Our Performance 2023/24

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Foreword

Security of energy supply is a responsibility we take extremely seriously. But we know it is important to balance this with our societal and environmental obligations.

Jon Butterworth
Chief Executive Officer

Welcome to our third performance report of the RIIO-T2 price control period. In this report, we will focus on what we have delivered against our allowances in 2023/24. We will also set out information on our performance over the 2023/24 year, as well as looking ahead to the rest of the RIIO-T2 period and identify the key areas of focus for us during the remainder of the price control.

In February, we celebrated our first birthday as National Gas. In just 12 months, we have proved that we are a trusted guardian of Britain's energy resilience, supporting both domestic demands and European supplies during troubled times. We have ramped up our capital delivery programmes to ensure we are delivering on our RIIO-T2 promises, so beginning to rectify the historic under investment in the transmission network. We have also taken the vital first steps in creating a core hydrogen network to transport this clean gas across the country.

Our journey of transformation has continued over the course of the year with the consortium comprising Macquarie Asset Management and British Columbia Investment Management Corporation taking a further stake in the business. This increased investment is a genuine vote of confidence not only in what National Gas delivers today, but in the role that we will play leading the UK's energy transition into the future.

As a new company, our Board met eight times over the course of the year to exercise scrutiny of our work and hold the Executive to account for delivery. The Board has been supported in its work by four committees: Audit and Risk Committee, Remuneration and Nominations Committee, Regulation and Strategy Committee and Safety and Sustainability Committee. The Board has operated in line with good governance practices, its agreed governance framework and the Wates Corporate Governance principles for large private companies.

Operationally, there have been signs of greater stability in the energy markets than over the previous years but, there is no room for complacency. Factors beyond our control, such as the weather, geopolitical events, global market developments and the wholesale cost of gas, all have the potential to impact our work. As the primary energy source for the UK, and a critical energy network, we remain ready to respond to whatever challenges come our way.

> We have continued to put customers and stakeholders at the heart of our business by listening to and acting upon their feedback. We are delighted that we have maintained our high satisfaction scores from the last few years, 8.56/10 and 8.75/10 for customers and stakeholders respectively.

Maintaining the safety and reliability of our network is our priority. We have again been able to achieve 100% reliability in our network. In the summer, we undertook the largest transmission maintenance programme in the current regulatory period. To ensure we were ready for winter, our team of field engineers had greater access to the network throughout the summer, to carry out vital pipeline inspections, digs and maintenance across our network, and across the length and breadth of the country.

This programme of maintenance not only made us all the more resilient when it came to winter but also ensured we maintained a strong focus on energy security and facilitated the continued exports to continental Europe. While the volume of exports did drop significantly in 2023/24, 8.84 billion cubic metres still flowed out to the Netherlands and Belgium from the two interconnector terminals at our Bacton gas terminal. Meanwhile it was a similar story in respect of liquified natural gas (LNG). In 2022/23, a record 26.2 billion cubic meters of LNG came into Britain via Milford Haven and the Isle of Grain terminals. This, unsurprisingly, dropped in 2023/24 to 15.93 billion cubic meters of LNG being delivered by 153 cargoes.

This recalibration hinted at greater stability in the energy market through the winter, as price differentials narrowed, and forward price curves reduced. But we know that we live in a volatile world and that things can change quickly. We continue to monitor the market closely for any developments that may impact our activities.

Whilst undertaking the maintenance programme, and running our business in general, we do not accept any compromise when it comes to the security and safety of our people and customers. In 2023/24, our safety performance indicator of lost time incidents per 100,000 hours was 0.02 compared to 0.02 in 2022/23, demonstrating a continued focus on ensuring world leading safety standards.

In October 2023, we successfully completed our annual network emergency exercise – Operation Everest – involving participation from over 400 individuals drawn from across 50 organisations. The exercise enables us to test our process and practice our responses to a National Gas Supply Emergency (NGSE). While this is an event, the like of which we have never seen, we know that it important to be prepared should it ever occur.

I am honoured to serve as the Network Emergency Co-ordinator (NEC). This important role is solely focused on co-ordinating actions of the gas industry to prevent or minimise the safety consequences of an NGSE. In discharging this function, I am proud to be supported by a team of senior managers at National Gas and grateful for the collaboration across the industry to prepare for such an unlikely event.

> Project Union – 'a hydrogen backbone' - will move hydrogen to where it needs to be across the whole of Britain, ensuring that all parts of the country can directly benefit from the hydrogen economy.

Security of energy supply is a responsibility we take extremely seriously. But we know it is important to balance this with our societal and environmental obligations. That is why we are committed to ensuring sustainability is at the heart of what we do. It is embedded within our purpose - leading a clean energy future for everyone – and is at the forefront as we lead the transition to clean, fair, and affordable energy.

We are fully committed to ensuring sustainable and ethical practices in all we do, and continually review, evaluate, and improve our operations to ensure we are delivering on that. We seek to act as a responsible and compassionate business, supporting the communities we serve – donating over £35k to our charity partners, investing in local communities through our Community Grant Fund and supporting our staff to deliver over 1,900 volunteering hours in 2023/24.

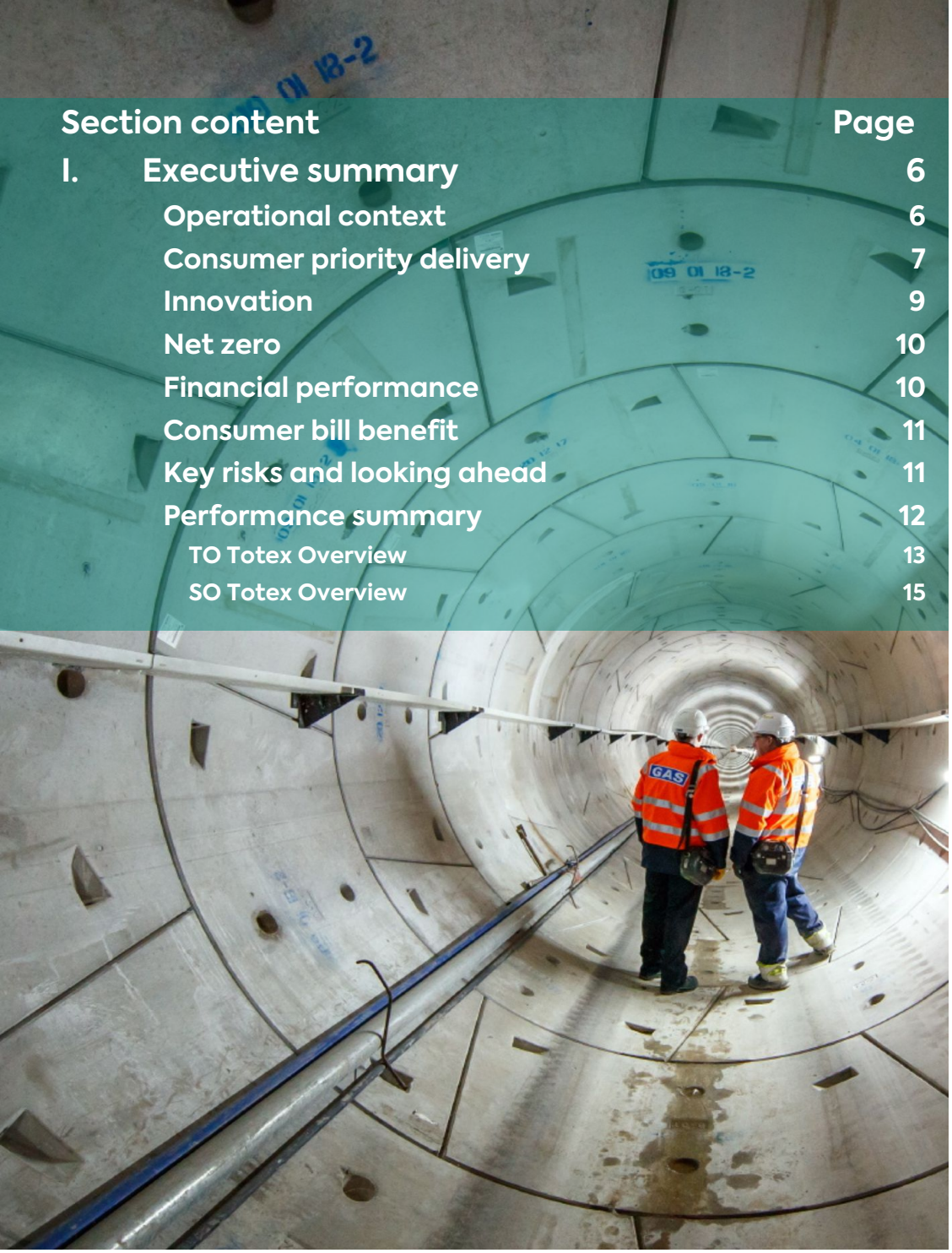
We are aware of the critical role we play in solving current and future challenges for energy and are ensuring that we are flexible in how we provide and use energy. This year, we have progressed our ambitious plans for a core hydrogen network across Britain. Project Union – 'a hydrogen backbone' - will move hydrogen to where it needs to be across the whole of Britain, ensuring that all parts of the country can directly benefit from the hydrogen economy.

In May 2023, Ofgem approved funding for feasibility work on our proposed 2,500km hydrogen transmission network, while in January 2024, we were grateful that Ofgem agreed the needs case in principle, inviting us to submit a full request for funding under the net zero reopener. Although after the 2023/24 year, I am pleased to report that we submitted this request to Ofgem at the end of April and look forward to receiving the outcome of that in due course.

Throughout the year, we have worked hard to prove that we can transport hydrogen safely and reliably through the National Transmission System (NTS). Making full use of our world leading hydrogen test facility – FutureGrid – which makes use of decommissioned transmission assets, we have successfully tested four key hydrogen concentrations – 2%, 5%, 20% and 100% hydrogen gas.

It was an extremely proud day, when in March 2024, for the first time we were able to introduce a 100% hydrogen flow safely at FutureGrid. We believe that this demonstrates that hydrogen transmission at 100% is safe and effective at scale – and we look forward to making the safety case to Government on this.

Looking to the future, there is much for us to focus on as we protect our energy system of today, grow our business in new areas, and innovate for the future through the remainder of the RIIO-T2 regulatory price control period and beyond in the RIIO-T3 period. We are committed to working closely with the government and key stakeholders as we continue to secure Britain's energy and build a clean energy system for this country. I am confident that as an organisation, National Gas will continue to evolve making sure we have the right structures and systems, skills and tools, people, and capabilities to continue to operate safely and reliably, so helping make Britain a clean energy superpower.



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I. Executive summary

This report is National Gas Transmission's Performance report for the third year of the five-year RIIO-T2 Regulatory Period. Within this report we describe our financial and operational performance against the consumer priorities we have committed to deliver as part of the RIIO-T2 Price Control.

This year marks the first full year for National Gas as a standalone business and within this regulatory year, progress has continued in the transfer of ownership from National Grid plc to the consortium comprising Macquarie Asset Management and British Columbia Investment Management Corporation.

Following the acquisition of a 60% equity stake in the business by the consortium on 31 January 2023, the consortium acquired a further 20% in March 2024. The consortium has now entered into a new option agreement with National Grid for the potential acquisition of the remaining 20% shareholding in the National Gas group.

Operational context

In recent years, the global economic conditions brought about by the aftermath of Covid and the Ukraine/Russia conflict have resulted in significant changes to the UK and European energy markets. In 2022/23 in particular, the curtailment of Russian gas created a European supply shock with GB playing a significant role as a land bridge to refill EU storage and provide energy security to the Continent. The resultant market conditions led to high sustained GB exports to the EU (increasing by 4-fold from the previous five years up to ~20 bcm/yr in 2022/23) particularly over the summer and shoulder months. This increase in demand was met via a corresponding increase in supplies, principally LNG via Milford Haven. These prevailing supply/demand dynamics required us to configure the NTS to move gas West to East, from LNG arriving at Milford Haven through to the two EU interconnectors (Interconnector and BBL).

The reduction of gas from Russia created uncertainty and volatility for energy markets with gas prices reaching record high levels. The resultant high energy prices impacted customer behaviours, with domestic and industrial consumers alike reducing energy consumption.

The UK and the Continent experienced mild winter conditions in both 2022/23 and 2023/24, meaning that Europe ended the winter period with healthy volumes of gas in storage and, consequently, didn't require as much gas from GB to replenish storage stocks in the summer months of 2023, therefore reducing demand for exports from GB (flows to Europe from GB saw a 57% reduction in 2023/24). In addition, the resolution of issues that impacted European hydropower and nuclear generation in 2023/24, the commissioning of the Viking Link from January 2024 and the addition of circa 15 bcm of new LNG import capacity in Europe all helped to further reduce the need for GB exports.

This overall reduction in demand and subsequent reduction in LNG cargos meant that the NTS switched to a more traditional North to South configuration in 2023/24, moving gas from high supply areas in Scotland and the Northeast, to higher demand areas in the Southeast and West. In addition, the reductions in overall flows combined with reductions in both interconnector exports and LNG supplies resulted in a ~40% reduction in compression required to achieve the operational flows and pressures to meet our customer's requirements across the network.

The marked change in network flows when compared to the previous year highlights the requirement for operational flexibility across the NTS, with flexible reliable assets needed to respond to volatile market conditions.

To meet customer's requirements National Gas has to cover a range of potential scenarios which are then assessed when we are planning outages and managing asset availability, ensuring an adequate number of assets are available at the right times in the right places. We continue to assess and adapt to the prevailing market conditions to meet the needs of our customers.

Consumer priority delivery

We are pleased to report that in 2023/24 we have been able to build on the good performance achieved in the previous year for our customers against the challenging outputs outlined in our three consumer priority areas and we are firmly on track to deliver the majority of our RIIO-T2 output. Table 2 summarises our performance against each individual price control deliverable (PCD) and incentive that sit within the consumer priority areas.

We achieved the relevant target for all of our outputs that sit within the **meeting the needs of consumers** and network users' priority area. In 2023/24 we have maintained our above target scores for both our customer (CSAT) and stakeholder (SSAT) satisfaction ratings, achieving a score of 8.56 against a target of 7.8 for CSAT and 8.75 against a target of 7.40 for SSAT. The CSAT score represents a small decrease of 0.04 compared to last year's score of 8.60, but is still higher than target, and the SSAT score is an increase of 0.06 from the 2022/23 score of 8.69 representing a year-on-year increase since 2017/18.

In response to feedback received from last year's surveys, we have restructured the Shaping the Future Webinars into smaller, more focused groups and 1-2-1 engagements which has helped to increase the survey response rate for CSAT from 27% in 2022/23 to 39% in 2023/24 and similarly, the SSAT response rate increased, from 18% in 2022/23 to 29% in 2023/24. To drive improvements throughout RIIO-T2, we have implemented several initiatives including the creation of the new Gas Customer Hub improving customers' experience when looking to connect to the NTS.

We have also had successes in our System Operator (SO) suite of incentives with Demand Forecasting, Maintenance, Constraint Management and Residual Balancing incentives where we have continued to look for opportunities to improve our performance and have achieved all of our incentive scheme targets.

This has helped to drive added value for our customers and stakeholders by avoiding constraints, providing accurate demand forecasts and giving our customers unrestricted access to the network.

It is worth noting that performance in the Demand Forecasting and Residual Balancing incentives has been particularly improved this year with the weighted average error on the Demand Forecasting day ahead (D-1) scheme improving from 8.97 mcm/day in 2022/23 to 7.86 mcm/day in 2023/24.

Whilst the volatility in global markets somewhat eased compared to the previous year, there remained a number of challenges including the high day-on-day average change in demand which continued to increase during 2023/24 to 13.02mcm/day from 12.68mcm/day in 2022/23, and high variability of power station gas usage.

We have continued to focus on improving our demand forecasting accuracy and throughout 2023/24 we have embarked on several activities to drive improvements including the investment in model development and ongoing operation totalling ~£149k which has been used to analyse the use of different raw weather forecast inputs and suppliers' data.

During 2023/24 we have successfully facilitated the delivery of 100% of gas requirements for our customers and made good progress against our outputs related to the **maintaining a safe and reliable network** consumer priority.

This includes progress against our asset health outputs where we have delivered a significant increase in volumes this year (~4,700 asset health volumes delivered in 2023/24 compared to ~1,340 delivered in the first two years of RIIO-T2) marking a positive shift in delivery compared to the opening years of the price control. This, together with our previously re-phased delivery plan means we remain very confident of achieving our full asset health outputs by the end of RIIO-T2.

We have achieved this by leveraging the comprehensive survey work conducted in the initial years of the price control to develop a robust programme of works.

In addition, the transition from relying solely on external contractors to a blend of internal and external execution, through our Operations and National Gas Services teams, and Main Works Contractors (MWC), has yielded benefits such as enhanced project control, improved efficiency, and a higher volume of successfully completed interventions.

We have also made progress with our Bacton terminal site redevelopment project submitting our Final Option Selection Report (FOSR) at the end of February 2024. Since submission of the FOSR we have been engaging with Ofgem to respond to supplementary questions (SQs) and starting to prepare for the cost reopener which will be submitted in 2024/25. We also submitted two EJPs related to Bacton under the Asset Health Reopener in June 2023, for work that was not known about at the time of the RIIO-T2 submission which we expect to have a decision on in the next financial year.

With regards to our Physical Security Upgrade Programme (PSUP) we have now built all four of our Phase 3 Lot 1 deliverables with commissioning due to take place in early 2024/25, and our five Phase 3 Lot 2 deliverables have been through design and contract award. All other deliverables related to PSUP Asset Refresh and Major Asset Health are progressing well.
There remain some challenges with our Cyber Operational Technology (OT) where delivery of the control system replacement project has been impacted by skilled labour shortages, the highly complex nature of the works and the ability to complete works in the permitted outage windows. Our underspend to date in this area represents a deferral of spend as opposed to a real reduction, as we rephase works into the later year of RIIO-T2 and into RIIO-T3. In other areas of our Cyber OT programme, such as Cyber PIN[1], strong progress has been made this year and the concept has been expanded further with successful development of a Cyber PIN equivalent for our metering systems.

We recognise the critical role that we must play in helping the UK achieve its environmental targets and are committed to achieving the Government's net zero ambition. In the third year of RIIO-T2 we have made positive steps in progressing the outputs that contribute to the consumer priority area of **delivering an environmentally sustainable network.** In 2023/24 we have performed well against baseline targets for our environmental incentives and the greenhouse gas emissions (GHG) incentive. Our GHG emissions were 2,293 tonnes, exceeding the incentive target. This level of performance has been supported by a number of improvement initiatives, including the continuation of the compressor inhibiting trial, and utilising supply and demand forecasts to identify future flow requirements to make early compressor and depressurisation decisions to reduce unit static seal losses.

In addition, in March 2024 Ofgem provided their final decision on funding for five projects following our submission of the Net Zero Pre-construction and Small Net Zero Projects reopener (NZASP) uncertainty mechanism to address methane emissions from operating the NTS.

Utilising this funding we are now working to identify and implement opportunities to remove methane losses from our operations (these are covered in more detail in Chapter XI. Non load related capital expenditure)

[1] Cyber PIN is an access control incorporated into the telemetry system

The compressor emissions projects that ensure our assets are compliant with the Industrial Emissions Directive (IED) have all been progressed since receiving Ofgem Final Option Decision. We have conducted Pre-Front End Engineering Design (pre-FEED) and remnant life studies at Wormington, King's Lynn, St Fergus, Peterborough and Huntingdon and are in the process of developing our commercial and delivery strategies in preparation for progressing FEED and contract tender. This has included detailed market engagement to understand the supply chains appetite for work disciplines, risks and contractual value levers.

We also have compressor emissions projects in physical delivery at Peterborough and Huntingdon, and Hatton. At Peterborough and Huntingdon we expect commissioning and operational acceptance of Units D and E and project close out to completed by the end of 2024.

At Hatton, mechanical, electrical and instrumentation and piping works are continuing before commissioning works can begin with the new compressor unit expected to be operational during winter 2024/25. The Hatton project has experienced programme slippage this year in part due to wet weather conditions. We, together with our contractors are fully focused on accelerating the programme where possible which will remain our focus in 2024/25.

For redundant assets, we have physically delivered a further six outputs and the majority of the works associated with the remaining outputs has commenced. We have been able to support our sustainability goals by identifying, recovering, and redeploying a range of redundant assets, such as Wormington Aftercooler and Huntingdon A compressor unit. These redundant asset are now being utilised for testing at Spadeadam to facilitate our Hydrogen FutureGrid project, which will allow us to assess their suitability for repurposing our compressor fleet.

Innovation

In 2023/24 we have continued to focus on innovation, with particular emphasis on projects that can facilitate the UK target of Net Zero by 2050. Our innovation strategy consists of three core RIIO-T2 Innovation themes: 'Fit for the Future', 'Ready for Decarbonisation' and 'Decarbonised Energy System'. Projects within these themes support the business in preparing for Net Zero by examining the suitability of hydrogen as a cleaner alternative to natural gas and identifying what changes may be needed across NGT to facilitate this. We also continue to maintain a core component of our overall innovation portfolio that looks at increasing the efficiency of our day-to-day maintenance and operational activities, by utilising innovative tools and methods, enabling us to deliver the greatest value for consumers.

This year a further 31 NIA projects were sanctioned leading to a total of 82 sanctioned projects through the RIIO-T2 period. We have progressed 26 projects with a total spend of £9.44m into delivery this year and have now completed a total of 49 projects in RIIO-T2. Highlights include the Safe Venting and Recompression project to review all of our safe venting and recompression technology opportunities with Hydrogen, with physical testing completed at one of our multi-junctions and a project to investigate the impact that hydrogen blends and 100% hydrogen will have on the energy stored as linepack in the NTS in the future.

With regards to the Strategic Innovation Fund (SIF) work, NGT have progressed successful applications for two x Round 1 Beta projects, two x Round 2 Alpha projects, and five x Round 3 Discovery projects with a total spend of £6.7m. Projects include HyNTS Compression (Beta) which provides the technical and safety evidence to enable repurposing of the NTS compression assets and HyNTS Deblending for Transport (Beta) which aims to demonstrate a future new industry where hydrogen refuelling stations are directly connected to the gas network.

A third innovation funding stream from RIIO-T1, the Network Innovation Competition (NIC), awarded NGT £9.7m in November 2020. The funding was for the construct of an offline hydrogen test facility at Spadeadam for hydrogen testing as part of the FutureGrid programme.

Over the past year we have successfully completed all testing and we are progressing with the project closure report in order to disseminate the knowledge and lessons learnt acquired in the project. Now that Phase 1 testing has been completed there are additional phases planned to adapt the FutureGrid facility and allow for further development. These are essential for understanding how a hydrogen NTS would operate.

All of the projects across the various funding streams tie into an overarching plan to understand transitioning towards hydrogen and net zero. This is in support of our proposals to repurpose part of the transmission network to develop the UK's hydrogen backbone.

More information on all our Innovation projects can be found in Chapter VII. Innovation.

Net zero

Our Net Zero strategy has an integral role to play in leading a clean, fair, and affordable energy future for all in the UK. The strategy focuses on facilitating the implementation of a decarbonised energy system while providing energy resilience. In all future energy scenarios, hydrogen as an energy vector has a key role throughout the transition to 2050 and beyond. We are exploring transporting hydrogen as an alternative to natural gas in the NTS to decarbonise heat, power, transport, and industry.

The Net Zero and reopener development (NZARD) together with use-it or lose-it (UIOLI) funding, enables and facilitates early development work on strategic projects. This early work is critical to underpinning Net Zero re-opener projects.

In 2023/24 we undertook nine UIOLI projects and spent £0.69m, of which seven were completed within year including the Hydrogen System Operator project which considered options for physical and commercial aspects of a future hydrogen system operator to meet the proposed hydrogen transition. These projects are all discussed in more detail in Chapter VIII. Net Zero.

For the Net Zero Pre-Construction and Small Projects Reopener mechanism we continued with the delivery of four projects; a reopener for Project Union Feasibility and the Methane Emissions Reduction Campaign (MERC) which included three discreet projects.

Project Union is a pioneering project led by NGT, which will create a hydrogen transmission backbone for the UK, facilitating the transport of 100% hydrogen. By the mid-2030s, through a combination of repurposed existing assets, and new infrastructure, a hydrogen backbone of up to 2,500km will connect strategic hydrogen production sites, industrial clusters, and hydrogen storage facilities, while serving major industrial customers and power generation sites directly, as well as through Gas Distribution Network (GDN) connections.

For Project Union, Ofgem approved £5.6m (2018/19 prices) in funding with our shareholders providing a contribution of 10% to deliver this phase which will complete a phasing strategy for delivery of each section of the hydrogen backbone, pre-FEED activities for a full UK hydrogen backbone and development of hydrogen market enabling activities.

The projects that fall under the Methane Emissions Reduction Campaign were awarded regulatory funding of £19.4m in the March 2024 reopener decision. Since submission NGT has continued with design work and site selection with respect of the compressor machinery train trials. Further information on these projects can be found in 'XI NLR Capex Compressor Emissions Methane Detection and Quantification'.

