c
TRANSPENNINE EXPRESS
Plasser UK
LNER
LONDON NORTH EASTERN RAILWAY
South Western Railway
Transport for London
NetworkRail

Net Zero Target

c2c
LNER
LONDON NORTH EASTERN RAILWAY
Transport for London
EMR

WSP
EMR

NB: Several companies had their net zero targets removed by the SBTi in March 2024 after they failed to submit within the 24-month window

SBTi – the target setting process

On 6 June 2024, EMR's commitment to the SBTi was accepted.

The validation of targets will be undertaken in July.

COMPANY	NEAR-TERM TARGET	NET-ZERO TARGET	ORGANIZATION TYPE	
Abellio East Midlands Limited United Kingdom, Europe	COMMITTED	COMMITTED	Company	View more

EMR's commitment has been published on the SBTi website.

EMR's Science-based Targets

EMR's Science-based Targets committed via the SBTi are outlined below.

Near-term targets

1. East Midlands Railway commits to **reduce** absolute **Scope 1 and 2** GHG emissions by **58%** by **FY2029/30** from a FY2022/23 base year.
2. East Midlands Railway commits to **reduce** absolute **Scope 3 GHG** emissions by **46%** by **FY2029/30** from a FY2022/23 base year.
3. East Midlands Railway commits to **reduce Scope 3** GHG emissions from the **use of sold products** by **46%** by **FY2029/30** from a FY2022/23 base year.

Net-Zero Targets

1. East Midlands Railway commits to **reduce** absolute **Scope 1, 2 and Scope 3** GHG emissions by **90%** by **FY2045/46** from a FY2022/23 base year.
2. East Midlands Railway commits to **reduce** absolute **Scope 3** GHG emissions from the **use of sold products** by **90%** by **FY2045/46** from a FY 2022/23 base year.

EMR's Carbon Inventory - FY23/24

Introduction

This section of the report provides the results of EMR's FY23/24 greenhouse gas emission footprint. The reporting period was 1st April 2023 to 31st March 2024.

This is then further broken down by scope to identify where the carbon hotspots for EMR lie. A comparison to the base year is also analysed.

EMR's Carbon Inventory

Scope 1 (Direct Emissions)

Traction
Fuel Consumption

Non-Traction
Natural Gas Consumption

Fuel Consumption

Vehicle Fleet Fuel Consumption

Refrigerants

Scope 2 (Indirect Emissions)

Traction
Electricity Consumption – EC4T

Non-traction
Electricity Consumption – Property & Buildings

Scope 3 (All other Indirect Emissions)

Purchased Goods and Services

Capital Goods and Construction

Fuel and Energy Related Activities

Upstream & Downstream Transportation

Waste Generated in Operations

Staff Business Travel

Employee Commuting

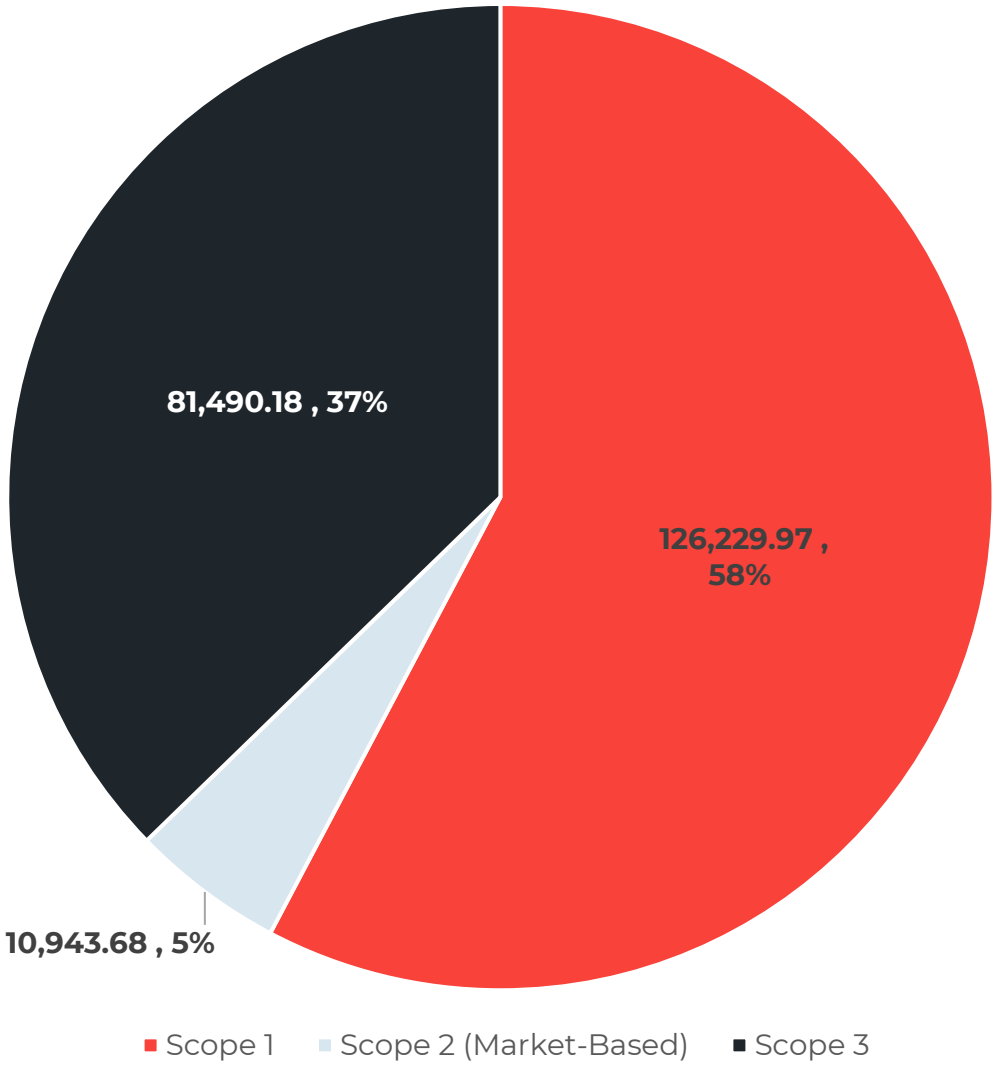
Water Consumption

WSP EMR

FY 2023/24- Carbon Footprint

Scope 1 (tCO_2e)	
Traction Fuel Consumption	124,710
Non-Traction Fuel Consumption	1,393
Vehicle Fleet Fuel Consumption	126
F-Gas	1
Total	**126,230**

Scope 2 (tCO_2e) (Market-Based)	
Traction Electricity Consumption	10,479
Non-Traction Electricity Consumption	465
Total	**10,944**

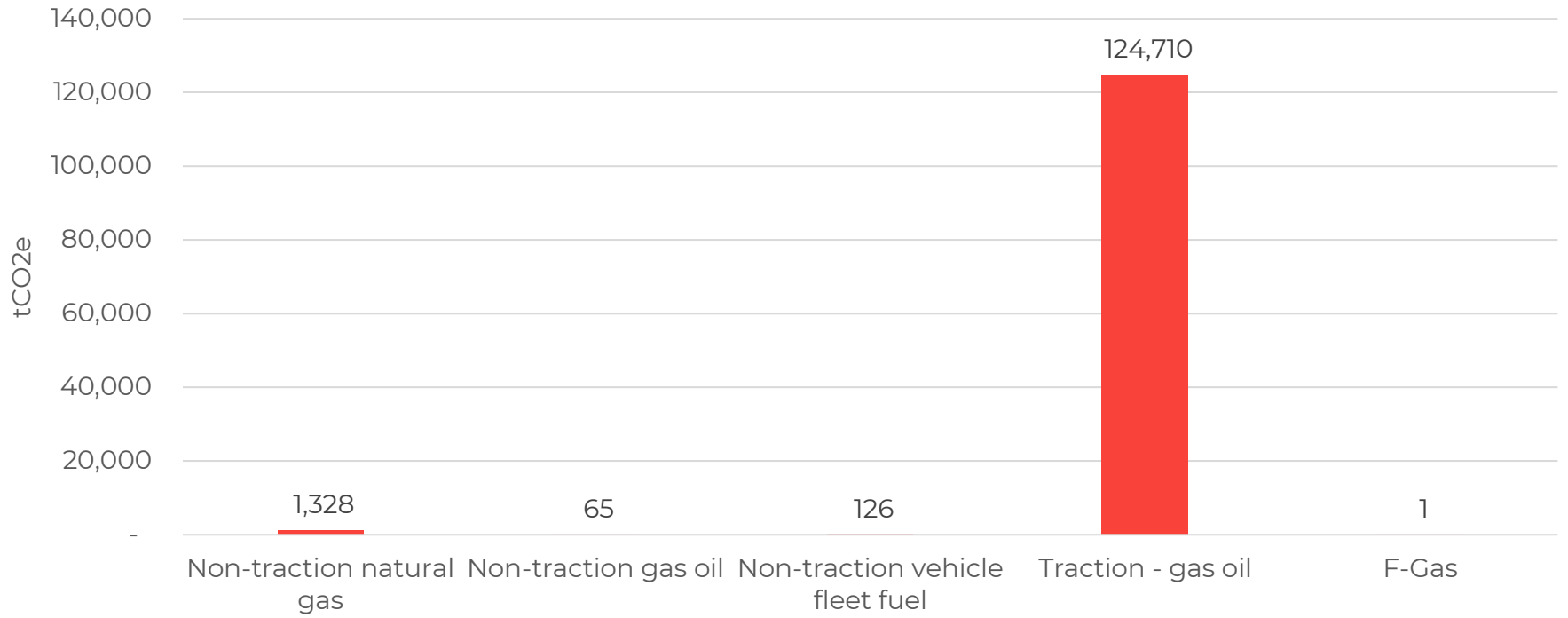


Scope 3 (tCO_2e)	
Purchased goods and services	10,414
Capital goods	37,574
Fuel and energy related activities (market-based)	30,425
Upstream transportation	1,449
Waste generated during operations	77
Business travel	277
Employee commuting	1,274
Total	**81,490**

Total = 218,664 tCO2e

FY 2023/24- Scope 1

Scope 1 (tCO_2e)	
Traction Fuel Consumption	124,710
Non-Traction Fuel Consumption	1,393
Vehicle Fleet Fuel Consumption	126
F-Gas	1
Total	**126,230**

