



Annex 16.01

Environmental Action Plan and Methodology December 2019

As a part of the NGGT Business Plan Submission

nationalgrid

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Introduction

We care about the environment and as a responsible business, we are committed to delivering environmental benefit, prioritising the issues that matter most to stakeholders. We recognise in particular the challenge ahead for the UK to meet net-zero carbon emissions by 2050. We stand ready to meet this challenge and want to protect the environment by providing options to reach net zero carbon by 2050 at lowest impact to society.

The environment factors into our decision making for all major investment proposals across our investment decision packs. This ranges from specific investments where deliverables are driven by environmental challenges to including cost of carbon in decision making processes through our cost benefit analyses. In addition to this, we are setting out a number of specific commitments within this Environmental Action Plan (EAP) to demonstrate how we, as a business, intend to reduce our impact on the environment. This EAP covers a suite of commitments with both legislative and non-legislative drivers.

Our EAP covers five broad areas which include the following key commitments:

Air quality – compressor emissions

We will work to reduce our NOx emissions from the business by the end of RIIO-2 and beyond. This includes replacing some of the most-polluting compressors on our network with cleaner technologies, improving local air quality.

Climate change – our climate commitment

Our key commitment in this space is to develop a science based target by 2023. 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. While we are developing the target we are setting out a package of commitments that begin to help us to reduce our carbon footprint.

Responsible asset use

We will address eighty redundant assets, asset groups or sites, supporting a sustainable lower carbon future through responsible demolition including asset repurposing.

Caring for the natural environment

We'll make sure both new construction and demolition projects include initiatives to protect and promote biodiversity, and we will enhance the value of natural assets on non-operational land.

Leadership for change

We will embed sustainability in our decision making, be transparent on our progress, and work with industry to drive forward the sustainability agenda.

We are proposing that each commitment set 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 (see annex A3.03 for more information).

In terms of our proposals relating to the decarbonisation of heat, they are not specifically included in the EAP. More information on these can be found in chapter 17 of our business plan.

Environmental Action Plan

| A: Topic | B: Strategy (What) | C: Tactic (How) | D: Measurement (Metrics) | E: Source of target (legislative, voluntary, group) <u>All commitments are NGGT commitments unless explicitly stated</u> | F: RIIO-1 Performance (18/19) Red = not currently on track; Amber = at risk of not delivering; Green = on track to deliver | G: What stakeholders have told us about this area | H: Expert Stakeholder or policy maker | I: Expert feedback (benchmarking) or relevant legislation |
|--|--|---|--|--|---|---|--|---|
| <p>A. Air quality: Compressor emissions compliance</p> | <p>Enable reduction in NOx emissions from the business by the end of RIIO-2.</p> | <p>Maintaining and operating our BAT equipment as the lead units for compression.</p> <p>As defined in the CECS, we will replace 2 compressor units in RIIO-2 and, subject to FEED, start work at a further 3 sites to be delivered in RIIO-3. These will help reduce NOx emissions into RIIO-3 and beyond.</p> | <p>Reduction in NOx emissions per hour of gas turbine running. Calculated using the average for RIIO-2 compared to the average for RIIO-1. Reduction dependent on supply and demand patterns, based on 2015 – 2019 (RIIO-1 period) this would be in the region of 10% during RIIO-2.</p> <p>Delivery of new compressors measured through price control deliverables (see Annex A3.01).</p> | <p>No specific reduction target but specific legislative requirements (IED, MCP) drive investment.</p> | <p>N/A</p> | <p>Stakeholders value our work on reducing emissions to improve local air quality and believe we should get on with it as soon as possible. Domestic consumers also consider air quality to be important.</p> | <p>UK Government</p> | <p>Clean air strategy "We will bring forward provisions on air quality in 2019. This will include an up to date legislative framework for tackling air pollution at national and local level, tying this into the development of the new environmental principles and governance framework to be outlined in the Environment Bill."</p> |
| <p>B. Our Climate Commitment: reduction in carbon emissions by 2026</p> | <p>Reduce methane emissions (CO₂e) from leaks on the network during RIIO-2</p> | <p>Establish a baseline for methane emissions leaks on the network through improved monitoring during RIIO-2 and use that information to understand how to begin to reduce these where possible</p> | <p>Baseline to be established in RIIO-2.</p> <p>Kg of CO₂e per mcm transmitted / Tonnes of CO₂e</p> | <p>NG Group 'our contribution' target to reduce emissions by 80% by 2050, from 1990 baseline (note these are due to be revised in light of recent legislation)</p> | <p>68% reduction in group emissions as of last year</p> | <p>Customers would like to see fugitive emissions measured to allow more informed decisions</p> |  |  |
| | <p>Replace 100% of our operational vehicle fleet with alternative fuel vehicles where there is a market alternative today (in 2019) with aim to reduce carbon emissions from operational transport by 22% on RIIO-1 averages to end of RIIO-2.</p> | <p>Currently, this results in 30% of our operational fleet that will be delivered through purchasing 80 vehicles and install charging points at 45 sites</p> | <p>Tonnes of CO₂e for emissions % vehicle replacement</p> <p>Baseline: RIIO-1 average</p> | | <p>N/A</p> | <p>Current non-operational emissions should be addressed</p> | | |
| | <p>Reduce carbon emissions for our business transport by 10% on RIIO-1 averages to end of RIIO-2</p> | <p>Reduce vehicle use by promoting rail and virtual meetings, promote EVs on company car scheme and install Electric car charging points at compressor sites</p> | <p>Tonnes of CO₂e Baseline: RIIO-1 average</p> | | | | | |
| | <p>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</p> | <p>Energy saving initiatives</p> | <p>Tonnes of CO₂e Baseline: 2019/20</p> | | | | | |
| | <p>We will purchase 100% of electricity for our offices from renewable sources</p> | <p>Purchase 100% renewable energy</p> | <p>Tonnes of CO₂e</p> | | <p>NG UK target</p> | | | |

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|--|---|---|--|---|---|--|---------------------------------------|---|
| C. Responsible Asset Use | Continue to participate in the EU-ETS and use as an opportunity to provide focus on our CO ₂ emissions across the business | Continue to follow in-house processes for 1 st , 2 nd , 3 rd line assurance of direct carbon emissions from permitted sites | No direct measure – commitment a behavioural driver | NG UK target EU-ETS participation driven by legislative requirements | N/A | We should meet legal requirements as a minimum | | |
| | Achieve carbon neutral construction for major projects starting in RIIO-2 | 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. This would include projects such as Wormington compressor and Bacton terminal in RIIO-2. Investigate potential for Bacton Redevelopment as a Carbon Neutral Site | Compliance to PAS2060 and PAS2080 Construction tonnes of CO ₂ e in 2026 | NG UK Reduction in carbon intensity Capital schemes (ET & GT) of 10% each year from 2015 to 2020 | 37% reduction achieved | We should consider carbon-offsetting all construction activity | | |
| | 75% of National Grid's top 250 suppliers (by category/spend) will have carbon reduction targets | Engage with our supply chain to set carbon reduction targets for suppliers engaged through the CDP supply chain program (top 250 by category/spend) | % of suppliers with reduction targets | NG Group Target 80% of top 250 suppliers reporting on CDP supply chain. This target relates to reporting – our RIIO-2 ambition stretches this to set reduction targets. | 92% of Top 250 suppliers disclosing to CDP globally 96% response in UK | Work with supply chain to reduce emissions | | |
| | Install renewable generation on our operational sites for our own use during RIIO-2 - starting with compressor sites | Install renewable generation, e.g. solar panels, on our sites to generate energy for site use and export excess to the grid for free | # sites with renewable generation OR kWh generated (therefore saved) | NG Group target to reduce emissions by 80% by 2050, from 1990 baseline (note these are due to be revised in light of recent legislation) | N/A | We should consider generating own-use electricity from on-site renewables | | |
| | Deliver a science-based target for gas transmission by 2023 | Establish a project team to further develop the business carbon footprint, identify costed options and develop roadmap for delivering Net Zero; linked to wider delivery of decarbonising the NTS | Target developed | Ofgem Business Plan requirement | N/A | N/A | | |
| C. Responsible Asset Use : Minimise waste and resource use, keep resources in use for as long as possible, recover and regenerate products and materials at the end of each service life | We will implement the ISO20400 sustainable sourcing process. | Alignment to ISO20400 Sustainable Procurement Guidance Standard Gap analysis against ISO20400 | Meeting ISO20400 Guidance (verification) # category strategies considering sustainability | NG UK target | Procurement strategy has been created but not aligned to ISO 20400 | Stakeholders would like NGGT to consider supply chain practices and their impacts on the environment and communities | | |
| | We will reduce the waste intensity of our construction projects year on year based on a 2019/20 baseline | We will continue to collect and measure our waste volumes to set a baseline for 2019/20. We will target the most waste intensive aspects of our project and work with our contractor resource forum to identify opportunities to reduce. | Target to be set during RIIO-2 period- baseline data dependent. Likely to be tonnes of waste/£100,000 | N/A | N/A | | | |

