Adapting to change, fit for the future

Our Climate Change Adaptation Report 2024

National Gas Transmission plc

December 2024

Contents

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This ARP and the previous reports are accessible via our external page www.nationalgas.com/responsibility/environment
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Executive summary

National Gas Transmission plc (NGT) previously National Grid Gas has submitted responses to the three previous Climate Change Adaptation Reporting cycles. This report fulfils our commitment to the fourth-round reporting cycle.

Since the publication of our third-round report, our understanding of potential climate change impacts has advanced with site specific climate change risk assessments for compressor stations and terminals being undertaken. In addition, we have built on these assessments and our latest flood risk assessment to propose in our Climate Resilience Strategy undertaking site specific climate change impact studies in the RIIO-GT3 price control period. These studies are to deepen our understanding of the risk posed by flooding and elevated temperatures and help inform a review of the suitability of existing standards and specifications for a changing climate.

In 2025 new national risk information for flooding and coastal erosion is expected from DEFRA and the Environment Agency. The release of this will inform the potential review of our 2016 NTS flood risk assessment. We will also undertake targeted river scour modelling for gas transmission pipelines at river crossings.

As in previous rounds this report has been developed in conjunction with the Energy Networks Association (ENA) and Gas Distribution Networks (GDNs). NGT has completed a fully scored risk assessment but simplified the number of climate risks assessed from the third-round report because of separation from National Grid Group. We have reviewed our present day and 2050 risk assessment and scores in line with DEFRA requirements and provided a view to 2100 along with a confidence rating.

The ARP4 risk assessment has identified two high risk and seven moderate climate risks. The climate variables linked to these risks are consistent with previous NGT ARP reports:

- Raised Temperatures
- Erosion
- Flooding from rivers and rainfall
- Tidal Flooding
- Ground Movement
- Wind Damage
- Vegetation Growth
- Lightning
- Snow

The assessment found that since ARP3, the considered present day risk from erosion (specifically pipeline crossings) has increased. There has however, been minimal change in the remaining risks. The view to 2050 sees the continued impact of raised temperatures alongside increased impacts from flooding and erosion. Our 2100 assessment sees the impact from these climate risks continuing but their likelihood and overall risk score slightly increasing, consistent with UKCP18 projections of increasingly warmer and drier summers, wetter winters, sea level rise and increased frequency of weather extremes.

As a result of the assessment, NGT has committed to continuing activities linked to review of standards and specifications, flood risk assessment and river scour modelling to help mitigate the present and anticipated impacts of climate change.

While high and medium risks have been identified the National Gas assessment is consistent with previous reports and those of the gas and electricity distribution and transmission sector detailed in the ENA sector report. National Gas and the UK gas transmission system remains inherently resilient but recognises the need to continually reappraise its climate risks and engage with regulators on financing adaptation measures to ensure it remains so.

Chapter 1: Introduction

The Adaptation Reporting Power (ARP)

ARP set out in the Climate Change Act 2008 provides for the Secretary of State to direct reporting organisations (those with functions of a public nature or statutory undertakers) to report on how they are addressing current and future climate impacts.

About ARP

The ARP aims to ensure that organisations of a public nature with climate-sensitive responsibilities are taking appropriate action to adapt to the impacts of climate change. It does this both directly, through engaging organisations in reporting, and indirectly, through raising awareness, building capacity in organisations, and making examples of good practice publicly available.

The Government's Adaptation Sub-Committee review the outputs of the ARP process which in turn supports the Government's National Adaptation Programme and future UK Climate Change Risk Assessments.

This report supports this process by fulfilling the requirements of ARP Round 4 (ARP4) for the National Gas Transmission part of the National Gas business and covers the period 2021 to 2024.

ARP report content

The reports are requested to detail:

- the current and future projected impacts of climate change on their organisation;
- proposals for adapting to climate change;
- an assessment of progress towards implementing the policies and proposals set out in previous reports.

Chapter 2: Summary of previous adaptation reporting power reports

National Gas, previously National Grid Gas, has reported in all previous rounds of the ARP process since its inception in 2010. This section provides a brief summary of the aims and conclusions from each of the previous reporting rounds.

National Gas has collaborated with all gas and electricity distribution and transmission businesses in the development of its ARP reports through its membership of the Energy Network Association (ENA). As of 1 January 2025, gas distribution and transmission owners and operators are to be represented by the Future Energy Networks (FEN).

"Consideration by National Gas of the physical risks posed by climate change to the gas transmission system is critical to ensure the continued reliability and climate resilience of the system. The ARP process is important to informing our Climate Resilience Strategy and proposed climate adaptation measures" – Jeremy Hunns, Chief Engineer

Report round	Adaptation First Round Report (ARP1)	Adaptation Second Round Report (ARP2)
Overview	National Gas were approached directly by Government to respond to the First Round of Adaptation Reporting (ARP1) in 2010, which was designed to assess the current and predicted impact of climate change in relation to the companies' functions. Outline the proposals and policies for adapting to climate change in the exercise of those functions and the timescales for introducing those proposals and policies.	The Second Round of Adaptation Reporting (ARP2) followed the same methodology as ARP1. There had been no significant changes in understanding of climate change impact between ARP1 and 2, with the exception of limited development of environmental regulators' flood mapping. The overall level of uncertainty for gas networks was assessed as low as the sector has a high level of inherent resilience due to the level of safety awareness and regulatory overview.
Identified risks and hazards	The main categories of climate change related hazards and risks were identified as follows: • Flooding and heavy rain fall (incl saturated ground conditions) • Snow and ice • Increases in temperature, heat waves and drought conditions • Coastal erosion from sea level rise • River erosion • Storm events and high winds	The assessment itself was however expanded to include a greater number of hazards and identified the following risks: • Increased solar heat • Increased heavy rainfall • Sea level rise • Increased lightning • Wind and gale • Snow, sleet, blizzard and freezing fog • Increased flooding • Increased coastal / river erosion • Increased subsidence / land slip
Outcomes	The first round report used climate projection data from the United Kingdom Climate Projections 2009 (UKCP09) and working alongside the Meteorological Office Hadley Research Centre, the Environment Agency and the Scottish Environmental Protection Agency, the key climate related risks and opportunities facing the business were identified. The report concluded that gas transmission network assets and processes may be vulnerable to certain aspects of climate change. However, the national and regional infrastructure has a significant degree of resilience to these impacts and none of the identified risks were considered to be high.	A number of high-level risks were identified; increased river erosion, increased coastal erosion, increased temperature and increased flooding. The report highlighted the Feeder 9 replacement project on the River Humber was as a result of changing tidal patterns but certainty of if this was climate change driven was limited. Although increased river and coastal erosion were highlighted as risks, there was already significant monitoring and risk management regimes in place as mitigation. Interconnections or interdependencies of the businesses operations on other sectors was highlighted as a risk but the level of risk was seen to be low given the level of co-operation within the gas sector and energy sector more broadly through working with organisations like the ENA. The report concluded there were a mix of low probability risks based on the present level of understanding and management through existing business controls was presently sufficient to mitigate these.
Government reporting links	ARP1 reports can be found on the UK government website: Adaptation Reporting Power.	ARP2 reports can be found on the UK government website: Climate change adaptation reporting.

