



I want you to care for the environment and communities

16. I want you to care for the environment and communities

What is this stakeholder priority about?

We care about the environment and the communities we serve. As a responsible business, we are committed to delivering environmental and community benefit, prioritising the issues that matter most to stakeholders.

A key strand in our vision for the future of the energy sector is concerned with limiting the dramatic impacts that climate change could have on our environment and way of life. We believe this is vital if we are to operate as a socially responsible business and play our part in helping Great Britain to meet the challenges of decarbonisation. These challenges have been laid out by stakeholders as they voice their concerns about climate change, culminating in the UK government setting out legally binding targets to achieve 'net zero' carbon emissions by 2050. We will step up to meet this challenge by embedding sustainability in our business strategy and using it to guide the way we work. We are driving more efficient performance and future-proofing our organisation as the environmental and social landscapes change. We want to protect the environment by providing options to reach net zero carbon by 2050 at lowest impact on society.

What have stakeholders told us?

Stakeholders have said that we have an important role to play in protecting the environment and moving towards decarbonisation, particularly around emissions and air quality. Their feedback has confirmed that they would like us to demonstrate the value and cost of going beyond legal requirements, considering the value of our actions to current and future generations.

What will we deliver?

We will shift our focus from environmental protection to environmental enhancement.

- We will improve air quality and reduce emissions from our operational plant by replacing two compressors with more efficient ones in RIIO-2. We'll start work on the solutions for three other sites that need to be resolved by 2030, driven by environmental legislation deadlines.
- We will increase our focus on reducing all methane emissions. We'll monitor leaks on the network and work on ways to reduce them.
- We'll reduce the carbon footprint by replacing 100 per cent of our operational vehicle fleet with alternative fuel vehicles where there is a market alternative in 2019 (30 per cent of vehicle fleet, 80 vehicles, 45 charging points), installing solar panels on our compressor sites, ensuring the energy we use in our office buildings is from sustainable sources and reducing carbon in construction projects.
- Address eighty assets, asset groups or sites. We'll make sure both new construction and demolition projects include initiatives to protect and promote biodiversity.
- We will continue our support for the communities we work in and commit 0.3 per cent of the value of major projects spend to support community initiatives.
- We'll develop our work on delivering benefits to wider society through supporting communities, education initiatives, promoting small and medium-sized enterprises, supporting local employment through the supply chain and implementing human rights strategies.

There are various commitments in this chapter which deliver **consumer value propositions**.

The total RIIO-2 spend for this priority is £275m. This amounts to an average annual spend of £55m (compared to £43m per year in RIIO-1). This is 10 per cent of the value of our full business plan. Nearly three-quarters of this relates to our compressor emissions compliance programme. The spend profile across price controls is shown in figure 16.01 below. Note that the spend profile is not linear as most of the spend relates to large capital investment on compressors. The spend profile increases in 2022 due to work beginning on our compressor fleet at the start of RIIO-2. Compared to our draft business plan costs, we have moved some of our compressor related spend out of baseline. £172m of the total RIIO-2 cost relating to compressor spend is now subject to an uncertainty mechanism. Table 16.02 shows the RIIO-2 spend for this chapter by activity.



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Figure 16.01 RIIO-1 and RIIO-2 spend profile 'I want you to care for the environment and communities'

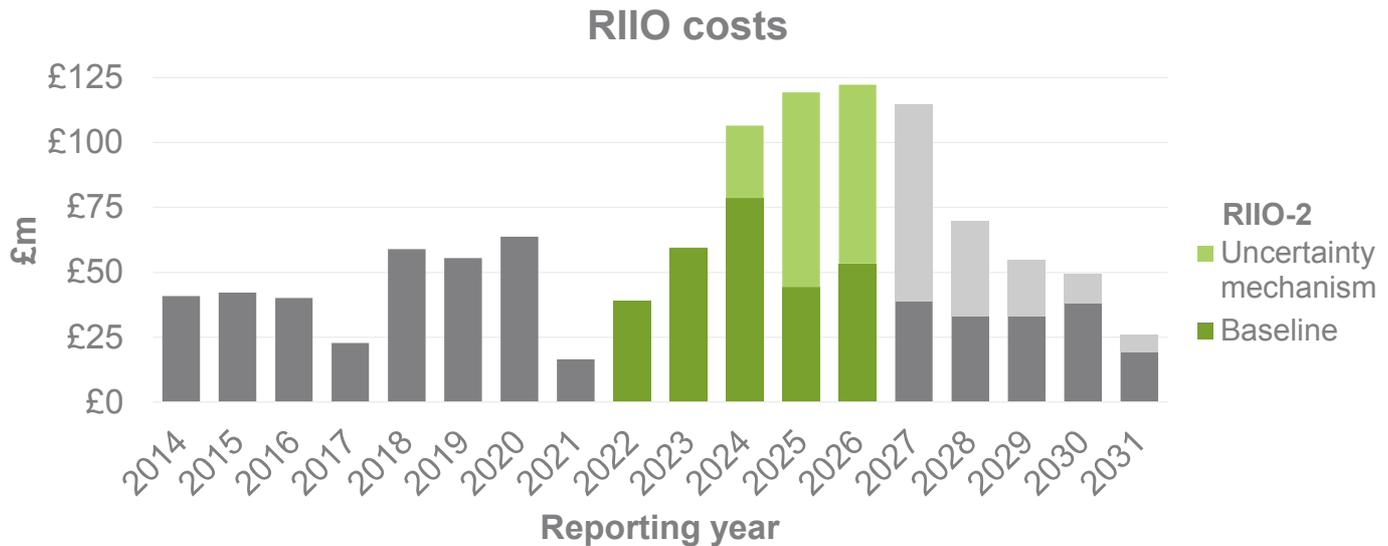


Table 16.02 summary of environment and community costs by activity

Activity spend (£m in 18/19 prices)	2022	2023	2024	2025	2026	Total RIIO-2	Annual RIIO-2	Annual RIIO-1
Compressors – emissions legislation	22.7	27.9	51.0	24.3	30.8	156.7	31.3	33.9
Redundant assets	4.2	24.6	21.4	15.0	17.5	82.6	16.5	2.7
Quarry and loss	4.3	4.4	4.4	3.0	3.0	19.1	3.8	5.3
Our climate commitment	6.7	2.3	1.6	1.7	1.7	14.1	2.8	1.6
Other & pension costs	1.0	0.3	0.3	0.3	0.3	2.3	0.5	-0.9
Total spend (£m)	39.0	59.5	78.6	44.3	53.4	274.8	55.0	42.6

Table 16.03 summary of environment and community costs by RRP category

RRP category (£m in 18/19 prices)	2022	2023	2024	2025	2026	Total RIIO-2	Annual RIIO-2	Annual RIIO-1
Closely associated indirects (BPDT 2.02)	1.8	1.1	1.1	1.1	1.1	6.2	1.2	1.5
Cost subject to uncertainty mechanism	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1
Direct costs (BDPT 2.02, 2.04)	4.5	4.5	4.5	3.1	3.1	19.7	3.9	0.7
Non-load related (BPDT 3.01)	31.6	52.7	72.5	39.4	48.4	244.6	48.9	37.2
Non-operational capex (BPDT 3.07)	0.9	0.9	0.1	0.4	0.5	2.7	0.5	0.0
Controllable pension costs (BPDT 2.02)	0.3	0.3	0.3	0.3	0.3	1.6	0.3	0.0
Total spend (£m)	39.0	59.5	78.6	44.3	53.4	274.8	55.0	42.6

Please note we have provided costs to one decimal place and hence some columns may not equal to the totals. Pension costs are based on proportion of total TOTEX.



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Chapter overview

Our Environmental Action Plan

National Grid's strategy is to move from environmental protection to environmental enhancement. At a gas transmission level, we have produced an Environmental Action Plan (EAP) (annex A16.01), which sets out how we plan to take forward our business-specific actions relating to the environment. This covers both legislative and non-legislative drivers. We recognise that much of this work provides wide benefits for society, and stakeholders have told us that they support going beyond legislative requirements in some cases to deliver additional environmental benefit.

Some of the commitments made in the EAP are included within this chapter, although this is not exhaustive and the EAP can be found in full in annex A16.01. We are proposing that each commitment in the plan is measured appropriately. Some of these commitments will be measured through our regulatory reporting pack, and we propose that others are measured as part of a scorecard incentive, described later in this chapter.

We will develop a science-based target by 2023

As laid out in Ofgem's business planning guidance, we intend to develop a science-based target. Science based targets are industry best practice and are carbon reduction targets. However, developing the target is no easy task, and is particularly challenging for the gas industry where routes to decarbonisation are unclear. This is recognised by the Science Based Targets Institute who are looking to produce a tool to aid the gas industry in 2020. Developing the target for gas transmission will require levels of detail that haven't been captured and reported on in the past, making it challenging to establish a baseline for future targets to be set against. We have already begun a series of mini projects to better understand the challenge ahead and ensure the data we need is available (impacts of options and costings) to make the right decisions to deliver value for customers, society and the environment. However, this will take some months and dedicated resourcing. We propose to develop this target for gas transmission by 2023. As set out in chapter 17, we are proposing a 'net zero' uncertainty mechanism to provide a route to funding for activities which deliver against the government's 2050 targets, which could be used should additional activities be identified that would be required as part of the project identifying our science-based target.

The rest of this chapter focuses on specific parts of our EAP:

- **Sustainability and leadership for change**
- **Air quality – compressor emissions**
- **Climate change – our climate commitment**
- **Responsible asset use and caring for the natural environment**

- **Quarry and loss**
- **Supporting the communities we work in.**

Our commitments around caring for the environment and communities are aligned to global and government ambitions as well as to stakeholder, societal and end consumer impacts. We have signed the United Nations Global Compact, which has a strategy to drive business awareness and actions to achieve the UN Sustainable Development Goals (SDGs) by 2030. The goals promote prosperity while protecting the planet. More information on how these SDGs link to our business areas can be found on our website⁶⁷, and the relevant SDGs are shown under each section of this chapter and in figure 16.04. Our approach in RIIO-2 will continue to be consistent with the UK Government's Clean Growth Strategy⁶⁸, 25-year environment plan⁶⁹ and commitments on climate change. We are also mindful of potential future changes to emissions legislation (for example, new air quality legislation) and, where possible, we test our proposals to ensure solutions are future-proofed.

Figure 16.04 relevant UN Sustainable Development Goals for this chapter



Sustainability and leadership for change

Our group environmental sustainability strategy focuses on managing the direct environmental impact of our operations, and we report on our impacts. As part of our reporting, we have recently been recognised as the leading utility company in the FTSE 100 for sustainability reporting, following our ranking of 8th in the overall assessment⁷⁰.

For RIIO-2, our EAP sets out where our commitments within it are influenced by our group strategy and targets. In addition, early next year, we will launch a responsible business charter articulating in more detail what responsibility means for National Grid, our people, and our communities. We aim to ensure that the communities we operate in thrive, by being economically, socially and environmentally strong.

⁶⁷ <https://www.nationalgrid.com/group/responsibility-and-sustainability/our-progress/defining-our-priorities>

⁶⁸ <https://www.gov.uk/government/publications/clean-growth-strategy>

⁶⁹ <https://www.gov.uk/government/publications/25-year-environment-plan>

⁷⁰ <https://info.eco-act.com/sustainability-reporting-performance-ftse-100-2019>



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Our focus on environmental sustainability is underpinned by an Environmental Management System (EMS) that is certified to ISO14001:2015⁷¹, covering all our operational and non-operational businesses in the UK. The EMS gives us a clear, systematic process to manage environmental risks and to realise opportunities to enhance the environment. This can be found in annex A16.02 and our business management standard can be found in annex A16.03.

We also have a stakeholder, community and amenity policy⁷², which we apply to all our work in the local community. Under this policy, we aim to enhance the local environment, mitigate our works or (where this is not possible) provide other benefits that deliver lasting value to the people and communities affected.

We have undertaken benchmarking exercises across environmental and supply chain sustainability activities. These can be found in annexes A16.04 and A16.19 respectively.