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|----------|---|--|---|--|---|--|---------------------------------------|---|
| | On construction projects, we will achieve zero waste to landfill and we will increase the recycling or reuse materials by 2026 | We will achieve zero waste to landfill and set a target on recycling rates using 2020/21 data to set a baseline, applicable to waste that can be diverted from landfill in accordance with the carbon trust standard | % waste recycled | NG UK target to achieve zero construction waste to landfill by 2020 | 98% diverted last year | N/A | | |
| | 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 | This is not currently measured so reporting process will be defined and performance baselined at the start of RIIO-2 | Measure to be set within the RIIO-2 period | N/A | N/A | N/A | | |
| | Pilot and implement circular economy principles for raw materials, goods procured and existing assets | Analyse current reuse projects for their circularity and refine to create circular processes; work with PMC Purchase products that can be recycled / reused | Number of Pilots that implement circular economy principles, circularity metric defined. Process to purchase products that can be recycled/reused Circular economy framework developed. Carry our gap analysis to industry standard such as BS 8001 and work towards alignment | N/A | N/A | N/A | | |
| | Address 80 redundant assets, asset groups or sites in RIIO-2 | Prioritise highest risk assets. Decommission where assets are redundant, repurpose where possible, leave pipelines purged and filled with nitrogen. | Measured through a Price control deliverable on the 80 identified assets, asset groups or sites. | N/A | RIIO-1 decommissioning work undertaken but not on these specific assets | Demolish assets on a risk-based approach, prioritising assets that have the largest impact on stakeholders | | |
| | Extend the life of equipment where appropriate by refurbishment | Refurbish equipment where possible Baseline over 2019/20 then target the most waste intensive parts of our work and work with our supply chain to reduce waste in these areas | #refurbished assets | NG Group 'our contribution' target to 'reuse or recycle' 100% of recovered assets - the target for RIIO-2 focuses on extending the life of these assets as much as it is feasibly possible | N/A | N/A | | |
| | We will reduce the waste we create at our offices (waste tonnage) by 20% from a 2019/20 baseline | Continue to roll out existing programmes to all sites Continue to roll out existing programmes to all sites | Waste in tonnes. Requires 3 rd party waste contractor information to confirm baseline. | Internal target to remove all single use plastics in our offices by 2020/21 | 46% of our office waste is recycled and 95% of it diverted from landfill | N/A | | |
| | We will recycle 60% of our office waste by 2026 | | % of waste recycled out of total. | NG Group 'our contribution' to achieve 100% landfill diversion in our offices and 95% on our operational sites. The focus for RIIO-2 is to move up the waste hierarchy to recycling | | | | |
| | Reduce water use in our offices by 20% by the end of RIIO-2 compared to 2019-20 baselines | Implement a water reduction programme at all sites owned and operated by NGGT | % reduction in water used | NG UK commitment | N/A | N/A | N/A | N/A |

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|---|---|--|---|---|---|---|---------------------------------------|---|
| | Assess and report our risk from climate change on our assets on network operation during RIIO-2 and beyond | Actively assess risks from climate change | Reduction in risk | NG Group commitment to align to Taskforce for Climate Related Financial Disclosure (TCFD) recommendations | In progress | We should adopt a proactive or risk-based approach to the management of environmental risks | N/A | N/A |
| D. Caring for the natural environment: material consideration is given to the value of nature and net gain in environmental value is achieved | 10% increase in environmental value on all non-operational land by the end of the RIIO-2 period. The GT estate is currently 1,093hectares and environmental value is measured in Biodiversity units and £ natural capital. | Natural Capital tool is used to assess how land can be developed and used to enhance the value of ecosystem services. Sustainability action plans on how we manage our land are managed and monitored. Tenancy agreements should include biodiversity clauses. | £ natural capital biodiversity (# units) | NG Group target to enhance environment at 50 sites by 2020 | 37 sites completed so far | N/A | [REDACTED] | [REDACTED] |
| | Act as custodians of our redundant sites by ensuring we reinstatement them to a net gain in environmental value | Identify local environmental initiatives e.g. living landscapers to inform our reinstatement plans. | % of net gain achieved | N/A | N/A | We should consider how to repurpose our assets and leave our land to maximise environmental benefit | [REDACTED] | [REDACTED] |
| | Deliver 10% Net Gain in environmental value (including biodiversity) on all planned construction projects (including those delivered by third parties). | Net Gain target is applied on all schemes that lead to permanent or temporary habitat loss, negative impacts on the habitat condition or provision of ecosystem function e.g. screening, flood management, recreation | #projects and % net gain | NG UK target to achieve net gain in major construction projects by 2020 | New target so process is still being set up for reporting | N/A | [REDACTED] | [REDACTED] |
| | Educate the public about environmental issues through outreach linked to major compressor emissions projects | Engage with local community through school visits, local talks, including the environmental impact of our major projects | Community engagement will be measured through our proposed new community engagement reputational ODI. | N/A | N/A | N/A | [REDACTED] | [REDACTED] |

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|---|--|--|---|---|---|---|---------------------------------------|---|
| E. Leadership for Change: we will demonstrate organisational leadership and make the right strategic choices; | An engaged workforce on environmental issues that lead by example | Implement a comprehensive employee engagement programme on environmental issues including emissions, waste, reduction in plastics and employee travel | % of employees engaged with environmental activities - employee engagement survey/ attendance of events/learning/training | N/A | We have an environmental champions network in place. | NA | NA | NA |
| | Sustainability is fully embedded in our decision making | Carbon pricing is influencing decisions and whole life costing is assessed in the decision-making process. | A clear framework for the different decision-making points | Group target of all decisions over \$10m should consider carbon efficiency | NA | | NA | NA |
| | Produce an annual environmental report (including BCF reporting). | Publish Gas Transmission environmental performance annually and is shared for feedback with stakeholders. Trust in National Grid GT as an environmentally responsible company is increased. | Annual publication of results and feedback where applicable | Licence Obligation | NA | Licence obligation | NA | NA |
| | We will lead in transparency on capital carbon and natural capital using data and tools to collaborate and drive environmental progress. | We will drive forward industry in areas of sustainability where we are leading. We will work collaboratively through industry working groups to deliver this. We will focus on two areas: natural capital/net gain and capital carbon. | NA | NG UK commitment | NA | NA | NA | |

National Grid Gas Transmission – RIIO-2 Environmental Action Plan Methodology

Definitions

| Title | Definition |
|----------------------|---|
| Aspect | An environmental aspect is an element of an organisation's activities, products or services which can interact with the environment |
| Inherent risk | The risk arising from a specific hazard before any control measures have been taken to manage it |
| Impact | An environmental impact is any change to the environment, whether positive or negative |
| Residual risk | The exposure arising from a specific risk after appropriate control measures have been put in place and which are assumed to be effective. |
| Lifecycle | Consecutive and interlinked stages of a product (or service) system, from raw materials from natural resources to final disposal. Life cycle stages include acquisition of raw materials, design, production, transportation/ delivery, use, end-of-life treatment and final disposal |

1. Introduction

1.1 Purpose of the document

This document:

- summarises National Grid's Gas Transmission approach and methodology to developing an Environmental Action plan for the RIIO-2 period, and
- sets out the specific environmental targets which we intend to achieve by the end of the 2021/22-2025/25 period.

1.2 Background to this document

For the new regulatory period of RIIO-2, Ofgem expect companies' focus to be on the following impacts:

- Decarbonising the energy networks – with a focus on business carbon footprint and embedded carbon.
- Reducing networks' other environmental impacts i.e. pollution to local environment; resource use and waste management; biodiversity loss; and other adverse effects that are specific to each sector
- Supporting the transition to an environmentally sustainable low-carbon energy system

As part of this new environmental framework, in the [RIIO-T2 Business Plan Guidance](#) Ofgem set out that companies should embed considerations for these three impact areas into their RIIO-2 business plans. This should take the form of an Environmental Action Plan (EAP), including a robust methodology setting out:

- a comprehensive review of the significant environmental impacts arising from its network
- the opportunities and challenges for addressing material environmental impact areas
- an options analysis to identify value for money environmental impact reduction initiatives
- evidence that consideration of environmental impacts was coordinated with the company's wider business planning
- evidence that wider stakeholders have been involved in the assessment processes and decisions

