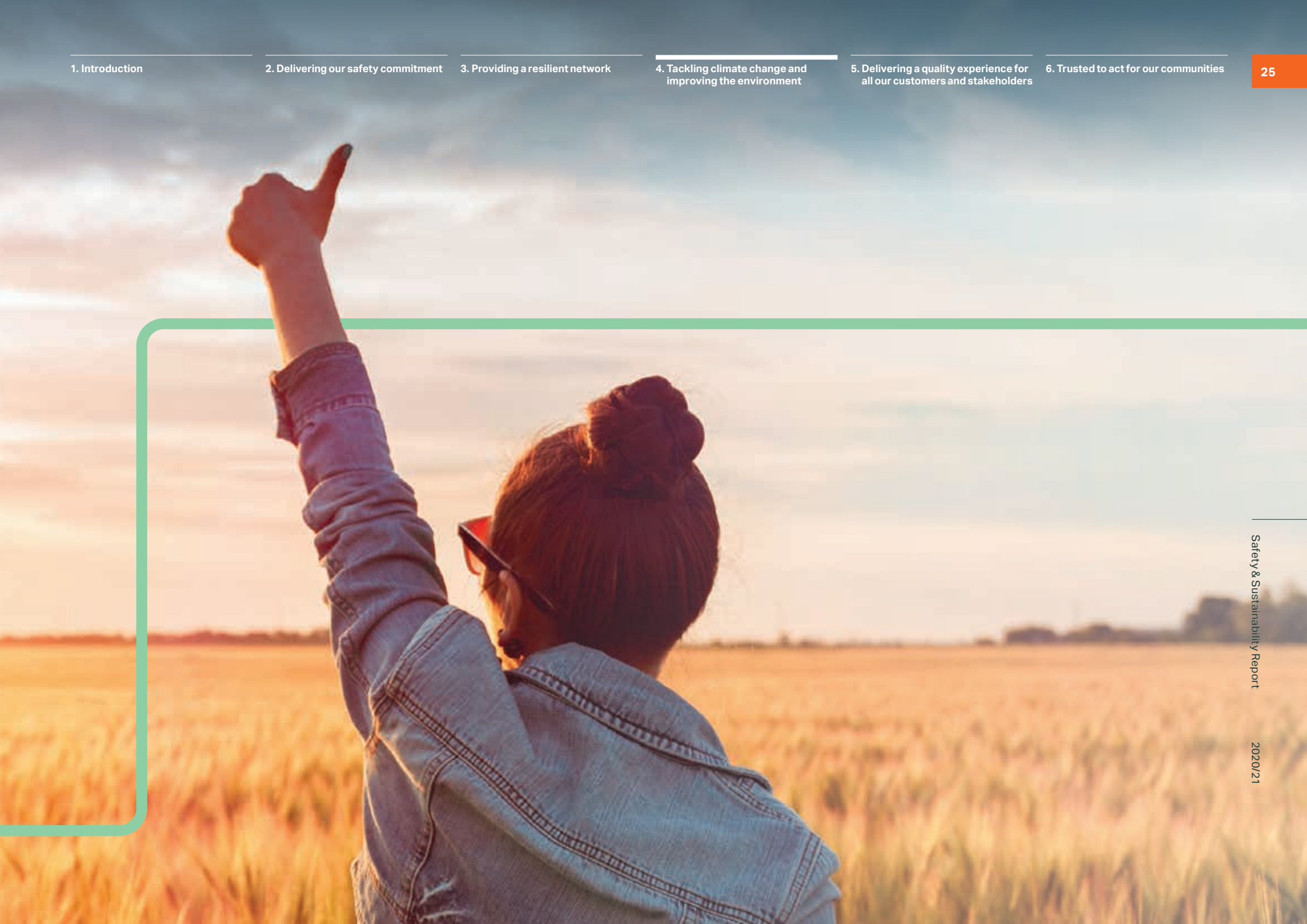




Connecting the UK to a greener future.

"As a responsible company, we are fully committed to our role in tackling climate change."

Dr Tony Ballance
Chief Strategy & Regulation Officer



Climate change statement

Our commitment to tackling climate change was clearly signalled by our robust and very ambitious business plan submission to Ofgem.

Our Environmental Action Plan ('EAP') sets out our role for the next five years and demonstrates our leadership in tackling climate change through innovation and creating pathways to decarbonisation.

Cadent is an industry leader in determining/establishing the future potential of hydrogen and we are increasingly confident that hydrogen will form part of the future energy mix. We are actively engaging with Government and regulators to build awareness of the opportunities offered by green gases in the journey towards net zero.

At the 26th UN Climate Change Conference of the Parties (COP 26) in November 2021 we hosted a panel event to discuss our innovation projects which demonstrate the viability of hydrogen networks including HyDeploy – blending of hydrogen into the gas network; and HyNet North West where we have secured funding to design the pipeline to bring hydrogen to industrial users in the region.

We are actively seeking ways to reduce our own carbon footprint through our mains replacement programme, use of electric vehicles for our First Call Operative ('FCO') fleet and gas-powered HGVs. We recognise our responsibility to support the UK to meet its greenhouse gas target and have committed to short-, medium- and long-term targets to reduce our greenhouse gas emissions. High standards of environmental performance are core to our ambition to become a net zero organisation protecting and enhancing the environment through continuous improvement, and key innovations will reduce our footprint and create long-term benefits for society.