We will have senior leadership accountability which reflects our corporate focus on the environment. Our leadership bonus plans incentivise the delivery of financial, strategic and operational measures. Measures are subject to change to ensure we drive the right focus on our short-term and annual priorities. For further information, please see chapter 18.

Air quality - compressor emissions compliance



1. What is this sub-topic about?

This sub-topic is about delivering consumer value through cleaner air in the local environment. Consumers are increasingly concerned about their local air quality as society understands more about the causes and implications of poor air quality. We describe how we play our part in improving air quality while continuing to deliver reliable energy supplies to consumers.

Our activities in operating and maintaining the network can have a negative impact on the environment. The most significant of the environmental impacts comes from emissions to air, from burning gas in gas-fired compressors to keep the gas flowing through the system, and from methane emissions when compressors vent. Carbon emissions from compressors are covered in the next topic 'climate change: our climate commitment'.

We use compressors to move gas around the network to meet stakeholder needs to take gas on and off the transmission system as and when they want. We currently have 71 operational units⁷³ on 24 compressor sites across the network. These compressors maintain the pressure of the gas in the network and move it around the country to areas of demand. There's more information about the need for compressors in chapter 12 'network capability' and chapter 14 'I want to take gas on and off the transmission system where and when I want'.

Deteriorating air quality because of Nitrous Oxide (NOx) emissions is linked to increased health risks such as asthma and other lung conditions. To combat this, legislation has been introduced through the clean air programme⁷⁴ to encourage a reduction in NOx emissions. The legislation affects 28⁷⁵ of our gas turbine-driven compressor units as well as a small number of water bath heaters, boilers and standby gas generators, which are also used in the operation of the gas transmission system.

The key pieces of legislation that affect our compressors are:

- **The Industrial Emissions Directive (IED) 2010**, which combines the Large Combustion Plant Directive (LCP) 2001 and the Integrated Pollution Prevention and Control Directive (IPPC) 2008. The IED has driven much of the RIIO-1 compressor work.
- **The Medium Combustion Plant Directive (MCPD) 2015**, applies specific limits on emissions to air from combustion plant from 2030 and is the major driver behind our RIIO-2 emissions investment programme.

This part of the chapter summarises which decisions we have taken for our compressor fleet that will become non-compliant with MCPD legislation in 2030. More detail can be found in our Compressor Emissions Compliance Strategy (CECS), in annex A16.05.

2. Our activities and current performance

Track record

At the outset of the RIIO-1 period, the requirements for our compressor fleet to achieve IED compliance were still uncertain. But now we've reached greater understanding of what's needed and the costs of doing it. We have completed Aylesbury and Wisbech in RIIO-1 under LCP emissions legislation. In delivering our first IED-compliant unit at Aylesbury, using an innovative catalyst solution, we saved around £68m against our allowance for entire new units. Our investment in RIIO-1 led to a reduction in the amount of NOx emitted for each hour of compressor running.

⁷¹ ISO 14001 is the international standard that specifies requirements for an effective environmental management system (EMS).

⁷² <https://www.nationalgridgas.com/document/81026/download>

⁷³ These 71 operational units do not include new units at Peterborough and Huntingdon that are currently not commissioned.

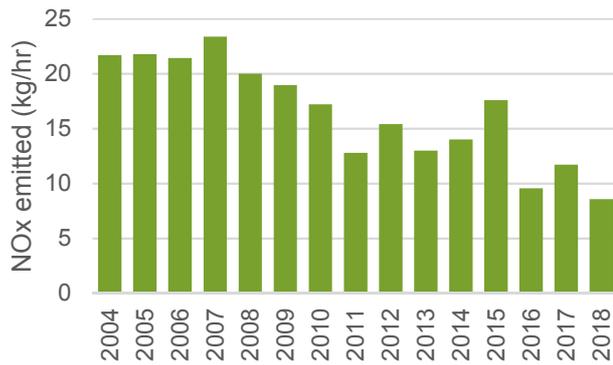
⁷⁴ http://ec.europa.eu/environment/air/index_en.htm

⁷⁵ Including King's Lynn A which was recently disconnected.



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Table 16.05 NOx emitted for each hour of compressor running (Kg/hr)



In total we spent £279.7m on compressor emissions compliance in RIIO-1. We also achieved derogations for several units. This allowed us to deliver the network capability customers needed at a cost that is best for consumers, while meeting legislative requirements. As a result of a successful derogation request during RIIO-1, we've been able to schedule capital works across RIIO-2 and RIIO-3 while making sure outages can be scheduled in a way that ensures minimal disruption and cost to customers. Currently, work is in progress to complete the installation of four new compressor units at Huntingdon and Peterborough to ensure compliance with IED emissions legislation.

Learning and innovation in RIIO-1

RIIO-1 has given us experience of managing changes on live compressor sites, and our cost confidence has improved as a result. We have also been investigating whether innovative techniques such as abatement (making an existing unit compliant through additional works) might be an option in RIIO-2. However, abatement seems unlikely to achieve the necessary reduction in NOx emissions. It may also not be an available or cost-effective option for our non-compliant MCPD units because of their age and asset characteristics. We will continue to look at how innovation may be applied during RIIO-2.

Following the 2015 reopener, we undertook further stakeholder engagement, fully assessed requirements of the legislation and challenged ourselves on our cost performance. We completed a comprehensive cost

benefit analysis (CBA) for each option considering a comprehensive set of regulatory, commercial and asset options. Given the scale of work required to make all our compressor sites compliant with legislative requirements, we targeted business improvements and learnings from best practice to ensure our programme is delivered in the most efficient way. We have also learnt lessons from delivering compressors, such as the complexity of ensuring there are enough operational units available to allow sites to undergo outages at points in the delivery process.

Table 16.06 RIIO-1 innovation projects

Example Project	Description
Aylesbury catalyst	Development of an innovative oxidation catalyst solution as an alternative to a new unit, saving £68m against the cost of new unit.
Selective Catalytic Reduction Environment and Technical Study	Investigation into selective catalytic reduction systems to assess whether emissions abatement fitted to our compressor could bring them in line with emissions standards. Currently not a proven cost-effective option for our non-compliant MCPD units because of their age and asset characteristics.
Predictive Emissions Monitoring (PEMS)	Testing a prototype PEMS system against the requirements of the industrial emissions directive.
Captivate	Proof of concept project of carbon mineralisation for emission capture.

3. What have stakeholders told us?

We engaged extensively with stakeholders on emissions compliance across the RIIO-1 period, both for the May 2015 reopener and for the May 2018 IED reopener. However, the reopener timing and decision (Ofgem's decision was published in September 2018) affected our stakeholder engagement on MCPD as part of the RIIO-2 business plan. We did not feel it would be appropriate or productive to start a fresh round of engagement while the reopener consultation was ongoing. We have continued to engage on specific elements relating to compressor emissions compliance and broader environmental engagement. Further detail is provided in the engagement log annex A16.06.

Table 16.07 CECS stakeholder feedback

	Compressor emissions compliance strategy
SH segments engaged	Environmental agencies (EA, SEPA).
Objective	Understand what is required with regards to ensuring compliance.
Channel/method	Trilaterals, bilaterals.
Key messages	It is important to make our compliance strategies clear.

Table 16.08 air quality stakeholder feedback

	Air quality
Stakeholder segments engaged	Consumer interest group, consultant/supply chain, customers energy network operator, environmental interest groups, gas distribution networks, industry/trade bodies, other energy industry, regulator/government, university/think tank, domestic consumers, non-domestic consumers, major energy users.



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Objective	Understand stakeholders' views on how we manage NOx emissions resulting from operating the compressor fleet and becoming compliant with legislation, and to understand consumers' views on local air quality impacts.
Channel/ method	Workshops, bilaterals, webinars, acceptability testing, consumer listening.
Key messages	Stakeholders value our work on reducing emissions to improve local air quality and believe we should get on with it as soon as possible. Managing and reducing emissions is very important. Customers want us to assess the impacts of any projects against environment, society and operational parameters. Local air quality is important to consumers due to the health concerns associated with it, and National Grid has a responsibility in improving local air quality. National Grid should use existing solutions such as the conversion of existing compressors to electric drive or other solutions that offset emissions.
Trade-offs and stakeholder influence on the plan	Majority of domestic consumers agree with proposed investments and bill impact. Significant proportion (around 25%) agree with proposals, but not with bill impact. There is some support from domestic consumers for doing more for air quality than currently proposed, but specific actions not specified.
SUG and Challenge Group feedback	We have simplified the compressor information provided following feedback to make the information clearer and improve our deliverability.

Table 16.09 future-proof stakeholder feedback

Future-proof compressor build	
Stakeholder segments engaged	Independent stakeholder user group, consumer interest groups, major energy users, other non-energy industry, regulator or government, university/think tank, industry/trade body, gas distribution network, consultant/supply chain, customers (entry, exit, shippers).
Objective	Understand the challenges to our compressor proposals and stakeholders' views on future proofing our assets.
Channel/ method	Stakeholder group, webinars, bilaterals, conferences.
Key messages	Stakeholders challenged us to ensure that we were giving due consideration to the UK Government's target to achieve net zero emissions by 2050, including whether we should consider any compressor unit replacement to be electric drive or hydrogen.
Trade-offs and stakeholder influence on the plan	Stakeholders believe we should consider future uses of the network when undertaking asset health works. Major energy users stressed the importance of keeping options open, in relation to compressors.
SUG and challenge group feedback	We have taken on board feedback relating to reflecting uncertainties with regards to our investments. We are utilising an increased number of uncertainty mechanisms relating to our compressor investments to reflect this.

4. Our proposals for RIIO-2 and how they will benefit consumers

Proposals in this section are driven by a need to meet customer network capability requirements and to ensure compliance with MCPD legislation. To develop our proposals on which compliance solution is appropriate, we have carried out CBAs for the compressors affected by emissions legislation. It has informed our understanding of the most cost-effective way of meeting our obligations and the needs of our customers while delivering the best value to consumers. We have tested a wide range of options and stress tested our solutions are robust against a range of scenarios. Our CECS sets out our consideration of the final options alongside outputs of

the CBAs and relevant engineering justification papers as appendices.

Where there is a long-term need for compressors to run over and above legislative limits, we will need to invest in our compressor fleet to ensure compliance. Several of our compressors will have to be replaced, which takes around six years to complete and there is only limited availability of network outages to accommodate the work. This means we can't wait until RIIO-3 to make a start and we need a programme that allows us to provide continuous use of the network from 2021 to 2030. Work is required during RIIO-2 to achieve the compliance date.

Table 16.10 output summary air quality – compressor emissions compliance

What our stakeholders have told us	Commitment	Output type	Consumer benefit
Domestic consumers consider air quality to be important.	Wormington: To meet customer network capability needs, we will ensure compressor emissions compliance at Wormington through delivery of two new units capable of supporting flows of 80 mscm/d that are broadly equivalent rated power to existing capability.	Price control deliverable [REDACTED] - annex A3.01)	Compressors are vital to moving gas around the system, enabling consumers to use gas as and when they want.