Report round	ARP Third Round Report (ARP3)
Overview	The Third Round of Adaptation Reporting (ARP3) was a significant evolution from the previous two rounds. Understanding and response to climate change grew with company net zero commitments and the implementation of climate related risk reporting (Task Force on Climate-related Financial Disclosures) in company annual reports and accounts. In addition, the UK Met Office released its updated climate modelling (UKCP18) which provided the most up-to-date assessment of how the UK climate may change in the future. The National Gas ARP3 report included a full reassessment of climate risks with the objective being to provide an update on existing risks and mitigation measures described in previous reports, identify new or emerging risks to provide a comprehensive picture of the potential for climate change impacts and incorporate the latest climate projection data provided by UKCP18. In the ARP3 report each climate risk was scored for likelihood and impact against a common standardised risk matrix agreed between the gas distribution and transmission networks in the ENA Gas Environment Group. National Gas also undertook a retrospective risk assessment for ARP2 using the standardised risk matrix with the purpose of showing how risks had evolved between reporting periods. To support the gas and electricity distribution and transmission businesses in the development of their ARP3 reports, the ENA facilitated commissioning of the UK Met Office to undertake a review of the UKCP18 data and provide an RCP 8.5 worst case scenario in order to understand the changes in potential impact to energy infrastructure assets from climate change. The report from this research was used to assess the risk assessment in ARP3 and inform future mitigation or management.
Identified risks and hazards	The ARP3 risk assessment identified 1 high risk and 10 medium climate risks. While more detailed in their nature, they were broadly consistent with previous National Gas adaptation reports: • Raised Temperatures • Erosion • Flooding • Ground Movement • Wind Damage • Vegetation Growth • Lightning This third-round assessment found that risks from raised temperatures and erosion (specifically pipeline crossings) had increased since the publication of the second-round report. There was minimal change in the remaining risks.
Outcomes	The assessment of risks in 2050 included a qualitative assessment which assumed present day 'business as usual' processes and risk management continuing. Based primarily on the findings of the ENA facilitated UK Met Office review of UKCP18 and the RCP8.5 worst case scenario, the assessment identified four potential high-level risks and 17 medium risks. The high-level risks saw the continued impact of raised temperatures alongside increased impacts from flooding and erosion. Actions from the ARP3 report included review of standards and specifications, flood risk assessment and river scour modelling to help mitigate the present and anticipated impacts of climate change.
Government reporting links	ARP3 reports can be found on the UK government website: Climate change adaptation reporting.

Chapter 3: National Gas Transmission

Who we are

National Gas is responsible for transporting gas to more than half a million businesses and 23 million homes through nearly 5,000 miles of pipes across Britain. We are the national gas network, providing secure energy to power Britain, whilst working to achieve net zero and maintain our industrial competitiveness. Our organisation comprises of four businesses.

National Gas Transmission owns and operates the high-pressure national gas network (National Transmission System, or the NTS) that transports gas safely and reliably to wherever it's needed in Great Britain.

National Gas Metering manages and maintains millions of gas meters throughout Great Britain. This part of the business is excluded from regulatory reporting.

National Gas Services provides nationally important pipeline repair and maintenance services to ensure the gas keeps flowing.

Premtech provides engineering, consultancy and design management services for onshore pipeline and associated installation projects.

National Gas Transmission (NGT) is regulated by the Office of Gas and Electricity Markets (Ofgem). The transmission regulatory framework is called RIIO (Revenue = Incentives + Innovation + Outputs) and lasts for five years. The current price control period, RIIO-T2, started on 1 April 2021 and runs until 31 March 2026. The next price control period, RIIO-GT3, starts on 1 April 2026. The other business units in the National Gas group are unregulated businesses.

Ownership

Since the publication of ARP3, National Grid Group sold an initial 80% share of National Grid Gas to a consortium lead by Macquarie Asset Management (MAM). Following the sale National Grid Gas changed its name to National Gas. In July 2024, MAM exercised its option to acquire the remaining 20 per cent equity interest in National Gas held by National Grid Group. The completion of this transaction is expected by Q1 2025, subject to the satisfaction of customary closing conditions and regulatory approvals.

>60 compressors across 21 sites

>500 above ground installations

c.5,000 miles of pipeline

Gas transportation and delivery

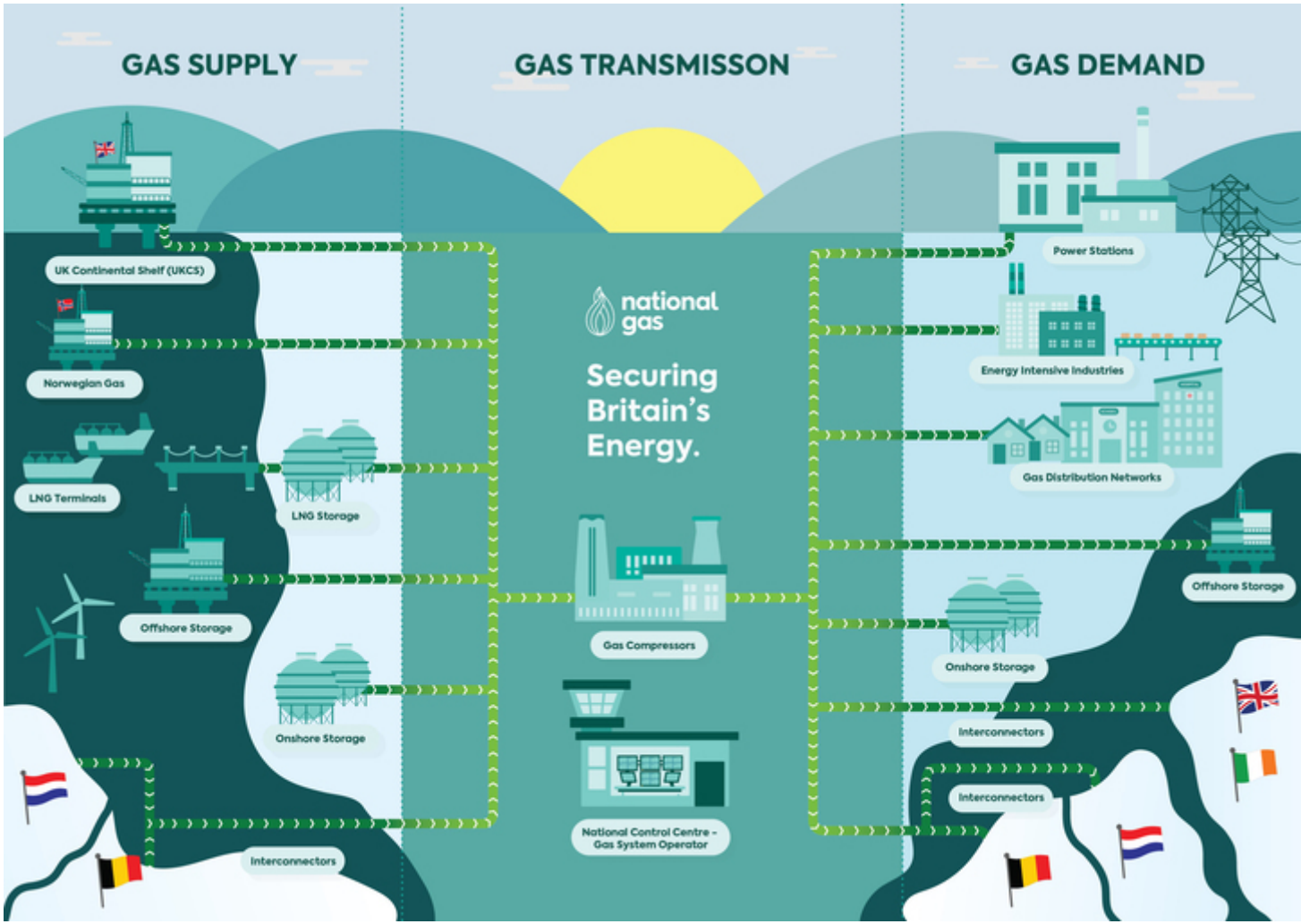
1. Gas distribution networks: Around 50% of gas in the NTS goes into Gas Distribution Networks (GDNs). It then goes into ±500,000 businesses and ±23 million homes.

