



Driving continuous improvement

Enabling a smooth transition to Net Zero

Welcome to UK Power Networks' Annual Environment Report 2023-24.

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About this report

We are pleased to present UK Power Networks' Annual Environment Report for 2023-24, on behalf of our three licensed distribution companies: Eastern Power Networks plc (EPN), London Power Networks plc (LPN), and South Eastern Power Networks plc (SPN). This report fulfils an annual requirement under standard condition 47 of the Electricity Distribution Licence and updates stakeholders on our progress in delivering our Environmental Action Plan (EAP) commitments as set out in our RIIO-ED2 Business Plan.

Executive summary

Mark Adolphus

Director of Health, Safety,
Sustainability and Connections



We are pleased to present UK Power Networks' Annual Environment Report for 2023-24, on behalf of our three licensed distribution companies: Eastern Power Networks plc (EPN), London Power Networks plc (LPN), and South Eastern Power Networks plc (SPN)."

As a network operator our greatest contribution to decarbonisation of the UK economy is through the efficient management of our network. Ensuring that our network is able to accommodate increasing volumes of clean and distributed energy, EV charging infrastructure and the roll out of heat pumps. The launch of our Distribution System Operator (DSO) is enabling us to enhance our capabilities, delivering flexibility models to manage demand and helping support local authorities and wider stakeholders to create their energy plans for decarbonisation. We also continue to support the communities we operate in, helping those in vulnerable situations, ensuring that the net zero transition is a just one and that no one is left behind.

We also have a clear responsibility to manage our own environmental and carbon impacts, set targets and action plans to mitigate these, and regularly review both progress and targets. In RIIO-ED1 we created stretch targets that went beyond our RIIO-ED1 environmental commitments. This resulted in us being the first UK DNO to have our carbon targets validated by the Science Based Target initiative (SBTi). We have continued this proactive approach into RIIO-ED2, upgrading our targets with the SBTi and becoming the first UK DNO to have our net zero target validated.

Key highlights

The key highlights on our environmental activities and performance during the 2023-24 year are outlined below, along with our current RAG status for our core Environmental Commitments for RIIO-ED2 – see below.

Business Carbon Footprint (BCF)

We have fulfilled our commitment to the SBTi's Business Ambition for 1.5°C by successfully upgrading and validating our Scope 1 and 2 targets from well below 2°C to 1.5°C, retaining our Scope 3 targets and keeping the target date at the near term ten years. Critically, we have also validated our net zero 2040 target with the SBTi as well, making UK Power Networks the only UK DNO to do so. We have reduced our BCF by 19.3% from the baseline year, and our validated SBTi Scope 1 and 2 emissions by 28.9% in the same period.

Sulphur Hexafluoride (SF6) and Other Insulation and Interruption Gases (IIGs)

All three of our licensees have met our target to emit a maximum of 0.15% of the total SF6 used in our equipment. During 2023-24, we have installed switchgear containing SF6 alternatives which have significantly reduced global warming potential. Our strategy continues to be investing in improving leak monitoring and reduction, exploring SF6 alternatives, and collaborating with research organisations to develop quick leak sealing technologies.

Electricity Distribution Losses

As per our Losses Strategy we have continued to seek to minimise losses wherever viable and in 2023-24 we are pleased to report that 13,152.4 MWh of improvements were made over the 12 month period, equating to 2,393 tCO₂e emissions in the year.

Embodied Carbon

We have developed and implemented an embodied carbon tool to monitor and reduce carbon emissions from new projects over £1m. Our aim is to reduce carbon emissions from production to disposal of materials by 25% by 2028 compared to the 2018-19 baseline year. Launched in April 2024, the tool's latest version (1.2) has shown a 15% carbon saving in 12 projects.

Supply Chain Management

Through supplier workshops and collaboration, we have launched several initiatives to enhance sustainable procurement and supply chain management, focusing on engagement, compliance, reporting, and carbon reduction. Our Supply Chain Code of Conduct ensures high standards of environmental supplier management with over 85% of our material suppliers signing the Code by November 2023. We developed a carbon data collection portal, which was released to over 100 suppliers in July 2023. Working in partnership with some of our largest carbon-emitting vendors, carbon reduction action plans have been implemented.

Executive summary continued

Key highlights continued

Sustainable Resource and Waste

During 2023-24 we achieved over a 70% recycling rate from our offices and depots. To improve our recycling performance, we are working with our waste contractors to provide training on enhanced waste segregation practices. All waste generated by our streetworks activities has been reprocessed and recycled.

We participated in the final assessment of the Ellen MacArthur Foundation's Circulytics toolkit, improving our score from last year. We are now developing our own in-house circular economy assessment tool to evaluate material streams and waste.

Visual Amenity

We continue to provide technical guidance to a Steering Group made up of landscape experts and stakeholders that nominate schemes to underground overhead lines in National Parks and National Landscapes within our EPN and SPN licensed areas. We have amended the constitution of the group which has allowed us to broaden the membership and bring in large landowners. This has brought forward more schemes for selection and approval, and to date we have undergrounded over 9km of overhead line and now have 24 schemes ready to move to the consents phase.

Noise Pollution

Over the past year, noise enquiries and complaints from substations have decreased, from 40 to 27, of which two required mitigation measures to be implemented. We continue to engage with local authorities to ensure new developments have the correct noise mitigation measures included in their planning applications. This follows the pioneering work we undertook to create online freely available mapping tools that identify possible areas of conflict for new housing developments.

Polychlorinated Biphenyls (PCBs)

During 2023-24, we continued to utilise the PCB cohort model of using statistical analysis to assist with the identification and removal of PCB contaminated transformers from our network. At the time of writing we have replaced 75 ground-mounted transformers and 722 pole-mounted transformers.

Biodiversity and/or Natural Capital

This year we have completed biodiversity enhancements at 24 of our sites against our 2028 target of improving 100 by 30% using the Defra biodiversity metric tool. We have been working with ecologists to identify, survey and develop bespoke biodiversity improvement plans. We have also formalised a cross-business steering group to lead the changes required to meet the 10% Biodiversity Net Gain planning requirements.

Fluid Filled Cables

We are committed to reducing our fluid filled cable leaks by 15% by 2028. This year we have continued to prioritise poor condition circuits for refurbishment and replacement schemes. We have completed the decommissioning of two schemes and feasibility studies for a further 15. We also continue to take proactive steps and actions to identify leaks and locate them quickly, as well as better manage circuits at risk so they are less likely to fail.

Wider Environment and Other Activity

Our actions across other areas of opportunity for environmental improvement are wide in scope and align to our RII0-ED2 environmental and carbon commitments. Two key projects are the fleet transition and temporary generators whose emissions account for 60% of our BCF, making diesel consumption a critical decarbonisation challenge.

Fleet Transition

We have enhanced our contract support and supplier diversity to ensure we have the right capability in place for vehicle choice and charging infrastructure. At the same time we have increased the availability of electric vehicles (EVs) and the incentives to adopt them for our staff when choosing their next company or private vehicle. This has seen EV penetration into the grey fleet¹ increase to over a third. In addition, we have now introduced EVs into the small van fleet with one in ten of these now an EV.

Temporary Generation

Using temporary generation ensures continuity of supply for our customers. We have trialled hybrid engines and low carbon fuels to reduce emissions and improve fuel efficiency. The trial achieved 25-40% fuel savings, reduced noise and lowered NOx (oxides of nitrogen) emissions during low load periods. From these results we have initiated the replacement of traditional diesel with new hybrid generators within our own fleet. We are also actively seeking contracts with our suppliers to adopt low carbon fuels, upgrade their fleets to hybrids, battery and more fuel-efficient (stage V) engines to improve fuel economy.

¹ This is the term given to private vehicles which are used for business purposes.

Executive summary continued

EAP Executive Summary Table		
Commitment	Benefit	RAG Status
EAP 1 Reporting Review of EAP and targets and reporting to the ESG Board Sub Committee	Ensures alignment and accountability with environmental goals, continuous improvement, and transparency.	Green
EAP 2 SBTi and Net Zero Certification and Targets Full carbon footprint target validated with the Science Based Target initiative (SBTi) Baseline year: 2018-19 Target year: 2028-29 Scopes 1 and 2 at 1.5°C and Scope 3 at well below 2°C Achieve net zero by 2040	Aligns carbon reduction targets with the global climate goals and will see Scopes 1 and 2 achieve a greater than 42% decrease and Scope 3 a 25% decrease. Provides short near-term targets to support long-term net zero goal.	Green
EAP 3 BCF Footprint Business Carbon Footprint exceeds SBTi of 1.5°C Baseline Year: 2018-19 Target year: 2028-29 Use high-quality carbon offsets for residual emissions in 2028	Addresses our day-to-day carbon impacts where we have greatest control, such as fleet, temporary generators, purchased energy and fugitive SF6 emissions. Development of carbon offset pathway following the Oxford Principles for offsetting. This will support the development of a credible offsetting pathway for the net zero target and the development of an internal price of carbon.	Amber
EAP 4 Scope 3 Supply Chain Emissions Supply chain Scope 3 emissions reduction at well below 2°C Target: 25%	Reduces emissions from supply chain activities, promoting sustainable behaviour and carbon reduction across our wider stakeholders where we have influence.	Green
EAP 5 Circular Economy Circular Economy, develop tool/approach for high impact materials and set targets	Promotes efficient resource use and waste reduction. Also supports the decarbonisation of our Scope 3 emissions and embodied carbon through reduction in materials use, substitution for less impactful and lower carbon materials.	Green
EAP 6 Recycling and Recovery Recycling and recovery targets for office/depot/network – 80% Target for street works – 99.5% with zero recoverable waste to landfill	Increases recycling rates, supports EAP 3 and EAP 4 and further reduces the already small volumes that go to landfill.	Green
EAP 7 Biodiversity Biodiversity net gain of 30% (aggregated) at 100 sites, further 100 sites identified and any major substation development achieving a net gain of 10-20%	Enhances and preserves biodiversity across multiple sites, helps ensure process for meeting new BNG planning requirements are met. Also helps support the national and global efforts to reverse the decline in nature and ecosystem services.	Green
EAP 8 Air Quality Air quality NOx emissions target: 33%	Improves air quality by reducing NOx emissions, which have a significant impact on human health. Aligns with the decarbonisation ambitions in EAP 3 as predominated source of NOx is diesel consumption in fleet and temporary generators.	Green
EAP 9 Oil Leaks Oil leaks – reduce annual leak rate by 15% in our fluid filled cable (FFC) network	Replacement targeting worst performing circuits eliminates potential for oil leaks and impacts on sensitive receptors. Improved leak detection and management of network further reduces potential for loss of oil.	Green
EAP 10 Visual Amenity Undergrounding overhead lines within National Parks and National Landscapes ensuring the £14.3 million allowance is spent	Enhances visual amenity and preserves natural beauty in protected areas in partnership with expert stakeholders who review and select appropriate projects.	Green

EAP Commitments with Amber Status

EAP 3 BCF Footprint

To date we have achieved a 19.3% reduction in emissions against our forecast of 24.8%, placing us behind target. Diesel consumption has on average accounted for 60% of this footprint and has proven to be a tough challenge to overcome. Nevertheless, the 2028 target is still achievable with the following interventions focusing on temporary generators and fleet.

Temporary generators

- Sourcing lower carbon fuels for temporary generators as a short/medium term measure
- Introducing hybrid engines into our directly owned fleet (currently in production)
- Stronger emphasis on utilising the latest generator technology such as fuel-efficient stage V engines, hybrids, and battery packs with generator suppliers

Road vehicle fleets

- Contract and supply chain support improvements implemented to:
 - improve charging infrastructure across our depots and employees' homes
 - provide a wider range of vehicle types to increase the breadth of EVs available to us
- Streamlining of internal processes to accelerate the adoption of EVs for our directly owned vehicles
- Incentivisation of EVs through our employee cash allowance schemes
- A fifth of the van fleet replaced with new vehicles to improve fuel efficiency (new Euro Stage 6 replacing older Euro Stage 5)
- EV champions now in place for smaller class B vans to demonstrate suitability and capability to wider operational teams

Business Carbon Footprint (BCF)

In our RIIO-ED1 Business Plan we set ourselves an overall target to reduce our BCF by 2% for each year of the RIIO-ED1 price control period, amounting to a 16% total reduction against our baseline year of 2014-15 by 2022-23. We achieved a reduction of 35.9%, which was significantly ahead of this target.

Over the course of RIIO-ED1 we also achieved two DNO firsts: attaining the Carbon Trust Standard for carbon reduction¹ and verifying our carbon targets with the Science Based Target initiative (SBTi).²

In our business plan for RIIO-ED2, we updated our core vision statements for the business – adding a fourth pillar to address the net zero challenge (see Figure 1). As a respected and trusted corporate citizen we aim to be the most socially and environmentally responsible in our sector. Our new fourth pillar will ensure that the move to a low carbon economy is a just transition, so that no one is left behind.

Figure 1: Our Vision



Our Environmental Action Plan for the RIIO-ED2 price control period builds on the significant positive action and research we undertook during RIIO-ED1 that led us to exceed our commitments on carbon reduction. The remainder of this section describes the BCF reporting requirements, our BCF methodology and reporting process, the various elements of our BCF and how they are measured, and how we track our carbon emissions throughout the year. We have also provided data on our 2023-24 performance in the KPI tables in the Annex; please see the BCF tab.

BCF Reporting Requirements

Decarbonisation in line with our validated Science Based Targets (SBTs) is one of four key pillars in our Environmental Action Plan for RIIO-ED2. Table 1 presents the objectives and targets we have formulated for this requirement.



Table 1: Our decarbonisation objectives and targets		
Pillar	Objectives	Targets
Decarbonisation in line with our validated SBT	Directly Support SBTi – achieve our validated 1.5°C target for our Scope 1 and 2 emissions and well below 2°C for our Scope 3 emissions. Achieve net zero for all emissions by 2040.	25% Near-term targets for our Scope 1 and 2 targets are 53.1% by 2029. We also commit to reducing Scope 3 emissions by 25% over the same time frame.
	Exceed an equivalent SBTi target of 1.5°C for our BCF (directly controlled emissions Scopes 1 and 2 excluding distribution losses)	42% Exceed minimum reduction of 42%. Note: This is not a standalone validated SBTi target. The BCF emissions are incorporated into the validated SBTi target above.

[For a complete view of our Environmental Action Plan please click here.](#)

1 To achieve validation against the Carbon Trust standard, an organisation would need to demonstrate it had correctly benchmarked and captured its carbon emissions in line with the Greenhouse Gas (GHG) protocols for Scopes 1 and 2. It would also have to show year-on-year reductions in emissions from a baseline year, over a three-year cycle.
 2 The Science Based Targets initiative (SBTi) is a corporate climate action organisation that enables companies and financial institutions worldwide to play their part in combatting the climate crisis.

Business Carbon Footprint (BCF) continued

There has been a change in the BCF reporting requirement for Ofgem which previously split carbon into subject areas which mixed the three scopes defined in the Greenhouse Gas (GHG) Protocol. The biggest change is the removal of the business transport category which historically at UK Power Networks mixed Scope 1 emissions from our company car fuel cards with Scope 3 emissions such as public transport and business mileage completed in private cars.

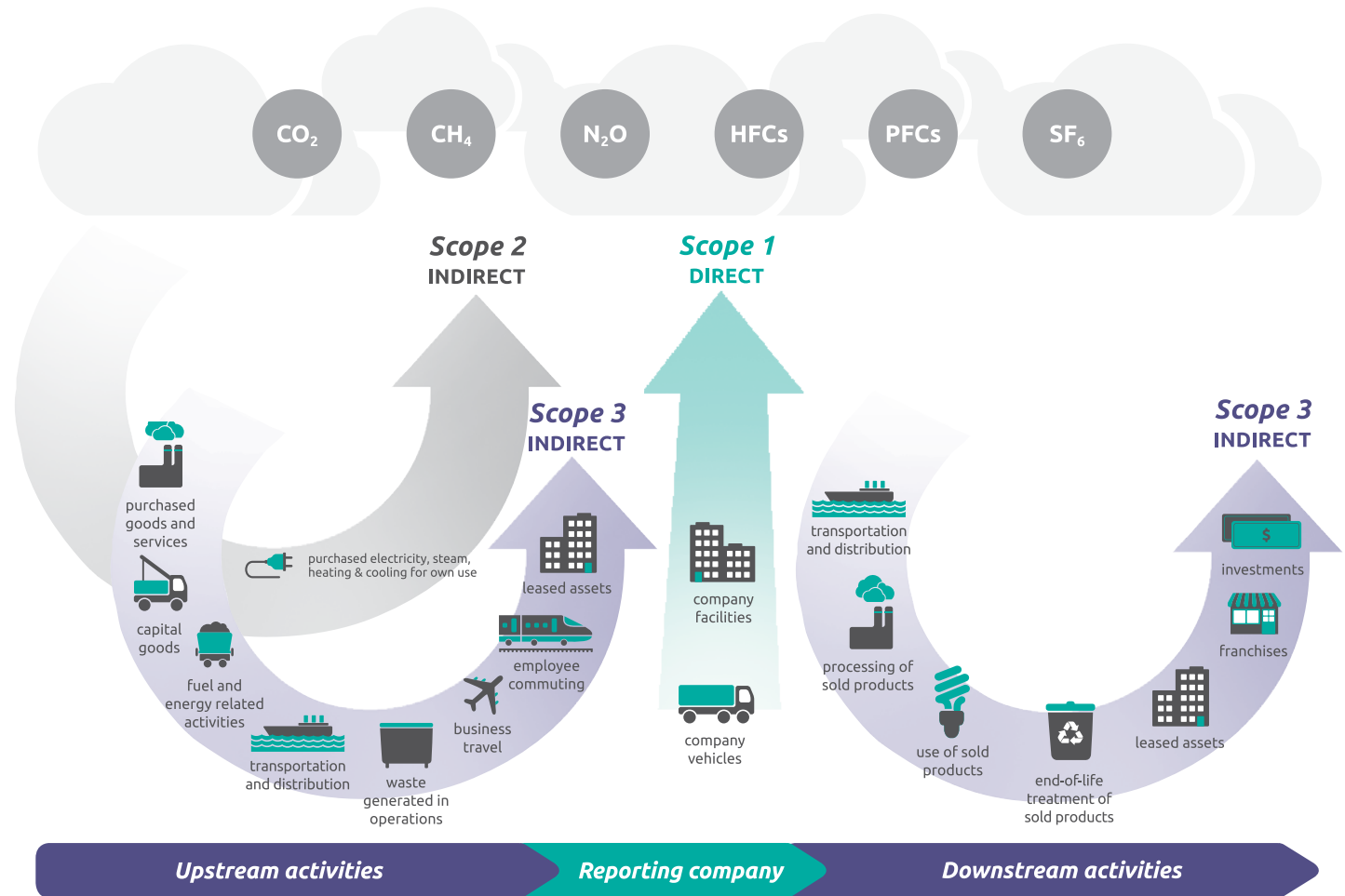
The GHG Protocol scopes are defined below and are illustrated in Figure 2:

Scope 1: direct emissions from sources owned or controlled by UK Power Networks. For UK Power Networks this covers fuels consumed by our road vehicle fleet, temporary generators and plant, as well as fugitive (SF6) emissions from our switchgear and building air conditioning systems.