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Stakeholders value our work on reducing emissions to improve local air quality and believe we should get on with it as soon as possible.	<p>King's Lynn and Peterborough: To meet customer network capability needs, we propose to deliver two new MCPD compliant compressor units at King's Lynn and one unit at Peterborough. PCDs to reach front end engineering design (FEED) in RIIO-2. New PCDs to be set at the point of FEED to deliver compressor emissions compliance (to be completed in RIIO-3). Post-FEED costs not in baseline and triggered by UM.</p>	<p>PCD for FEED at King's Lynn [REDACTED] and at Peterborough [REDACTED]. See annex A3.01.</p> <p>UM (King's Lynn [REDACTED] and Peterborough [REDACTED]). See annex A3.02. Trigger: Year 2 (end of FEED) for King's Lynn, Year 4 (end of FEED) for Peterborough</p>	<p>These proposals support an affordable energy bill through prioritising and innovating to ensure compressor compliance is met in a cost-effective way.</p> <p>Our proposals also facilitate delivery of a sustainable energy system through improving air quality via our compressor emissions compliance programme, ensuring the most polluting compressor trains are decommissioned and replaced where necessary with cleaner machinery.</p>
	<p>St Fergus (whole site): To meet customer network capability needs, we propose to deliver three new emissions compliant units at St Fergus. We will reach FEED in RIIO-2. New PCD to be defined at the point of FEED to ensure sufficient compliant capability to deliver at St Fergus compressor station (to be completed in RIIO-3). Three units anticipated at this stage; post FEED costs not in baseline and triggered by UM.</p>	<p>PCD for FEED [REDACTED]. See annex A3.01.</p> <p>Uncertainty mechanism (£118m) Trigger: Year 2 (end of FEED)</p>	<p>Utilising a reopener mechanism for compressor emissions costs where there is uncertainty around solutions and costs ensures the most cost-effective solution is taken forward.</p>
	<p>Decide on decommissioning or derogation for RIIO-3 for other affected MCPD units at Cambridge, Diss, Chelmsford, Huntingdon, Alrewas, Kirriemuir, St Fergus, Wisbech.</p>	<p>Commitment (legislative driver)</p>	
	<p>Enable reduction in our NOx emissions from the business in RIIO-2 by maintaining and operating our best available technique (BAT) equipment as the lead units for compression.</p>	<p>Commitment (legislative driver). Measure: Reduction in NOx emissions per hour of gas turbine running, dependent on supply and demand patterns.</p>	<p>Facilitate delivery of a sustainable energy system through improving air quality.</p>

Compressor proposals detail

Our compressor fleet strategy is set out in chapter 12, network capability. As laid out in our fleet strategy principles, we will focus investment on the most important/critical compressors to meet the network capability needs of customers. In terms of decision-making from MCPD units, we have carried out CBAs for compressors affected by emissions legislation to ensure our proposals are robust. We have also undertaken analysis relating to different network capabilities with different compression levels to test some of our proposals.

As set out in the CECS, there are four ways in which compliance can be met:

Table 16.11 MCPD compliance options

Decommission and reduce network capability	Close and decommission units if changing gas flow patterns render them no longer required.
Derogate	Existing medium combustion plant operating for no more than 500 hours on a rolling five-year average after 1 st January 2030 does not need to comply with the new emission limit values (ELVs).
Make compliant	Two high-level options for achieving compliance: 1. Install abatement technology to achieve the specified ELVs with asset health work as required on the machinery train ⁷⁶ . 2. Install a new, emissions-compliant compressor machinery train. Build options to make compliant would be required to go through a full BAT ⁷⁷ process.
Commercial options	Options such as turn-up or turn-down contract for constraint management. Could mitigate the need for asset-based solutions although typically suited to short-term scenarios, meeting a peak demand and supply pattern linked to a single-entry point; they aren't a complete alternative option to investment in the compressor fleet. It is also important to note that commercial solutions to meet emissions requirements may have corresponding physical requirements in other parts of the network.

⁷⁶ This doesn't come out as a preferred option due to the age of our non-MCPD compliant assets.

⁷⁷ We are bound through legislation to undertake a process with relevant environmental bodies which defines the BAT in relation to new build compressors. BAT is the primary selection mechanism for all new and substantially modified compressor trains and will continue to be so during RIIO-2 and RIIO-3.



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These high-level options were broken down into more detail for consideration for inclusion in the CBAs. These high-level options can be summarised as:

- 500 hours derogation for affected units (counterfactual).
- Disconnect and decommission Avons prior to 2030
- Control system restricted performance.
- Emissions abatement (SCR) on Avons.
- Two new 15MW gas turbine compressors. Decommission Avon once new unit is operational (not considered for Wormington and Peterborough where parallel running is required for more than 500 hours).
- One new 15MW gas turbine compressor. Decommission Avon once new unit is operational.
- Two new 15MW electric drive compressors. Decommission Avon once units are operational.
- One new 30MW electric drive compressor. Decommission Avon once new unit is operational (note both these electric drive options discounted for these 4 sites considered. Wormington and Peterborough already have electric drive on site and King's Lynn and Huntingdon do not have sufficient running hours to warrant a VSD).
- Commercial contracts to manage constraints and to ensure compliance with 1 in 20 obligations (not considered for sites without a 1 in 20 requirement).

The needs case options for sites for which we are requesting funding are summarised below and can be found in more detail in the relevant EJPs and include the above option analysis.

Wormington

EJP and CBA annexes A16.10 and A16.11.

Wormington is a bi-directional compressor site used to resolve supply-demand imbalances in South Wales. It is used to move gas out of South Wales when supplies from Milford Haven are high, and to move gas into South Wales when supplies from Milford Haven are low. Forecast running hours under different Future Energy Scenarios (FES) range from 1,300-2,200 hours per annum in 2020, and 1,700-12,000 hours per annum in 2045. Compression at Wormington is required to meet flows of up to 80 mscm/d. The electric drive is capable of flows up to 50 mscm/d and will remain the lead unit, but additional compression is required to support very high flows from Milford Haven and for periods when the electric drive is unavailable, which could be of long duration.

Figure 16.12 Wormington units on site

Current units on site		
Electric	Non compliant gas	Non compliant gas
Proposed units on site by 2030		
Electric	Compliant gas	Compliant gas

Analysis

The clear financially beneficial option from the CBA is to install two new gas-driven compressor units (of similar rated power to the existing Avon units – approximately 15MW each) and decommission the existing Avon units. This comes out as the most cost-effective option in the CBA and is consistent with the preliminary BAT assessment. This preferred option has a consumer saving of £455m compared to the counterfactual (2 derogated units) in a central scenario. Without these new units, there would be a risk that entry and exit capacities and/or 1 in 20 obligations would not be met if the existing electric drive unit is unavailable.

There is currently a PARCA process being undertaken relating to Milford Haven. We won't know the outcome of this process until mid-2020 so are unable to factor this into our proposals. However, if this is taken forward it is likely to strengthen the justification for compression at Wormington further and may require us to consider additional compression at other sites and pipelines to allow for a higher flow to be accommodated.

Proposed option

Deliver two new units at Wormington with a capability of 40 mscm/d each. This will provide additional compression to run alongside the electric drive and also provide resilience in the case this is on outage. We propose this work is started at the beginning of RIIO-2 to ensure compliance work can be undertaken and delivered alongside the rest of the emissions compliance work by 2030. Should the PARCA process identify further investment on Wormington compressors impacting this work, we propose that the price control deliverable should be adjusted accordingly.

King's Lynn

EJP and CBA annexes A16.14 and A16.15.

King's Lynn is a bi-directional compressor site that performs a critical role on the NTS, used to resolve supply-demand imbalances in the South East. This is a unique area on the network, including the bi-directional interconnectors (IUK and BBL) at Bacton and the liquefied natural gas (LNG) importation facility at Isle of Grain. This means the South East has the potential to be in a net supply or demand position at any time of year, depending on the flows from these entry terminals which are market driven and difficult to predict.

Under our FES scenarios, running time in 2020 is forecast at around 900 hours. Future running hours are dependent on the rate of UK Continental Shelf (UKCS) decline and levels of exports at Bacton. However, FES scenarios differ greatly. By 2035, forecast flow ranges under the FES scenarios range from ~150-6,500 hours per year and 300-4,200 hours per year in 2045.



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Figure 16.13 King’s Lynn units on site

Current units on site			
Compliant gas	Compliant gas	Non compliant gas	Non compliant gas
Proposed units on site by 2030			
Compliant gas	Compliant gas	Compliant gas	Compliant gas

Analysis

The outcomes of the CBAs are sensitive to the supply and demand assumptions in each scenario, leading to different lead options across the scenarios. In the consumer evolution and two degrees FES scenarios, increased utilisation of King’s Lynn operating in parallel mode (two units running together) to support high levels of exports through the interconnector mean that a single derogated unit would provide insufficient levels of resilience to the lead units at this critical site, and the investment in two new units is the most cost-effective solution with the highest net present value (NPV). In the steady progression and community renewables scenarios, where supply and demand are relatively balanced and flows through the interconnector are relatively low, the counterfactual (derogate unit B) has the highest NPV.

Timing of any such investment is also constrained by available outage windows on this critical site. We need to make sure that we deliver the right solution on site, so we can continue to meet customer needs if these scenarios occur. However, there is some uncertainty around whether we need two new units or should just derogate.

Proposed option

We want to make sure that the right solution is progressed to ensure maximum benefits for consumers. Proceeding to FEED with delivery of one or two new units ensures this option can be delivered in time should this be required. Progressing with the counterfactual would incur a significant delay if future flows require the capability of new units. The delay would result in significant constraint costs and customer impact. In addition, we would have spent significant asset health to refurbish a unit which would no longer be required.

Proceeding to FEED allows significant flexibility if, at a later stage, it becomes clear the investment is not required as it could be converted to another option such as one or two units. Costs post-FEED have not been included in our baseline request. These costs will be subject to an associated uncertainty mechanism reopener to cover costs past FEED as set out in annex A3.02.

Peterborough and Huntingdon

EJP and CBA annexes A16.12 and A16.13.

We are considering Peterborough and Huntingdon in a cluster as there are close links between these sites. We

cannot meet our 1 in 20 licence obligations for demand in the south of the country without Peterborough and Huntingdon. Both sites operate with two units running in parallel. We are already investing in new units to meet these needs in the long term; however, with a need for two units, it is important to have resilience. In 2020, we forecast over 4,800 running hours for Peterborough. This is expected to decline as national demand falls, reaching ~1,200 hours in 2045. In 2020, we forecast over 2,000 running hours for Huntingdon. We expect this to decline in the future as gas demand in the south declines, reaching ~1,200 hours in 2045.

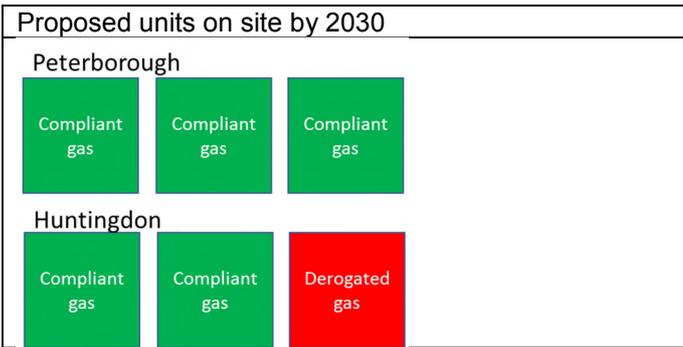
Peterborough compressor station is at the centre of the NTS. It is considered to be the most important compressor station on the NTS by the teams who operate the network. As well as its primary purpose of ensuring sufficient gas is moved into the south of the network to provide our customers with the flow rates and levels of pressure that they require; it is also key in maximising entry capability at a number of the larger supply points across the country and ensuring the effective north to south transfer of gas. Peterborough sits in the centre of a train of compressors across the country, from north Lincolnshire to the southern extremities. Without the station, we cannot move sufficient gas from the north to meet our customer needs when southern demands exceed a certain level. A reduction in the flow through Peterborough has a knock-on impact to the level of flow through all compressors upstream and downstream of Peterborough (Bishop Auckland, Hatton, Huntingdon and Lockerley) which are also used to support southern demand. There are no other credible options to re-route this gas on the NTS. On this basis, two new compressor units are currently being built to replace two of the existing 40+ year old units. There is a requirement to run these two units in parallel; they will not be available 100% of the time and a level of resilience is needed.

Figure 16.14 Peterborough and Huntingdon units on site

Current units on site				
Peterborough				
Compliant gas	Compliant gas	Non compliant gas	Non compliant gas	Non compliant gas
Huntingdon				
Compliant gas	Compliant gas	Non compliant gas	Non compliant gas	Non compliant gas



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Analysis

The option that has the highest NPV relative to the counterfactual (derogate all non-compliant units) is an option which proposes derogating one unit at each site and decommissioning the other two. However, we believe that this would not lead to the best outcome for consumers because:

- Peterborough is critical to supporting 1 in 20 demand in the South West for a sustained period beyond 2030.
- Our forecasts of run hours indicate a sustained requirement for around 500 hours of resilience operation at Peterborough.
- Due to the central location of Peterborough and Huntingdon, the operational risk and consequential impact on customers and consumers of not having a fully available resilient unit at Peterborough is not adequately represented in the standard CBA.
- Our forecast of run hours at Peterborough and Huntingdon is sensitive to changes in forecasts of demand in the South East and South West.
- Our proposals to decommission or derogate all non-compliant compressors in the South East, particularly Cambridge, will increase reliance on Peterborough and Huntingdon.