Figure 1 overview of development of the Environment Action Plan

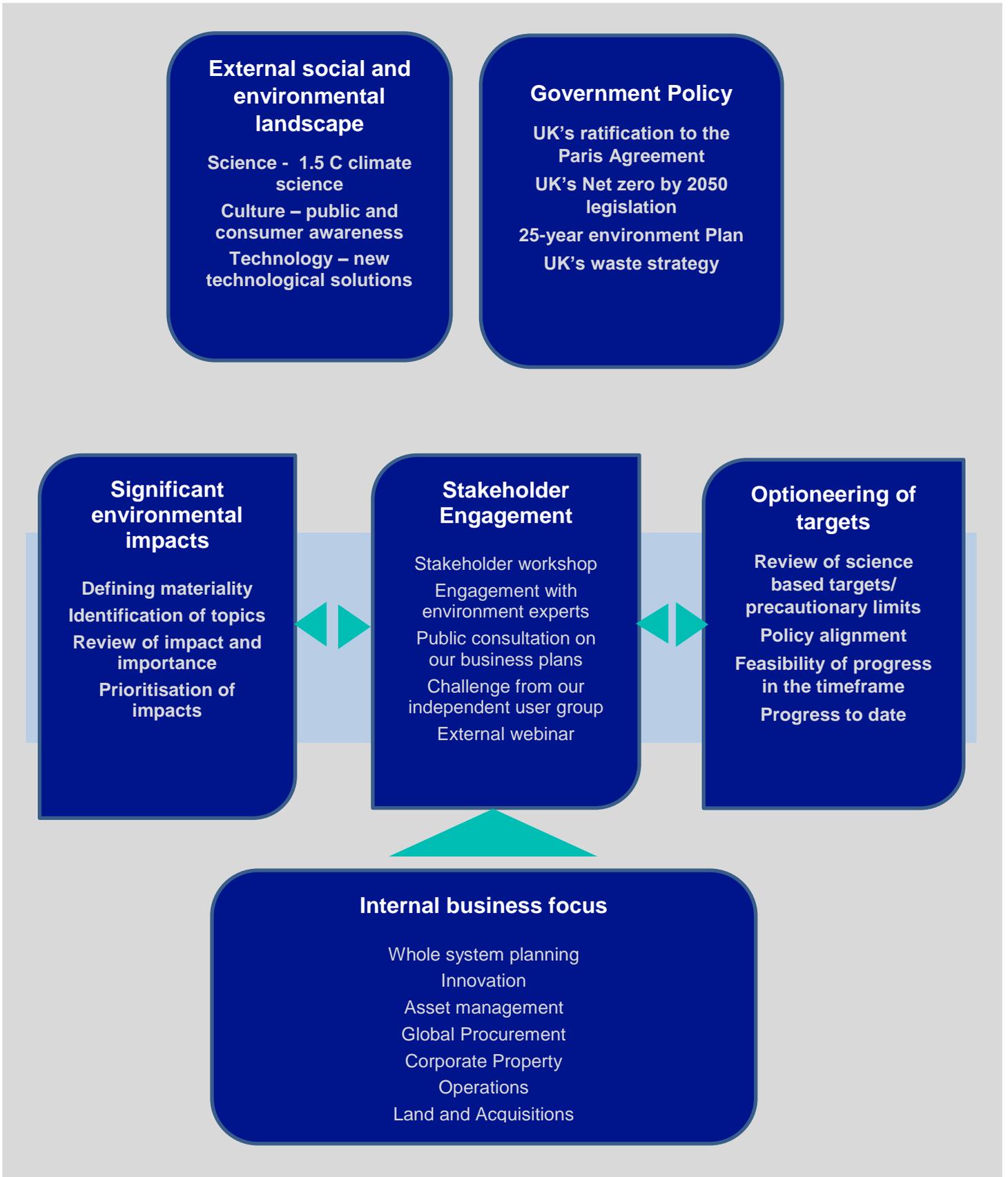


Figure 2. Environmental Action Plan commitments in summary form (full table at beginning of the document)

| | |
|--|---|
| <p>A. Air quality: Compressor emissions compliance</p> | <p>Enable reduction in our NOx emissions from the business in RIIO-2 by maintaining and operating our BAT equipment as the lead units for compression.</p> <p>We will also replace to compressor units in RIIO-2 and subject to FEED, start work at a further 3 sites to be delivered in RIIO-3. These will help reduce NOx emissions into RIIO-3 and beyond.</p> |
| <p>B. Our Climate Commitment: reduction in carbon emissions by 2026</p> | <p>Reduce methane emissions (CO2e) from leaks on the network during RIIO-2 and 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.</p> <p>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.</p> <p>Reduce carbon emissions for our business transport by 10% on RIIO-1 averages to end of RIIO-2</p> <p>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</p> <p>We will purchase 100% of electricity for our offices from renewable sources</p> <p>Continue to participate in the EU-ETS and use as an opportunity to provide focus on our CO2 emissions across the business</p> <p>Achieve carbon neutral construction for major projects starting in RIIO-2</p> <p>75% of National Grid's top 250 suppliers (by category/spend) will have carbon reduction targets</p> <p>Install renewable generation on our operational sites for our own use during RIIO-2 - starting with compressor sites</p> <p>Deliver a science-based target for gas transmission by 2023</p> |
| <p>C. Responsible Asset Use : Minimise waste and resource use, keep resources in use for as long as possible, recover and regenerate products and materials at the end of each service life</p> | <p>We will implement the ISO20400 sustainable sourcing process.</p> <p>We will reduce the waste intensity of our construction projects year on year based on a 2019/20 baseline</p> <p>On construction projects, we will achieve zero waste to landfill and we will increase the recycling or reuse materials by 2026</p> <p>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</p> <p>Pilot and implement circular economy principles for raw materials, goods procured and existing assets</p> <p>Address 80 redundant assets, asset groups or sites in RIIO-2</p> <p>Extend the life of equipment where appropriate by refurbishment</p> <p>We will reduce the waste we create at our offices (waste tonnage) by 20% from a 2019/20 baseline</p> <p>We will recycle 60% of our office waste by 2026</p> <p>Reduce water use in our offices by 20% by the end of RIIO-2 compared to 2019-20 baselines</p> <p>Assess and report our risk from climate change on our assets on network operation during RIIO-2 and beyond</p> |
| <p>D. Caring for the natural environment:</p> | <p>10% increase in environmental value on all non-operational land by the end of the RIIO-2 period.</p> <p>Act as custodians of our redundant sites by ensuring we reinstatement them to a net gain in environmental value</p> |

| | |
|--|---|
| material consideration is given to the value of nature and net gain in environmental value is achieved | Deliver 10% Net Gain in environmental value (including biodiversity) on all planned construction projects (including those delivered by third parties). |
| | Educate the public about environmental issues through outreach linked to major compressor emissions projects |
| E. Leadership for Change: we will demonstrate organisational leadership and make | Implement a comprehensive employee engagement programme on environmental issues including emissions, waste, reduction in plastics and employee travel |
| | Carbon pricing is influencing decisions and whole life costing is assessed in the decision-making process |
| | Produce an annual environmental report (including BCF reporting). |
| | We will lead in transparency on capital carbon and natural capital using data and tools to collaborate and drive environmental progress. |

2. A comprehensive review of the significant environmental impacts from our network

The first step in developing an environmental plan for the Gas Transmission business involved carrying out a comprehensive review of the significant environmental impacts created from our network. This involved a review of the environmental aspects that relate to our activities, products and services; those we can control and those we can influence. A review of Gas Transmission's environmental aspects is done annually, in alignment with our externally accredited Environmental Management System.

2.1 Step 1: identification of environmental aspects

To identify the environmental topics for focus during RIIO-2, a bottom up approach was taken. Environmental specialists from the Gas Transmission business mapped business activities against their impact on the environment, throughout the lifecycle of our operations and value chain.

Figure 3. Environmental impact across the lifecycle



Raw materials: any activity undertaken for the acquisition of raw materials, used to create the end products.

Design: how the product/ services is designed. Future risks from other aspects of the life cycle can be considered at this stage and deigned out of the product/ service

Manufacturing: how the product/ services is created. This can be an energy intensive part of the life cycle.

Transportation/ logistics: the packaging, transport and logistics involved with delivering the services/ products to the destination

Use/ operation: the impact of the product/ service during its intended use.

End of life treatment: disposal of the product/ service at the end of life. Having recyclable/ reusable aspects is highly important, following the waste hierarchy.

This process involved the

- identification of activities, products and services undertaken, or those that the Company has influence over
- evaluation of significant environmental impacts by determining the inherent impact or risk of the activity assuming no managerial controls in place,

- the residual risk following an evaluation of the control measures that have been put in place and which are assumed to be effective.

We started by target setting on what is material and significant to our business to manage risks and deliver a positive impact. This process is designed to identify and give significance to sustainability and environmental efficiencies; reduce risk and deliver societal improvements. Air quality impacts in relation to compressor emissions compliance were excluded at this stage of development of plan target as a project was already underway to establish legislative compliance options for our compressors.

We reviewed our Environmental Aspects and Impacts register, aligned to ISO14001:2015 to ensure that all our significant risks and opportunities had been considered. The summary of the aspects and impact register are below in table 1 & 2. This is a summary of the Environmental Aspects and Impacts register, aligned to ISO14001:2015 to ensure that all our significant risks and opportunities have been considered.

2.2 Define Scope

The environmental action plan is a requirement under RIIO-2, it contains our commitments relating to our own material environmental impacts with clear targets that we will achieve by the end of RIIO-2.