Financial performance

Overall, our Totex spend was £483.2m compared to allowances of £584.1m (2018/19 price base). There are two main drivers for the underspend against allowances, firstly, the inclusion of additional allowances from final determinations of a number of Uncertainty Mechanisms during the year. These new allowances have been factored into our capital programmes for delivery in the remainder of RIIO-T2. Secondly, the legacy impact from the global economic challenges and our early T2 planning activities, as covered within the first two reporting packs of RIIO-T2. At the end of year 2 of the current price control period we rephased our spending profiles across the remaining years to deliver our T2 obligations by the end of RIIO-T2. For this year 3, we have been able to slightly exceed our rephased spending profile.

Across RIIO-T2 our like-for-like Totex is planned to be £2,489.3m against an allowance of £2,527.7m. This results in a forecasted spend below allowances of £38.4m. Over the RIIO-T2 period we plan to invest circa £1.6bn of Capex across our overall business which will further increase when we agree the final options and cost allowances through the agreed reopener uncertainty mechanisms. We are forecasting to spend above allowances in TO load related Capex, TO non-load related Capex, TO other Capex and TO Opex. This is being offset by lower than forecast spend against TO non-operational Capex, SO Capex and SO Opex.

In relation to our portfolio of reopener uncertainty mechanisms set out in our RRP table 8.10 Pipeline Log, we anticipate the potential for our Totex to be £3.2bn over RIIO-T2 due to the forecast of investments needed to deliver improvements in resilience, reliability and meeting our environmental emissions obligations. Our approach is to signal these costs in our baseline Totex once we have certainty on scope and more accurate cost information. For example, we have included the outcome of Ofgem's decision relating to our Compressor emissions projects within our Totex and allowance forecast in RRP.

Consumer bill benefit

We are acutely aware of the impact that high gas prices can have on consumers across the board, and we are committed to delivering value for money with the services and investments we undertake.

Our consumer bill calculation aims to quantify the financial impact on consumers for the work we do in maintaining and operating the National Transmission System.

In 2023/24 the portion of the consumer bill attributable to National Gas Transmission is approximately £9.52. This is an increase compared to 2022/23 where the National Gas Transmission portion of the domestic consumer gas bill was estimated to be £7.99. This increase was primarily driven by higher General Non-Transmission revenue, caused by the catch-up of System Costs (shrinkage) incurred in 2022/23 but not recovered that year. The 2023/23 shrinkage costs have now mostly been recovered, and therefore this driver of the consumer bill increase is expected to reduce in subsequent years. The reduction of exit flows in 2023/24 also contributed to the higher consumer bill estimate. A reduction in General Transmission revenue and lower Typical Domestic Consumption Values for gas (as published by Ofgem) had a slightly off-setting effect.

Key risks and looking ahead

Looking ahead, our key area of focus for 2024/25 will remain on delivering our RIIO-T2 consumer priorities. We will achieve this through managing our ageing asset base, facilitating the Net Zero energy transition by supporting developments towards a Hydrogen network, responding to the dynamic cyber threat landscape and through the efficient delivery of high value reopener projects, such as Bacton and the compressor emissions cost reopener submissions. These reopener submissions represent a significant area of workload for us as we focus our efforts on creating robust and fully justified submissions that provide Ofgem with the confidence that we are delivering the right solution at the right time. We are also expecting the Ofgem final decisions for a number of the reopener submissions that we made during 2023/24, within the next financial year. These decisions will provide greater clarity on the programme of works that we will need to deliver in the remaining years of the price control and into RIIO-T3.

A further area of focus will be the continuation of work to support the development of the regulatory framework.

In October 2023, Ofgem published their decision on the Future Systems and Networks Regulation which set out the overarching framework design for our next price control (RIIO-T3, commencing in April 2026). This is an important milestone in ensuring the future systems and network regulation is fit for the needs of all energy consumers over the coming years. Ofgem are now finalising the methodology for applying the framework for the next regulatory period.

Whilst hydrogen was out of scope in the Future Systems and Networks Regulation consultation, in applying the methodology for the framework Ofgem recognise the important interaction across hydrogen and natural gas given the potential for clear benefits for natural gas consumers through repurposing. This is being considered through the critical work underway on the development of the Hydrogen Transport Business Model (HTBM) which DESNZ is leading. The first round to allocate funding through the HTBM is due to commence in 2024, leading to successful projects being announced by the end of 2025. This will run in parallel to the detailed design of the HTBM. There are significant opportunities to drive value to consumers through leveraging the co-management of natural gas and hydrogen, enabling a balanced position on risk and reward, and keeping costs down for consumers today and tomorrow.

The role of a hydrogen network in ensuring security of supply and optimising network infrastructure is key to delivering a decarbonised power network by 2035[2], lowering emissions from industrial clusters in the later 2020s and beyond and providing low carbon energy for transport and potentially heat, enabling the transition to Net Zero. We will submit further reopeners to Ofgem in 2024/25 to progress regional aspects of Project Union to FEED to enable development aligned with meeting important government targets.

[2] CCC. (March 2023). Delivering a reliable decarbonised power system:

Following on from DESNZ's publication of Powering up Britain[3] and the focus on GB security of supply. We have worked closely with Ofgem and DESNZ to explore the resilience and flexibility of the Gas Transmission network. This led to a number of agreed recommendations that are being taken forwards. These include recommendations around network capability risk, supply and demand risks and failure of asset risks. NGT welcome this focus on resilience to ensure the gas infrastructure retains the needed capability and reliability to the yet unknown, future energy requirements.

There are significant external policy and regulatory developments underway which sit alongside these activities. These include the broader role of the National Energy System Operator, Regional System Planners and development of a Centralised Strategic Network Plan. There is a significant amount of work to be done to ensure effective and holistic operation across the various developments.

We are also focused on developing our ambitious and well justified regulatory business plan for our next price control period, which we will submit to Ofgem in December 2024. We have mobilised a programme of work to develop our plans which will be our first with new investors and under our new company name and it will set out the level of investments required for the next regulatory period, which we expect will run from 2026 to 2031. Alongside this will be undertaking sufficient preparations within the current regulatory price control period to seamlessly transition to output delivery in the next price control period.

The business plan will continue to be aligned to the needs of our stakeholders and users of the network and will be overseen by our Independent Stakeholder Group. The plan will be designed to deliver our stakeholder priorities through managing our ageing assets whilst facilitating Net Zero and, where appropriate, investments to support the transition to a Hydrogen network. We have multiple working groups in place for various internal stakeholders to come together and share progress and ideas and are excited to move forward with the plan build.

Our business plan will focus on methane whilst ensuring that we also consider the needs of the hydrogen transmission system of tomorrow. It is anticipated that demand for natural gas will start to decrease as we move towards Net Zero, however we will maintain the network to meet peak gas requirements. The period towards the end of the decade will be critical if we are to meet our interim targets and Net Zero by 2050. With hydrogen, we can support the development of renewable sources like wind and solar – providing energy in the depths of winter when sunlight is at a premium and in the height of summer when the wind is not blowing. By using our existing infrastructure and expertise, we are proud to play a leadership role in delivering a clean energy system of the future and realising our Net Zero ambitions. Significant interdependencies exist across methane, hydrogen, and electricity – therefore our business plan will utilise a planning scenario that provides a prudent approach across all these energy vectors. We understand the vital role we can play in decarbonising our own system and providing hydrogen solutions for the UK. This will grow GDP, create skilled jobs and provide export opportunities to meet the economic growth ambition for our country.

With the upcoming implementation of the National Energy System Operator (NESO), this year we have worked closely with NESO to better understand accountabilities and the skills required to deliver a whole system approach that will strengthen energy security, help deliver net zero and ensure household bills are affordable in the long-term. We have provided substantial resources to assist NESO in forming their detailed proposals on how and where they will be involved across the industry and have started to deliver specific training and awareness sessions for them on the existing framework in place in the gas industry, including the role of the Network Emergency Co-ordinator. In the coming year we will continue to support NESO as it develops its gas capability and works towards the scheduled launch in Summer 2024.

Lastly, we look forward to continuing our constructive and collaborative relationship with Ofgem in particular developing the RIIO framework of the future proactively working to build on the current regulation framework to ensure we deliver the best value for the end consumer, through meeting our regulatory obligations, developing compelling reopeners cases that will ensure the right investments in the NTS to deliver safety, reliable energy to our customers, and by helping to shape the next Price Control.

Performance summary

[3] Powering up Britain.

The table below summarises spend and allowances (baseline and uncertainty mechanisms) for 2023/24 and for the five-year RIIO-T2 period.

The table and commentary in this section reference allowances that include Real Price Effects ('RPE'), whereas commentary provided for each individual category of spend in the remainder of this document excludes the impact of RPE.

Activity	FY24 Totex Spend (£m, 18/19 prices)	FY24 Allowance (£m, 18/19 prices)	FY24 Cost vs Allowance (£m, 18/19 prices)	5 Year Totex Forecast (£m, 18/19 prices)	5 Year Allowance (£m, 18/19 prices)	5 Year Cost vs Allowance (£m, 18/19 prices)
TO Load Related Capex	10.7	9.8	0.9	95.5	87.9	7.6
TO Non-Load Related Capex	161.0	203.4	(42.4)	809.0	784.5	24.5
TO Non-operational Capex	20.8	24.4	(3.6)	104.0	122.8	(18.8)
TO Other Capex	83.2	111.7	(28.5)	433.8	429.1	4.7
TO Opex	127.4	128.1	(0.7)	645.0	635.1	9.9
TO Totex	**403.1**	**477.4**	**(74.3)**	**2,087.3**	**2,059.4**	**27.9**
SO Capex	26.1	45.3	(19.2)	136.5	158.3	(21.8)
SO Opex	54.0	61.4	(7.4)	265.5	310.0	(44.5)
SO Totex	**80.1**	**106.7**	**(26.6)**	**402.0**	**468.3**	**(66.3)**
Total	**483.2**	**584.1**	**(100.9)**	**2,489.3**	**2,527.7**	**(38.4)**

Table 1 - Summary of 2023/24 and five-year forecast spend and allowances

In 2023/24 our Totex spend was £483.2m compared to allowances of £584.1m. A large element of the £100.9m underspend relates to UMs which were directed part way through this year, in particular, Cyber OT (c£39m), Methane Emission Reduction Compliance (MERC c£8m), and Non Operational IT (c£5m) which we expect to spend during 2025 and 2026. In addition to this, a further £37m relates to Compressor stations as we rephased spend to align with the delivery and contract strategy. We did spend more in 2023/24 than we forecast to against last years rephased RRP capital plan (£483.2m vs £462.7m), particularly in Asset Health and UMs, with most other areas meeting our target. This stands us in good stead to deliver the majority of our Totex spend within the remainder of RIIO-T2.

Over the five-year RIIO-T2 period, Totex is forecast to be broadly in line with allowances at £2.5bn.

Totex forecast and allowances include some spend for uncertainty mechanisms. Spend and allowances for Western Gas Network Upgrade (WGNU), Wormington, Cyber OT, Non Operational Capex and Methane Emission Reduction Compliance (MERC) projects are included in the table above as the need cases have been approved. The 2023/24 Totex spend for asset health work at the St Fergus terminal (cumulative spend to date c£50m) is also included. The needs case approval was received 8 July – we have assumed all spend is met with an allowance at this point, whilst discussions continue. RRP table 8.10 includes a list of all other reopeners we are expecting to submit, which if successful would increase the total Totex spend and allowances over the RIIO-T2 period to £3.2bn (as presented at the top of table 3.4). Further information can be found in RRP table 8.10.

A breakdown of the key variances is detailed below.

TO Totex Overview

TO Capital Expenditure for 2023/24 was £275.7m against total allowances of £349.3m. Capital Expenditure for the five-year period is forecast to be £1,442.3m against allowances of £1,424.3m.

Load Related Capital Expenditure was £10.7m against allowances of £9.8m in 2023/24. Of this, £8.4m relates to Western Gas Network Upgrade against £7.4m of allowances under the relevant Uncertainty Mechanism. Cumulatively this spend totals £17.6m compared to allowances of £16.8m. In 2023/24 £0.6m was incurred on unfunded projects, principally the Felindre VSD project, which has a cumulative spend of £6.0m against Entry RIIO-T1 carry over works in RIIO-T2 and accounts for the majority of forecast Load Related overspend versus allowances across RIIO-T2. T1 spend on Felindre and a higher spend on Network capability of £0.5m, was offset by lower spend on Net Zero (UIOLI) of £1.1m in 2023/24. These are expected to be in line with allowances across RIIO-T2.

Non-Load Related Capital Expenditure was £161.0m, £42.4m lower than allowances of £203.4m. Cumulative spend is £437.1m, which is £71.9m lower than allowances. Our underspend has been caused by a number of factors including continued procurement long lead times following the Ukraine/ Russia war and skilled labour shortages. We delivered a significant increase in asset health volumes in 2023/24, leveraging extensive survey work carried out in years 1 and 2 of RIIO-T2 and utilising a blend of external and internal resources to increase activity year on year. Asset Health expenditure was £23.8m below allowances (including RPEs) in 2023/24, impacted primarily by increased procurement lead times and labour shortages. As summarised in Chapter XI, actions have been taken to increase the proportion of internal resource utilised to deliver such work and to enhance our recruitment to continue to ramp up delivery for the remainder of RIIO-T2. In aggregate, spend across Bacton Site Redevelopment Feed and Emissions projects is £30.3m lower than allowances in the year, with activity due to be completed in years 4-5 of RIIO-T2.

We have incurred £17.2m of expenditure at St Fergus (cumulatively £49.8m) against the relevant Uncertainty Mechanism which we received from Ofgem determination on 8th July – we have assumed allowances are equal to spend.

A further £10m has been incurred on RIIO-T1 carry over Non-Load Related projects in 2023/24 (cumulative £83.4m). This primarily consists of ongoing expenditure on Peterborough and Huntingdon Compressor emissions works (cumulative £76.0m). NGT continues to engage with Ofgem in respect of proposed investments to comply with MCPD emissions legislation, with further reopener submissions now expected in the latter part of 2025.

Our Forecast RIIO-T2 spend on Non-Load Related Capital Expenditure is expected to be £24.5m higher than allowances, lower spend on Asset Health (£61.3m) and Decommissioning (£3.8m) are being offset by additional spend at Hatton (£7.8m) and RIIO-T1 carry over works (£83.4m).

Non-Operational Capex spend was £20.8m in 2023/24, £3.6m below allowances. This includes £1.2m (cumulative £1.5m) spend against the Non Operational Capex UM of £5m expected to be utilised during RIIO-T2. Cumulative spend is £60.8m (£53.4m excluding one-off property purchases in 2021/22), £18.8m below allowances. The IT programme spend has accelerated in 2023/24 as separation from National Grid progressed, but capex expenditure across the RIIO-T2 period is expected to be c£20m lower than allowances primarily driven by the impact of Software-as-a-System (SaaS) spend now expensed under International Financial Reporting Standards (IFRS) accounting rules as Opex.

TO Other Capex expenditure was £83.2m, which is £28.5m below allowances. The underspend against allowances largely relates to Cyber OT (£31.6m), where the high complexity of the projects has led to difficulties completing all works in the permitted outage windows. Works will be rephased into the remainder of RIIO-T2 and maturity has been maintained through compensating controls. This is partly offset by an overspend in Physical Security Resilience of £3.6m. RIIO-T2 forecast spend of £433.8m is £4.7m higher than allowances, primarily reflecting spend carried over from RIIO-T1.

TO Opex costs in 2023/24 were £127.4m against allowances of £128.1m. This includes £4.6m of allowance relating to the Cyber OT UM, of which we have spent £0.5m. Direct Opex was largely in line with allowances, with lower maintenance costs driven by a mix of labour resource, reduced use of agency staff and procurement efficiencies, offset by higher fault maintenance costs caused by higher than expected levels of linewalking and DSEAR defects costs and Operational Property costs (£4.5m higher than allowances) driven by a significant market-driven increase in own use electricity costs. TO Indirect costs were higher than allowances in 2023/24, the majority of the overspend relating to IT, primarily due to reclassifications of SaaS expenditure from Non-Operational Capex.

TO Opex is expected to be £9.9m more than allowances across the RIIO-T2 period, reflecting the ongoing impact of DSEAR and SaaS.

SO Totex Overview

SO capital expenditure in 2023/24 was £26.1m, £19.2m lower than allowances (cumulative spend of £61.0m versus allowances of £102.1m). This was primarily driven by IT Capex, partly due to SaaS cost reclassifications and the ramp up of the separation programme in later years of RIIO-T2, but also due to realised savings on the Gemini programme. £2.9m (cumulative £3.6m) was spent against the Non Operational Capex UM allowance of £22.1m, which is expected to be fully utilised during RIIO-T2.

SO Opex costs were £54.0m in 2023/24, £7.4m lower than allowances. Direct Opex costs were lower than allowances, primarily due to net staff cost savings as a result of ongoing vacancies, combined with lower Xoserve costs. SO Indirect costs were broadly in line with allowances. SO Opex is expected to be £44.5m lower than allowances across the RIIO-T2 period, reflecting the ongoing impact of vacancies and lower Gemini running costs.

Our Output	Description	Output Type	2023/24 Target	2023/24 Performance	2023/24 Financial Incentive/penalty (£m, 18/19 price base)
Customer satisfaction	Undertake annual satisfaction survey with our customers	ODI-F	7.8/10	8.56/10	3.6
Stakeholder satisfaction	Undertake annual satisfaction survey with our stakeholders	ODI-R	7.4/10	8.75/10	N/A - reputational
Quality of Demand Forecast	Deliver accurate day ahead demand forecasting (D-1)	ODI-F	8.52 mcm average forecast error	7.86 mcm/d average forecast error	0.3
	Deliver accurate demand forecasting at the two to five days ahead stage (D2 to D5)	LO	13.70 mcm average forecast error	12.89 mcm/d average forecast error	N/A - reputational
Maintenance	Deliver benchmark performance for maintenance outage day (including valve operations)	ODI-F	11 days or less	1 maintenance day called	0.5
	Deliver benchmark performance for maintenance outage day (excluding valve operations)	ODI-F	75% of NG driven customer impacting works aligned with customer outages	100% of NGT driven customer impacting works aligned with customer outages	
	Minimise NGT driven changes to maintenance planning	ODI-F	9.06 days change	0 changes initiated by NGT	
Entry and Exit capacity constraint management	Meet constraint management target	ODI-F	£8.5m	£0 costs	3.7
Residual Balancing	Meet residual balancing linepack performance measure (LPM) target	ODI-F	<2.8 mcm average daily change	1.8 mcm average daily change	0.8m
	Meet residual balancing price performance measure (PPM) target	ODI-F	Difference 1.5% of SAP	Difference 0.9% of SAP	
Modernising energy data (digitalisation strategy and action plan)	Set out our approach to using data and digitalisation to deliver benefit for our stakeholders and society	LO	Publish Digitalisation Strategy and action plan	Digitalisation Strategy Action Plan published in June 2023 and December 2023 Independent Digitilisation Strategy published March 2024	N/A

Our Output	Description	Output Type	2023/24 Target	2023/24 Performance	2023/24 Financial Incentive/penalty (£m, 18/19 price base)
Network Asset Risk Metric (NARM)	Deliver our Baseline Network Risk Outputs (measured as long term risk benefits (LTRB)) as a result of asset health investment into our lead secondary assets using Baseline NARM allowances.	PCD	Deliver our Baseline Network Risk Outputs of R£200.77m (across three risk sub-categories) by the end of RIIO-T2.	Projects delivered in 2023/24 have been at the lower end of LTRB scale however projects with large amounts of LTRB are forecast to be closed out across 2024/25 to ensure National Gas remain on target to deliver the overall NARMs target	N/A
Cyber resilience OT	Deliver cyber resilience programme related to Cyber Operational Technology	PCD UIOLI	Deliver Year 3 PCD deliverables	Year 3 progrramme delivered. Majority of PCD outputs on track but delivery of control systems is behind target	N/A
Cyber resilience IT	Deliver cyber resilience programme related to Cyber Information Technology	PCD	Deliver Year 3 PCD deliverables	Year 3 programme delivered. Majority of PCD outputs on track but some deliverables rephased to year 4	N/A
Physical resilience	Deliver physical security upgrades at sites designated as Critical National Infrastructure (CNI).	PCD	Deliver PSUP requirements by 2026	4/4 Lot 1 deliverables under construction, awaiting commisioning. 5/5 Lot 2 deliverables design complete and contract awarded. Asset Refresh and Major Asset Health upgrades are progressing well. On track for 5 year output	N/A
Annual Network Capability Report	Publish annual ANCAR document	LO	Publish report for 2023/24	ANCAR published in June 2023, with an update published in September 2023	N/A
Exit Capacity	Run the annual exit capacity process in accordance with the Exit Capacity Planning Guidance (ECPG)	LO	Run annual exit capacity process and submit Exit Capacity Allocation Report	Report published October 2023	N/A
Asset health non-lead assets	Delivery of agreed AH non-lead assets volumes	PCD	Deliver agreed volumes for non-lead assets	Delivered a significant increase in non-lead PCD volumes. On track for the year 5 output.	N/A
Bacton terminal site redevelopment	Deliver a Final Options Selection Report (FOSR) and Re-opener submission	PCD	FOSR Delivery date Feb 2022, Reopener date Sep 2023	FOSR submitted in February 2024 in line with Ofgem agreement. Cost reopener due to be submitted in September 2024, in line with Ofgem agreement of not later than August 2025	N/A
King's Lynn subsidence	Delivery of Re-opener submission	PCD	Delivery date 31/03/2022	PCD complete	N/A

Our Output	Description	Output Type	2023/24 Target	2023/24 Performance	2023/24 Financial Incentive/penalty (£m, 18/19 price base)
Greenhouse gas emissions (venting)	Meet greenhouse gas emissions venting targets	ODI-F	<2,897 tonnes for 23/24	2,293 tonnes	1.5
NTS Shrinkage	Meet our targets for the amount and the cost of the energy we use to run the network	ODI-R	N/A for 2023/24	3,090 GWh £107.1m	N/A - reputational
Annual Environmental Report	Publish an Annual Environmental Report	LO	Publish Oct 2023	Published October 2023	N/A - reputational
Deliver our Baseline Environmental Incentive targets	Reduce operational transport emissions	ODI-F	16% reduction in operational transport emissions against baseline level of 1748 tCO2e to achieve benefit threshold	0% increase in operational transport emissions compared to baseline levels (1742.8 tCO2e)	0.1
	Reduce business mileage emissions	ODI-F	7% reduction in business mile emissions against baseline level of 1608 tCO2e to achieve benefit threshold	47% decrease in business mile emissions to 850.1 tCO2e	
	Reduce office and operational waste recycling	ODI-F	57% of office and operational waste recycled to achieve benefit threshold	51.4% recycled	
	Reduce office waste	ODI-F	7% reduction in office waste against baseline level of 54.6 tonnes to achieve benefit threshold	38.2% increase in office waste	
	Reduce office water use	ODI-F	7% reduction in water use against baseline level of 7,380 m3 to achieve benefit threshold	57.7% decrease in water use to 3,124 m3	
	Increase the environmental value of non-operational land	ODI-F	3.15% increase in natural capital valuation against baseline level of £32.92m to achieve benefit threshold	3.2% increase in natural capital valuation	
	Increase the biodiversity net gain on new network projects	ODI-F	N/A	Not triggered in 2023/24	
Redundant assets	Decommission 80 redundant assets/asset sites, five customer sites and four compressors	PCD	Delivery date Mar 2026	15.2 Redundant Asset outputs have been physically delivered in total. 8 outputs have a provisional classification of not progressing due to changing circumstances and custumer requirements. Remaining outputs are on track to be delivered by year 5.	N/A
Incremental Capacity	Needs case submission and FIOC Project Direction submission (Re-opener allowance request) for in-flight Western Gas Network project (Milford Haven PARCA)	Re-opener	Needs Case submission June 2021 FIOC Project Direction submission May 2023 Consultation response July 2024	Needs Case submitted June 2021 (approved Dec 2021). FIOC Project Direction submitted May 2023. Updated consultation response on track for July 2024	N/A

Compressor emissions – Wormington	Deliver a Final Options Selection Report, long lead items and Reopener submission for Wormington	PCD	FOSR delivery date May 2022, Reopener date Nov 2024	FOSR submitted Aug 2022 in line with Ofgem agreement. Reopener date in discussion with Ofgem – expected 2025/26	N/A
Compressor emissions – Kings Lynn	Deliver a Final Options Selection Report, long lead items, and Reopener submission for King's Lynn	PCD	FOSR delivery date Oct 2022, Reopener date Apr 2025	FOSR submitted Jan 2023 in line with Ofgem agreement. Reopener date in discussion with Ofgem – expected 2025/26	N/A
Compressor emissions – Peterborough and Huntingdon	Deliver a Final Options Selection Report, long lead items and Reopener submission for Peterborough	PCD	FOSR delivery date Dec 2022, Reopener date Jun 2025	FOSR submitted Jan 2023 in line with Ofgem agreement. Reopener date in discussion with Ofgem – expected 2025/26	N/A
Compressor emissions – St Fergus	Deliver a Final Options Selection Report, long lead items and Reopener submission for St Fergus	PCD	FOSR delivery date Dec 2022, Reopener date Jun 2025	FOSR submitted Jan 2023 in line with Ofgem agreement. Reopener date in discussion with Ofgem – expected 2025/26	N/A
Hatton	Deliver emissions compliance at Hatton with a new unit scoped and procured to deliver 41MW mechanical output power.	PCD	Delivery date Mar 2025	Project experienced programme slippage and is expected to complete after March 2025 PCD delivery date	N/A

Table 2 – Output and incentive performance

II. Operational context

As the sole owner and operator of the NTS in Great Britain, NGT manages the day-to-day operation of the NTS including the residual balancing of the network, maintaining system pressures, and assuring gas quality.