The highest NPV options are combinations of derogated units. Solely derogating units on sites would significantly reduce optionality and flexibility if we were to need to run the derogated units for significantly more than 500 hours in a single year. For example, due to a cold winter or a long outage on one of the new units, this would severely restrict use of the derogated units. The next highest options which don't include combinations of derogating units with the highest relative NPVs are the option with one new unit at Peterborough and one derogated unit at Huntingdon and the option with one new unit at Huntingdon and one derogated unit at Peterborough.

Proposed option

We are proposing to progress the option with one new 15MW unit at Peterborough and one derogated unit at Huntingdon in preference to the highest NPV option (one derogated unit at each site) for the reasons given above.

We want to make sure that the right solution is progressed to ensure maximum benefits for consumers. We believe that proceeding through the FEED phase of the project will allow us to fully assess options and the value investments will bring to consumers. Proceeding to FEED ensures this option can be delivered in time to

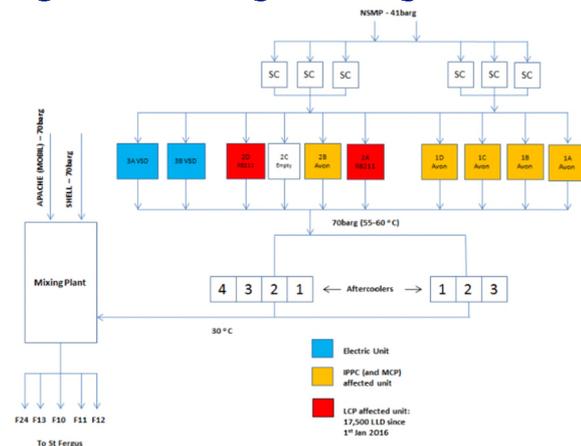
deliver its benefits. This also allows significant flexibility if, at a later stage, it becomes clear the investment is not required as it could be converted to another option such as two units, or asset health work. Costs post-FEED have not been included in our baseline request. These costs will be subject to an associated uncertainty mechanism reopener to cover costs past FEED as set out in annex A3.02.

St Fergus

St Fergus is one of the most strategically important sites for the NTS, as well as for the wider energy system of the UK. Our St Fergus gas terminal handles between 25% and 50% of the UK's gas supplies, dependent on supply and demand patterns. The site has been in continuous operation for over 40 years and is now moving beyond the design life of the critical original assets. The site is one of two upper tier COMAH sites on our network (the other being Bacton terminal) and as such is a major accident hazard site, subject to regular HSE and SEPA inspections and significant health, safety and environmental legislation. It has the highest emissions of any site on our network.

The terminal receives gas from three sub-terminals (currently owned by Ancala, Shell and North Sea Midstream Partners/Gassco). Uniquely on the NTS, National Grid provides 24/7/365 compression services for gas received from the NSMP terminal under the terms of the Network Entry Agreement (NEA). This is a legacy arrangement dating from when British Gas was privatised and cannot be changed unilaterally by National Grid.

Figure 16.15 St Fergus site diagram



There are nine units across three current compressor plants at St Fergus. The bulk of the compression is provided by two electric variable speed drive (VSD) compressor units which were commissioned in 2015. The remaining seven are gas powered compressors from the original site (commissioned in 1978) on plants 1 and 2 and are not compliant with emissions legislation in force from 2030. These compressors currently provide: the low flow capability, back-up to the VSDs, bulk flow and high capability when used with the VSD compressors. Compression continues to be required to maintain service to the customer; therefore, a solution to address the



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environmental non-compliance on these gas units is required.

The analysis was carried out on all four scenarios in FES 2018 and there is a compression requirement at St Fergus to 2040 and beyond. The expected flow range for NSMP is large, between 10 mscm/d and 68 mscm/d across the four different FES scenarios. Overall, the predicted flows show a slight decline over the next 10 years, with older gas field decline being largely offset by an increase in flows as new West of Shetland fields connect.

Analysis

We used the 2018 FES in our analysis, with the steady progression scenario as our central case for the CBA with sensitivities being run against the other three scenarios. Maximum flows at the NSMP sub terminal do vary depending on the FES scenarios. Despite this, the CBA outcomes were not sensitive to changes in the FES scenario.

The most cost-effective and lowest risk option is to redevelop the plant 2 area of the St Fergus Terminal with new compression. There are three potential compressor options, that will continue to be assessed through the FEED study. These are

- redeveloped plant 2 with two new units and one derogated Avon
- redeveloped plant 2 with three new units
- redeveloped plant 2 with three new units (one large).

Proposed option

For the RIIO-2 data tables, we have currently selected as our proposed option redeveloping plant 2 with three new ~15MW gas turbine compressors. The cost of our proposed option in RIIO-2 and RIIO-3 is £244.1m for asset health, plant 2 redevelopment and decommissioning of plant 1 thereafter.

This is split into the following funding requests for RIIO-2 and RIIO-3:

- [REDACTED] baseline funding for FEED work at the beginning of RIIO-2.
- Funding for the remaining scope of plant 2 redevelopment and all plant 1 asset health is not requested at this time and will be subject to a UM in year 3 of the RIIO-2 price control. We anticipate that this spend to equate to a further £174.3m over RIIO-2 and RIIO-3. More information on our proposed UM can be found in annex A3.02.

A further £64.6m has been requested within our asset health investment proposals as no regrets asset health work and does not involve investments on either plant 1 or 2. Decommissioning of plant 1 is expected to follow in RIIO-4.

Delivery of our proposals will result in:

- The St Fergus terminal having sufficient capability to meet current and future gas supply forecasts.

- A reduction in capability of the site of between 30 and 60mcm/d from the original site design by RIIO-4.
- Compliance with MCPD and LCPD emissions legislation.
- Consumers not being exposed to cost uncertainties in final solution as a result of the detailed design and build allowances being subject to an UM in RIIO-2.

In our RIIO-2 proposals, baseline funding has been requested for FEED and essential asset health costs only. An uncertainty mechanism is to be applied to all non-essential asset health costs post-FEED for the St. Fergus proposals. Please see annex A3.02 for more information on uncertainty mechanisms. More information on asset health work can be found in chapter 14.

Derogated and decommissioned units

We have not proposed build options for every unit affected by MCPD legislation. We are mindful that the energy landscape is changing and there may not be a need for the current levels of compression going forwards. For these units, we will need to decide on whether to decommission or derogate.

Our initial proposals can be found in our CECS (annex A16.05). Our initial proposals are not to replace 20 of the 28 units impacted by MCPD legislation that will become non-compliant with emissions legislation in 2030.

However, our proposals for RIIO-3 are only initial thinking at this stage and further work is required to refine which units will be decommissioned and which will be derogated at the end of RIIO-3. Minimal spend is proposed on these units in RIIO-2 to ensure we meet current capability requirements and retain optionality for the future – please see the fleet strategy table in chapter 12 for more information.

Timings of decommissioning will be informed by network capability assessment methodology as it could be impacted by the need to maintain resilience on the network whilst compliance works are being undertaken. As we engage on the broader business plan, we will test the suitability of this plan to achieve the costs and operability that our stakeholders are looking for.

Whether these units are decommissioned or derogated, we currently propose to leave them in place during RIIO-2 ahead of a decision in RIIO-3. In addition to meeting customer need, keeping these units operational during RIIO-2 supports us as we replace the other compressor units and undertake asset health work.

5. How will we deliver?

Efficient delivery

Projects will be delivered through our standardised processes, which are set out within our CECS. We are incentivised to deliver capital projects efficiently through our totex incentive mechanism. Our approach to contracting and procurement is laid out in chapter 20.



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Competition

We have identified that the Wormington compressor proposal will meet the cost materiality for early competition. Our current view is that we would unflag for early competition. For further details see chapter 20.

Planning for delivery to 2030

We are requesting funding to deliver two new compressor units at Wormington in RIIO-2. However, even for the other proposed new units to be delivered in RIIO-3 some costs will be incurred during RIIO-2.

We believe the option that delivers the best outcomes for consumers is requesting ex-ante funding in RIIO-2 to cover the preparatory works for projects due to be started in RIIO-2 but delivered in RIIO-3 (King's Lynn, Peterborough, St. Fergus). This option minimises the risk of not meeting compliance deadlines if work can't be started until certainty around RIIO-3 is agreed.

These preparatory works up to the point of FEED include the assessment of best available techniques (BAT⁷⁸) assessment with environmental regulators, which is required before starting mobilisation. Further information on BAT can also be found in the CECS.

Net zero

The UK government recently committed the UK to a new binding target of net zero carbon emissions by 2050. We expect an asset life of around 25 years for new compressor investments (and we are currently replacing assets with a life of over 40 years). This means that the compressors we are delivering in RIIO-2 and 3 are likely to remain in use to 2050, so it is important that we consider how they will interact with a net zero world.

As set out in our changing energy landscape chapter, there are ways in which this decarbonisation challenge may be met in the coming years. The different routes that decarbonisation might take could impact our compressor fleet in a number of ways, from needing to capture carbon emissions to adapting compressors to hydrogen blends.

Electric compressors

Stakeholders challenged us about whether replacement compressors should be electrified to reduce our primary carbon emissions, particularly in the light of net zero ambitions. We need to consider the trade-offs between costs to consumers, network resilience and the impact to the environment in our decisions. From a cost perspective, our analysis of the construction and operation of electric units means investment is only cost-effective when the compressors run for more than 5,000 hours per year. This is not the level of operation expected from units that will become non-compliant in 2030.

From a resilience perspective, the UK Black Start strategy (how the electricity system would be re-energised after a complete or partial shutdown) depends on gas supplies being available to power stations. Therefore, the need to

move gas around the network means that it is currently not feasible or cost-effective to move to a fully electrified compressor fleet. Similarly, we have set a principle that, where a primary unit on site is electric, we would use a gas compressor as a back-up for resilience purposes, enabling the gas system to run independently from the electricity system.

However, recognising the need to move towards net zero to meet environmental targets, we will continue to consider the wider benefits of electric drives as part of the FEED phase of our projects.

Innovation

Hydrogen compatible gas turbines

We are working across the industry to identify and develop innovations that would support the range of potential decarbonised futures. Gas turbine suppliers are continually developing their product lines; one example is that of developing existing combustion technology within their machinery that is compatible with *fuel gas* containing high hydrogen content; there are already commercial offerings available to National Grid with the capability of running on a fuel mix that contains in excess of 50% hydrogen.

The challenge to us at present is how to get the hydrogen to the fuel system as we currently use pipeline gas to provide this function (which at present contains 0% hydrogen) therefore a system such as this would require an external source of hydrogen to 'dose' the fuel gas system.

Investing in this technology future-proofs our network by ensuring that we will need to do nothing to adapt our equipment as hydrogen becomes more widely used. Our emissions will reduce by default as the proportion of natural gas in our systems reduces over time.

Innovation also has a role to play in reducing carbon emissions from compressors through the development of carbon capture usage and storage. We have recently begun our captivate project to prove the concept of carbon mineralisation from boiler house emissions at our Stallingborough site, building a fully containerised emissions capture demonstrator. As well as our existing projects, we will continue to explore how innovation may help us move towards a lower carbon compressor fleet. Below highlights some of the potential innovation we will look to do during RIIO-2:

Table 16.16 air quality innovation themes

Theme	Commentary
Fit for the future	Digital twin to improve compressor build programmes. Tools to improve network modelling and future compression strategy and requirements.

⁷⁸ We are bound through legislation to undertake a process with relevant environmental bodies which defines the BAT in relation to new build compressors. BAT is the primary selection mechanism for all new and

substantially modified compressor trains and will continue to be so during RIIO-2 and RIIO-3.