Our environmental ambition is underpinned by three primary commitments:

- **Reduce the impact of climate change** by implementing mitigation and adaptation measures.
- **Ensure environmental sustainability** is considered in our decision-making and inspire our people to consider it in everything they do.
- **Improve our environmental management system** to protect the environment and reduce the risk of environmental incidents.

It is vital for us to create social value by benefitting the most vulnerable in our societies, and contributing to our local communities to reduce the impact of our operations and working together to reach our net zero ambitions. The importance of climate change can be seen by our two issuances under its Transition Bond Framework highlighting strong investor appetite to support the energy transition in the UK.

The financial resilience to climate change has also been considered by assessing the financial impact of different net zero scenarios. We have concluded that our network can be adapted to use alternative technologies and hence its lifespan be extended beyond future net zero ambition that are in-line with our policy published pathways to net zero made by the Climate Change Committee and others show that hydrogen has a key role in enabling net zero to be met. The infrastructure assets that we own will form an important part of this transition by being re-purposed to transport hydrogen. The regulatory funding model used by Ofgem underpins our investment in the network, and provides a strong basis for the future recoverability of our assets and to estimate the long-term cash flows for inclusion in our asset valuations.

We support and are committed to implementing the recommendations of the Task Force on Climate Related Financial Disclosures ('TCFD') starting with this year's annual report and accounts. The processes we use to identify, assess and manage risks are embedded in the business and have been used to address the climate change risk.

Governance

The Board maintains oversight of the company's Future of Gas and Environmental Improvement programmes which encompasses a strategy to decarbonise energy and develop pathways that will help the UK to achieve net zero. The Board is supported by the work of the Sustainability Committee, which was established as a standalone Committee in December 2020.

Our climate-related risks and opportunities are identified and managed by our Executive Committee with specific focus areas delegated to the Safety and Engineering Committee, Net Zero Transition Committee and the RIIO-2 Environment Steering Group.

These groups meet monthly, led by Executive Members, to monitor progress of action plans and provide assurance of commitments made to prepare the business for transition to net zero. Our RIIO-2 Environment Steering Group undertook a readiness review for delivery of our Environmental Action Plan from the start of RIIO-2 and graded our readiness as green. The Board and the Sustainability Committee have oversight of the work of these management committees.

Our current risk and opportunity assessment takes account of the long-term risks to the business in relation to the UK's net zero commitment, and wider environmental agenda.

Our initiatives to manage these risks and capitalise on the opportunities are detailed throughout our Tackling Climate Change and Improving the Environment section of this document.

Our three action plan areas are summarised here with further supporting actions:

Decarbonising our business operations

Over 97% of our business carbon footprint ('BCF') relates to leakage from our iron and steel pipe networks. Our RIIO-2 plan is funded to further reduce this leakage through continued replacement of these iron and steel pipes with polyethylene ('PE') pipes. This is supplemented with the continued application of monoethylene glycol ('MEG') where iron and steel networks remain. We align closely with the Government's net zero pathway and have further committed to reach a net zero non-leakage BCF by the end of the RIIO-2 period; we are prioritising activities to reduce leakage in order to achieve this. This target net zero ambition excludes most shrinkage-related emissions, but we have included our own use gas within this key climate change commitment.

Reducing our environmental impact

As a responsible business, it is incumbent on us to become more resource-productive, to manage our consumption of finite natural resources and reduce the amount of waste material that we dispose of. We have embedded a highly effective environmental management system and supporting control measures to avoid or mitigate environmental impacts, and have used the system to show how we can drive even greater performance through the RIIO-2 period.

We have already made significant progress in improving our waste management practices and have driven significant reductions in our waste production. Our contract partners are routinely exceeding Ofgem's target of sending less than 10% of waste spoil and excavation waste to landfill.

We have applied a parallel focus on managing waste from our direct operations. In 2015/16, over 25% of our waste was sent to landfill. This was reduced to 20% by 2018 and is currently below 4%. Through mapping our waste management chain, we have identified that there are key opportunities for us to improve further. In particular, we will address behavioural, organisational and technical factors that are resulting in some recyclable materials and natural resources being either landfilled or incinerated as fuel rather than being recovered.

We have partnered with the Supply Chain Sustainability School, achieving Gold member status, and have used their resource videos to help educate our colleagues/supply chain on sustainability topics including waste management. At present, 83% of our supply chain attributable to the scheme are registered, representing an approximate annual spend of £750m. This provides an opportunity for us to increase knowledge and help our colleagues to support sustainable practices. The School connects us with products and services across the world, improved continuity of supply, protecting against reputational damage and enabling the potential for new partnerships.



Read more about our Environmental Action Plan ('EAP') here

https://cadentgas.com/nggdwsdev/media/Downloads/business-plan/APP_CAD_07-04-00-Detailed-Environmental-Action-Plan.pdf

Facilitating the low carbon/emission system transition

Our EAP sets out how we are responding to the urgent need to decarbonise the energy system. It describes how we are applying whole energy system thinking to support decarbonisation and the energy system transition, as well as wider stakeholder-driven environmental and economic considerations.

We show a pathway where energy efficiency and low carbon gases and hydrogen combine to deliver the climate change targets. This also sets out how we are determined to drive this transformation to secure a net zero future.

We had previously undertaken scenario analysis in the development of our strategies, particularly in the area of decarbonising the network and how the costs of the varying options influenced strategic direction.