An issue is considered material to National Grid if it meets one of these three conditions:

1. it is an environmental impact that is considered high risk/ opportunity for our business
2. it is important to our stakeholders – such as consumers, customers, employees, government, investors, NGOs and suppliers
3. it is required by the regulator for inclusion in the plan

2.3 Identifying Topics

Table 1: High impact/ high risk in environmental aspects

| Design | Transportation / logistics | Use/ Operation | End of life treatment | Indirect activities |
|--|--|---|---|--|
| <ul style="list-style-type: none"> • Capital Carbon from construction design • Loss of natural capital/ biodiversity | <ul style="list-style-type: none"> • Business travel • Operational travel • Employee travel | <ul style="list-style-type: none"> • Fugitive emissions from equipment • Venting from compressors • Air pollution emisisions • Use of energy from fixed sites • Use of water • Noise pollution from compressors | <ul style="list-style-type: none"> • Generation of waste from our offices, operational sites and construction • Decomissioning of plant and equipment • Disposal of waste from sites | <ul style="list-style-type: none"> • Supplier or supply chain management using unsustainable resources • Environmental impacts associated with extraction, manufacture, storage and delivery of products and services procured and used by National Grid |

Table 2: High impact/ high opportunity in environmental aspects

| Design | Transportation/ logistics | Use/ Operation | End of life treatment | Indirect activities |
|---|---|--|--|---|
| <ul style="list-style-type: none"> • Reduce capital carbon from construction design as much as it is feasible and offset the remaining to deliver net zero construction • Incorporate net gain at a design stage, so no biodiversity is lost. | <ul style="list-style-type: none"> • Alternative Fuel Vehicles to reduce impact of transport and logistics | <ul style="list-style-type: none"> • Reduce fugitive emissions • Reduce emissions from venting • Purchase 100% renewable energy • Enhance the land of our non-operational site to improve natural capital • Reduce water use at our sites | <ul style="list-style-type: none"> • Follow the waste hierarchy, focussing on reusing and recycling • Focus on circular models | <ul style="list-style-type: none"> • Supplier engagement on sustainability issues • Mandated requirements for suppliers to follow |

2.4 Defining material impact areas

At National Grid, stakeholder views on sustainability issues are pivotal to ensure we focus on significant aspects important to them. Materiality helps us identify and prioritise the sustainability issues that matter most to our business and to our stakeholders.

An issue is considered material to National Grid if it meets these conditions:

1. It's an environmental impact that is considered high risk/ high opportunity for the business
2. It's important to our stakeholders – such as consumers, customers, employees, government, investors, NGOs and suppliers; or a concern has been voiced in the scientific community and policy circles

2.5 Step 3: An assessment of the external landscape

From this initial internal review of our business impacts we compiled a list of areas for consideration, grouped under the 3 themes of

- Our Climate Commitment for greenhouse gas reduction
- Responsible Asset Use
- Caring for the Natural Environment

The final step for identifying topics involved horizon scanning and market research. This included reviewing upcoming legislation, consideration of macro trends and using global sustainable frameworks such as the 2030 United Nations Sustainable Development Goals. This is pivotal as there is a constant changing political, social, economic and environmental landscape, ever increasing and complex regulatory frameworks and trends that continue to develop,

We also received specific requirements from Ofgem for inclusion in the EAP. From this review, we identified several commitments for consideration that aligned with our other areas and range of best practice that we grouped under the theme of:

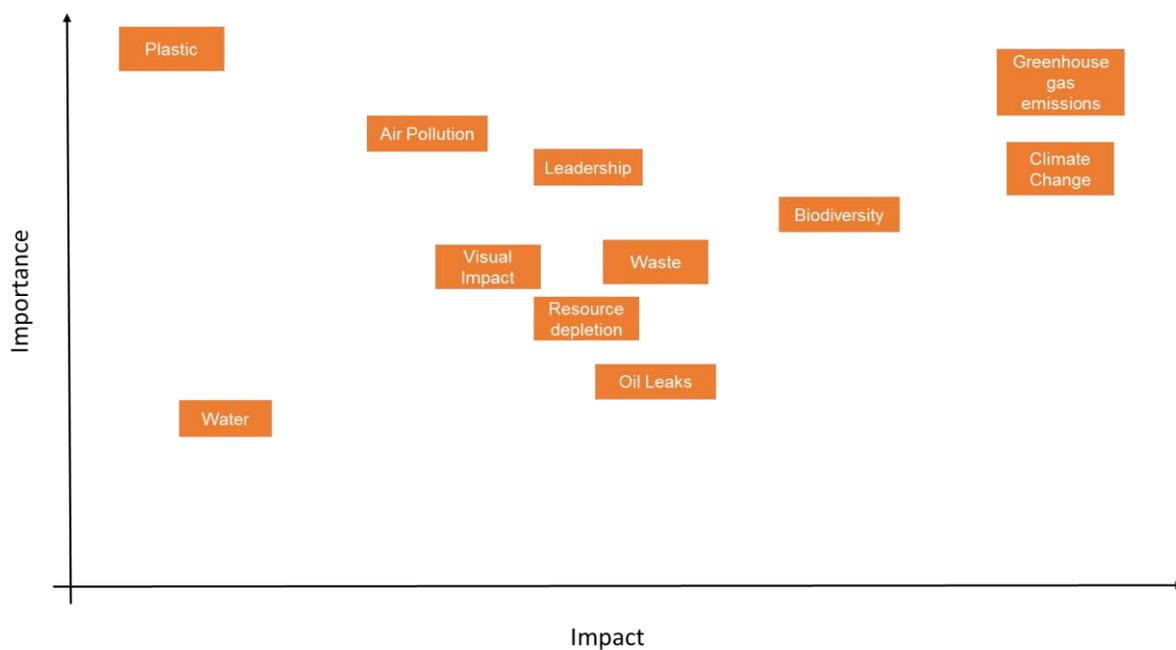
- Leadership for change

Detail on the findings from the external landscape horizon scanning are provided in appendix 1.

2.6 Review of Impact & Importance

A review of impact of each area was considered and mapped against its importance both for National Grid and our stakeholders.

Figure 4 materiality map of environmental impacts



3. Prioritisation

Based on the impact analysis and aligning with National Grid's Group priorities the topic areas are prioritised into 3 tiers:

1. Topics for which we would set a numerical target
2. Topics for which we would make commitment statements
3. Topics which have not been included on the Environmental Action Plan

For topics with numerical targets an options assessment was carried out, further information is included in appendix 2. To support this, we have also provided a detailed options narrative in appendix 3.

We have provided a report on our proposed pathway to setting a science-based target for our emissions in appendix 4 as we recognise this is the right thing to do and we are committed to work towards this during RIIO-2.

3.1 Feedback & Governance

To ensure the EAP is deliverable, senior leaders were engaged throughout the process with targets being signed off through our environmental governance groups.

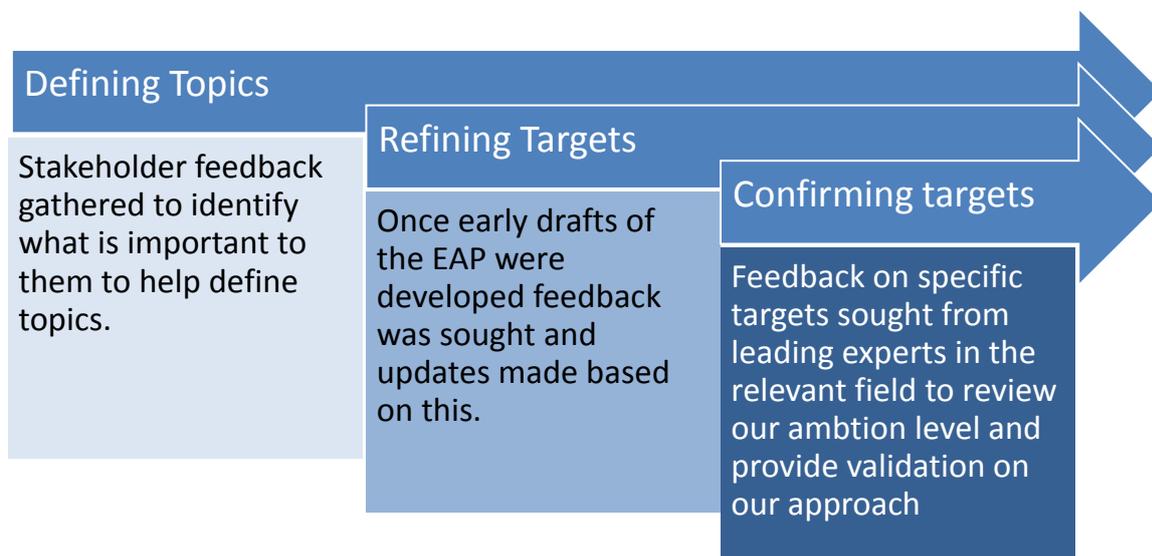
3.2 Environmental impacts considered important to our stakeholders

Part of being a responsible business is listening to our stakeholder, customers and consumers and acting on that feedback. Stakeholder feedback has been an integral part of the process throughout defining the EAP and has been on-going throughout development.

A high-level overview of Stakeholder feedback through key stages of development are shown in figure 2 below. Full information on our stakeholder engagement on the Environment are given in our stakeholder log provided in annex A16.06

We have also set out within the main body of our action plan where stakeholder feedback has influenced a deliverable.

Figure 5 Our stakeholder approach



4. Embedding our Impact Across the Business Plan

The EAP's scope is our environmental footprint and our proposals impact across the full range of activities we undertake as a business. However, we recognise the largest impact we can have is in facilitating, and promoting the UK's decarbonisation of energy, heat and transport.

This is a fundamental part of our business plan and is considered in chapter 25 'I want you to facilitate the whole energy system of the future, innovating to meet the challenges ahead'.