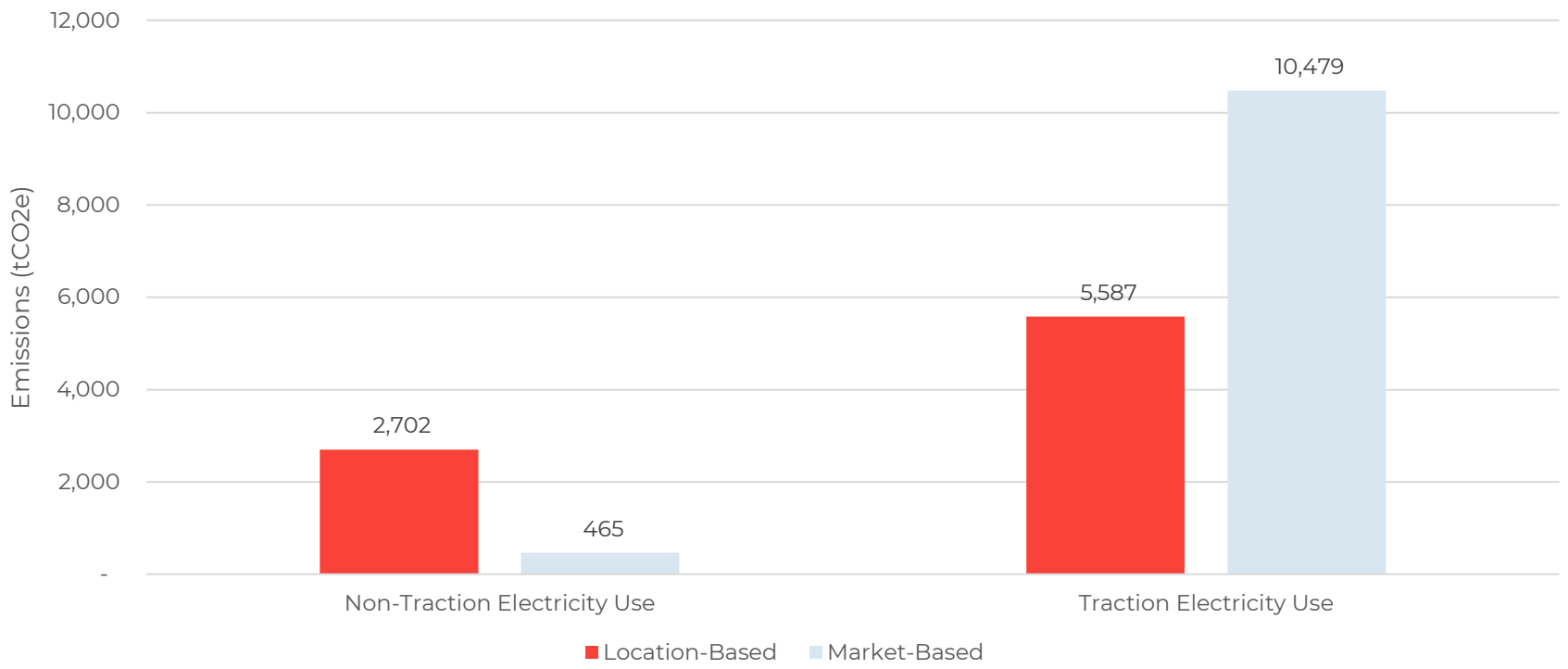


- **Scope 1** emissions account for **58%** of EMR's total GHG footprint.
- **Traction – gas oil** is the predominate Scope 1 emission source and accounts for **98.8%** of Scope 1 emissions and XX of total carbon inventory.
- Replacing trains which mainly consume gas-oil with diesel-battery train, and the electrification of the rail network, will decrease these emissions in the future.
- The second largest source of Scope 1 emissions is non-traction natural gas consumption and accounts for **1.05%** of Scope 1 emissions and XX of total carbon inventory.
- FY2023/24 was the first year that emissions from refrigerant gases have been included in EMR's GHG Footprint,

FY 2023/24- Scope 2

Scope 2 (Market-based) (tCO_2e)	
Non-traction electricity	465
Traction electricity	10,479
Total	**10,944**

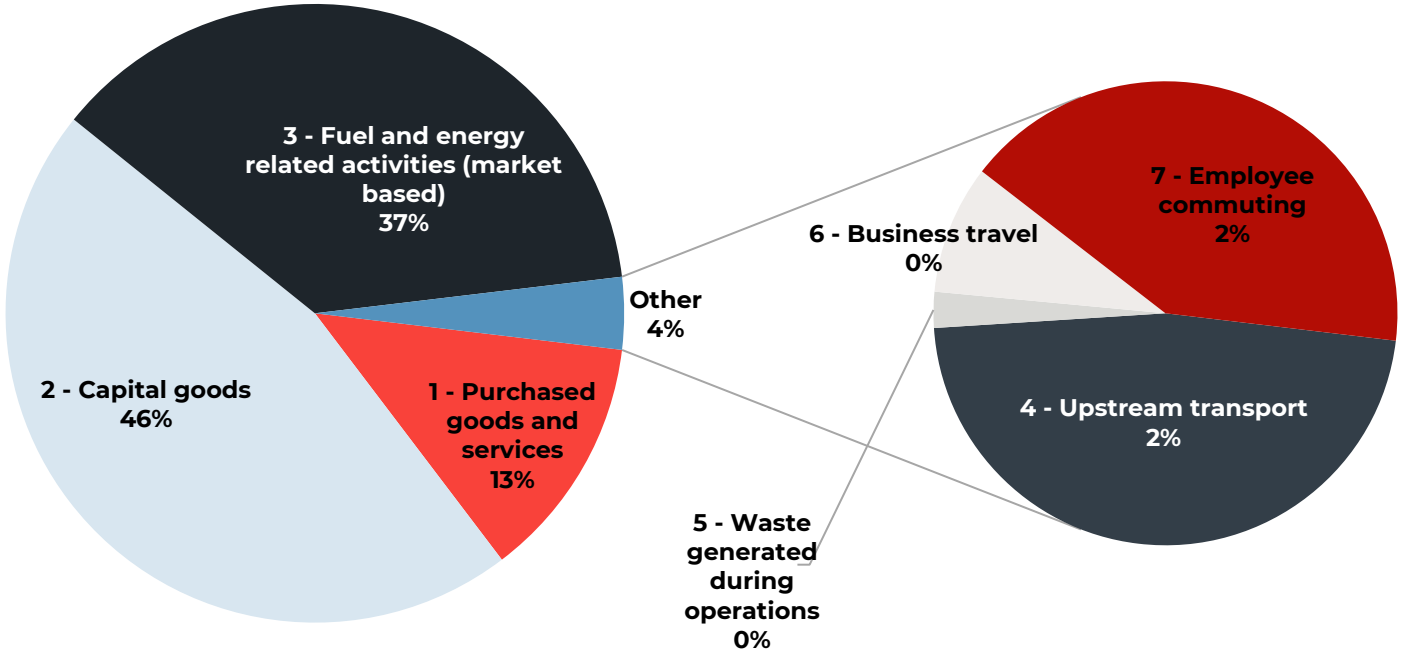
Scope 2 (Location-Based) (tCO_2e)	
Non-traction electricity	2,702
Traction electricity	5,587
Total	**8,289**



- **Traction electricity consumption** is the predominate Scope 2 emission source in both location and market-based Scope 2 emissions.
- Government policy target to decarbonise the UK electricity grid by 2035 will reduce these emissions.
- Market-based non-traction electricity emissions are considerably lower (2,237 tCO2e difference) than location-based due to REGO HH energy contracts in place at several sites, so emissions are only emitted from NHH depots, stations and offices.
- However, for traction energy, location-based emissions are considerably lower than traction market-based emissions due to the location-based emissions factor taking into account the emissions intensity of the UK's grid. The residual mix factor for market-based emissions is much more carbon intensive as it discounts the effects of all renewables.

FY23/24 - Scope 3 emissions

Scope 3 (tCO_2e)	
Purchased goods and services	10,414
Capital goods	37,574
Fuel and energy related activities (market-based)	30,425
Upstream transportation	1,449
Waste generated during operations	77
Business travel	277
Employee commuting	1,274
Total	**81,490**



Scope 3 emissions accounted for **37.27%** of FY2023/24's GHG footprint.

In FY23/24 EMR's top three activities were:

1. Capital goods
2. Fuel and energy related activities
3. Purchased goods and services

These are broken down further in the next pages.

'Other' activities account for approximately 4% of the total Scope 3 emissions.

Business travel and employee commuting will be influenced by Government decarbonisation targets, for example the UK's target to deliver net zero transport by 2050.

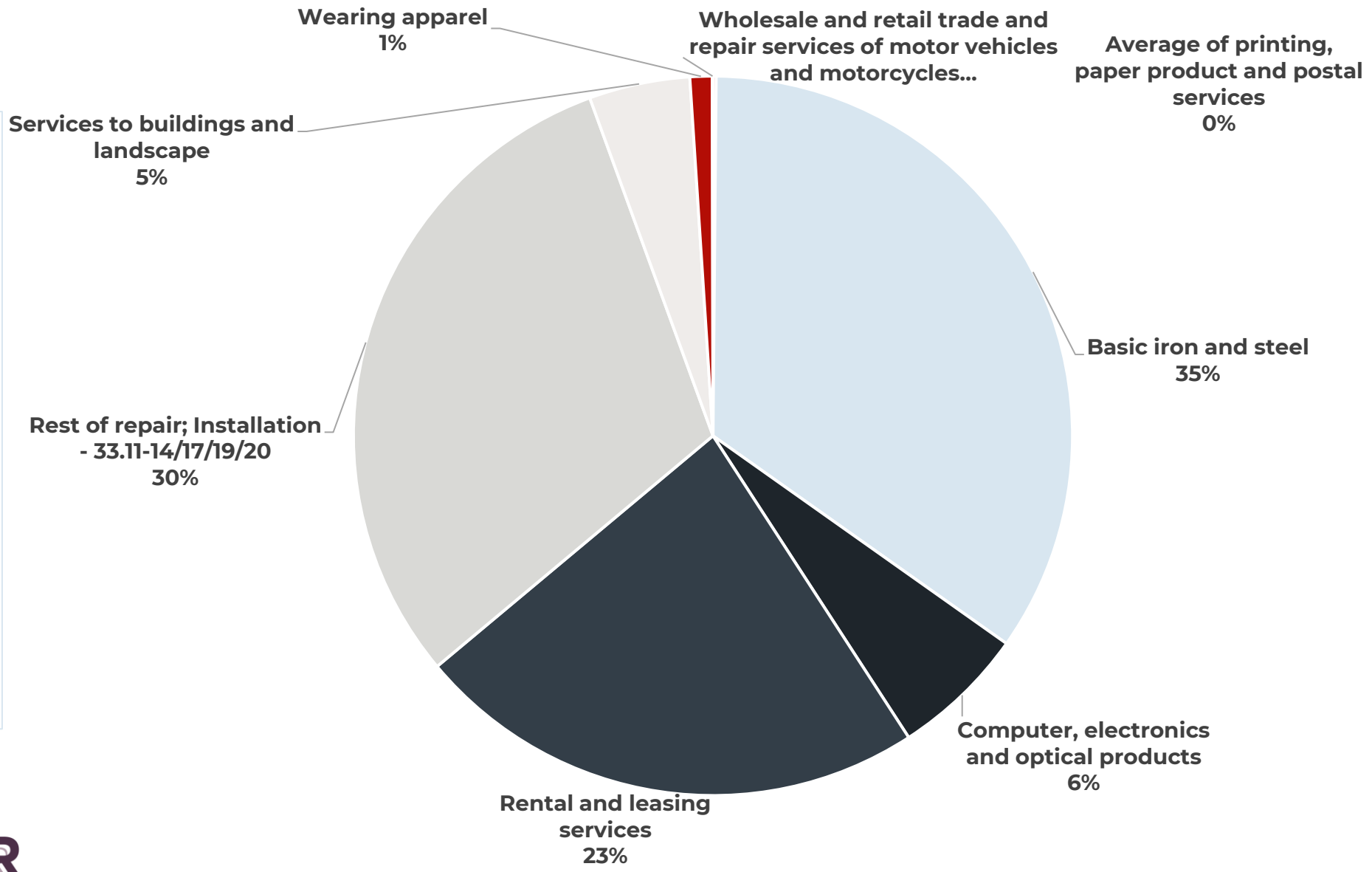
Waste and Upstream Transportation can be targeted with specific sustainability initiatives.