However, many components of these scenarios became redundant following passing of legislation in 2019 requiring the Government to reduce the UK's net emissions of greenhouse gases by 100% relative to 1990 levels, effectively making the UK a 'net zero' emitter. The Government's 10-point plan removed the option of fossil fuel gas as a form of energy use in the future.



These changes have influenced our strategy, but we recognise the need to undertake scenario planning in the coming months for our networks due to each having different characteristics and a 'one size fits all' approach not being appropriate.

It is clear from the 10-point plan that hydrogen is going to play a major role in the future of energy provision for customers. Therefore, we will continue to be a leading force in our development work with hydrogen, enabling networks to support this as much as possible through future-proofing our networks via our repex programme. This work not only makes networks hydrogen ready it also improves leakage reduction in our current state.

The financial resilience to climate change has also been considered by assessing the financial impact of the different scenarios.

We have concluded that our network can be adapted to use alternative technologies in line with our policy. We have also considered the impact of net zero on our underlying cash flows used in valuation of assets and concluded that our valuation methodology remains appropriate and consistent with the regulatory model used by Ofgem.



Risk management

Our climate change risks are managed in line with our overall risk management framework. This includes a thorough, consistent and documented approach to identifying, assessing, treating, monitoring and reporting risks. All our risks are recorded in our enterprise risk management system, and are scored on a unified scoring scale, providing consistency, comparability and visibility of risks and how they are being managed. Risks are managed by an assigned owner within our overall governance structure.

The risk that we 'fail to respond to climate change and biodiversity' is one of our 'Principal Risks', which is overseen by our Executive Committee and Safety and Engineering Committee.

Ultimately our climate-related risks and opportunities can be categorised as having one of two main causes:

- Physical impacts that need to be adapted to, such as increased severity of extreme weather events (acute) including storms, droughts and floods or longer term shifts in weather patterns (chronic).
- Transitional impacts: associated with the transition to a low carbon economy, for instance from changes to policy and legal actions, technology, market and reputational concerns.

Our climate-related opportunities arise from the transition to a low carbon economy, and in finding new ways of meeting our customers' needs in that context.

Metrics and targets

Our metrics and targets have been developed through engagement with not only company strategy and risk but also to satisfy our regulators and customers.

Our Scope 1 and 2 metrics are well developed. We have made good progress in reducing our business carbon footprint, as defined, and reported throughout our RIIO-1 regulatory reporting. We have outperformed Ofgem's targets set for 2020/21 and will continue to drive further reductions in areas within our direct control.

Overall, the target was to reduce our aggregate Scope 1 and 2 emissions by 20% during RIIO-1 from a 2012/13 level of 48,691 tonnes CO₂e (excluding shrinkage).

For Scope 1 emissions, we targeted a 5% reduction over the RIIO-1 period and have achieved a 9.71% reduction.

For Scope 2 emissions, we targeted a 27% reduction over the RIIO-1 period and have achieved a 43% reduction.

We have outperformed our emissions targets throughout the RIIO-1 period. For emissions defined in BCF as Scope 1 and 2, we have outperformed having achieved an overall reduction of -27% compared to our 1990 baseline (at the end of 2020/21).

For each area of our business carbon footprint, we have identified an ambitious set of actions, which we have stretched to make them as challenging as possible.

We are improving depth and accuracy of our Scope 3 metrics in conjunction with our suppliers through our Global Supplier Code of Conduct which requires all suppliers to meet the standards we set in environmental and social performance. As part of this, we require specific disclosure of data relating to emissions impact. During RIIO-1, (eight financial years from April 2013 to March 2021), we recorded and reported on indirect, Scope 3 emissions embedded in pipe and fittings used in mains replacement and contractor vehicle usage.

Through the RIIO-2 period we will extend our accounting and reporting of Scope 3 emissions to include other principal indirect emissions and engagement more widely in our supply chain.

We will account for the indirect emissions associated with the management of waste, initially using Department for Environment, Food and Rural Affairs ('DEFRA') conversion factors to establish baseline values. We will work with our waste management contractors to establish emissions from the transport and other related activities arising from the management of our wastes. This would include any potential emissions gain through the use of our waste as feedstocks in waste to energy facilities.

We will work with our in-house Estates Team and third-party providers to develop the data to account for the indirect emissions due to our use of cloud-based computing solutions in parallel with the reduction in our own energy use. This would help prevent masking of direct emissions reductions by exporting the emissions to a third party.

We will also implement a common standard for sustainability options appraisal and carbon accounting in construction and other capital projects. This has been piloted within the Integrated Security Solutions project and has led to new best practice. This includes using hydrogen fuel cell lighting on our construction sites and a major redesign of key aspects of the civil engineering design.

Accounting for carbon will be used as a decision support tool in design and project delivery, optimising material usage and transport which are frequently the most carbon intensive elements of a project.

Contractor vehicle emissions will be measured and subject to the same goals as for our own direct operations.

We have linked aspects of performance against targets to employee remuneration incentives, to further embed our culture of sustainability. We have also developed our waste targets and are baselining our biodiversity targets.

Over the coming 12 months and beyond we will review our current climate-related risks and opportunities with a view to greater application of TCFD recommendations providing clearer and more relevant targets to reapply to our risks and opportunities.

Our continuing TCFD journey will focus on:

- further refining and quantifying our significant climate-related risks and opportunities;
- enhancing governance and management of climate-related issues; and
- developing our scenario analysis to further assist with our assessment of the impact of climate-related risks and opportunities on our business.