Scope 2: indirect emissions from the consumption of purchased electricity, heat and steam and, in a DNO's case, distribution losses.

Scope 3: upstream and downstream emissions which are as a result of our activities but outside UK Power Networks' ownership and control, such as those embedded in our supply chain, purchased goods and services, waste disposal and transportation in vehicles not owned or controlled by UK Power Networks.

Figure 2: The GHG Protocol scopes



Source: Greenhouse Gas Protocols - Corporate Value Chain (Scope 3) Accounting and Reporting Standard

Business Carbon Footprint (BCF) continued

Our BCF Methodology

All data provided is for the regulatory reporting year from 1 April 2023 to 31 March 2024. All reductions reported are against a baseline of 2018-19, which is the baseline year for our validated SBTs.

The [UK Government GHG Conversion Factors for Company Reporting \(published in June 2023\)](#) have been used in all calculations. This approach complies with Defra guidance to use these factors for any April to March reporting as well as calendar year reporting.

BCF Scope 1 and 2 Reporting

Distribution losses account for 96% of our Scope 1 and 2 footprint and are the focus of a separate strategy; please see [Electricity Distribution Losses](#). Focusing on our BCF without distribution losses highlights the potential for sustainability improvements in our operational activities. In 2023-24 the largest element of our Scope 1 and 2 footprint was operational transport (42%), followed by building and substation energy usage (30%), temporary generation (23%) and fugitive (SF6) emissions (5%). Figure 3 illustrates our Scope 1 and 2 footprint including distribution losses. Figure 4 illustrates the Scope 1 and 2 percentage splits excluding distribution losses.

Figure 3: Scope 1 and 2 footprint with network losses

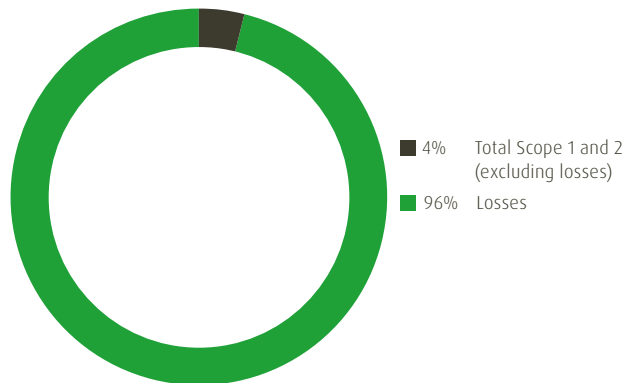


Figure 4: BCF Scopes 1 and 2 percentage splits (excluding network losses)

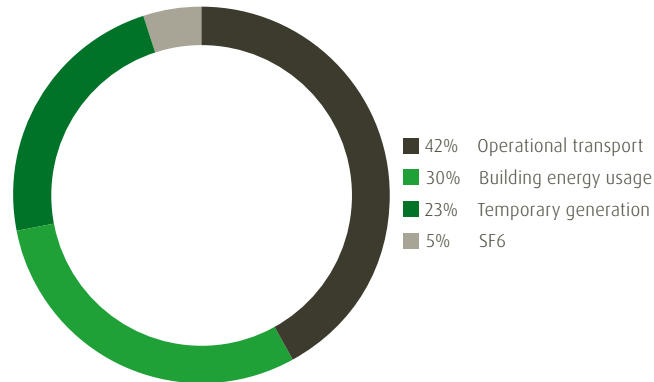
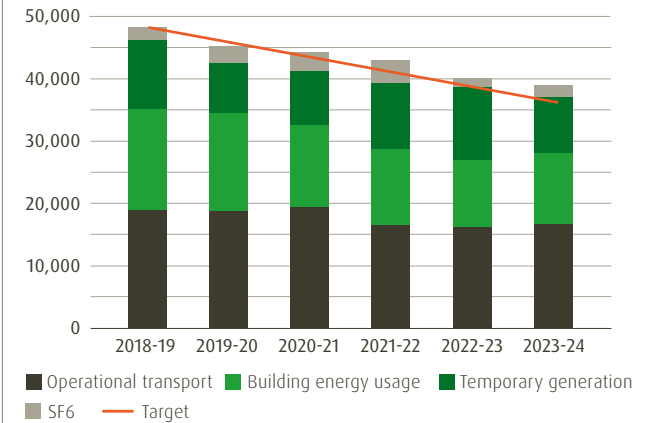


Table 2 shows a reduction in our Scope 1 and 2 footprint, including and excluding distribution losses, between the regulatory years 2018-19 (our baseline year for our SBTi targets) and 2023-24. In Figure 5, the individual components of our BCF (excluding distribution losses) are shown in tonnes of CO₂ equivalent (tCO₂e).

Table 2: Our Scope 1 and 2 emissions, including and excluding distribution losses, between 2018-19 and 2023-24

	2018-19 (tCO ₂ e)	2023-24 (tCO ₂ e)	% change
Excluding distribution losses	48,250.42	38,919.07	-19.3%
Including distribution losses	1,535,217.42	1,092,295.47	-28.9%

Figure 5: BCF progress against baseline year 2018-19 (tCO₂e)



Note: BCF focuses on those emissions directly associated with our operational activities and covers fleet, temporary generators, energy purchased for the running of our offices, depots/substations and fugitive SF6 emissions. Target under location based carbon reporting and baseline year is 2018-19.

Over the last five years there has been a steady decline in BCF emissions from the 2018-19 baseline year. The relative percentage splits between the emissions sources have largely stayed the same, albeit emissions from building energy usage have decreased. Liquid fuels, such as diesel, and SF6 emissions remain challenging to decarbonise.

To monitor progress against our targets, we prepare monthly reports which are presented to our cross-business Environmental Action Plan senior management team using data received from internal and external sources. Any anomalies in the data are interrogated with an annual internal assurance check and corrective actions implemented where necessary.

Monthly reports cover:

- Fleet fuel usage
- SF6 top-ups
- Electricity and gas meter readings
- Generator and bowser fuel usage

Business Carbon Footprint (BCF) continued

The Individual Elements of our BCF

Since UK Power Networks validated its carbon targets with the SBTi the relative percentage splits in our BCF between fuel use, energy and fugitive emissions have remained constant. Fuel consumption by fleet and temporary generators, mainly diesel, has been at around 65% with energy at 30% and fugitive emissions at 5%. The energy efficiency action we have taken across our sites combined with the decarbonisation of grid supplied electricity, has led to a significant reduction in emissions in this area; however, as highlighted above, the diesel we consume and our fugitive emissions remain challenging to decarbonise.

Tackling the emissions from our road vehicle fleet has seen us pilot various electric vehicles (EVs) across roles and vehicle types to prepare for our fleet transition. While for generators we have implemented innovation projects to trial lower carbon fuels with hybrid technology, to test their efficacy and suitability in terms of use, supply and performance. These have demonstrated fuel savings, reduced emissions, and improved air quality impacts. We will decarbonise our road vehicle and temporary generator fleets by adopting the right technology at the right time to maximise carbon savings at the least cost to our customers.



Operational Transport

This element of our Scope 1 and 2 footprint represents the fuel used by our fleet of vans, trucks and specialist vehicles which work directly on our networks. We also report on the fuel used by company cars classed as under UK Power Networks' operational control where drivers have been issued with fuel cards. Fuel purchased for UK Power Networks' fleet vehicles is captured centrally using fuel cards. A small quantity of diesel for temporary generation is also purchased in this way but is recorded separately and reported later in this section as part of our temporary generation carbon footprint.

Table 3 shows the levels of tCO₂e emitted by UK Power Networks' operational fleet between the 2018-19 baseline year and 2023-24.

Table 3: Our operational transport emissions between 2018-19 and 2023-24

	2018-19 (tCO ₂ e)	2023-24 (tCO ₂ e)	% change
Operational transport	18,925.8	16,555	-12.5%

Overall, operational transport emissions have reduced from 18,925.8 tCO₂e in 2018-19 to 16,555 tCO₂e in 2023-24. This represents a 12.5% reduction and is due to the modernisation of our operational fleet which has led to more than 20% of vehicles being replaced with more fuel efficient models in the last two years. We have rolled out more sophisticated technology to enable staff to access cable plans and other documents in the field without incurring unnecessary mileage and have also significantly increased support for our employees to change both their company and personal vehicles from diesel to an EV as part of our fleet transition strategy.

Temporary Generation

This element of our Scope 1 and 2 footprint covers emissions from plant and equipment, such as temporary generators used during fault repairs and planned work on our networks. Data for such emissions is captured from the following sources:

- Monthly fuel usage reports from external providers of standby diesel generators – though provided on an as needed basis, these generators are in direct use on our networks and under our operational control and are therefore classified as Scope 1 rather than Scope 3 emissions
- Fuel cards capturing the amount of fuel used by company owned plant and equipment
- Invoices submitted by the tanker company that fills the bowsers at several of the sites used to fuel our own generators

We use temporary generation to minimise the time that customers are off supply. Severe weather can add significantly to this element of our BCF as we restore customers' power supplies as quickly as possible, often using temporary generation whilst repairing storm damage.

Table 4 shows the levels of tCO₂e emitted from temporary generators and plant and equipment used on our networks. This represents a 19.8% reduction from our 2018-19 baseline year.

Table 4: Our temporary generation emissions between 2018-19 and 2023-24

	2018-19 (tCO ₂ e)	2023-24 (tCO ₂ e)	% change
Temporary generation	11,144.6	8,939.2	-19.8%

Following a successful trial of temporary generators, UK Power Networks has placed an order for new, bespoke hybrid generators which will reduce the fuel we use, the noise made and improve local air quality. We expect them to be deployed this autumn.

Business Carbon Footprint (BCF) continued

Building and Substation Energy Usage

We collate data on building and substation energy usage from the electricity and gas bills received for each of our sites. Gas and electricity usage is billed in kWh then converted into tCO₂e using the appropriate carbon factors.

Under the GHG Protocol we can use both location- and market-based methodologies to report our Scope 2 emissions. Market-based reporting takes account of the electricity we purchase under renewable energy contracts. These are supported by Renewable Energy Guarantees of Origin (REGO) certificates to ensure the sources of renewable energy are properly accounted for. For greenhouse gas reporting purposes we follow a location-based method which uses the UK's annual grid electricity conversion factor, regardless of the type of tariff purchased. Since 1 January 2018 all of UK Power Networks' purchased electricity has been on a 100% renewable tariff. Under a market-based reporting methodology all our electricity could therefore be discounted from our BCF.

Table 5 shows the levels of tCO₂e emitted from energy usage at our sites. Calculated using a location-based methodology, they represent a 28.2% reduction on our 2018-19 baseline year.

Table 5: Our building energy emissions between 2018-19 and 2023-24

	2018-19 (tCO ₂ e)	2023-24 (tCO ₂ e)	% change
Building energy	16,087	11,542.9	-28.2%

We have continued with our staged approach to investing in the modernisation of our buildings and increasing the energy efficiency of our estate. During refurbishment projects we install LED lights and occupancy sensors as standard in our buildings.

³ Building Management System

⁴ In 2023-24 the carbon factor for SF₆ was increased by 3.1% from 22,800 kg CO₂e to 23,500 kg CO₂e. See the UK Government GHG Conversion Factors for Company Reporting.

In addition to this we have delivered energy efficiency projects at a number of our key sites, including:

- **Fore Hamlet:** We have recently installed a new BMS³ system giving us detailed control over the heating, cooling and lighting systems. For example, the air conditioning and air handling (fresh air) systems now communicate to take advantage of free cooling when outside air temperatures are low enough. We also have more control over the volumes of fresh air being brought in and recirculation levels.
- **Bedford:** We completed the installation of solar powered LED street lights in the yard, providing sufficient lighting to ensure field staff are able to operate safely overnight and during the winter months.
- **Bury St Edmunds:** We have installed solar photovoltaic panels to the roof which will provide much of the power required on site. Solar powered lighting has been installed around the building exterior to illuminate walkways and eliminate the need for mains powered street lighting outside core hours.
- **Sundridge:** A mini BMS system has been installed that enables trainers to remotely control their classrooms and avoid having systems running when they are not required.

Fugitive Emissions

SF₆ is an electrical insulating gas which is commonly found in modern electrical switchgear and can have a significant impact on the environment.⁴

It is possible for SF₆ gas to leak following faults or from old equipment and we actively monitor our assets to minimise its escape to the environment. For more detail on our procedures, reporting process and annual performance, please see [Sulphur Hexafluoride \(SF₆\) and Other Insulation and Interruption Gases \(IIGs\)](#).

From a BCF perspective, we measure and record the quantities of SF₆ lost as fugitive emissions. Table 6 shows the level of SF₆ emissions in 2018-19 and 2023-24. The difference in these levels represents a 10.1% reduction on our baseline year.

Table 6: Our fugitive emissions between 2018-19 and 2023-24

	2018-19 (tCO ₂ e)	2023-24 (tCO ₂ e)	% change
Fugitive emissions	2,093	1,882	-10.1%

Distribution Losses

These calculations measure units exiting our distribution network compared to units entering from Grid Supply Points and any other sources. Estimated data can have a big impact on distribution losses. These estimates are based on historical data which has fluctuated enormously in recent years. During the pandemic, a large number of estimated meter readings were taken and there was a shift from office to home working, which will have impacted on the losses calculations. As actual meter readings and corrections to estimates have fed through, the changes in losses shown in Table 7 are reflective of this.

We then saw the lowest distribution losses reported in 2022-23. The exact cause of this is difficult to establish but is likely to be due to a significant overestimate of supply volume being corrected in that reporting year. During the pandemic meter reading ceased, increasing estimates, and volumes of consumption would have shifted from business sites to homes, affecting standard estimates. It is likely that these overestimates have now been corrected with actual readings. In addition, more smart meters have been installed and consumers may also have been much more careful with their energy use given the high costs.

This year, the reported data we receive is back on a more normal footing. The figures shown in Table 7 are correct at the time of submitting our report but may be subject to further updates given the standard reconciliation cycle in the settlements process.

Table 7: Our distribution losses between 2018-19 and 2023-24

	2018-19 (tCO ₂ e)	2023-24 (tCO ₂ e)	% change
Distribution losses	1,486,966.7	1,053,376.4	-29.2%

Business Carbon Footprint (BCF) continued

Our Scope 3 Emissions

UK Power Networks screened and mapped out its Scope 3 footprint with the Carbon Trust utilising Environmentally Extended Input and Output data (EEIO) in accordance with the GHG protocols for Scope 3. This work was conducted in 2020 and we validated our carbon reduction targets with the SBTi the following year. The purpose of the screening was to assess the scale of the estimated Scope 3 emissions in our footprint (i.e. greater than 40%), what categories they fell into and who the material suppliers were.

The work to assess the scale and impact of our Scope 3 emissions utilised spend data and average carbon factors as per the EEIO methodology. This enabled us to determine that most of our Scope 3 emissions were upstream, focused around Category 1 (Goods and Services) and Category 2 (Capital Goods); please see Table 8. In addition, we were able to identify the top 100 materials suppliers who accounted for 80% of our Scope 3 emissions. We now have a targeted programme of more accurately measuring emissions associated with these suppliers, encouraging them to adopt SBTi targets and GHG reporting as well as developing carbon reduction programmes. For more information please see [Supply Chain Management](#).

Our Scope 3 (indirect) emissions accounted for 24% of our total carbon footprint (Scopes 1, 2 and 3). Under SBTi rules we could have legitimately excluded these Scope 3 emissions from our target, as they fell below the SBTi 40% threshold for inclusion. To ensure our targets have a greater reach, we chose to include Scope 3. We have influence over our supply partners and believe we should address these emissions in partnership with them.

We have taken a proactive approach to managing our Scope 3 emissions by including them in our validated SBTi targets and will continue to report on this. We have taken significant measures to improve the accuracy of the assessments of Scope 3 and expect this to improve year on year. The key focus is on partnering with suppliers who share the same values as UK Power Networks and who will work with us to develop carbon reduction plans, improved accuracy of data and where applicable validate their reduction plans with the SBTi. For further information please see [Supply Chain Management](#).

Table 8: Our Scope 3 emissions between 2018-19 and 2023-24

	2018-19 (tCO ₂ e)	2023-24 (tCO ₂ e)	% change
Total Scope 3 footprint including distribution losses	486,822	447,478	-8.1%
Total Scope 3 footprint excluding distribution losses	266,315	213,987	-19.6%
1a – Main Product Related	106,467	106,406	-0.1%
1b – Non-product	61,202	19,811	-67.6%
2 – Capital Goods	73,057	72,717	-0.5%
3 – Fuel Related	5,100	6,461	+26.7%
3 – Electricity Related	3,986	3,723	-6.6%
3 – Electricity Related (Losses)	220,507	233,491	+5.9%
4 – Road	6,269	1,097	-82.5%
5 – Waste Generated in Operations	5,570	1,581	-71.6%
6 – Ground Travel	1,865	953	-48.9%
6 – Air Travel	175	143	-18.3%
7 – Employee Commuting	2,624	1,095	-58.3%

Our SBTs

UK Power Networks committed to the Business Ambition for 1.5°C programme. This required us to upgrade our near-term SBT from well below 2°C to 1.5°C (a move from a 25% decrease to 42% from a baseline year of 2018-19 to a target year of 2028-29) and also to set a long term net zero target.

We have now had our targets validated to the 1.5°C standard and the new net zero standard by the SBTi.

Our targets are:

- **Overall net zero target:** UK Power Networks Holdings Ltd commits to reach net zero GHG emissions across the value chain by FY2040.
- **Near term targets:** UK Power Networks Holdings Ltd commits to reduce absolute Scope 1 and 2 GHG emissions by 53.1% by FY2029 from an FY2019 base year. UK Power Networks Holdings Limited also commits to reduce absolute Scope 3 GHG emissions by 25% within the same time frame.
- **Long term targets:** UK Power Networks Holdings Ltd commits to reduce absolute Scope 1 and 2 GHG emissions by 90% by FY2040 from an FY2019 base year. UK Power Networks Holdings Ltd also commits to reduce absolute Scope 3 GHG emissions by 90% within the same time frame.

Sulphur Hexafluoride (SF6) Emissions and Other Insulation and Interruption Gases (IIGs)

Reducing SF6 leakage from our network assets is key to our vision of being a respected and trusted corporate citizen. Our Asset Management directorate has a target of emitting no more than 0.15% as a proportion of SF6 in service at the start of the RIIO-ED2 price control period in all three of our licence areas and achieving 0.1% by the end of the period.

We use SF6 in our switchgear as an insulation medium, an arc extinction method or for both functions, from 6.6kV up to 132kV. SF6 leakage is measured in kilogrammes as the amount of SF6 that is used to top up our gas filled switchgear. The total capacity of SF6 utilised in electrical assets on our network is just under 130,000 kilogrammes across our three licence areas; please see the corresponding breakdown in Table 9 below.

Table 9: SF6 bank per licensee

Licensee	SF6 bank (kg)
EPN	52,376
LPN	49,626
SPN	26,202
Total	128,204

The SF6 bank is a combination of the SF6 contained in assets on the network and the bottles held by UK Power Networks operational functions used to top up assets. The measurement of SF6 leakage as a percentage of installed capacity is more reflective of the performance of the assets. By omitting the SF6 stock from the calculation, we eliminate the diluting effect that high stock levels may have on the perception of leak performance. The leakage percentage figures can be found in the KPI tables in the Annex; please see the SF6 and IIGs tab.