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Ready for decarbonisation	New materials and construction techniques can offer environmental savings and these should be trialled and developed throughout RIIO-2 whilst embedding those that have been successful in RIIO-1.
Decarbonised energy system	We should be able to facilitate the early adopters of hydrogen within the transport and industrial areas. This can start to provide environmental benefits by reducing their carbon emissions and future proof compressor investments.

available emissions reduction technology and/or incur additional costs from the supply chain to hold prices for a number of years. So, our business planning process will involve a preliminary BAT assessment using currently available information.

There is a known uncertainty around the EU Emissions Trading Scheme (EU-ETS) relating to Brexit. These costs are factored into the CBA for compressor investments. However, it is unlikely that resultant scheme changes would be significant enough to change a proposed build solution.

6. Risks and uncertainty

Cost uncertainty

We recognise the uncertainty in the changing energy landscape and we want to ensure that consumers are protected from the risk of asset stranding, or from potentially overpaying where there is cost uncertainty. Therefore, we propose to use uncertainty mechanisms to protect consumers and our business from these risks.

Legislative uncertainty

If tighter emissions legislation is introduced (for example, new air quality legislation), it would affect our older, non-electric compression fleet before the new gas units we propose to install in RIIO-2 and RIIO-3. Compressor equipment manufacturers are continuing to invest in new technology and innovate to reduce emissions from compression. We will include all commercially available technologies in our tender and BAT process. Using this approach minimises the risk of new compressors being impacted if legislation is tightened further.

A full BAT process requires the outcome from tender events to establish the most cost-effective way of reducing emissions. Tender events cost time and money including for our supply chain and, if they are conducted too early, they could lead to us not considering the best

Solution uncertainty

We want to make sure that the right solutions are progressed to ensure maximum benefits for consumers. For some investments, there is uncertainty around the best solution for delivering against a need. In these cases, we are proposing proceeding to FEED, but having post-FEED costs subject to an uncertainty mechanism. This ensures that critical investment preparations are not delayed whilst at the same time allowing flexibility if, at a later stage, it becomes clear that another option is more appropriate such as a different number of units or asset health work instead of new build.

Our proposed uncertainty mechanism reopeners are set out in annex A3.02 which will allow us to confirm levels of baseline funding following a reopener.

7. Our proposed totex costs for RIIO-2

We are currently proposing to request full funding for Wormington in RIIO-2. Our proposed costs of £157m include expected costs at Hatton (depending on reopener decision). At King's Lynn, Peterborough and St Fergus costs are only included up until the point of FEED. Costs following this point would be confirmed through a reopener process.

Table 16.17 cost assessment criteria compressors

Cost realised from RIIO1 actuals	Cost forecast based on competitive process	External benchmark	NARM or volume driven PCD
Yes	Yes	No	Yes (PCD)

Table 16.18 compressor emissions compliance costs

	2022	2023	2024	2025	2026	Total RIIO-2	Annual RIIO-2	Annual RIIO-1
Hatton	■	■	■	■	■	■	■	-
Wormington	■	■	■	■	■	■	■	-
FEED costs at King's Lynn, Peterborough, St Fergus	■	■	■	■	■	■	■	-
Decommissioning	■	■	■	■	■	■	■	-
Compressors – emissions legislation (£m)	22.7	27.9	51.0	24.3	30.8	156.7	31.3	33.9



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Climate change: our climate commitment



1. What is this sub-topic about?

This sub-topic is about delivering consumer value by reducing our impact on climate change. The Committee on Climate Change (CCC) predicts that, without intervention, global temperatures could rise by as much as 7°C over the next century, exposing Britain to increased inland and coastal flooding, water scarcity and heatwaves. The scale and impact of these events on our population will be dramatic; if we don't respond urgently we will fall far short of our responsibility to future generations to protect society and the environment from irreparable damage.

We fully support the UK Government's ambitions to achieve net zero carbon emissions by 2050. We believe that, as an industry, we have the greatest responsibility to address our climate challenge urgently. More fundamentally, we believe business has a responsibility to lead the transition and secure the investment and shift in consumer attitudes needed to deliver it.

Emissions of greenhouse gases (GHGs) such as carbon dioxide and methane are harmful to the environment. As a gas transmission business, our normal business activities contribute to GHG emissions. There are ways we can reduce them, ranging from taking actions targeted at particular types of GHG emissions such as methane, to embedding the principles of carbon reduction in our everyday business practices. We are mapping our physical risks and opportunities from climate change and will be working to reduce these, in line with the recommendations from the Task Force on Climate-related Financial Disclosure (TCFD). We will also propose incentives to drive performance and innovation area.

This part of the chapter will cover:

- targeted activities relating to direct and indirect emissions
- reducing emissions associated with our business e.g. offices and fleet vehicles
- reducing shrinkage on the network by reducing methane emissions.

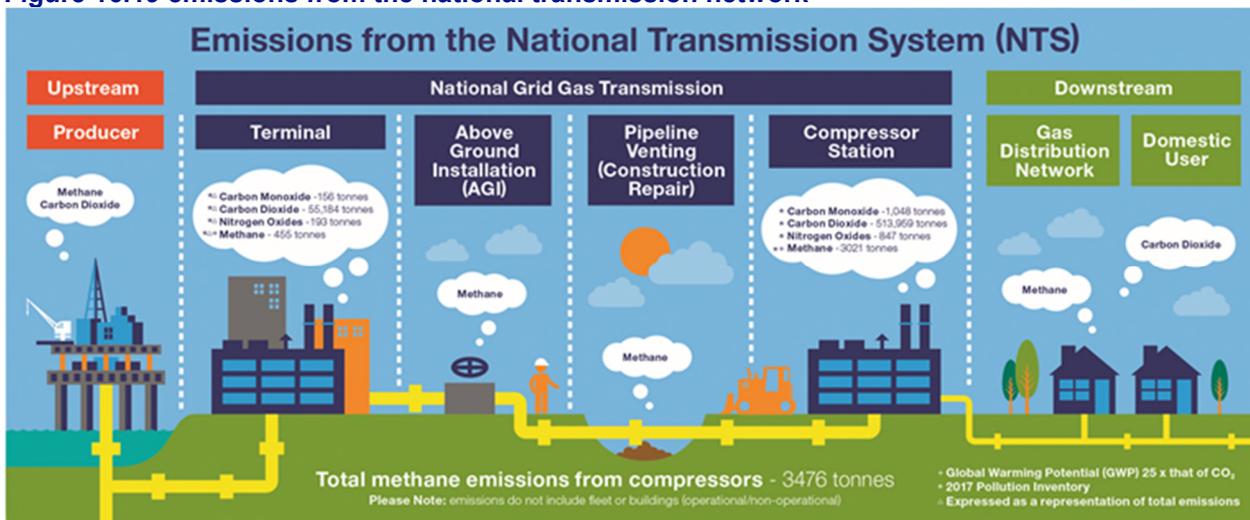
2. Our activities and current performance

Track record

Emissions of GHGs from our assets

Emissions that are produced from the network are shown in figure 16.19 below.

Figure 16.19 emissions from the national transmission network



Note: Calculated methane emissions from compressors relate to 2018

NOx: Nitrogen oxide (NOx) emissions are addressed through relevant emissions legislation in the previous part of this chapter 'air quality – compressor emissions compliance'.

Carbon dioxide: CO₂ emissions from our gas-fired compressor units are subject to the EU Emissions Trading Scheme (EU-ETS). This is a market-based cap and trade programme that applies a carbon price to emissions. We have bought additional credits in three of

the last five years to cover our carbon dioxide emissions because, in those years, we have had to use compressors more frequently due to changes in supply and demand patterns. We also report on carbon dioxide emissions via our business carbon footprint (BCF) reporting⁷⁹.

Methane: Methane, which has 25 times⁸⁰ the global warming potential of carbon dioxide, is emitted through our activities.

⁷⁹ <https://www.nationalgrid.com/group/responsibility-and-sustainability/our-progress/our-performance/performance-environmental>

⁸⁰ IPCC figure <https://www.ipcc.ch/report/ar5/syrl/>



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We are currently incentivised to reduce methane from compressor venting activities through our GHG incentive. This is a challenging downside-only incentive that converts methane emissions into carbon dioxide equivalent and uses a non-traded carbon price. Our performance in RIIO-1 demonstrates the level of challenge. During RIIO-1 there was some performance improvement in the initial years of this incentive being set. However, there have been some years where, due to changes in supply and demand patterns and the needs of our customers, venting on compressors has had to be carried out more frequently. This has led to higher than anticipated emissions in relation to this incentive in some years and we incurred penalties. Further information on how this incentive has been set and how we have delivered against it in RIIO-1 can be found in annex A3.03.

Shrinkage represents a financial and environmental cost to consumers both in terms of cost for all elements and in terms of methane lost to atmosphere as a result of ownership, maintenance and operation of the network. During RIIO-1, we were incentivised to reduce the cost of shrinkage to align our interests with those of the end consumer. We performed well in reducing these costs during the price control period by adopting trading/operational strategies. For example, without these actions, costs would have been increased in the range of £3-16m in 2017/18 compared to target. Therefore, both National Grid and end consumers have benefited by actions we have taken to perform against this incentive. Please see annex A3.03 for further information on this incentive and RIIO-1 performance against it.

Whole life carbon

Our policy is to implement carbon pricing in our investment decision-making processes. This means that we don't only consider the capital cost of new assets but the carbon cost of them as well. We'll roll this out in the gas transmission business during the 2019/20 financial year and it will be in place by the beginning of RIIO-2. We have also worked in RIIO-1 to reduce our capital carbon from construction.

Supply chain

We engage with 250 of our most carbon-intensive global suppliers annually with a target of 80% response rate to complete the Carbon Disclosure Programme (CDP) supply chain submission. We achieved an 92% response rate in 2019 and have received an 'A' for our supplier engagement rating. We work collaboratively across industry to share best practice in this space and we are members of initiatives such as the Supply Chain Sustainability School, United Nations Global Compact and Achilles UVDB, among others.

Innovation

During RIIO-1, our focus has been developing a better understanding of leaks from assets and equipment on the network.

Table 16.20 RIIO-1 innovation

Example project	Description
Greenhouse gas investigation mechanism	A project to monitor and control fugitive emissions from above ground NTS installations. Further developments required which led to MoRFE.
Monitoring of real-time fugitive emissions (MoRFE)	Detection and measurement of fugitive emissions using a network of connected sensors strategically located around an above ground installation. This project could lead to the removal of an expensive regular survey programme and by locating and resolving issues on site would result in a reduction of emissions.
Mini grouted tee	The mini-grouted tee allows safe repair works with gas live in the pipeline, avoiding the need for recompression and venting of gas, and the associated carbon emissions. 1,500 tonnes of CO ₂ saved at King's Lynn.

3. What have stakeholders told us?

We have received a great deal of feedback from stakeholders about our climate commitments, particularly in relation to emissions and air quality. Detailed stakeholder views are set out in our environment engagement log (annex A16.06).

Table 16.21 emissions stakeholder feedback

	Emissions
Stakeholder segments engaged	Consumer interest group, consultant/supply chain, customers (entry, exit, shippers), energy network operator, environmental interest groups, gas distribution networks, industry/trade bodies, other energy industry, regulator/government, university/think tank, domestic consumers, non-domestic consumers, major energy users.
Objective	Understand stakeholders' views on how we manage the greenhouse gas emissions resulting from our operations.
Channel/method	Workshops, webinars, bilaterals, consumer listening, interactive slider tool, acceptability testing, surveys.
Key messages	Customers would like to see emissions measured to allow more informed decisions. Reducing our carbon footprint should always be a consideration when carrying out operations. Stakeholders would like us to offset all construction activity. We should be applying a single cost of carbon in our decision-making processes. Stakeholders want us to set ambitious goals when it comes to reducing our carbon footprint, they support us generating own-use electricity on site from renewables. Stakeholders would like us to work with our supply chain on environmental matters. Stakeholders are keen to know our plans on net zero targets and would like to see a discussion of this in the business plan. In relation to managing vented compressor emissions, stakeholders expressed the importance of getting the right framework for an emissions incentive to deliver maximum benefit to consumers.