2. Exports: Up to 25% of gas in the NTS can be exported into Europe. All gas exported out of Britain into Europe goes through the Bacton Gas Terminal in Norfolk, from where it reaches Belgium and the Netherlands. This has been a particular feature in the past two years, owing to increased exports into European gas storage following Russia's invasion of Ukraine. A smaller proportion, typically less than 10%, is exported to the island of Ireland, via Moffatt in South West Scotland.

3. Power stations: Around 20% of the gas in the NTS is fed into power stations. There are 35 power stations across Great Britain that are directly connected to the NTS and rely on high volumes of gas to generate electricity. In 2023, gas was used to generate around a third of the country's electricity.

4. Storage : Approximately 3% of gas in the NTS is fed into storage sites. There are nine storage sites that are directly connected to the NTS in Great Britain – which act as a formal supply of gas for a number of days during cold periods. We can also store gas within the pipes themselves, referred to as 'linepack'.

5. Industry: Approximately 2% of the gas in the NTS is fed directly into large industrial plants like those manufacturing glass, paper and chemicals. These industries require high levels of thermal energy which, whilst supplied by gas today, it will be possible to decarbonise through either CCS or hydrogen in the future.



Chapter 4: Adaptation fourth round report

In December 2023 National Gas was invited by DEFRA to participate in the Fourth Round of Adaptation Reporting. The guidance issued by DEFRA for a previously reporting organisation has been used in the development of this report. National Gas has reviewed its present day and 2050 climate risk scores from ARP3 and provided an end of century, 2100 score for the first time. An update on actions raised in the previous round of reporting has been provided.

Methodology

Since the publication of our ARP3 report our understanding of the risks posed by climate change to our assets has evolved. We have initiated the development of site specific climate change risk assessments for all twenty two permitted compressor stations and terminals on the National Transmission System. Where available these have been used to inform the review of our risk scores for present day and 2050 from ARP3 and establish risk scores for the end of century, 2100. The site specific risk assessments make use of the UK Met Office climate projections for the UK (UKCP18). There has been no update to these projections since our ARP3 report.

ARP4 therefore represents a continuation of the transition from a qualitative to quantitative approach to establishing climate risk scores. In ARP1 and ARP2 a qualitative approach was taken, in ARP3 this evolved to a hybrid of both. ARP4 is a continuation of a hybrid approach as we continually improve our understanding of the sensitivity of the NTS to climate change. As our understanding improves and availability and confidence in climate projections increases our aim is to continue the journey towards a quantitative climate risk score for the gas transmission network.

As with the previous round of reporting climate risk scores for 2050 and 2100 are based on the Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathway (RCP) 8.5. RCP8.5 assumes an increase in global mean surface temperature of 4.3 °C over 2081 to 2100 compared to the pre-industrial period (average between 1850-1900). The RCP8.5 scenario is suggested to occur by close of the current century if global emissions continue unabated at their current rate. Electricity and Gas systems justify the choice of omitting the 2°C degree projections (RCP 2.6, RCP 4.5 and RCP 6.0) as the industry adapts to worse-case scenarios and any adaptation and mitigation progress towards the 4°C scenario will encompass 2°C scenarios by default. However a 2°C degree scenario will be explored by National Gas and risk scores reported as part of our second annual reporting submission to Ofgem for RIIO-GT3 and in ARP5.

National Gas has reviewed the climate risks considered within its ARP3 report and removed those which link to National Grid Group ownership. In undertaking this review four additional National Gas specific risks have been added to the twenty two gas sector specific risks considered by the gas transmission and distribution networks.

A copy of the risk matrix and likelihood / impact definitions used in the scoring of the adaptation risk can be found in Appendix 1. In addition to a risk scoring National Gas has attributed a confidence rating of low, medium or high to each score. The confidence rating is informed by a combination of subject matter expert opinion and evidence of the sensitivity of gas transmission assets to the risks along with confidence, uncertainty and availability of future UK climate projections

Assumptions

In undertaking its climate risk assessment National Gas has made assumptions about the gas transmission system and how it may evolve to the end of century, these include:

- That future regulatory settlements will support the continuance of specific work programmes and schemes designed to respond to and manage the impacts of climate change.
- The size and scale of the gas transmission system remains the same and independent of the gas we transport. Whether it is methane today or as we support the low carbon energy transition through the emerging hydrogen economy and requirement for carbon dioxide transport infrastructure supporting carbon capture utilisation and storage (CCUS).

Climate risk assessment

The following section provides the risk scores on the 22 gas specific climate risks (ARGs) from the ENA gas and electricity transmission and distribution network sector report along with four National Gas specific risks (NGTs). A brief commentary in the discussion to explain the scoring has been provided for each risk. For more detail on each risk refer to the National Gas ARP3 report.