FY23/24 - Scope 3: Capital Goods

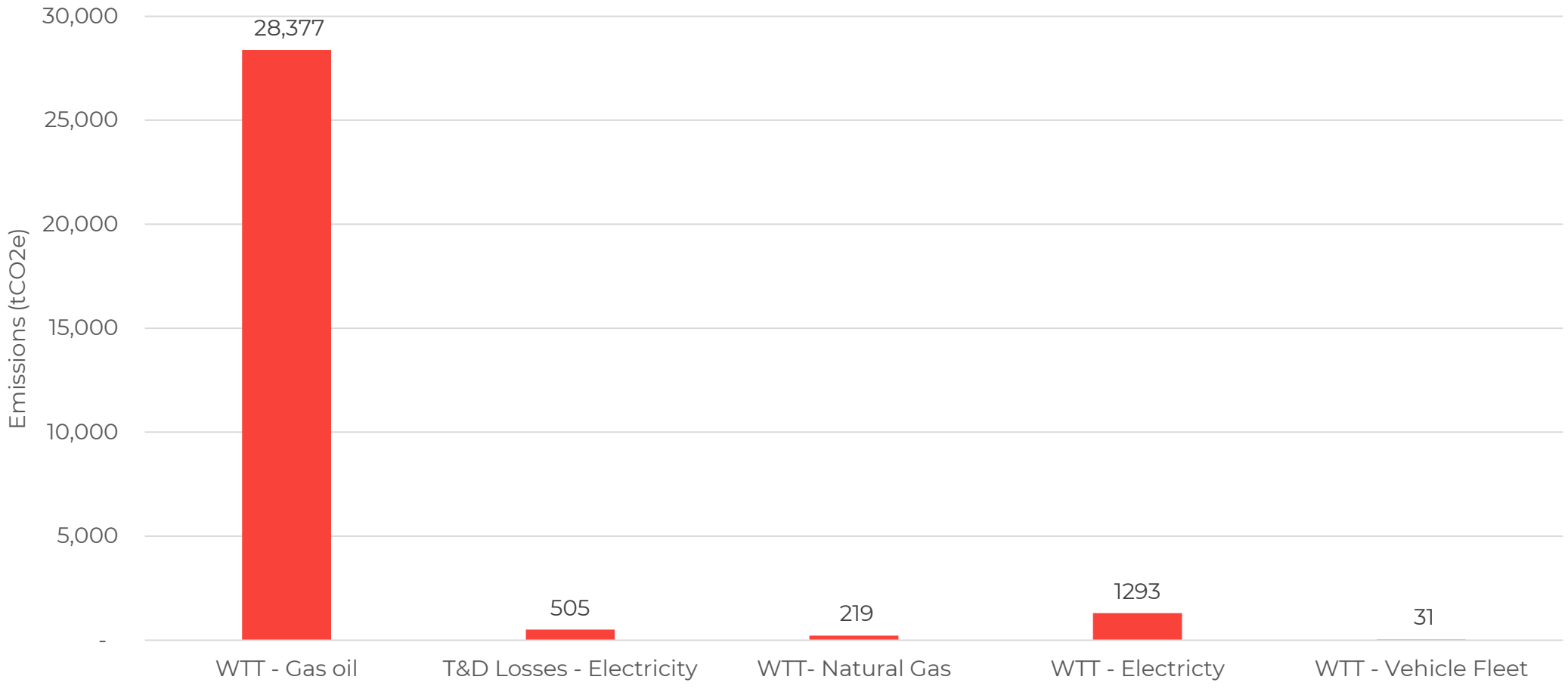
In FY23/24 the highest emitting activities in Scope 3 Capital Goods were:

1. Basic iron and steel. This included spend on light and heavy maintenance materials.
2. Rest of repair; Installation. This included spend on 3rd Party Maintenance and Track Maintenance.
3. Rental and leasing services. This included spend on equipment hire and the renting of trains.

Collecting emission-related data for capital goods will increase the accuracy of the calculations, rather than relying on spend data.



FY22/23 - Scope 3: Fuel and Energy related activities



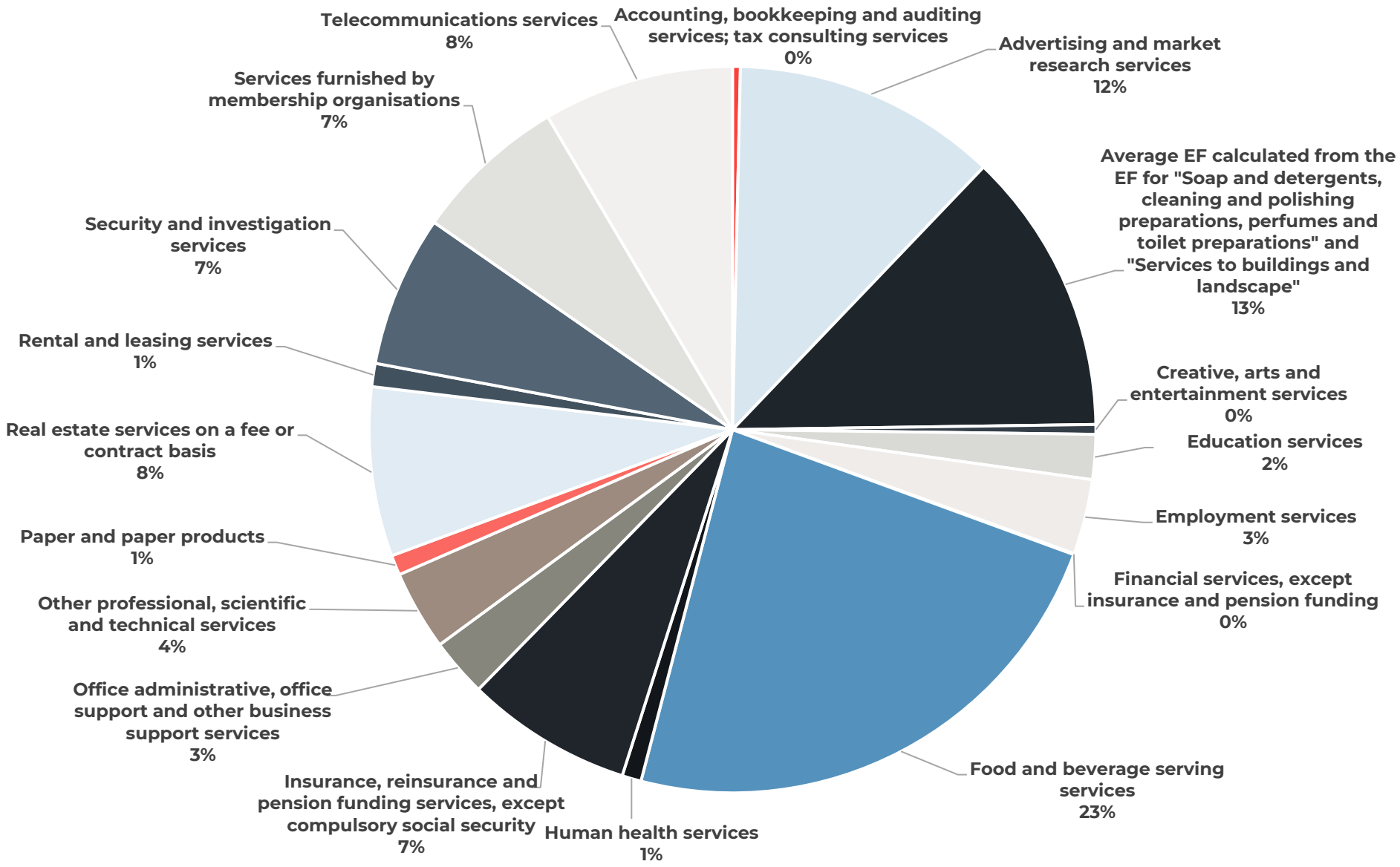
The highest source of emissions in Scope 3 Category 3 was WTT (well-to-tank) gas-oil, due to the large consumption required to fuel EMR's rolling stock. As EMR begin to replace their existing stock with diesel-battery hybrid, emissions from WTT-Gas Oil should begin to decrease.

FY22/23 - Scope 3: Purchased Goods and Services

In FY23/24 the highest emitting activities in Scope 3 Purchased Goods & Services were:

1. Food and beverage services. This included spend on employee meals when they are on shift, catering on team days and meal allowances..
2. Cleaning materials/cleaning services. This spend on cleaning materials and the service of cleaning trains and stations.
3. Advertising and market research services.

Collecting emission-related data for purchased goods and services will increase the accuracy of the calculations, rather than relying solely on spend data.



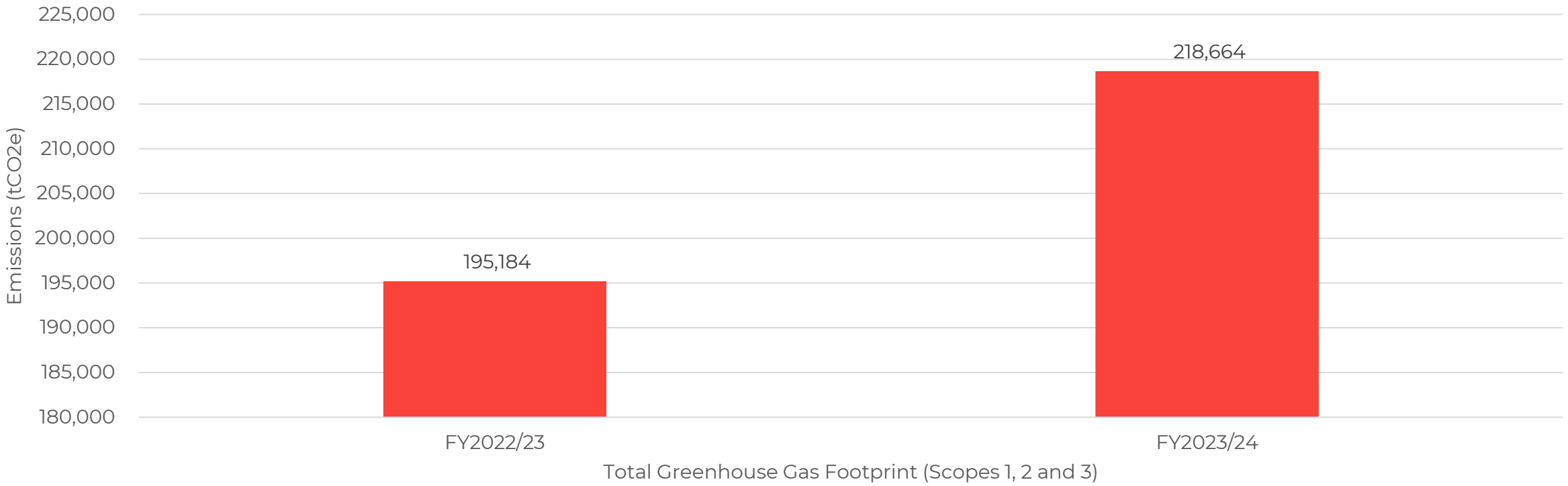
FY23/24 Inventory – Comparison to the Base Year

Introduction

This section of the report reviews EMR's carbon inventory from FY23/24 and compares it against the FY22/23 baseline year to identify areas where EMR should aim to improve for the following financial year.

The comparison against the baseline is broken down by scope.

FY2022/23 and FY 2023/24 GHG Footprint Comparison

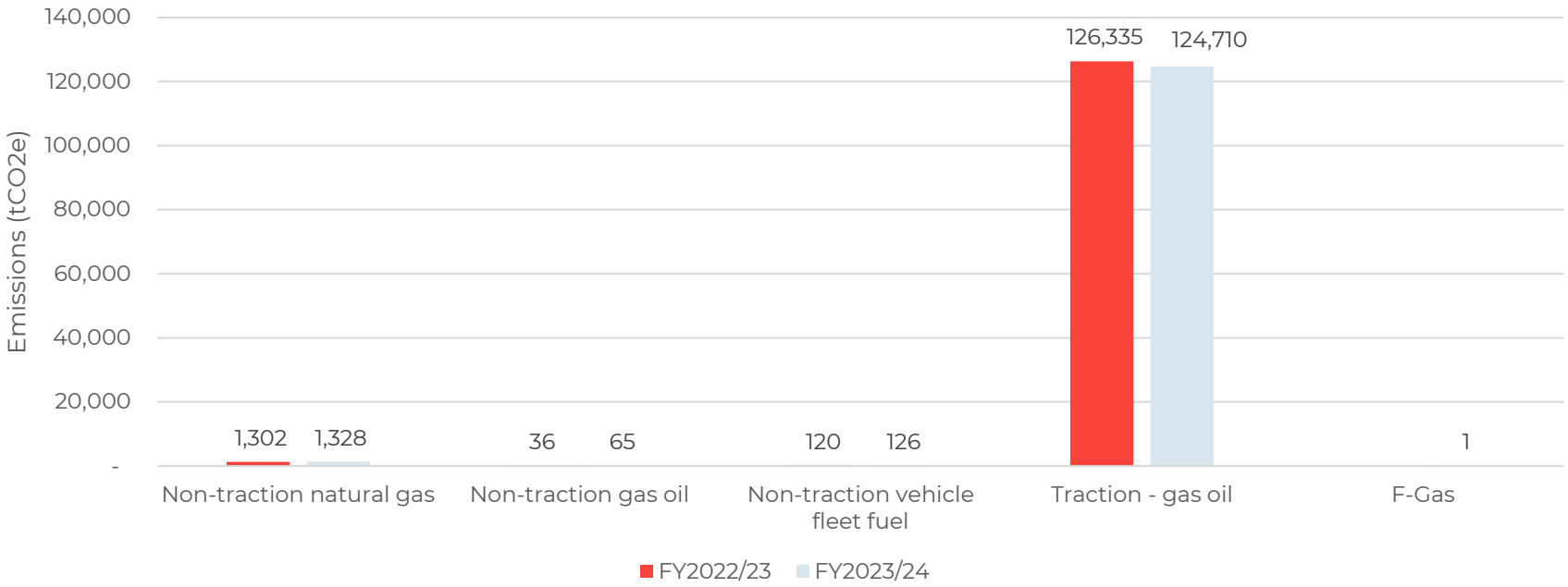


- When the emissions from Scopes 1, 2 and 3 are combined, EMR's total GHG footprint **increased** in FY2023/24 (compared to the baseline) by **23,480 tCO2e**. This is a **12.03% increase** from FY2022/23 to FY2023/24.
- This is predominantly due to the increase in Scope 3 emissions as explored below.