Did you know?

Target reduction for Scope 1 emissions

9.71%

against a 5% target

Target reduction for Scope 2 emissions

43%

against a 27% target

Transforming the environment

Positive environmental action

Managing the environment is more than just minimising our impact and the impact it has on us; it's about taking positive action to be resilient when faced with environmental changes while providing a greener, more responsible and sustainable future. High standards of environmental performance are core to our ambition to become a net zero organisation. Protecting and enhancing the environment through continuous improvement and key innovations will lighten our footprint and create long-term benefits for our customers, people and stakeholders.

We are committed to reducing our carbon footprint in line with the latest science methodology. A key goal to achieve our ambition will be to ensure our targets are verified by the Science Based Targets Initiative ('SBTi').

Our scope 1 and 2 targets are in line with the latest science-based methodology and we have made this commitment through the SBTi. The target is consistent with our RIIO-2 Environmental Commitments. The target is defined as a reduction of -43% relative to our 2019/20 Scope 1 and 2 emissions over 15 years, and is based on a 'well below 2°C' absolute contraction approach. The target is primarily derived from the volume of iron mains replacement we have been funded for in our current regulatory price control, between 2021 and 2026, as estimated losses from our iron mains represents over 97% of our current emissions.

We view this target as an interim step that reflects our current regulatory settlement. However, our longer term ambition is to significantly accelerate investment in our assets, subject to Ofgem regulatory approval, and to facilitate the introduction of green gas into our network, which will enable us to move towards a more aggressive 1.5°C profile thereby bringing forward the date Cadent will achieve net zero to nearer 2040.

We are committed to continually improve and will pursue signing up to the United Nations 'Race to Zero', a commitment to achieve net zero ambitions and minimise temperature rise to 1.5°C. We continue to align our activities to deliver against the UN Sustainable Goals and have recently become a corporate member of Support the Goals achieving a five-star rating.

Environmental Management System ('EMS')

The EMS defines our key objectives, ensures compliance with our obligations and supports our employees to drive continual environmental improvements. Our operations are covered by an EMS, which in 2020 continued to be certified to the latest ISO14001:2015 standard. The EMS sets out our environmental procedures to identify, manage and control potential environmental impacts of our operations and activities. During 2020/21, we completed a series of internal environmental audits to ensure compliance across the business, and to provide assurance for the environmental management at our depots.

We have progressed our environmental baseline exercise to assess the status and quality of the environmental practices at every occupied site. The results have provided a comprehensive insight into our risks and areas for improvement year-on-year. Based on these findings, we have established action plans and targets that will ensure we can deliver targeted and measurable improvements in both the short and medium term.

In 2020, we submitted our second Global Real Estate Sustainability Benchmark ('GRESB') Assessment. GRESB is the environmental, social and governance ('ESG') benchmark for infrastructure. We have successfully improved our 2019 score of 66% by nine percentage points to 75% in 2020 and maintained its four-star GRESB rating. We will widen our ESG reporting in 2021/22 to include Sustainalytics and MSCI benchmarks.





Say Hy to the home of the future

Hydrogen Home

The UK's first public homes with household appliances fuelled entirely by hydrogen are now built in Low Thornley, Gateshead, providing the public with a glimpse into the potential home of the future where no carbon emissions are released.

The two semi-detached homes, funded with the help of the UK Government's Hy4Heat Innovation programme, Cadent and NGN, opened in April 2021, showing how hydrogen has the potential to be used as a clean replacement to natural gas in the home.

Now 86% of homes in the UK use gas to heat their homes. The new hydrogen homes will use 100% hydrogen for domestic heating and cooking appliances including boilers, hobs, cookers and fires. Unlike natural gas, which is responsible for over 30% of the UK's carbon emissions, hydrogen produces no carbon at the point of use, with the only by-product being water.

The project secured a £250,000 grant from the Government's Hy4Heat Innovation programme and is being run by Cadent and NGN, who have both input £250,000 of funding each.

The houses will open to members of the public, who will be able to view appliances and see how they compare to existing ones. Local schools, colleges and universities will also be welcome to learn about the new technology, as well as potential careers in the emerging green economy and in science, technology, engineering and maths ('STEM') subjects.





Reducing our greenhouse gas emissions

We recognise the responsibility to support the UK to meet its greenhouse gas target and have committed to medium- and long-term targets to reduce our greenhouse gas emissions. Our target was to reach 45% by 2020 and we have successfully reached 69%. Moving forward, we have set a GHG target with the help of the Carbon Trust and using the latest science-based methodology the target is a 43% reduction by 2023.

More than 97% of our greenhouse gas emissions are from gas lost from our network, known as shrinkage. Through our repair, maintenance and mains replacement programme we have replaced damaged or low-quality pipes with new plastic alternatives which resulted in lower leakage from the network. Leakage from our network in 2020 was 0.4% of total throughput and our mains replacement programme will continue to deliver this year and in future years.

Streamlined energy carbon reporting

Whilst the majority of our greenhouse gas emissions are from shrinkage, other significant sources are energy consumption in offices and other business premises, along with fleet vehicles, primarily vans and company cars.

We have implemented an energy management system across the business that monitors performance and identifies opportunities for reducing energy consumption. The majority of greenhouse gas emission data is captured at corporate level. To meet the requirements for the Regulatory Reporting Business Carbon Footprint table, an apportionment methodology has been applied to report data by network.