We are already witnessing a slowdown in the replacement of oil switchgear with SF6 filled switchgear on our network. This is due to three factors:

1. UK Power Networks' commitment to limit SF6 emissions involves adopting SF6 alternatives when they become technically feasible. Where there is a need to continue to use equipment containing SF6, such as the extension of existing switchboards or where the physical nature of the SF6 equipment is more suitable, approval is required from our Asset Management directorate.
2. The development and trialling of alternative gases by equipment manufacturers continues to gather pace. The latest development in this space is the arrival of a 33kV dry air circuit breaker (manufactured by Nuventura) in the marketplace. Subject to a successful passage through checks mandated by the Energy Networks Association (ENA) switchgear assessment panel approvals process (UK Power Networks is a member of the panel), it will become an option for use on our network.
3. On 11 March 2024, revised EU [F-gas regulations](#) came into force with specified dates for the prohibition of the marketing and sale of switchgear containing SF6 (including parts), with lower voltages up to 24kV being embargoed by 1 January 2026, those with voltages between 52kV and 145kV by 1 January 2028, and those between 24kV and 52kV by 1 January 2030. This will have an indirect effect on the UK market because manufacturers will not be incentivised to produce SF6 switchgear for the UK alone. At the 132kV voltage level, where SF6 is the industry standard arc extinction method for circuit breakers, alternative gases and technologies such as clean air insulation combined with vacuum interruption and fluoronitrile-based solutions for insulation and arc interruption have been successfully developed. Due to its compact nature, SF6 filled switchgear offers space-saving advantages at installation. It remains to be seen if alternative gases can be used in our LPN licence area or in any other licence area where space constraints might be an issue. Where alternatives can be used in such circumstances, the transition will be managed in a safe and cost-effective manner.

The timeline for widespread adoption is dependent on the technical approval of SF6 alternative switchgear. This is a meticulous process and SF6 switchgear will need to be used in the medium term. Consequently, due to the replacement of oil and air-blast circuit breakers, the SF6 capacity on our network increased by 1,249 kilogrammes at the end of the first year of RIIO-ED2 from that recorded at the end of March 2023.

Due to an increase in the proportion of electrical equipment for which SF6 alternatives are being introduced to the marketplace and the need to use up stock of already purchased SF6 equipment, it is anticipated that the additional quantity of SF6 on the network will increase by approximately 1,000 kilogrammes by the end of the 2024-25 regulatory year.

Deciding to install air insulated (AIS) or gas insulated (GIS) switchgear is based primarily on the cost of delivery, available space and project delivery targets. Choosing to install SF6 or SF6 alternatives is dependent on these factors as well as ensuring the alternative equipment is safe and technically acceptable for use.



Sulphur Hexafluoride (SF6) Emissions and Other Insulation and Interruption Gases (IIGs) continued

Our 2023-24 Performance

The figures presented in Table 10 are also shown in the KPI tables in the Annex; please see the SF6 and IIGs tab. They demonstrate that in 2023-24 our three licensees comfortably met the 0.15% target for leakage.

Table 10: SF6 emissions per licensee

DNO licence area	Quantity of SF6 in service emitted (kg)	% SF6 in service emitted
EPN	52.8	0.10
LPN	16.1	0.032
SPN	11.2	0.041
Total	80.1	0.062¹

In EPN, we repaired a 33kV circuit breaker at the Earlham Grid 33kV substation, thereby saving almost half a kilogramme worth of SF6 emissions which is equivalent to over 10,000kg of CO₂.

We also used an innovative SF6 adhesive-based leak sealing solution, developed in conjunction with the Electric Power Research Institute (EPRI), to save the loss of SF6 from an 11kV busbar at our Severall Lane Primary 11kV substation in the EPN licence area over a period of six months until the manufacturer could visit site to perform a permanent repair.

Going forward, we are prioritising SF6 leak reduction projects and the evaluation and implementation of innovative measures to expedite the delivery of leak mitigation, to ensure we meet our leakage target in all three of our licence areas.

¹ The total refers to the percentage of the total SF6 bank and is therefore not a sum of the percentages for the individual licence areas.

Our Strategy

We are taking action to minimise SF6 emissions to:

- Remain compliant with the [F-gas Regulations](#)
- Minimise our impact on the environment and achieve our vision of being a respected and trusted corporate citizen
- Minimise the network outages required to top up leaking circuit breakers – reducing costs associated with the top-up and the period the network is at risk
- Reduce the probability of mal-operation or failure – improving network performance
- Minimise the risk of exposure to SF6 for our operational staff when working on the network or handling this substance

Where SF6 leaks occur our current approach is to carry out leak detection works on the affected unit, scope out the works and complete all repair or refurbishment works required to mitigate the leak. The aforementioned activities may be carried out by the manufacturer or an approved contractor, depending on the scale and complexity of the work required. Refurbishment can be on-site or factory based. It generally consists of a strip-down of the circuit breaker, a comprehensive clean and replacement of all worn seals or parts. Repairs are usually carried out on-site. Where it is not reasonably practicable or cost-effective to complete a refurbishment or repair of the circuit breaker, timely replacement will be considered.

Our process for recording top-ups of SF6 is set out below:

- A low gas pressure alarm is automatically received by Network Control
- A top-up work order is raised when a low SF6 gas alarm is detected
- A competent person (holding a valid SF6 handling certificate) tops up the asset to within the manufacturer's recommended pressure range
- The magnitude of the top-up is recorded in an SF6 Top-Up condition measure document, which is associated with the asset in our asset register, and the top-up work order is closed

We have produced three documents specifying the operating constraints that apply to the handling of SF6 or the operation of any switchgear containing this substance. One of these documents is Engineering Design Standard EDS 03-0036 – Management of Switchgear containing SF6, which offers guidance on the management of switchgear containing SF6 from voltages of 6.6kV up to 132kV. More specifically, it details the processes followed in identifying and managing SF6 filled switchgear that may be leaking. This policy applies to all UK Power Networks plant and staff, including contractors who work on the network on our behalf.

Sulphur Hexafluoride (SF6) Emissions and Other Insulation and Interruption Gases (IIGs) continued

Our Stakeholders

Our stakeholders include those who can potentially impact or be impacted by the safety, operational or environmental effects of an SF6 leak. Correspondence is required with operational staff such as field engineers and craftsmen when ascertaining the feasibility of remedial works. For example, information about the precise source of an SF6 leak, where known, will enable the manufacturer to decide whether the proposed remedial action is cost-effective and will prevent costly and potentially unnecessary leak detection visits. We engage regularly and openly with manufacturers on ways to enhance our SF6 management approach.

DNOs and TOs (Transmission Operators) in the UK are also stakeholders in a broader sense. UK Power Networks will continue to work with both stakeholder groups as appropriate to assess the current and evolving state of switchgear technology with a view to charting a technological, practical and sustainable path to the reduction and ultimate elimination of SF6 from electricity networks in the coming decades.

Our Programme to reduce SF6 Emissions

Our programme adheres to the requirements of the UK's equivalent of the EU [F-gas Regulations](#) – to resolve all gas leaks without undue delay. Generally, for primary switchgear and above, a repair or refurbishment will be sought. For secondary switchgear and below, it is generally more prudent to action a replacement than to undertake remedial works, due to the associated costs.

SF6 leakage figures are held on UK Power Networks' asset register and are reported to the senior management team in our Asset Management directorate each month. Top-up figures are also submitted to Ofgem each year.

Our 2023-24 plans included investment targeted at further leak reduction work at Earlham Grid 33kV (EPN), Southern Cross 132kV (SPN), Trowse Grid 132kV (EPN), March Grid 33kV (EPN) and Harlow West Grid (EPN). The work at Earlham Grid was successfully completed. Given the need to prioritise the reliability of customer supplies in the year, combined with the unavailability of specialist engineers from the equipment manufacturer, work at the other listed sites has been rescheduled until 2024-25.

Looking Ahead: Our Future Strategy

Our future strategy is focused on assessing and improving our SF6 leak monitoring and response process as well as continuing to assess the viability of SF6 alternatives with significantly lower greenhouse effects.

Key areas we will continue to explore as part of our future strategy are:

- Collaboration with research organisations, such as the EPRI, and industry partners to develop and implement a quick and easy leak sealing technology which is not dependent on manufacturer availability, and which drastically reduces the time between leak detection and repair
- Monitoring the innovation space for the development of rapid SF6 leak detection technologies and adopting them once proven to be safe and technically acceptable
- Researching the practicality and cost-effectiveness of installing SF6 leak detection sensors on electrical equipment with smaller amounts of gas, such as ring main units (RMUs), to facilitate faster responses to smaller leaks
- Exploring the use of SF6 alternatives, such as vacuum/clean air, and commissioning these assets on our network where safe and economically viable to do so. This will be accomplished by maintaining contact – partly through the ENA – with manufacturers, academic institutions and electricity distribution industry participants who are considering or conducting trials to be well positioned to take advantage of any cost-effective breakthrough product that results from such efforts
- Exploring the potential for replacing SF6 with alternative gases (retro-filling) for carefully specified functions in electrical switchgear

We keep abreast of all innovations related to SF6 as an insulation medium, including the exploration of SF6 alternatives.

Achievements in the 2023-24 regulatory year are shown on the SF6 and IIGs tab of the KPI tables in the Annex.



Sulphur Hexafluoride (SF6) Emissions and Other Insulation and Interruption Gases (IIGs) continued

SF6-Alternative IIG Population

Table 11 shows the alternative Interruption and Insulation Gases (IIGs) on our network and should be read in conjunction with the notes below. There are no IIGs on our LV or HV networks and hence these sections are shaded in darker grey. The below information is recorded on the SF6 and Other IIGs tab of the KPI tables in the Annex.

Table 11: Alternative IIGs on our network

Category	Voltage	Sub-Category (where applicable)	Unit of Measure
IIG name	LV	No of Assets with IIG	#
		Amount of IIG	kg
		Global Warming Potential of IIG	CO ₂ Comparison Constant
		Leakage	kg
IIG name	HV	No of Assets with IIG	#
		Amount of IIG	kg
		Global Warming Potential of IIG	CO ₂ Comparison Constant
		Leakage	kg
C5 Air Plus	EHV	No of Assets with IIG	44
		Amount of IIG	144kg
		Global Warming Potential of IIG	0.9
		Leakage	0kg
g3 C4-FN	132kV	No of Assets with IIG	2
		Amount of IIG	11kg
		Global Warming Potential of IIG	300
		Leakage	0kg

The installation of switchgear containing Air Plus (C5 Fluoronitrile) at EHV and g3 (C4 Fluoronitrile) at 132kV is in accordance with UK Power Networks' policy, which, as mentioned earlier, is documented in EBB 03-0130.

36kV-rated switchgear containing Air Plus was the first SF6-alternative switchgear available in the marketplace. In alignment with our aim to remain the most innovative DNO (which is captured in our Business Plan), following a thorough technical and safety approvals process it was installed and continues to be installed at multiple sites across the UK Power Networks footprint.

We have utilised g3 switchgear as part of new connections on the EPN side of the 132kV switchboard at our Brimsdown 132kV grid site. This type of switchgear was used because, with a global warming potential (GWP) of 300, it is just over 1% of the GWP of SF6.

It should be noted that other non-GWP SF6 alternatives have been installed on the network. For example, we installed the first clean air 132kV GIS switchboard at Lewes Grid near Brighton in East Sussex (SPN).

The installation of Air Plus and clean air SF6 alternatives is evidence of our work with manufacturers to reduce (and ultimately eliminate) the use of SF6 containing switchgear on our network.



Electricity Distribution Losses

Electricity distribution losses can be technical, caused by transferring electricity across the distribution system, or non-technical, due to under-recording or non-recording, for example illegal extraction of electricity from the network. This section examines technical losses.

Technical losses have a significant financial and environmental impact on customers as they require the production of excess energy (with the associated CO₂ emissions), which ultimately forms part of customers' electricity bills. Due to the nature of equipment used in the distribution of electricity, these losses can never be eliminated completely. However, it is possible to reduce them and to mitigate their impact with innovative equipment and practices.

Technical losses arise for physical reasons and depend on the energy flowing through the network, the nature of distribution overhead conductors and cables and transformers. The total amount of technical loss is made up of a fixed component, a function of the network itself, and a variable component which is dependent on the level of load on the network. Variable losses may also be impacted by the power factor, network imbalance and the effects of harmonics. For a typical distribution network around 30% of technical losses will be of the fixed variety and around 70% will be of the variable type, although we observe regional variations in this ratio.

We have developed robust cost-benefit analyses (CBAs) which justify upsizing LV and HV mains cables on our network, using engineering, statistical and economic analyses to overcome the challenges presented by data sparsity. Our approach for HV cables has been widely accepted by our peers in the ENA's Technical Losses Task Group (TLTG).

Current Assessment of Technical Losses

Table 12 shows a summary of total losses on our networks from data that has been developed from the E3 – BCF tables in our 2023-24 Regulatory Reporting Pack (RRP) submission to Ofgem. From this extract, we are able to provide a position on the percentage of total losses on our three networks.

Table 12: Summary of losses per year and licence area

	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Total losses (tCO₂e)								
EPN	1,016,939	838,822	603,788	448,578	607,329	531,037	359,902	475,074
LPN	779,598	644,058	503,865	495,864	407,761	341,426	290,718	323,478
SPN	541,021	489,723	379,314	380,844	328,261	313,823	196,685	254,825
Total losses (GWh)								
EPN	2,468	2,386	2,133	1,755	2,605	2,501	1,861	2,294
LPN	1,892	1,832	1,780	1,940	1,749	1,608	1,503	1,562
SPN	1,313	1,393	1,340	1,490	1,408	1,478	1,017	1,231
Total units distributed (GWh)								
EPN	33,295	33,106	32,994	31,973	30,657	31,567	30,130	29,843
LPN	27,266	27,012	26,864	25,779	22,309	23,802	23,828	23,656
SPN	19,468	19,373	19,379	18,763	17,922	18,378	17,500	17,238
Total percentage losses (GWh)								
EPN	7.41%	7.21%	6.46%	5.49%	8.50%	7.92%	6.18%	7.69%
LPN	6.94%	6.78%	6.63%	7.53%	7.84%	6.76%	6.31%	6.60%
SPN	6.74%	7.19%	6.91%	7.94%	7.86%	8.04%	5.81%	7.14%

UK Power Networks undertakes a large number of activities that substantially reduce losses but for which losses are not the primary driver. An example would include replacing an aged distribution transformer with a current specification Ecodesign transformer of the same rating. Ecodesign transformers comply with EU Regulations setting compulsory maximum losses levels for distribution transformers that are substantially more efficient than older specification transformers.

Electricity Distribution Losses continued

Table 13 shows a summary of losses reductions in the 2023-24 regulatory year. The values in this table should be read in conjunction with the notes below.

Table 13: Summary of losses reductions per licence area in 2023-24

Asset	EPN Saving (MWh)	LPN Saving (MWh)	SPN Saving (MWh)
LV cables	1,126.8	385.7	525.0
HV cables	1,168.5	390.2	680.7
Distribution ground-mounted transformers	2,491.1	2,021.5	2,118.0
Distribution pole-mounted transformers	1,097.5	0.0	494.4
Primary Ground Mount	253.0	0.0	400.0
Grid Ground Mount	0.0	0.0	0.0
Total	6,136.9	2,797.4	4,218.1

Based on the realised benefits reported in the E4 – Losses Snapshot tables in our 2023-24 RRP submission, a total of 13,152.4 MWh of improvements were made over the 12 month period, equating to 2,393 tCO₂e emissions in the year¹.

Activities undertaken in this Regulatory Reporting Year

UK Power Networks' Distribution Losses Strategy

Updated in December 2023, [UK Power Networks' Distribution Energy Losses Strategy 2023](#) is built upon the corporate vision, values and wider societal need. Our goal is to excel in performance, be an employer of choice, a responsible and trusted corporate citizen, sustainably cost efficient and enable the net zero transition for all. This means that we seek to do what is right for our customers by providing the best possible service at the best possible price, aiming to be as efficient as possible and limiting the environmental impact arising from our business activities.

¹ Based on the average carbon intensity of 182g CO₂ per kWh of electricity produced in the same year.

Our strategy sets out our ambition to lead the creation of energy efficient distribution networks in Great Britain, underpinned by three objectives:

- Maximise the amount of energy saved per year
- Integrate losses management into business processes and systems
- Continue working with stakeholders and innovators to integrate learning into our Distribution Losses Strategy

Our 2023 Distribution Energy Losses Strategy update highlights two new subcategories of technical losses, Power Quality and Electrical Power conversion, which have been previously identified as areas of focus.

Current Programmes to manage Distribution Losses

The following activities are embedded in our business-as-usual activities to reduce losses.

- **HV cables** – We are installing larger cross-sectional conductors on the main lines of HV underground feeders to reduce resistance and hence variable I²R losses. We have completed a comprehensive system-wide study which demonstrated that we save 5.94 MWh/annum for every kilometre of HV underground main line that we upsize from 185 to 300 mm² aluminium. This study further revealed that the NPV for this change is strongly positive. The methodology developed in this study was presented to our peers in the ENA's TLTG to ensure that our approach is robust.
- **LV cables** – We are installing larger cross-sectional conductors in LV underground feeders to reduce energy losses. Similar to HV cables, we have completed a comprehensive system-wide study which demonstrated that we save 6.35 MWh/annum for every kilometre of underground main line that we upsize from 185 to 300 mm² aluminium. This study further revealed that the whole-life benefit for this change is strongly positive.

The following activities were not driven primarily by network losses considerations but were undertaken as part of our business-as-usual activities and have had a positive impact on energy loss reduction.

- **Ongoing review of design standards** – We are continuously developing new business cases to support further losses reductions. Once we have established a positive CBA in favour of an intervention,

we amend associated engineering design standards to ensure that our recommendations are implemented swiftly and effectively. In this way, we ensure that losses are minimised for the entire lifespan of our new assets.

Forthcoming Programmes to manage Distribution Losses

During the next regulatory year, we will continue to implement our updated losses strategy and roll out the proven innovative solutions trialled during RII0-ED1 as business as usual to reduce our network technical losses.

We will continue to broaden our understanding of distribution losses, further develop our tools and processes, and embed these into our business-as-usual activities.

We will also continue to investigate new approaches and technologies, including flexibility and our Distributed Energy Resources Management System (DERMS) to deliver flexible connections, to understand and quantify network losses changes. Broadly speaking, these technologies are being developed to maximise network utilisation, which delivers financial and societal benefits to our customers by reducing the need to invest in network upgrades, but they may increase technical losses.

Hence, we will integrate energy losses into every CBA that we develop to assess the economic merits of using new technologies.

We will continue our collaboration with manufacturers and disseminate our findings to other DNOs who might benefit from these activities. Looking ahead, we will continue to consider the impact our DSO capabilities are likely to have on network losses.

Finally, we will keep abreast of new technologies coming to the market that may be used to minimise losses. Technological developments may also highlight new areas that we can focus on to target losses.