FY2022/23 and FY 2023/24 Scope 1 Comparison

Scope 1 FY22/23 (tCO_2e)		
Traction Fuel Consumption (gas oil)	126,335	98.86%
Non-Traction Fuel Consumption (natural gas)	1,302	1.02%
Non-Traction Fuel Consumption (gas oil)	36	0.03%
Vehicle Fleet Fuel Consumption (diesel)	113	0.09%
Vehicle Fleet Fuel Consumption (petrol)	7	0.01%
Total	**127,794**	

Scope 1 FY23/24 (tCO_2e)		
Traction Fuel Consumption (gas oil)	124,710	98.8%
Non-Traction Fuel Consumption (natural gas)	1,328	1.05%
Non-Traction Fuel Consumption (gas-oil)	65	0.05%
Vehicle Fleet Fuel Consumption (diesel)	116	0.09%
Vehicle Fleet Fuel Consumption (petrol)	10	0.001%
F-Gas	1	0%
Total	**126,230**	

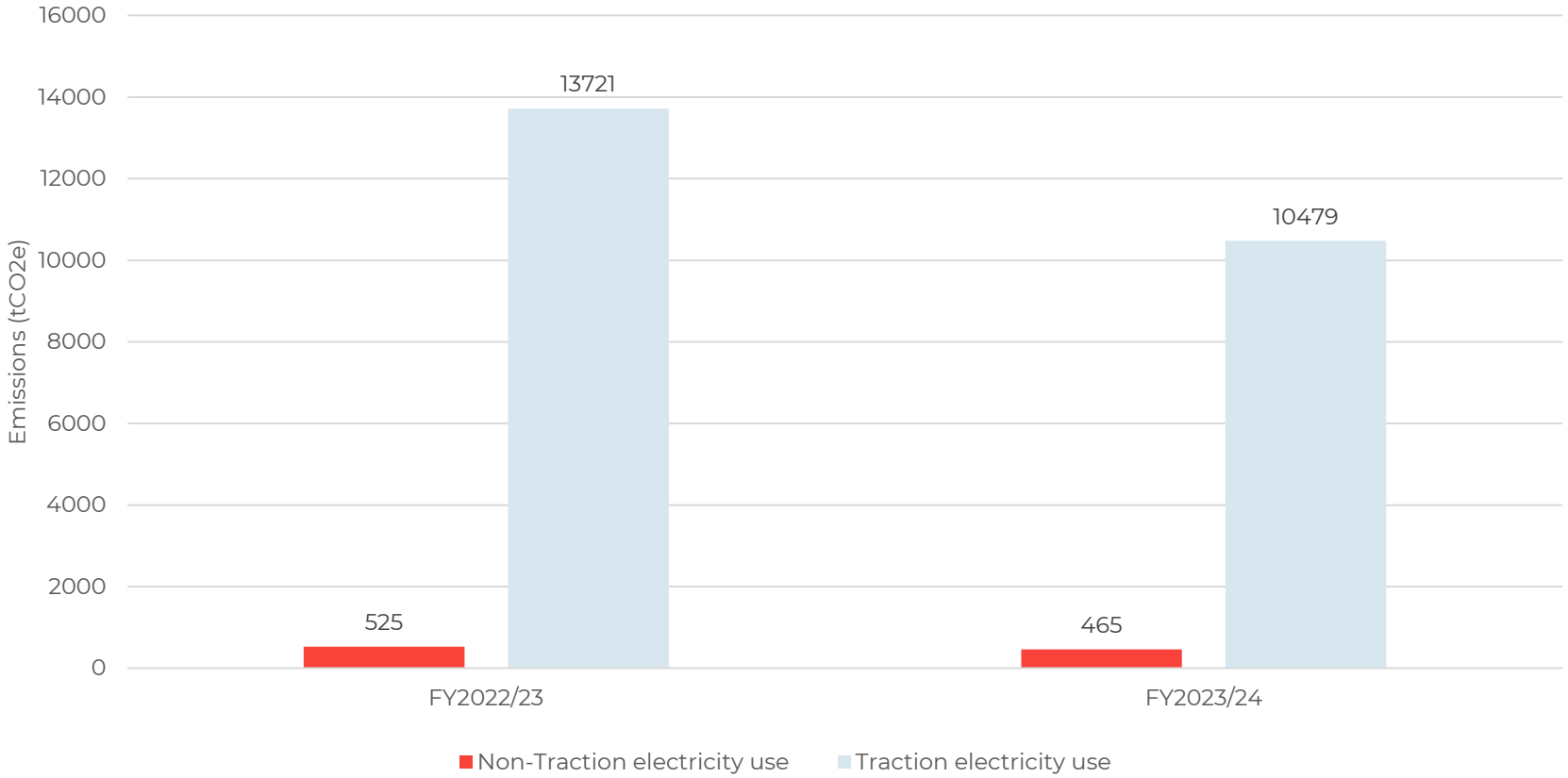


- Traction **gas oil consumption** is the predominate Scope 1 emission source **(>98.8%).**
- Non-traction **natural gas consumption** is the second largest scope 1 emission source **(1-1.05%).**
- Overall scope 1 emissions **decreased by 1,564 tCO2e** (1.22%) between FY2022/23 and FY2023/24. This is predominantly due to a **1.17% decrease in traction gas oil consumption**.

FY2022/23 and FY 2023/24 Scope 2 Comparison

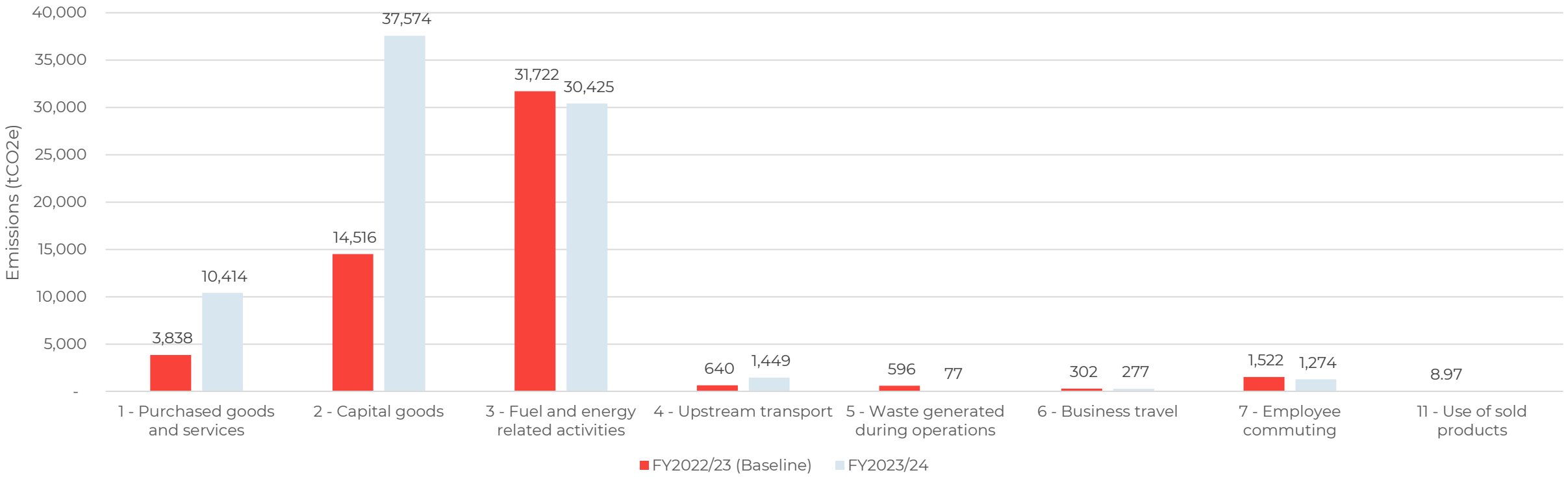
Scope 2 FY22/23 (tCO_2e)		
Traction Electricity Consumption	13,721	96.31%
Non-Traction Electricity Consumption	525	3.69%
Total	**14,246**	

Scope 2 FY23/24 (tCO_2e)		
Traction Electricity Consumption	10,479	95.71%
Non-Traction Electricity Consumption	465	4.25%
Total	**10,944**	



- **Traction electricity consumption** has remained the predominate Scope 2 emission source **(>95%).**
- Target to decarbonise the UK electricity grid by 2035 will reduce these emissions.
- Overall, Scope 2 emissions have **decreased by 3,302 tCO2e** (26.22%%) between FY22/23 and FY23/24. The is largely due to a **90.27% decrease in non-traction electricity consumption.**
- This decrease was the result of a decrease in consumption of electricity in both traction (32.83% reduction) and non-traction (18.23% reduction) between FY22/23 and FY23/24.

FY2022/23 and FY 2023/24 Scope 3 Comparison



- In FY2023/24 the highest emitting Scope 3 category was Category 2 Capital goods, whereas in the baseline year, the highest emitting category was Category 3 Fuel and energy related activities.
- Overall, Scope 3 emissions between the baseline and FY2023/24 increased by **53%**, from **53,144 tCO2e** to **81,487 tCO2e**. This is predominantly due to an increase in spend in FY2023/24 which increased the emissions allocated to Scope 3 Category 1 (a 171% increase between the baseline and FY2023/24) and Category 2 (a 159% increase between the baseline and FY2023/24).
- There were no emissions recorded under Scope 3 Category 11 for FY2023/24 because EMR did not sell any fuel to other TOC's in this financial year.

EMR's Net Zero Roadmap

Introduction

This section of the report introduces EMR's Net Zero Roadmap. This consists of commitments and actions which have been agreed by EMR to reduce greenhouse gas emissions in line with their Science-based Targets. The results of the net zero modelling of an additional scenario, Scenario 6, have been included.