We ensure that we procure efficient vehicles for our fleet and have placed a cap on company car emissions, and offer 'green' incentives to company car users. These incentives are aimed at encouraging efficient, low emissions choices which are taken up by 43% of drivers. Our new company car scheme offers electric vehicles only and a cash alternative voucher will encourage the purchase of low/zero emissions vehicles.

For 2020/21, we decreased our overall BCF emissions by 22% compared to the previous year. The data reflects the climate in which we worked throughout the year due to the pandemic. All office colleagues worked at home where possible and our operational programme mainly consisted of essential works.

Scope 1 emissions: In 2020/21 Scope 1 emissions (excluding shrinkage) decreased by 2.1% compared to 2019/20. The emissions for business mileage (company cars) were 36% lower compared to 2019/20, reflecting the change in working practices throughout the year due to travel restrictions, a continued focus on reducing business mileage and increasing uptake amongst colleagues of low/no emission company cars. Direct (Cadent owned) commercial vehicle emissions are 3.4% higher than for the previous year, reflecting an increase in direct labour activity across our networks.

Of the gas consumed at operational and non-operational sites, in 2020/21 we saw an overall 6% decrease in emissions ('tCO₂e').

Scope 2 emissions: Emissions related to electricity consumption across operational and non-operational sites has decreased in 2020/21 by 12%. This reflects a reduction in electricity use across our occupied sites and a reduction in the published DEFRA conversion factor. We procure 100% renewable electricity through our energy provider, certified by a Renewable Energy Certificate.

Scope 3 emissions: Overall emissions decreased by 38% compared to 2019/20. This was due to a decrease in tCO₂e emissions associated with polyethylene ('PE') pipe procurement through the reporting year compared to 2019/20. Emissions associated with travel (including air, rail, and casual mileage via car hire) decreased by 98% compared to 2019/20. The pandemic was the main contributing factor for this and saw use of air, rail and hire cars cease throughout the 2020/21 year.

We have made good progress in reducing our business carbon footprint, as defined, and reported throughout our RIIO-1 regulatory reporting. We have outperformed Ofgem's targets set for 2020/21 and will continue to drive further reductions in areas within our direct control. We are committed to leading on sustainable gas usage and have identified wider use of the renewable compressed natural gas as transport or heating fuel as a route to delivering a low carbon future.

Renewable energy

Through our energy procurement contracts, we secured access to certified renewable sources of electricity. Through 2020/21 we procured 100% renewable energy, reducing our Scope 2 carbon footprint. This energy covers approximately 95% of our locations.

A small amount of our depot locations are leased and therefore use the energy procured by the landlords. We have contracted for the provision of 100% certifiable renewable energy to meet the electricity needs of our offices and depots by 2024, reducing this element of our business carbon footprint emissions to zero and we are targeting reducing all utility energy consumption by over and above the 43% reduction we have already achieved throughout the RIIO-1 period.

Managing our resources

We engage our people and work with external partners to minimise the avoidable waste we produce. Through 2020/21, optimisation of waste management at specific locations helped improve our recycling rates and cost efficiency.

Our Gas Distribution Strategic Partners are incentivised to recover, reuse or recycle 90% of the spoil they generate from excavations and street works, and use less than 30% first-use aggregate for backfilling. Overall, our partners are outperforming these targets, currently diverting 97% of spoil from landfill and only importing 17% of first-use aggregate. In 2016, we introduced our goal of zero avoidable waste to landfill by 2021/22, acknowledging that a small proportion of waste will not be able to be diverted or recycled. In 2021/21, 3.71% of our non-operational waste went to landfill, which is a 3.2% reduction from 2019/20. We will continue to develop our recycling waste streams and facilities, educate our colleagues to change behaviours and embrace innovation to deliver further improvements.

Reducing our waste

We have removed all single-use plastics such as cutlery from our offices and depots through a combination of incentives and removal of unsustainable choices such as plastic packaging for materials. Over the past year we have been working with our supply chain to target the removal of single-use plastics and have an ambition to eliminate all avoidable plastic across the supply chain by 2025. We ask potential suppliers to demonstrate how they will support this objective during the tendering process including the reduction of packaging or substitution for more sustainable alternatives.

We'll also continue to work with our waste management provider to optimise recycling waste streams and ensure our sites display best practice to further improve waste segregation and reduction. Moving forward we will target and incentivise colleagues to reduce overall total tonnage of general waste to support a reduce, reuse and recycle culture.

Environmental training

To ensure that our people have the knowledge and skills to manage the environment in their day-to-day activities, we provide environmental awareness training. The training course not only offers employees the background information for energy, waste and environmental management, but the interactive sessions enable them to have the confidence to identify ways to manage environmental risk and impacts.

Limiting our environmental footprint and improving biodiversity

Although greenhouse gases and waste are considered our primary environmental issues, we also address other environmental impacts including monitoring water consumption in offices and depots, and reducing the impact on biodiversity from our projects.

Our new biodiversity strategy will ensure that we always deliver a net neutral impact on the environment as a result of our operations, but wherever possible the ambition is to deliver a net gain. Although we don't have a large landholding, we'll work to improve the land we do occupy, and we will undertake the Wildlife Trust's Biodiversity Benchmarking accreditation to ensure that our action plans are robust and conform to externally assessed standards. We'll start to improve our sites by completing habitat surveys to identify suitable sites and our Warrington depot will be used as a pilot project to demonstrate part of a baseline in site biodiversity.