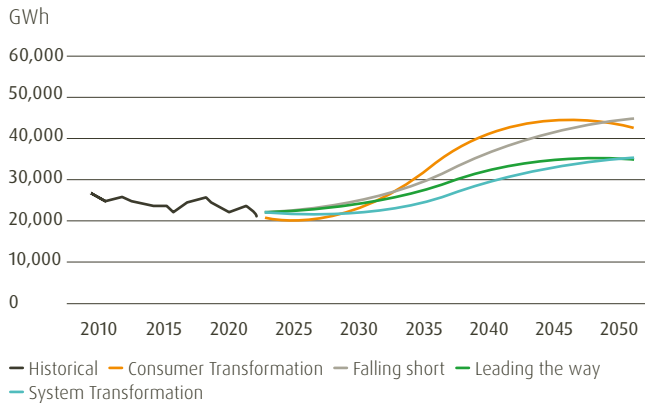
Electricity Distribution Losses continued

Forecast Electricity Losses

National Grid Electricity System Operator's Future Energy Scenarios (FES) set out credible scenarios to achieve net zero by 2050 and meet the UK Government's commitment to a decarbonised electricity system by 2035.

In the transition to net zero, we will see an increase in energy losses across the transmission and distribution networks as demand for electricity increases following the connection of heat pumps and EVs. From the current value of 20.7TWh of energy lost, each of the four different scenarios leads to a higher level of energy lost, ranging from 34.1TWh (Leading the Way) to 42.3TWh (Falling Short), as illustrated in Figure 6.

Figure 6: Electricity energy losses – historical (2010 to 2022) and FES scenarios²



Losses mitigation approaches identified by UK Power Networks will be even more important in the future to further reduce energy lost to an economical minimum.

² Sources: UK Power Networks Distribution Energy Losses Strategy 2023 Regional breakdown of FES data (Electricity) | ESO (nationalgrideso.com).

Summary of Losses Activities and Benefits during this Regulatory Reporting Year

Table 14 provides a summary of the benefits from our losses activities and has been developed from the E4 – Losses Snapshot tables in our 2023-24 RRP submission.

Table 14: Summary of losses reduced, costs and benefits from activities in 2023-24

Programme	Regulatory reporting year (2023-24)	
	Reduced losses (MWh)	Reduced emissions associated with losses (tCO ₂ e)
LV cable	2,037.5	421.9
HV cable	2,239.4	463.7
Distribution ground-mounted transformers	6,630.6	1,373.0
Distribution pole-mounted transformers	1,591.9	329.6
Primary Ground Mount	653.0	135.2
Grid Ground Mount	0.0	0.0
Total	13,152.40	2,723.4

Table 15 shows a summary of the volumes of CBA-justified losses activities during this regulatory reporting year and has also been developed from the E4 – Losses Snapshot tables.

Table 15: Summary of amount of losses activities in the regulatory reporting year

Programme/project title	Description of unit	Volumes in regulatory reporting year (2023-24)
LV cable	km	321
HV cable	km	377
Distribution ground-mounted transformers	each	738
Distribution pole-mounted transformers	each	1,283
Primary Ground Mount	each	7
Grid Ground Mount	each	0

For information on our 2023-24 performance and target RIIO-ED2 (2028) performance, please refer to the Electricity Distribution Losses tab of the KPI tables in the Annex.

Embodied Carbon

Embodied Carbon Tool

Embodied carbon is a significant source of the UK's carbon emissions, consequently, addressing this is critical to achieving its net zero targets. Embodied carbon refers to the total greenhouse gas emissions (GHG) produced during production, transportation, construction, installation, and end-of-life disposal of products and materials. These emissions fall within our Scope 3 emissions as they are not directly produced or controlled by UK Power Networks, but instead occur within the supply chain and during a product's lifecycle.

UK Power Networks committed to embedding an embodied carbon tool to monitor and report on embodied carbon in new projects. This will allow us to establish a baseline and commit to a target percentage reduction over the RII0-ED2 price control period. Furthermore, it is essential to achieving our Scope 3 Science Based Target (SBT) of well below 2°C, through a reduction of 25% by 2028 compared to our 2018-19 baseline.

Similarly, UK Power Networks undertook to collaborate with our supply chain and the wider industry to reduce embodied carbon in the network and address associated challenges. We are dedicated to ensuring consistency in reporting, through aligning our tool with best practice and the PAS 2080 international standard for Carbon Management in Infrastructure.

Likewise, the tool draws on the following common sources for carbon factors:

- ICE vs 3 – the Alliance for Sustainable Building Products and the Royal Institute of Chartered Surveyors-created free tool provided by Circular Ecology
- EcoInvent – a comprehensive life cycle assessment database for licensed users
- UK government greenhouse gas carbon reporting factors
- Environmental Product Declarations (EPDs) – verified assessments provided by suppliers for specific products

From May 2023, we partnered with Minimum – a specialised carbon consultancy – to build the embodied carbon tool. However, inter-directorate staff and supply chain collaboration similarly influenced the build. The tool underwent a lengthy period of development and was revised several times.

The tool is based on reportable assets and focuses on key elements of the project which can be influenced through detailed design and significantly impact a project's carbon footprint. It measures the embodied carbon of all major projects, at both the concept and developed design phases. We have defined all major projects as those valued at over £1m.

We launched the revised version (version 1.1) to staff over four workshops in January 2024. The general consensus was that this version was a vast improvement, as it was less complex, more efficient to use, complemented existing practice, and required very little manual manipulation. Feedback and subsequent requests for further amendments resulted in the creation of version 1.2, which was released in April 2024.

Since launch, 12 projects have been completed with an associated embodied carbon saving of approximately 15%, which translates to a carbon intensity metric for construction projects of 385.70 tCO₂e/£m for concept design and 328.17 tCO₂e/£m. for developed (final) design. This has a corresponding intensity metric for cables projects of 100.22 tCO₂e/km for concept design and 81.46 tCO₂e/km for developed design.

The differences in carbon intensity between the concept design and developed design stages can be predominantly attributed to the de-scoping of items included in the design stage versus the as-built stage.

This usually occurs during the project lifecycle as a consequence of identifying resource, cost and time savings. Likewise, these savings can be attributed to utilising lower carbon materials – such as low-carbon concrete and alternative bedding materials. Crucially, design leads can now make informed choices regarding potential carbon impacts of critical amendments to project designs. We can additionally use this tool to inform our decision-making process and design standards.

Through continued builds received from colleagues and input from our supply chain, we are in the process of incorporating further amendments and aim to release version 1.3 in quarter one of 2025. We believe it is critical that we continue to regularly revise and improve this tool and thus it will continue to be amended and evolve.

Other next steps are to review projects on which the tool has been used to identify opportunities for carbon reduction through redesigning equipment, improving business processes, innovation, and substituting materials for lower carbon equivalents, and to summarise key principles in a handbook. We aim to distribute this guidance to our employees and our supply chain to drive greater collaboration and consistency.

Likewise, we are partnering with our supply chain to investigate innovations and lower carbon materials – examples of relevant sectors are cement and steel. We aim to identify areas for improvement through more detailed examination of contractor manufacturing and distribution processes. This aligns to our Scope 3 digital reporting portal, associated carbon action plans, as well as circular economy and waste developments.

We aim to further influence governance and decision making of stakeholders internal and external to the UK Power Networks organisation. Consequently, the tool's output is being added to Gate papers which are used for internal project development from inception through to delivery and will be provided to our connections customers. Similarly, we are scoping the creation of another version of the tool to allow for 'project close out' embodied carbon quantification reported by our contractors. We expect this to be completed over the coming months.

For more information please see the Supply Chain Management tab of the KPI tables in the Annex

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Supply Chain Management

To embed sustainable procurement and actively manage our supply chain, UK Power Networks has implemented new information gathering systems, compliance measures, KPIs, and associated reporting requirements for our supply chain partners. These are explained below.

Supply Chain Code of Conduct

As part of our RII0-ED2 commitments we undertook to adopt high standards of environmental supplier management in our Supply Chain Code of Conduct (click on Figure 7), to ensure material supplier compliance, and to adhere to public disclosure requirements. Consequently, we adopted a target of more than 80% of our supply base (by value) meeting the Code by 2028 and undertook to report annually on this percentage.

We developed and initially introduced the Code to our supply base at our Supply Chain Conference in March 2023, and issued requests for signature in May. UK Power Networks has a target of over 80% of our material suppliers signing the Code and agreeing to abide by our ethical standards by the end of RII0-ED2. To date, 78.4% of our 2023-24 supply base has signed the Code (please see the Supply Chain Management tab of the KPI tables in the Annex), accounting for £661.59m of our 2023-24 spend.

The Code is an agreement between UK Power Networks and our suppliers to uphold the standards of ethical conduct our customers expect of us. In addition to signing the Code, suppliers are required to provide evidence of how they have adhered to its requirements.

The Code is split into two distinct criteria, mandatory requirements and focus areas. As shown in Figure 7, there are 27 mandatory requirements and 13 future focus areas. Focus areas are a suggested means to drive improvement which may become mandatory in the future. These two criteria are further split into four sections which are mapped against our vision.

We created a means to evidence adherence to the Code by mapping mandatory criteria against existing practices and systems to pinpoint the new systems that needed to be implemented. 70% of the mandatory aspects are already covered by existing processes (or those subsequently implemented, like the Scope 3 carbon data portal; see below).

The remaining 30% has been addressed by adding bespoke questions to screening facilitated by our Achilles platform.

This is critical to Scope 3 reporting as it ensures we address our high-impact activities in partnership with our contractors. This formalises our contractors' commitment to do so and reinforces its importance. Ultimately, the Code ensures that the products and services we procure are aligned to our vision; to be an employer of choice, a respected and trusted corporate citizen, sustainably cost efficient, and enable the net zero transition for all.

Figure 7: Our Supply Chain Code of Conduct – mandatory and focus areas

Scope 3 Carbon Data Portal

To meet our Scope 3 SBTi target of well below 2°C and achieve the 25% reduction from our baseline by 2028, we ultimately need to achieve a 2.5% Scope 3 reduction year-on-year. We have set ourselves an internal stretch target of 1.5°C which translates into a yearly 4.2% reduction (this is not validated by the SBTi). To achieve this, we need to increase both the accuracy of measuring Scope 3 and the quality of our data, so that we can more accurately and effectively tackle our footprint.

To do this, we have moved away from a spend-based footprint (using environmentally extended input output (EEIO) analysis) to an activity-based supplier footprint. We consider this to be a much more accurate method as it analyses our vendors' actual carbon emitted in fulfilling their contracts with UK Power Networks, allowing us to better identify our biggest carbon emitting vendors and determine their carbon hotspots.

To facilitate this, UK Power Networks partnered with the Minimum consultancy to develop a new supplier carbon data collection portal, which we trialled with five of our key suppliers, in May 2023, to ensure it was user-friendly and compatible with supplier processes. Through this trial we aimed to drive greater consistency through the shared development and incorporation of amendments and improvements.

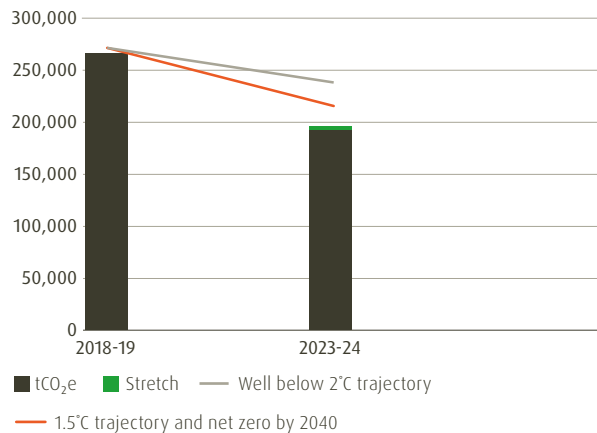
In July 2023, we released the carbon data portal to over 100 of our suppliers (including inter-company splits), with over 80% making submissions on the portal. Throughout the process UK Power Networks held workshops and sessions with suppliers to ensure collaboration. These sessions identified further improvements to be made to our portal and informed our data gathering process.

Between March and May 2024, we released the portal to a second round of more than 150 suppliers (including inter-company splits). Over 90% of those suppliers submitted data on the portal and from the quality of the data supplied we were able to move away from a spend-based EEIO approach to a more accurate, activity-based assessment for the majority of these. In addition, in this second round of submissions from suppliers, we have improved the quality control around data, which provides us with greater assurance around the assessments made by our consultancy partner, Minimum.

Supply Chain Management continued

Figure 8 presents our Scope 3 supply chain tCO₂e reduction flight path. Our overall topline Scope 3 (without losses) footprint has decreased by 20% from our baseline year – a reduction of 266,315 tCO₂e in 2018-19 to 213,987 tCO₂e in 2023-24. Consequently, we are well on track to meet our reduction targets. The categories relevant to our supply chain and falling within their control are Categories 1a, 1b and 2 (Purchased Goods and Services, and Capital Goods). In our baseline year these accounted for a footprint of 240,726 tCO₂e. This has dropped to 198,935 tCO₂e for 2023-24 – roughly a 17% reduction from our baseline.

Figure 8: BCF progress against baseline year 2018-19 (tCO₂e)



As a next step, we will make further amendments to the portal informed by supply chain feedback ahead of data collection in 2025. Similarly, using these submissions, we can identify and target our top emitting suppliers who do not have an SBTi in place. We will do this with cross-directorate support and key teams' inputs, particularly our supplier relationship management colleagues. We have already begun to investigate a Minimum-provided, supported SBTi service which may be of interest to our supply chain which they can investigate independently.

For more information please see the Supply Chain Management tab of the KPI tables in the Annex



Supplier Action Plans

UK Power Networks aspires to ensure that we continually track and drive carbon reductions, and supply chain improvements. To support this, we have implemented action plans with 12 (not counting inter-company splits) of our largest carbon emitting vendors identified by the first round of portal submissions. These suppliers account for over 20% of our 2023-24 activity-based carbon footprint.

The action plans are a commitment between UK Power Networks and designated vendors to actively drive continuous improvement and support one another to do so through setting (and tracking) reduction targets. These targets address vendors' individual carbon hotspots identified by the portal. Additionally, the action plans cover circular economy, waste, and adherence to our Supply Chain Code of Conduct.

The first action planning meetings were launched with five of our key suppliers in December 2023. By March 2024 we had held kick-off sessions with all relevant contractors and received commitments from them to complete their action plans following the second round of portal submissions. Since then, seven of the 12 vendors have returned completed action plans with the remainder expected in the coming months, post analysis of the latest results.

For more information please see the Supply Chain Management tab of the KPI tables in the Annex



Supply Chain Sustainability School

UK Power Networks recognises the importance of working together with our supply chain to help the UK achieve its net zero aspirations. Consequently, we are a partner to the Supply Chain Sustainability School, a universally acknowledged, virtual, free learning platform which provides skills and knowledge to organisations of all sizes to promote a sustainable future.

The Supply Chain Sustainability School acts as a leveller as it affords small and medium-sized enterprises (SMEs) access to materials that they may otherwise not have obtained. Among other benefits, these materials can be utilised to boost their knowledge, reduce costs, enhance their reputation, and potentially win further opportunities. Additionally, participation in the School is a means to demonstrate adherence to several mandatory requirements in our Code of Conduct.

UK Power Networks introduced the School to the supply chain at our March 2023 Supply Chain Conference, with 17% of our supply base subsequently utilising the platform. We have now built a bespoke UK Power Networks learning pathway containing a variety of CPD-accredited¹ resources (of different levels, types and durations) we have specifically selected. This has been test-driven and launched both internally and externally in July 2024.

We have selected a second batch of materials, which we will use to refresh our portal following launch and a subsequent period of engagement. We will continually review resources on our pathway to ensure materials remain pertinent to our supply chain based on feedback from and through collaboration with our supply base and other external stakeholders.

¹ Continuing Professional Development.

Sustainable Resource Use and Waste

Our waste and resources target for the RIIO-ED2 price control period is to recycle 80% of office, depot and network waste and 99% of street works material. The goal is to ensure that all recoverable waste is diverted from landfill by the end of the price control period.

In 2023-24 we generated a grand total of 11,572.24 tonnes of waste made up of office, depot and network waste. Of this, 70.6% (8,171.60 tonnes) was recycled, demonstrating significant progress towards our RIIO-ED2 target of achieving 80% recycling. Additionally, 26.2% (3,036.10 tonnes) of waste were sent for recovery. Despite the challenges of waste management, only 3.2% (364.55 tonnes) of our waste ended up in landfill, resulting in a diversion rate of 96.8%.

The data presented in Table 16 categorises waste into hazardous and non-hazardous streams (excluding street works waste). The first two tables are also shown in the KPI tables in the Annex; please see the Resource Use and Waste tab.



Table 16: Our 2023-24 waste footprint

Waste destination – non-hazardous/non-special		Unit	2023-24
Total waste produced directly by Licensee	Tonnes		7,323.15
% reused/recycled	%		60.5%
% energy from waste	%		34.6%
% sent to landfill	%		4.8%
% other	%		0%
% of waste diverted from landfill (excluding compliance waste)	%		95.2%
Waste destination – hazardous/special		Unit	2023-24
Total waste produced directly by Licensee	Tonnes		4,249.09
% reused/recycled	%		88.0%
% energy from waste	%		11.7%
% sent to landfill	%		0.2%
% other	%		0%
% of waste diverted from landfill (excluding compliance waste)	%		99.8%
Waste destination – combined		Unit	2023-24
Total waste produced directly by Licensee	Tonnes		11,572.24
% reused/recycled	%		70.6%
% energy from waste	%		26.2%
% sent to landfill	%		3.2%
% other	%		0%
% of waste diverted from landfill (excluding compliance waste)	%		96.8%

In 2023-24 we generated and managed a total of 7,323.15 tonnes of non-hazardous waste, which accounted for 63.3% of the combined total waste produced. Of this, 60.5%, or 4,431.65 tonnes, was successfully recycled. Additionally, 34.6%, amounting to 2,537.14 tonnes, was sent to energy-from-waste (EfW) facilities for recovery. Only 4.8%, or 354.37 tonnes, ended up in landfill, resulting in an overall 95.2% diversion rate.

During the same period, we produced 4,249.09 tonnes of hazardous waste constituting 36.7% of our combined total waste output. A significant 88%, or 3,739.95 tonnes, was recycled. Additionally, 11.7%, amounting to 498.96 tonnes, was diverted to energy recovery, further reducing reliance on landfill disposal. Only 0.2%, or 10.18 tonnes, ended up in landfill, achieving an impressive 99.8% diversion rate.

In summary, while both hazardous and non-hazardous waste streams are managed effectively, with high diversion rates from landfill, the hazardous waste category demonstrates even greater recycling and recovery rates. Hazardous waste – often subject to stricter regulatory controls and requiring specialised handling and treatment – benefits from established recycling infrastructures and technologies. In contrast, while non-hazardous waste also shows significant recycling and diversion efforts, the available infrastructure and end of use options can sometimes vary, impacting overall performance. Nonetheless, performance across both waste streams demonstrates our commitment to sustainable waste management practices.