EMR's Net Zero Roadmap

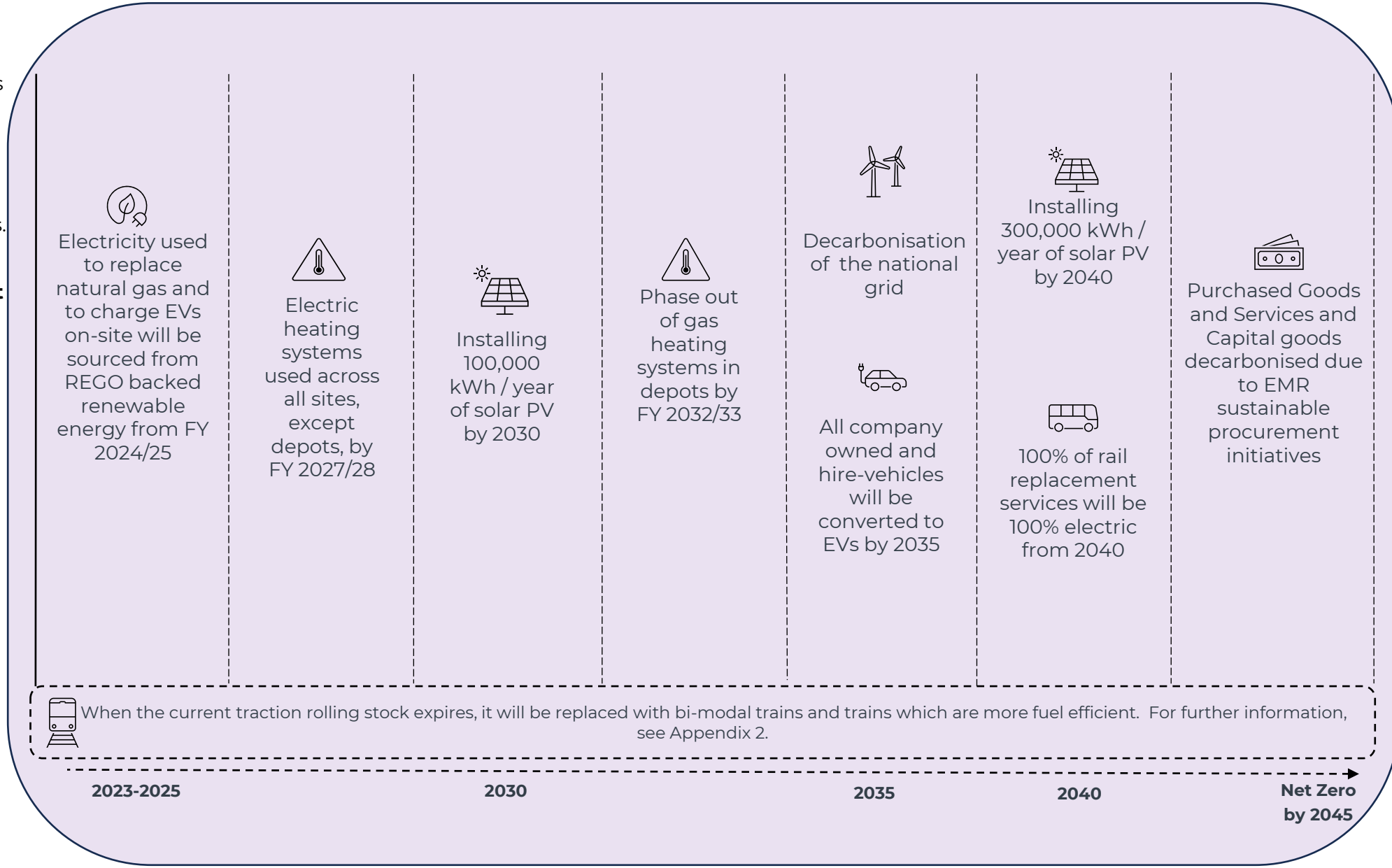
On 17th January 2024, WSP hosted a carbon reduction workshop with EMR's key stakeholders, to discuss commitments, initiatives and actions which could realistically be implemented to ensure EMR reached net zero. The actions in this final Net Zero Roadmap have been agreed by EMR and the stakeholders.

EMR is committed to achieving net zero by 2045.

This commitment will be **achieved by FY2045/46** and delivered against **validated SBTi targets**..

As part of this commitment, EMR also commits to a short-term target, which is a minimum reduction of 4.2% compared to the baseline year (FY22/23), in line with the 1.5°C pathway.

This net zero roadmap provides some examples of key milestones, internal targets, and actions for EMR to take to reach net zero.



Reduction scenarios were modelled to identify Net Zero path

Six scenarios were modelled to identify a feasible pathway to net zero from the base year (FY22/23) through to 2050, to align with the UK regulatory requirement to reach net zero by 2050.

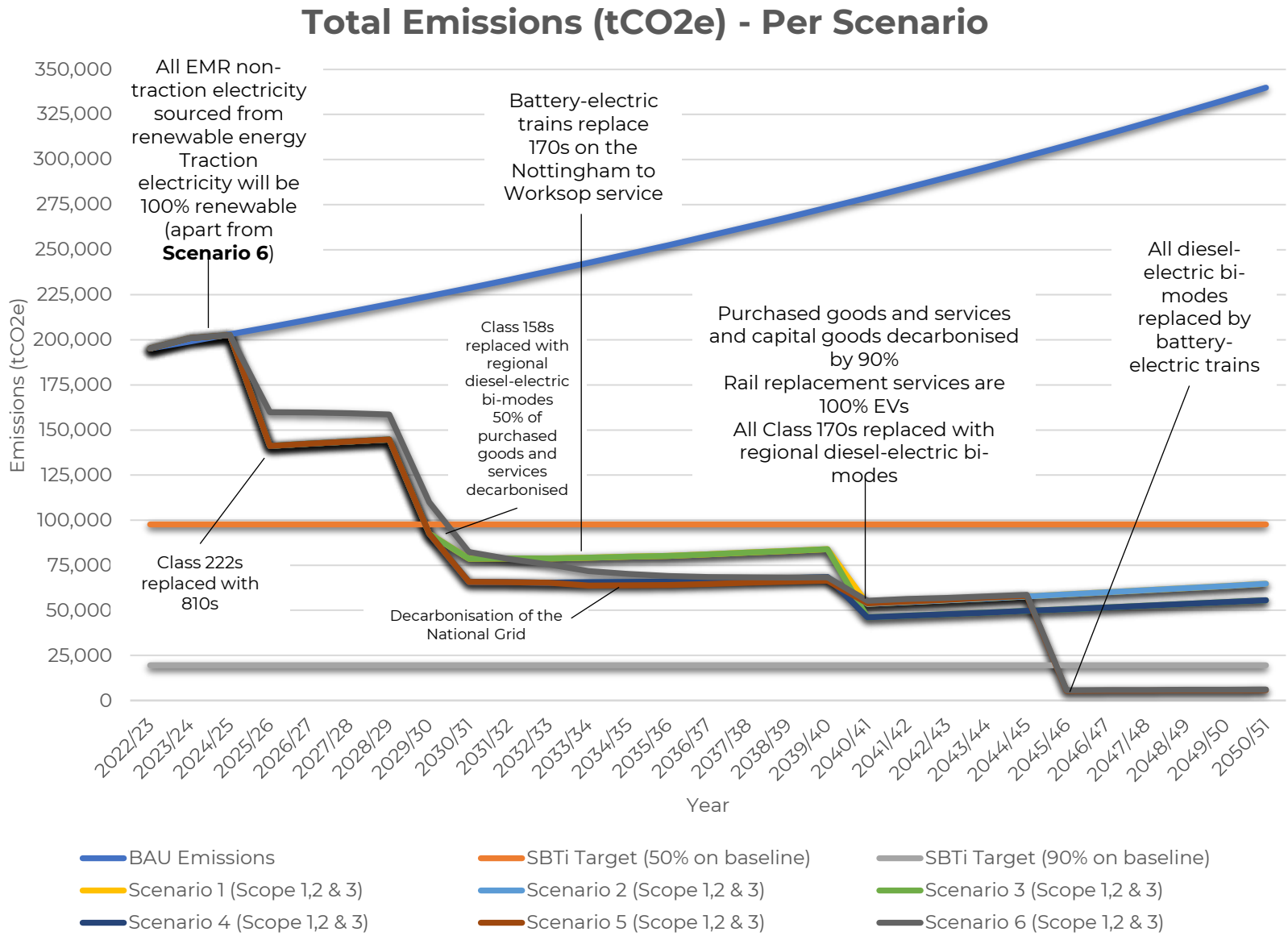
As seen in the graph, **Scenario 5 and 6 are the only scenarios that reach net zero** in line with regulatory requirements across Scopes 1, 2 and 3.

The difference between Scenario 5 and 6 is the source of traction electricity used in the forecasting. Scenario 5 is based on traction electricity being 100% REGO backed from 2025, whereas in Scenario 6 no REGOs are assumed; instead, decarbonisation is in line with societal decarbonisation of the national grid. By 2050, Scenarios 1 and 2 reach a 67% reduction against the baseline, Scenarios 3 and 4 reach 71%. Scenario 5 reaches 97% reduction and Scenario 6 reaches a 97% reduction.

Scenario 5 reaches a 67% reduction against the baseline by 2035/36 and a 97% reduction by 2045/46. Scenario 6 reaches a 65% reduction against the baseline by 2035/36 and a 97% reduction by 2045/46.

The net zero enabling difference between Scenario 5 and 6 and the other scenarios is the deployment of battery-electric bi-mode trains from 2033/34 on the Robin Hood Line and from 2045/46 for all other services.

EMR are being more ambitious than the UK legal requirement and are working towards net zero by 2045 based upon the decarbonisation pathway in Scenario 5 and 6. However, WSP suggest Scenario 6 should be the net zero trajectory EMR follow, in case Network Rail cannot deliver on their commitment to back traction electricity by REGO's from 2025.



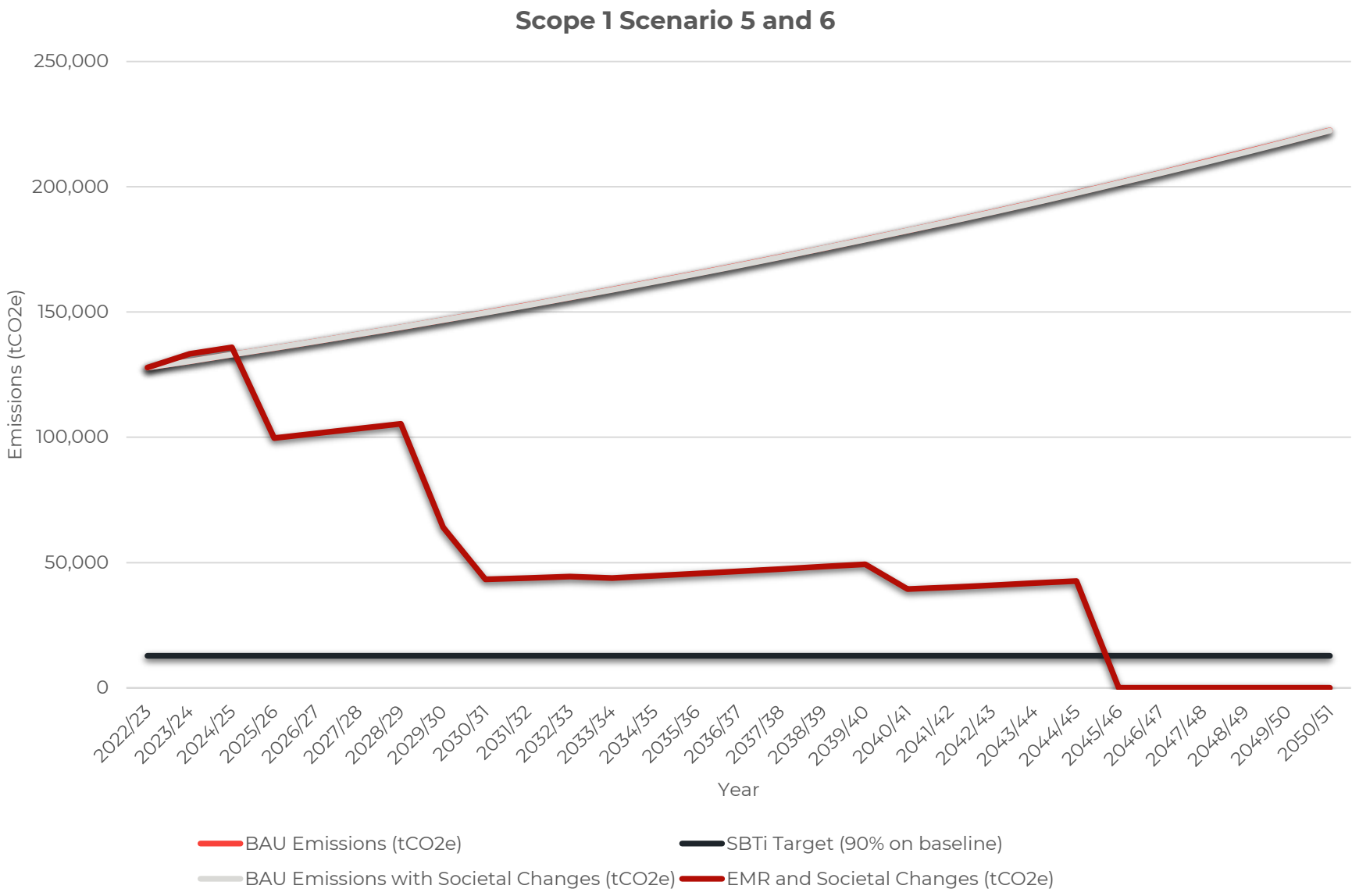
Scenario 5 and 6 - Scope 1 trajectory

Scenario 5 and 6 both demonstrate the same trajectory for Scope 1 emissions.