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Trade-offs and stakeholder influence on the plan	There is willingness to pay for improvements but a greater level of granularity on metrics is needed.
SUG and Challenge Group feedback	We have received a considerable amount of feedback on our EAP (annex A16.01) which has been substantially updated to reflect this feedback, particularly around specificity of commitments.

4. Our proposals for RIIO-2 and how they will benefit consumers

We aim to reduce the GHG emissions our business produces. We will do this on a carbon dioxide equivalence basis, because methane is about 25 times more damaging to the environment than carbon dioxide. Our full suite of environmental commitments can be found in our Environmental Action Plan in annex A16.01.

Table 16.22 output summary 'our climate commitment'

What our stakeholders have told us	Commitment	Output type	Consumer benefit
Reducing our carbon footprint should always be a consideration when carrying out operations, but without large impacts on stakeholders'	Produce an annual environmental report (including BCF reporting).	Licence obligation	These commitments support a sustainable lower carbon future by focusing on reducing greenhouse gas emissions such as methane, carbon dioxide and others to reduce our impact on climate change, with clear benefits for society.
	Continue to participate in the EU-ETS as required and use this as an opportunity to provide focus on our CO ₂ emissions across the business.	EAP NGGT commitment (legislative driver)	
Customers would like to see fugitive emissions measured to allow more informed decisions	Reduce methane emissions (CO ₂ e) from leaks on the network during RIIO-2 – establish a baseline for methane emissions leaks on the network through improved monitoring and use that information to understand how to begin to reduce these where possible.	EAP NGGT commitment	Decarbonising our fleet will deliver consumer benefit through reduced local air pollution from particulates.
We should be applying a single cost of carbon in our decision-making processes	Continue to use a single consistent carbon price in our investment decisions for each tonne of controllable carbon dioxide equivalent (CO ₂ e) emitted.	EAP NGGT commitment	
Current non-operational emissions should be addressed	Replace 100% of our operational vehicle fleet with alternative fuel vehicles where there is a market alternative today (in 2019). Currently, this results in 30% of our operational fleet that will be delivered through purchasing 80 vehicles and install charging points at 45 sites with aim to reduce carbon emissions from operational transport by 22% on RIIO-1 averages to end of RIIO-2. Measure: tCO ₂ e, % vehicles replaced.	EAP NGGT commitment	<p>Carbon neutral construction provides a consumer value proposition valued at £0.3m (for more information on CVP3 please see annex A10.05).</p> <p>Methane emissions reductions could provide a consumer value of £2.2m (for more information on CVP6 please see annex A10.05).</p>
	Reduce carbon emissions for our business transport by 10% on RIIO-1 averages to end of RIIO-2 – Reduce vehicle use by promoting rail and virtual meetings, promote EVs on company car scheme and install electric car charging points at compressor sites. Measure: tCO ₂ e.	EAP NGGT commitment	
	We will focus on an efficiency-first approach to decrease the carbon emissions from our office energy use by 20% from a 2019/20 baseline to 2026. Measure: tCO ₂ e.	EAP NGGT commitment	
	We will purchase 100% of electricity for our offices from renewable sources.	EAP NGGT commitment	
We should consider generating own-use electricity from on-site renewables	Install renewable generation on our operational sites for our own use during RIIO-2, starting with compressor sites. Measure: # sites with renewable generation.	EAP NGGT commitment	
We should carbon-offset all construction activity	Achieve carbon neutral construction for major projects by 2025/26 by further implementing PAS20260 and PAS2080, supported by an offsetting policy and based on current business assumptions that 26,000tCO ₂ e can be offset with up to £310k. Measure: PAS 2060/80 compliance, construction tCO ₂ e in 2026.	EAP NGGT commitment	



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What our stakeholders have told us	Commitment	Output type	Consumer benefit
Work with supply chain to reduce emissions	75% of National Grid's top 250 suppliers (by category/spend) will have carbon reduction targets. Measure: % suppliers with carbon reduction targets.	EAP NG UK commitment	
Stakeholders are keen to know NGGT's plans on net zero targets and would like to see a discussion of this in the business plan. They have asked NGGT to provide a much clearer explanation of how our plan fits (or not) with the delivery of net zero, following recent legislation	We are proposing a reopener relating to net zero to ensure we are able to respond quickly to work towards net zero goals.	Uncertainty mechanism (annex A3.02). Trigger: End of year 2, 1% baseline revenue threshold.	
Get the right incentive framework to deliver maximum benefit to consumers	Please see annex A3.03 for further information on our incentive proposals.		
	Shrinkage incentive Retain shrinkage incentive scheme with access to seasonal markets to drive further consumer savings for RIIO-2. This incentive aligns our interests with that of consumers to minimise the cost of shrinkage.	ODI proposed cap: £5m / collar: £5m pa.	The incentive means that we manage shrinkage to minimise consumer cost exposure by procuring shrinkage energy at below average market price.
	EAP incentive We are proposing a potential new ODI to incentivise additional performance above and beyond our baseline commitments in measurable areas in our environmental action plan.	ODI proposed cap: £2.5m/ collar: £2.5m pa.	Improving the environment (air quality, carbon emissions, local community and the environment) is very important for domestic consumers. This incentive will help drive progress in this area over and above our baseline.
	GHG incentive Retain GHG incentive scheme proposing caps and collars to further drive performance.	ODI proposed cap: £1.5m/ collar: £1.5m pa Target: 2,897 metric tonnes.	

5. How will we deliver?

Emissions from our assets

We will measure and reduce methane leaks on our network:

- Following on from our MoRFE, RIIO-1 innovation project we are proposing to install real-time methane monitoring equipment at the highest risk areas of the network (compressor stations). This will give us accurate emissions readings at these locations, improving intelligence for maintenance and asset health programmes and providing the basis for more accurate emissions reporting.
- Using innovative recompression equipment at points in maintenance works that require pressure reduction through gas venting. This will prevent more methane from escaping to the atmosphere, which will be even more important in RIIO-2 due to anticipated higher venting.

Other emissions associated with our business

We have an ambition to reduce our carbon emissions from our operational fleet. Many of our sites are remote and away from centres of population and a proportion of our fleet are 4x4 vehicles and other vehicles for which there are no or limited low carbon commercially available vehicles. We will seek to replace 30% of our commercial vehicle fleet with low carbon-fuelled vehicles by 2026, which is 100% of the vehicle fleet for which low carbon alternatives are currently commercially available. We will

also install electric vehicle charging infrastructure on operational sites by 2026. This equates to 80 vehicles and charging points at 45 sites. This proposal is supported by an EJP in annex A16.18. Detail for how we will deliver on each of our EAP commitments can be found in the EAP annex A16.01.

Innovation

Table 16.23 climate change innovation for RIIO-2

Theme	Commentary
Fit for the future	Efficient leak detection on sites and pipelines.
Ready for decarbonisation	Intelligent leak detection on sites and pipelines. Design and construction to minimise our business carbon footprint.
Decarbonised energy system	Impact assessment of emissions and leakage rates from a hydrogen compatible network. Use of Carbon Capture and Storage to reduce our business carbon footprint

6. Risks and uncertainty

Methane emissions

We propose to use recompression equipment to help us reduce methane emissions during asset works. However, there will be a residual amount that cannot be recompressed, and it would therefore need to be vented. Black box flaring is a technology we haven't used before



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and it could further reduce methane emissions. We would have to install vents which enable combustion of the vented gas to produce CO₂ instead of methane, with reduced environmental impact. We need to do more work to understand if this would deliver consumer benefit and we will seek to explore the costs and application of the technology in the run-up to RIIO-2. We will also continuously look for innovative techniques to further

improve performance and delivery to meet stakeholder needs and those of end consumers.

EU-ETS

In terms of other uncertainties, there is a known uncertainty around the EU Emissions Trading Scheme; due to Brexit, the UK government is consulting on the future of the scheme. The outcome may increase costs for us as a business in meeting our climate change commitments, but this is currently unknown.

7. Our proposed totex costs for RIIO-2

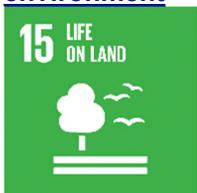
Table 16.24 climate commitment costs

Activity spend (£m 18/19 prices)	2022	2023	2024	2025	2026	Total RIIO-2	Annual RIIO-2	Annual RIIO-1
Methane monitoring	4.7	0.2	0.2	0.1	0.0	5.3	1.1	0.0
Methane recompression equipment	0.1	0.1	0.1	0.1	0.1	0.4	0.1	0.0
Fleet emissions reductions	0.8	0.8	0.1	0.3	0.4	2.5	0.5	0.0
Renewables on site	0.1	0.1	0.1	0.1	0.1	0.4	0.1	0.1
Support staff	1.1	1.1	1.1	1.1	1.1	5.5	1.1	1.5
Total spend	6.7	2.3	1.6	1.7	1.7	14.1	2.8	1.6

We are requesting £14.1m across the RIIO-2 period to reduce the impact we have on climate change. The largest expenditure in this chapter relates to methane monitoring and recompression, and the proposed expenditure for RIIO-2 would be approximately £5.3m. The spend is higher in year one, relating to the purchase of equipment. This will deliver long-term value for consumers by allowing us to identify leaks and make repairs earlier, reducing venting quantities.

Of the remaining spend identified, £0.4m relates to deployment of renewable generation on our operational sites. It also includes continuing support staff for delivery of our environmental commitments. We are also requesting £2.5m to support the roll-out of low carbon fuel vehicles to our operational fleet. This is supported by the justification paper in annex A16.18.

Responsible asset use and caring for the natural environment



1. What is this sub-topic about?

The UK government's 25 Year Environment Plan, published in January 2018, sets out a comprehensive long-term approach to protecting and enhancing the environment. The vision at the heart of the plan is that the current generation will be the first to leave the environment in a better state than they found it. As an asset-based business, the impact of our assets on the environment is incredibly important. This impact can be minimised through responsible procurement and construction processes, reusing and recycling assets and

materials where possible and being responsible custodians. We will look to enhance the environment on and around our sites in the interests of consumers.

Our network is getting older and we are faced with a challenge about how we should manage redundant assets in a way that is in line with our environmental and sustainability goals, whilst delivering value for consumers. Assets become redundant for a number of reasons. The needs of stakeholders or individual customers may have changed, legislation changes may mean that assets can no longer be used, or investment in new assets may mean that life-expired assets are no longer required. We are anticipating more work in this area, caused by the changing uses of the network and our ageing asset base.

We have identified 80 sites, asset groups or single assets that are already redundant or will become so during RIIO-2. This includes 138km of our 7,660km pipeline network and three out of 240 block valves. We will continue to monitor operational assets both as part of our normal annual planning processes and when customers tell us of a change in system use, so more assets may become redundant before and during RIIO-2. Our approach to addressing redundant assets should be driven by our social, economic, health and safety and environmental responsibilities. We are also mindful that there may be increasing mandates set by government in the future.

As well as addressing our redundant assets, in this section we will also describe our commitments around land and resource use and improving biodiversity as well as how we are embedding sustainability into the supply chain.



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2. Our activities and current performance

Track record

Redundant assets

We have spent more than our allowances in RIIO-1 (£13.15m compared to £12.41m) as we have seen more customer disconnections than anticipated. Unless specified in customer connection agreements, the costs of decommissioning fall to us. We also had unanticipated expenditure on rationalisation of Paull above ground installation (AGI) which was not in our original business plan. However, this was partly offset by deferring the removal of Feeder 1 as this decommissioned pipeline was too close to our Feeder 9 Humber river crossing to be able to carry out work safely.

Land and resource use

Over RIIO-1, we have worked to improve our non-operational land. To do this we have developed sustainability action plans for five sites. We are reusing and recycling materials. From a group perspective, in the last year, we reduced waste (in tonnage) from our offices by 20% and eliminated eight types of single-use plastic from our main head office site. We already divert 100% of our office waste from our main sites away from landfill.

Supply chain

In line with our approach on responsible asset use and caring for the natural environment, we have a supplier code of conduct which sets out how we expect our suppliers to operate.