The war in Ukraine had a significant impact on the operation of the network and connected sites throughout 2022/23. We saw unprecedented change with large quantities of gas flowing in a prominently West to East direction from LNG at Milford Haven and Isle of Grain, through Interconnector and BBL into continental Europe throughout the summer and shoulder months.

Within the 2023/24 financial reporting period we initially continued to see similar flow patterns throughout April and May to those experienced in the previous year. However, from June onwards flows into continental Europe reduced significantly which equated to a 57% reduction over the year, with LNG imports reducing by 43% in line with this. The drop in Interconnector exports was the result of a number of factors:

- A mild 2022/23 winter meant that European storage stock levels were higher in comparison to the previous year and therefore did not require refilling to the same extent as the previous year.
- There was an increase of 18% in European LNG capacity due to the rise in the number of Floating Storage Regasification Units available in Europe.
- The return of the French Nuclear fleet from outages meant less gas for power was required on the Continent.

The overall reduction in demand and reduced LNG cargos meant the Network switched to a more traditional North to South configuration, moving gas from high supply areas in Scotland and the North East, to higher demand areas in the South East and West.

The significant shift in network flows highlights the requirement for operational flexibility across the NTS. National Gas has to cover a range of potential scenarios that could occur when it comes to outage planning and asset availability, ensuring an adequate number of assets are available at the right times. The charts below demonstrates that although the maximum demand was lower in both summer and winter, the range of demand was greater in both periods. This larger variation shows that there is an increased element of uncertainty, making outage planning, and network operation more difficult to predict

The reduced demand continued throughout the winter period, with the average daily demand around 45 mcm/d lower in comparison to previous years as shown in Figure 1 - Minimum, Maximum, Average and Trend of Demand in 2022/23 vs 2023/24. Figure 1 also shows that the average daily winter demand in 2023/24 was only 11 mcm/d higher than the average daily summer demand in 2022/23.

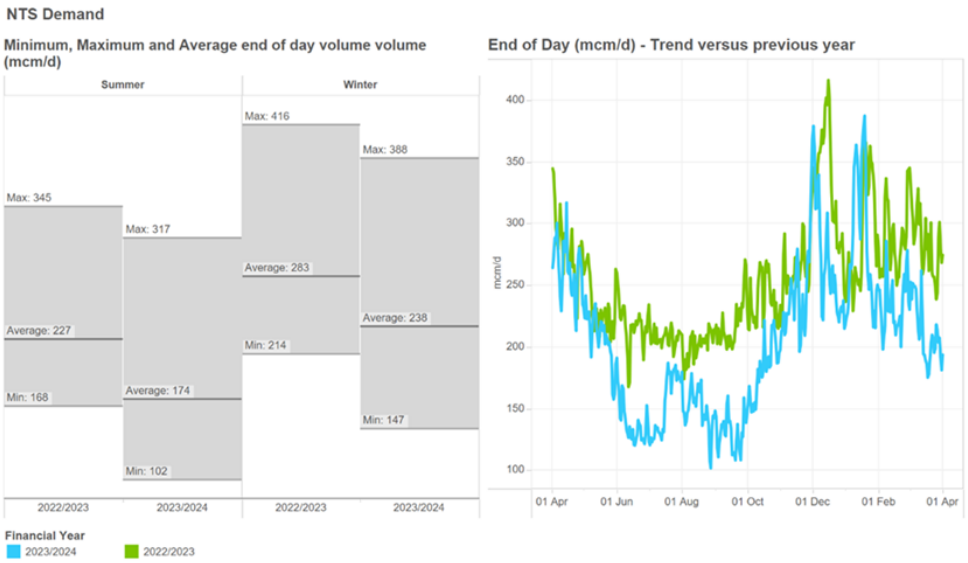

Figure 1- Minimum, Maximum, Average and Trend of Demand in 2022/23 vs 2023/24

The below Figure 2 - Breakdown and comparison of Demand in BCM between 2022/23 and 2023/24 shows the breakdown of demand between the previous two years and percentage difference, further highlighting the difference in interconnector exports over the previous year.

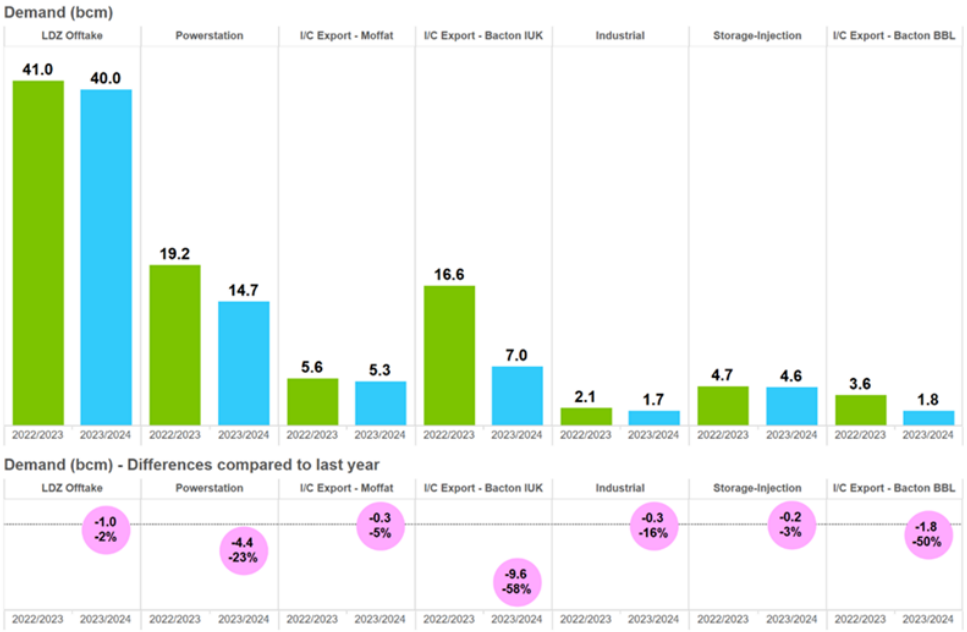

Figure 2 - Breakdown and comparison of Demand in BCM between 2022/23 and 2023/24

LDZ demand was broadly similar to previous years, (as shown in Figure 2), indicating that the energy saving measures adopted by consumers in 2020/21 when the initial increase in energy prices occurred, are being retained as the cost-of-living challenges continue. The difference of 1 BCM seen in Figure 2 is most likely due to the milder winter seen in 2023/24.

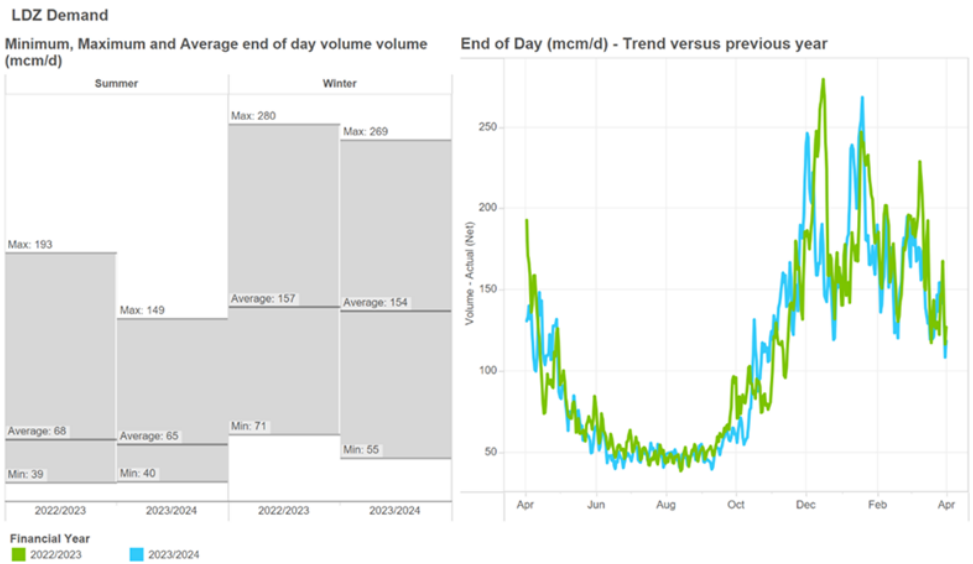

Figure 3 – Min, Max, Average and Trend of LDZ demand 2022/23 vs 2023/24

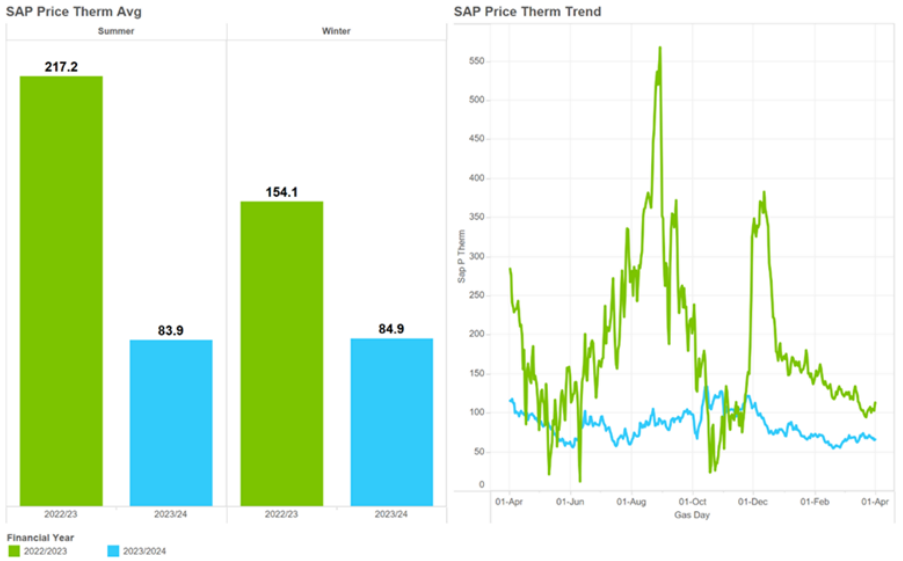

Figure 4 – Average SAP price per therm and Price Therm Trend

As mentioned previously the reduction in EU Interconnector exports was likely due to a number of economic reasons, such as increased availability of LNG capacity in continental Europe which resulted in a significantly smaller price spread between GB and the Netherlands/Belgium. In 2022/23 on average based on the day ahead closing price per therm, Belgium had a 49.2 pence/therm differential to GB and the Netherlands 102.9 pence/therm price differential to GB where both the prices were greater than GB. In 2023/24 this reduced to 1.7 pence/therm and 3.1 pence/therm respectively. This reduction in price spread between GB and Europe highlights the lack of a requirement for gas to be exported to Europe in comparison to the previous year i.e. the market is not signalling a need.

With the price spread significantly reduced in 2023/24 in comparison to the previous year, there was also much less volatility seen in the GB SAP Price, with very minimal difference between summer and winter prices as shown in Figure 4. The price volatility seen in 2022/23 was an outlier in comparison to earlier years, as shown in Figure 5, using day ahead prices as a measure, showing that whilst 2023/24 had significantly reduced volatility, it was still higher than historic years preceding 2021/22 and 2022/23.

EU Prices

	Day Ahead Closing (p/th)								
	Belgium			Great Britain			Netherlands		
	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max
2015/16	37.6	27.2	48.3	38.3	28.6	50.0	37.9	27.4	49.4
2016/17	38.0	26.0	58.5	39.1	20.5	60.8	38.1	26.0	58.5
2017/18	46.5	35.2	219.3	47.4	25.0	230.0	46.8	37.6	221.2
2018/19	56.9	34.6	77.7	58.0	35.3	78.9	57.5	35.6	77.8
2019/20	28.2	18.0	41.9	28.8	17.3	42.2	29.0	18.5	42.8
2020/21	29.8	7.6	70.0	31.1	8.5	78.9	30.3	8.2	69.3
2021/22	163.1	46.5	512.0	161.4	50.2	512.0	165.7	47.7	514.6
2022/23	227.3	20.0	605.0	177.8	10.0	516.0	280.7	59.8	761.5
2023/24	84.7	57.9	131.3	83.0	55.3	138.0	86.1	57.5	141.3

Figure 5 – Historical Gas Prices

The reduction seen in European exports also brought a significant reduction in LNG import as shown in Figure 6 – Supply Type 2022/23 vs 2023/24. UK continental shelf and Norway imports were broadly similar, although a little lower in comparison to previous years. Storage withdrawal was the only supply category that saw an increase over the previous reporting year, which was likely due to the expansion of Rough Storage facility with around 0.5 to 0.6 BCM of additional supply.

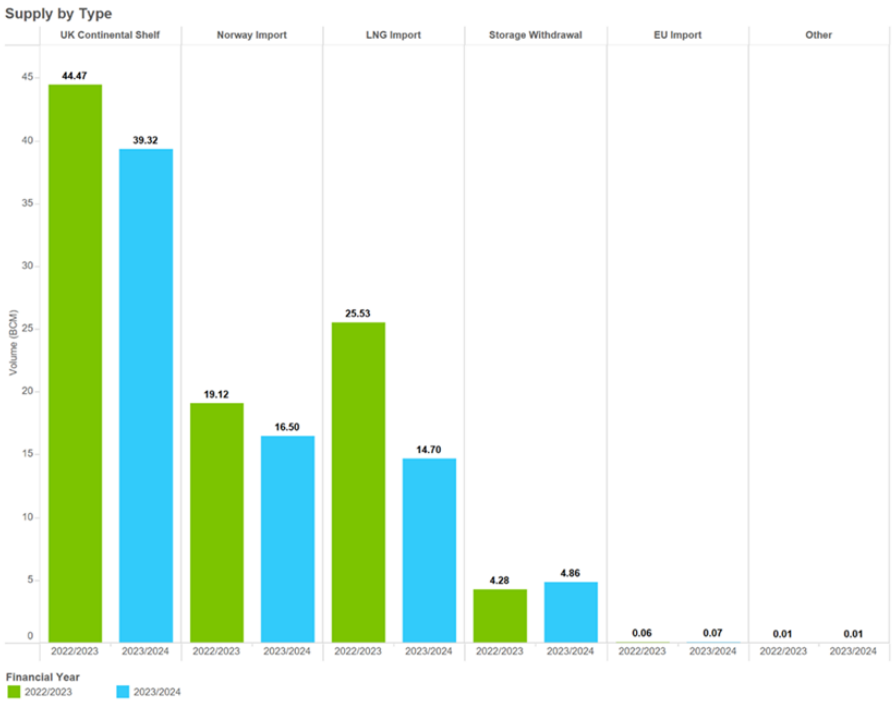

Figure 6 - Supply Type 2022/23 vs 2023/24

Throughout the 2023/24 winter period on average LNG supply into the NTS was half of 2022/23 winter. Increased demand was often met via supplies from the medium range storage (MRS) sites, with the highest maximum daily output from MRS being 92 mcm compared to 70 mcm in the previous year.

These reductions in both interconnector exports and LNG supplies meant much less compression was required to achieve the operational flows and pressures required to meet our customer's requirements across the network.

At the start of the year compressor run hours were broadly in line with the previous year, but as exports eased in June so too did compressor run hours, resulting in a 37% reduction (excluding St. Fergus) in run hours by year end compared to 2022/23, as shown in Figure 7.

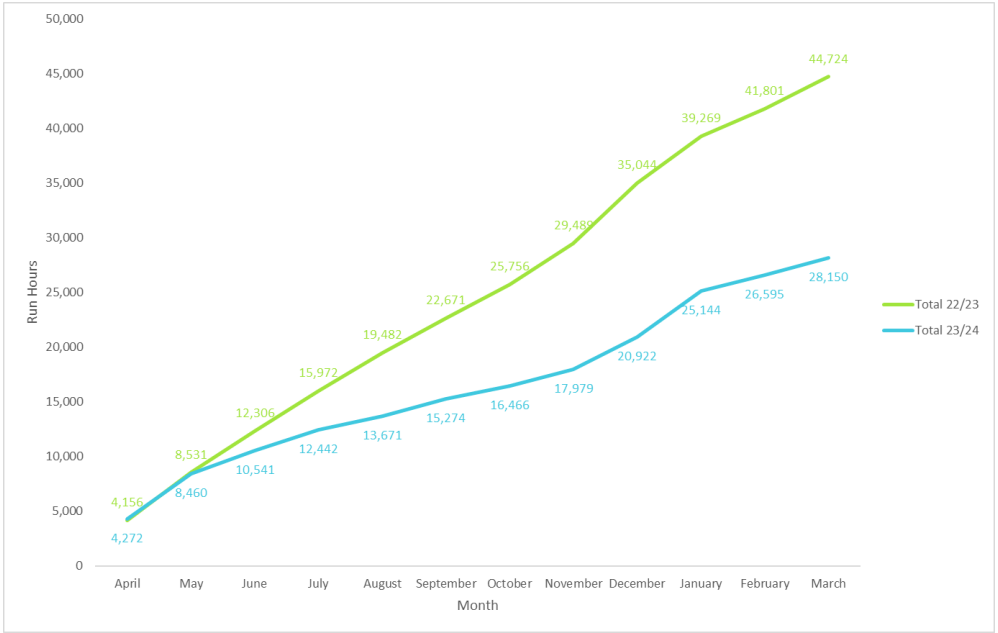

Figure 7 – Compressor cumulative hours 2022/23 vs 2023/24 (excluding St Fergus)

Compression utilised was largely used to carry out traditional North to South flows. Even throughout periods of high LNG flows, North to South compression train flows are usually required to move gas from the supply heavy centres in Scotland and the North East to the demand heavy centres in the South East and South West, although the amount of compression required to move gas from the North will be reduced.

Finally, Power station demand on average was lower, although we did see higher peaks of Gas for Power, particularly in December, where up to 102.6 mcm/d of gas was being used for electrical generation highlighting the influence and intermittency that renewable energy can have on the gas transmission network.

National Energy System Operator (NESO)

The creation of the National Energy System Operator (NESO), currently due to launch in Summer 2024, is one of the most significant institutional changes to Britain's energy system governance in recent times.

A new independent and impartial public corporation, the NESO will be responsible for the strategic planning of Britain's energy networks taking a whole system approach and operating the electricity system. The NESO will provide the UK Government, Ofgem and the energy industry with expert independent advice to inform the development of energy policy, systems and markets to support the vision of a safe, secure and affordable transition to net zero.

The aims of the NESO are:

- to strengthen energy security
- to help deliver net zero
- to ensure household bills are affordable in the long-term

Within their joint consultation, launched in July 2021, Ofgem and the UK Government's DESNZ set out a case for change with regards to Britain's energy system operation. In October 2023, following industry consultation, the Energy Act 2023 was passed, legislating for the creation of a Future System Operator (now referred to as the NESO).

Borne out of the current Electricity System Operator (ESO), the NESO will undertake all roles currently fulfilled by the ESO, plus a number of additional whole system responsibilities:

- Network Planning - plan the gas and electricity networks, and provide a whole system view of the energy sector
- Resilience - identify gaps, risks, interactions and opportunities within the whole energy system, and coordinate emergency response
- Security of Supply - enable electricity security of supply and advise on gas security of supply, and enable energy security across Britain's whole energy system
- Market Development - support DESNZ with market development across gas and electricity, and advise on whole energy market strategy
- Net Zero Energy Insights - deliver energy insights and advice to Government for the existing energy system and it's development, including new vectors such as hydrogen

These responsibilities and associated specific obligations are of strategic and/or operational significance to National Gas Transmission:

- Strategic Network Planning – identification of NTS investment needs based on a view of long term supply and demand which will inform future Ofgem decisions
- Resilience and Emergency Management – whole energy system resilience given the increasingly inter-related nature of the gas and electricity systems
- Medium Range Gas Security of Supply Assessment – publication of an annual assessment of GB gas supplies in-line with a defined methodology, the outcome of which will inform actions required to help achieve GB energy security
- Gas Market Strategy – optimising and evolving gas market arrangements in partnership with all gas market participants
- Long Term Forecasting – development of energy scenarios for the future against a defined and consulted on methodology, to include an illustration against which GB can achieve Net Zero

As the NESO teams have been built we have proactively engaged with them to better understand their likely accountabilities and what skills they need in order to best fulfil them. As an example, in the strategic planning area we have established a bespoke training programme delivered by our senior analysts to train the NESO team from first principles in the understanding of the operation of the NTS and how we hydraulically model the network for long term planning, including the use of forward looking supply and demand ranges. Additionally in the area of Resilience and Emergency Management we have assisted NESO in forming their detailed proposals on how and where they will be involved across the industry and have started to deliver specific training and awareness sessions for them on the existing framework in place in the gas industry including the role of the Network Emergency Co-ordinator.

As part of this engagement, we have agreed with Ofgem and NESO that appropriate costs should be recovered either directly from NESO or via an adjustment to our Totex allowance by Ofgem. The costs that are to be recovered directly from NESO include the time involved in delivering the training programme(s) and the provision of our network modelling tools to avoid the NESO team building new versions of these (or similar) thus avoiding additional time and complexity. The majority of these costs will be recovered in 2024/25.

The costs associated with the Totex adjustment mechanism approved by Ofgem will be those incurred for transitional purposes until April 2026 such as:

- Programme oversight and management, governance procedures and project planning
- Engagement with key external stakeholders, such as ESO, DESNZ, Ofgem and other industry parties, including management of NGT communications
- Providing expert input for requisite gas licence and code changes
- Internal employee engagement
- Identification, development and implementation of new business processes
- Management and delivery of necessary changes within NGT to ensure smooth transition to new ways of working
- Establishing the process to link FSO/NGT and core suppliers and for other related IT systems
- Legal support, including legislative amendments, contractual changes, etc.

We are yet to request this Totex adjustment via the agreed Ofgem process.

Securing the future role and investment required to maintain a flexible and resilient energy system to safeguard Britain's energy security, despite the uncertainty over the pathway to net zero, is an objective that we believe National Gas and the NESO share. We look forward to working in partnership with the NESO to secure this outcome to provide a safe, secure and affordable gas transmission system.

Resilience

In response to resilience actions set out within the Energy security plan of the Powering up Britain Publication and aligned to our Annual Network Capability Report (ANCAR) that has flagged the lack of resilience available on the NTS, we have explored issues impacting the condition of the NTS assets and their ability to meet the future credible Supply and Demand scenarios.

Following review, five recommendations were agreed by Ofgem, DESNZ and NGT at the DESNZ Energy Security Steering committee to be taken forwards:

1 Network capability risk. NGT recommended amending the current Transmission Planning Code (TPC), with the objective of delivering a standardised approach to planning and developing the NTS in response to both capability (additional infrastructure) and resilience (reliable infrastructure) requirements. These amendments also recognise that Cost Benefit Analysis (CBA) approach as applied may not in itself be creating the justification for resilience investments where the impact is credible but of low probability. The amendments to TPC went out to the industry for consultation in the autumn of 2023 and Ofgem approved the revised TPC in May 2024, which is now published.

2 In addition, to determine network capability risk, NGT recommended the use of the credible high case gas demand FES scenario (Falling Short from FES23) when considering network investments. This is to ensure that the overall gas network capability is not reduced beyond the future energy market uncertainties that exist and can outturn as periods of high gas supply and demand. The GT RIIO-T3 Business Plan will be based on this high gas case.

3 Supply and demand risk, a government led review should be undertaken on the acceptable risk appetite for network single points of failure. This recognises that there are a number of locations where a single failure of an asset or piece of infrastructure would cause the loss of supply to industrial and domestic consumers or disruption to key entry points for gas to the GB market, which creates significant societal risk. Follow on work is expected within 2024/25.

4 Based on the same single points of failure driver for item three, NGT will complete a full option assessment on single points of failure identified, to be undertaken within RIIO-T2

5 Overall asset failure risk. NGT will consider and determine the Asset Health investments needed for the next price control to ensure the level of network asset failure risk is not greater that the risk levels at the start of RIIO-T2. This is driven by the level of inherent risk on the high-pressure gas network increasing together with the rate and duration of asset failures.