By 2025/26 in Scenario 5 and 6, EMR's Scope 1 emissions will have decreased by 22% against the baseline. This reduction will be achieved chiefly by the replacement of Class 222s with Class 810s to reduce traction emissions.

By 2030/31 in Scenario 5 and 6, EMR's Scope 1 emissions will have reduced by 66.1% against the baseline. This is due to the replacement of Class 158s with regional diesel-electric bi-modes to utilise electrification of EMR's network and thus reduce diesel consumption.

By 2045/46 in Scenario 5 and 6, EMR's Scope 1 emissions will have reduced by 99.96% against the baseline. This will be achieved principally by the replacement of all diesel-electric bi-mode trains with battery-electric bi-modes, thus leaving EMR with a fleet of rolling stock which is powered by renewable energy. On the non-traction side, all heating at sites will be electric and powered by renewable energy.



Scenario 6 - Scope 2 trajectory

Scenario 6 assumes that traction electricity is **not backed by any REGO's** from 2022, and instead decarbonisation is in line with societal decarbonisation of the national grid using the UK Government Greenbook projections.

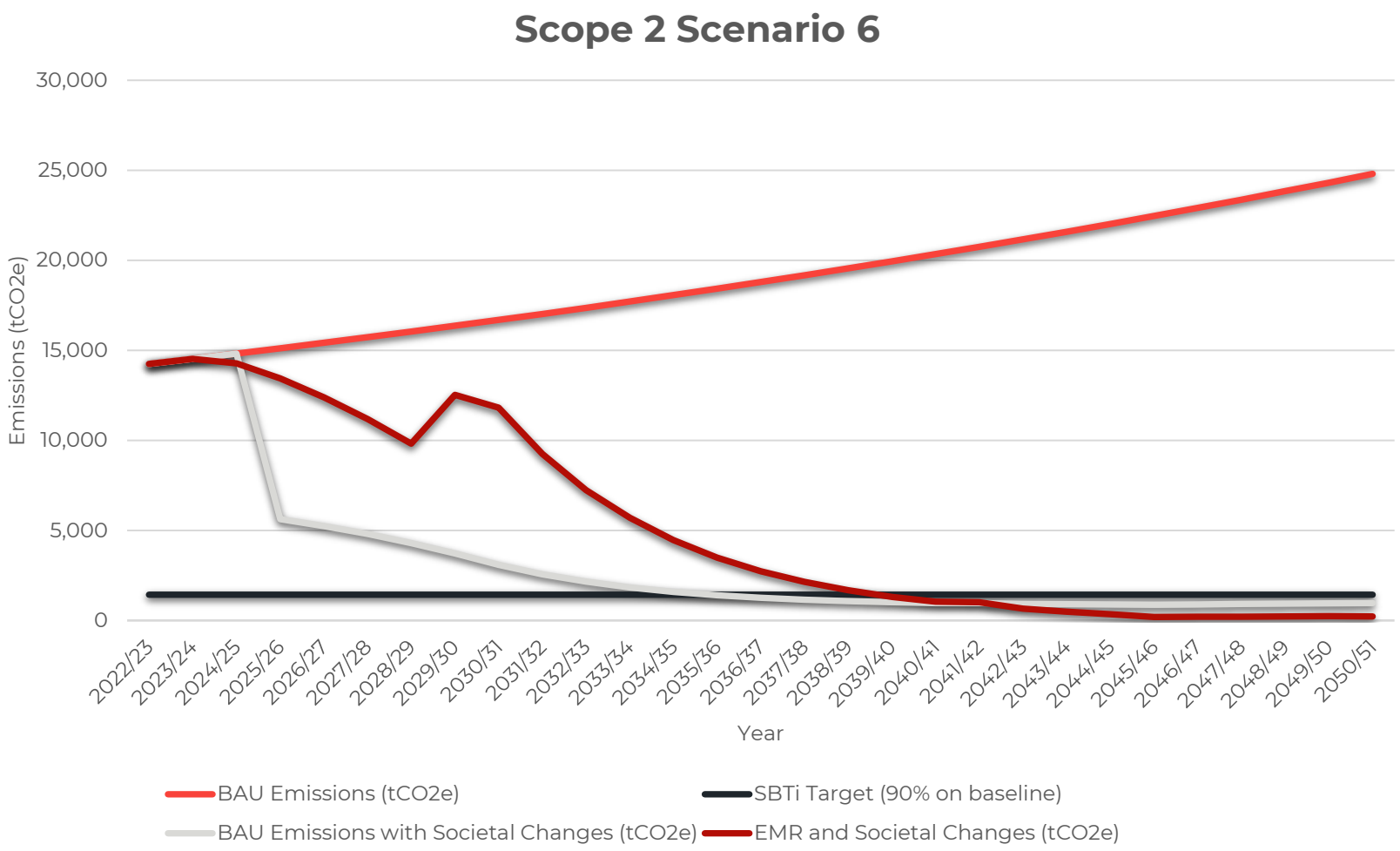
Scope 2 emissions will increase in 2030 due to the Class 158s being replaced with a region diesel-electric bi-mode, increasing EMR's traction electricity consumption.

From 2035, as the national grid will have decarbonised, emissions will be minimal.

By 2040/41 in Scenario 6, EMR's Scope 2 emissions will have reduced by 71% against the baseline.

By **2045/46**, EMR's Scope 2 emissions will have reduced by 99.82%.

This differs from the BAU Emissions with Societal Changes trajectory, as the continued use of diesel trains would not impact EMR's electricity consumption. Therefore, EMR's Scope 2 emissions would continue to decrease as the grid decarbonises.

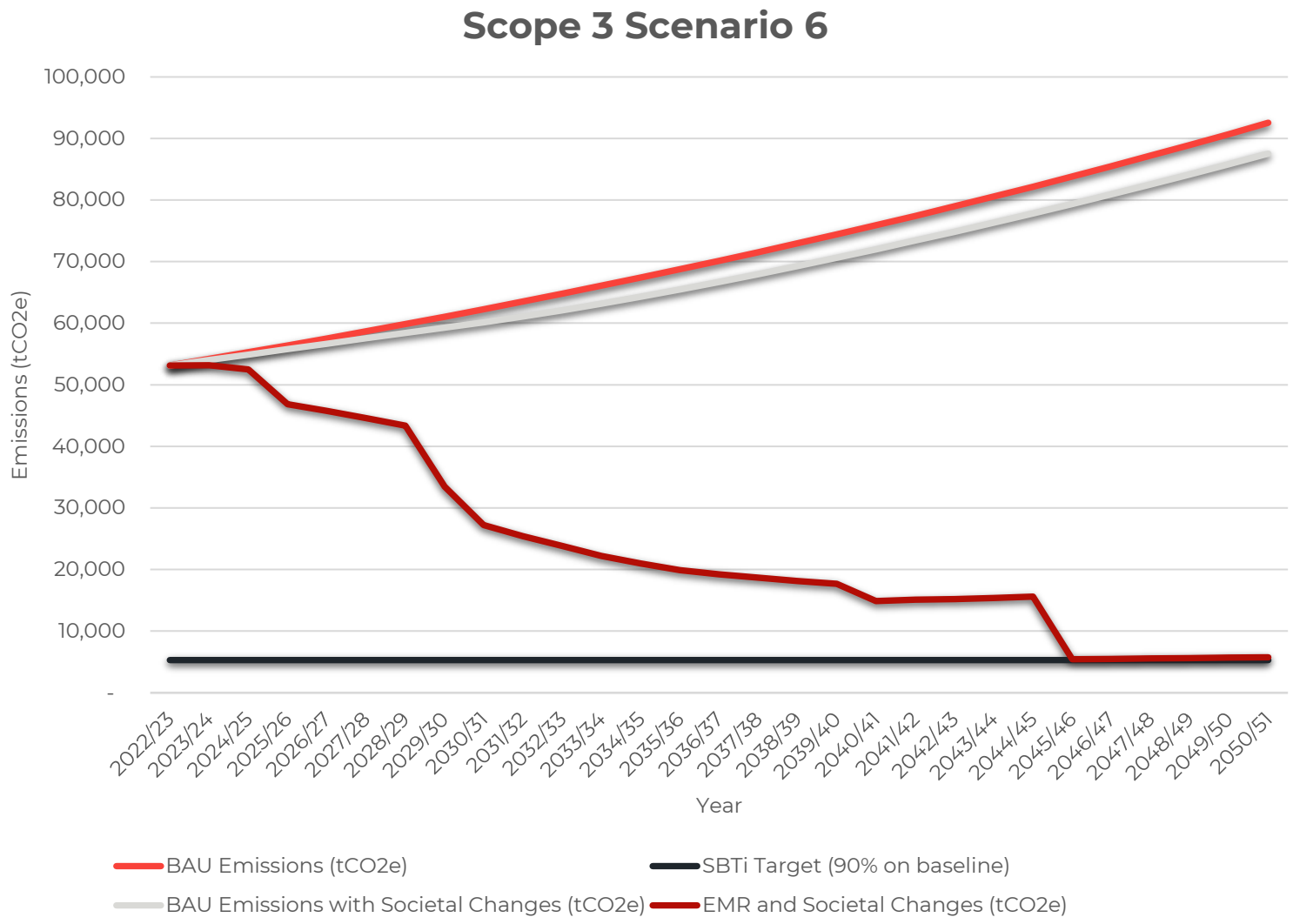


Scenario 6 - Scope 3 trajectory

By 2025/26 in Scenario 6, EMR's Scope 3 emissions will have reduced by 12% against the baseline. This reduction will be achieved chiefly through the replacement of Class 222s with Class 810s. EMR's sustainable procurement initiatives will also contribute significantly to this reduction.

By 2030/31 in Scenario 6, EMR's Scope 3 emissions will have reduced by 49% against the baseline. This reduction will be achieved because EMR's purchased goods and services will be decarbonised by 50%. From 2030, as the national grid will have decarbonised, EMR's Scope 3 emissions will continue to decrease.

By 2045/46 in Scenario 6, EMR's Scope 3 emissions will have reduced by 90% against the baseline. This reduction is achieved chiefly by the replacement of all remaining diesel-electric bi-modes with battery-electric bi-modes, which will make EMR's fleet 100% powered by electricity. Battery charging will be 100% renewable energy, whether charged off the OLE or via static charging points. Any and all rail replacement services will also be powered by electric coaches. Furthermore, EMR's purchased goods and services and capital goods will have decarbonised by 90% through the deployment of sustainable procurement initiatives.



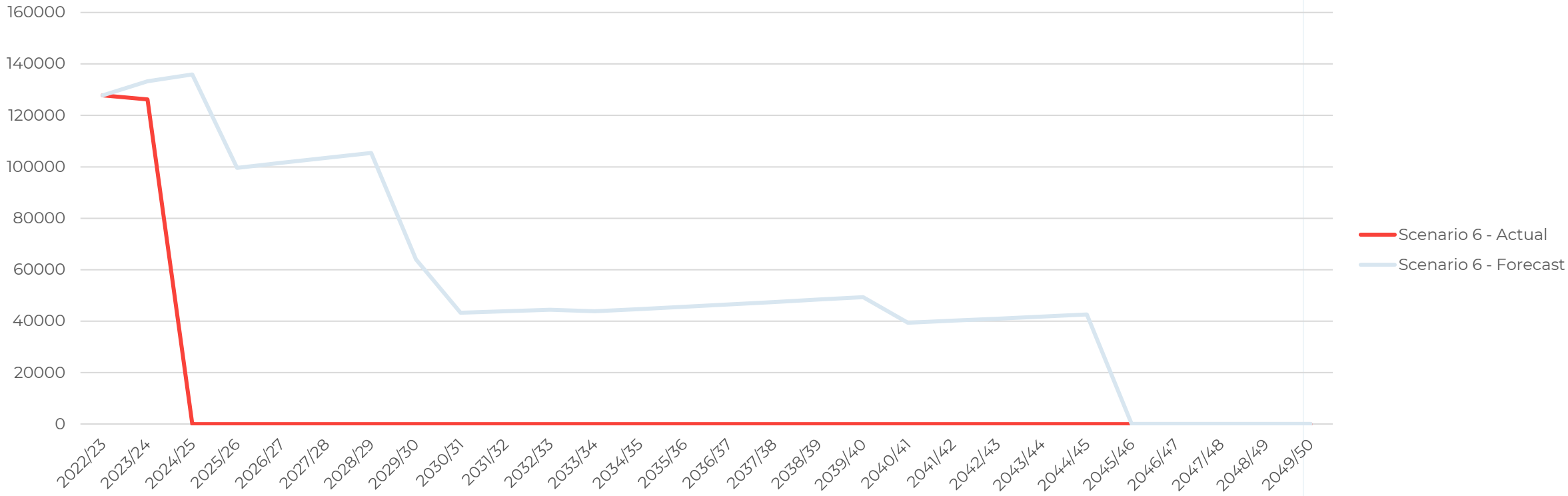
EMR's Progress Against Net Zero Targets

Introduction

This section of the report assesses how EMR are currently performing against their net-zero trajectory and science-based targets submitted to the SBTi.