Appendix 1 Summary of Aspects, External Drivers & Feedback

| Aspects | Legislation | Alignment to UN Sustainable Development Goals | Other macro trends | Stakeholder Feedback / expectations |
|---------------------------|--|--|---|---|
| <p>Air quality</p> | <p>Compressor emissions legislation:</p> <p>Industrial Emissions Directive (IED), Medium Combustion Plant Directive (MCPD)</p> <p>Please see Compressor Emissions Compliance Strategy (Annex A16.05 for further information)</p> | <p>Goal 7: Affordable and clean energy</p>  <p>Goal 13: Climate action</p>  | <p><u>Emissions legislation</u></p> <p>Emissions legislation has been tightened as further legislation develops.</p> | <p><u>Stakeholders have told us that</u> they value our work on reducing emissions to improve local air quality and believe we should get on with it as soon as possible</p> |

| Aspects | Legislation | Alignment to UN Sustainable Development Goals | Other macro trends | Stakeholder Feedback / expectations |
|--|--|--|---|---|
| Capital carbon from infrastructure | There is a strong 'push' by the UK Government to reduce carbon emissions to meet legally binding commitments. | Goal 9: Industry, Innovation and Infrastructure  | Infrastructure carbon <u>review:</u> The infrastructure industry is one of the biggest contributors of UK CO ₂ emissions Net zero construction: Skanska UK commits to net-zero carbon emissions on all its UK projects by 2045 across its project portfolio EU Gas Industry Increasing focus from Europe on efforts to reduce fugitive emissions from gas infrastructure | Stakeholder workshop: many stakeholders believed we should aim to be carbon neutral, and that we should do this by firstly ensuring that we minimise our carbon emissions wherever possible. Carbon offsetting was largely seen as something we should do once we have exhausted opportunities to minimise emissions |
| Net Gain/ loss | Spring statement 2019 - net gain is now mandated for new housing and infrastructure developments under the Town and Country Planning Act regime | Goal 15: Life on land  | 25 Year Environmental Plan The very first action in the very first chapter of the 25 Year Environment Plan is to embed 'environmental net gain' | Stakeholder workshop: The majority of stakeholders believe that we should focus on this area as long as the additional costs are reasonable. |
| Travel: business, operational and employee | Road to Zero | Goal 13: Climate Action | Committee on Climate Change: | Science based targets: |

| Aspects | Legislation | Alignment to UN Sustainable Development Goals | Other macro trends | Stakeholder Feedback / expectations |
|---|---|--|--|---|
| | All new cars in the UK will be 'effectively zero emission' by 2040, under plans to tackle air pollution |  | <p>The transport sectors is the fastest-growing contributor to climate change, accounting for 23% of global energy-related greenhouse gas emissions.</p> <p><u>EV1000 the Climate Group:</u> EV 100 is a global initiative bringing together forward looking companies committed to accelerating the transition to electric vehicles. Since The Climate Group launched EV1004 in September 2017, 31 major companies with over US\$0.5 trillion in combined revenue have joined to accelerate the transition to EVs. This has included other energy companies such as SSE.</p> | Travel is considered scope 1 emissions which we have to reduce under Science based targets |
| Loss of oil, fuels or chemical and failure of secondary containment | Environmental Permitting (England and Wales) Regulations | | Minimum expectation to not leak | |
| Light and excessive use of energy from fixed sites | <u>The Energy Savings Opportunity Scheme Regulations 2014:</u> ESOS is a mandatory energy | Goal 13: Climate Action | <u>RE100:</u> RE100 is a global corporate leadership initiative bringing together influential | <u>Science Based targets:</u> Energy use is considered scope 2 emissions which we |

| Aspects | Legislation | Alignment to UN Sustainable Development Goals | Other macro trends | Stakeholder Feedback / expectations |
|--|--|--|---|--|
| | assessment scheme for organisations in the UK that meet the qualification criteria. |  | businesses committed to 100% renewable electricity. | have to reduce under Science based targets |
| Use of land for asset infrastructure, including non-operational land around sites | <p>National Planning Policy Framework NPPF currently requires developers to deliver measurable net gains for biodiversity.</p> <p>The 25-year Environment Plan commits to widen scope to include Natural Capital and Ecosystem Services.</p> <p>The draft UK Environment Bill will include a mandatory requirement for 10% biodiversity Net Gain - due to implemented around 2022 - (nationally significant infrastructure projects (NSIPS) and marine development are exempt)</p> | Goal 15: Life on land  | <p>In addition to mandatory requirements National Grid have an opportunity to take proactive approach to manage our natural assets (nonoperational land) to deliver biodiversity and ecosystem service enhancements against a defined baseline over RII0-2 Period.</p> <p>Use of land for carbon capture and storage will also be required as part of meeting net zero targets.</p> <p>State of Nature 2019 confirmed that the decline in biodiversity in the UK continues to decline resulting</p> | <p><u>Stakeholder workshop:</u></p> <p>The majority of stakeholders believe that we should focus on this area as long as the additional costs are reasonable.</p> |

| Aspects | Legislation | Alignment to UN Sustainable Development Goals | Other macro trends | Stakeholder Feedback / expectations |
|-------------------------------|--|--|--|--|
| | | | in significant net loss of biodiversity | |
| Excessive use of water | | Goal 14: Life on water  | Although water use is not a significant material aspect for our business, it is an aspect that is of great importance around the world and is considered a key item in the United Nations Sustainable Development Goals | |
| Waste management | <u>The Environmental Protection Act 1990:</u> The Environmental Protection Act deals with issues relating to waste on land, defining all aspects of waste management and places a duty on local authorities to collect waste. As a business, you have a duty to ensure that any waste your company produces is handled safely and within the law. | Goal 12: Responsible consumption and production  | <u>Plastics crisis:</u> Currently, 12.7 million tonnes of plastic ends up in our oceans each year, and the consequences for sea life are tragic, from choking turtles to poisoning whales. There is a world-wide movement to reduce plastic consumption at personal and workplace level. <u>Resource depletion:</u> <i>We are coming resources faster than it can be replenished.</i> | <u>Following the Waste Hierarchy:</u> The Waste Hierarchy sets out a hierarchy of options for managing waste in terms of what is best for the environment. This is what is considered best practice |

| Aspects | Legislation | Alignment to UN Sustainable Development Goals | Other macro trends | Stakeholder Feedback / expectations |
|-------------------------|-------------|--|--|-------------------------------------|
| | | | <u>Circular economy</u> | |
| Supply chain management | | <p>Goal 13: Climate Action</p>  | <p>CDP supply chain:</p> <p>There is power in procurement. The environmental impact within their supply chain significantly outstrips the impact related to their own operations. The decisions they make when purchasing goods and services, and the way they influence their suppliers, offers a far greater opportunity for positive change than could be achieved through acting only on areas within their direct operational control.</p> | |

Appendix 2 Options assessment

Please note air quality (compressor emissions compliance) and redundant assets have been excluded from this options assessment as there has been more detailed and complex options analysis included in investment decision packs supporting business plan proposals. Please see the following justification papers and CBAs relating to our investment proposals set out in the EAP

- Annex A16.08 – Redundant assets justification paper
- Annex A16.05 - Compressor Emissions Compliance Strategy (CECS)
- Annexes A16.10-18 - Compressor emissions compliance justification papers and cost benefit analyses (Wormington, King's Lynn, Peterborough, St Fergus site)
- Annex A16.18 – Low carbon vehicles justification paper.

| Theme | Topic | Option 1 | Option 2 | Option 3 | Baseline funding request) |
|------------------------|--------------------------------|--|---|---|---|
| Our climate commitment | Reduction in Methane Emissions | Do nothing; this was deemed unacceptable as it does not align with our commitment to decarbonisation | Chosen option: Invest in better monitoring equipment to develop robust baseline and enable a targeted approach. Set a target once the baseline is established during RIIO-2. | Set a reduction target today; Discounted as there are too many unknowns | We have included a proposal for baseline funding on this in our RIIO-2 plan. |
| | Fleet | Do nothing; this was not deemed acceptable as it does not align with our commitment to decarbonisation | Chosen option: 30% based on market availability today. This option was selected as it balances our ambition with cost and the commercial availability of suitable vehicles. | >30% based on the market evolving before 2026; this is subject to significant uncertainties in cost and vehicle technology which we could not commit to at this time. | We have included a proposal for baseline funding on this in our RIIO-2 plan See annex A16.18. |
| | Carbon neutral construction | Do nothing – this would be less ambitious than our | Continue to set reduction targets | Chosen option: Carbon neutral construction on major projects – this was | We have committed to do this at Wormington and Bacton terminal redevelopment as major |

| Theme | Topic | Option 1 | Option 2 | Option 3 | Baseline funding request) |
|------------------------------------|------------------------|---|---|---|--|
| | | current work so was deemed unacceptable | | selected based on positive feedback from SH | projects. These will be trial projects for Gas Transmission. |
| | Renewable Energy | Do nothing | Chosen Option: Reduce energy usage and purchase renewable energy for offices – this option has been selected as it's relatively low cost | Chosen Option: Reduce Generate renewable energy on operational sites – this option has been selected | N/A. No specific baseline funding has been requested for this. |
| Responsible asset use | Waste for construction | Zero waste to landfill – this would maintain the RIIO-1 level of ambition | | Chosen option: Zero waste to landfill and improved recycling – this option was selected as it maintains the RIIO-1 ambition on diversion from landfill while promoting recycling instead of just energy from waste | N/A. No specific baseline funding has been requested for this. |
| Caring for the Natural Environment | Natural Capital | Do Nothing | Continue based on number of sites with interventions | Chosen option: Create new base line that include measurement of natural capital increase across our land portfolio. | N/A. No specific baseline funding has been requested for this. |
| | Net Gain | Do the minimum as required by planning | Commit to net gain on all major projects (same as end of RIIO-1) | Chosen option: Extend approach to commit to Net gain on all projects | N/A. No specific baseline funding has been requested for this. |