The capability, resilience and flexibility requirements from the gas transmission network remain a key focus for NGT during the rest of RIIO-T2 and into the next price control. Furthermore, this issue will be of vital importance into the medium to long terms as the energy system transitions to net zero and the role of NTS evolves.

III. Consumer priorities

Through the development of our RIIO-T2 Business Plan, we undertook extensive stakeholder engagement, using and building upon the three main output categories that Ofgem identified as stakeholder priorities in their May 2019 Sector Specific Methodology Decision (SSMD) document.

These output categories were:

- Meet the needs of consumers and network users
- Maintain a safe and resilient network
- Deliver an environmentally sustainable network

These priority areas focus on delivery of outcomes that our customers and stakeholders have told us that they value most. There are also a series of more specific outputs that sit within each of these three key priority areas. These include Price Control Deliverables (PCDs), Output Delivery Incentives (ODIs) and Licence Obligations (LOs). Further detail on our performance against these outputs can be found within Table 2 and have been used in our assessment of our 2023/24 performance.

We have continued to implement a number of strategies and applied these through a range of initiatives to deliver our outputs as efficiently as possible and to provide the greatest benefit to customers. Our 2023/24 performance against these key outputs is outlined further below.

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IV. Meeting the needs of consumers and network users

Our customers and stakeholders have told us that they want us to deliver a high quality and reliable service to all network users and consumers. They expect data and insights that we produce to be transparent, accurate and timely, and for our processes to allow for quick and easy connection or disconnection to the network.

Our customers and stakeholders want us to be able to meet the needs of consumers and network users both now and in the future, helping to lead the way with decarbonisation, decentralisation and future energy systems transition. The provision of these services must be balanced with the overarching need to keep domestic and non-domestic consumer bills as affordable as possible.

The section below details how we have performed against the deliverables that sit within the 'Meeting the needs of consumers and network users' priority area. Our commitment to customer and stakeholder satisfaction has been recognised with strong scores in both of these areas. Good communication, helpful staff and transparency were highlighted as key positive attributes that respondents mentioned when providing a positive high score.

In addition we have maintained or improved incentive performance for Residual Balancing, Demand Forecasting, Constraint Management and all facets of the Maintenance incentive. This represents improved performance compared to last where difficult operating conditions created a challenging environment for performance against our suite of incentives.

In summary we have met or exceeded all of our outputs in this area.

Meeting the needs of consumers and network users outputs not discussed in the below section are covered in XI. Non Load Related Capital Expenditure.

Digitalisation strategy and action plan (DSAP)

In today's world, digital technologies are integrated into all areas of a business, leading to fundamental changes in how the business operates and delivers value to its customers. We consider digitisation to be a key enabler for the future of our business and integral to achieving our goal of "Leading a clean Energy future for everyone".

Our DSAP[4] tracks the progress that we are making in delivering the work required to fulfil our Digitalisation Strategy, as well as the open actions carried over from our previous DSAP submissions.

Business separation from National Grid in 2023, has allowed us to focus solely on the needs of National Gas customers and stakeholders and in the last financial year we have been working hard to redefine our identity and purpose.

In our first independent Digitalisation Strategy[5] published in March 2024, we redefined our digital aspirations into five dedicated focus areas. These focus areas are in line with new corporate strategy, stakeholder priorities and regulator guidance such as Ofgem's Data Best Practice document. Emphasis has been put on on data trustworthiness, access, and visualisation aided with the latest digital technologies including analytics and Artificial Intelligence (AI). They have been developed with the aim of improving decision making and enhancing workforce efficiency. The focus areas are as follows:

1. Data Foundation: Continue building a strong and trusted data foundation to access a wider range of datasets, especially for RRP. For example, with our Insight data platform we will continue to update the platform with new visualisation and reporting capabilities.
2. Data sharing platform: Continue updating our data sharing platforms. Our new information provision (NIP) program went live in Summer 2023 providing market participants near real time view of Operational data, paving the way for enhanced user experience and interaction.
3. Digital Twin: Leverage IT and OT for select areas of asset management, operations and automated data capture. With the configuration of Common Data Environment (CDE), two projects have been onboarded and work is going on achieving a plan for adoption of Business Information Modelling (BIM) standards under "Enhanced Asset Design".
4. Enhanced decision making: Continue to utilise frontier technologies such as machine learning and AI for building enhanced decision-making capabilities. The MASS (Modelling, Analytics, and Simulation Services) programme began in 2024 and leverages the capability offered by the Data and Insights platform to automate key steps in network modelling and analysis, alongside risk-based decision making.
5. Efficient Enterprise Essentials: Review of infrastructure and systems for improving simplicity and efficiency and keeping them evergreen. We have been maintaining/enhancing applications such as SAP and Service Now to keep our enterprise essentials up to date and supportable.

We have been engaging with various data stakeholders on our latest strategy via a range of forums including the Gas Operation Forum, Gas Data Portal User Community, dedicated industry webinars, customer workshops and meetings with the Regulator and other government bodies. This engagement gives us the opportunity to share our plans and progress, as well as gather valuable insight from our key customers and stakeholders around how they use our data now and how they expect to use it in the future.

Further discussions are planned throughout the upcoming financial year and we will continue to participate and deliver outputs within the Data Strategy Group, working and collaborating with other Gas/Electricity Networks, Independent Stakeholder group (ISG) on Meta Data Standards and Open Data Licensing.

RRP maturity

As part of regulatory reporting process improvement, we are gradually digitising our key business processes, data conversion and quality fixes are happening under Digital Asset Management and data platform updates. Operational Enablement programs are helping with better alignment of Operational costs.

In the near future we will be continuing the digitalisation process to achieve data connectedness with clear ownership and governance model defining and tracking performance metrics, eventually working towards critical data and RRP table automations.

[4] Digitalisation Strategy and Action Plan
[5] National Gas Digitalisation Strategy

We have been working on capital reporting enablement via our "Enhance asset data" program. Asset level costs allocations are tracked via the "Future of Asset management" program. Continued data quality and governance standards are being worked on "Data platform and Strategy" program.

More information about project delivery can be found in Chapter XII: Non-Operational Capex - IT and Telecoms.

Data best practice

At National Gas we know that the availability and utilisation of good quality and accessible data is key to making the right decisions and ensuring that we continue to offer the best service to our customers and stakeholders.

National Gas has a unique position in the gas industry, and its data will be critical for market transition. Our data strategy will give industry increased value through improved data management, conferring a step change in the quality of data and services we can provide for them.

We are guided by Ofgem's Data Best Practice Guidelines (ODBPG) which form a critical part of the industry's ability to transition to Net Zero, by driving a change in the way data is discovered, shared, accessed, and understood across the energy sector; It creates ease of use when querying our published data and creates easier interactions for innovation use cases.

In order to develop the capabilities required to deliver on this guidance, we have established the Data Strategy and Governance team that reports into the General Counsel directorate. In addition, within 2023/24 we have engaged with Ofgem to review the ODBPG and discuss the challenges and opportunities associated with it. Through this engagement it was agreed that National Gas will focus implementation of the Dublin Core Metadata Standard on data publications such as our Gas Data Portal as well as any net new data being created.

This engagement has fed into our Data Strategy, developed over the last reporting year, to ensure that we understand the initiatives that will deliver significant data capability, address gaps that could affect that delivery, and identify opportunities to deliver value to our customers. This strategy was approved by the Executive Committee in November 2023 and contains the following five key streams:

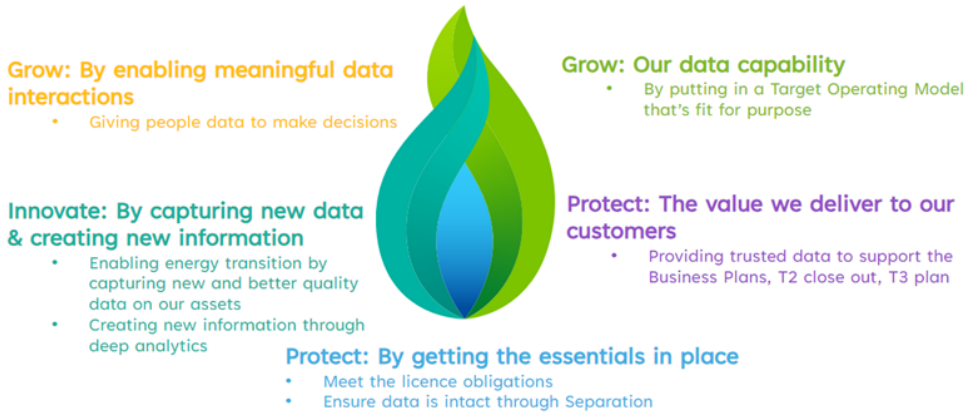

Figure 8 - Strategic roadmap

'Protect: By Getting the essentials in place' and will directly support development of our compliance to ODBPG. It has focused on policy development and driving the build out of the taxonomies and documentation required by Data Best Practice.

'Grow: By enabling meaningful data interactions' also directly supports development of our compliance to ODBPG. This stream has made changes to the architecture and target operation model of our Data and Insights Platform and brought consistency to our internal reporting. As this work continues those benefits will be conferred to our external publications such as information served through the Gas Data Portal.

In addition to refining our strategic position regarding data, we have reviewed the Data Business Management System (BMS) to ensure alignment with business and stakeholder needs, and ODBPG. This review resulted in adaptations to the Data BMS, with a rebranding and simplification approach being taken to support implementation of the behaviours described in our internal principles. These new principles have been linked directly with all ODBPG principles to ensure the licence condition is supported from the foundations of the business.

We use policies to codify and enable the desired behaviours established in our principles. Within year we have written and approved three data policies to support compliance with the ODBPG; Complex Data enrichment, Data Quality, and AI and Machine Learning In addition to these, policies governing Metadata and Data Ownership have been written and are under review, and these will further contribute to meeting our obligations under ODBPG.

Understanding our data, making it discoverable to users and fit for purpose is a fundamental element to meet ODBPG obligations. Our Data Quality Policy defines the rules our business must follow in relation to data quality. To enable the business to comply with the policy, we are developing our Data Quality Framework. The Framework is comprised of Standards, Guidelines and Templates employees will use to comply to the policy and extends the scope of work we will pursue to additionally focus on data lineage, discovery, cataloguing, profiling, and more extensive and automated data quality corrections.

Looking ahead to the remainder of the RIIO-T2 period, National Gas will continue to develop data policies and supporting frameworks that will enable the organisation to manage data more effectively. We will also focus on identifying opportunities to unlock efficiencies using automation of business processes and reporting. Finally, with the momentum continuing to build a strategic solution for net-zero, we will support our Asset, Commercial, and Hydrogen teams in enabling access to the high quality data they need to enable the transition to cleaner energy.

Customer and stakeholder satisfaction survey

At NGT we have always had a clear commitment to working closely with our customers to give them opportunities to provide feedback on our services and shape our plans for the future. The Customer Satisfaction (CSAT) Incentive is a financial incentive which encourages us to drive improvements in the quality of our customer services allowing us to earn revenue from surveying customers on their experiences of working with us. The Stakeholder Satisfaction (SSAT) survey is a similar mechanism but is a reputational incentive only.

We always listen to and where appropriate act upon the feedback provided by our customers and stakeholders. In response to feedback received from last year's surveys, we have restructured the Shaping the Future Webinars into smaller, more focused groups and 1-2-1 engagements. The focus of these engagements has been on the next price control and what our stakeholders and ultimately consumers want and need from the gas transmission system.

As a result of this change, the response rate for CSAT increased from 27% in 2022/23 to 39% in 2023/24. Similarly, the SSAT response rate increased, from 18% in 2022/23 to 29% in 2023/24.

Although the response rates increased, the actual volume of respondents for both CSAT and SSAT reduced this year, going from a high volume of 113 respondents for CSAT in 2022/23, and 84 for SSAT to 79 for CSAT and 40 for SSAT in 2023/24. This decrease in response volumes can be attributed to the reduction in larger industry-wide webinars such as the Shaping the Future Programme.

Replacing the webinars series with targeted face-to-face engagements has demonstrated that our customers and stakeholders are more willing to participate in our survey following a more personal interaction. In addition, the feedback that we received from these bespoke sessions was more meaningful and was more valuable when creating action plans and looking for opportunities to improve our service. Continuing to host webinars will fulfil the customer/stakeholder need of keeping the industry up to date on our key updates and projects we are working on but conducting and valuing one-to-one sessions to collect more in-depth feedback will provide us with the information we need to keep improving. Going forward, providing a balance between webinars and focused engagement will be a priority for us to ensure that we obtain more actionable feedback whilst also capturing the views of a wide range of customer and stakeholders.

In 2023/24 we achieved a customer satisfaction score of 8.56 against a baseline of 7.80. This has decreased by 0.04 compared to last year's score of 8.60. Five out of the nine survey areas had decreases in their scores this year (Gas Markets Policy and Change Service, Connections Service, GNCC, Maintenance Service and National Gas Events), one stayed the same (Energy Balancing Services), one had an increase (Capacity Auction Service) and two new survey areas were created (Project Union and Operational Liaison). Some of the decreases were slight, with one dropping from 8.64 to 8.63. Others were more significant, but the smaller volumes of participants meant that one or two lower scores could have a greater impact on the overall scores.

Two survey areas scored below the baseline (Gas Markets Policy & Change Service and GNCC). Of those, despite some high scores being received, a couple of low scores pulled the average score down significantly and the feedback highlighted a lack of and disjointed communication.

There has been a continued drive to improve communication, including using plain English in our communications and ensuring a single point of contact where possible. Our highest scoring area this year, Operational Liaison Team, had good quality feedback. Amongst other things, good communication, helpful staff and transparency were highlighted as key positive attributes that respondents mentioned when providing a high score. The feedback received across all areas demonstrates that communication remains a key area of importance to customers and stakeholders, with this being positively mentioned in a number of survey responses. We remain committed to ensuring that this way of working continues.

The stakeholder satisfaction score was 8.75 against a baseline of 7.40, an increase of 0.06 from the 2022/23 score of 8.69. This continues a year-on-year increase since 2017/18.

To drive improvements throughout RIIO-T2, we have implemented several initiatives including the creation of the new Gas Customer Hub improving customer's experience when looking to connect to the NTS. We've continued to engage with customers and stakeholders which has led to a more focused engagement strategy enabling richer feedback. In addition, we have streamlined communications internally and externally and have utilised CRM more effectively enhancing our account management capabilities which ultimately benefit the customer.

Quality of demand forecasting

The national demand forecasts published by National Gas Transmission for day ahead (D-1) and for two to five days ahead (D-2 to D-5) are a key tool for the UK gas industry in understanding their balancing positions.

In Ofgem's RIIO-T2 Final Determinations they opted to retain Demand Forecasting D-1 as a financial incentive scheme, with the D2-D5 scheme moving to a reputational incentive.

In 2023/24, the weighted average error on the D-1 incentive was 7.86 mcm/day against a target of 8.517 mcm/day (Fixed target of 8.35 mcm + Demand Forecasting Storage Adjuster (DFSA) of 0.167 mcm). The weighted average error has decreased this year from 8.97 mcm in 2022/23. The associated incentive revenue for 2023/24 is £0.26m, compared to -£0.19m in 2022/23. Total gas injected into Short-cycle Storage facilities (including Rough) during 2023/24 was 4581.77mcm which is a decrease from 4751.2mcm in 2022/23.

The D-2 to D-5 incentive weighted average error was 12.89 mcm/day in 2023/24 against a target of 13.70 mcm/day. The weighted average error has decreased from 13.95 mcm/day in 2022/23. There is no associated incentive revenue for this scheme.

The volatility in global markets, in relation to prices that impacted both supplies and demands and therefore demand forecasts in the previous incentive year, eased as global market pressures reduced. The total annual exports via BBL and Interconnector decreased from 20,247mcm in 2022/23 to 8,841mcm in 2023/24, however this is still almost double the exports seen in 2021/22 (4,429mcm). The total annual LNG supply was 14.7 bcm in 2023/24 compared to 25.5 bcm in 2022/23 and was comparable to that seen in 2021/22 (16.5bcm).

From a demand forecasting perspective, 2023/24 proved to be another challenging year as whilst global uncertainties eased, we continued to see volatile gas and electricity prices in comparison to prior to the Russia Ukraine conflict, both from a forward curve and SAP perspective. During the winter months SAP ranged from 55p/th on 18th February 2024 to 134p/th on 15 October 2023.

In addition, there were 15 days showing a greater than 40mcm total demand change from the previous day, a 3-day increase from the 12 days witnessed in 2022/23 highlighting the continuing challenge in providing an accurate forecast. The most extreme of these daily demand changes was 68.28mcm compared to a peak of 59.76mcm in the previous year. The day-on-day average change in demand remains high, it continued to increase during 2023/24 to 13.02mcm/day from 12.68mcm/day in 2022/23.

Power Station gas usage continues to be highly variable, with new sources of electricity from renewable generation and increased capacity from electricity interconnectors impacting the variability and accuracy of forecasting gas for power at the day ahead and five day ahead stage. The day-to-day change in Power station demand is expected to continue to increase as renewable capability increases. In 2023/24 there were 3 days where the day-to-day changes in Power Station Demand have been more than 40mcm with a maximum change of 49.57mcm[6] and an average change of 10.7mcm/day. This compares to 3 days more than 40mcm in 2022/23 where the maximum day to day change was 44.29mcm and the average was 10.37mcm.

[6] The power station variability is a subset of the total variability outlined in paragraph 9 and as such the days where a large swing in power demand is witnessed Residual Balancing actions may align with or be different to those where the total demand change exceeds 40mcm

We continue to focus on improving our demand forecasting accuracy and throughout 2023/24 we have embarked on several activities to drive improvements, including:

Power Stations - We continued with the internal development of improved demand forecasting capability models. We have developed and implemented a weighted combination model, investigated the use of different model types and other input data sources to the models. The investment in model development and ongoing operation totalled ~£149k and has been used to analyse the use of different raw weather forecast inputs and suppliers data. The model forms part of the suite of tools available to support demand forecast generation and we will continue to look for additional improvements over future years of the price control to further enhance its accuracy.

The manual Power Station forecast process has evolved to try and predict the likelihood of errors or changes to the input data, e.g., if wind is predicted to be very high then the forecast is adjusted up to allow for changes. For Power Stations we have continued tracking the bias for the total electricity demand to ascertain trends against wind generation and changes to electricity interconnectors. We have implemented a change to incorporate day ahead electricity prices into the Interconnector forecasts but unfortunately this is only applicable to the day ahead forecast as there is currently no information for D-2 onwards.

Fluctuating prices coupled with the impact of storms have meant we continue to see LNG tankers getting diverted to other countries. In 2023/24 we have seen changes to scheduled deliveries, with 25 vessels diverted from Isle of Grain and 17 diverted from Milford Haven. Diversions of cargos can lead to an increasing level of supply uncertainty on the network, the consequence of this is that it can have an impact on the level of flexible demand we can see on any given day, this is most likely to be within either storage injection of exports to Europe via the interconnectors.

Supply forecasting - Identifying continuous improvements to better understand supply behaviour and what causes changes to supply patterns. During this year we have continued to contact sites to better understand their operation to support effective forecasting processes. Additionally, prior to publishing each forecast we have introduced a new challenge and review discussion between forecasters to ensure we have common understanding and provide the opportunity to test logic leading to us being able to cover as many realistic scenarios as possible using the range of expected min/max supplies and min/max demands to improve accuracy where possible.

Maintenance

The Maintenance Incentive Period runs from 1 April – 31 October each year, to align with the summer outage plan.

To ensure the ongoing reliability and integrity of the NTS, we are required to periodically undertake maintenance. Where this work requires an outage, or to reduce the flexibility available at one or more direct exit connections, NGT may 'call' one or more 'Maintenance Days' in accordance with the UNC.

We plan maintenance activities to align with periods which minimise disruption to our customers. If the maintenance period has no impact on customer contractual rights, this is communicated as an 'Advice Notice Day'. Where this is not possible, a 'Maintenance Day' will be called. We are incentivised to minimise the use of maintenance days and changes to the maintenance plan.

To incentivise the efficient planning and execution of network maintenance impacting customers at direct exit connections from the NTS, the maintenance incentive is split into three scheme components:

- Use of Days - Maintenance days (Valve Operations)
- Use of Days - Maintenance days (excluding Valve Operations)
- Changes - Minimisation of changes initiated by NGT to the agreed maintenance plan.

Use of Days - Maintenance days (Valve Operations)

The Use of Days – Maintenance Day (Valve Operations) scheme is designed to reduce the impact we have on our customers when we undertake our Valve Operations (VO).

All VO activities were completed in 2023/24, whilst still ensuring minimal impact to customers. This was achieved using mostly 'Advice Notices' and one 'Maintenance Day' outperforming our target of 11 days or less (relating to utilising maintenance days). In 2022/23 we also achieved all VO activities utilising one 'Maintenance Day' with the rest achieved through 'Advice Notices'.

This element of the RIIO-T2 scheme is downside only (£0.5m collar). As we outperformed the target of 11 days or less, no financial downside was triggered, and we incurred £0 cost.

Use of Days – Maintenance days (excluding Valve Operations)

The Use of Days – Maintenance Day (excluding Valve Operations) scheme is designed to reduce the impact we have on our customers for all other maintenance activities (excluding VO).

For 2023/24 the incentive included 194 days of customer impacting works, of which all 194 were aligned to customer outages. This demonstrates that 100% of customer impacting works (excluding VOs) were successfully aligned with customer outages against a target of 75%. This compares to 95 days of customer impacting works in 2022/23, of which 87 were aligned to customer outages (92% of customer impacting works).

This element of the RIIO-T2 scheme has a cap and collar of £0.5m, due to the 100% alignment this resulted in an outturn of £0.5m.

Changes - Minimisation of changes initiated by National Gas Transmission to the agreed maintenance plan

The aim of the Maintenance Day Changes scheme is to reduce the impact our maintenance activities have on customers should we make changes to our planned maintenance after 1 April for the forthcoming summer maintenance period. The scheme scope does not include changes that were initiated by customers, only those initiated by NGT.

The Maintenance Day Changes scheme includes any maintenance days called; it is not limited to VOs. In total, there were 242 days (inclusive of 194 days in the Use of Days – Maintenance Day (excluding Valve Operations)) of planned maintenance in 2023/24 compared to 125 days in 2022/23. This led to an updated benchmark for changes of 17.55 days in 2023/24, which is 7.25% of all Maintenance Days and Advice Notice Days called. This compares to a benchmark of 9.06 days in 2022/23.

Although the number of maintenance days categorised under the scheme has increased in 2023/24 compared to 2022/23, the overall number of maintenance jobs has remained relatively consistent. For example, the number of jobs related to ILI runs, Defect Inspections and Pipeline/AGI works, decreased slightly from 428 in 2022/23 to 419 in 2023/24. However, more of these pipelines tend to have customer connections thereby having a direct increase on the number of maintenance days. It is still expected that the number of maintenance activities will remain around this level for the remainder of RIIO-T2.

This element of the RIIO-T2 scheme is downside only (£0.5m collar) therefore as we outperformed the target, we incurred £0 cost.

In 2023/24, there were zero changes initiated by us during the maintenance period. This is the same level of performance as in 2021/22 and 2022/23. This demonstrates the continued effort that has been made to minimise change, despite several of our In-Line Inspections and pipeline works impacting customers. Ensuring we minimised the impact of these Inspections was crucial in demonstrating our continued commitment to be flexible to customers' requirements. An example of this is where we accelerated a project to build a new installation to facilitate an in-line inspection aligned to our customers plans.

This performance was primarily delivered by carefully monitoring our maintenance and communications processes, including continuing with our customer face-to-face meetings with renewed engagement at least eight weeks prior to the planned maintenance affecting them, allowing us to capture any changes to customer outages earlier. As an example, we completed an ILI run on Feeder 28 between Three Cocks and Tirley, whereby we required a specific flow rate from Milford Haven terminal to successfully complete the ILI run. The flow rate was acquired by working closely with the sub terminals. If this had not been successful, the pipeline would have been non-compliant which could have resulted in the pipeline having to be shut down.

Our annual review of the 2023/24 maintenance programme can be found on https://www.nationalgas.com/data-and-operations/maintenance

Entry/exit capacity constraint management

The Capacity Constraint Management Incentive is designed to drive National Gas Transmission to maximise available network capacity and minimise constraint management costs, through efficient and economic planning and operations. We therefore release as much capacity as possible (with due risk/reward consideration), develop effective constraint management strategies, and make economic and efficient NTS investment and planning decisions. This benefits our customers, and ultimately end consumers, as costs shared with industry resulting from constraint management actions are mitigated or minimised and the release of capacity is maximised thus enabling customers to flow gas on and off the network.

A robust Constraint Management Incentive drives an effective strategy which delivers value to the industry and end consumers, who benefit directly from a strong performance. The overall 2023/24 Constraint Management Incentive scheme performance was £3.7m (2018/19 price base) – a decrease of £0.9m from 2022/23, which will be explained within this section.