The review of progress against the net-zero trajectory is broken down by scope.

FY23/24 progress against Scenario 6 Net-Zero Pathway – Scope 1



This chart shows EMR's actual progress in Scope 1 emissions across the reporting periods compared to the Scenario 6 trajectory. The graph shows in FY2023/23, EMR are currently performing **better** than the Scenario 6 forecasted trajectory.

In FY2023/24, EMR's actual Scope 1 emissions were **126,230 tCO2e**. The Scenario 6 trajectory for the same financial year indicated that EMR's Scope 1 emissions should have been no higher than **133,247 tCO2e** to remain on track. Therefore, the difference between EMR's actual and forecasted Scope 1 emissions is **7,017 tCO2e**. As a result, EMR are **5.26%** ahead of target for their Scope 1 emissions projection for FY23/24 and so **on track** to meet net zero in Scope 1 by 2045.

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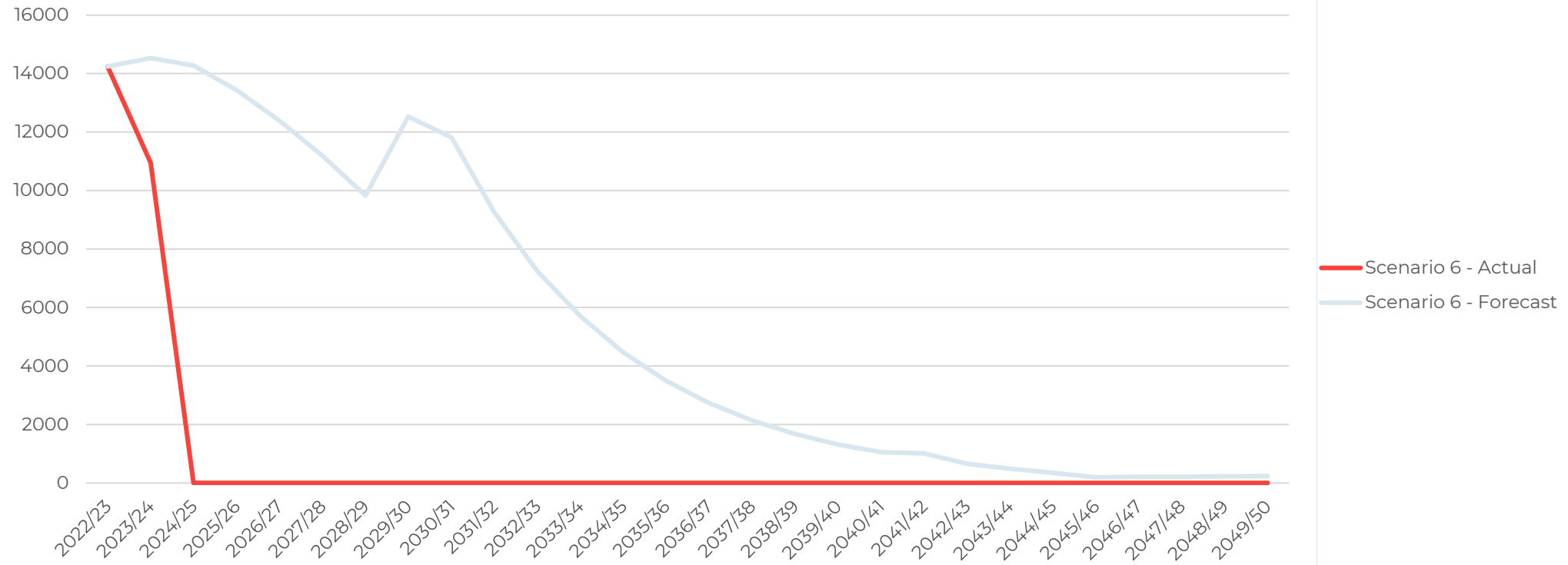
FY23/24 progress against Scenario 6 Net-Zero Pathway – Scope 2



This chart shows EMR's actual progress in Scope 2 emissions across the reporting periods compared to the Scenario 6 trajectory. The graph shows in FY2023/23, EMR are currently performing **considerably better** than the Scenario 6 forecasted trajectory.

In FY2023/24, EMR's actual Scope 2 emissions were **10,944 tCO2e**. The Scenario 6 trajectory for the same financial year indicated that EMR's Scope 2 emissions should have been no higher than **14,531 tCO2e** to remain on track. Therefore, the difference between EMR's actual and forecasted Scope 2 emissions is **3,587 tCO2e**. As a result, EMR are **26.16%** ahead of target for their Scope 2 emissions projection for FY23/24., and so **on track** to achieve their net zero in Scope 2 by 2045

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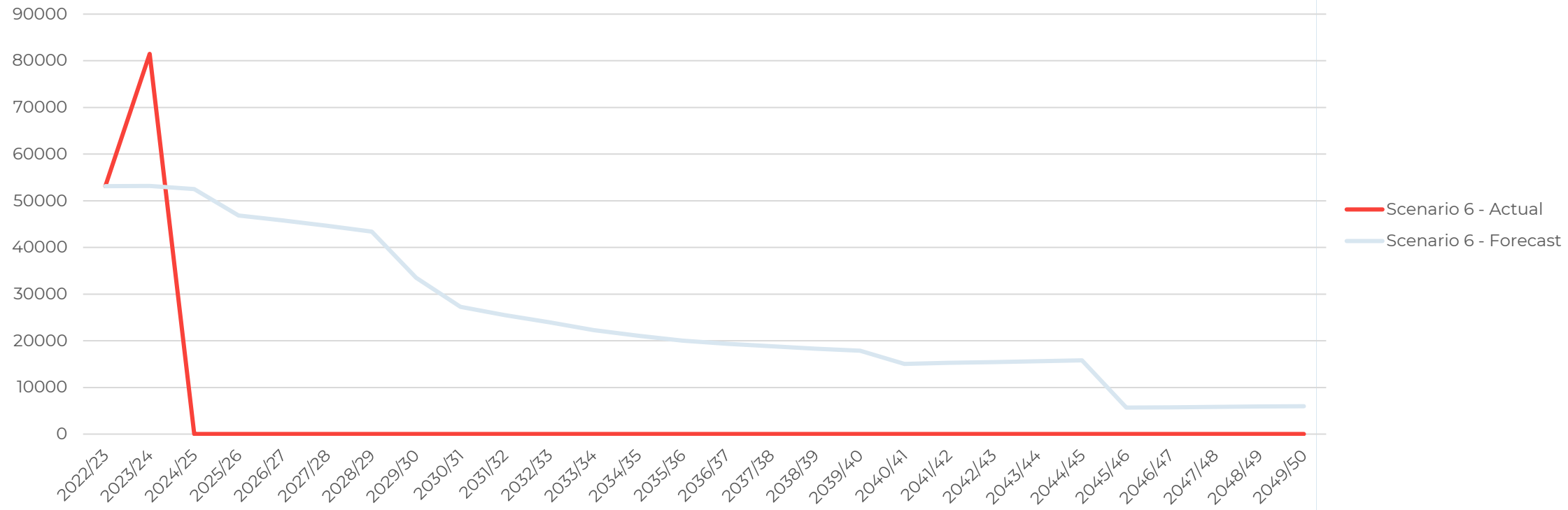
FY23/24 progress against Scenario 6 Net-Zero Pathway – Scope 3



This chart shows EMR's actual progress in Scope 3 emissions across the reporting periods compared to the Scenario 6 trajectory. The graph shows in FY2023/23, EMR are currently performing **worse** than the Scenario 6 forecasted trajectory.

In FY2023/24, EMR's actual Scope 3 emissions were **81,490 tCO2e**. The Scenario 6 trajectory for the same financial year indicated that EMR's Scope 3 emissions should have been no higher than **53,187 tCO2e**. Therefore, the difference between EMR's actual and forecasted Scope 3 emissions is **28,303 tCO2e**. As a result, EMR are **42.03%** behind their Scope 3 emissions projection for FY23/24, and so **not currently on track** to meet their net-zero target in Scope 3 by 2045.

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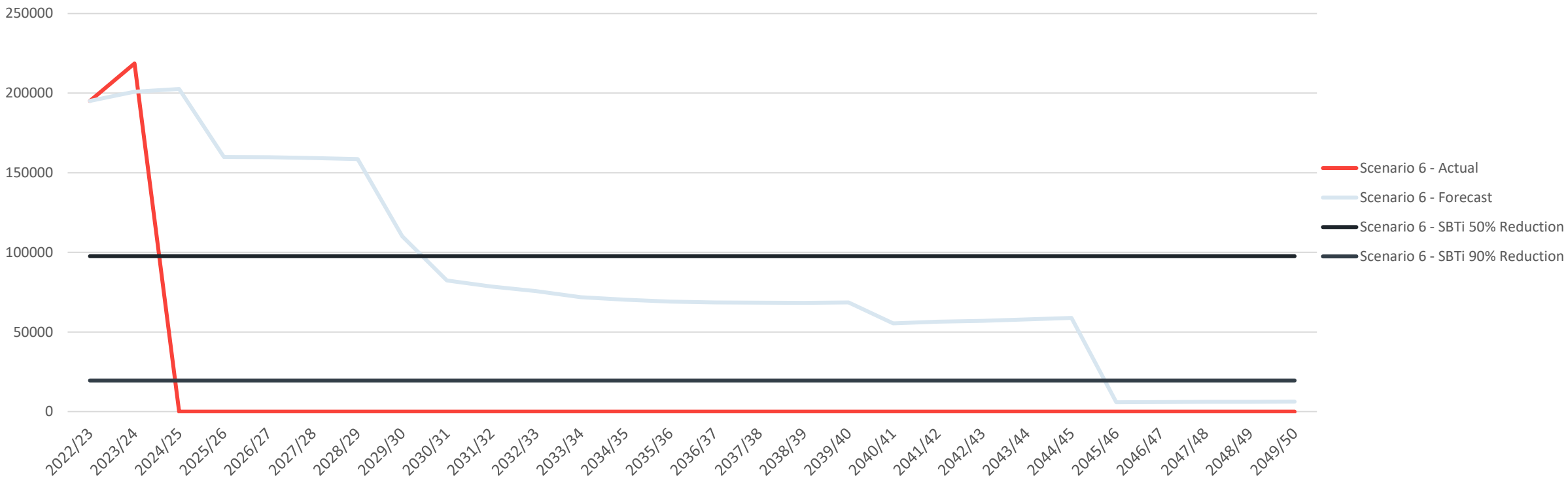
FY23/24 progress against Scenario 6 Net-Zero Pathway – All Scopes



EMR's GHG emissions across all three scopes were forecasted to be **200,965 tCO2e** in FY23/24 based on Scenario 6. The actual trajectory shows EMR operated slightly above the model's projected emissions, as EMR's total emissions for FY2023/24 were **218,664 tCO2e**. This is a difference of **17,699 tCO2e**, or **8.44%**.

This is predominantly due to a substantial increase in Scope 3 emissions, especially Scope 3 Categories 1 and 2, as a result of an increase in spend. However, this increase in Scope 3 emissions has been offset slightly by Scopes 1 and 2 which were performing better than the forecast.