Appendix 3 - Options Narrative

1. Reduction in Methane Emissions - *Invest in better monitoring equipment to develop robust baseline and enable a targeted approach. Set a target once the baseline is established during RIIO-2.*

| Opportunities | Challenges |
|---|---|
| <p>Methane enters the atmosphere in two main ways from the NTS; venting from compressors and fugitive emissions. The former is already incentivised and working groups within National Grid Gas are already addressing ways to reduce this further. The latter point, fugitive emissions, is something the entire gas industry is tackling. National Grid's continued involvement with the European and Global gas industry is sharing knowledge to address this global warming gas. We estimate that some 50k tCO₂e is emitted to the atmosphere from our operations; however, we don't fully understand when and where this is coming from.</p> <p>We have undertaken some RIIO-1 innovation to develop a method to better monitor methane emissions. There is an opportunity to further develop some innovative technology and install it at our highest risk installations, to monitor, measure and report emissions of methane in near real-time. This will enable National Grid to address emissions as they happen and limit the quantities escaping. We anticipate installing the equipment at the start of RIIO-2, establishing a baseline and working towards implementing stretch targets to reduce emissions from our high-risk areas within the network. This will be a no-regrets course of action that can be taken in parallel to developing our science based target.</p> | <p>There is presently no industry standard for monitoring or measuring fugitive emissions. Our work with European working groups has identified best practices, but no approved method. We have been working with the European value chain for the gas industry to establish a standard. However, this is some time away (EU Commission is working to a 3+ year programme due to complexity). Whilst a standard approach is developed, we are pressing ahead with innovation to inform investment decisions today and in the future, however, this will have its limitations. It won't cover the whole network due to cost limitations but will address the high-risk areas. Confidence in the data collected will have greater tolerances than existing methods, but won't give absolute figures, instead providing a range with a confidence interval. We feel this is sufficient to provide a baseline for our emissions and an accurate view across the network of where to target our abatement activities</p> |

2. Vehicle Fleet - *30% based on market vehicle availability today. This option was selected as it balances our ambition without significant and uncertain costs to the consumer.*

| Opportunities | Challenges |
|--|---|
| <p>With the advent of technology and infrastructure improving rapidly, National Grid Gas Transmission is able to reduce emissions from our operational vehicles. Our proposals are anticipated to reduce our annual vehicle CO₂ emissions by 22% when compared to annual vehicle-related CO₂ emissions at the start of</p> | <p>Our ambition is to replace as many of our Internal Combustion Engine (ICE) vehicles with zero-emissions alternatives such as EVs where we believe it is efficient for consumers. There is a proportion of our fleet however where zero-emissions alternatives are not yet available on</p> |

| | |
|---|--|
| <p>RIIO-2, as well as seeing a 30% reduction in annual vehicle-related air pollution. Reductions in air pollution, especially in built up areas, will be beneficial for local communities and aligns to both government and local authority strategies around air quality improvement.</p> <p>Transitioning to a low carbon fleet will help the UK in its ambition to Net Zero, supporting the CCC's statement on transitioning away from new ICE vehicles from 2030.</p> <p>In the future it is expected that EV's will achieve overall price parity with ICE vehicles in the mid-2020s, therefore there is a future (post RIIO-2) opportunity for cost savings for both National Grid and the end consumer.</p> | <p>the market. Only 30% of our fleet has alternatives on the market today.</p> <p>Charging infrastructure, and the best way of delivering this to users is not fully understood and there is a risk of charging/vehicle availability issues, see next section for further details We have plans for on-site charging at 45 sites due to the nature of our sites predominantly located away from populated areas. For any additional chargepoints required in RIIO-2 we will work with ET colleagues, other networks etc to build an efficient network of vehicle charging infrastructure by avoiding duplication.</p> <p>The types of electric vehicles available and the current mileage range means certain vehicles may not be suitable at more remote locations.</p> |
|---|--|

3. Carbon neutral construction - *Carbon neutral construction on major projects – this was selected based on positive feedback from Stakeholders*

| Opportunities | Challenges |
|---|--|
| <p>Ensuring that our major projects are carbon neutral brings two benefits; we will know that the construction will not have a detrimental impact on increasing greenhouse gases in the atmosphere, whilst also driving innovation within our supply chain to offer more carbon neutral products and services. The latter point would utilise National Grid's reputation to drive more efficient design and product selection, ensuring that others benefit from the vision we are setting.</p> | <p>As with all changes, there will be challenges associated with the new ways of working, concepts, visions and products. Through testing this on a limited number of projects in the right environment, National Grid is confident that we can deliver. Presently, there isn't a 'one-size fits all' approach for construction projects. However, by utilising our knowledge and our relationships with our suppliers, we can develop the pieces to ensure carbon neutral construction is achievable. There is a risk that we are ahead of wider industry and therefore it may require innovation and new approaches. However, we are confident that from experience developed over RIIO-1 we are in a good position to lead industry in this area.</p> |

4. Renewable Energy - *Purchase renewable energy for offices and generate renewable energy on operational sites*

| Opportunities | Challenges |
|---|---|
| <p>With the economies around renewable energy continuing to improve, National Grid has two opportunities to reduce our Business Carbon Footprint beyond reducing our energy usage which we are committing to within this EAP; procuring renewable energy and installing generation for own use on the land we own. Procuring renewable energy through an assured, certificated process will reduce carbon emissions</p> | <p>Selecting a purely 100% renewable energy solution carries with it a cost premium, however, when considering the total cost of carbon emissions, this will be offset within the other initiatives for emissions reduction.</p> <p>Installing renewable energy generation on our sites and land is relatively straightforward,</p> |

| | |
|--|---|
| <p>associated with our electricity use. Furthermore, National Grid plans to utilise renewable energy generation on our sites and for our own use. This will further offset the use of grid power and provide an element of supplying baseload to sites. Cost benefit analysis demonstrates that the availability of technology is reducing prices, making it more favourable for use on our sites; something which is echoed by stakeholder feedback and ambition.</p> | <p>however, it does require a change or deviation in the existing licence to be able to generate for own use and supply surplus to the grid at no profit/benefit to National Grid Gas Transmission. This has already been done at 1 National Grid site in RIIO-1.</p> |
|--|---|

5. Waste from construction - *Zero waste to landfill and improved recycling*

| Opportunities | Challenges |
|---|--|
| <p>Employing the full waste hierarchy to our capital projects would see waste being designed out, reused where possible, then recycled and landfill avoided. There is an opportunity to remove waste from landfill completely for inert and non-hazardous waste – hazardous/special waste will always have to go to landfill due to its nature.</p> | <p>Education and availability of solutions are the key blockers to reaching this target. However, by introducing a robust education programme, through our Contractor Resource Forum – continuing our engagement with the value chain and driving innovation, solutions will be found to ensure the objective is delivered for all capital projects.</p> |

6. Natural Capital - *Create new base line that include measurement of natural capital increase across our land portfolio*

| Opportunities | Challenges |
|---|---|
| <p>To drive the Natural Capital agenda within National Grid and our sites and assets, the first step is to ensure that we have a valid view and thorough understanding of our capital. We will undertake a baseline review to inform investment decisions and designs to ensure the virtues of Natural Capital are embedded within our business processes. Once the baseline has been established, principals will be put in place to deliver capital gains at our sites.</p> | <p>The adoption of a Natural Capital approach will need to balance land management with other competing concerns on site, i.e. safety & cost. As the framework is designed and developed involvement with internal interested parties will take place to ensure delivery of Natural Capital. We are building on our work delivered in RIIO-1 and will utilise our experience from this.</p> |

7. Net Gain – *Extend approach to commit to Net Gain on all projects*

| Opportunities | Challenges |
|---|--|
| <p>There is general consensus within the ecological and environmental community that there is urgency to halt the retreat of biodiversity loss within Britain (and the world). National Grid controls a large area of land for both operational</p> | <p>The concept of Net Gain is relatively new and will take time to embed whilst establishing the frameworks to compliment construction activities. However, through expert support, education, training and innovation, it is possible</p> |

and non-operational reasons. We have an opportunity to implement a process/system for Net Gain, using approved frameworks and policies, to ensure Net Gain on all our projects where there is an impact on the natural environment from the project itself. A robust process will be developed to understand the current biodiversity index of our sites, prior to construction activities, whilst understanding the activities we need to undertake to ensure a Net Gain at the end of construction work. The opportunity extends to our contractors and wider community, as the potential for being a good steward of our land will drive others to develop approaches which would complement the vision that National Grid is setting.

to enhance construction projects further and support National Grid commitments to halt biodiversity loss on our sites and deliver a net gain.

Appendix 4 - Science-based Targets

What are science-based targets (SBTs)?

Science-based targets provide companies with a clearly defined pathway to net-zero by specifying how much and how quickly they need to reduce their greenhouse gas emissions. The Science-based Target Institute (SBTi) are the experts in disseminating information to companies to enable accurate plans to be created. The Institute is currently creating a data template for the gas industry to use in the early part of 2020.

Targets adopted by companies to reduce greenhouse gas (GHG) emissions are considered “science-based” if they are in line with what the latest climate science says is necessary to meet the goals of the Paris Agreement – to limit global warming to well-below 2°C above pre-industrial levels and pursue efforts to limit warming to 1.5°C.