There has been a 69% decrease in the total revenue generated from the release of both Entry and Exit Non-Obligated capacity in this reporting year. In 2023/24, revenue from all Non-Obligated capacity was £7.2m, whereas for 2022/23 it was £23.3m. The year-on-year reduction in revenue was primarily due to the level of surcharges paid for Non-Obligated capacity at Bacton Exit IP in 2022/23 (in response to the curtailment of Russian gas to Europe and increased exports from GB).

In addition to Non-Obligated Entry and Exit Capacity, under RIIO-T2 we continue to report on revenue generated from; Locational Sell Actions, Physical Renomination Incentive charges, and any further revenues derived by the licensee that the Authority directs us to include. We also continue to report any Constraint Management costs or revenues resulting from Entry and Exit capacity Buy Back, Locational Buy and Sell actions, Turn-up and Turn-down Contracts, Offtake Flow Reductions, and Investment Constraint Management costs.

There were no commercial constraint actions taken during the 2023/24 reporting year which generated costs or revenues. All potential capacity constraints were managed by deploying operational and/or no cost commercial tools, through bespoke strategies aimed at minimising financial and operational impacts to our customers.

Non-Obligated Entry Capacity

In reporting year 2023/24, revenue from all Non-Obligated Entry Capacity was £2.5m. This was 7.4% lower than in 2022/23, when revenue from the same products was £2.7m.

Short-term Non-Obligated capacity sold in 2023/24 saw a significantly higher volume of Non-Obligated capacity sold at Rough Storage. Rough Storage was brought back online for Winter 2022, to increase GB supply resilience during the energy crisis. Non-Obligated capacity was released whenever requests could be physically accommodated.

The volume of Long-term Non-Obligated Entry Capacity across the two reporting years was identical, though less revenue was generated in 2023/24 than in 2022/23 due to a year-on-year reduction in reserve prices.

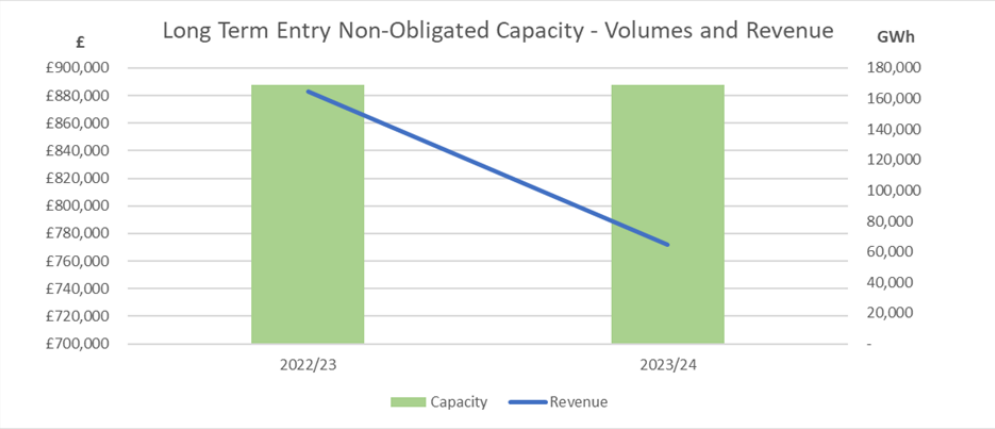

Figure 9 - Long-term Non-Obligated Entry Capacity volumes and revenues

Non-Obligated Exit Capacity

Non-Obligated Exit capacity revenue decreased by 77% from £20.6m in 2022/23 to £4.7m in 2023/24.

The reduction in volume in 2023/24 was due to an unprecedented level of Non-Obligated capacity sold at Bacton Exit IP in 2022/23, in response to the war in Ukraine. To meet customers' requirements, we aimed to maximise exports to Europe, to increase EU storage levels prior to winter. High demand for capacity during this time led to periods of high surcharges (prices bid for by Shippers and allocated above the reserve price), which inflated the revenue generated. As these requirements have reduced in 2023/24 (see the Operational Context section for further information) this explains the disparity between year-on-year changes to both volumes, and volumes compared to revenues.

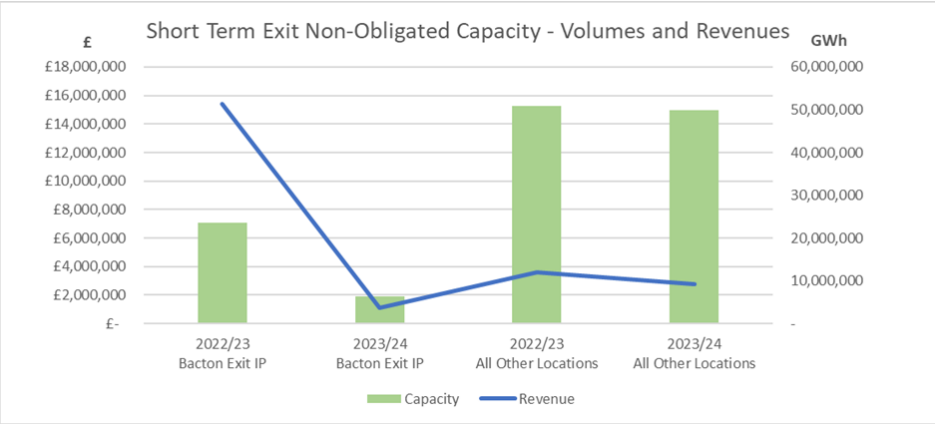

Figure 10 - Short-term Non-Obligated Exit Capacity volumes and revenues

For Long-term Non-Obligated Exit Capacity, the volume sold in 2023/24 was 31% lower than in 2022/23, and the revenue was 47% lower.

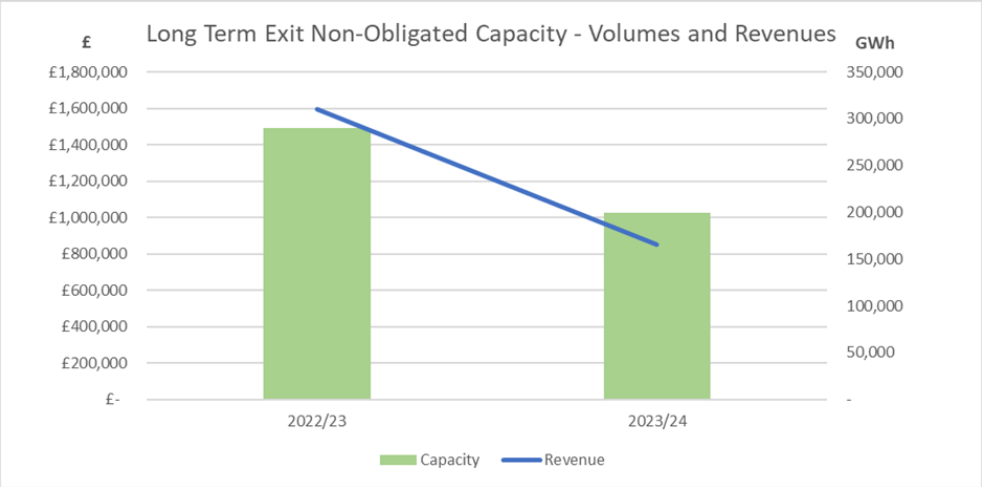

Figure 11 - Long-term Non-Obligated Exit Capacity volumes and revenues

Capacity constraint risk management

We assess the impact of maintenance throughout the year; be that planned maintenance (primarily undertaken in summer months, as per the annual maintenance plan), or unplanned maintenance (undertaken in response to unforeseen events or circumstances). We assess the level of risk and determine the most efficient approach to take, with consideration of aspects such as the urgency and duration of the work, and the potential physical and commercial impact. This is essential to ensuring the right decisions are made for our customers, as any reduction in asset availability can heighten the risk of a network constraint and consequential costs.

In 2023/24, a number of emerging constraint risks were effectively managed through the use of operational and commercial tools (which were zero cost), bespoke strategies and response arrangements in place with our wider support teams. We managed to prevent further impacts to customers by mitigating the need for additional commercial tools which could have generated costs though the incentive. A few examples of potential or emerging constraints are outlined in the following paragraphs, along with the actions we took in each case.

Prior to Summer 2023, we undertook detailed analysis to assess the inherent risk of an Entry capacity constraint at Milford Haven LNG terminal. We assessed summer capability levels against historic and forecast supply flows, to ascertain the likelihood and potential cost of constraint days from April – September 2023. In the latter stages of analysis, we became aware of an increase in Norwegian maintenance planned for May, June, and August. We believed this, combined with the ongoing possibility of increased LNG flows associated to EU exports, had the potential to increase the risk of constraints, should LNG supplies increase beyond those typically seen (in response to reduced East Coast supplies from Norway). We consulted with industry from December 2022, to ensure transparency for our customers, and proposed a proactive strategy instead of a reactive approach which could generate higher constraint management costs. On 20 April 2023, our proposal to reduce the volume of Firm Entry capacity released at Milford Haven (for periods aligned to the Norwegian maintenance) was rejected by the Authority. The rejection was primarily due to a belief that the risk carried a low likelihood of materialising, based on historic low summer flows and capacity under-utilisation in Summer 2022.

In early May, a sustained period of high supplies from the Isle of Grain LNG terminal required additional compression to move gas away from the South East. Demand levels were low in the Distribution Network (which reduced Entry capability) and a compressor trip resulted in pressure levels forecast to breach safe operating levels. A number of operational and commercial tools were used on 1, 3 and 5 May to maintain safe operations – Flow Swaps, Interruptible capacity scale-back, and withholding of unsold Firm capacity. Locational Sells were requested on 1 May, though none were actioned due to a lack of market response. The actions taken combined with an increase in South East demand successfully alleviated the forecast constraint.

On 15 May, a pipeline was damaged at Bacton which impacted the Perenco sub-terminal. We advised customers of the issue, resulting in supply flows being diverted to an alternative sub-terminal such that end of day impact was minimised. In the final hours of gas day on 18 May, full service was restored at the sub-terminal for customers. At terminal level, overall capability at Bacton was unaffected throughout.

On 15 May, a trip at Avonbridge compressor reduced our ability to move gas away from St Fergus. High supply flows and stock levels in the North were already more challenging due to the unavailability of Aberdeen compressor (undergoing summer maintenance). Interruptible capacity for gas day 16th May was scaled back and Firm capacity was restricted to 60mcmd to restrict St Fergus supplies whilst compression was re-established. The unit was re-established on the 16th May which, combined with the strategy adopted, prevented the need for further commercial actions and the risk of generating consequential costs for customers.

On 18 May, an essential valve failed at Avonbridge compressor station. The sustained high supply flows at St Fergus meant that pressures were forecast to rise above safe operating levels. For both 18th and 19th May, to ensure safe operations, Interruptible capacity was scaled back, unsold Firm entry capacity was withheld, a REMIT notice was posted, and a pressure TFA issued to St Fergus sub-terminals. Again, a swift response from our operational teams ensured the replacement valve was in place on 19th May, and normal service restored for our customers with no constraint management costs generated.

Supporting our customers

We continually strive to improve and provide high standards of service to customers and to support industry with regards to the capacity regime. Our aim is to help raise understanding and aid participation in capacity auctions, and to provide a contact point for any capacity-related processes and queries. Throughout the year, we used several different approaches as a means of raising awareness and offering support, all with the objective of helping meet customer's requirements and managing network capacity more efficiently.

In 2023/24 we supported a number of Gas Operational Forums on capacity-related topics. These primarily focused on a deeper dive into "Interesting Days" providing customers with an explanation of our operational and commercial considerations of each situation. We also provided information in the January Operational Forum on the annual Entry Capacity auctions which generated a number of bi-lateral customer meetings to answer more detailed queries. We used these to further enhance the published information already available and received positive feedback for doing so.

We have also supported the progression of capacity aspects for the Western Gas Network Upgrade project throughout 2023/24. This Entry PARCA (Planning and Advanced Reservation of Capacity) will be a physical upgrade to assets in the South West and result in a permanent increase to Baseline capacity at the Milford Haven ASEP of circa 163 GWh, subject to Authority approval. A number of bilateral discussions were held, and information provided, as well as system testing being completed to ensure that the process would be completed successfully. The capacity allocation did not conclude as planned in August 2023 and the registration start date has been deferred to January 2027, with capacity allocation now due to take place in August 2024.

During Winter 2023/24, we developed and facilitated a manual process to support the transfer of capacity from Easington ASEP to the Rough Storage facility, in line with UNC Modification 0846. This enabled the customer to successfully transfer any existing NTS Entry Capacity holdings at Easington ASEP to the Rough Storage facility.

On a daily basis, we provide support to customers on all aspects of the capacity regime, via our email account and phoneline. We seek feedback as a means of continually improving the service we provide, ensuring customers' needs have been fully satisfied and that additional information is provided to further their understanding, where required. Both of our Frequently Asked Questions (FAQ) and Capacity Guidelines documents underwent a complete review in 2023/24 to reflect trending customer queries and provide greater clarity.

Residual balancing

The aim of the Residual Balancing incentive scheme is to incentivise NGT residual balancing activities in two ways:

- The Linepack Performance Measure (LPM) incentivises NGT to minimise the differences in the linepack volumes measured at the start and end of each gas day. This is to help ensure that any system imbalances within the gas day are managed, and that any associated costs are levied across those system users responsible for that day's imbalance.
- The Price Performance Measure (PPM) evaluates the impact NGT has on the market in its Residual Balancing role by measuring the price range of its residual balancing trading actions compared to the System Average Price (SAP). This incentivises the System Operator to minimise the impact it has on the market

The LPM element for 2023/24 achieved a daily average linepack performance of 1.8 mcm/d, compared to the 2.8 mcm/d incentive target. This is an improvement in performance from 2022/23 where the average linepack performance was 2.5 mcm/d. The LPM was better than the incentive target of 2.8 mcm/d on 287 days during the year (78% of days), an increase in performance compared to 2022/23 (225 days, 62% of days).

The PPM element achieved an average price spread of 0.9% of SAP, compared to the 1.5% incentive target, although we have seen several days where the price spread was greater than 5%, peaking at over 10%. The 0.9% in 2023/24 represents an improvement in the average price spread performance compared to the 2022/23 value of 4.0%. We took Residual Balancing actions on 241 days (66%) compared to 273 days (75%) in 2022/23. On the days when we took actions, the average price spread was 1.4%, compared with 5.3% in 2022/23.

In 2022/23 minimising linepack change and the price spread of our Residual Balancing actions was more difficult to achieve than in 2023/24 because of market uncertainty driven by the significant global events that impacted supply, demand, and associated volatility. Gas prices and price volatility both between and within days have since reduced from 2022/23 levels, although in 2023/24 we have still seen SAP changes of up to 21% between consecutive gas days. The NTS continues to manage wide system imbalances in supply and demand throughout/during a gas day, presenting a challenging environment for Residual Balancing to operate efficiently in. As a result, we continue to enter the market earlier and more frequently during challenging periods.

Shipper behaviour remains a primary factor influencing the balancing of the NTS, and we continue to engage with Shippers to help understand the changing drivers behind Shipper imbalance positions.

We have also recently incorporated an in-depth weekly residual balancing insight report into our processes. This has helped our understanding on the drivers for balancing behaviour, emerging trends and risks and has also stimulated further conversation and shared learning within the GNCC.

Section contents

V. Maintaining a safe and resilient network

Providing a safe and resilient transmission network that is efficient and responsive to change is fundamental to everything we do. Through the development of our RIIO-T2 business plan, our customers and stakeholders told us that safety of the public, our employees and of our assets is a key priority. They expect to be able to access a resilient and reliable network and to be able to flow gas without restriction.

In 2023/24 we have made positive progress against our outputs in this priority area, in particular in the asset health arena where the measures we have put in place in the opening years of the price control have supported accelerated delivery this year and will allow us to maintain this trajectory into years four and five. We also submitted our Bacton terminal site redevelopment FOSR in February 2024 and are on track to submit the full cost reopener within the 2023/24 period.

There remain some challenges for us in this consumer priority area particularly in Cyber OT where delivery of the control system replacement project has been impacted by skilled labour shortages, the highly complex nature of the works and the ability to secure outages for the duration of time needed to complete works. Our underspend to date in this area represents a deferral of spend as opposed to a real reduction, as we rephase works into the later year of RIIO-T2 and into RIIO-T3.

The section below provides further detail on how we have performed against specific deliverables that sit within the 'Maintaining a safe and resilient network' theme.

Outputs linked to this theme but not discussed in the section below can be found in XI. Non-Load Related Capex and XIII. Other Costs.

Safety

The safety and health of our workforce, the public and our assets is an integral part of National Gas Transmission and a top priority within our overall strategy. We aim to have a proactive safety culture within the RIIO-T2 price control which will support the movement towards the highest level of maturity within RIIO-T3. This approach is crucial to driving strong safety performance and to ensure delivery for our customers, the communities we serve and to maintain the reputation of our business.

Gas Transmission Safety Performance

To support our proactive aim National Gas Transmission has an ambition to be 'safe every day'. The ambition sets the strategic direction for the RIIO-T2 framework and associated safety and health plans - focus within these plans is to be aligned to four key target areas:

- Keeping our assets and processes safe every day
- Demonstrating safe behaviours every day
- Supporting health and well-being every day
- Improving safety every day

NGT has now concluded year two of its ambition with positive progress being made.

The NGT lost time injury frequency rate (LTIFR) out turned at 0.02. This measure is aligned to the business stretch target (<0.1) and is comparable to our 2022/23 performance (0.02).

The LTIFR was made up of one employee lost time injury which resulted during line walking activities. The Injured Person (IP) was digging a hole for a marker post when their spade hit a rock which caused them to fracture their wrist. This event is under investigation, following which all learnings from this incident will be shared.

There have been six high potential controllable events (HPCE), including the lost time injury (LTI) referenced above, and one high potential but not controllable event, which involved a third party on a shared site.

There have been no public safety injuries attributable to National Gas operations/assets.

There have been no tier one[7] process safety events, however there was one tier two[8] process safety event in May, and a further tier two process safety event in October. Both were also HPCE and have been included in the figure above. Leading indicators aligned to process safety have continued to receive sustained focus, with actions in place to improve performance and manage risk. Compliance levels against these indicators at the end of the financial year was 78%, an 11% increase when compared to 2022/23.

We have continued with our programme of Executive Safety Health and Environment (SHE) Leadership visits with 100% of visits (minimum of four visits per leader per year) being completed in 2023/24.

Visible senior commitment to safety, health and the environment is critical to strong performance and the majority of our leaders have exceeded requirements this year, further increasing their visibility. This leadership programme measure has now been re-set in preparation for 2024/25 delivery.

The quality of Investigations reported into our Incident Management System (IMS) have been delivered to a high standard, with a quality assessment of 87.76% at year end. The action closure rate concluded at 94.4% which is slightly below the required target of 95%.

Key highlights delivered in 2023/24 include:

- 100% of process safety risk control indicators have been reviewed and implemented with refreshed process safety training embedded.
- All Tier one standards have been re-branded to be reflective of National Gas identity.
- A review and update of the Tier 1 Management of Change Standard has been completed, including the provision of a robust organisational change handover document, to support risk mitigation.
- Review and re-set of the process safety and occupational safety risk content.
- The development and roll out across the gas business of a new investigation methodology (5 why's) which is now live following a successful pilot.
- Advancement of works to the National Gas Transmission Safety Management System (SMS) to simplify the SMS and support accessibility improvements that are being made to the system.
- Delivery of SHE surgeries to support back to basics and let's talk sessions.

The themes for the 2024/25 Safety and Health Plan have been developed following a senior level sign off process and continue to support our "Safe Every Day" commitments.

[7] A tier one process safety event is a catastrophic process safety event for example fire, explosion or release of hazardous substance which results in loss of life and/or serious or life-threatening injuries or where that potential exists.
[8] A tier two process safety event is a serious process safety event such as a major release of hazardous substance: a. Sudden uncontrolled release of high-pressure natural gas.

NARM

For RIIO-T2, the Network Asset Risk Metric (NARM) builds on the progress made in RIIO-T1 and is using Monetised Risk as the primary measure. Ofgem uses this measure for defining outputs and setting allowances associated with our asset management activities. In RIIO-T2 we have outputs defined using the Long-Term Monetised Risk measures. This is a Monetised Risk measure over a defined period of time greater than one year from a given start date and equal to the cumulative Single-Year Monetised Risk values over the defined period.

Network asset risk relates to the consequence of failure of a network asset and the probability of a failure occurring. If we do not maintain, replace, or refurbish assets, the probability of them failing will generally increase over time, and so would the risk of the consequence of failure materialising. To keep network asset risk within reasonable bounds, we are funded to carry out asset management activities such as replacement or refurbishment. The NARM has been developed to allow Ofgem to quantify the benefit to consumers of our asset management activities and hold us accountable for our investment decisions.

In 2023/24 we have delivered a further R£20.5m in Long-Term Risk Benefit (LTRB) in NARM outputs (A1 Unique Identifiers (UIDs)) subject to work closeout between now and the final RRP NARM submission. With this, alongside previous the year's cumulative delivery of R£63.5m, it takes the total LTRB delivered in RIIO-T2 so far to R£84.0m against the target of R£200.8m.

We will use the LTRB delivered in 2023/24 to provide the revised forecast in the NARMs RRP submission.

Annual Network Capability Assessment Report (ANCAR)

The Annual Network Capability Report (ANCAR) is a published document which includes, for all NTS Exit and Entry Zones, so far as is reasonably practical:

- Flow forecasts
- Physical capabilities
- Capabilities that can be delivered using commercial tools
- Explanations of any changes, since the last report, resulting from changes in our assets
- As required by the ANCAR license condition, a view of the situation in 10 years' time.

The Network Capability Zones:

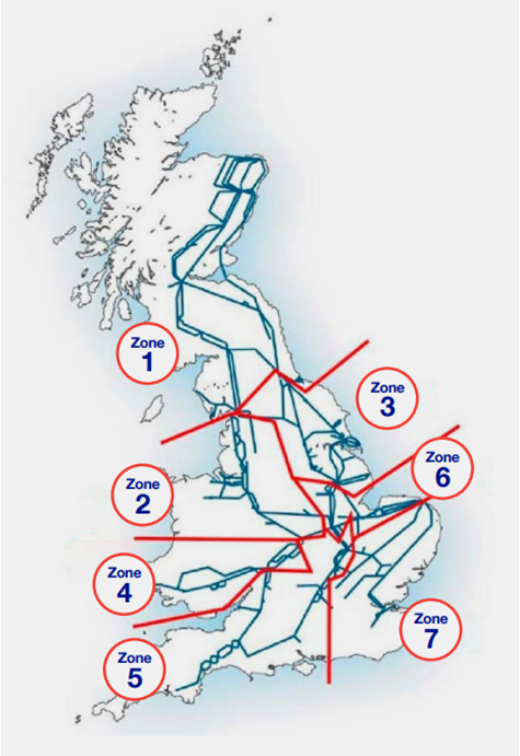

Figure 12 - Network Capability Zones

The third edition of the ANCAR was initially published in June 2023 (with an update published in September 2023, to cover minor amendments and additional internal feedback). The ANCAR included information on current asset availability and network resilience in addition to what has been included previously, the main findings were:

- The entry and exit capabilities of most of the zones are sufficient to meet all the supply and demand flows anticipated under all Future Energy Scenarios (as published by ESO), over the next 10 years. The exceptions being South Wales entry, South East entry and East Midlands exit.

- South Wales' entry capability shows the strongest indication of all the zones that an increased capability is required for both now and in future years, due to a greater reliance on the imports of LNG through Milford Haven.
- The South East's assessment indicates the network has insufficient capability to meet both high Bacton and Grain LNG flows simultaneously. The report highlights the requirement to assess our capability and resilience requirements as part of the RIIO-T3 business plan for both entry and exit within the zone. East Midlands exit flows, which are predominantly interconnector exports to the EU, indicate that currently we have sufficient capability to meet exit demand for the majority of scenarios with the chance of having a constraint being less than once per year in the current year, however when resilience is taken into account this figure increases to a potential 11 days of constraint a year. Looking ahead to 2030, there is sufficient capability to meet all anticipated exit flows.
- The newly included information on resilience demonstrated that while the intact network capability demonstrates the best case figures for network capability, when factoring in asset reliability / availability the actual capability can be significantly lower and constraints can be more likely.

The investment programme in the current 10-year Business Plan, as contained within our RIIO-T2 proposals, remains the appropriate and economic approach to meeting forecast customer needs.

Out to 2030, the data and our analysis supports the proposals we made in our latest RIIO-T2 Business Plan. That is, the range of physical capability available to us via existing and planned assets is consistent with the requirements as indicated by the scenarios based on the FES.

Exit Capacity

The annual exit capacity process is run according to the Exit Capacity Planning Guidance[9] (ECPG) introduced as part of RIIO-T2. The aim of this guidance/process is to ensure that Flat and Flex capacity bookings as well as Assured Offtake Pressure (AOP) requests are booked as efficiently as possible given the removal of the incentive arrangements on the GDNs. The ECPG process also aims to make the process more transparent and increase our engagement with the GDN's. The ECPG outlines the methodology, engagement, and reporting requirements of this process.