Greenhouse gas emissions reduction

69%

Our target was 45% by 2020

Suppliers

83%

are members or partners at the Supply Chain Sustainability School



Our future

The importance of green gases in the delivery of net zero

Our focus is on enabling an effective transition of our gas network to green gases, and over the past year, the UK has embraced the net zero challenge as the impacts of both climate change and a global pandemic have offered a rare opportunity to both think about and tackle things differently.

We have organised ourselves to be the most effective in thinking about the near-, medium- and long-term solutions where the existing infrastructure, that our customers have already paid for, can be repurposed to carry low carbon gases. We have invested significantly in our Future of Gas programme over the past year, which has created a positive momentum both across our research activities, but also in providing a clear pathway for hydrogen as a viable energy source for the future.

This covers both blending hydrogen into the gas network at a concentration of up to 20% and then later, a full transition to 100% hydrogen in the gas network. Our work, combined with the collective work across the sector, culminated in November 2020 with the Government including hydrogen as a key component of the 10-point plan for a green industrial revolution and the commitment to the production of a Hydrogen Strategy for the UK in 2021.

There is now more certainty of the role that hydrogen will play in the future of the UK. The UK's gas pipe network is an asset of enormous value and one which we can operate and should continue to serve the country for many years to come. Fortunately, this network can be adapted to deliver low carbon green gases, such as hydrogen and biomethane. Over the past year hydrogen has been discussed as a central component of achieving net zero, because of its ability to support the decarbonisation of areas previously thought difficult to reach.

Due to the flexibility of hydrogen as an energy vector, it is expected to play a significant role in the decarbonisation of industry, aspects of transport and heat. Hydrogen is recognised as a key component in creating a balanced and resilient energy system, allowing the peak demands of winter energy needs in the UK to be met at lowest cost to the customer. Hydrogen is a place to store energy and utilising the gas network for this, plays to the strengths of the sector allowing electricity and gas to work in tandem. The amount of hydrogen required in the future is still an area of much debate, but most net zero pathways centre around a figure close to 300 TWh of hydrogen per year. This is as large as the current annual UK electricity demand. Kick starting the hydrogen production has already begun, with a focus around the industrial clusters in the UK (e.g. Aberdeen, Teesside, Humberside, Merseyside).

Supported by the Government's industrial decarbonisation mission, these locations will be where hydrogen happens first, and we are pleased to share more about the progress made with the HyNet North West project here. The role of hydrogen in domestic heat is also becoming more certain as the strengths of utilising the gas system are becoming clearer from both a safety aspect, but also the technical feasibility of both blending hydrogen into the gas grid and the successful development of hydrogen-ready appliances. Hydrogen provides a low disruption pathway to heating homes for consumers, without the potential hassle associated with some of the electrified options on offer.





Our first hydrogen-powered construction site

Off-grid energy generators are required to power welfare facilities at our construction sites where a connection to the electricity power grid is not possible. Traditionally this would be a diesel-powered generator.

We are targeting the first hydrogen-powered construction site through a pilot project due to begin this summer. We approached GEOPura supplier of off-grid renewable solutions, to see if they could work with us to help reduce the emissions we generate from our major construction projects recognising that we need to look across our work activities to deliver a net zero ambition. Meriden Water, dubbed the greenest re-development in London was chosen to pilot our ambition to deliver net zero construction projects and this involves powering our construction site with zero emissions hydrogen.

A hydrogen fuel cell will be placed in a storage container on site, powered by a tanker full of hydrogen which will remain on site until low in supply, at which point the tanker will be replaced with a full one enabling the site to be supplied with clean, hydrogen-fuelled power. If the project were to go ahead and be traditionally powered then 28,066 tonnes of CO₂ equivalent would be emitted into the atmosphere, we hope to save this amount of CO₂, the equivalent uptake of 2,200 trees, by trialling our first hydrogen-fuelled construction project paving the way for this to become the new way of working in the future.



External engagement

Our external affairs team together with senior members of the business have spoken at over 300 events over the past year, made possible through the increased use of online webinars, conferences and forums bought about by the pandemic. This has included speaking at webinars, political engagement, cross-sector working, and collaborative workshops, including groups such as the Energy Networks Association and their Gas Goes Green campaign, as well as the Confederation of Business Industry and the Hydrogen Taskforce. The teams have used these platforms to share the research and trial outputs, in support of the case for including hydrogen in the UK's energy plans. Our close engagement with key members of the Government and their advisers, has already helped influence the Government's 10-point plan, where the language has moved away from banning boilers, to moving to hydrogen-ready boilers and referencing large scale blending trials and industrial clusters, such as our own flagship project, HyNet.

We know how important it is to bring our stakeholders and employees along with us and have successfully launched both internal and external web content this year on the Future of Gas programme, such that our own employees can act as educators and ambassadors; this also includes launching the first ever hydrogen chatbot.



Our flagship industrial cluster project, HyNet, has delivered on the pre-engineering design work and is now able to progress to the front-end engineering design and consenting phase. Our role in the consortium is the construction of the UK's first regulated hydrogen pipeline, that will distribute 100% hydrogen to multiple users and to blending points for the cities of Manchester and Liverpool. The consortium has gained much political interest over the year as we have bid and won the competition for funding from the Industrial Decarbonisation Challenge led by UKRI. Regional interest is high, due to the potential to both provide significant carbon emissions reduction, but to support the boost to much needed jobs and skills in the region. We are pleased that Ofgem have recognised the importance of HyNet and included the project in our RIIO-2 capital programme as a price control deliverable. HyNet is the only industrial cluster that covers the whole value chain for hydrogen, carbon capture and storage.