We are collaborating with our waste contractors to conduct staff waste management events on-site. In the coming months our contractor will attend one of our key facilities and provide comprehensive training to warehouse staff on enhanced waste segregation practices. This training will include a practical demonstration with staff through a ‘tip on site’ exercise where a general waste skip will be emptied and sorted to identify materials that should be recycled, thereby improving overall waste management practices.

Sustainable Resource Use and Waste continued

Streetworks Waste Classification Project

The waste generated by our street works team – mainly spoil from excavations – is transported to a processing and recycling facility where it is transformed into reusable material. In 2023-24 we produced 57,810.02 tonnes of street works waste, all of which was sent for reprocessing and recycling.

We maintain ongoing engagement and collaboration with Streetworks UK and have actively contributed to the Phase 3 trials, submitting over 100 samples to assist in designing and refining the new sampling protocol. The objective of this protocol is to streamline classification efforts by establishing a sampling plan tailored to site-specific conditions. Its development is crucial as we prepare for the transition away from the Environment Agency's Regulatory Position Statement (RPS) 298 which currently guides the management of excavated wastes where pre-disposal sampling is not feasible. Streetworks UK and its members are finalising this protocol to replace the existing RPS.



1 About Circulytics | Ellen MacArthur Foundation.

Circular Economy (CE) and Waste Management

UK Power Networks has continued to advance its efforts in the CE field and made its second submission of the Circulytics toolkit to the Ellen MacArthur Foundation¹ in 2023. Prior to this, we collaborated with parts of our organisation to collect the necessary data and relevant information required for the toolkit. There has been an ongoing effort in developing and enhancing our data capture tools to streamline the collection process and this effort has led to improved datasets as well as information sharing across different departments and teams.

These efforts led to a higher score in the 'Enablers' category, marking a significant improvement in our approach to setting up the right conditions for a circular transition. We also received positive feedback from the Ellen MacArthur Foundation regarding improved data availability, particularly in mass estimates across various asset categories. Building on these achievements, we are now actively identifying waste and material streams to assess their circularity, aiming to gain deeper insights into our decision-making processes. As the Circulytics tool is now discontinued, we are developing an in-house tailored CE assessment tool focusing on various waste and material streams such as IT equipment, end-of-life transformers, hard plastics, meters, precast concrete bases, and cable ducts.

Additionally, we are in the process of creating a centralised waste data system which will further improve data quality, ensure consistency, and facilitate detailed analysis. We have also initiated collaboration with our supply chain and are currently developing an assessment tool to evaluate supplier circularity.



Visual Amenity

UK Power Networks has continued to participate in the Steering Group that nominates schemes to underground overhead lines within National Parks and the National Landscapes (previously Areas of Outstanding Natural Beauty). This group promotes projects in both the EPN and SPN licence areas and follows the funding criteria specified by Ofgem.

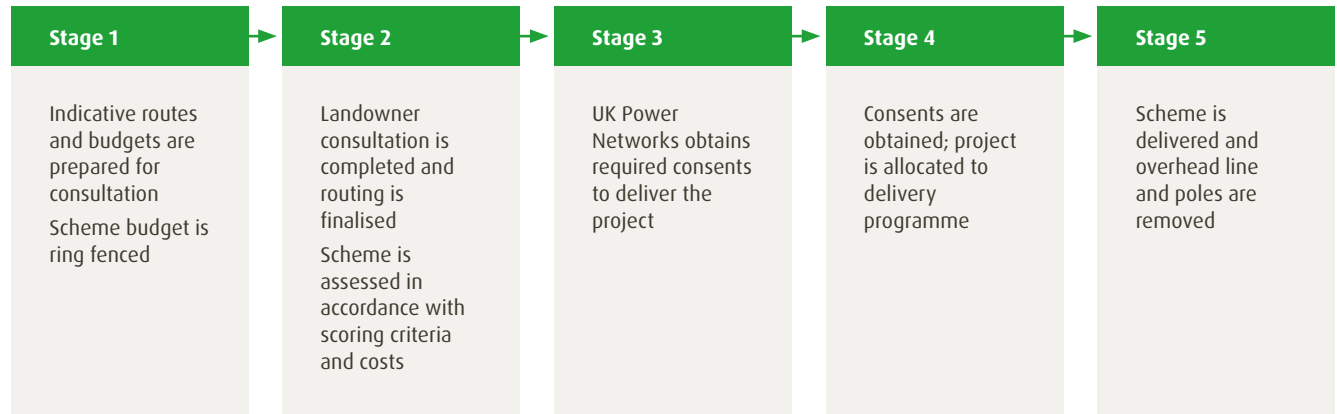
The group is comprised of a number of landscape experts, including representatives from the National Park and National Landscape boards within our EPN and SPN licensed areas, and is chaired and facilitated by Natural England who hold the national remit to advise on the management of designated landscapes. The group meets every three months to review the current programme of works as well as the development and promotion of new schemes.

In the last year we have welcomed the National Trust to this group who are a significant landowner within the designated landscapes of our operational footprint. Their involvement has already ensured the promotion of a scheme at Brancaster in Norfolk. The Steering Group will continue to broaden access to the group for nationally significant landowners to ensure nominated schemes benefit sites with significant public access, thereby maximising the greatest benefit and ensuring a higher level of stakeholder engagement from landowners.

UK Power Networks is a non-voting member of the group; its role is to provide the necessary technical guidance in support of a nominated scheme by group members. Additionally, it reviews proposals made by local landowners and community groups, submitted via our website, to understand if they relate to existing proposals or could form a scheme that a local landscape board may wish to take forward as a dedicated project.

Before UK Power Networks can obtain the required consents to deliver a project, it must proceed through Stages 1 and 2 (see Figure 9), which are voted on by the Steering Group members.

Figure 9: Project process



All projects are scored to ensure they meet the requirements for selection. This includes the impact on the landscape’s character, visual amenity and on work to underground the overhead line which might impact on other features or designations within the landscape.

If a project is successful in achieving Stage 2 approval it is passed to UK Power Networks to acquire the necessary consents to deliver the works. Regular meetings are held with the proposer in the group to keep them updated on progress and any changes that are made. If an increase of 20% to the initial estimate occurs during this stage, the proposer must seek the group’s approval to continue. In 2023-24 no schemes were withdrawn on this basis.

Our 2023-24 performance is shown in the KPI tables in the Annex; please see the Visual Amenity tab. The first year of RII0-ED2 saw significant work to complete schemes at Latimer and Potter Heigham in EPN and at Telscombe in SPN, which were all under way in the final year of the RII0-ED1 allowance period. The schemes at Potter Heigham and Telscombe were completed, work continues on the final phases of the Latimer scheme and is due to be completed at the end of 2024. In 2023-24 a total of 9.37km were removed across the three schemes.

Currently UK Power Networks is instructed to progress 24 nominated and approved schemes (see Table 17).



An image of Brancaster AONB, which we are consulting currently.

Visual Amenity continued

Table 17: Undergrounding schemes in progress

Project	Landscape	Licence Area
Blythburgh Hen Reed Beds	Suffolk Coast & Heaths	EPN
Angel Marshes	Suffolk Coast & Heaths	EPN
Felixstowe Ferry	Suffolk Coast & Heaths	EPN
Brett Vale North	Dedham Vale	EPN
Latimer	Chilterns	EPN
Brancaster	Norfolk Coast	EPN
Stoke by Nayland	Dedham Vale	EPN
Sheffield Park	High Weald	SPN
Swingfield	Kent Downs	SPN
Royal Military Canal	Kent Downs	SPN
Olantigh	Kent Downs	SPN
Bodsham	Kent Downs	SPN
Lees Court	Kent Downs	SPN
Elham Valley	Kent Downs	SPN
Birling Phase 2	Kent Downs	SPN
Preston Hill	Kent Downs	SPN
Chilham	Kent Downs	SPN
Folkington and Wilmington	South Downs	SPN
Swanborough Levels	South Downs	SPN
Littlington North	South Downs	SPN
Mailing Hill	South Downs	SPN
Littlington Phase 2	South Downs	SPN
Charleston	South Downs	SPN
Bedgebury	High Weald	SPN

Table 18 highlights an additional 16 schemes presently being promoted by members, with the prospect that they are approved for progression to the consenting phase (Stage 3). The continued interest and support of this programme of works by all stakeholders ensures there will be sufficient projects to utilise the RII0-ED2 allowances and roll forward into the next price control period, RII0-ED3.

Table 18 – Undergrounding schemes in initial development (Stage 1 or 2)

Project	Landscape	Licence Area
Broads Authority	EPN	2
Norfolk Coast	EPN	2
Suffolk Coast and Heaths	EPN	1
Surrey Hills	SPN	5
High Weald	SPN	3
South Downs	SPN	3

We are currently developing our website to showcase the work that we and the Steering Group undertake as part of the Visual Amenity allowance. This will allow for more information to be shared with local stakeholders from a project's inception and for members of local communities to understand more about what is being undertaken in the area.



An image of the scheme at Telscombe after removal of the overhead lines.

Noise Pollution

We have seen a downward trend in complaints and enquiries about noise from substations over the 12 months to March 2024, with 27 complaints received during 2023-24 compared to 40 in the previous regulatory year. Each enquiry is assessed by our environment advisers to understand whether the noise complained of could be attributable to substation transformers and, if so, whether it is likely to be at a level that constitutes a statutory nuisance.

If a potential risk is identified, then appropriate further investigation is undertaken. This commonly includes visiting the customer to take noise measurements. To determine whether a nuisance is present we compare recorded values to the reference curves in the Defra-commissioned procedure for assessment of low frequency noise (NANR45). If the low frequency noise exceeds those curves, it is likely to be considered a statutory noise under the Environmental Protection Act. For the vast majority of enquiries, the noise is found to be below the level of nuisance or unrelated to the electricity distribution network. Over the year we had just two complaints that required intervention. One in EPN required some insulating material to be applied to the fence line at the customer's request. A second in SPN will require the outdoor transformer to be replaced and if feasible, a brick enclosure will be installed.

Our 2023-24 performance is shown in the KPI tables in the Annex; please see the Noise Pollution tab



Following our engagement with local authorities, we are pleased to see increasing awareness of the National Planning Policy Framework 'agent of change' clause which helps to ensure that future residents of new housing do not experience noise nuisance from pre-existing sources of noise including electricity substations. Recognising the potential risk at the earliest opportunity ensures that the developer can incorporate and fund mitigation, so that the associated costs do not fall to UK Power Networks and our customers. This principle was reinforced by the local authority ombudsman, who investigated a complaint from the owner of a new home on a development adjacent to an existing substation. The developer had ignored advice and recommendations provided by UK Power Networks about suitable mitigation.

Building on the successful integration into our internal mapping systems and the open data portal of noise propagation layers around grid and primary substations, we are continuing to look at ways to provide a similar facility for secondary substations.



Polychlorinated Biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) are man-made chemicals known for their toxicity and adverse effects on human health and the environment. They are chemically inert, flame resistant, and stable at high temperatures. Historically PCBs were introduced via the supply chain, as an unintentional contaminant, into insulating oil and some electrical equipment, especially power transformers.

Legislation requires us, as a DNO, to remove assets contaminated with PCBs at a level above 50ppm from our network by 31 December 2025. In addition, the Environment Agency has issued Regulatory Position Statement (RPS) 246 which allows the use of a statistical model, to allow transformers to remain on the network beyond 31 December 2025 and only dispose of them at the end of their useful life where the model shows they are statistically unlikely to contain more than 50ppm.

The presence of PCBs in an asset remains unknown until tested. Ground-mounted transformers (GMTs) often undergo testing whilst operational, but pole-mounted transformers (PMTs) usually do not due to the nature of where they are located and the fact that they are sealed units.

In July 2020, the ENA developed a PCB cohort model – a statistical method to identify potentially contaminated PMTs. This approach was accepted by the Environment Agency as fit for purpose under RPS 246. The model employs statistical analysis for oil results taken from PMTs which have been removed from the network to evaluate the risk of PCBs in in-service PMTs. After assessment, PMTs are categorised into the following two groups:

- Red – Cohorts that have (i) a traceable manufacturer; (ii) a production year before 1987; and (iii) sufficient test data indicating a high incidence of PCB contamination, defining these groups as contaminated.
- Green – Cohorts that have (i) a traceable manufacturer; (ii) a production year before 1987; and (iii) sufficient test data reflecting a low incidence of PCB contamination, indicating these cohorts are not contaminated.

Through the implementation of the PCB cohort model, we have made significant progress in delivering outcomes and removing PCBs from our network and are confident that we will achieve a PCB free network by the end of 2025. We have noted a reduction in the number of assets likely to contain PCBs, as more testing and replacements take place. Various PMTs listed for PCB replacement are being addressed for multiple reasons, not all directly associated with the PCB initiative. During these replacements, transformers are also upgraded where required to enhance their capacity and make the network more robust for future demands. In 2023-24 we replaced 722 PMTs on the network. Of these replacements, 260 were completed under the PCB programme and the remainder were covered through other drivers. For more information, please see the PCB tab of the KPI tables in the Annex.

Sampling of GMTs is almost complete and soon all of UK Power Networks' pre-1987 transformers will be assigned a PCB concentration value. At the beginning of the 2023-24 regulatory year, we identified 342 GMTs on our system with PCB levels exceeding 50ppm. Throughout the year, although additional transformers were found to contain PCBs due to ongoing sampling, the replacement of 75 units brought the total down to 327. When replacing the 75 GMTs on the network, five were completed through the PCB programme and the remainder were covered through other drivers.



Biodiversity and/or Natural Capital

Biodiversity Net Gain (BNG)

We committed to enhancing the biodiversity potential of 100 of our own sites in RII0-ED2 with an aggregated net gain target of 30% using the Defra biodiversity metric tool. Sites were identified and assessed by ecologists using the tool and biodiversity improvement plans developed. So far, 24 of these sites have been completed with improvements ranging from changes in the vegetation management regimes, coppicing, sowing of wildflower meadows, pond and hedge restoration through to installing bird and bat boxes, bee hives and hibernacula¹ for invertebrates (see the case study below). In addition to this, we committed to identifying a further 100 sites for future potential enhancements and to date our ecologists have assessed 25 sites.

For our sites requiring planning consent and associated statutory BNG requirements, we have partnered with a number of specialist providers to deliver the biodiversity enhancements that are required. This is an evolving area as the market for BNG credits develops and enhancement practice evolves. Our approach will remain on a case by case basis, utilising the opportunities that are present on-site and working with third parties to develop biodiversity banks and schemes off-site where appropriate.

¹ Hibernacula are shelters occupied during the winter by dormant animals such as insects, snakes or bats.

Biodiversity Site

During the 2023-24 regulatory year, 27 of our employees participated in team volunteering days fulfilling tasks to improve biodiversity at the Addington Grid site; see Figure 10. This large site is in a semi-rural location in Croydon and is quite unique as a large proportion comprises ancient woodland and chalk grassland, both of which are very important habitats that should be preserved in the UK.

The woodland was in poor condition due to invasive species and the chalk grassland was heavily overgrown. With repeat visits from volunteers the condition of this land is positively changing. The volunteers are gradually removing the non-native invasive shrub, creating hibernacula for wildlife, and installing birdboxes in the woodland. Whilst the chalk grassland has significantly improved due to scraping back the topsoil to create chalk scrapes, and reseeding with a specific chalk grassland seed mix. Chalk grassland scrapes are well known for attracting and supporting a remarkable array of butterfly and moth species, as well as other creatures.

Signage was designed in 2023 and is being installed at the sites to keep our staff and the community informed of UK Power Networks' BNG commitments.

One of this year's learnings for the delivery phase is that UK Power Networks needs to scale up the programme with the required skills, tools and machinery to fulfil the specific recommended tasks by the end of the RII0-ED2 period. We are currently engaging with our third party ecologists and contractors to resource the implementation plans for the remaining biodiversity sites.

“

Works at Addington Grid are having a positive impact on the structural diversity and restoration of habitats through the promotion of chalk grassland species and the eradication of an invasive non-native species, whilst providing staff firsthand experience in engaging with nature conservation.”

James Simpson,

Saxifrage Environmental Limited's ecologist

Figure 10: Staff volunteers at our Addington Grid site



Biodiversity and/or Natural Capital continued

BNG and Planning Consents

Our voluntary programme to increase flora and fauna at our sites is a longstanding commitment from previous regulatory periods. This year saw new BNG legal requirements come into force, making a BNG of 10% improvement in biodiversity value a condition of planning permission.

A cross-business BNG steering group has been established to bring together the various key internal stakeholders within the organisation. The steering group has managed the step change in policies, processes and reporting requirements, ensuring that communications and engagement are effective with all impacted teams.

We are taking the approach of embedding the BNG hierarchy into our processes by utilising on-site measures, off-site measures and statutory credits where needed to meet the number of biodiversity units we require.

Natural Capital (NC)

Natural capital (the biosphere) represents the world's stock of natural assets, which our societies and economies derive direct benefit from. For example, *regulating services* help with flood control and carbon sequestration, *provisioning services* provide things like timber, agricultural produce and biofuels, *cultural services* provide amenity landscapes, tourism and leisure opportunities, and *habitat services* are critical for things like pollination and seed dispersal, water filtration and sources for new drugs.

To recognise this, the Stockholm Resilience Centre outlined a new approach in valuing the biosphere, using the UN Sustainable Development Goals (UNSDGs). This placed the UNSDGs – 6 Clean Water and Sanitation, 13 Climate Action, 14 Life Below Water and 15 Life on Land, as the foundation on which all other UNSDGs depend (see the Stockholm UNSDGs Wedding Cake in Figure 11).

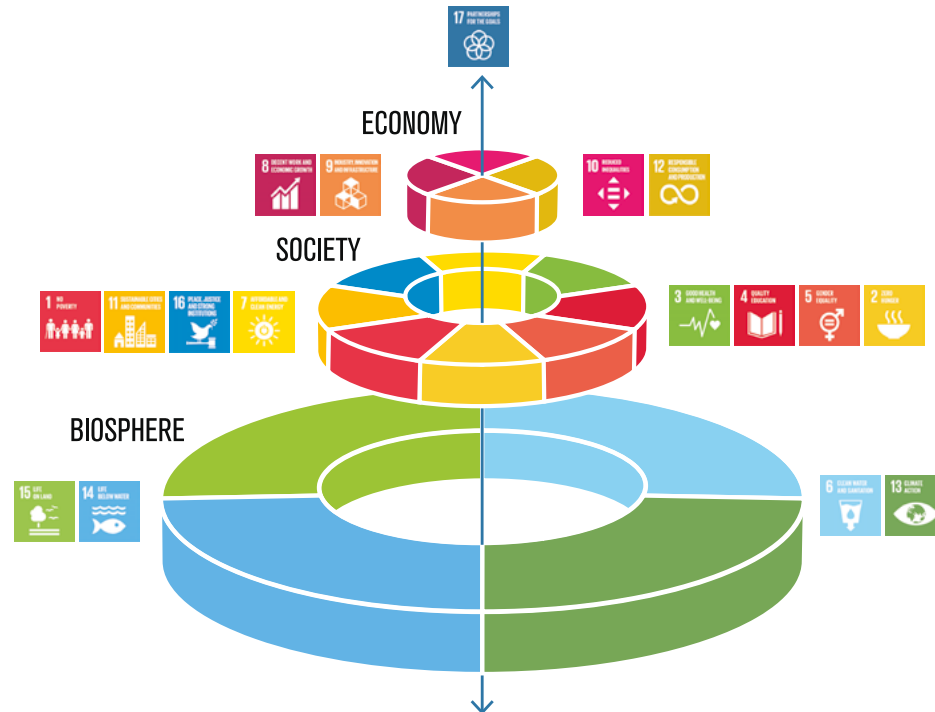
Organisations are starting to try and place a value on this natural capital and identify what risks and opportunities this may have for them. The Task Force for Nature Related Financial Disclosure is developing a formal method for assessing this, in a similar fashion to carbon and climate disclosures.