Capacity bookings were largely in line with what we would expect to see (based on previous years), with a slight increase in Distribution Network bookings compared with last year, which was less than 3% above the FES forecast suggesting that bookings are being made efficiently. The number of AOP changes was similar to previous years which is significantly more than experienced in RIIO-T1. We also received nine firm non-obligated requests of which eight were accepted. Given the increased engagement with the GDN's it was possible to negotiate AOPs in a way which avoided any unnecessary investment and therefore was to the financial benefit of customers and ultimately consumers.
We provided the outcome of the ECPG process in the 2023 Exit Capacity Allocation Report to Ofgem, as well as a redacted version[10] which was made publicly available on our website in October 2023. This was followed by the accompanying Exit Capacity Assessment Methodology Statement[11] in January 2024. This was in line with the ECPG licence conditions. The GDN's also published equivalent documents in line with their ECPG obligations.

[9] Exit Capacity Planning Guidance | Ofgem
[10] Exit Capacity Allocation Report
[11] Exit capacity planning | National Gas

Asset Health – non lead assets

The majority of our asset health plan is covered by NARM – work that is necessary to maintain the safety and reliability of the network, and outputs are measured in LTRB.

For Non Lead Asset Health there are 38 intervention types (UIDs), across five asset sub-themes. Of the 38 intervention types, 18 have received baseline funding and have price control deliverables (PCD) with volume targets. These 18 UIDs cover:

- Security fences and gates
- Pipe supports
- Access roads and paths
- Lighting
- Major remediation of civils at Bacton

The Non-Lead asset interventions associated with fences, gates, roads, pathways, and pipe supports are being considered alongside similar NARM assets requiring intervention within the National AGI Renovation Campaign (NARC). In this manner, bundling efficiency and timely intervention is best achieved.

Asset Health sub theme	Asset	2021/22 Volume Interventions	2022/23 Volume Interventions	2023/24 Volume Interventions
Cabs and Compressors	Air intake	5	1	2
	Cab structure	3	3	6
	Cab ventilation	5	1	1
	Exhausts	5	4	1
	Fire Suppression	4	0	6
Civils - Structural Integrity	Pipe Supports	37	83	438
	Security	4	5	3
	Access	8	3	2
Electrical	Site lighting	0	0	10
	TOTAL	**71**	**100**	**469**

Table 3 - Non-lead PCD volumes delivery

In the first two years of the price control, we undertook comprehensive surveying to develop a robust programme of works that would support delivery in the latter years of the price control. This strategic planning has allowed us to deliver a significant increase in volumes in Year 3. In addition, the transition from relying solely on external contractors to a blend of internal and external execution, through our Operations and National Gas Services teams, together with third party MWCs, has yielded invaluable benefits. These include enhanced project control, improved efficiency, and a higher volume of successfully completed interventions. This strategic approach not only accelerated our delivery in Year 3 (2023/24) but also enabled us to clearly define our delivery objectives for Year 4 (2024/25) and Year 5 (2025/26).

For the Cabs and Compressor sub theme assets, we have undertaken physical delivery of works and claimed a total of 16 volume outputs at Chelmsford (Unit A and B), Hatton (Unit A), Alrewas (Unit A, B and C), Wormington (Unit A and B), and Kirriemuir (Unit E). In addition to the infrastructure works, this year we have developed the Cab Infrastructure scope for Huntingdon (Unit C), Aylesbury (Unit A and Unit B), Churchover (Unit D), Cambridge (Unit C), Aberdeen (Unit A and Unit B) Kings Lynn (Unit B) for delivery in 2024/25 and 2025/26.

For the Structural Integrity assets, 443 PCD non-lead Civils volumes have been delivered and claimed in 2023/24. This is a significant increase from 91 volumes delivered in 2022/23. In addition, a full professional technical and risk assessment was undertaken at 42 sites, with these surveys used to assess and select intervention options prior to conceptual design and delivery in RIIO-T3 of potential further non-lead PCD Civils volumes.

We have delivered and claimed 10 lighting Non-Lead Asset volumes associated with the electrical sub theme in 2023/24. The larger and more complex lighting projects are to be delivered within the main electrical campaign in 2024/25. Less complex lighting volumes are in delivery with our operational teams since this provides greater value. The overall delivery of lighting Non-Lead Asset volumes is on target but the mix of intervention UIDs differs from the business plan expectations.

Section contents

VI. Deliver an environmentally sustainable network

National Gas Transmission is at the forefront of leading a transition to clean, fair, and affordable energy. As one of our key outputs under RIIO-T2, delivering an environmentally sustainable network is important both to us and our customers. As a responsible business, we are committed to delivering environmental and community benefit, prioritising the issues that matter most to stakeholders.

In 2023/24 we have made steady progress against our deliverables in this consumer priority area. Our GHG emissions were 2,293 tonnes, exceeding the incentive target of <2,897 tonnes. This level of performance has been supported by a number of emissions identification and reduction activities, including the the continuation of the compressor inhibiting trial, and utilising supply and demand forecasts to identify future flow requirements to make early compressor and depressurisation decisions to reduce unit static seal losses.

In the Environmental Action Plan we have performed well against our key commitments and we are now embedding our Net Zero by 2050 commitment across the business, verifying our strategy, aligning future investments and operational practices to support delivery of our commitment. With regards to our environmental incentives we have exceeded the benefit threshold in four out of a possible seven areas. More detail on our environmental incentive performance can be found in the chapter below.

For redundant assets, we have physically delivered a further six outputs and the majority of the works associated with the remaining outputs has commenced. We have been able to support our sustainability goals by identifying, recovering, and redeploying a range of redundant assets, such as Wormington Aftercooler and Huntingdon A compressor unit, due for decommissioning in 2025, for testing at Spadeadam to facilitate our Hydrogen FutureGrid project.

The section below provides further detail on how we have performed against specific deliverables that sit within the 'Deliver an environmentally sustainable' theme.

Outputs linked to this theme but not discussed in the section below can be found in XI. Non-Load Related Capex.

Environmental Action Plans

NGT aims to reduce the impact its operations have on the environment, whilst delivering positive benefits for the communities we serve.

For RIIO-T2 we developed an Environmental Action Plan (EAP) which underpins our aim and helps us to measure how we're progressing. The EAP contains 30 commitments aligned to five pillars:

1 Air Quality

2 Our Climate Commitment

3 Responsible Asset Use

4 Caring for the natural environment

5 Leadership for change

We have now completed year three of this plan with positive progress being made. Performance highlights for each of the five pillars has been captured in the table below:

Area	Key Commitments	Update
Air Quality	We will work to reduce our NOx emissions from the business by the end of RIIO-T2. This includes replacing some of the most-polluting compressors on our network with cleaner technologies, improving local air quality.	The NOx from our gas compressor running as an intensity measure of kilograms per hour (kg/h) have fallen from 6.3 to 5.42kg/h which equates to a 13.9% reduction due to the increased utilisation of Best Available Technique (BAT) units (newer, cleaner units). There has been a reduction in run hours across the network of 30%, with a greater proportion of the hours being attributed to electric Variable Speed Drive (VSD) running (23.9% in 2022/23 to 27.4% in 2023/24).
Our Climate Commitment	Our key commitment in this space was to develop a science-based target by 2023. Update: The Science Based Targets initiative (SBTi) stated that the oil and gas sector is imperative and one of the most challenging sectors to decarbonise. The SBTi are developing a sector-specific methodology for oil and gas and is expected to be complete by the end of 2024.	National Gas Transmission has successfully delivered a SBTi corporate standard aligned net zero target for scope 1 and 2 emissions which achieved board approval in December 2023. We also conducted a partial scope 3 footprinting exercise and continue to develop in this area. National Gas Transmission has committed to achieving net zero by 2050 for scope 1 and 2 emissions but also maintains an ambition to achieve this earlier, by 2040. We are now embedding our Net Zero by 2050 commitment across the business, verifying our strategy, aligning future investments and operational practices to support delivery of our commitment. A key component to delivering the net zero commitment is reducing methane emissions from our operations. NGT submitted a funding request to support methane emissions reduction in October and November 2023. We received the outcome of our reopener request, the Methane Emissions Reduction Campaign (MERC) in March 2024, securing £19.4m in funding. The MERC submission comprised of three themes: 1) Expansion of NGTs fugitive emission detection and repair (LDAR) programme and establishment of a measurement-based fugitive emission performance baseline. 2) Combined Gas Recompression and Zero Loss seals (CMT) 3) Recompression Units - We are developing our LDAR programme process and trials continue for the CMT and recompression themes.[12]
Responsible Asset Use	We will address eighty redundant assets, asset groups or sites (subject to customer and network need), supporting a sustainable lower carbon future through responsible demolition including asset repurposing.	9.2 outputs were delivered in the first two years of the Price Control. A further 6 were delivered in 2023/2024. We also continue to identify opportunities to minimise waste by reusing assets. This includes the recovery of grey spares for reuse within the business and redeploying redundant assets for the Hydrogen FutureGrid project. Further detail can be found in the Redundant Asset narrative.
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.	The Creekside initiatives delivered 500 visitors during FY23/24. These visits teach environmental conservation to both adults and children. At Aberdeen Compressor Station we have developed and implemented a woodland diversification and ride management plan including broadleaved woodland creation, management for biodiversity and moorland vegetation communities. The plan will be delivered via a rolling programme accruing benefits over an expected 30 year period Our major construction project at Hatton has measured the Biodiversity Net Gain loss of the project and enhancement units required to reach a 10% net gain. We are in discussions with external providers regarding delivery of BNG units where on-site delivery may not be possible.
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.	A network of Sustainability Champions has been created, to support the business in identifying sustainability issues that our employees are passionate about. The Champions help promote behavioural changes across the business which help reduce our impact. Our first topic is 'green commuting' which will commence in June 2024. Within the past two years, we have conducted an ESG survey. Our 2023/24 survey asked questions surrounding air quality, supporting charities and communities. There were 341 internal and 17 external responses which have been used to build our ESG materiality assessment. We also conducted another survey to understand employee views on our strategy – there were 208 respondents to this survey. Results showed that the important themes to National Gas were supporting charities (93% of respondents agreed/strongly agreed) and supporting the fair energy transition (also 93% of respondents agreed/strongly agreed). For every completed survey, we donated £5 to our official National Gas charity partner Barnardo's to support its great work helping families and young children in the UK.

Table 4 - Overview of EAP progress

[12]Scope 1 emissions — This covers the GHG emissions that a company makes directly — for example while running boilers and vehicles which are not electrically powered.
Scope 2 emissions — These are the emissions a company makes indirectly – like the electricity or energy it buys for heating and cooling buildings which is being produced on its behalf.
Scope 3 emissions - This encompasses other indirect emissions that are not produced by the company itself but in the upstream and downstream activities of the company e.g. employee commuting or purchased goods and services.

Progress against the 30 Environment Action Plan targets are reported annually to Ofgem in the Annual Environmental Report and our next submission will be in October 2024. In our annual report 2022/23, we said we are reviewing our EAP targets in line with business separation. The results of this review will be documented within our next EAP publication. However, the review and proposed direction has been discussed with Ofgem.

GHG Emissions (venting)

The aim of the Greenhouse Gas (GHG) Emissions incentive scheme is to incentivise NGT to reduce the amount of natural gas vented from our compressors (primarily methane), and to reduce the effect of our operational activities on the environment. This is important to our customers, stakeholders, ourselves and society in general.

The GHG venting allowance is set by Ofgem for the entire RIIO-T2 price control period; the allowance is set at 2,897 tonnes. For each tonne of natural gas vented over or under this allowance a price is levied. Should we vent more than 2,897 tonnes we are subject to a charge and for each tonne under this allowance, a revenue under the incentive scheme.

For 2023/24 this price was £2,420 per tonne of natural gas vented, this is an increase of £316 or 15% from 2022/23.

The need to operate an individual compressor on any given day is dependent upon several variables, including the sources of supply and demand, the prevailing network conditions, and the need to accommodate maintenance and construction plans.

The total amount of natural gas vented from compressors in 2023/24 was 2,325 tonnes, with 32 tonnes as site vents which are not part of the financial incentive. This is a marginal increase from 2022/23 when venting totalled 2,287 tonnes.

The average annual venting through compressors in the last 10-year period including 2023/24 is 2,761 tonnes, with the maximum venting being 3,928 tonnes (2017/18) and the minimum being 2,061 tonnes (2021/22).

To support this year's emissions identification and reduction activities we continued to embed previous years initiatives and to utilise supply and demand forecasts to identify future flow requirements to make early compressor and depressurisation decisions, the effect of this is a saving on unit static seal losses. We also continued to align our maintenance policy around the emission testing and prioritised critical units for winter assurance preparedness tests, all supporting venting reductions.

In 2023/24 we continued to embed summer engine inhibition into our decision making and processes. The inhibiting process allows compressor units identified as unlikely to be required over the summer period to be temporarily isolated from the network. Although given the flow uncertainty linked to global events, we kept a number of units available for use and inhibited some units. During summer 2023 a total of eight units across four sites were able to be inhibited and this saved approximately 86 tonnes of venting this was higher than 2022 summer which had 7 units inhibited and 60 tonnes saved.

The GHG emissions calculation methodology for calculating the mass of natural gas vented in 2022/23 was verified by an Independent Examiner by visiting Kings Lynn compressor station and this was submitted to the Authority in July 2023. In accordance with our Licence an audit will be carried out again this year for 2023/24 emissions and will be submitted to the Authority by 31 July 2024.

In March 2024 Ofgem provided their final decision on funding for five projects following our submission of the Net Zero Pre-construction and Small Net Zero Projects reopener (NZASP) uncertainty mechanism to address methane emissions from operating the NTS. Utilising this funding we are now working to identify and implement opportunities to remove methane losses from our operations (these are covered in more detail in the Net Zero compressor emissions methane detection and quantification and environmental plans section).

NTS Shrinkage

We are responsible for managing the procurement of energy and emissions for NTS Shrinkage, in our role as NTS Shrinkage Provider. These costs are recharged back to users as part of general non-transmission charges. A reputational incentive is in place for NTS Shrinkage for RIIO-T2. Under the scheme, from 2022/23 onwards, annual gas procurement costs are compared to benchmark costs, which are based on benchmark and actual volumes and market prices.

Total NTS shrinkage costs for 2023/24 were £107.1m , including £76.3m for gas (including third party revenues and meter reconciliation revenues), £25.4m for electricity and £5.3m for emissions. Costs were around five times lower than 2022/23, which had been driven by high volumes of gas shrinkage, and gas market prices rising to unprecedented levels following the Russian invasion of Ukraine. Costs for 2023/24 include a meter reconciliation revenue of £29.2m (18/19) received for a meter error at the Thornton Curtis offtake in the previous formula year.

Gas procurement costs (not including third party revenues), which are the costs of trades and energy imbalance cashout for the year, were £109.8m (the net cost for gas in the paragraph above is lower than this mainly because of the Thornton Curtis meter reconciliation revenue returned to customers). This is lower than the average cost benchmark for the year, which is calculated according to the published methodology and based on benchmark and actual volumes and average market prices, of £133.6m. Although the average cost benchmark uses the same net daily volumes as for actual procurement, it uses published volumes for forward procurement based on forecasts at the time of publication, which were relatively high, while the actual forward procurement profile was different and based on adjusted forecasts which were lower. This led to a substantial difference between the benchmark and actual cost.

For gas shrinkage for 2023/24, we procured our forecast requirement utilising forward and prompt markets. We continued to review our trading strategy to manage the price risk for consumers, and although market prices were reduced compared with 2022/23, geopolitical factors continued to impact on gas markets, and we procured a high proportion of forecast volume ahead of the month, as seasons, quarters, and month products. Market prices fell significantly ahead of 2023/24, for example the Summer 2023 product falling from around £4/th in early October 2022 to around £1/th in late March 2023. During 2023/24, prices saw substantial variation, with Winter 2023/24 trading between around 105p/th and 165p/th.

NTS Shrinkage gas includes Own Use Gas (OUG, for compressor use), Calorific Value (CV) Shrinkage (gas that cannot be billed), and Unaccounted for Gas (UAG, the remaining quantity of gas after considering measured inputs and outputs to the system). The overall volume of NTS Shrinkage gas was 3,090 GWh in 2023/24. This is less than half the 2022/23 outturn of 6,795 GWh but is in the volume range of previous years.

The volume reduction was largely driven by the UAG volume decreasing from 4,655 GWh in 2022/23 to 1,607 GWh in 2023/24. This is pre-reconciliation UAG, which includes some energy that is reconciled to particular users after close-out (the high UAG in 2022/23 was mainly attributed to an increased throughput in the summer period and a significant known meter error detected within that period). The annual UAG volume for 2023/24 was 0.19% of the annual NTS throughput and remains significantly below the meter error tolerance standard of 1.1% in energy terms.

More details on UAG volumes can be found in the May 2024 UAGCVS report at www.nationalgas.com/document/145526/download

The volume of OUG decreased from 1648 GWh in 2022/23 to 1040 GWh in 2023/24 which correlates to the reduction in compressor running hours while electricity consumption for electric compressor units decreased from 168 GWh to 151 GWh. Compressor use is primarily driven by the supply/demand patterns presented by the market, and the higher volumes in 2022/23 were primarily driven by transit flows to support high exports to Europe.

CV shrinkage volume remained the smallest component of overall gas shrinkage and decreased from 491 GWh in 2022/23 to 443 GWh in 2023/24. This continued to be driven by CV capping, particularly in the North-East Local Distribution Zone, where gas of different calorific values (energy contents) from different entry points converged, and some energy associated with the gas of higher calorific value could not be billed.

As a result of the decrease in overall volume of NTS shrinkage gas, our trading activity reduced, with 1,291 trades completed for 2023/24, compared to 2,023 trades for 2022/23. However, activity remained above pre-2022/23 levels, compared to 890 trades completed for 2021/22. Reduced market prices meant that the weighted average price of these trades fell to 130 p/th for 2023/24, from 270 p/th for 2022/23.

Electricity and emissions costs also reduced year-on-year but remain a smaller percentage of overall costs.

Shrinkage costs for 2024/25 are forecast to be similar to 2023/24, though uncertainty remains in volumes and prices. As of late May forecast costs for 2024/25 were £115m.

Environmental Incentive

The National Gas Transmission EAP sets out how we intend to take forward specific actions relating to the environment. The EAP includes stretching targets that go above our licence obligations, and as such it was recognised that there was value for consumers and wider society in incentivising some of these.

The table below summarises our 2023/24 performance against those incentivised areas. The benefit and penalty thresholds are updated in line with Appendix 2 within our licence.

Environmental Incentive	Baseline Levels	Benefit Threshold	Penalty Threshold	2023/24 Level	2023/24 % difference to baseline levels	RAG
Operational transport emissions (tCO2e) (% change)	1748	-16% (1468.32)	4% (1817.92)	1,742.8	0%	
Business mileage (tCO2e) (% change)	1608 (2019/20)	-7% (1495.44)	-5% (1527.69)	850.1	-47%	
Percentage of operational and office waste recycled (value)	------	57%	49%	51.4%	-	
Office waste generated in tonnes (% change)	54.60t (2019/20)	-7% (50.78)	-5% (51.87)	75.46t	38.2%	
Office Water use in m3 (% change)	7,380m3 (2019/20)	-7% (6863.4)	-5% (7011)	3,124m3	-57.7%	
Environmental value of non-operational land (£m) (% change)	32.92 (2020/21)	3.15%	1.35%	3.2%	3.2%	
Biodiversity Net Gain (BNG) on projects affecting the local environment	All years in RIIO-T2	Reward if a project achieves 15% or more BNG	Penalty if a project achieves 5% or less BNG	Not activated	N/A	

Table 5 - Environmental Incentives performance summary[13]

Operational transport

Our operational transport emissions target is set at 1468.32 tCO2e to achieve the benefit threshold. With 1,742.8 tCO2e emitted for 2023/24, target levels were not met this year, but remain below the penalty threshold.

Future RIIO-T2 plans include, where possible, increasing Electric Vehicle use across all business mileage options and installation of electric charging points at sites to support this transition. There are challenges such as the mileage range of electric vehicles when converted to meet our operational requirements and security of supply obligations whilst striving to reduce emissions from vehicle use. Advanced technology in the future will help support our transition away from traditional internal combustion engines. These initiatives will support a reduction in transport tCO2e. However, it should be noted that at the beginning of the price control period we had 247 commercial vehicles and currently have 283, by the end of the price control period the operational fleet will have expanded to 300 vehicles to accommodate the increase in work on the network.

Business mileage

Our business mileage emissions target is set at 1495.4 tCO2e to achieve the benefit threshold. Results for 2023/24 were 850.1 tCO2e, meaning our benefit threshold target level was exceeded.

We are continuing to review how we can reduce the miles undertaken and tCO2e of journeys undertaken in company, personal and hire cars. This includes reviewing company car and hire car options, encouraging car sharing and encouraging use of meeting space accessible by public transport.

Operational and office waste

The combined office and operational waste recycled for 2023/24 was 51.4%. We have not met the benefit threshold of 57% but remain above the penalty threshold of 49%.

[13] Please note that with some recent improvements to our methodologies, we have revised prior year figures relating to waste

If comparing to the previous year, this suggests a considerable drop-in recycling rate. In the past years we had applied an assumption on diverted waste being classed as recycling. This was based on information available at the time. We have since determined that the approach used in 2021/22 and 2022/23 to consider diverted as recycled could be improved upon. We have worked with our national waste contractor to gain greater insight into the more specific destination of our diverted waste e.g., estimated proportions of waste classed as "diverted" that is recycled, incinerated etc allowing us to break this data down within our submission. We have now backdated the approach to not class "diverted" waste as recycled and deem this a positive in reducing the assumptions placed upon our data and will be reporting using this approach going forward. However, for the "Percentage of operational and office waste recycled incentive", retrospective data shows that in 2021/22 (now 34%) and 2022/23 (now 40.7%), we would have been within the penalty threshold.

The total office waste generated in tonnes was 75.46t resulting in a 38% increase on baseline levels, thus exceeding the penalty threshold. This is due to the inclusion of additional office sites due to data becoming available and to ensure transparency of our data. With increased numbers of employees using the offices, including a high level of new starters, we are in the process of developing a waste reduction campaign to raise awareness and drive behaviours to reduce waste produced.

Please note that for the related incentive "Office waste generated in tonnes (% change)", retrospective changes as discussed for 2021/22 (now 26%) and 2022/23 (now 16.8%) remained above the reward threshold.

Office water

Water use for 2023/24 was 3,124 m3. This exceeded our benefit threshold target of 6863.4 m3, this is despite the addition of data for Warrington archives being included as data became available.

The contributing factor to the reduction is that office occupancy is still below the pre pandemic baseline year. We will continue to monitor this and implement further plans as required.

Environmental value

In 2023/24, a 3.2% increase in natural capital valuation was achieved, contributing towards our target to obtain a 10% increase in environmental value by the end of RIIO-T2. This exceeded the benefit threshold target which was set at 3.15%. Across the first 3 years of RIIO-T2, we have increased environmental value by 9.8%.

We are continuing to work towards increasing our environmental value on non-operational land, through increasing biodiversity and natural capital. For example, the woodland diversification work at Aberdeen Compressor station includes Broadleaved woodland creation, woodland management for biodiversity and open habitat management (including moorland vegetation communities). The Creekside Education Trust Project continues to deliver an additional 500 educational visits with focus on teaching environmental conservation to both children and adults.

Redundant Assets

As the requirements on the National Gas Transmission System change, there are assets on the network that are no longer required by National Gas or our customers to operate the network and these are defined as redundant assets. If these assets remain on the network for longer than required then they represent an ongoing maintenance commitment and operational cost, as well as having the potential to cause a detrimental impact to the environment.

Through the development of our RIIO-T2 business plan we identified and agreed 85 scopes of work that were classified as redundant in the RIIO-T1 period. These scopes are the outputs in the Redundant Assets PCD annex. Of these outputs, 84 were to be assessed at the close of the RIIO-T2 price control. One has been partially delivered and will be assessed at the close of RIIO-T3.

Last year we mentioned the risk to delivery of 13 condensate tanks. A Mobile Condensate Tank solution has been developed, meaning the Fixed Condensate Tanks are redundant. To ultimately decommission these assets, we have engaged contractors, who have provided estimates. Delivery is expected to be complete the end of RIIO-T2. The below summary table shows progress made to date against our 85 PCD outputs:

PCD Output Status	Volume of Outputs
Planned	1
Planned (Pending Customer Application)	0.2
Sanctioned – Conceptual Design Stage	19
Sanctioned – Build Stage	55.8
Part completed – output to be assessed in the next price control	1
Not Progressing	8
Total	**85**

Table 6 - Breakdown of delivery for redundant assets

Over the first two years of the price control we delivered 9.2[14] outputs. A further six, listed below, were delivered in 2023/2024:

- Churchover Compressor – Decommission Unit A and pressure reduction area for Units A and B (fully delivered).
- Churchover Compressor – Decommission Unit B (fully delivered).
- Feeder 14 Austrey to Shustoke – Disconnect pipeline and nitrogen fill (fully delivered).
- Theddlethorpe Terminal and Multijunction – Decommission (partially delivered).
- Great Wilbraham – Decommission buried condensate vessel and a 36" valve and dome end (partially delivered).
- King's Lynn Compressor Station – Decommission disused gas analyser (fully delivered).