Biomethane producers are currently required to add propane when injecting into our network, in order to bring the Calorific Value of the gas in line with our current billing method of Flow Weighted Average Calorific Value. This practice is both a cost and reduces the green credentials of the gas. Over 2020/21, Cadent's NIC project, Future Billing Methodology, has explored ways to alter the way we bill, which would avoid the need to add propane and inform how we look at hydrogen blending in the future. The project concluded in March 2021 and the resultant recommendations are now being shared with industry, to then be taken forward for further exploration.

COP26 and beyond

2021 is likely to be a pivotal year for the gas sector. The Government will publish its Hydrogen Strategy, which will set out the UK's ambition to build a hydrogen economy.

Similarly, there are expected to be key announcements relating to hydrogen, carbon capture and storage, that underpin the decarbonisation of industrial clusters, ahead of COP26 ('United Nations Conference of Parties'). COP26 itself is expected to be an opportunity for the UK to showcase how innovation in hydrogen sets the UK in the lead on the world stage.

We must continue to focus on developing the safety case for hydrogen in the gas grid and homes, this will enable the next phases of demonstration projects and pilots to happen. We will also progress our support for the regulatory framework enabling hydrogen blending. This is important as it unlocks a significant demand centre for hydrogen producers. Lastly, we will progress our plans to demonstrate how a town conversion to hydrogen could happen, whilst building on our economic assessments and consumer research, to ensure that heat decarbonisation is fair and just.

Biomethane producing plants

36

Generating enough biomethane for

228,180 homes

Transport pathways

Over the past year, we have led a study, in conjunction with the other gas networks, to understand the transition from the economy today to a decarbonised economy, focusing on how the transition is achieved, and the competing and complementary nature of different low emission fuels and technologies over time. Whilst the project has considered the whole economy, it focuses predominantly on transport, especially HGVs, as an early adopter of green gases and as a key enabler to net zero emissions.

The project has highlighted that biomethane has an important role to play in the pathway to net zero but will need to ramp up quickly to maximise its potential. Biomethane and hydrogen-powered trucks represent a substantial opportunity for green gases to accelerate transport decarbonisation by 2030.

A large-scale deployment of these trucks would lead to a 38% reduction in emissions from trucks by 2030, compared to just 6% if decarbonisation efforts in this segment focus solely on zero-emission options. Beyond 2030, hydrogen trucks are expected to begin deployment at scale, but they will not initially compete for the same use cases as gas trucks, as early hydrogen vehicles are likely to be better suited to medium-range applications. The project also explores the associated infrastructure needs, suggesting that around 170 re-fuelling sites for gas trucks will need to be deployed over the next decade to meet the growing demand for these vehicles.

The project has therefore enabled development of a green gas decarbonisation narrative, supported by a wide range of stakeholders which clarifies the path ahead and demonstrates how the use of biomethane and hydrogen are scaled up over time, and how they compete and complement one another.



HyNet

HyNet North West is a full chain hydrogen / carbon capture, utilisation and storage ('CCUS') project located in the North West, which is aimed at delivering full industrial decarbonisation across the cluster and providing the backbone for wider cross-sectoral decarbonisation. HyNet North West plans to be producing around 3.8GW of low carbon hydrogen by 2030, nearly 80% of the UK's target set out in the Government's 10-Point Plan. In development since 2016 by Cadent and partners Progressive Energy, HyNet North West has been through origination, feasibility and Front-End Engineering and Design ('FEED') pre-phases.

In 2020, we have seen the emergence of the HyNet consortia, which consists of Progressive Energy (project integrators), ENI (CO₂ transport and storage), Essar (hydrogen production), Cadent (hydrogen network), Inovyn (hydrogen storage), CF Fertilisers (capture plant) and Hanson Cement (capture plant). Our role in the consortium is the delivery of a FEED and consenting package for the hydrogen network. This past year has been dominated by completing a Pre-FEED on the hydrogen pipeline, assembling a Basis of Design ('BoD') and Scope of Work ('SoW') for the FEED and consenting.

There have also been several smaller work packages looking at detail in potential pipeline routes and some high-level Hazard Operations Assessments, to ensure that there is a level of integration across the hydrogen production, distribution and storage work packages. On the 1 March 2021 the FEED and Consenting phase commenced, which will ultimately lead to a final investment decision for the baseline projects in 2023 and operation in 2025.



HyDeploy

In 2019, HyDeploy became the first project in the UK to inject a blend of up to 20% by volume of hydrogen into the existing gas supply.

Over the 17-month trial period at Keele University, the project focused on the safe management of the blending process. The project followed a strict management regime, which included checks on how the blend smelt, how it burned and how safe it was. There were also regular gas quality checks, to ensure the incremental increases in blending over the trial period could be safely managed, allowing up to 20% concentration of hydrogen to be blended into the gas network and on to the end user.

The project has proved successful, with the hydrogen blends having been safely and efficiently distributed to a broad range of users within the Keele gas network. This includes 100 domestic properties and up to 30 university campus buildings, such as, office blocks, lecture theatres and laboratories.