Risk Reference	ARG1, ARG2 and ARG3
Description	Lack of climate change management procedure, lack of specific policies and procedures governing risk assessment process on climate change and risk and action owners not identified at senior leadership team level.`
Climate Variable	All
Impact	Management risks have been identified where there is a potential that company corporate policy, procedure and strategy may not be adequate to realise and address climate change hazards or where the risk is not directly attributed to damage or reduced operation of an asset.
Discussion	National Gas has a corporate risk for climate change which drives business risk management. It is also supports our corporate climate risk disclosure in the company annual report and accounts. Within National Gas the risk is owned by the Director of Asset. In February 2024 the International Organisation for Standardisation (ISO) released a climate change amendment to its management system standards. This amendment requires companies to consider climate change risks and stakeholder needs in their risk analysis and contextual analysis. National Gas is in the process of embedding this requirement within applicable management systems.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	5 =Very Unlikely (1) x Extreme (5)	5 =Very Unlikely (1) x Extreme (5)	5 =Very Unlikely (1) x Extreme (5)
Confidence	High	High	High

Risk Reference	ARG4
Description	Flood risk of above ground assets
Climate Variable	Precipitation
Impact	There is a risk of physical damage to assets located in flood plains (fluvial) or to other assets from extreme and extended rainfall (pluvial). Whilst feeders and block valves are able to operate if submersed in water, electrical and electronic equipment may be susceptible to damage or will require isolating if flooding is anticipated. This will be exacerbated if flood defences are ineffective and/or plant relocation is not possible.
Discussion	There is no change to the risk scoring for present day and 2050 from ARP3. We consider 2100 risk score likelihood to be increased to 'Almost Certain' due to increasing winter rainfall and frequency of extreme events. Flooding is considered to be one of the most significant risks posed by climate change on our network and therefore is an area of focus for our RIIO-GT3 climate resilience strategy. A flood risk assessment for the NTS was undertaken in 2016. We expect to review this in 2025 as national flood risk maps are updated.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	9 =Possible (3) x Moderate (3)	16 =Probable (4) x Significant (4)	20 =Almost Certain (5) x Significant (4)
Confidence	High	Medium	Low

Risk Reference	ARG5
Description	Flood risk of above ground assets (governors and pressure reducing equipment) from catastrophic dam failure
Climate Variable	Precipitation
Impact	Extreme precipitation can lead to dam overload and failure. Where assets are located far enough away from dams, the impact of water inundation from a dam burst is no different from "standard" pluvial, fluvial or tidal flooding, and flooding impacts can be considered similar. Where assets are close enough to dams to be impacted by the full force of a breach, the damage would be substantial. Plant and equipment would not only be impacted by water ingress it is likely to be physically damaged or washed away by the force of water.
Discussion	There is no change to the risk scoring for present day and 2050 from ARP3. We consider the 2100 risk score to be maintained from 2050. NGT remains in close contact with dam owners and environmental regulators with respect to dam integrity inspection and overspill protection in the event of extreme rainfall events. With these controls in place NGT considers the flood risk of above ground assets from catastrophic dam failure to be negligible.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	4 =Very Unlikely (1) x Significant (4)	4 =Very Unlikely (1) x Significant (4)	4 =Very Unlikely (1) x Significant (4)
Confidence	High	Medium	Low

Risk Reference	ARG6a
Description	Above ground assets affected by lower temperatures
Climate Variable	Temperature
Impact	Gas network assets are designed and manufactured to international standards and designed to operate within particular temperature parameters. Lower temperatures can impact equipment operating performance from both a temperature and (water) freezing perspective. There are also safety concerns for colleagues who are required to free or fix the impacted equipment.
Discussion	There is no change to the risk scoring for present day and 2050 from ARP3. We consider the 2100 risk score to be maintained from 2050. The risk to above ground assets is considered negligible today and that is expected to continue as low temperature days will become less frequent. However extreme low temperatures are still expected therefore it is important we still make provision for these events for example by still allowing for anti-icing heaters to be included in any new gas turbine air intake systems.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	2 =Very Unlikely (1) x Minor (2)	2 =Very Unlikely (1) x Minor (2)	2 =Very Unlikely (1) x Minor (2)
Confidence	High	Medium	Low

Risk Reference	ARG6b
Description	Above ground assets affected by raised temperatures
Climate Variable	Temperature
Impact	Gas network assets are manufactured to international standards and designed to operate within particular temperature parameters. Increasing temperature impacts all plant and equipment and increases may reduce their rating and asset performance leading to reduced operating capacity. Temperature increases, particularly during the summer, potentially coupled with an increased demand for electricity to support a growth in demand for electric road vehicles may present a significant change in operation for gas networks. The potential for increased consumer demand for electricity that is driven by increased adoption of air conditioning may result in increased demand for gas driven generation. As a result, there may be reduced maintenance windows, challenges to asset operation and potentially network reinforcement. National Gas has also seen gas supply and demand profiles change driven by geopolitical events such as the Ukraine war. This event saw natural gas exports increase into Europe during the summer to support filling of gas storage.
Discussion	There is no change to the risk scoring for present day and 2050 from ARP3. We consider 2100 risk score likelihood to be increased to 'Almost Certain' due to the increasing temperatures particularly in summer. We are seeing isolated occurrences on the NTS of raised temperatures impacting assets, therefore managing this risk is an area of focus for our RIIO-GT3 climate resilience strategy. For example we propose undertaking climate change impact studies to improve our understanding of this risk for gas transmission assets.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	12 =Possible (3) x Significant (4)	16 =Probable (4) x Significant (4)	20 =Almost Certain (5) x Significant (4)
Confidence	Medium	Medium	Low

Risk Reference	ARG7
Description	Wind damage to above ground assets from storm events
Climate Variable	Wind
Impact	Assets are subject to damage from extreme weather events including storms and high winds. Any increase in the frequency and severity of these events will mean a higher risk of infrastructure damage failure and an impact on support services.
Discussion	There is no change to the risk scoring for present day and 2050 from ARP3. We consider 2100 risk score to be maintained from 2050. This is unlikely to present significant impacts to NGT assets, with the greatest business risk considered to be personnel being impacted by flying debris.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	9 =Possible (3) x Moderate (3)	9 =Possible (3) x Moderate (3)	9 =Possible (3) x Moderate (3)
Confidence	Medium	Medium	Low

Risk Reference	ARG8
Description	Extreme weather impacts from lightning
Climate Variable	Lightning
Impact	Increased storm frequency can lead to an increased lightning strike frequency. Where lightning strikes exposed assets, this could cause physical damage and failure. This may lead to operational failure, loss of telecommunications equipment and a fire risk to gas venting stacks.
Discussion	There is no change to the risk scoring for present day and 2050 from ARP3. We consider 2100 risk score to be maintained from 2050. Lightning strikes are not considered to be a significant risk to NGT assets. Electronic control and communication systems are robust. Systems are also surge and lightning protected. To maintain the level of protection provided lightning protection a refurbishment of these is proposed within our RIIO-GT3 climate resilience strategy.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	6 =Unlikely (2) x Moderate (3)	6 =Unlikely (2) x Moderate (3)	6 =Unlikely (2) x Moderate (3)
Confidence	Low	Low	Low