Innovation

National Grid also has a strong history of supporting local communities. One way we do this is by managing our non-operational land in innovative ways. In 2015, we developed an innovative in-house natural capital evaluation tool to recognise and account for the value of

benefits provided by these natural assets, both to National Grid and our neighbours and communities. A natural capital valuation is an assessment that looks at the services we get from the natural environment. We cost these services, and this gives us the natural capital value. It is a way of monetising the services to effectively incorporate them into decision-making.

During RIIO-1, we also supported a Construction Industry Research and Information Association (CIRIA) working group to develop industry guidance 'Net Gain Best Practice Principles' for how to approach net gain in biodiversity and have been working to embed it as a requirement on our major construction projects.

Table 16.25 responsible asset use and caring for the natural environment innovation in RIIO-1

Projects	Description
Natural capital	An innovative tool to recognise and account for the value of benefits provided by natural assets, to National Grid, our neighbours and communities. Tool embedded into business as usual.
Valve care toolbox 1 and 2	This project includes assessment of options for optimising the use of redundant valves, included further research and development opportunities. Project ongoing.
Resource and asset reuse toolkit	Development of a toolkit, to support decisions to deliver circular economy opportunities, including making surplus assets and materials visible, defining processes and making it easier to reuse. Embedded, use ongoing in particular with our external contractor base.

3. What have stakeholders told us?

We have asked specific questions on redundant assets as part of our stakeholder engagement, and you can find our engagement log in annex 16.07.

Table 16.26 redundant assets stakeholder feedback

	Redundant assets
Stakeholder segments engaged	Consumer interest group, consultant/supply chain, customers energy network operator, environmental interest groups, GDNs, industry/trade bodies, other energy industry, regulator/government, university/think tank, domestic consumers, non-domestic consumers, major energy users.
Objective	Understand stakeholders' views on how we should manage the impacts of removing redundant assets from the transmission system and whether current or future consumers should pay for the demolition of redundant assets.
Channel/Method	Workshops, webinars, bilaterals, consumer listening, interactive slider tool, acceptability testing, surveys, deliberative engagement.
Key messages	Doing nothing is not acceptable to stakeholders. We should consider different approaches for pipelines and compressors. All options should be considered to repurpose equipment before removal.
Trade-offs and stakeholder influence on the plan	Stakeholders were asked if current or future consumers should pay for demolition of assets that are no longer required for operational use. 87% said that NGGT should prioritise projects on a risk basis and maintain the remaining assets until the point of removal. Costs should be shared between current and future consumers; 10% said NGGT should deliver this all in RIIO-2 even if it means costs for current consumers are increased and only 3% believed that NGGT should defer all works and pass costs on to future consumers.

Table 16.27 Land and resource use stakeholder feedback

	Land and resource use
Stakeholder segments engaged	Consumer interest group, consultant/supply chain, customers energy network operator, environmental interest groups, gas distribution networks, industry/trade bodies, other energy industry, regulator/government, university /think tank, domestic consumers, non-domestic consumers, major energy users.



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Objective	Environmental stewardship – understand stakeholders’ views on environmental stewardship and our role within it.
Channel/method	Workshops, webinars, bilaterals, consumer listening, interactive slider tool, acceptability testing, willingness to pay.
Key messages	We should do more in this space but should be careful of the role we take, making sure we complement and don’t duplicate what is already available. Stakeholders would like NGGT to return land to a good state when they have used it. These projects are seen as highly valuable to the community and should be done in cooperation with local communities. Stakeholders’ views are mixed on whether the funding should come from consumers or us.

Table 16.28 responsible procurement stakeholder feedback

Responsible procurement	
Stakeholder segments engaged	Procurement experts, consumer interest group
Objective	To understand views of procurement experts on the ambition of our goals
Channel/method	Webinar, playback consultation feedback
Key messages	Consumer interest groups would like us to consider supply chain practices and their impact on the environment and communities.
Trade-offs and stakeholder influence on the plan	Of the 65% of webinar attendees that responded to the question, 83% were satisfied that our commitment to carbon reduction in the supply chain was ambitious enough in terms of our proposed percentage of suppliers with carbon reduction targets. Of the 68% of webinar attendees that responded to the question, 100% felt that the scope of our procurement commitments in this space was correct.

4. Our proposals for RIIO-2 and how they will benefit consumers

Table 16.29 output summary ‘responsible asset use and caring for the natural environment

What our stakeholders have told us	Commitment	Output type	Consumer benefit
Demolish assets on a risk-based approach, prioritising assets that have the largest impact on stakeholders. We should consider how to repurpose our assets and use our land to maximise environmental benefit.	Address redundant assets across 80 assets, asset groups or sites. Act as custodians of our redundant sites by ensuring we reinstate them to a net gain in environmental value.	Price control deliverable (£82.6m). See annex A3.01. EAP NGGT commitment	This supports an affordable energy bill through protecting future consumers from the costs of disposing of assets they may not have benefited from. Supports a sustainable lower carbon future through responsible demolition including asset repurposing, releasing materials back into the value chain to reduce the need to mine raw materials. Improving biodiversity on non-operational land and reconstructing the environment when we have demolished a site, to bring positive benefits to nature and communities.
Stakeholders would like NGGT to return land to a good state when they have used it.	10% increase in environmental value on all non-operational land by the end of the RIIO-2 period. The GT estate is currently 1,093 hectares and environmental value is measured in Biodiversity units and £ natural capital. Measure: £ natural capital biodiversity (# units)	EAP NGGT commitment	Our work in these areas delivers on the consumer priority “I want you to facilitate delivery of a sustainable energy system” to minimise our impact on the environment and bring positive benefits to nature and communities. Enhancing the value of our natural assets on our non-operational land by 10% provides a consumer value proposition valued at £1.75m (for more information on CVP4 please see annex A10.05).
Stakeholders would like NGGT to consider supply chain practices and their impacts on the environment and communities.	Deliver 10% Net Gain in environmental value (including biodiversity) on all planned construction projects (including those delivered by third parties). Measure: # projects and % net gain	EAP NGGT commitment	
	We will lead in transparency on capital carbon and natural capital using data and tools to collaborate and drive environmental progress. We aspire to have a consistent industry approach to capital carbon and natural capital by 2026.	EAP NG UK commitment	
	We will reduce the waste we create at our offices (waste tonnage) by 20% from a 2019/20 baseline. Measure: waste in tonnes.	EAP NG UK commitment	



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	We will recycle 60% of our office waste Measure: % of waste recycled out of total.	EAP NG UK commitment
	We will reduce the waste intensity of our construction projects year on year from a 2019/20 baseline. Measure: Baseline tbc, likely tonnes waste/£100,000	EAP NGGT commitment
	On construction projects, we will achieve zero waste to landfill and we will increase the recycling or reuse materials by 2026. Measure: % of waste recycled out of total.	EAP NGGT commitment
	We will work with contractors to measure the proportion of recycled materials used on construction projects and will set a target during the RIIO-2 period to increase from this baseline. Measure: to be set during RIIO-2.	EAP NGGT commitment
	Extend the life of equipment where appropriate by refurbishment.	EAP NGGT commitment
	Pilot and implement circular economy principles for raw materials and goods procured and existing assets.	EAP NGGT commitment
	Reduce water use in our offices by 20% by the end of RIIO-2 compared to 2019/20 baselines. Measure: % reduction in water used.	EAP NG UK commitment
We would like to hear more about sustainable procurement	We will implement the ISO20400 sustainable sourcing process. Measure: alignment to ISO20400, (verification) # category strategies considering sustainability	EAP NG UK Commitment

Redundant assets proposal detail

We have considered what we should do with the redundant assets we have identified. This is a larger number of redundant assets identified than in RIIO-1 as we have been through an extensive business exercise to ensure our understanding of the redundant asset base is as accurate as possible. To address these assets our broad options are:

- **do nothing**, but we would still incur maintenance spend
- **disconnection** from energy supplies and leaving the asset or site in place, with expenditure to ensure the site environment remains safe
- **decommissioning** i.e. disconnecting the asset or site from energy supplies and removing part or all of it, re-purposing the materials or sending them for recycling.

For redundant assets, we propose a price control deliverable (PCD), and this can be found in annex A3.01. In summary, it will address work across the 80 assets, asset groups and sites we've identified so far as well as any others we identify during RIIO-2. Within this PCD, we propose to build in flexibility so that we can respond to newly identified changes by removing the highest risk (commercial, safety or environmental) assets first. The EJP for this proposed PCD can be found in annex A16.08.

We feel that deferring these actions would not be in line with the direction of travel from government or stakeholder feedback. Future costs and requirements for decommissioning are uncertain as legal requirements around them are subject to change. Therefore, there is a potential that the impact of delaying this work could result in increased costs through more stringent specifications for the management of waste from decommissioned assets, and for the remediation of land or higher costs of disposal. Any increased costs would be passed on to future consumers who have not had the benefit of using those assets and, if delayed for many years, could fall on

a smaller number of consumers who haven't benefited from the assets.

Based on the environmental impact of our redundant assets, our opinion is that addressing these now rather than later is the correct approach to take. We plan to develop a programme to prioritise action on assets that pose greatest environmental and safety risks and to comply with our contractual obligations.

5. How will we deliver?

Redundant assets

This will enhance biodiversity; it controls the risk of ground and water contamination and promotes environmental net gain.

Innovation

Table 16.30 responsible asset use and caring for the natural environment innovation themes

Theme	Commentary
Fit for the Future	Innovative alternatives for redundant assets. Decommissioning with robotics. Innovation from our supply chain.
Ready for decarbonisation	Innovative community engagement through augmented reality on major construction projects.
Decarbonised energy system	Innovative alternatives for redundant assets related to hydrogen and CCUS. Innovation for the transformation of Theddlethorpe terminal for hydrogen production or CCUS.

The Theddlethorpe site is a potential location for the export of CO₂ for carbon sequestration in the North Sea as part of a Carbon Capture Usage and Storage (CCUS) scheme, or it may be a location to produce hydrogen. Our current business plan includes the provision to undertake a feasibility study in RIIO-2 to consider these future activities for the site. Please see chapter 17.



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Supply chain

How we plan to deliver against our supply chain commitments is set out in the responsible procurement action plan Annex A16.20.

6. Risk and uncertainty

During RIIO-1, more assets became redundant than we'd anticipated so we have completed an exercise to understand how many redundant assets we should expect over RIIO-2. However, the final number will be influenced by customer behaviour. Where possible, we will recover costs from customers but, as many of our older contracts don't allow this, we would propose to defer additional work identified in RIIO-2 into RIIO-3.

7. Our proposed totex costs for RIIO-2

For our work on responsible asset use and caring for the natural environment, we anticipate a spend of £82.6m across the RIIO-2 period as per table 16.32 below. We anticipate this level of spend (which is higher than previous price control periods) to continue into RIIO-3. We will commit to funding costs for other elements of this chapter such as sustainable procurement and biodiversity investments from within the wider business and so we are not requesting specific funding for these activities during RIIO-2.

Table 16.31 cost assessment criteria redundant assets

Cost realised from RIIO1 actuals	Cost forecast based on competitive process	External benchmark	NARM or volume-driven PCD
Yes, where available.	No	Some costs are based on costs included as part of competitively tendered feasibility exercise	Bespoke PCD

Table 16.32 redundant assets costs

(£m 18/19 prices)	2022	2023	2024	2025	2026	Total RIIO-2	Annual RIIO-2	Annual RIIO-1
Redundant assets spend	4.2	24.6	21.4	15.0	17.5	82.6	16.5	2.7

Quarry and loss

1. What is this topic about?

We have contractual relationships with owners of the land that our pipelines pass through. As part of these contracts we are liable for the impact of our pipelines and this includes a responsibility to compensate and make good where the presence of a pipeline affects drainage or crop production. Some contracts require us to divert our pipeline if the land is needed for other purposes such as quarrying or development.