Figure 13 - An uncovered valve due for decommissioning at Theddlethorpe

[14] 1 out of the 84 outputs is for disconnections at five customer sites – which we have split evenly into 5 (i.e., 1/5 = 0.2 deliverable). Out of the 5 customer disconnections, one (0.2) is pending customer application and the remaining four are sanctioned and in construction.

Figure 14 - Crane valve removal at Theddlethorpe

We intend to deliver the remaining outputs (60.8) in the last two financial years of RIIO-T2. The majority of these outputs, especially for the larger projects, have already commenced but are not yet ready to be claimed as complete.

There are eight outputs that have a provisional classification of not progressing. This has arisen where we now expect to retain rather than decommission assets (e.g. where a customer requires continued service from the assets during the remainder of the RIIO-T2 period) or where other changes in circumstances mean we no longer think it is in the best interests of consumers to deliver scope in the form originally specified. In the latter case we are continuing to evaluate whether there is alternative specification delivery which would bring equivalent redundant asset consumer outcomes in the RIIO-T2 period. Subject to the outcome, this could lead to final output classifications differing from our provisional view.

In 2023/24, there have been a number of factors impacting delivery and costs of our Redundant Asset outputs. This includes:

- Decommissioning of compressor units such as at Hatton and Huntingdon are dependent on the commissioning and operational acceptance of the new units. Where there are delays to commissioning, old units must be kept for network resilience purposes, preventing them from being decommissioned. For this reason, work has been delayed at these sites.
- Whilst Redundant asset work is important, it is of strategically lower prioritisation compared to activities furthering network resilience, and therefore the combination of compressed outages and the priority of workload can impact redundant asset delivery.
- The appointment of a specialist design engineer is giving us increased control over the design process and allowing us to deliver some of the work in-house. This is resulting in better control of risks on outputs at sites such as Kirriemuir and King's Lynn.

We will work with Ofgem to manage the impact of changes to delivery outputs status and delivery delays to support our PCD close-out. Despite delays, the majority of our Redundant Asset investments are currently in delivery.

We have been able to support our sustainability goals by identifying, recovering, and redeploying a range of redundant assets, such as Wormington Aftercooler and Huntingdon A compressor unit, due for decommissioning in 2025, for testing at Spadeadam to facilitate our Hydrogen FutureGrid project. This project recycles redundant assets which were at the end of their useful life. Recovered assets also better support testing requirements as their age profile makes them more representative of National Transmission System assets. Fuel gas filters, regulator skids and pipe sections from Moffat have been sent to Spadeadam. Careful decommissioning for recovered assets takes longer than conventional decommissioning.

Section contents

VII. Innovation

In RIIO-T2, we have focussed not only on regulatory innovation, but on reinforcing our innovation culture across the business, driving innovation and efficiency into every investment and activity. Whilst the transition of the energy system is an immediate focus, we must also ensure our transitioned network is optimised to deliver energy at the lowest cost and with the highest levels of safety.

NGT is in a unique position, as owners and operators of the NTS, to take a leading role in whole system energy thinking. We are working closely with the UK electricity and gas networks to enable future interactions across the energy networks and supporting our network connections to transition to Net Zero with us.

Network Innovation Allowance (NIA)

The NIA provides an allowance to fund small-scale, low Technology Readiness Level (TRL) projects from early research through to demonstration. During 2023/24, NGT has sanctioned a further 31 NIA projects leading to a total of 78 sanctioned projects through the RIIO-T2 period. We have progressed 26 projects into delivery this year and have now completed a total of 44 projects. Our 2023/24 spend was £7.6m and over the first three years of the price control we have spent a total of £13.6m in delivering NIA projects. A total of five sanctioned projects remain under contracting discussions and are yet to commence. Our Year 3 spend is lower than forecast primarily due to these contacting delays but we are continuing to engage with our suppliers to develop our contracting processes and accelerate projects from sanction to delivery.

Highlights from the completed NIA projects from 2023/24 are detailed below:

- **Safe Venting and Recompression** – Significant work is being undertaken to reduce venting of methane on the NTS today and reduce our greenhouse gas emissions. Recompression is the process of capturing and re-injecting methane that would otherwise be vented back into the NTS, avoiding significant methane emissions.

A project was completed with external suppliers to review all our safe venting and recompression technology opportunities with Hydrogen and a physical test was completed on site at one of our multi-junctions.

The following conclusions were drawn, venting of hydrogen and hydrogen blends should be avoided where possible due to the safety, environmental and economic impact of venting hydrogen. Emissions capture solutions should be developed and technologies should be deployed where systematic venting does not occur. Large scale recompression of hydrogen needs development. Where venting cannot be avoided, flaring[15] will be considered to ensure safe operation and reduce environmental impact. Figure 15 shows the set up that was built to demonstrate the recompression system with the venting technology at an AGI and multi-junction point.

Figure 15 – Recompressor unit with the temporary vent stack (green) on site at a multi-junction on the NTS

- **Collaborative Visual Data Twin (CVDT)** – The introduction of hydrogen into the NTS poses many technical challenges and additional complexity which digital tools may enable us to resolve. A virtual and data twin is required to fully understand the intricacies of how traditional gas assets are affected by the introduction of hydrogen. This project uses the FutureGrid facility as a test case to explore how the virtual world can directly benefit our physical understanding of assets and the network.

  It is developing a data link from live site data utilising an asset database that was created during the project on historical data. This asset data can also be accessed via the digital twin, allowing key information and insights into the performance of the test site to be learned. The hierarchy of the database has been designed to mimic National Gas' systems, for ease of integration/replication in future project phases.

  Wider impact of Digital Twins Reports are also being produced examining the role that CVDT plays in the wider digital twin ecosystem and the potential opportunities for digital twins at National Gas as a whole. Training opportunities have been investigated approaches are being understood to role out.

  Through these deliverables, the project has successfully met its main objective: to prove that the concept of using an application programming interface (API) Gateway is a flexible and appropriate architecture to enable the integration of a multitude of data sources into a web-app developed on a modern framework.

- **Multiple Gas Detection** – National Gas Transmission currently operates a system of safety sensors to detect flammable gases in enclosed spaces and work areas. In addition, we are now trialling new installations of fugitive emission detectors to help us in our drive towards net zero operations, and to help us to reduce network shrinkage. These new sensors can detect extremely low concentrations of both natural gas and hydrogen from a single calibration, meaning we can get to work detecting and repairing leaks today and in the future – on a blended and 100% hydrogen network.

  We have partnered with Nevada Nano Technology to trial their (Molecular Property Spectrometer (MPS) sensors at two of our sites: Future Grid and Bacton Gas Terminal.

[15] Flaring is the process of burning excess natural gas at the production well using a dedicated flare to ignite the methane and other components in the gas, which can result in both methane and carbon dioxide emissions (CO_2). Venting is the direct release of natural gas into the atmosphere, typically in small amounts.

A full installation of the system was completed at Bacton Gas Terminal in October 2023, including 120+ sensors and two anemometers. The system has already been providing benefits with Operational teams now being able to prioritise repairs by reported leak volumes and carry out leak repairs using locations provided by the system.

The project ends in May 2024 with a full report of the Nevada Nano systems performance at both sites. Learning and experience taken from the project will help National Gas to improve our emissions reduction strategy and work towards our net zero operation ambitions, both for the existing natural gas network and for the network of the future. The report will be issued via the Energy Networks Association (ENA) portal during the annual reporting phase at the end of July 2024.

Impact of Hydrogen and Hydrogen Blends on Linepack – This project investigated the impact hydrogen blends and 100% hydrogen will have on the energy stored as linepack in the NTS in the future. A section of the NTS was modelled using natural gas and several supply and demand scenarios, including a low, average and peak scenario. This model was then used to determine the loss of linepack energy for hydrogen blends and 100% hydrogen in that section of the network.

At the end of the project, it had quantified the loss of linepack energy from the NTS when blending hydrogen and for 100% hydrogen, relating to expected blending and Project Union (100% hydrogen). It was previously known that hydrogen has a lower energy density than natural gas, however the actual linepack reduction has now been quantified. Additionally, the project has conducted an assessment of hydrogen storage projects and forecasts and determined how these could support hydrogen linepack in the future. Finally, the project assessed relevant gas transmission regulations and licenses, such as the Gas Transporters License, to determine the applicability to hydrogen transport and any changes we may need to be implemented.

Strategic Innovation Fund (SIF)

The Strategic Innovation Fund (SIF) provides funding for larger scale demonstration projects and enables their development through several separate project phases – Discovery, Alpha and Beta. This funding is determined by annual challenges which focus on encouraging cross industry collaboration.

Throughout 2023/24 we have delivered:

- Successful applications for 2 x Round 1 Beta projects; HyNTS Compression and HyNTS Deblending, that started delivery in FY 2023/24 and supports the continued development of the FutureGrid test facility.
- Successful applications for 2 x Round 2 Alpha projects which were successfully completed at the end of April 2024. The topics covered Waste Heat Recovery and Hybrid Storage Solutions.
- Successful applications for 5 x Round 3 Discovery projects covering a range of topics including Maritime, Aviation, Linepack, Offshore Energy Hubs, Modelling of Power-to-Gas Operability.

SIF Beta Projects

- **HyNTS Compression (Beta)** – This project provides the technical and safety evidence to enable repurposing of the NTS compression assets. The project aims to determine the technical and commercial feasibility, provide a technical demonstration and create a strategy for UK NTS Compression System transition. Discovery and Alpha have investigated the key challenges associated with compression of hydrogen and hydrogen blends and the Beta phase will demonstrate the proposed solutions. This project will enable a reduction in the cost of the energy transition by eliminating the need to replace entire compression systems which are one of the most expensive assets on the network; whilst ensuring the gas network is able to support the whole energy system. The results of this project will feed into Project Union and our business compression strategy to enable the energy system to transport energy from supply to demand and utilise hydrogen as an energy storage mechanism. This project is now live.
- **HyNTS Deblending for Transport (Beta)** – Demonstrating a future new industry where hydrogen refuelling stations are directly connected to the gas network, benefiting from a secure supply of low cost, high purity hydrogen, helping to promote the hydrogen transport sector and serve the large scale needs of rail, bus, heavy haulage, marine and aviation sectors. Demonstration of this opportunity is vital to enabling hydrogen refuelling infrastructure and should be commenced now to align with the Industrial Cluster and Project Union activities due to begin construction in 2025/2026. This project is now live and construction activities began..

SIF Alpha Projects

- **HyNTS Hybrid Storage (Alpha)** - Storage and release of hydrogen within relevant timescales is going to be vital to ensuring a consistent energy source and improved resilience. Compressed gas storage is a method utilised today to support green hydrogen production, however, the large scale space requirements and safety of these systems are limited. Alternative technologies such as solid state or liquid hydrogen storage provide benefits in storage density and safety but have challenges in the release rates of the hydrogen. It is believed that a hybrid storage system of solid and gaseous storage managed by an artificially intelligent management network HyAI could provide a safe and reliable opportunity.
- **HyNTS Waste Heat Recovery for Electrolysis (Alpha) –** The use of solid oxide electrolysers to produce green hydrogen is more efficient compared to conventional PEM/alkaline electrolysers. However, they must operate at high temperatures to realise this efficiency advantage. This project looks to investigate the use the waste heat (produced from the transportation of network gases at compressor stations) to improve the efficiency of solid oxide electrolysers for green hydrogen production.

FutureGrid NIC project

Our FutureGrid project is the first of many steps towards a full-scale conversion of the existing NTS to transport hydrogen. The project involves constructing a test facility from decommissioned assets that will be used to carry out a wide range of hydrogen tests in an offline environment, to demonstrate its effect on our assets, as well as the operation of our network.

Figure 16 - Photo of FutureGrid Phase 1 site at Spadeadam

FutureGrid Phase 1 commenced in April 2021 after the "Roadmap to FutureGrid" Project was completed. This was the baseline project where the plans were devised for the FutureGrid programme. The de-commissioned assets were tested with 100% Natural Gas to obtain baseline data and then tested to blends of hydrogen (2%, 20% and 100%). In addition to this, as part of the project there were standalone tests conducted which feed into the testing data. The standalone tests include fatigue tests, material permeation tests, Pipe coating and CP testing, flange, asset leak and rupture testing.

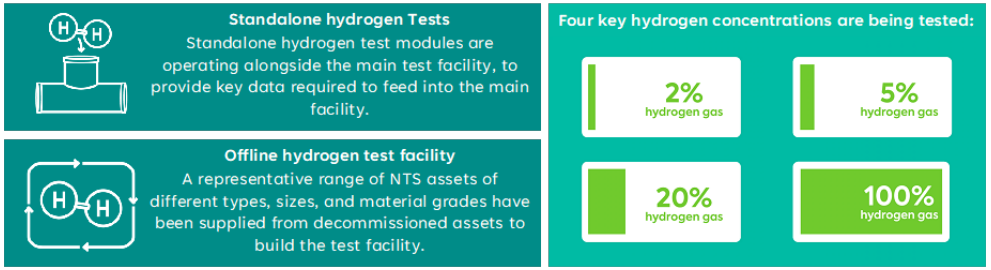

Figure 17 - Testing overview completed during Phase 1 of FutureGrid

We have also completed elements of quantitative risk assessments on the project which form part of the safety case of using existing transmission pipelines with hydrogen.

The layout of the facility is illustrated below, demonstrating a range of representative assets taken from the network which have seen real life natural gas service, some up to 40 years.

Figure 18 – Digital representation of FutureGrid from CVDT project showing each asset on the system and providing an overview of the site

During 2023/24 we have successfully completed all testing and we are progressing with the project closure report in order to disseminate the knowledge and lessons learnt acquired in the project.

Now that Phase 1 testing has been completed there are additional phases planned to adapt the FutureGrid facility and allow for further development. These are essential for understanding how a hydrogen NTS would operate.

Figure 19 – Digital Model of FutureGrid showing the Phase 2 HyNTS Compression and Deblending Projects

The following projects are part of FutureGrid Phase 2:

- Phase 2 Compression: FutureGrid Compression is a SIF Beta Project that investigates the key challenges associated with compression of hydrogen using existing NTS assets.
- Phase 2 Deblending: FutureGrid Deblending for Transport Applications is a SIF Beta Project which will develop an offline test facility to demonstrate the separation, purification and compression of Hydrogen to support transport applications. The project will also work with the transport industry to identify the potential routes to deployment of this technology to support the decarbonisation of transport in the UK.

Both of the projects have been awarded and commenced in September 2023.

Section contents

VIII. Net Zero

Our Net Zero strategy has an integral role to play in leading a clean, fair, and affordable energy future for all in the UK. The strategy focuses on facilitating the implementation of a decarbonised energy system while providing energy resilience. In all future energy scenarios, hydrogen as an energy vector has a key role throughout the transition to 2050 and beyond. We are exploring transporting hydrogen as an alternative to natural gas in the NTS to decarbonise heat, power, transport, and industry.

We are building the evidence base to convert the NTS to hydrogen through FutureGrid and a suite of innovation projects (see Chapter VII. Innovation). In our RIIO-T2 business plan, we committed to be ready to start the conversion to hydrogen by 2026. All the evidence gained throughout RIIO-T2 will support the transition of the NTS to hydrogen.

Project Union

Project Union is a pioneering project led by National Gas Transmission (NGT), which will create a hydrogen transmission backbone for the UK, facilitating the transport of 100% hydrogen. By the mid-2030s, the backbone will connect strategic hydrogen production sites, industrial clusters, and hydrogen storage facilities, while serving major industrial customers and power generation sites directly, as well as through Gas GDN connections.

Through a combination of repurposed existing assets, and new infrastructure a hydrogen backbone of up to 2,500km will be created. A hydrogen backbone will be at the heart of a net zero future, acting as a key enabler for developing a hydrogen economy and realising key UK Government targets.

Project Union will support a whole UK energy system approach to decarbonisation by providing critical resilience and flexibility to the electricity system during periods of low renewable electricity generation.

In 2023, Project Union was awarded funding to carry out the Feasibility Phase of the project. The Feasibility phase had three key outcomes:

1. Phasing Strategy, including prioritisation and timing for delivery of each section of the hydrogen backbone while ensuring security of supply on the remaining methane network. It will also deliver a staged approach to project delivery and funding.

2. Pre-Front End Engineering Design (Pre-FEED) activities for a full hydrogen backbone, delivering an appraised set of routing options, a constructability assessment and a planning and consenting strategy based on enhanced cost estimates and asset data. A full engineering policy review will also be undertaken.
3. Hydrogen market enabling activities including a supply chain assessment and ongoing customer and stakeholder engagement.

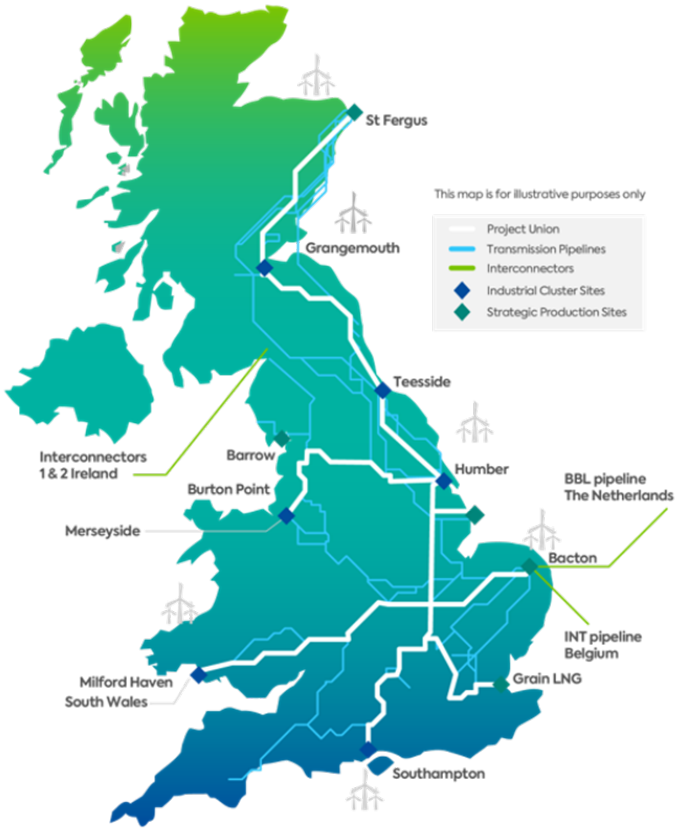

Figure 20: Illustrative Project Union Overview Map

Net Zero and Reopener Development (NZARD) Use-it-or-Lose-it (UIOLI)

In 2023/24, we have focused on strategic activities that will support National Gas Transmission to achieve Net Zero by 2050. The NZARD UIOLI funding enables and facilitates early development work on strategic projects which are critical to progress further through Net Zero reopener mechanisms.

In 2023/24 we undertook nine UIOLI projects and spent £0.6m compared to 13 projects with a spend of £1.9m in 2022/23.

Of the nine projects, seven were completed within 2023/24. These are:

- Hydrogen Grid Research and Development System Transformation - Network Modelling-This project follows on from the priority projects identified in phase 1 of the programme. It seeks to understand the options for infrastructure for hydrogen rollout. The analysis carried out will provide evidence to DESNZ to inform a hydrogen heating policy decision in 2026.
- Hydrogen System Operator – The project developed and considered options for physical and commercial aspects of a future hydrogen system operator to meet the proposed hydrogen transition. This work will continue to support the next phase of Project Union.
- East Coast Hydrogen Pre-FEED – East Coast Hydrogen (ECH2) is Section 1 of Project Union. East Coast Hydrogen is a collaborative project between Northern Gas Networks, Cadent and National Gas Transmission. Each network has completed their own pre-FEED studies but have come together to ensure alignment in infrastructure plans. The outputs of the pre-FEEDs fed into the NZASP reopener applications to Ofgem in April 2024 for funding to take the projects to FEED. Assuming a positive decision, the networks will commence FEED late 2024. It will also see continuing engagement with customers and stakeholders in the region to ensure we are creating a shared vision and meeting their network needs. This vision was shared publicly with the release of the ECH2 Delivery Plan Report which was launched in November 2023.

- NZASP reopener 2022 - CH4RGE - UIOLI Emissions Capture – Combined Gas Recompression (Process and Seal) is a modular, retrofittable, skid-based technology that seeks to capture compressor shaft seal gas losses and planned routine process gas compressor casing vents, using emissions capture and recompression technologies. This technology is expected to be deployed on two of the existing fleet of rotating machinery units during 2024/25, thus, eliminating emissions from compressor leaks for both methane and in the future, hydrogen process gas options. This work feeds into the Methane Emissions Reduction reopener within the Net Zero Pre-Construction and Small Projects Reopener section.
- Hydrogen Valley – To enable the transition from natural gas to hydrogen, the gas transmission and distribution networks will need to provide the transportation network to supply hydrogen to customers in the future low carbon economy. The project will develop a vision for hydrogen in the 'Hydrogen Valley' region of the West Midlands and the Northern section of the East of England networks, creating a roadmap and feasibility study, including conceptional design for the conversion of existing networks to hydrogen
- Scotland Whole Energy System Infrastructure Evaluation – This project developed a whole system view of gas and electricity transmission infrastructure for Scotland to analyse Net Zero scenarios in view of the Scottish government's 2030, 2035, and 2045 targets. The cross-sector modelling conducted in this study concluded that Scotland could be a key player in the future global energy market thanks to competitive power and hydrogen production, and proximity to one of the world's largest demand markets. As such, Scottish exports to the rest of GB and Europe could reach up to £15 billion worth of energy commodities annually by 2045. Unlocking this opportunity requires significant investments in both electricity and hydrogen transmission infrastructure. These investments are needed as early as possible to increase developers' confidence and avoid delaying energy generation investments. Stakeholders have highlighted that translating this vision into reality will require going beyond ad-hoc engagement into true cooperation between all actors of Scotland and Great Britain's energy sector. This will require concrete efforts by all actors to engage other players beyond industry forums or ad-hoc events.
- Pipeline Maintenance Centre (PMC) Repair Techniques for Hydrogen Pipelines – Offsite trials at Spadeadam which include welding, drilling (hot tapping) and installation of a grouted tee as a demonstration of mechanical repair methods currently used on the NTS today. The procedures for hot tapping and welding on hydrogen pipelines will be produced for validation under controlled conditions. This work and subsequent new procedures will feed into live trials in 2025 and feed into our Project Union reopeners to prepare our workforce for conversion and construction.

The following two projects were initiated in 2023/24 and are ongoing into 2024/25:

- European Hydrogen Backbone (EHB) Phase 3 - The program "Igniting corridor implementation" will consist of some continuous, year-round activities, which are needed to run the EHB initiative and maintain and expand the presence of the EHB-brand, such as updating the interactive EHB visionary maps on the website and posting on social media. In addition, we will develop an implementation roadmap towards 2030 on a European Union (EU) and Hydrogen corridor level as a key content deliverable, which is to be leveraged in our EHB communication towards EU institutions, key stakeholders and for the foreseen "Corridor Day", a full day physical event in Brussels.
- Hydrogen Valley and Capital Hydrogen Consortium - Two key regional projects, Hydrogen Valley and Capital Hydrogen, are both at pivotal milestones and will provide a clear roadmap for the West Midlands and London, East of England and South East. Both projects are delivered in partnership by Cadent and National Gas Transmission, with Scotia Gas Network (SGN) also a key partner on Capital Hydrogen. Gemserv are now carrying out the secretariat role for the consortiums on a 12-month contract.

Net Zero Reopener

In 2023/24 no projects were started or delivered under this funding mechanism however we are continuing to develop our portfolio and programme of work and will continue to review those with the potential to trigger a Net Zero reopener in 2023/24.

Net Zero Pre-Construction and Small Projects Reopener

This mechanism allows Gas Transporter licensees to undertake early design, development, general pre-construction work, and Net Zero facilitation capital projects that will enable the achievement of Net Zero Carbon Targets.

The mechanism can only be triggered by Ofgem based on a detailed engagement phase where it will establish the needs case in principle. The project must exceed £1.0m in value, but there is no specified upper limit under this mechanism.

In 2023/24 we continued delivery of the following applications under this mechanism as below:

Project Union Feasibility - Ofgem approved £5.6m (2018/19 prices) in funding in addition to a company contribution of 10% to deliver this phase which will complete a phasing strategy for delivery of each section of the hydrogen backbone, pre-FEED activities for a full UK hydrogen backbone and development of hydrogen market enabling activities. National Gas has been progressing this phase over 2023/24 and is due to complete this phase in May 2024.