How do we set SBTs – what do we need?

In order to develop a science-based target, we need to know our end point (net zero 2050), our costed engineering solutions and a programme for delivery – we currently have the end point and need to develop the other two.

Typical programme – The general consensus for developing ambitious targets is one of a slow start (whilst technology is developed and adopted), with a middle period of return on investment. The final period is the harder, more difficult area to address.

Interim target – with the lack of a sufficient dataset, a stretching estimate is that NGGT could deliver a 5-10% CO₂e saving by 2030 – however this is heavily caveated against the quality of the baseline dataset, the adoption of a funded emissions reduction programme and changes in supply/demand patterns.

What are the challenges to setting SBTs?

1. Establishing a confident baseline of emissions

1. We are committing to reducing our emissions in the interim to developing our science based target through the actions set out in our EAP These are no-regrets reductions as we stand ready to work towards the UK’s goal of net-zero in 2050. We are also already working towards getting the data we require to be able to understand the full picture of our emissions. However, some data has not been measured before. In assessing the data needed to make informed decisions for a science-based target, data availability for all emissions are either not available or difficult to count (a point discussed below). Strong data from NGGT’s operational emissions is a result of legislative requirements; EU Emissions Trading Scheme, Climate Change Act, Environmental Permitting and Pollution Prevention and Control Regulations. These instruments have driven the necessity to collect and report data as it is required for regulatory reporting. Gaps exist in the data where there isn’t a regulatory requirement for reporting, for example, gas boilers used on the NTS to maintain gas temperature during pressure reduction, have traditionally not been recorded or aggregated. Investigations are ongoing to establish the emissions of these equipment so that they can be considered as part of the science-based target. Without this data, it could influence how investment decisions are made, resulting in poor choices being made for the network on behalf of consumer’s interests and funding.

2. Difficult to 'count' fugitive emissions (methane emissions associated with a loss of tightness or operational venting). The gas industry hasn't established a means to address this issue, although there are very accurate ways to measure fugitive emissions from assets. However, these do not scale due to detailed nature of the measurement and the sheer number of assets on the network. The European Commission recognises the need to measure, and the current difficulty with fugitive emissions, therefore they have commissioned work to investigate (>3 years) the best available techniques to detect, monitor, measure and report fugitive emissions going forward. Presently, National Grid provides an assumed emission rate based on data from original equipment manufacturers, supported by traditional means of emissions monitoring through Flame Ionising Detectors (FIDs). We have also undertaken a RIIO-1 innovation activity relating to better methane monitoring. As part of our RIIO-2 business plan proposals we are requesting funding for methane monitoring equipment as a result of this innovation project to facilitate baseline data to better understand our emissions and allow us to further reduce leaks.
3. The Science-based Target Institute are currently developing a tool for the gas industry to use. This new tool will provide the framework for accurate and consistent measuring across the industry; however, it is not available for use until 2020.

The first step for us to be able to set out a science-based target is for this baseline to be established.

2. Fully costed options

Once a confident baseline is established, behaviours and technologies can be identified to deliver the necessary reductions. This will be a complex challenge for our organisation as a gas transmission business. Large amounts of energy are required to move gas from supply to demand; whether it is through traditional means of gas turbines or electric drive compressors. The challenges can be categorised:

1. There is currently no clear route to decarbonisation, and more specifically the future that gas will play in this. Therefore, a number of assumptions will need to be made within any costed scenarios. These could range from a full electrification decarbonisation not involving a Gas Transmission system to widescale hydrogen roll out involving the Gas Transmission system.
2. The suitability of technology for gas transmission applications hasn't been widely investigated beyond traditional purposes. i.e. replacing end-of-life gas turbines, with new gas turbines. Manufacturers have been developing more efficient and lower emission engines, with future innovations potentially involving carbon capture of emissions and/or hydrogen technology. Electric drive units have greater benefits above their gas turbine equivalents – CO₂ emissions are limited to whatever the mix is at any given moment on the electricity network; similarly, air quality emissions are removed as there is no combustion activity associated with electric drive units. However, the move to electric drives has disadvantages around costs of associated electricity infrastructure, gas network resilience should the electricity supply fail and black start resilience for the electricity network, which would affect security of supply for the UK. These need to be considered in conjunction with the elements below about behaviours.

3. Behaviours around how the network is operated, the contracts in place for supply, investment policies and decisions etc. all have large impacts on reaching a net zero target. Identifying and understanding the political and economic barriers to meeting net zero, will identify other areas for CO₂ savings – however these would have a greater impact on the expectations of industry and society in general. These opportunities and challenges need to be considered in addition to what technology can bring to table, whilst understanding that these difficult decisions will need to be implemented at some stage.

3. Developing a roadmap

There is a further way these challenges could be categorised, along the lines of timescale of delivery. Short, medium- and long-term deliverables can be affected by changes of both technological and behavioural advancement and, both bring advantages and challenges.

Deciding when to implement a technology or behaviour can have significant consequences and must be informed by stakeholders to ensure it is the right decision at the right cost to consumers, customers and society in general. Creating a baseline, along with the understanding of gaps associated with technology and behaviours, should enable us to create a roadmap for decarbonising the NTS.

Government has indicated its approach to decarbonising heat and, and the anticipated timescales associated with a national plan. National Grid knows that it needs to move within RIIO-2 to set out its vision and ambition; this is the job that can't wait. Activities are already underway to develop a roadmap strategy to outline the route or routes National Grid Gas are considering.

What have we done so far in RIIO-1?

The challenges National Grid faces are not unique; across the UK, businesses have been considering similar issues about how to reach Net Zero. We know this is the job that can't wait and see this as an extension to our existing work to decarbonise our business contributing to commitments such as the Kyoto protocol.

When we review our Business Carbon Footprint we must consider those emissions which are in our immediate, direct control and those which we have some influence over. This helps to focus our activities to ensure that we are driving down emissions as quickly as economically acceptable. Splitting our emissions into operational, those which we have influence over, and non-operational, those which we can control, provides a different lens. Operational emissions, which are our largest (~85%) emissions, are linked to operating the NTS and its supply/demand patterns as well as seasonality. Non-operational emissions include the energy in our buildings and how we travel for work; i.e. cars and air travel.

As discussed above, technology improvements and behavioural changes can have an effect on both classifications of emissions. Whereas the majority of our emissions come from running gas compression as a process, we have addressed these through major investment programmes to install more efficient equipment. Away from our compressors we continue to deliver carbon efficiencies in the areas where we have immediate control:

- Changing behaviours around venting of compressors to reduce methane emissions.
- Reducing carbon impact in construction activities.

- Removing or reducing the need for travel through flexible working policies and implementing technologies to provide 'virtual meetings' through web and teleconferencing.
- Implementing standard best practices in our offices and our equipment for energy saving.

We have been making incremental steps to reducing our emissions. As we develop the science-based target for Net Zero, we will identify the step changes needed to significantly reduce our emissions towards 2050. We will continue on our path in RIIO-2 through the actions set out in the EAP.

Reduction in Methane Emissions – Current Process

NGGT actively seeks out and looks to reduce emissions from gas escapes as quickly as possible, for safety as well as environmental reasons. To this end, as a matter of regular installation inspection duties, if gas escapes are found, primarily work procedure T/PR/TR/32 (Work Procedure For Reporting And Investigating Gas Escapes On Above 7 Bar Gas Installations) is used to manage the gas escape to resolution. The procedure applies to all gas escapes that can be identified by the human senses¹ and fugitive emission surveys. The procedure is used for reporting and investigating gas escapes from pipework at Gas Transmission sites including terminals, compressor stations, block valve sites, above ground installations, multi-junctions, above ground crossings and pig traps.

When a gas escape is detected it is assessed for safety and environmental impact. If the gas escape cannot be repaired immediately then a site-specific assessment is completed. An immediate repair is instigated where possible. If an immediate repair is not possible then the gas escape will be managed safely and programmed to be repaired as soon as reasonably practicable.

Managed gas escapes are risk assessed to determine the priority for repair as per NGGT defect repair management process (T/PM/DEFECT1). The escape is then programmed to be repaired or monitored; each time it is monitored the assessment is repeated. If the monitoring deems the gas escape to be getting worse then it is programmed for repair as soon as is reasonably practicable.

Fugitive emissions surveys are also carried out on a rolling frequency (once every four years) on compressor installations. These surveys measure gas escapes from all equipment with the potential to leak such as, valves, pipework flanges/connectors, pressure relief systems, opened pipework, instrumentation and meters. The survey is usually completed in two stages, firstly initial screening is completed using a Flame Ionisation Detector (FID), this identifies the gas escapes from around the equipment. Any leaking components will then be clearly labelled for quantification. The second stage uses a Hi Flow Sampler (BHFS) to determine the mass emission from each component gas escape.

The gas escape volumes are then reported, and the equipment items that are identified with gas escapes enter into the T/PR/TR/32 process described above for resolution

¹ Note Gas in the Transmission system is unodorised, therefore leaks can be detected by their noise or by vision (if significant).

What do we know at present?

The table below represents the tonnes of CO₂e emissions publicly reported by National Grid Gas Transmission for the previous 6 years.