Risk Reference	ARG9
Description	Asset impact from snow/ice falls and accumulation
Climate Variable	Precipitation
Impact	The risk to above ground assets is expected to gradually decrease due to less frequent snow events. However, a risk remains of physical damage from excessive snow or ice falls, for example increased loading on building roofs. There is also the risk that access might be compromised, delaying routine or emergency work.
Discussion	There is no change to the risk scoring for present day and 2050 from ARP3. We consider 2100 risk score likelihood to be increased to 'Possible' due to the increased likelihood of weather extremes including snowfall. Periods of extended cold weather (including snow) tend to be associated with peak demands on the NTS. During periods when heavy snow is expected, arrangements are made to permanently man critical compressor stations and manned terminals to ensure operation of critical assets can be maintained. Sites are equipped with sufficient stores and backup systems to enable them to run for periods without outside support. Operational teams also have access to 4x4 vehicles, allowing them to access difficult locations.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	6 =Unlikely (2) x Moderate (3)	6 =Unlikely (2) x Moderate (3)	9 =Possible (3) x Moderate (3)
Confidence	High	Medium	Low

Risk Reference	ARG10
Description	Risk to underground pipelines from river erosion
Climate Variable	Precipitation
Impact	Pipelines can be exposed and then susceptible to physical damage from external impact or from being unsupported. More frequent flooding and increased river and watercourse flows will increase this level of risk.
Discussion	There are over 600 points at which below ground pipelines cross a watercourse including rivers, streams and ditches. Of these, six are considered as major river crossings, which lie under the river Thames, Exe, Forth, Tay, Duddon and the Humber Estuary. These existing crossings are monitored regularly as part of the routine integrity management process, the frequency of monitoring being set by individual risk assessments. Where an issue with erosion leading to risk of the feeder being exposed is identified, specific action plans are developed to resolve the issue, including working with stakeholders such as the Environment Agency. As a present and continuing high risk for NGT, management of the risk to underground pipelines from river erosion is included in NGTs RIIO-GT3 climate resilience strategy.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	12 =Possible (3) x Significant (4)	16 =Probable (4) x Significant (4)	20 =Almost Certain (5) x Significant (4)
Confidence	Medium	Medium	Low

Risk Reference	ARG11
Description	Ground contamination and transport of materials from flooding of contaminated sites
Climate Variable	Precipitation
Impact	Flooding of contaminated sites will lead to faster and greater transportation of materials in ground water, especially for sites located within flood plains. This will lead to increased inspection and remediation costs to mitigate any damage. There is also a risk of resulting regulatory and enforcement action.
Discussion	There is no change to the risk scoring for present day and 2050 from ARP3. We consider 2100 risk score to be maintained from 2050. The risk of potentially contaminated land on the NTS is low, for example the majority of compressor stations are constructed on previously greenfield sites.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	2 =Very Unlikely (1) x Minor (2)	2 =Very Unlikely (1) x Minor (2)	2 =Very Unlikely (1) x Minor (2)
Confidence	High	Medium	Low

Risk Reference	ARG12
Description	Ground movement due to drought conditions and dry ground
Climate Variable	Temperature and Precipitation
Impact	Ground movement caused by drying and shrinkage may exert additional tensile forces on underground assets. Coupled with other issues, this could lead to mechanical damage and the potential fracture of pipelines leading to a gas release, fire and possible explosion.
Discussion	There is no change to the risk scoring for present day and 2050 from ARP3. We consider 2100 risk score to be maintained from 2050. At present, there is no reason to believe that gas escapes as a result of ground movement exist under current conditions. Routine helicopter surveying, line walking with depth finding and in-line inspections (which can detect imperfections in the pipes) are undertaken on the NTS at regular intervals. The robust construction and engineering of the NTS provides it with a good level of resilience.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	6 =Unlikely (2) x Moderate (3)	9 =Possible (3) x Moderate (3)	9 =Possible (3) x Moderate (3)
Confidence	Medium	Medium	Low

Risk Reference	ARG13
Description	Vulnerability of critical IT systems managed by third parties from extreme weather events
Climate Variable	Temperature and Precipitation
Impact	This represents an interdependency with other service suppliers and there is a risk of the loss of critical IT systems and functionality, especially if there is insufficient flood protection or cooling of third-party data centres and/or these cannot be relocated.
Discussion	There is no change to the risk scoring for present day and 2050 from ARP3. We consider 2100 risk score to be maintained from 2050. As examples of resilience NTS remotely operated assets have telephone backup systems or can be operated with manual intervention. NGT also has access to satellite phones to aid infield communication in the event of a mobile phone network failure.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	4 =Unlikely (2) x Minor (2)	9 =Possible (3) x Moderate (3)	9 =Possible (3) x Moderate (3)
Confidence	Low	Low	Low

Risk Reference	ARG14
Description	Asset damage if no wildfire risk assessment or remediation measures in place
Climate Variable	Wildfire
Impact	Wildfire is a consequential risk of increased temperatures and reduced precipitation and, whilst difficult to forecast, pose a significant risk to above ground assets where they are located in susceptible areas. These include open heathland, grassland or forested areas and may be in remote locations. The risk of pipelines damage is increased in the absence of vegetation clearance within 3m of site boundaries. There is also a significant human component in the cause of wildfires in combination with local geological and vegetation characteristics.
Discussion	There has been no change in the risk score for present day and 2050, as well as the three principle ways the NTS may be impacted by wildfire. These are through the burning through the surface layers resulting in a reduction in surface cover, and in extreme circumstances may continue to burn down through the sub-strata to the extent that the pipe wrapping may become damaged (particularly older coal tar coatings). This impacts pipelines passing through peat moorland areas. The second is through wildfire in surrounding vegetation but this is managed through vegetation growth, the control of which is discussed in ARG15. Finally through wildfire impacting electricity distribution assets supplying NGT. The 2100 likelihood has increased to 'Almost Certain' due to the hotter drier summers expected which could trigger wildfire events.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	3 =Possible (3) x Limited (1)	3 =Possible (3) x Limited (1)	5 =Almost Certain (5) x Limited (1)
Confidence	Medium	Medium	Low

Risk Reference	ARG15
Description	Vegetation Growth
Climate Variable	Temperature and Precipitation
Impact	Increases in both temperature and precipitation will lead to increased vegetation growth. Above ground assets will be impacted by any increased growth of trees adjacent to operational equipment. This will lead to increased levels of maintenance and reduced access issues. Similar issues may be encountered with the accelerated growth of plants or invasive species.
Discussion	Vegetation growth presents challenges to NGT, particularly where assets are surrounded by third-party land. Access is required to sites, pipelines and other assets for both routine and emergency purposes. Maintaining appropriate security at fixed sites, particularly related to clearing areas around fence lines is also significant. Following the anecdotal evidence that was signposted in ARP3, that NGT is starting to see increased levels vegetation clearance as part of its routine work. This has been proven and has lead to increased proposed investment to manage vegetation growth as part of NGTs RIIO-GT3 Climate Resilience Strategy.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	9 =Possible (3) x Moderate (3)	9 =Possible (3) x Moderate (3)	9 =Possible (3) x Moderate (3)
Confidence	High	Medium	Low