Currently, EMR are not on track to meet net zero by 2045.

Conclusion

Conclusion

Following a successful commission carried out between October 2023 and April 2024 where WSP developed EMR's Net Zero Roadmap and submitted SBTi targets by calculating the base year and most recent financial year carbon inventories, in May 2024, WSP was commissioned by EMR to complete:

- The calculation of EMR's most recent greenhouse gas footprint for FY2023/24.
- Update the net zero model WSP had previously developed to include 'Scenario 6', which reflected EMR's net zero trajectory in line with national grid decarbonisation, rather than relying on traction electricity being backed by REGO's.
- Develop a SBTi tracker to support EMR in measuring their progress against their net zero targets.

For FY2023/24 GHG emission footprint, there was a few differences in the methodology compared to the calculation of previous years footprints, due to data availability. For the first time, data was available on refrigerant gases used. Additionally, EMR were able to provide distance-based data for their use of rail replacement buses, allowing for more accuracy in emission calculations.

In FY2023/24 emissions from Scope 1 were EMR's main source of emissions, accounting for 58% of the GHG footprint. This is due to the large amount of gas oil consumption required to fuel their rolling stock. Traction electricity use was their largest source of Scope 2 emissions (market-based) as consumption was high and it was not backed by REGO's like several of the non-traction sites. Capital goods were the largest source of emissions in Scope 3, due to high spend on emission-intensive activities, such as maintenance.

Compared to EMR's carbon baseline (FY2022/23), the FY2023/24 footprint resulted in higher emissions. This is predominantly due to a large increase in Scope 3 emissions compared to the baseline. However, this large increase in Scope 3 was offset slightly by the decrease in Scope 1 and 2 emissions for FY23/24 compared to the baseline.

Due to feedback from Network Rail, EMR requested WSP to develop a new scenario within the Net Zero model, to remove the assumption that Network Rail will provide 100% renewable traction electricity by 2024/25, and instead align the scenario with grid decarbonisation. This scenario successfully also reached net zero by 2045.

The SBTi tracker was used to assess EMR's performance. When considering all scopes, EMR are currently not on track to meet their net zero targets. However, when broken down, emissions from scope 1 and 2 are less than the forecasted Scenario 6 whereas Scope 3 emissions are higher.

Next, EMR should use the carbon footprint to identify where their carbon hotspots are and reduce them over the coming reporting periods. This will ensure EMR stay on track to reach their net zero targets. Additionally, WSP suggest EMR focus on collecting as much primary data from their suppliers in the future to ensure more accurate calculations.

Appendices

Appendix 1 – Rolling stock replacement scenario details

Scenario 1

Class 158s replaced with cascaded Class 170s in 2030

Class 156s replaced with Class 170s in 2023/24

Class 180s replaced with 222s in 2023/24

All Class 222s replaced with 810s in 2025/26

All Class 170s replaced with regional diesel-electric bi-modes in 2040

Class 360s replaced with more efficient electric train in 2043

Scenario 2

Class 158s replaced with regional diesel-electric bi-modes in 2030

Class 156s replaced with Class 170 in 2023/24

Class 180s replaced with 222s in 2023/24

Class 222s replaced with 810s in 2025/26

All Class 170s replaced with regional diesel-electric bi-modes in 2040

Class 360s replaced with more efficient electric train in 2043

Scenario 3

Class 158s replaced with cascaded Class 170s in 2030

Class 156s replaced with Class 170s in 2023/24

Class 180s replaced with 222s in 2023/24

All Class 222s replaced with 810s in 2025/26

Class 810s replaced with 100% electric train in 2040

All Class 170s replaced with regional diesel-electric bi-modes in 2040

Class 360s replaced with more efficient electric train in 2043

Scenario 4

Class 158s replaced with regional diesel-electric bi-modes in 2030

Class 156s replaced with Class 170s in 2023/24

Class 180s replaced with 222s in 2023/24

Class 222s replaced with 810s in 2025/26

Class 810s replaced with 100% electric train in 2040

All Class 170s replaced with regional diesel-electric bi-modes in 2040

Class 360s replaced with more efficient electric train in 2043

Scenario 5 (reaches Net Zero)

Class 158s replaced with regional diesel-electric bi-modes in 2030

Class 156s replaced with Class 170s in 2023/24

Class 180s replaced with 222s in 2023/24

Class 222s replaced with 810s in 2025/26

Class 360 replaced with more efficient train in 2043

All Class 170s replaced with regional diesel-electric bi-modes in 2040

Battery-electric trains replace 170s on the Nottingham to Worksop service (Robin Hood Line) from 2033/34

All diesel-electric bi-modes replaced by battery-electric bi-modes in 2045

NEW - Scenario 6 (reaches Net Zero)*

Class 158s replaced with a regional diesel-electric bi-mode in 2030.

Class 156 replaced with Class 170s in 2023/24

Class 180s replaced with 222s in 2023/24

Class 222s replaced with 810s in 2025/26

Class 360 replaced with more efficient electric train in 2043 (appears in Scope 2)

All Class 170s replaced with a regional diesel-electric bi-mode in 2040

Battery-electric trains replace 170s on Nottingham to Worksop service (Robin Hood Line) from 2033/34

All diesel-electric bi-modes replaced by battery-electric trains from 2045/46

**The difference between Scenario 5 and Scenario 6 is the source of the traction electricity used in the forecasting. Scenario 5 is based on traction electricity being 100% REGO backed from 2025, whereas in Scenario 6 no REGOs are assumed; instead decarbonisation is in line with societal decarbonisation of the national grid.*

Appendix 2 - Modelling Assumptions (Traction)

General

- Electrification of EMR network to be progressed at the timescales committed by DfT at time of writing. It is assumed no electrification will be modelled beyond which has been committed by the UK Government.
- The growth projections on passenger journeys were sourced from Office for Rail and Road for the baseline year and then assumed to increase by 2 % up to 2050.
- For service routes which have no electrification committed yet by DfT, it is assumed these routes will use diesel-electric bi-mode in diesel mode only
- Train Idling is accounted for in the fuel efficiency rates of trains which are based on historical performance data. For any rates not based on history (i.e. for new trains) assumed rates have been uplifted by 4% to account for engine idling.
- Traction electricity will be 100% renewable energy from 2024/25 as per Network Rail Traction Decarbonisation Network Strategy other than in Scenario 6.
- Battery-electric bi-mode trains will be viable for operation on the EMR network from 2033 for Robin Hood Line and 2045 for all other routes.
- Modelling based on current EMR emissions reporting and modelling may change as and when additional emissions sources are captured
- The embodied emissions of new trains have not been included in this modelling.

Societal Trends

- Assumed that the AIB's (Association of Issuing Bodies) UK residual mix emission factor for market-based electricity will be constant from 2022.
- The UK electricity grid will decarbonise at a rate predicted by the UK Government (Greenbook)
- Gas oil and diesel will not decarbonise
- Fuelling of other TOCs trains with gas oil and diesel is expected to decrease as TOCs transition to bi-mode and battery trains. No sales of diesel fuel to other TOCs from 2040
- Charging of other TOCs battery trains on EMR site excluded as there is too much uncertainty regarding this.

Appendix 2 (Cont'd) - Modelling assumptions (traction)

Scope 1

- Use of diversionary routes has been accounted for by reducing electric miles proportion of bi-modes by 4%
- Fuel efficiency of a regional diesel-electric bi-mode available in 2030s assumed to be 0.90381 litres per mile in diesel mode and 3.14658 kWh per mile in electric mode
- Fuel efficiency of a class 810 assumed to be 1.05444 litres per mile in diesel mode and 3.66543 kWh per mile in electric mode
- Electric mode assumed to be used for 100% of electrified rail where it is available; only using alternative where rail is not electrified.

Scope 2

- In Scenarios 1, 2, 3, 4, 5 traction electricity via OLE will be 100% renewable energy from 2025/26FY as per Network Rail Traction Decarbonisation Network Strategy
- Electric trains that are new in 2040s are assumed to be 25% more efficient than electric trains at time of modelling (2024)
- First battery-electric train to be used on Nottingham - Worksop service from 2033/34 and all services to use battery-electric trains or electric train from 2045
- Battery-electric trains to be charged with 100% renewable energy when they enter service (from 2033)
- Battery-electric train available in 2030s assumed to have same fuel efficiency when used in either battery or OLE mode - with this being 3.14658 kWh per mile
- Battery-electric train available in 2040s assumed to have same fuel efficiency when used in either battery or OLE mode - with this being 2.35994 kWh per mile
- Fuel efficiency of a regional diesel-electric bi-mode available in 2030s assumed to be 3.14658 kWh per mile in electric mode
- Fuel efficiency of a class 810 assumed to be 3.66543 kWh per mile in electric mode
- Fuel efficiency of an electric train available in 2040s assumed to be 2.48515 kWh/mile (25% more efficient than a class 360)
- Modelling assumes battery-electric trains will be charged via the OLE and static charging stations; however the embodied (scope 3) emissions of charging points have not been included in this model.
- Electricity supplied to battery trains via static chargers (i.e. not OLE) to be sourced from 100% renewable energy

Appendix 2 (Cont'd) - Modelling assumptions (traction)

Scope 3

- Traction assumptions listed as Scope 1 and 2 affect Scope 3.
- Modelling assumes battery-electric trains will be charged via the OLE and static charging stations; however the embodied (scope 3) emissions of charging points have not been included in this model.

Appendix 3 - Modelling assumptions (non-traction)

Societal Trends

- Zero emission technology will be available for all coaches and buses
- For every 5% increase in car EV kms completed, the combined BEIS emission factor for car is forecasted to decrease by 3.6% in Societal Trends. This ratio is applied to forecast future coach and bus emission factors in the absence of BEIS emission factors for coach and bus split by fuel type.
- Rail replacement bus services assumed to remain constant from baseline up to 2050
- The UK electricity grid will decarbonise at a rate predicted by the UK Government (Greenbook)
- For every 5% increase in car EV kms completed, the combined BEIS emission factor for case is forecasted to decrease by 3.6% in Societal Trends. This ratio is applied to forecast future coach and bus emissions factors in the absence of BEIS emission factors for coach and bus split by fuel type.

Scope 1

- All company-owned and hire road vehicles will be EVs by 2035, with 50% EVs achieved in 2030
- It is assumed no company owned vehicles will be EV until 2025/26
- Natural gas to be 100% replaced by electric heating system by 2027/28 across all site except depots, with the phase out of depots by 2032/33. Assume transition starts in FY 2024/25 and a linear progression onwards

Appendix 3 (Cont'd) - Modelling assumptions (non-traction)

Scope 2

- In Scenarios 1, 2, 3, 4 and 5, all EMR non-traction energy will be sourced from renewable energy by 2024/25
- The reduction in natural gas consumption (kWh) will result in equivalent quantity (kWh) increase in electricity consumption
- Electricity used for heating to replace natural gas will be sourced from REGO backed renewable energy from 2024/25
- Electricity used for electric vehicle (EV) charging on-site will be sourced from REGO backed renewable energy from 2024/25
- All EV charging to take place on EMR site
- Electric vehicle (road) fuel efficiency assumed to be 3.5 miles per kWh
- EMR will install 100,000 kWh/year of solar pV between 2024-2030, and will install 300,000 kWh/year of solar pV by 2040

Scope 3

- All cars on UK roads in 2050 will be zero emission
- Well to Tank (WTT) emissions from switching to EVs have been modelled in line with a reduction in diesel/petrol WTT emissions, but still accounting for WTT for electricity use
- No EMR initiative that exceeds societal trend for business travel and commuting categories.
- Rail replacement services will be 100% EVs by 2040
- The ratio of train services vs rail replacement services is assumed to remain the same as the baseline
- Purchased goods and services and Capital Goods to decarbonise by 90% by 2040/41 (within this, by 50% in 2030/31 and 75% in 2035/36) due to EMR sustainable procurement initiatives.
- EMR target to install 100,000 kWh/year of solar pV by 2030 and 300,000 kWh/year by 2040
- It has been assumed that the PV modules and inverters would be installed at a linear rate between 2025/26 and 2040/41
- Solar panels and inverters assumed to originate from China (worst case scenario)