UK Power Networks does not manage large areas of land as our physical footprint is relatively small but we do operate a large number of small sites that do have biodiversity potential. These are managed in a sympathetic way, where applicable, as our work around biodiversity improvement demonstrates. To enhance this and provide a clearer picture of what our natural capital resources are, we have commenced an assessment of the natural capital value of our estates against the BS 8632:2021 Standard on Natural Capital Accounting for Organisations.

This will be implemented under three phases as outlined below and conclude towards the end of 2024. Phase 1 is complete and we will report the outputs and next steps in our 2024-25 Annual Environmental Report.

Phase 1	An NC baseline assessment for the initial 100 sites that have already had BNG assessments undertaken
Phase 2	An NC baseline assessment for primary and grid sites
Phase 3	NC accounts to sit alongside the above's NC baseline assessments

Figure 11: The SDGs wedding cake – Stockholm Resilience Centre



Source: Stockholm Resilience Centre – <https://www.stockholmresilience.org/research/research-news/2016-06-14-the-sdgs-wedding-cake.html>

Fluid Filled Cables

Fluid filled cables (FFCs) account for 35% of all cables running at 33kV, 66kV and 132kV in our three licence areas by length. Leaks from FFCs occur for various reasons, including the failure of ancillary oil equipment (e.g. pipework, monitoring gauges and oil tanks), cable joint failure, cable damage due to third-party excavations, and incorrect installations.

This section provides information about our strategy for reducing oil leakage from FFCs, a summary of 2023-24 performance and details of the work we have undertaken both independently and with key stakeholders.

UK Power Networks has made a commitment to reduce the annual leakage rate by 15% by the end of the RII0-ED2 period. Key reasons to reduce cable fluid loss include:

- Complying with environmental legislation by taking all reasonably practicable steps to prevent pollution of controlled waters
- Ensuring a continuous supply of electricity to customers by reducing instances of power loss caused by leaking cables
- Ensuring the network operates as efficiently as possible by reducing the cost to customers of cleaning up oil leakages

We have thorough procedures in place to manage, report and address leaks to minimise the amount of fluid lost and its environmental impact. Our strategy to reduce cable fluid loss is to invest in the network to refurbish and replace poor condition circuits. Where circuits develop new leaks we ensure we are at the forefront of new technology and best practice to identify and repair damage as swiftly as possible. For the last few years we have used perfluorocarbon tracer (PFT) for leak location. This technology is based on introducing a controlled volume of chemical tracer which is mixed into pumped cable fluid. Once it has reached the point of the leak this 'tagged' fluid becomes detectable in the atmosphere or through bore-hole sampling using either a static detector or a vehicle-mounted vapour analyser.

2023-24 Performance

A summary of 2023-24 cable fluid loss is provided in Table 19 and in the KPI tables in the Annex (please see the FFC tab). Cable fluid loss is measured by the total amount of fluid used to top up cables* less any fluid recovered**. The reported values should be read in conjunction with the notes below.

Table 19: Our 2023-24 oil leakage performance

Sub Category	Unit	2023-24
FFC in service	km	2,267.82
Oil in service	litres	7,096,464.66
Cable oil top up*	litres	198,306.00
Fluid used to top up cables as a percentage of volume in service	%	2.79
Removal of FFC	km	7.11
Leak reduction	litres	20,593.00
Oil recovered**	litres	30,544.00

During the 2023-24 regulatory year, a total of 167,762 litres of oil were lost to the ground in our three licence areas. We have maintained the focus on improving prioritisation, response and repair times of cable fluid leaks to ensure cable fluid losses reduce in line with the commitment made in our RII0-ED2 Business Plan. During 2023-24, the projects described in that document were reviewed to prioritise where circuit performance was known to be poorest. The highest priority projects were authorised internally at both a senior and executive management level. Some of these projects are currently at the execution stage and others are at the design stage with construction planned for 2024-25 or during the remainder of the RII0-ED2 period.

In 2023-24 we completed the following projects:

- The Barking C to Barking Grid circuit 1 was decommissioned in December 2023.
- The Wimbledon to Wandsworth circuit 1 was fully decommissioned as of March 2024.

Following the publication of Ofgem's Final Determinations for companies under the RII0-ED2 price control, we shared our five-year HI driven cable replacement programme with our delivery partners to allow for feasibility studies, route proving, consents, and outage planning to be initiated. This approach not only supports our environmental commitment to reduce oil leakage but will also enable a more efficient and cost-effective delivery of cable projects, allowing for longer lead times, better planning, and coordination with other stakeholders and work programmes.

Initial feasibility studies were completed for 15 schemes and reviewed with relevant stakeholders (e.g. local councils, Transport for London, and the Greater London Authority), and some of these have progressed to ground penetrating radar (GPR) surveys and trial holes.

We also purchased an additional perfluorocarbon tracer (PFT) unit to carry out proactive leak location of moderate persistent leaks. With this new unit we will have increased capacity to monitor and maintain our cable assets, reducing the risk of oil leakage and environmental damage. We will also be able to carry out proactive leak detection on a regular basis, rather than waiting for signs of leakage such as oil seepage or pressure loss. This will help us to prevent potential failures and avoid disruption to our customers and stakeholders.

Fluid Filled Cables continued

To improve the performance of our underground cable network, we have adopted the following innovative solutions:

Pressurised Cable Active Control and Monitoring

This project reviewed the operating systems for FFCs so that cables can be operated at lower pressures to reduce leakage without the risk of customer interruptions, extending their operational life. The project is registered under the NIA project NIA-UKPN-0012. It started in September 2015 and concluded in 2019.

The project developed and trialled a new device – an Active Pressurised Control Unit (APCU) – to avoid fluid leakages from cables. An APCU is operated by a variable speed pump and pressure valve to create a pressure differential across the unit, and sensors on either side of the unit to control the flow of oil into and out of the APCU. This allows the pressure of oil inside the cable to be maintained at a constant value, which is expected to avoid cable degradation versus simply operating them within their designed pressure.

APCU units were successfully developed and trialled as part of this project. The findings largely suggest that the APCU could be permanently deployed on the FFC network, with confidence in its safe long-term operation. We have carried out further work to accommodate minor modifications to the original design and adopt the solution as a business-as-usual activity and have also updated our policies and standards to define pressure reduction techniques, based on findings from the network trials. To date we have installed eight units on our network.

Self-Healing Cables (registered for NIA as ‘Development of Oil-Filled Cable Additive – Phase 3’)

UK Power Networks is leading this project in collaboration with Northern Powergrid to identify new additives to cable fluid that would seal small or medium leaks (up to 20 litres per month) without the need for leak location and excavation. The project comprises three phases. Phases 1 and 2 are registered under the NIA project NIA-UKPN0030, which started in March 2016 and concluded in March 2020. These phases successfully demonstrated that the self-healing cable additive (Anagen) was ready to be trialled on DNOs’ FFC networks as a top-up fluid. Phase 3, launched in March 2023, focuses on assurance and further work required in a practical environment to ensure the formulation is electrically compatible over a more extended period, at a threshold of 10 years.

The project has shown strong results and work has continued throughout 2023-24 to deliver its aims and objectives. Further testing is required as part of Phase 3 and through live circuit trials on UK Power Networks’ assets. The learning from the trials will further inform the review of our policy and standard operating procedures and give us more assurance in adopting the technology for a wider network.

Stakeholder engagement

As outlined in the previous sections, we take a proactive approach to identifying leaks through monitoring cable pressures and utilising perfluorocarbon tracer (PFT), enabling us to identify leaks rapidly. We use active pressure control units (APCUs) to ensure we reduce pumping pressures where needed to prevent cable joint failure and oil loss to the surroundings. We also have dedicated teams whose primary role is to minimise the impacts of any leaks with immediate interventions, protecting vulnerable receptors such as water courses and water abstraction points, as well as recovering the majority of any oil lost and remediating the soil. These teams are fully supported by our contract partners, RSK, who are leading experts in managing spill and leak incidents. Our contractors and teams engage directly with all relevant statutory stakeholders, landowners and interested parties during cable interventions. At the same time, we are constantly innovating to preserve the life of the cables and reduce the risk of leaks through actions such as the self-healing cable initiative, and we have a rolling programme of replacement, targeting the worst performers.

The environmental impacts of cable fluid loss must be managed effectively, and we have a partnership agreement with the Environment Agency outlining how we should report, notify and manage cable leaks across the network. We also work with key stakeholders to share best practice and target the poorest performing circuits in our network. In 2023-24 this included:

- Ongoing engagement with the Environment Agency at six-monthly meetings of the ENA Fluid Filled Cable Liaison Group where performance is reviewed and best practice is shared with the other DNOs
- A review of Engineering Recommendation C135 (EREC C135, ‘Guidance for the Operation and Management of Fluid-filled Cables’ Issue 1). A revised version was released in Q2 of 2024
- Regular updates to the Environment Agency on the mitigation in place on specific projects and on the progress of capital replacement and refurbishment of FFCs more generally
- Enduring consultation/knowledge sharing with other DNOs, on a six-monthly basis or as required. These meetings focused on the delivery of specific projects where there were opportunities to share learning
- Discussions of individual poorly performing circuits with local stakeholders including Thames Water, the Canal and River Trust, and local authorities (as required), enabling UK Power Networks to hear and take account of their views

Wider Environment and Other Activity

Global Environmental Benchmarking

UK Power Networks has continued to support its shareholders with their global sustainability indices submissions, namely the Dow Jones Sustainability Index and the Hang Seng Sustainability Index, where they continue to hold healthy positions. This reporting covers a broad scope with information provided on our approach and progress in governance, risk management, supply chain management, innovations, operational efficiencies, biodiversity, corporate citizenship, and stakeholder engagement.

Alliance Contractor Forum

The Alliance Contractor Forum is a partnership between key contractors who undertake major infrastructure projects for UK Power Networks. The forum was established to assist in achieving the environmental commitments highlighted in UK Power Networks' Business Plan and Environmental Action Plan. Attended by key contractors and UK Power Networks sustainability leads, it acts as a platform for our key supply chain partners to regularly interact and share innovative ideas to help reduce our impact on the environment.

The Alliance holds regular meetings to monitor performance against targets and share best practice and innovations. In 2023 they introduced low carbon concrete into their operations, exceeding the target of 70%, and also crushed limestone as a substitute for cement bound sand, exceeding the target of 30%. They also continued to achieve high recovery rates for street works waste (spoil), exceeding 95% recycling rates.

In 2024 the Alliance targets were:	
1. Use of low carbon concrete	80%
2. Crushed limestone	75% of cable backfill to be replaced with crushed limestone
3. Environmental audits	two per site
4. Street works waste	99.5%
5. Diesel/petrol use reduction	25% by 2028
Initiatives to explore further are:	
1. Investigate alternative tarmacs	
2. Plans for energy reduction on-site (e.g. eco cabins)	
3. Circular economy (waste recycling) – to be determined	
4. Recycled aggregates – to be determined	
5. Recycled (green) steel – to be determined	

Water Management

As part of our strategy to reduce our impact on the world's limited resources we have committed to reduce our water consumption by 10% by 2028. While UK Power Networks is not a significant user of water and it is not a material environmental impact for us, we do have leaks from time to time.

According to the Climate Change Committee¹, it is anticipated that wetter winters and drier summers will result in water deficits of around 25% of water resource zones. Government publications also highlight that with climate change and population growth, demand for water is ever increasing and many areas of England are already experiencing water shortages.

This includes those within our own operating area – in parts of Sussex, Cambridgeshire, Suffolk and Norfolk where additional demands on water supplies from businesses and new housing developments are placing pressure on water resources.

Our primary goal has been to enhance our monitoring, smart metering, and consumption reporting systems as leaks can go undetected. To this end we installed AMRs (automatic meter readers) at our key tier 1 high consuming sites which provide 24 hour monitoring of water consumption. This has allowed us to pinpoint sites that consume unusually large volumes of water and our efforts have already uncovered atypical consumption patterns, indicating the presence of leaks. For example, at one site our AMRs enabled us to identify a leak and repair it, saving over 1,600m³ of water per year.

We have now retendered our water contracts to include increased levels of monitoring and targeting which will see both improved data reporting and visibility and the addition of 15 more AMRs. This will also include 46 limpet readers which will provide monthly remote readings for hard to access sites with moderate consumption, reducing the volume of estimated readings and further adding to our capability to spot leaks.

Our facilities management team continues to focus on upgrading our office welfare facilities with water-saving devices when refurbishments are undertaken, with examples including the installation of sensor-flow urinals which can save up to 80% on water consumption, sensor taps which can save up to 65% usage, and toilet sensor controls which can save up to 30% usage.

Operationally, when feasible, our large-scale projects continue to make use of eco cabins equipped with water-saving technology. These cabins provide rainwater harvesting for toilet facilities and waterless urinals, and on-demand hot water and sensor technology to prevent water wastage.

1 Meeting our Water Needs for the Next 25 Years – Creating a better place (blog.gov.uk)

Wider Environment and Other Activity continued

Fleet Transition Initiative

Our fleet of cars and vans accounts for 42% of our BCF. Diesel remains a significant contributor to our BCF and a difficult carbon emission to abate.

Comprehensive Strategy

To realise these challenging targets, we have devised and implemented a multi-faceted approach. This strategy encompasses several key elements:

1. Upgrading our existing fleet with newer, more fuel-efficient vehicles
2. Implementing measures to reduce overall mileage
3. Sourcing and utilising cleaner, alternative fuels
4. Transitioning a substantial portion of our fleet, including cars, car-derived vans, and small vans, to EVs

Central to our approach is the replacement of end-of-life vehicles with electric alternatives, where suitable models are available and operationally feasible.

Project Background and Current Progress

In recent years we have conducted a comprehensive feasibility study to evaluate the opportunities and challenges associated with transitioning to an EV fleet. Building on the insights gained from this study, we have now advanced to the next phase of our fleet transition. This current phase involves conducting an EV pilot project and developing a robust, long-term strategy that addresses both the technical and commercial aspects of transitioning our entire fleet.

Fleet Vehicle Analysis and Transition

We have made significant progress in our transition efforts, particularly in the analysis and categorisation of our fleet vehicles. A thorough assessment has been conducted on our category A (cars), B (car-derived vans), and C (panel vans) vehicles to determine their suitability for conversion to EVs. This analysis considered several key factors:

1. **Vehicle age:** We aim to reduce the average age of our fleet as a co-benefit of the EV transition, prioritising older vehicles for replacement.
2. **Mileage:** High-mileage vehicles are identified as prime candidates for transition given the lower operational cost per mile for EVs compared to internal combustion engine (ICE) vehicles.
3. **Charging zones:** We have carefully considered the impact of various road charging schemes – Low Emission Zone, Ultra Low Emission Zone, and Congestion Charge Zone – on our fleet vehicles operating in Greater London.

Based on this analysis, we have determined that our car category is ready for full transition to EVs. Consequently, we have implemented a new policy ensuring all new company cars will be electric – with exceptions made only for job roles where EVs are unsuitable or in locations lacking appropriate charging infrastructure. To support this transition, we have expanded EV options for our staff, ensuring suitable choices for various job roles. We now have over 270 electric cars in both our commercial and grey fleet².

For our car-derived van fleet, we have initiated the transition to electric models, focusing on vehicles with daily ranges compatible with current EV capabilities. Concurrently, we are conducting a comprehensive vehicle-to-role assessment for operational staff with company vehicles. This assessment aims to ensure correct vehicle sizing for job roles and, where possible, reduce vehicle size or replace with a low-carbon alternative. This effort has allowed us to hit an 11.2% electrification rate across our car-derived vans fleet.

Addressing Larger Vehicles and Alternative Fuels

It is important to note that larger vehicles, particularly those in category E which account for 3 to 4% of our fuel consumption, do not yet have suitable EV models for our operational duty cycles. To address this challenge, we are exploring alternative low-carbon fuels such as hydrotreated vegetable oil (HVO) which is primarily made from waste vegetable oils. While these fuels come at a higher premium, they offer a 90% reduction in reportable carbon emissions, serve as a drop-in replacement for diesel, and have a much longer storage duration.

Charging Infrastructure Development

To support our growing electric fleet, we have established a clear hierarchy of charging priorities:

1. **Home charging:** This option has the lowest impact on fleet operations as employees can charge vehicles overnight at their residences. Initial surveys suggest that approximately 50% of employees can install a home charge point.
2. **Depot charging:** For cases where home charging is not feasible, we are installing charge points at our sites for overnight charging or rapid charging during the day.
3. **Public charging:** As a tertiary option, public charge points may be utilised by employees when they are unable to reach a company site for recharging.

To facilitate this transition, we have committed to providing and funding home chargers for all business-need vehicles. This initiative has significantly boosted EV adoption and contributed to a reduction in diesel consumption for company cars.

Furthermore, given our extensive geographical coverage, we recognise the importance of a robust in-house charging network. We are working to electrify our offices and depots by introducing both rapid and slow chargers. The installation of these chargers is being phased to align with the ongoing transition of our vehicle fleet, ensuring our staff can charge and top up their vehicles while they are on-site.

² This is the term given to private vehicles which are used for business purposes.

Wider Environment and Other Activity continued

Innovative Fuel Card Solution

To streamline the charging process and reduce administrative burden, we have introduced a new fuel card system. This innovative solution allows EV drivers to charge at home, at company sites, and on public charging networks without incurring out-of-pocket expenses. This seamless integration ensures that drivers do not face higher home energy bills or have to cover the cost of charging on public networks and subsequently claim these expenses. Additionally, this system has significantly reduced the administrative workload for our transport staff in managing expense claims.

These comprehensive initiatives demonstrate our unwavering commitment to reducing our carbon footprint and optimising our fleet operations. By adopting a holistic approach to our fleet transition, we are not only progressing towards our emission reduction targets but also enhancing operational efficiency and cost-effectiveness. Our ongoing efforts in this area underscore our dedication to environmental stewardship and sustainable business practices.



Temporary Generator Strategy

Temporary generators remain an essential part of our operational activities to maintain continuity of supply to our customers, whether that is for planned works or during emergency events such as storms. The amount of diesel consumed by temporary generators accounts for one-fifth of our BCF and like the operational vehicle fleet it remains a challenging source of carbon emissions to abate.

Over the RII0-ED1 period and into the first year of RII0-ED2 we have run an innovation project to trial hybrid engines with a number of low carbon and cleaner fuels. The purpose of this was to assess their performance and suitability for deployment both in-house and with our suppliers' fleets. The project demonstrated that the most suitable low carbon fuel was HVO, which would currently provide a greater than 90% carbon reduction per litre consumed.