Risk Reference	ARG16
Description	Wildlife Impacts
Climate Variable	All
Impact	Changes to breeding patterns, nesting seasons and species distribution as the result of climate change has the potential to impact operations. Access to locations where protected species are present, and the care and attention required to minimise impacts or implement mitigation may cause adverse impacts on operations.
Discussion	Wildlife presents a number of challenges to NGT's operations both at fixed and non-fixed locations. Nesting birds in particular are attracted to the open space, structures and security of NGT sites, including ground nesting species that utilise the chippings. Rabbits and other burrowing species can also impact assets, particularly cables and other ancillary equipment. Non-fixed locations and development sites are subject to significant constraints which include protected species and habitats which must be carefully assessed and managed. It remains uncertain how, or if, climate change will influence both the type and activity of wildlife that access NGT locations. As a result, existing processes are considered to be suitable at this stage, however, given significant changes, additional resource and investment may be required to manage wildlife impacts.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	4 =Unlikely (2) x Minor (2)	4 =Unlikely (2) x Minor (2)	6 =Possible (3) x Minor (2)
Confidence	High	Medium	Low

Risk Reference	ARG17
Description	Supply chain impacts
Climate Variable	All
Impact	Supply chains could be affected due to travel difficulties resulting from extreme weather events. This can result in an impact on the continued operation and maintenance of the networks and on emergency response during and after a significant event. Business Continuity Management plans must consider the impact of climate change.
Discussion	Disruption to our global supply chain (continuity of supply) is recognised as a key risk within our procurement teams risk register. National Gas, as part of its procurement framework, works with responsible businesses who themselves consider climate and extreme weather vulnerability and associated risks as part of their supply chain and risk management frameworks.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	1 =Very Unlikely (1) x Limited (1)	4 =Unlikely (2) x Minor (2)	6 -Possible (3) x Minor (2)
Confidence	Medium	Medium	Low

Risk Reference	ARG18
Description	Business continuity management plans affected due to severe travel difficulties resulting from extreme weather events
Climate Variable	All
Impact	Severe weather has the potential to disrupt service to customers and business operations. Critical locations and systems may be impacted alongside a number of safety and logistical challenges in operatives gaining direct access to assets. The potential to compound emergency situations or slow the mitigation of their impacts may be an issue.
Discussion	National Gas has a robust resilience framework. The plans are focussed on disruption of service, for example as a result of severe weather, rather than specific climate risks. No change to present day and 2050 risk scoring, 2100 likelihood scoring increased due to increased likelihood of weather extremes.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	6 =Possible (3) x Minor (2)	12 =Probable (4) x Moderate (3)	15 =Almost Certain (5) x Moderate (3)
Confidence	High	Medium	Low

Risk Reference	ARG19
Description	Knock on effect on gas distribution and transmission network operations from variable electricity supply due to impact on electricity distribution network operators
Climate Variable	All
Impact	One of the potential interdependencies within the sector is the knock-on effect on gas network operations from a variable electricity supply. An initial climate impact on the electricity networks as set out in the electricity network risks may result in electricity supply interruptions leading to an impact on asset operations and gas supplies to customers.
Discussion	The risk is considered low due to emergency diesel standby generators at compressor stations and terminals providing a minimum of four days supply in the event of electricity distribution system disruption. In addition to this batteries are also in place for other systems providing 24 hours of backup. At compressor sites with electrically powered variable speed drive (VSD) these have turbine driven compressors as a contingency to ensure gas security of supply.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	6 =Possible (3) x Minor (2)	6 =Possible (3) x Minor (2)	6 =Possible (3) x Minor (2)
Confidence	High	Medium	Low

Risk Reference	ARG20
Description	Tidal Flooding of above ground assets due to sea level rise
Climate Variable	Sea Level Rise
Impact	Independent of the source, the impact of flooding on above ground assets is the same. There is a risk of physical damage to assets. Although pipework is generally resilient to being submerged in water, electrical equipment is not. Loss of telemetry and communications has the potential to significantly impact site operation and the wider network. At a strategic level, with likely sea level rise, this will be exacerbated if flood defences are ineffective and/or plant relocation is not possible.
Discussion	NGT owns and operates a number of significant assets in coastal locations, including two gas terminals at Bacton in Norfolk and St Fergus in Aberdeenshire. Although these two assets are not at risk from sea level rise and associated tidal flooding as they are located at elevations above that projected to be impacted, NGT does have assets particularly in East Anglia which could be impacted in a 2050 and 2100 RCP8.5 scenario. No change to present day and 2050 risk scoring, 2100 likelihood scoring increased due to the increased area of the UK and NTS impacted by tidal flooding due to sea level rise.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	6 =Unlikely (2) x Moderate (3)	12 =Possible (3) x Significant (4)	16 =Probable (4) x Significant (4)
Confidence	High	Medium	Low

Risk Reference	ARG21
Description	Saline contamination and increased corrosion rate of above and below ground assets from sea water
Climate Variable	Sea Level Rise
Impact	There is a risk of gradual chemical damage to pipelines from increased tidal flooding, which will affect asset integrity and could lead to water ingress and gas release. Ingress of saline groundwater may impact the buoyancy of pipes and cause structural issues.
Discussion	NGT has significant experience of operating subsurface assets in saline environments. It already operates pipelines in areas of salt marsh and flood or tidal zones subject to saline inundation without seeing significant impacts. The combination of cathodic protection and regular inspection to examine corrosion growth is employed. No change to the ARP3 risk score for present day and 2050. Our view is that the likelihood of this risk occurring increases to 'Probable' in a 2100 RCP8.5 scenario linked to sea level rise and increased areas of the UK and our network to be at risk from sea water exposure.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	2 =Very Unlikely (1) x Minor (2)	4 =Unlikely (2) x Minor (2)	6 =Possible (3) x Minor (2)
Confidence	Medium	Medium	Low

Risk Reference	ARG22
Description	Groundwater flooding of below ground assets leading to water ingress to pipes
Climate Variable	Precipitation
Impact	Despite the inherent resilience of pipelines, more frequent and prolonged flooding will increase the risk of physical damage and the likelihood of water ingress leading to operational and supply issues.
Discussion	The operating pressure and mechanical integrity of NGT pipelines mitigates this risk which is primarily confined to low pressure distribution systems where groundwater pressures can readily exceed those of the gas in the pipe resulting in water ingress.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	2 =Unlikely (2) x Limited (1)	3 =Possible (3) x Limited (1)	3 =Possible (3) x Limited (1)
Confidence	Medium	Medium	Low