During the trial, COVID-19 led to restricted site access and reduced demand on the network, with students returning home. The project was therefore extended until March 2021, to provide the opportunity to undertake further blending over what would be a vital winter period, with high probability of increased gas demand.

The HyDeploy project has been very successful in realising what it was set out to deliver. Consumers noted no difference between the hydrogen blend and that of their former gas supply and are proud to be advocates for this innovative project. The outputs of this project will be crucial in closing the evidence gaps needed to facilitate the future roll out of hydrogen blends.



Developing a decarbonisation pathway for Greater Manchester

We collaborated with Electricity North West on a sector-first piece of whole-systems planning to show how Greater Manchester ('GM') could reach its ambitious target of being net zero by 2038, 12 years ahead of the UK's legally binding target. The scale of change required for GM's urban fabric, its residents' lifestyle and the way businesses operate is unprecedented. It will require concerted effort from all stakeholders. GM's existing building stock will have to be upgraded and heating technology replaced with zero carbon options (such as hydrogen and hybrid heating systems), at a rate of 400 properties a day – a scale which has never before been demonstrated anywhere in the world.

Commuters will be encouraged to walk or cycle, whilst all transport will be decarbonised. Industrial processes will have to be re-engineered to run on renewable electricity and low-carbon hydrogen instead of conventional fuels. The work produced a pathway of cross-sector actions that need to take place over the remaining timeframe for GM to reach its goal. It also provided near to mid-term certainties over the future of energy in order to stimulate investment in low carbon technologies, inform stakeholders' net zero plans and signpost political lobbying and the necessary supportive regulatory framework.

The Greater Manchester Combined Authority has been positive about the work, which is now informing Local Area Energy Plans being developed for its 10 local authorities. It has also led to continued collaboration between Cadent, Electricity North West and the Combined Authority to progress actions on the pathway. Further collaboration took place to develop decarbonisation pathways for Lancashire and Cumbria in the North West and we are also working with Scottish Power Energy Networks to develop a plan for the Liverpool City Region, Cheshire West, and Chester and Warrington local authority areas.



Zero-emissions vehicles that will get our engineers to emergencies pollution free

We're taking the road to a greener future by starting the journey to convert our fleet to zero-emissions vehicles enabling our gas engineers to respond to emergencies across our London network pollution free. Engineers are now using five electric vans and five hydrogen response cars to patrol our North London network which includes parts of Berkshire, Buckinghamshire, Surrey and Essex. The new cars are hydrogen-fuelled Hyundai's with a range of almost 400 miles. The only product of their emissions is water. The fleet decarbonisation initiative has seen demonstration vehicles operating in the North West and Eastern networks. The new vehicles have been bought as part of our commitment to introduce zero-emission First Call Operative ('FCO') vehicles and to have over 1,000 zero-emission vehicles across all our networks by 2026. This ambition provides a unique opportunity to encourage the development and supply of a new product, hydrogen vans, into the UK market.

The new hydrogen fuel cell cars and e-vans are a first for us and represent a major step forward in working to achieve our RII0-2 environmental goals. The London network was chosen as the first recipient of the new vehicles because of the availability of charging points and fuelling stations.

Our growing green fleet includes a pair of Iveco repair CNG vans in the North West and West Midlands network, with another CNG van expected to join the North West Network soon. For movement of large items, we have invested in a fleet of nine biomethane trucks. These vehicles will significantly reduce greenhouse gas emissions and help improve air quality. The trucks are cheaper to run, generating savings of around 38% compared to diesel.



"It's a really exciting time to introduce these vehicles to our fleet as the required infrastructure is growing and developing rapidly. These vehicles will allow us to gain valuable feedback which will be used to determine our pathway to reducing the emissions of our fleet."

James Harrison
Director of North London network

MyHeat

Our regional modelling tool, MyHeat, has been developed to serve two purposes. Firstly, to assist us in modelling future net zero pathways for the impact on our network, so that we can ensure we invest in the right infrastructure going forward, and secondly to assist in visualising to Local Authorities how the impact of net zero pathways might impact on their planning needs. With the independence provided by Element Energy, we have created a model that enables us to compare how some of these aspects influence the applicability of specific technologies in the home. The MyHeat model allocates homes based on their Energy Performance Certificate data to a specific archetype. This archetype is then assigned a merit order of applicable low carbon heating solutions, based on both the lowest whole life cost and specific applicability of that heating system to the home archetype. This enables us to explore street by street the likely low carbon heating solutions of the future, based on best fit for the home. Our model enables a view both on choices that might be made on the lowest whole life cost of a technology, but also on the lowest upfront cost. The outputs of the model include information on the specific heating technology changes required, along with information on future hydrogen and electricity demand.



Future Billing Methodology

As we move to a network that conveys low carbon gases, such as hydrogen and biomethane, we need to develop a way of recognising the wider energy range of the gas we supply. The Future Billing Methodology project led by Cadent, is exploring ways to attribute energy values that are reflective of the gas being supplied at a local level. This will remove the cost of enriching biomethane to standardise energy content and enable hydrogen to be blended into the network, while ensuring consumers are billed in a fair and equitable way.

The project has involved the installation of sensors within the network to validate modelling software used across the industry today. The software has the ability to model zones of influence and mixing of gases from different sources to allocate energy content at a local level for consumer billing. The ultimate objective of the project is to 'prove the concept' and provide a recommendation of a future billing methodology that unlocks the full potential of the gas network to deliver low carbon energy.