In addition, the hybrid engines performed well and delivered between 25 to 40% fuel savings as the battery element took over during low load periods. Typically, low loads tend to be at night so this also reduced noise issues at sensitive times of the day. The battery also improved the emissions of NOx (oxides of nitrogen), as diesel generators do not operate well at low loads and fuel economy is poor.

We have now started to introduce hybrid engines into our in-house fleet, with nine planned for the coming year. The expectation is that these will be for primary use, so that they are utilised as much as possible. As generators within our fleet approach the end of their life then, where available, hybrid engines with the latest cleaner stage V engines will be adopted.

We are also working with our suppliers to adopt HVO for some of our contracts, to immediately reduce our carbon emissions. We will ensure that the suppliers used for the HVO are UK based and are accredited to the Renewable Fuels Assurance Scheme (RFAS). This scheme works alongside the government's Renewable Transport Fuel Obligation (RTFO) which provides a mechanism for guaranteeing that the fuels purchased are low carbon. We see HVO as a short to medium term solution while improved hybrids and battery generating capacity, along with improved engines and additional low carbon fuel sources, come to market.

We have also improved the monitoring of our generator use and the associated impacts so that these show not just cost and deployment time but carbon impacts as well. This feeds into our operational management reports on a daily basis, so that we can minimise deployment time, costs and carbon emissions.

Looking ahead, we will continue to work with our suppliers to develop hybrid and battery engine solutions and are looking at the next innovation project for battery deployment on the network.

BCF Key Performance Indicators (KPI)

UKPN

Category	Sub-Category	Expected Annual Emissions in 2027-28	2023-24 (tCO ₂ e)
Operational Transport	Total		16,555.0
	Road		16,555.0
	Marine		
	Air		
Building Energy Usage	Total		11,542.9
	Electricity		2,060.3
	Other fuels		
	Substation electricity		9,174.4
	Gas		308.2
Fuel Combustion	Total		8,939.2
	Diesel (excluding transport)		8,939.2
	Diesel (embedded stations)		
	Other		
Fugitive Emissions	Total		1,882.0
	SF6		1,882.0
	Other IIG		
Total Scope 1 and 2 Emissions (Excluding Losses)		26,668.0	38,919.1
Electricity Distribution Losses			1,053,376.4
Total Scope 1 and 2 Emissions (Including Losses)		801,537.0	1,092,295.5

LPN

Category	Sub-Category	2023-24 (tCO ₂ e)
Operational Transport	Total	4,818.9
	Road	4,818.9
	Marine	—
	Air	—
Building Energy Usage	Total	3,185.9
	Electricity	717.5
	Other fuels	—
	Substation electricity	2,418.9
	Gas	49.5
Fuel Combustion	Total	681.5
	Diesel (excluding transport)	681.5
	Diesel (embedded stations)	
	Other	
Fugitive Emissions	Total	379.3
	SF6	379.3
	Other IIG	—
Total Scope 1 and 2 Emissions (Excluding Losses)		9,065.6
Electricity Distribution Losses		323,477.5
Total Scope 1 and 2 Emissions (Including Losses)		332,543.1

BCF Key Performance Indicators (KPI) continued

SPN

Category	Sub-Category	2023-24 (tCO ₂ e)
Operational Transport	Total	4,374.8
	Road	4,374.8
	Marine	---
	Air	---
Building Energy Usage	Total	2,693.2
	Electricity	484.4
	Other fuels	---
	Substation electricity	2,076.9
	Gas	131.9
Fuel Combustion	Total	3,368.5
	Diesel (excluding transport)	3,368.5
	Diesel (embedded stations)	
	Other	
Fugitive Emissions	Total	262.5
	SF6	262.5
	Other IIG	---
Total Scope 1 and 2 Emissions (Excluding Losses)		10,699.0
Electricity Distribution Losses		254,825.3
Total Scope 1 and 2 Emissions (Including Losses)		265,524.3

EPN

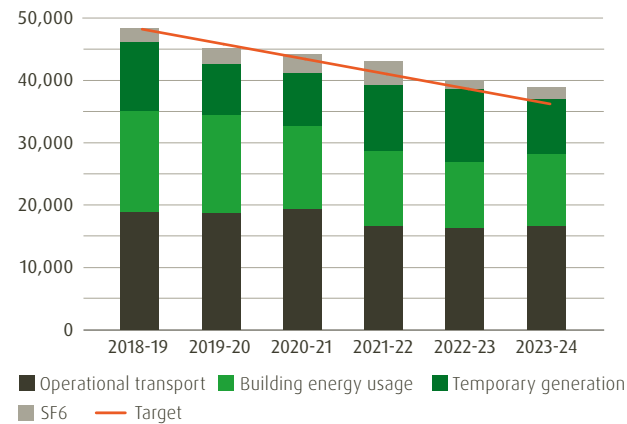
Category	Sub-Category	2023-24 (tCO ₂ e)
Operational Transport	Total	7,361.4
	Road	7,361.4
	Marine	---
	Air	---
Building Energy Usage	Total	5,663.8
	Electricity	858.4
	Other fuels	---
	Substation electricity	4,678.6
	Gas	126.8
Fuel Combustion	Total	4,889.2
	Diesel (excluding transport)	4,889.2
	Diesel (embedded stations)	
	Other	
Fugitive Emissions	Total	1,240.2
	SF6	1,240.2
	Other IIG	---
Total Scope 1 and 2 Emissions (Excluding Losses)		19,154.6
Electricity Distribution Losses		475,073.6
Total Scope 1 and 2 Emissions (Including Losses)		494,228.2

Additional BCF Data

BCF

Category	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Operational Transport	18,925	18,749	19,317	16,527	16,205	16,555
Building Energy Usage	16,087	15,652	13,310	12,108	10,731	11,543
Temporary Generation	11,145	8,090	8,571	10,614	11,612	8,939
SF6	2,093	2,649	2,975	3,768	1,493	1,882
Total Scope 1 and 2 (excluding losses)	48,250	45,141	44,172	43,017	40,041	38,919
Target	48,250	45,852	43,454	41,056	38,658	36,260

Figure 12: BCF progress against baseline year 2018-19 (tCO₂e)



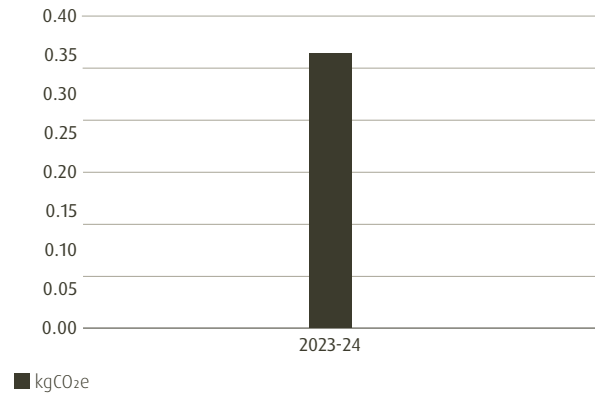
BCF focuses on those emissions directly associated with our operational activities and covers fleet, temporary generators, energy purchased for the running of our offices, depots/substations and fugitive SF6 emissions
 Target under location-based carbon reporting and baseline year is 2018-19

Additional BCF Data continued

Evolution over time of an operational km travelled expressed as KgCO₂e

Fuel	Litres	Diesel factor	Carbon kgCO ₂ e	km	kgCO ₂ e/km
Diesel	5,379,966.90	2.512	13,514,821	38,206,058	0.354
Unleaded	15,519.44	2.097	32,552	268,428	0.121
Total			13,547,372.16	38,474,486.54	0.352

Figure 13: kgCO₂e per operational km

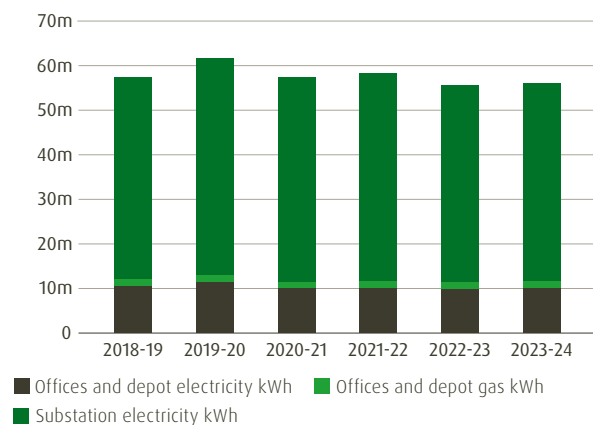


Additional BCF Data continued

Evolution over time of the energy consumption in kWh at our offices, depots and substations

Category	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Offices and depot electricity kWh	10,480,429	11,412,159	9,965,990	10,005,644	9,736,553	9,949,492
Offices and depot gas kWh	1,437,584	1,482,225	1,379,645	1,593,812	1,622,330	1,686,243
Substation electricity kWh	45,415,953	48,759,434	46,035,040	46,521,375	44,225,168	44,305,001
Total	57,333,966	61,653,818	57,380,674	58,120,831	55,584,051	55,940,735

Figure 14: Energy consumption at offices and depots and substations (kWh)



SF6 and Other IIGs Key Performance Indicators (KPI)

UKPN

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
SF6 Bank	HV	Total no. of assets containing SF6	No. of Assets	61,201
		Total amount of SF6 on network	kg	57,169
		No. of SF6 assets replaced (per annum)	No. of Assets	346
		No. of SF6 alternative assets (per annum)	No. of Assets	0
		% of assets containing SF6 (% of bank)	%	43.73%
		No. of SF6 assets installed (per annum)	No. of Assets	1,171
SF6 Emissions	HV	Leakage (per annum)	kg	9
		Leakage rate (% of bank)	%	0.02%
		Interventions (per annum)	#	0
		Impact of Interventions	kg	0

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
SF6 Bank	EHV	Total no. of assets containing SF6	No. of Assets	3,149
		Total amount of SF6 on network	kg	15,481
		No. of SF6 assets replaced (per annum)	No. of Assets	4
		No. of SF6 alternative assets (per annum)	No. of Assets	44
		% of assets containing SF6 (% of bank)	%	13.66%
		No. of SF6 assets installed (per annum)	No. of Assets	69
SF6 Emissions	EHV	Leakage (per annum)	kg	20
		Leakage rate (% of bank)	%	0.13%
		No. of SF6 assets replaced (per annum)	#	4
		Interventions (per annum)	#	0
		Impact of Interventions	kg	0

SF6 and Other IIGs Key Performance Indicators (KPI) continued

UKPN

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
SF6 Bank	132kV	Total no. of assets containing SF6	No. of Assets	2,927
		Total amount of SF6 on network	kg	56,790
		No. of SF6 assets replaced (per annum)	No. of Assets	1
		No. of SF6 alternative assets (per annum)	No. of Assets	0
		% of assets containing SF6 (% of bank)	%	44.04%
		No. of SF6 assets installed (per annum)	No. of Assets	17
SF6 Emissions	132kV	Leakage (per annum)	kg	51
		Leakage rate (% of bank)	%	0.09%
		No. of SF6 assets replaced (per annum)	#	1
		Interventions (per annum)	#	0
		Impact of Interventions	kg	0

SF6 and Other IIGs Key Performance Indicators (KPI) continued

UKPN

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
IIG Name	LV	No of Assets with IIG	#	0
		Amount of IIG	kg	0
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0
		Leakage	kg	0
IIG Name	HV	No of Assets with IIG	#	0
		Amount of IIG	kg	0
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0
		Leakage	kg	0
C5 Air Plus	EHV	No of Assets with IIG	#	44
		Amount of IIG	kg	144
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0.9
		Leakage	kg	0
g3 C4-FN	132kV	No of Assets with IIG	#	2
		Amount of IIG	kg	11
		Global Warming Potential of IIG	CO ₂ Comparison Constant	300
		Leakage	kg	0

SF6 and Other IIGs Key Performance Indicators (KPI) continued

LPN

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
SF6 Bank	HV	Total no. of assets containing SF6	No. of Assets	20,171
		Total amount of SF6 on network	kg	22,868.25
		No. of SF6 assets replaced (per annum)	No. of Assets	162
		No. of SF6 alternative assets (per annum)	No. of Assets	0
		% of assets containing SF6 (% of bank)	%	46.00%
		No. of SF6 assets installed (per annum)	No. of Assets	386
SF6 Emissions	HV	Leakage (per annum)	kg	3.096
		Leakage rate (% of bank)	%	0.01%
		Interventions (per annum)	#	0
		Impact of Interventions	kg	0

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
SF6 Bank	EHV	Total no. of assets containing SF6	No. of Assets	446
		Total amount of SF6 on network	kg	4,042
		No. of SF6 assets replaced (per annum)	No. of Assets	0
		No. of SF6 alternative assets (per annum)	No. of Assets	0
		% of assets containing SF6 (% of bank)	%	8.10%
		No. of SF6 assets installed (per annum)	No. of Assets	0
SF6 Emissions	EHV	Leakage (per annum)	kg	0.3
		Leakage rate (% of bank)	%	0.01%
		No. of SF6 assets replaced (per annum)	#	0
		Interventions (per annum)	#	0
		Impact of Interventions	kg	0

SF6 and Other IIGs Key Performance Indicators (KPI) continued

LPN

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
SF6 Bank	132kV	Total no. of assets containing SF6	No. of Assets	977
		Total amount of SF6 on network	kg	22,757
		No. of SF6 assets replaced (per annum)	No. of Assets	1
		No. of SF6 alternative assets (per annum)	No. of Assets	0
		% of assets containing SF6 (% of bank)	%	45.90%
		No. of SF6 assets installed (per annum)	No. of Assets	0
SF6 Emissions	132kV	Leakage (per annum)	kg	12.745
		Leakage rate (% of bank)	%	0.06%
		No. of SF6 assets replaced (per annum)	#	1
		Interventions (per annum)	#	0
		Impact of Interventions	kg	0

SF6 and Other IIGs Key Performance Indicators (KPI) continued

LPN

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
IIG Name	LV	No of Assets with IIG	#	0
		Amount of IIG	kg	0
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0
		Leakage	kg	0
IIG Name	HV	No of Assets with IIG	#	0
		Amount of IIG	kg	0
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0
		Leakage	kg	0
C5 Air Plus	EHV	No of Assets with IIG	#	0
		Amount of IIG	kg	0
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0
		Leakage	kg	0
g3 C4-FN	132kV	No of Assets with IIG	#	0
		Amount of IIG	kg	0
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0
		Leakage	kg	0

SF6 and Other IIGs Key Performance Indicators (KPI) continued

SPN

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
SF6 Bank	HV	Total no. of assets containing SF6	No. of Assets	16,309
		Total amount of SF6 on network	kg	12,469
		No. of SF6 assets replaced (per annum)	No. of Assets	88
		No. of SF6 alternative assets (per annum)	No. of Assets	0
		% of assets containing SF6 (% of bank)	%	47.33%
		No. of SF6 assets installed (per annum)	No. of Assets	298
SF6 Emissions	HV	Leakage (per annum)	kg	2.88
		Leakage rate (% of bank)	%	0.02%
		Interventions (per annum)	#	0
		Impact of Interventions	kg	0

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
SF6 Bank	EHV	Total no. of assets containing SF6	No. of Assets	692
		Total amount of SF6 on network	kg	3,731
		No. of SF6 assets replaced (per annum)	No. of Assets	0
		No. of SF6 alternative assets (per annum)	No. of Assets	36
		% of assets containing SF6 (% of bank)	%	14.24%
		No. of SF6 assets installed (per annum)	No. of Assets	22
SF6 Emissions	EHV	Leakage (per annum)	kg	0
		Leakage rate (% of bank)	%	0.00%
		No. of SF6 assets replaced (per annum)	#	0
		Interventions (per annum)	#	0
		Impact of Interventions	kg	0

SF6 and Other IIGs Key Performance Indicators (KPI) continued

SPN

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
SF6 Bank	132kV	Total no. of assets containing SF6	No. of Assets	711
		Total amount of SF6 on network	kg	10,070
		No. of SF6 assets replaced (per annum)	No. of Assets	0
		No. of SF6 alternative assets (per annum)	No. of Assets	0
		% of assets containing SF6 (% of bank)	%	38.43%
		No. of SF6 assets installed (per annum)	No. of Assets	4
SF6 Emissions	132kV	Leakage (per annum)	kg	8.289
		Leakage rate (% of bank)	%	0.08%
		No. of SF6 assets replaced (per annum)	#	0
		Interventions (per annum)	#	0
		Impact of Interventions	kg	0

SF6 and Other IIGs Key Performance Indicators (KPI) continued

SPN

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
IIG Name	LV	No of Assets with IIG	#	0
		Amount of IIG	kg	0
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0
		Leakage	kg	0
IIG Name	HV	No of Assets with IIG	#	0
		Amount of IIG	kg	0
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0
		Leakage	kg	0
C5 Air Plus	EHV	No of Assets with IIG	#	36
		Amount of IIG	kg	116
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0.9
		Leakage	kg	0
g3 C4-FN	132kV	No of Assets with IIG	#	0
		Amount of IIG	kg	0
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0
		Leakage	kg	0

SF6 and Other IIGs Key Performance Indicators (KPI) continued

EPN

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
SF6 Bank	HV	Total no. of assets containing SF6	No. of Assets	24,721
		Total amount of SF6 on network	kg	21,831
		No. of SF6 assets replaced (per annum)	No. of Assets	96
		No. of SF6 alternative assets (per annum)	No. of Assets	0
		% of assets containing SF6 (% of bank)	%	39.50%
		No. of SF6 assets installed (per annum)	No. of Assets	487
SF6 Emissions	HV	Leakage (per annum)	kg	3.1
		Leakage rate (% of bank)	%	0.02%
		Interventions (per annum)	#	0
		Impact of Interventions	kg	0

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
SF6 Bank	EHV	Total no. of assets containing SF6	No. of Assets	2,011
		Total amount of SF6 on network	kg	7,708
		No. of SF6 assets replaced (per annum)	No. of Assets	4
		No. of SF6 alternative assets (per annum)	No. of Assets	8
		% of assets containing SF6 (% of bank)	%	14.70%
		No. of SF6 assets installed (per annum)	No. of Assets	47
SF6 Emissions	EHV	Leakage (per annum)	kg	19.725
		Leakage rate (% of bank)	%	0.26%
		No. of SF6 assets replaced (per annum)	#	4
		Interventions (per annum)	#	0
		Impact of Interventions	kg	0

SF6 and Other IIGs Key Performance Indicators (KPI) continued

EPN

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
SF6 Bank	132kV	Total no. of assets containing SF6	No. of Assets	1,239
		Total amount of SF6 on network	kg	23,963
		No. of SF6 assets replaced (per annum)	No. of Assets	0
		No. of SF6 alternative assets (per annum)	No. of Assets	0
		% of assets containing SF6 (% of bank)	%	0.458
		No. of SF6 assets installed (per annum)	No. of Assets	13
SF6 Emissions	132kV	Leakage (per annum)	kg	29,949
		Leakage rate (% of bank)	%	0.12%
		No. of SF6 assets replaced (per annum)	#	0
		Interventions (per annum)	#	0
		Impact of Interventions	kg	0