Risk Reference	NGT1
Description	Changes to groundwater levels resulting in floating of pipelines without buoyancy coatings
Climate Variable	Precipitation
Impact	There is a risk of physical damage to pipelines caused by buoyancy in saturated ground. Additional stresses placed on the pipeline by changes to groundwater levels can result in plastic deformation and eventually rupture. This will be exacerbated with changes to groundwater levels, particularly at the coast, associated with sea level rise.
Discussion	In general, pipelines are routed away from known areas where the ground is saturated. Where this is unavoidable, pipelines located in saturated ground are laid with additional concrete anti-buoyancy coatings. No change to the ARP3 risk score for present day and 2050. Our view is that the likelihood of this risk occurring does not change in a 2100 RCP8.5 scenario.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	2 =Very Unlikely (1) x Minor (2)	6 =Possible (3) x Minor (2)	6 =Possible (3) x Minor (2)
Confidence	Medium	Medium	Low

Risk Reference	NGT2
Description	Increased humidity causing elevated corrosion of exposed above-ground assets.
Climate Variable	Temperature and Precipitation
Impact	There is a risk from increased humidity causing elevated corrosion of exposed above-ground assets. Our ongoing above-ground asset coating program is designed to address and manage the risk from corrosion. Increased humidity has the potential to increase the costs associated with managing corrosion by increasing the frequency of re-coating.
Discussion	As the global temperature of our atmosphere rises, it can hold more moisture. As well as contributing to an increase in frequency and intensity of extreme rain events, this additional moisture held in the atmosphere can increase humidity. This is a new climate risk for NGT in ARP4. We have seen some specific examples of compressor assets within buildings being impacted by corrosion. Elevated humidity levels has been identified as a contributing factor to the corrosion seen and the need for dehumidifiers identified.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	4 =Unlikely (2) x Minor (2)	6 =Possible (3) x Minor (2)	8 =Probable (4) x Minor (2)
Confidence	High	Medium	Low

Risk Reference	NGT3
Description	Ground movement and landslips due to excessive rainfall
Climate Variable	Precipitation
Impact	Physical movement of slopes can undermine foundations, resulting in asset stress and, in some circumstances, the catastrophic failure of an asset.
Discussion	Depending on the characteristics and management of natural and engineered slopes there is the potential for movement during or following excessive rainfall. If this was to occur in the location of a NTS feeder then large sections could be put under mechanical stress due to reduced support or become dented if forced onto buried rocks. This is a new climate risk for NGT in ARP4.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	2 =Very Unlikely (1) x Minor (2)	4 =Unlikely (2) x Minor (2)	6 =Possible (3) x Minor (2)
Confidence	Medium	Medium	Low

Risk Reference	NGT4
Description	Increased rate of loss of level in areas with already low depth of cover
Climate Variable	Temperature and Precipitation
Impact	Increased temperatures and reductions in rainfall may result in shrinkage of clay and organic soils, resulting in reduced cover for pipes. The shrinkage and associated drying of soils also make it vulnerable to wind or water driven erosion, further compounding the issue. The resulting soil loss may make pipes more prone to strikes and bursts.
Discussion	For safety reasons, depth of cover over gas pipelines is important as this provides a primary level of protection from accidental third-party interference. The land the NTS crosses is not owned by NGT but is subject to easements which control activities which can be undertaken within the boundaries of the easement. No change to the ARP3 risk score for present day and 2050. In line with expected increases in temperature and precipitation by 2100 in a RCP8.5 scenario the likelihood is increased to 'Almost Certain', no change in impact. Mitigation of this risk is through inspection and monitoring such as NGTs line walking and helicopter surveillance programme of the gas transmission system.

	Present Day	2050	2100
Risk score (Likelihood x Impact)	6 =Possible (3) x Minor (2)	12 =Probable (4) x Moderate (3)	15 =Almost Certain (5) x Moderate (3)
Confidence	Medium	Medium	Low

Interdependencies

Infrastructure systems can have interdependencies on each other for their operation. National Gas has considered five interdependencies in its risk assessment namely ARG5, ARG13, ARG14, ARG17 and ARG19. In addition there are potential interdependency elements to ARG4, ARG7 and ARG9.

National Gas is committed to improving its understanding of the interdependence of the gas transmission system and NTS operations on other infrastructure systems. For example National Gas is a partner alongside the Cadent Gas Limited, National Energy System Operator (NESO) and Scottish Power Energy Networks on the UK Power Networks led CReDo+ project funded through the Ofgem Strategic Innovation Fund (SIF).

CReDo+ will develop the Climate Resilience Demonstrator into the Climate Resilience Decision Optimiser digital twin and data sharing platform allowing the electricity and gas sectors to understand their infrastructure interdependencies and cascading risks from extreme weather including flooding, extreme heat, and strong winds.

National Gas is a member of both the ENA co-ordinated Climate Change Resilience Working Group (CCRWG) and Climate Change Adaptation Reporting Group (CCARG). Participation in these groups enables a co-ordinated energy sector response to the challenges posed by climate change to energy system resilience, and a forum for knowledge sharing and collaboration on topics such as interdependencies, cascading risks and climate resilience metrics.

Chapter 5: ARP3 action progress

In ARP3 three actions were identified to address the risks posed by temperature, flooding and river scour. These climate risks were of most concern to operation of the gas transmission system between 2016 and 2021. The actions remain valid and a further progress update on their completion will be given in the next round of ARP reporting.

Action 1

Review its standards and specifications for construction of new assets/plant to ensure resilient operation from the impacts of climate change throughout their life cycle.

Progress

Site specific climate change risk assessments for compressor stations and terminals are being undertaken and will be complete by the end of 2024. In addition climate change impact studies are proposed in the RIIO-GT3 price control period to deepen our understanding of the risk posed by flooding and elevated temperatures. Both activities will inform a review of the suitability of existing standards and specifications for a changing climate.

Action 2

Undertake a flood risk assessment using the latest available flood risk mapping, updating its 2008 assessment.

Progress

A NTS flood risk assessment was undertaken in 2016 to update the previous 2008 assessment. New national risk information for flooding and coastal erosion is expected in 2025 from DEFRA and the Environment Agency. The release of this will inform the potential review of the latest 2016 NTS flood risk assessment.

Action 3

Undertake a river scour risk modelling exercise for gas transmission pipelines at river crossings using the UKCP18 Met Office climate change scenarios to inform its future depth of cover inspection regime and mitigation plans where appropriate.

Progress

A river scour modelling exercise has not yet begun for gas transmission pipelines at river crossings. These existing crossings are monitored regularly as part of the routine integrity management process, the frequency of monitoring being set by individual risk assessments. Further detail on NGTs approach to managing the risk to underground pipelines from river erosion is described in ARG10. This exercise will be undertaken prior to the next round of ARP reporting.