Table 3. Summary of NGGT emissions 2014/15 to 2018/19

| | Scope | Op / Non-Op | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | Average of RIIO-1 |
|----------------------------|-------|-------------|----------------|----------------|----------------|----------------|----------------|-------------------|
| Buildings - Electricity | 2 | Non-op | 35593 | 61325 | 118784 | 101147 | 50642 | 73498.2 |
| Buildings - Other fuels | 1 | Non-op | 392 | 563 | 404 | 558 | 422 | 467.8 |
| Total | - | - | 35,985 | 61,888 | 119,188 | 101,705 | 51,064 | 73,966 |
| Road – Operational Fleet | 1 | Op | 1226 | 1303 | 1498 | 1600 | 1629 | 1451.2 |
| Total | - | - | 1,226 | 1,303 | 1,498 | 1,600 | 1,629 | 1,451.2 |
| Road - commercial fleet | 1 | Op | 960 | 963 | 958 | 1122 | 673 | 935.2 |
| Road - private car use | 3 | Non-op | 60 | 61 | 94 | 97 | 73 | 77 |
| Rail | 3 | Non-op | 14 | 23 | 28 | 37 | 46 | 29.6 |
| Air | 3 | Non-op | 650 | 514 | 803 | 2274 | 1789 | 1206 |
| Hire Car | 3 | Non-op | 23 | 31 | 18 | 27 | 37 | 27.2 |
| Total | - | - | 1,707 | 1,593 | 1,900 | 3,557 | 2,618 | 2,275 |
| Fugitive Natural Gas | 1 | Op | 48005 | 46741 | 60732 | 87126 | 57799 | 60080.6 |
| Total | - | - | 48,004 | 46,741 | 60,732 | 87,125 | 57,799 | 60,080.2 |
| Diesel (standby gen) | 1 | Op | 138 | 309 | 0 | 0 | 0 | 89.4 |
| Natural Gas (turbine fuel) | 1 | Op | 209158 | 304352 | 493647 | 494139 | 234141 | 347087.4 |
| Gas Pre-heaters* | 1 | Op | - | 4021 | 8189 | 10537 | 7451 | 6039.6 |
| Total | - | - | 209,296 | 304,661 | 493,647 | 494,139 | 234,141 | 347,176.8 |
| Grand Total | - | - | 296,219 | 420,206 | 685,155 | 698,663 | 354,702 | 490,989 |

*Data is incomplete for gas pre-heaters

- c. Produce a science-based target with fully costed options aligned to National Grid/National Grid Gas strategy – including efficient and economic actions to address controllable BCF in RIIO-2 and, identify metrics to track outcomes of implementing actions and overall progress towards science-based target
2. An Uncertainty Mechanism reopener in RIIO-2 to provide a funding route for implementing the costed options from the dedicated team and, deliver an emissions reduction programme on the journey to net zero 2050. More information can be found on this in Annex A3.02.

Appendix 5 – Business Plan Guidance Cross-Reference

| Requirement | Location within BP / EAP / Annexes |
|---|--|
| 2.33. In the SSMD, we set out that companies should embed considerations for the three impact areas above into their RIIO-2 Business Plans in the form of an Environmental Action Plan (EAP). The EAP should explain how a company will take responsibility for the environmental impacts of their network in RIIO-2. | EAP (annex A16.01) |
| 2.34. EAPs included in Business Plans should: | - |
| <p>include a robust methodology that has been used to assess the environmental impacts of the company's network and Business Plan in RIIO-2 to inform its EAP. The assessment methodology should set out:</p> <ul style="list-style-type: none"> o a comprehensive review of the significant environmental impacts arising from its network o the opportunities and challenges for addressing material impact areas o an options analysis to identify value for money impact reduction initiatives o evidence that consideration of impacts was coordinated with the company's wider business planning processes and decisions o evidence that wider stakeholders have been involved in the assessment | <p>EAP (annex A16.01) includes Environmental Action Plan Methodology which covers the key points.</p> <p>In addition to this further options analyses relating to high impact environmental impacts can be found in the following</p> <ul style="list-style-type: none"> • Compressor investments: CECS annex A16.05, justification papers/CBAs in annexes A16.10-17 • Redundant assets: justification paper annex A16.08 • Low carbon vehicles justification paper annex A16.18 <p>Stakeholder engagement relating to EAP commitments set out in annexes A16.06 and A16.07</p> |
| clarify their long-term overall targets/objectives for the network's environmental impacts, which might be longer- term than the RIIO-2 period | Environmental Action Plan A16.01; column B |
| include an assessment of the network's potential environmental impacts in RIIO-2, in comparison to its current impacts | Reported through new Ofgem data tables 6.01/6.03 |

| Requirement | Location within BP / EAP / Annexes |
|--|---|
| set out clear links between the impact areas it has prioritised for in the EAP, action in RIIO-2 and how these are linked to the company's long-term environmental targets/objectives | EAP (annex A16.01), particularly main table column E Please also see main Business Plan chapter 16 |
| set out the role the company envisages playing in supporting the low carbon energy transition | EAP (annex A16.01), including appendix 4 Please also see main Business Plan chapters 16 & 17 |
| set out the deliverables, outputs or environmental benefits the company proposes to deliver from implementing the EAP | EAP (annex A16.01), particularly main table columns B, C D |
| 2.35. In Appendix 2, we set out our initial views of the minimum level of ambition we would expect from the companies in their business plans. Where these initiatives, or equivalent, are not thought to be appropriate for their networks, companies should provide clear justification for why they believe this to be the case. | - |
| Appendix 2 requirements | - |
| <p>We expect that EAPs will to draw together the direct carbon impacts claimed in Investment Decision Pack submissions (for example leakage, losses, EV fleet) and will include a list of all</p> <p>Investment Decision Pack submissions where:</p> <ul style="list-style-type: none"> <input type="checkbox"/> carbon reduction is the main driver of the proposal <input type="checkbox"/> carbon reduction contributes to a substantial part of the benefits claimed by the projects. For example, intervention on the gas network justified mainly on avoided leakage | <p>Included in relevant investment decision packs in Annexes A16.08, A16.10-18.</p> <p>Link to investment decision packs (justification papers and CBAs) in EAP (annex A16.01) appendix 2</p> |
| <p><i>Business carbon footprint (BCF)</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Adopt science-based target for company to reduce its scope 1 and 2 BCF by 20XX, without relying on international GHG offsetting <input type="checkbox"/> Commit to efficient and economic actions to address controllable BCF in RIIO-2 <input type="checkbox"/> Identify metrics to track outcomes of implementing actions and overall progress towards science-based target | <p>EAP (annex A16.01), appendix 4</p> <p>EAP (annex A16.01)</p> <p>Metrics for reducing BCF in main EAP table (column D).</p> |

| Requirement | Location within BP / EAP / Annexes |
|--|---|
| <input type="checkbox"/> Commit to reporting on scope 3 emissions | Emissions reporting via new Ofgem data tables 6.01/6.03 |
| <p><i>Shrinkage (gas only)</i></p> <input type="checkbox"/> Develop and adopt strategy to contribute efficiently to fewer losses on network, including over the long term, than would otherwise be the case in the absence of strategy | Business plan chapter 16 |
| <input type="checkbox"/> Report on key milestones of implementing losses reduction strategy | EAP (annex A16.01) including commitments on methane monitoring and establishing baseline. |
| <input type="checkbox"/> Contribute to evidence base on proportion of losses that network companies can influence/control | Reported through new Ofgem data tables 6.01/6.03 |
| <p><i>Embedded carbon</i></p> <input type="checkbox"/> Monitor and report on embedded carbon in new projects | Reported through new Ofgem data tables 6.01/6.03 |
| <input type="checkbox"/> Collaborate with supply chain on addressing challenges to reduce embedded carbon in network | Supply chain commitments set out in responsible procurement action plan Annex A16.20 |
| <input type="checkbox"/> Commit to establishing baseline and a target to reduce embedded carbon on new projects during RIIO-2 | EAP (annex A16.01) main table. |
| <p><i>Supply chain</i></p> <input type="checkbox"/> Adopt high standards of environmental management in supplier code, including requirements for public disclosure of metrics and cascading code to their suppliers that are material to company's inputs | EAP (annex A16.01) |
| <input type="checkbox"/> Adopt target of more than 80% of suppliers (by value) meeting code in RIIO-2 | Supply chain commitments set out in responsible procurement action plan Annex A16.20. |
| <input type="checkbox"/> Report on actual percentage of suppliers (by value) meeting code | |
| <p><i>Resource use and waste</i></p> <input type="checkbox"/> Update procurement processes to embed Circular Economy principles | Resource use and waste commitments set out in |
| <input type="checkbox"/> Adopt a target for: | <ul style="list-style-type: none"> • Business Plan, environment chapter 16 • EAP (annex A16.01) |

| Requirement | Location within BP / EAP / Annexes |
|--|--|
| <ul style="list-style-type: none"> o Zero waste to landfill by 20XX o Recycled and reused materials as a percentage of total materials by 20XX o Report on actual waste to landfill, recycling and reuse as a percentage of total | <ul style="list-style-type: none"> • Responsible procurement action plan Annex A16.20 |
| <p><i>Biodiversity/natural capital</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Adopt appropriate tool to assess net changes in natural capital from different options for new connections and network projects <input type="checkbox"/> Adopt appropriate tool to monitor the provision of ecosystem services from network sites and report annually | <p>EAP (annex A16.01) including Appendix 2&3</p> |