SF6 and Other IIGs Key Performance Indicators (KPI) continued

EPN

Category	Voltage	Sub-Category (where applicable)	Unit of Measure	2023-24
IIG Name	LV	No of Assets with IIG	#	0
		Amount of IIG	kg	0
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0
		Leakage	kg	0
IIG Name	HV	No of Assets with IIG	#	0
		Amount of IIG	kg	0
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0
		Leakage	kg	0
C5 Air Plus	EHV	No of Assets with IIG	#	8
		Amount of IIG	kg	28
		Global Warming Potential of IIG	CO ₂ Comparison Constant	0.9
		Leakage	kg	0
g3 C4-FN	132kV	No of Assets with IIG	#	2
		Amount of IIG	kg	11
		Global Warming Potential of IIG	CO ₂ Comparison Constant	300
		Leakage	kg	0

Electricity Distribution Losses Key Performance Indicators (KPI)

UKPN

Electricity Distribution Losses

	Target RII0-ED2 2028	Unit	2023-24
Annual Losses	5,103 GWh	GWh	5,087.00
Share of Total Electricity Distributed	7.07%	%	7.19
Carbon Equivalent	801,537 tCO ₂ e	tCO ₂ e	1,053,377.00
Annual Interventions completed	3,000	#	2,726.00
Impact of Interventions (per annum)	-14,000	MWh	-13,152.30
Impact of Interventions (per annum)	-2,900	tCO ₂ e	-2,723.50

Summary of amount of losses activities in the regulatory reporting year

Description	Unit	2023-24
LV cable	km	320.90
HV cable	km	377.00
Distribution Ground Mount	each	738.00
Distribution Pole Mount	each	1,283.00
Primary Ground Mount	each	7.00
Grid Ground Mount	each	—

Summary of losses activities reductions MWh

Description	Unit	2023-24
LV cable	MWh	-2,037.50
HV cable	MWh	-2,239.40
Distribution Ground Mount	MWh	-6,630.60
Distribution Pole Mount	MWh	-1,591.90
Primary Ground Mount	MWh	-653.00
Grid Ground Mount	MWh	—

Summary of losses activities reductions tCO₂e

Description	Unit	2023-24
LV cable	tCO ₂ e	-421.90
HV cable	tCO ₂ e	-463.70
Distribution Ground Mount	tCO ₂ e	-1,373.00
Distribution Pole Mount	tCO ₂ e	-329.60
Primary Ground Mount	tCO ₂ e	-135.20
Grid Ground Mount	tCO ₂ e	—

Electricity Distribution Losses Key Performance Indicators (KPI) continued

LPN

Electricity Distribution Losses

	Unit	2023-24
Annual Losses	GWh	1,562
Share of Total Electricity Distributed	%	6.6%
Carbon Equivalent	tCO ₂ e	323,478
Annual Interventions completed	#	
Impact of Interventions (per annum)	MWh	
Impact of Interventions (per annum)	tCO ₂ e	

Summary of amount of losses activities in the regulatory reporting year

Description	Unit	2023-24
LV cable	km	60.74
HV cable	km	65.69
Distribution Ground Mount	each	194.00
Distribution Pole Mount	each	—
Primary Ground Mount	each	—
Grid Ground Mount	each	—

Summary of losses activities reductions MWh

Description	Unit	2023-24
LV cable	MWh	-385.72
HV cable	MWh	-390.20
Distribution Ground Mount	MWh	-2,021.48
Distribution Pole Mount	MWh	—
Primary Ground Mount	MWh	—
Grid Ground Mount	MWh	—

Summary of losses activities reductions tCO₂e

Description	Unit	2023-24
LV cable	tCO ₂ e	-79.87
HV cable	tCO ₂ e	-80.80
Distribution Ground Mount	tCO ₂ e	-418.60
Distribution Pole Mount	tCO ₂ e	—
Primary Ground Mount	tCO ₂ e	—
Grid Ground Mount	tCO ₂ e	—

Electricity Distribution Losses Key Performance Indicators (KPI) continued

SPN

Electricity Distribution Losses

	Unit	2023-24
Annual Losses	GWh	1,231
Share of Total Electricity Distributed	%	7%
Carbon Equivalent	tCO ₂ e	254,825
Annual Interventions completed	#	
Impact of Interventions (per annum)	MWh	
Impact of Interventions (per annum)	tCO ₂ e	

Summary of amount of losses activities in the regulatory reporting year

Description	Unit	2023-24
LV cable	km	82.67
HV cable	km	114.60
Distribution Ground Mount	each	233.00
Distribution Pole Mount	each	412.00
Primary Ground Mount	each	3.00
Grid Ground Mount	each	—

Summary of losses activities reductions MWh

Description	Unit	2023-24
LV cable	MWh	-524.96
HV cable	MWh	-680.73
Distribution Ground Mount	MWh	-2,117.97
Distribution Pole Mount	MWh	-494.40
Primary Ground Mount	MWh	-400.00
Grid Ground Mount	MWh	—

Summary of losses activities reductions tCO₂e

Description	Unit	2023-24
LV cable	tCO ₂ e	-108.71
HV cable	tCO ₂ e	-140.96
Distribution Ground Mount	tCO ₂ e	-438.58
Distribution Pole Mount	tCO ₂ e	-102.38
Primary Ground Mount	tCO ₂ e	-82.83
Grid Ground Mount	tCO ₂ e	—

Electricity Distribution Losses Key Performance Indicators (KPI) continued

EPN

Electricity Distribution Losses

	Unit	2023-24
Annual Losses	GWh	2,294
Share of Total Electricity Distributed	%	8%
Carbon Equivalent	tCO ₂ e	475,074
Annual Interventions completed	#	
Impact of Interventions (per annum)	MWh	
Impact of Interventions (per annum)	tCO ₂ e	

Summary of amount of losses activities in the regulatory reporting year

Description	Unit	2023-24
LV cable	km	177.45
HV cable	km	196.72
Distribution Ground Mount	each	311.00
Distribution Pole Mount	each	871.00
Primary Ground Mount	each	4.00
Grid Ground Mount	each	—

Summary of losses activities reductions MWh

Description	Unit	2023-24
LV cable	MWh	-1,126.84
HV cable	MWh	-1,168.49
Distribution Ground Mount	MWh	-2,491.11
Distribution Pole Mount	MWh	-1,097.46
Primary Ground Mount	MWh	-253.00
Grid Ground Mount	MWh	—

Summary of losses activities reductions tCO₂e

Description	Unit	2023-24
LV cable	tCO ₂ e	-233.34
HV cable	tCO ₂ e	-241.96
Distribution Ground Mount	tCO ₂ e	-515.84
Distribution Pole Mount	tCO ₂ e	-227.26
Primary Ground Mount	tCO ₂ e	-52.39
Grid Ground Mount	tCO ₂ e	—

Supply Chain Management Key Performance Indicators (KPI)

Supply Chain Management

	Unit	Target by end of RIIO-ED2 2028	2023-24
Percentage of suppliers meeting licensee's supplier code	Cumulative % by Annual Spend	80	78.4

Embodied Carbon

Project	Embodied carbon values					
	Concept Emissions (tCO ₂ e)	Developed Emissions (tCO ₂ e)	Difference between concept and developed design	Identified savings	Type	Confirmed value
Ponders End 11kv Swg Replacement	276.80	277.90	1.10	0	switchgear	£1,719,356.21
Kings Lynn Grid – replace GT1 and GT2	1,301.10	1,444.60	143.50	11	TX replacement	£5,561,664.72
Austin Canons Grid – replace 33/11kV switchgear	944.81	978.60	33.79	4	switchgear	£4,690,363.74
Broadway Enterprise Park NR10 3JX	932.54	989.18	56.64	6	switchhouse and TX	£2,676,230.34
Taversham Primary	1,958.01	1,445.95	-512.06	-26	TX installation	£6,410,602.76
Grain transformer replacement	765.38	385.34	-380.04	-50	TX replacement	£2,218,822.05
Tunbridge Wells Grid Transformer Replacement	400.74	382.97	-17.77	-4	TX replacement	£1,799,536.00
Wharf Road SS17 0EH	136.69	133.05	-3.64	-3	Installation of CB	£2,102,876.00
Palmers Green	1,515.00	415.10	-1,099.90	-73	switchgear	£3,890,127.75
EH132 Extra Cambridge	6,226.30	5,734.10	-492.20	-8	Primary TX and cable	£3,967,000.00
WIMB GT4B Replacement	357.40	337.50	-19.90	-6	GT replacement	£3,127,246.00
Groton Primary	539.90	539.90	—	0	switchgear	£1,645,624.58
TOTAL: 12 projects	15,354.67	13,064.18	-2,290.49	-14.92	N/A	£39,809,450.15

Supply Chain Management Key Performance Indicators (KPI) continued

Embodied Carbon

Project	Embodied carbon – construction intensity metric (tCO ₂ e/£m)				
	Concept Emissions – construction projects (tCO ₂ e)	Developed Emissions – construction projects (tCO ₂ e)	Confirmed value	Construction intensity metric – Concept Design (tCO ₂ e/£m)	Construction intensity metric – Developed Design (tCO ₂ e/£m)
Ponders End 11kv Swg Replacement	276.80	277.90	£1,719,356.21	160.99	161.63
Kings Lynn Grid – replace GT1 and GT2	1,301.10	1,444.60	£5,561,664.72	233.94	259.74
Austin Canons Grid – replace 33/11kv switchgear	944.81	978.60	£4,690,363.74	201.44	208.64
Broadway Enterprise Park NR10 3JX	932.54	989.18	£2,676,230.34	348.45	369.62
Taversham Primary	1,958.01	1,445.95	£6,410,602.76	305.43	225.56
Grain transformer replacement	765.38	385.34	£2,218,822.05	344.95	173.67
Tunbridge Wells Grid Transformer Replacement	400.74	382.97	£1,799,536.00	222.69	212.82
Wharf Road SS17 0EH	136.69	133.05	£2,102,876.00	65.00	63.27
Palmers Green	1,515.00	415.10	£3,890,127.75	389.45	106.71
EH132 Extra Cambridge	6,226.30	5,734.10	£3,967,000.00	1569.52	1445.45
WIMB GT4B Replacement	357.40	337.50	£3,127,246.00	114.29	107.92
Groton Primary	539.90	539.90	£1,645,624.58	328.08	328.08
TOTAL	15,354.67	13,064.18	£39,809,450.15	385.70	328.17

Supply Chain Management Key Performance Indicators (KPI) continued

Embodied Carbon

Embodied carbon – cables intensity metric (tCO₂e/£m)

Project	Concept design emissions – cables (tCO ₂ e)	Developed design emissions – cables (tCO ₂ e)	Cable km – concept design	Cable km – developed design	Cable intensity metric – Concept Design (tCO ₂ e/km)	Cable intensity metric – Developed design (tCO ₂ e/km)
Ponders End 11kv Swg Replacement	79.50	79.50	0.90	0.90	88.33	88.33
Kings Lynn Grid – replace GT1 and GT2	231.80	102.00	2.70	2.16	85.85	47.22
Austin Canons Grid – replace 33/11kV switchgear	513.40	430.90	5.85	7.56	87.76	57.00
Broadway Enterprise Park NR10 3JX	570.20	696.50	6.60	12.60	86.39	55.28
Taversham Primary	751.90	230.40	8.70	8.70	86.43	26.48
Tunbridge Wells Grid Transformer Replacement	27.50	27.50	0.30	0.30	91.67	91.67
Wharf Road SS17 OEH	40.80	29.80	0.29	0.36	143.16	82.78
Palmers Green	1,313.80	107.50	15.00	1.50	87.59	71.67
EH132 Extra Cambridge	5,884.10	5,351.80	55.38	55.38	106.25	96.64
Groton Primary	456.60	456.60	2.76	2.76	165.43	165.43
TOTAL	9,869.60	7,512.50	98.48	92.22	100.22	81.46

Supply Chain Management Key Performance Indicators (KPI) continued

Scope 3 (Excluding Network Losses) Cat 1 to 7

Year	Scope 3 – total (excluding losses)	
	2018-19	2023-24
Scope 3 carbon footprint – excluding losses (tCO ₂ e)	266,315.00	213,987.00
Difference to baseline		-52,328.00
% reduction from baseline		-20

Year	Scope 3 – Cat 1a, 1b and 2 (excluding losses)	
	2018-19	2023-24
Scope 3 carbon footprint (1a, 1b, 2) – excluding losses (tCO ₂ e)	240,726.00	198,935.00
Spend (£)	£852,543,432.00	£915,771,858.80
Carbon intensity metric (tCO ₂ e/£m)	282.36	217.23
Difference to baseline		41,791.00
% reduction from baseline		-17

Year	Action planning suppliers	
	2022-23	2023-24
No. of key vendors	12	12
Carbon footprint of key vendors (tCO ₂ e)	42,472.50	49,264.00
% of Scope 3 footprint (tCO ₂ e)	22	25

Resource Use and Waste Key Performance Indicators (KPI)

Office, Depot and Network Waste

Waste Destination - Non Hazardous/Non Special	Unit	2023-24
Total Waste Produced directly by Licensee	Tonnes	7,323.15
% Reused/Recycled	%	60.5%
% Energy from Waste	%	34.6%
% Sent to Landfill	%	4.8%
% Other	%	0%
% of Waste Diverted from Landfill (excluding compliance waste)	%	95.2%

Waste Destination - Hazardous/Special	Unit	2023-24
Total Waste Produced directly by Licensee	Tonnes	4,249.09
% Reused/Recycled	%	88%
% Energy from Waste	%	11.7%
% Sent to Landfill	%	0.2%
% Other	%	0%
% of Waste Diverted from Landfill (excluding compliance waste)	%	99.8%

COMBINED TOTALS for Office, Depot and Network Waste

Waste Destination - Total	Unit	2023-24
Total Waste Produced directly by Licensee	Tonnes	11,572.24
% Reused/Recycled	%	70.6%
% Energy from Waste	%	26.2%
% Sent to Landfill	%	3.2%
% Other	%	0%
% of Waste Diverted from Landfill (excluding compliance waste)	%	96.8%

Street Works

Waste Destination - Non Hazardous/Non Special	Unit	2023-24
Total Waste Produced directly by Licensee	Tonnes	57,810.02
% Reused/Recycled	%	99.9%
% Energy from Waste	%	0%
% Sent to Landfill	%	0%
% Other	%	0%
% of Waste Diverted from Landfill (excluding compliance waste)	%	99.9%

Visual Amenity

UKPN

Visual Amenity Scheme	Units	2023-24
Removal of overhead lines (due to a visual amenity scheme)	km	9.37
No. of Amenity Schemes	#	3
Other (if applicable)		—

LPN

Visual Amenity Scheme	Units	2023-24
Removal of overhead lines (due to a visual amenity scheme)	km	0
No. of Amenity Schemes	#	0
Other (if applicable)		

SPN

Visual Amenity Scheme	Units	2023-24
Removal of overhead lines (due to a visual amenity scheme)	km	0.601794
No. of Amenity Schemes	#	1
Other (if applicable)		

EPN

Visual Amenity Scheme	Units	2023-24
Removal of overhead lines (due to a visual amenity scheme)	km	8.76447
No. of Amenity Schemes	#	1
Other (if applicable)		

Note: During the 2023-24 regulatory year, three amenity schemes were completed. In EPN, two amenity schemes – Latimer and Potter Heigham – were completed in two separate National Landscapes/National Parks and only one of those schemes involved the removal of overhead lines. The third amenity scheme, Telscombe, was completed in SPN.

Noise Pollution

UKPN

Noise	Units	2023-24
No of Complaints Received	#	27
No of Complaints Leading to Intervention	#	2

LPN

Noise	Units	2023-24
No of Complaints Received	#	2
No of Complaints Leading to Intervention	#	0

SPN

Noise	Units	2023-24
No of Complaints Received	#	15
No of Complaints Leading to Intervention	#	1

EPN

Noise	Units	2023-24
No of Complaints Received	#	10
No of Complaints Leading to Intervention	#	1

Polychlorinated Biphenyls (PCBs)

UKPN

PCBs – Pole Mounted Transformers	Units	2023-24
No. of assets PCB contaminated or statistically likely to be contaminated (i.e. no. remaining on PCB register held with environmental regulator)	#	3,219
No. of assets PCB negative or statistically likely to be negative (i.e. no. that can be removed from PCB register held with environmental regulator)	#	18,222
No. of asset replacements due to known or statistically likely PCB contamination	#	722
No. of assets tested to confirm levels of PCB contamination	#	0

PCBs – Ground Mounted Transformers	Units	2023-24
No. of assets PCB contaminated or suspected to be contaminated (i.e. no. remaining on PCB register held with environmental regulator)	#	327
No. of assets PCB negative (i.e. no. that can be removed from PCB register held with environmental regulator)	#	3,577
No. of asset replacements due to known or suspected PCB contamination	#	75
No. of assets remediated due to known or suspected PCB contamination	#	0
No. of assets tested to confirm levels of PCB contamination	#	3,634

PCBs – Other assets	Units	2023-24
No. of assets PCB contaminated or suspected to be contaminated (i.e. no. remaining on PCB register held with environmental regulator)	#	1,973
No. of assets PCB negative (i.e. no. that can be removed from PCB register held with environmental regulator)	#	0
No. of asset replacements due to known or suspected PCB contamination	#	0
No. of assets remediated due to known or suspected PCB contamination	#	0
No. of assets tested to confirm levels of PCB contamination	#	0

Notes:

We have reported asset replacements as the number of potentially PCB contaminated assets removed from the network.

When replacing the 722 PMTs on the network, 260 were completed through the PCB programme and the remainder through other drivers.

When replacing the 75 GMTs on the network, 5 were completed through the PCB programme and the remainder through other drivers.

Fluid Filled Cables

Fluid Filled Cables Oil Loss

UKPN

Sub Category	Units	2023-24
FFC in service	km	2,267.82
Oil in Service	Litres	7,096,464.66
Cable Oil Top Up	Litres	198,306.00
Fluid Used to Top Up Cables as a percentage of volume in service	%	2.79
Removal of FFC	km	7.11
Leak Reduction	Litres	20,593.00
Oil Recovered	Litres	30,544.00

LPN

Sub Category	Units	2023-24
FFC in service	km	762.70
Oil in Service	Litres	2,929,766.92
Cable Oil Top Up	Litres	85,461.00
Fluid Used to Top Up Cables as a percentage of volume in service	%	3%
Removal of FFC	km	7.094
Leak Reduction	Litres	1,996.00
Oil Recovered	Litres	11,557.00

SPN

Sub Category	Units	2023-24
FFC in service	km	658.38
Oil in Service	Litres	2,037,178.44
Cable Oil Top Up	Litres	47,871.00
Fluid Used to Top Up Cables as a percentage of volume in service	%	2%
Removal of FFC	km	0.015
Leak Reduction	Litres	2,066.50
Oil Recovered	Litres	5,195.00

EPN

Sub Category	Units	2023-24
FFC in service	km	846.74
Oil in Service	Litres	2,129,519.31
Cable Oil Top Up	Litres	64,974.00
Fluid Used to Top Up Cables as a percentage of volume in service	%	3%
Removal of FFC	km	0
Leak Reduction	Litres	-24,655.00
Oil Recovered	Litres	13,792.00



A full list of our contact details can be found at:
www.ukpowernetworks.co.uk