Chapter 6: Climate resilience strategy

Within the National Gas RIIO-GT3 business plan submission we have submitted a Climate Resilience Strategy. The strategy sets out our holistic approach towards maintaining an appropriate level of climate resilience for our current methane network.

The document takes the indicated seven highest climate risks from our ARP3 report and proposes a mixture of reactive and proactive actions, in addition to the three actions raised in the ARP3 report itself, to adapt to our changing climate and ensure the climate resilience of the gas transmission system.

Our Climate Resilience Strategy submitted as part of our RIIO-GT3 business plan submission can be found here.

"Within our RIIO-GT3 business plan, we have proposed climate resilience driven essential investment in physical asset enhancements and protection where we had justifiable evidence of the adverse impact of climate change on the operation of our asset base. To further increase our understanding of climate change, we have also made provision for specific impact assessment studies." Kate Boxall, Head of Asset Management.

Chapter 7: Conclusion

This report is the first as National Gas but follows three previous rounds of reporting as National Grid Gas. National Gas has completed this report as an organisation who reported in ARP3 and in accordance with Defras ARP4 reporting guidance.

National Gas has reviewed the climate risks considered within its ARP3 report and removed those which link to National Grid Group ownership. In undertaking this review, four additional National Gas specific risks have been added to the twenty two gas sector specific risks considered by the gas transmission and distribution networks. In addition, we have reported a risk score for end of century, 2100 and attributed a confidence rating to the risk scores in our assessment.

The ARP4 risk assessment has identified two high risk and seven moderate climate risks. They are consistent with previous National Gas ARP reports.

Identified risks

1	Raised temperatures
2	Erosion
3	Flooding from rivers and rainfall
4	Tidal flooding
5	Ground movement
6	Wind damage
7	Vegetation growth
8	Lightning
9	Snow

The assessment found that since ARP3, the considered risk from erosion (specifically pipeline crossings) has increased. There has however, been minimal change in the remaining risks.

The view to 2050 sees the continued impact of raised temperatures alongside increased impacts from flooding and erosion. Our 2100 assessment sees the impact from these climate risks continuing but their likelihood and overall risk score slightly increasing, consistent with UKCP18 projections of increasingly warmer and drier summers, wetter winters, sea level rise and increased frequency of weather extremes.

Temperature, flooding and river scour remain the greatest climate risk to National Gas. Three actions were raised in the ARP3 report, two are in progress and one has yet to begin. National Gas will provide a further update on progress with these in its next report. No further actions were raised following the ARP4 risk assessment and the existing actions remain valid and reasonable.

While high and medium risks have been identified the National Gas assessment is consistent with previous reports and those of the gas and electricity distribution and transmission sector detailed in the ENA sector report. National Gas and the UK gas transmission system remains inherently resilient but recognises the need to continually reappraise its climate risks and engage with regulators on financing adaptation measures to ensure it remains so. Where uncertainty on its exposure to climate risks exists, for example on the topic of interdependencies and cascading risks within infrastructure, National Gas is committed to working with the partners and regulators to ensure we increase our understanding, adapt to our changing climate and ensure the climate resilience of the gas transmission system.

Appendix 1: Risk matrix

For ARP3 a common risk matrix with impact and likelihood definitions was developed within the ENA Gas Environment Group. For consistency in ARP4 the same risk matrix and definitions have been used.

Note - The impact and likelihood definitions below reflect those from ARP3 and the ownership of National Gas in October 2021.

Measurement of risk matrix

Impact	1 Very unlikely	2 Unlikely	3 Possible	4 Probable	5 Almost certain
5 Extreme	5	10	15	20	25
4 Significant	4	8	12	16	20
3 Moderate	3	6	9	12	15
2 Minor	2	4	6	8	10
1 Limited	1	2	3	4	5

Likelihood

Risk	Negligible	Low	Medium	High

Impact definitions

Extreme	Significant	Moderate	Minor	Limited
Regional area affected with people off supply or significant asset failure which exceeds ability for network intervention or reinforcement.	**County or city area affected with people off supply or significant asset failure which requires significant network intervention or reinforcement.**	**Significant increase in costs of response and network strengthening.**	**Cost of network maintenance requirements and impact on business now of concern.**	**Limited impact - can be managed within "business as usual" processes.**
Financial: Cost dependent on TO/DNO impact (>£50M, >£20M).	**Financial:** Cost dependent on TO/DNO impact (Up to £50M, >£10M).	**Financial:** Cost dependent on TO/DNO impact (Up to £30M, £1-10M).	**Financial:** Cost dependent on TO/DNO impact (Up to £10M, £1M).	**Financial:** Cost dependent on TO/DNO impact (Up to £5M, £500K).
Reputation: External impact on international stakeholders, company accused of poor practice or negligence, direct blame to company leading to extensive media coverage, significant business and company value impact, potential loss of licence.	**Reputation:** External impact on national stakeholders, major environmental incident with extensive media coverage, business and company value impact, repeated regulatory intervention.	**Reputation:** External impact on stakeholders, wider and prolonged adverse media coverage, negative customer impact, regulatory intervention.	**Reputation:** Internal impact within business and stakeholders, local media interest and complaints, some business criticism.	**Reputation:** Internal issue from local event, negligible inconvenience, minimal media coverage.
Environment: Reportable incident, serious and lasting environmental damage or loss, enforcement action and fine certain.	**Environment**: Reportable incident, significant environmental damage or loss, long recovery time, enforcement action expected.	**Environment:** Reportable environmental incident resulting from breach of consent or permit, medium damage and loss to environment, potential enforcement action.	**Environment:** Minor, non-reportable incident affecting local environment, quick resolution.	**Environment:** Non-reportable incident with negligible environmental impact or damage, immediately resolved.
Asset/Security of Supply: Total loss of asset, major conurbation and high customer numbers off supply, national transmission system disruption.	**Asset/Security of Supply:** Major asset damage, geographical area off supply, major outage on distribution networks.	**Asset/Security of Supply:** Asset damage leading to plant shutdown, significant numbers of tariff customers off supply for considerable time.	**Asset/Security of Supply issues:** Minor asset damage leading to localised shut down, firm contract customers affected and off supply.	**Asset/Security of Supply:** Limited impact on assets and supplies, limited disruption to interruptible supplies.

Likelihood definitions

Rating	Definition	Guideline
Almost certain	The risk is expected to be realised and may already be under active management as an event.	>90% or once a year frequency.
Likely	More likely and probably will occur, mitigations not fully effective, control weaknesses are known but being managed.	50-90% or 1 in 5 years frequency.
Possible	Equally likely as unlikely, mitigations are in place, control measures are under active management.	30-50% or 1 in 10 years frequency.
Unlikely	Events are rare and unlikely but could occur, required mitigations in place, controls are effective.	10-30% or 1 in 15 years frequency.
Very Unlikely	No known event or extremely rare or remote chance of occurring.	<10% or 1 in 20 years frequency.