2. Our activities and current performance

We are committed to honouring these long-standing contracts. However, we have well-established processes to validate the claim and challenge the amount of any compensation when landowners apply for it. In each case, we adopt a solution that delivers value for consumers. For example, we might make annual payments, make full and final settlements, or carry out investigation and repairs (e.g. for drainage issues). During RIIO-1 we made several full and final settlements (106 at the time of our reopener submission) and these reduce some elements of our RIIO-2 liabilities. Examples of how we manage such claims can be found in the RIIO-1 reopener submission in this area⁸¹.

Funding for this suite of activities during RIIO-1 was provided via a quarry and loss reopener rather than through ex-ante funding. Ofgem observed during the RIIO-1 reopener that some of our costs in this space were predictable and therefore should be part of funding in the future.

Table 16.33 quarry and loss RIIO-1 innovation

Projects	Description
New techniques for the measurement of pipeline depth of cover as part of easement process	Use of X,Y,Z coordinate geographic data from in-line inspection (ILI) operations and analysing the results against ground level data from light detection and radar (LIDAR) surveys to calculate depth of cover. It is anticipated that this will become part of standard operating procedures resulting in a more accurate reporting mechanism for shallow pipelines.

3. What have stakeholders told us?

The majority of domestic and non-domestic consumers find the current proposal on compensating landowners acceptable. There is mixed appetite for further action in this area. We understand that a key stakeholder priority is for us to be efficient and affordable, and this principle feeds into driving down costs wherever possible.

Table 16.34 'quarry and loss' stakeholder feedback

What our stakeholders have told us	Commitment	Output type	Consumer benefit
The majority of domestic and non-domestic consumers find the current proposal on compensating landowners acceptable. We must be efficient and affordable.	Manage contractual obligations relating to quarry and loss efficiently. Costs relating to loss of development and sterilised minerals to be subject to a reopener.	Commitment and uncertainty mechanism Trigger: Year 2, 1% baseline trigger threshold	Delivering contractual obligations at lowest possible cost helps keep consumer bills lower.

⁸¹https://www.ofgem.gov.uk/system/files/docs/2018/05/nggt_quarry_and_loss_reopener_submission_08may2018_public_version_2.pdf



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4. Our proposals for RIIO-2 and how they will benefit consumers

We will continue to work with landowners to meet our legal and contractual obligations relating to the presence of our pipeline network and continue to ensure we are doing these in a way that minimises costs to the end consumer. This will cover issues such as loss of crops, impacts on drainage, loss of development or restrictions on extracting minerals.

5. How will we deliver?

We will deliver the best possible value for consumers while ensuring our legal obligations relating to quarry and loss are met. As in RIIO-1, we will negotiate outcomes that keep costs low in the long term, such as the use of full and final settlements, although these will reduce in number because of our success in RIIO-1.

Innovation

Table 16.35 quarry and loss innovation themes

Theme	Commentary
Fit for the Future	Innovative options for pipeline monitoring including innovation from our supply chain which could be part of easement process.

6. Risks and uncertainty

We are requesting funding for £19.1m for costs relating to compliance with our contractual requirements. We propose to retain an uncertainty mechanism in relation to loss of development and costs relating to loss of mining of sterilised minerals in case these breach the base revenue funding requested. This avoids us being subject to a windfall gain or loss because of circumstances that we can't control or predict. This uncertainty mechanism proposal is outlined in more detail in annex A3.02.

7. Our proposed costs for RIIO-2

The below costs have been split out to align with the BDPT's 2.02 direct- planned inspection and maintenance and 2.06 quarry and loss.

Table 16.36 'quarry and loss' costs

Activity spend (£m 18/19 prices)	2022	2023	2024	2025	2026	Total RIIO-2	Annual RIIO-2	Annual RIIO-1
Quarry and loss (2.06)	3.9	3.9	4.0	2.5	2.5	16.8	3.4	
Planned inspection and maintenance (2.02)	0.5	0.5	0.5	0.5	0.5	2.3	0.4	
Total	4.3	4.4	4.4	3.0	3.0	19.1	3.8	5.3

Supporting the communities we work in



1. What is this sub-topic about?

We have an impact on many communities when we carry out works ranging from routine maintenance to major projects. The expectation from external stakeholders, shareholders and communities affected by our work is that we should 'give something back'. Our purpose, vision and values articulate our desire to exceed the expectations of communities. Our work, through our employee volunteering and fundraising programmes, supports charities and community organisations. We also give grants to community groups, so they can deliver a range of social, economic and environmental benefits.

2. Our activities and current performance

Track record

Highlights of our activities during RIIO-1 include:

- Investing £106m (so far) supporting 42,000 vulnerable households across England, Scotland and Wales through the Warm Homes Fund.
- Launching a pilot programme called 'Grid for Good', which is a social mobility project to connect those in need to support services and networks.

- Partnering with designated charities each year including Macmillan Cancer Support, the Alzheimer's Society and City Year UK, raising £2.24m for partnered charities in RIIO-1 to date.
- Encouraging and supporting 5,000 employee volunteering hours and providing £1.13m to their chosen charities in matched giving.
- Awarding £1.2m in grants for communities located near to (or impacted by) our business activities.
- Spending more than 2,500 hours with young people to inspire them about science, technology, engineering and maths (STEM) subjects.
- Implementing human rights and supply chain due diligence strategies (including meeting modern slavery and conflict minerals commitments). We are now 12th best in the FTSE 100 Modern Slavery rating index.
- Supporting the government's Inclusive Economy Partnership to protect and improve mental health and equip people to get back to work.
- Being a member of the Living Wage Foundation and promoting commitment to the real living wage, both in our organisation and in the wider supply chain.
- Delivering the Energy & Utility Procurement Skills Accord commitments, which promote skills development and work towards bridging the skills gap in the energy sector; we received a recognition of our contribution.
- Committing to align with the government's own targets by awarding 33% of annual spend to small and medium-sized enterprises (SMEs) by 2020.



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- Promoting local employment by using the CompeteFOR tool for major projects with packages of work advertised to the local supply chain.
- Managing our environmental education centres with 35-40k visitors on average per year.
- Providing grants for community projects that are focused on delivering local social, economic or environmental benefits, where communities are affected by our work.
- Managing EmployAbility, an employee-led supported internship programme for young people aged 17-25 years with special educational needs. In 2018/19, we provided 13 placements at three of our office locations. We have achieved great results so far with 68% of our supported interns going into paid employment.
- We have signed the Social Mobility Pledge.

Table 16.37 supporting communities RIIO-1 innovation

Projects	Description
Noise mitigation tool	Development of a tool and process informed through market engagement to evaluate options for noise abatement, ensuring the Best Available Technique (BAT) solution for a given project is identified. Projected savings of £150k per site over a 10- year period.
Valve pits insulation	Assessment of alternative insulation materials in valve pits to reduce noise pollution in neighbouring communities. Projected savings of £550k over a 10-year period due to a reduction in noise pollution investigations and frequency of replacement.

3. What have stakeholders told us?

Table 16.38 supporting local communities stakeholder feedback

Supporting local communities	
Stakeholder segments engaged	Consumer interest group, consultant/supply chain, customers energy network operator, environmental interest groups, gas distribution networks, industry/trade bodies, other energy industry, regulator/government, university/think tank, domestic consumers, non-domestic consumers.
Objective	To understand views on our role in supporting local communities.
Channel/method	Workshops, webinars, bilaterals, consumer listening, interactive slider tool, acceptability testing, willingness to pay.
Key messages	Customers value the work we do in this area and think we should make it more visible. We should continue to look for opportunities to support local communities within the realm of our business. Activities should promote social sustainability in both the short and long term, these programmes also need to be well advertised to everyone in the community.
Trade-offs and stakeholder influence on the plan	Supporting the local community is of importance to stakeholders. However, views are not consistent across all stakeholder groups and evidence collected. Domestic consumers tended to support it, while other stakeholders offer less support. Ideas supported by domestic consumers on ways NGGT can help the public resulted in suggestions similar to those currently employed/proposed by NGGT in the business plan. The majority of domestic consumers believe that costs for NGGT's charity and community work should be shared between NGGT and customers. However, a small proportion of consumers also believe that costs should be borne entirely by NGGT. This is aligned with UKERC evidence, which found that the majority of customers felt that social and environmental goals should be funded by Government or energy companies ⁸² . Domestic consumers are willing to pay a small additional amount to help fuel poverty. While most consumers and stakeholders agree that this is an important issue, many feel acting to help fuel poverty is not the responsibility of NGGT. This view is particularly strong among non-domestic consumers and major energy users.

Table 16.39 responsible procurement stakeholder feedback

Responsible procurement	
Stakeholder segments engaged	Procurement experts
Objective	To understand views of procurement experts on the ambition of our goals.
Channel/method	Webinar
Key messages	Of those that responded to the question: 97% were satisfied or very satisfied that our living wage commitments are ambitious enough, 100% felt that the scope of our procurement commitments in this space was correct.

⁸² <http://www.ukerc.ac.uk/publications/paying-for-energy-transitions.html>



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4. Our proposals for RIIO-2 and how we will deliver consumer value

Table 16.40 output summary supporting communities

What our stakeholders have told us	Commitment	Output type	Consumer benefit
<p>Customers value the work we do in this area and think it should make it more visible.</p> <p>We should continue to look for opportunities to support local communities within the realm of our business.</p> <p>Activities should promote social sustainability in both the short and long term, these programmes also need to be well advertised to everyone in the community.</p>	We are developing national and local skills development partnerships and initiatives, with a focus on the lower income communities we serve. We aim, across the UK regulated businesses, to give access to 6,000 young people from these communities over the next five years, tracking their progress from first interaction right through to potential employment in National Grid, our partners, our suppliers, or adjacent companies and industries.	NG group commitment	We are dedicated to working with young people, who are the future of our business, and our country. The Engineering UK 2018 report showed that engineering companies will need 203,000 more people with Level 3+ engineering skills every year to 2024.
	We will assign 0.3% of all major project funding to community-led community improvement in locations where we have a presence, without requesting additional funds	EAP NGGT commitment	Assigning 0.3% of major project funding to community improvements provides a consumer value proposition valued at £0.6m (for more information on CVP5 please see annex A10.05).
	Continue to fund the community-led grant scheme of up to £20k near to a construction project and £10k near our operations	EAP NG UK commitment	
	Educate the public about environmental issues through outreach linked to major compressor emissions projects and through our education centres.	EAP NGGT commitment	
	Require all our suppliers, Tier 1 and beyond, pay the real living wage to their UK workers and will verify this at Tier 1 in relevant categories. Measure: # of suppliers signed up to Skills Accord (or equivalent), % technical headcount under training plans	NG UK commitment	Responsible procurement activities create positive effects down the supply chain with positive impacts on communities.
	Deliver impact in supply chain at scale by engaging with the supply chain through relevant forums. Measure: # actions driven through engagement # suppliers actively engaged through SCSS scorecard	NG UK commitment	
	Promote skills development in the supply chain by requesting that a minimum of 5% of the supply chain technical headcount is upskilled annually. Measure: # of suppliers signed up to Skills Accord (or equivalent) % technical headcount under training plans	NG UK commitment	
	Use influence in sector to identify and address potential human rights risks in the supply chain. Measure: # action plans in place with suppliers	NG UK commitment	
	Promote equal opportunities in the supply chain. Measure: # events supported to identify and support new suppliers, # of projects using CompeteFor (a tool used to advertise opportunities in the supply chain)	NG UK commitment	

5. How will we deliver?

We will reduce and simplify our RIIO-1 period initiatives to make sure we prioritise the activities that offer the most value for society. We will focus our societal impact work on mitigating the effects (to vulnerable consumers in particular) associated with the major infrastructure changes that are likely to be carried out as part of the transition to a low carbon energy system.

How we plan to deliver against our supply chain commitments is set out in the responsible procurement action plan Annex A16.20.

Table 16.41 supporting communities innovation themes

Theme	Commentary
Fit for the future	Innovative alternatives to minimise community disruption.
Ready for decarbonisation	Innovative community engagement at our environmental education centres.

6. Our proposed totex costs for RIIO-2

We have not requested specific allowances for spend in this area for RIIO-2. This was similar to RIIO-1 where we didn't set RIIO-1 targets to cover citizenship activities but many of our programmes have featured in the annual customer and stakeholder submissions to Ofgem.