Methane Emissions - This submission under the NZASP reopener allows us to start to reduce known methane emissions arising from operating the NTS, while also establishing a measurement-based fugitive methane emission performance baseline. The submissions comprised three investment proposals which were submitted separately and are considered individual submissions under the NZASP reopener mechanism, and a core document comprising common elements of the submissions. The three themes of the submissions are Mobile Recompression, Compressor Machinery Train and Detection and Analytics which were submitted between October and December 2022.

1. **Mobile Recompression** – This submission was for additional mobile pipeline recompression capability and new mobile recompression units to capture methane emissions arising from pipeline inspection works and compressor station depressurisations.
2. **Compressor Machinery Train** – This submission was for the trials of combined gas recompression and zero loss compressor seal technology to reduce methane emissions from the compressor machinery trains. We requested funding over a 4-year period to develop detail designs and deliver the trials at the chosen site locations.
3. **Detection and Analytics** – This submission covered an expansion of the periodic fugitive monitoring programme and an implementation of new continuous fugitive monitoring systems at selected above ground installations.

Ofgem issued their decision on National Gas Transmissions reopener submission on the 14 March 2024 awarding £19.4m (18/19 prices). Since submission NGT has continued with design work and site selection with respect of the compressor machinery train trials using UIOLI funding as detailed in the previous submissions. Delivery planning including equipment procurement and personnel training has progressed to ensure NGT is well placed to deliver the periodic fugitive monitoring programme proposed in the detection and analytics theme. Narrative with respect to this can be found in 'XI. Non load related capital expenditure - Compressor emissions methane detection and quantification'.

We have not progressed the investments in additional mobile recompression capability while funding award was pending. However, now the decision has been received this is progressing. In addition, NGT has paused plans to deploy continuous fugitive monitoring systems at selected above ground installations as Ofgem disallowed this allowance request. We look forward to reporting our progress on the delivery of these investments and the methane emission reductions they achieve in future submissions.

In 2023/24 we submitted applications under this mechanism as below:

- East Coast Hydrogen FEED needs case - In December 2023, National Gas submitted a needs case for East Coast Hydrogen FEED to Ofgem. In January 2024, Ofgem agreed the needs case in principle and invited us to submit a full request for funding under the Net Zero reopener mechanism. This submission was delivered at the end of April 2024 and included a funding request for FEED for East Coast Hydrogen as well as essential enabling activities.

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IX. Totex (TO and SO)

The table and commentary in this section reference allowances that include Real Price Effects (RPE), whereas commentary provided for each individual category of spend in the remainder of this document excludes the impact of RPE.

The table below summarises spend and allowances (baseline and uncertainty mechanisms) for 2023/24 and for the five-year RIIO-T2 period.

Activity	FY24 Totex Spend (£m, 18/19 prices)	FY24 Allowance (£m, 18/19 prices)	FY24 Cost vs Allowance (£m, 18/19 prices)	5 Year Totex Forecast (£m, 18/19 prices)	5 Year Allowance (£m, 18/19 prices)	5 Year Cost vs Allowance (£m, 18/19 prices)
TO Load Related Capex	10.7	9.8	0.9	95.5	87.9	7.6
TO Non-Load Related Capex	161.0	203.4	(42.4)	809.0	784.5	24.5
TO Non-operational Capex	20.8	24.4	(3.6)	104.0	122.8	(18.8)
TO Other Capex	83.2	111.7	(28.5)	433.8	429.1	4.7
TO Opex	127.4	128.1	(0.7)	645.0	635.1	9.9
TO Totex	**403.1**	**477.4**	**(74.3)**	**2,087.3**	**2,059.4**	**27.9**
SO Capex	26.1	45.3	(19.2)	136.5	158.3	(21.8)
SO Opex	54.0	61.4	(7.4)	265.5	310.0	(44.5)
SO Totex	80.1	**106.7**	**(26.6)**	**402.0**	**468.3**	**(66.3)**
Total	**483.2**	**584.1**	**(100.9)**	**2,489.3**	**2,527.7**	**(38.4)**

Table 7 - Summary of 2023/24 and five-year forecast spend and allowances

In 2023/24 our Totex spend was £483.2m compared to allowances of £584.1m. A large element of the £100.9m underspend relates to UMs which were directed part way through this year, in particular, Cyber OT (c£39m), Methane Emission Reduction Compliance (MERC c£8m), and Non Operational IT (c£5m) which we expect to spend during 2025 and 2026. In addition to this, a further £37m relates to Compressor stations as we rephased spend to align with the delivery and contract strategy. We did spend more in 2023/24 than we forecast to against last years rephased RRP capital plan (£483.2m vs £462.7m), particularly in Asset Health and UMs, with most other areas meeting our target. This stands us in good stead to deliver the majority of our Totex spend within the remainder of RIIO-T2.

Over the five-year RIIO-T2 period, Totex is forecast to be broadly in line with allowances at £2.5bn.

Totex forecast and allowances include some spend for uncertainty mechanisms. Spend and allowances for Western Gas Network Upgrade (WGNU), Wormington, Cyber OT, Non Operational Capex and Methane Emission Reduction Compliance (MERC) projects are included in the table above as the needs cases have been approved. The 2023/24 Totex spend for asset health work at the St Fergus terminal (cumulative £50m) is also included. We received Ofgem's minded to position on the needs and cost case on 8 July 2024 – we have assumed all spend is met with an allowance at this point whilst discussions continue. RRP table 8.10 includes a list of all other reopeners we are expecting to submit, which if successful would increase the total Totex spend and allowances over the RIIO-T2 period to £3.2bn (as presented at the top of table 3.4).

A breakdown of the key variances is detailed below.

TO Totex Overview

TO Capital Expenditure for 2023/24 was £275.7m against total allowances of £349.3m. Capital Expenditure for the five-year period is forecast to be £1,442.3m against allowances of £1,424.3m.

Load Related Capital Expenditure was £10.7m against allowances of £9.8m in 2023/24. Of this, £8.4m relates to Western Gas Network Upgrade against £7.4m of allowances under the relevant Uncertainty Mechanism. Cumulatively this spend totals £17.6m compared to allowances of £16.8m. In 2023/24 £0.6m was incurred on unfunded projects, principally the Felindre VSD project, which has a cumulative spend of £6.0m against Entry RIIO-T1 carry over works in RIIO-T2 and accounts for the majority of forecast Load Related overspend versus allowances across RIIO-T2. T1 spend on Felindre and a higher spend on Network capability of £0.5m, was offset by lower spend on Net Zero (UIOLI) of £1.1m in 2023/24. These are expected to be in line with allowances across RIIO-T2.

Non-Load Related Capital Expenditure was £161.0m, £42.4m lower than allowances of £203.4m. Cumulative spend is £437.1m, which is £71.9m lower than allowances. Our underspend has been caused by a number of factors including continued procurement, long lead times following the Ukraine/ Russia war and skilled labour shortages. We delivered a significant increase in asset health volumes in 2023/24, leveraging extensive survey work carried out in years one and two of RIIO-T2 and utilising a blend of external and internal resources to increase activity year on year. Asset Health expenditure was £23.8m below allowances (including RPEs) in 2023/24, impacted primarily by increased procurement lead times and labour shortages. As summarised in Chapter XI, actions have been taken to increase the proportion of internal resource utilised to deliver such work and to enhance our recruitment to continue to ramp up delivery for the remainder of RIIO-T2. In aggregate, spend across Bacton Site Redevelopment Feed and Emissions projects is £30.3m lower than allowances in the year, with activity due to be completed in years four and five of RIIO-T2.

We have incurred £17.2m of expenditure at St Fergus (cumulatively £49.8m) against the relevant Uncertainty Mechanism which we received from Ofgem draft determination on 8 July 2024 – we have assumed allowances are equal to spend.

A further £10m has been incurred on RIIO-T1 carry over Non-Load Related projects in 2023/24 (cumulative £83.4m). This primarily consists of ongoing expenditure on Peterborough and Huntingdon Compressor emissions works (cumulative £76.0m). NGT continues to engage with Ofgem in respect of proposed investments to comply with MCPD emissions legislation, with further reopener submissions now expected in the latter part of 2025.

Our Forecast RIIO-T2 spend on Non-Load Related Capital Expenditure is expected to be £24.5m higher than allowances. Lower spend on Asset Health (£61.3m) and Decommissioning (£3.8m) are being offset by additional spend at Hatton (£7.8m) and RIIO-T1 carry over works (£83.4m).

Non-Operational Capex spend was £20.8m in 2023/24, £3.6m below allowances. This includes £1.2m (cumulative £1.5m) spend against the Non Operational Capex UM of £5m expected to be utilised during RIIO-T2. Cumulative spend is £60.8m (£53.4m excluding one-off property purchases in 2021/22), £18.8m below allowances. The IT programme spend has accelerated in 2023/24 as separation from National Grid progressed, but Capex expenditure across the RIIO-T2 period is expected to be c£20m lower than allowances primarily driven by the impact of Software-as-a-System (SaaS) spend now expensed under International Financial Reporting Standards (IFRS) accounting rules as Opex.

TO Other Capex expenditure was £83.2m, which is £28.5m below allowances. The underspend against allowances largely relates to Cyber OT (£31.6m), where the high complexity of the projects has led to difficulties completing all works in the permitted outage windows. Works will be rephased into the remainder of RIIO-T2 and maturity has been maintained through compensating controls. This is partly offset by an overspend in Physical Security Resilience of £3.6m. RIIO-T2 forecast spend of £433.8m is £4.7m higher than allowances, primarily reflecting spend carried over from RIIO-T1.

TO Opex costs in 2023/24 were £127.4m against allowances of £128.1m. This includes £4.6m of allowance relating to the Cyber OT UM, of which we have spent £0.5m. Direct Opex was largely in line with allowances, with lower maintenance costs driven by a mix of labour resource, reduced use of agency staff and procurement efficiencies, offset by higher fault maintenance costs caused by higher than expected levels of linewalking and DSEAR defects costs and Operational Property costs (£4.5m higher than allowances) driven by a significant market-driven increase in own use electricity costs. TO Indirect costs were higher than allowances in 2023/24, the majority of the overspend relating to IT, primarily due to reclassifications of SaaS expenditure from Non-Operational Capex.

TO Opex is expected to be £9.9m more than allowances across the RIIO-T2 period, reflecting the ongoing impact of DSEAR and SaaS.

SO Totex Overview

SO capital expenditure in 2023/24 was £26.1m, £19.2m lower than allowances (cumulative spend of £61.0m versus allowances of £102.1m).

This was primarily driven by IT Capex, partly due to SaaS cost reclassifications and the ramp up of the separation programme in later years of RIIO-T2, but also due to realised savings on the Gemini programme. £2.9m (cumulative £3.6m) was spent against the Non Operational Capex UM allowance of £22.1m, which is expected to be fully utilised during RIIO-T2.

SO Opex costs were £54.0m in 2023/24, £7.4m lower than allowances. Direct Opex costs were lower than allowances, primarily due to net staff cost savings as a result of ongoing vacancies, combined with lower Xoserve costs. SO Indirect costs were broadly in line with allowances. SO Opex is expected to be £44.5m lower than allowances across the RIIO-T2 period, reflecting the ongoing impact of vacancies and lower Gemini running costs.

Consumer Bill

Our consumer bill calculation aims to quantify the financial impact on consumers for the work we do in maintaining and operating the National Transmission System. We apply Ofgem's methodology for calculating the components of a domestic consumer's bill; there are inherently a number of assumptions used. Approximately 50% of gas transmission charges are recovered via entry charges and classified by Ofgem as costs entering the wholesale market prices; we exclude these costs as not being directly attributable to the consumer. The exit costs, which include the 'direct' domestic sector consumption, are allocated to Gas Transmission network costs.

In 2023/24 the portion of the consumer bill attributable to National Gas Transmission is approximately £9.52. This is an increase compared to 2022/23 where the National Gas Transmission portion of the domestic consumer gas bill was estimated to be £7.99. This increase was primarily driven by higher General Non-Transmission revenue, caused by the catch-up of System Costs (shrinkage) incurred in 2022/23 but not recovered that year. The 2023/23 shrinkage costs have now mostly been recovered, and therefore this driver of the consumer bill increase is expected to reduce in subsequent years. The reduction of exit flows in 2023/24 also contributed to the higher consumer bill estimate[16]. A reduction in General Transmission revenue and lower Typical Domestic Consumption Values for gas (as published by Ofgem) had a slightly off-setting effect.

[16] We divide the exit revenue by the exit flows to get a cost per kWh (which is then multiplied by Ofgem's estimated consumer demand value). If the exit flows are lower then we end up with a high cost per kWh (as the dividing number is smaller).

Return on Regulated Equity (RoRE)

The Return on Regulatory Equity (RoRE) figure will be provided as part of Regulatory Finance Performance Reporting (RFPR) in September 2024.

Allowed Revenues TO and SO

Allowed Revenues for TO and SO will be provided as part of the Price Control Financial Model (PCFM) in September 2024.

Section contents

X. Load related capital expenditure (TO)

In 2023/24 our LR expenditure was £10.7m compared to an allowance of £9.8m. This variance relates to higher spend (£1.0m) on Western Gas Network Upgrade (WGNU). Other categories include RIIO-T1 carry over works and Network Capability, which were higher by £0.6m and £0.5m respectively, offset by £1.1m lower spend on UIOLI.

Cumulatively, our RIIO-T2 spend was £29.1m compared to allowances of £24.1m and our current forecast spend for RIIO-T2 remains in line with allowances.

For our WGNU Uncertainty Mechanism submission, our expenditure in 2023/24 was £8.4m compared to an in-year allowance of £7.4m. RIIO-T2 costs-to-date are £17.6m versus cumulative allowances of £16.8m. We are in the process of agreeing our final determination with Ofgem and expect spend to ramp up over the next two years subject to signature of the capacity allocation by Exxon Mobil.

In terms of RIIO-T1 unfunded Load Related Capital Expenditure, we incurred £0.6m costs in 2023/24 for Entry RIIO-T1 carry over works, principally driven by the Felindre VSD project. Cumulatively, for the first three years of RIIO-T2 costs for Entry RIIO-T1 carry over works total £6.0m.

Entry RIIO-1 carry over

Felindre Compressor Station was built as part of the South Wales Expansion Project (SWEP), triggered by the requirement to connect the Milford Haven LNG terminal to the NTS.

Construction of the compressor station was completed in 2010 but commissioning of the electric variable speed drive (VSD) was deferred until the required volume of gas for which the assets had been designed materialised. Based on higher flow forecasts, in January 2016 the decision was made to progress with commissioning the VSD.

During 2023 work has been ongoing to resolve remaining issues and to carry out VSD test runs where operating conditions and other work on site allows. This includes works by the Site Operations team to re-coat sections of pipework, which is planned to continue through summer 2024 preventing VSD test runs during that time.

One item to achieve Asset Acceptance remains, which will be fully resolved after the control system is replaced as part of our RIIO-T2 Cyber OT programme of works. The Felindre control system replacement is now scheduled to commence in 2025 and complete in 2026. Although the VSD unit will be available for use before then, it will be on a restricted operation basis until replacement of the control system is completed.

A software modification followed by final test running was initially scheduled for early March 2024 but due to a lack of Milford Haven flows and other works on site, there was no opportunity to complete performance testing. Final software modification and remote running is now scheduled for October 2024, prior to the commencement of the control system replacement works in 2025. When the VSD control system work is completed in 2026, the unit can be signed off with full Asset Acceptance and the restricted operation can be lifted.

Incremental Capacity

Since receiving a PARCA for incremental capacity at the Milford Haven Entry Point, we have followed the approved capacity methodologies and framework obligations to develop a proposal for the Western Gas Network Project. The capacity requests cannot be met by the existing network in any scenario and is therefore to be treated as Funded Incremental Obligated Entry Capacity.

We submitted our Need Case in June 2021 and approval was published in December 2021. The majority of the project works will be carried out without the need for planning permission (permitted development rights). One planning permission was requested and granted for site extension works to facilitate the connection of one of the new pipelines.

Since last year's submission:

- May-23: we submitted the Project Direction to Ofgem.
- Jun-23: Ofgem provided positive feedback on the submission and published a minded-to position.
- Jul-23: Ofgem commenced the consultation process.
- Aug-23: the original reservation party failed to commit to the capacity allocation.
- Dec-23: PARCA reassigned to the new reservation party.
- Jan-24: pipelines MWC has been awarded.
- Jan-24: Ofgem published an update letter stating that due to the PARCA reassignment, consideration of consultation representations and their decision to issue a direction would be paused until the Reservation Party has been able to provide the necessary commitment to capacity allocation.

Work is proceeding to plan and we will provide an updated consultation response that details project development since our Project Direction submission. We will inform Ofgem when the Reservation Party has committed to the capacity allocation to enable a direction to be issued.

Since the start of the project, we have held 22 meetings with stakeholders including four online public events. In these meetings we have reached over 50 people, including local residents and all the major political stakeholders who accepted our offer of a meeting. This engagement aims to provide stakeholders with further understanding and clarity on the project and seek meaningful feedback to help inform our programme. Further engagement events have been organised for 2024 including both virtual and face-to-face events.

A particular area of focus for our stakeholder engagement plan has been with landowners who are impacted by the project. We have taken the time to explain NGT's land rights requirements, kept landowners informed of progress of the project, encouraged them to take professional advice and considered any feedback received. We have negotiated voluntary agreements (option agreement for easement or option agreement for lease) set out in Head of Terms, with all of the grantors, for the project. The land rights strategy for the project includes a Compulsory Purchase Order (CPO) which has been 'made' to include all land rights required to deliver the project. The CPO inquiry commenced in May 2023 and was approved in January 2024. CPO powers will only be exercised where we have failed to secure voluntary agreements with grantors.

The Ukraine/Russia conflict continues to affect global prices and availability of materials and so, over the last year, we have worked with suppliers to understand the supply constraints that might impact this project. To mitigate the risk of delays, we have altered our procurement strategy to order long lead items earlier than we normally would and free issue them to the MWC. This helps to shorten the timeline of project delivery, helping us maintain our programme of capacity release by January 2027. It also allowed us flexibility to purchase materials at an opportune time, such as our purchase of pipelines, given the current volatility in prices.

We have continued to have positive Ofgem engagement throughout 2023 in the lead up to the Project Direction submission, in order to achieve an assessment to maintain a challenging programme, and this has continued into 2024 following the change in Reservation Party.

Network Capability - Changing customer needs

These works are to upgrade metering assets at two sites, ICI Billingham and Weston Point. These upgrades will ensure greater accuracy of flow measurement of gas, to ensure that National Gas Transmission customers are charged correctly and that there is an accurate view on the NTS energy balance. Due to the customers reducing their flows the existing metering has become oversized; the new metering system being installed will accommodate the reduced flow rate and future proof it.

These projects involve the replacement and upgrades of various metering assets on the network. The physical works at ICI Billingham were completed in 2022/23. Detailed design activities at Weston Point are ongoing with physical works planned to start in 2024/25.

Network Capability - Tactical Access (Tirley AGI)

The Tirley Tactical Access project at Tirley Above Ground Installation (AGI) is required to enable filter maintenance to be undertaken without causing constraints on the network. The primary driver is network resilience for consumers in Wales and for Milford Haven.

The investment will also contribute to National Gas's continued security of supply. We remain on track for full project delivery within the RIIO-T2 period. Other investments are planned in this area within the RIIO-T2 period, and we have been assessing project interactions both in terms of design and delivery.

In 2023/24 we have:

- Commenced conceptual design (Jun-23)
- Completed the Conceptual Design phase of the project
- The Detailed Design contract and Build contract have both been awarded. The scope of the preferred option remains to remove and replace the existing plug valves immediately upstream and downstream of the three 750 mm nominal bore filters

The Russia/Ukraine conflict continues to have a lingering impact on market conditions and project delivery. We have seen both the cost and lead times for materials, such as valves, increase since the start of the price control. Where possible we have tried to mitigate the impact, adapting our processes to account for these changing market conditions for example, we have ordered valves earlier to negate the negative impact of the long lead times. They will then be free issued to the contractor to support the timely delivery of the project. It allows us flexibility to purchase materials at an opportune time, given the current volatility in prices. As well as changing market conditions, we have also encountered additional unforeseen challenges at Tirley AGI in the form of contamination caused by Naturally Occurring Radioactive Materials (NORM). There are also complications in replacement works because of pipe springing risks that cannot be fully designed out.

In the first three years of RIIO-T2, we have spent £0.99m on this project against an allowance of £1.0m. The current project forecast is £1.4m. The combination of factors presented above has meant that costs will increase beyond our original allowances but we will continue to look for efficiencies and opportunities to reduce costs where possible.

Offtakes

We continue to deliver connections to our network, supporting a competitive market and enabling natural gas to both enter and exit the network. The end-to-end process can take several years to complete depending on the scale of the project. A project will move through the Application to Offer (A2O) process, design and build phases before being commissioned as a live connection.

In total, there were 33 NTS connection applications received within the A2O process during 2023/24.

Of the 33 applications made, thirteen were for exit connections, nine were for entry connections, eight were for entry and exit connections combined, two were modifications to existing sites and one was an application to disconnect.

Of the 33 applications received, fourteen Final Connection Offer's (FCOs) were not due within this period and were carried over to 2024/25. Ten offers from applications within the 2023/24 period were produced, six of which were signed, two have been extended and two are awaiting a customer decision. Of the six offers which were signed, five were for exit connections and one was for entry and exit connections.

Connection Application		Offers made in 2023/24	
Received in 2023/24	33	Applications not progressed	9
		Offers accepted	6
		FCO Extensions	2
		FCO pending customer decision	2
		FCO's not made - Application carried over to 2024/25	14

Table 8 - Summary of the NTS Connection Applications and Offers

In comparison to the number of applications received in the previous year, there is a rising trend and increase in activity from customers wishing to connect to the NTS, eleven of them being biomethane customers. This is close to double the applications from the biomethane market sector received in 2022/23.

In 2023/24 we received one new application to disconnect from the NTS. There has also been an increase in the number of modification applications to current connections due to customers evaluating economic operation and making the best use of their assets.

We continue to deliver improvements across the business, using standardised designs and process where possible, continuing to engage with our biomethane and hydrogen customers to encourage and facilitate more green gas connections. We have received requests from three customers seeking high level studies to establish whether hydrogen blend can be accommodated. Engagement via biomethane forums and innovation projects for blending has continued and learning from these projects will be used as templates for future customers wishing to connect.

A release of a new Gas Customer Hub has been scheduled for Q3 this year (2024) providing the customer with real time updates as their project progresses and creating efficiencies for internal workflow management.

Section contents

XI. Non load related capital expenditure (TO)

This section covers our Non-Load Related Capex, where in 2023/24 our RIIO-T2 expenditure (including UMs and RIIO-T1 expenditure) was £161.0m, which was £36.2m below allowances of £197.2m (excluding RPEs).

This compares to expenditure of £154.5m (including uncertainty Mechanism costs) versus allowances of £170.9m in 2022/23. Cumulatively, our RIIO-T2 Non-Load Related Capex spend of £437.1m is £42.4m below allowances.

The first three years of RIIO-T2 have experienced slower than expected progress across many of our Non-Load Related Capex deliverables. During the second year of RIIO-T2 the Russia/Ukraine conflict resulted in the curtailment of Russian gas to Europe and meant that the UK acted as a land bridge to refill EU storage. These market conditions led to high exports to the EU particularly during the summer months, which required us to reconfigure the network and created some limitations on gaining access to outages to complete asset health and cyber programmes of work. Alongside this, in 2023/24, Final determinations on some of our Emissions UM submissions took longer than originally forecast, leading to some movement of spend to later in RIIO-T2 and into RIIO-T3.

We have delivered a significant increase in volumes during 2023/24, leveraging survey work carried out during the first two years of the price control and changing to a blend of internal and external work execution. We expect this trend of increased activity to continue during RIIO-T2 Years 4-5.

For 2023/24 spend, the key variances to forecast include:

- **Asset Health** - spend was £20.4m below our Year 3 allowance, and is broken down as follows:
  - £14.6m lower on Plant and Equipment
  - £14.7m lower on Pipelines
  - £7.2m higher on Compressors
  - £2.1m higher on Electrical
  - £3.8m higher on Valves
  - £2.7m lower on Civils

- £1.4m lower on Cabs

Across the Asset Health portfolio, we expect to spend c£40m less than our allowances for the RIIO-T2 period.

This has been achieved through a number of internal initiatives including our approach to Cathodic Protection (CP) interventions which has proven highly effective. By employing a blended labour model and bundling with ILI digs, we have significantly reduced the need for excavation while maintaining the same level of defect resolution through utilisation of lower costs intervention techniques such as Transformer Rectifiers (TRs) and ground-beds.

In addition, the rollout of remote CP monitors has been a cost-saving measure. By deploying these units, at a lower cost than anticipated, we have enhanced our CP monitoring capabilities without exceeding budget expectations.

Our compressor overhaul contract strategy has delivered savings through bulk discounts and the inclusion of non-OEM to the supply chain. This shift in contracting strategy together with our transition to Operations delivery is yielding further value.

In the area of asset innovations, we have introduced various solutions. This includes galvanised steel pipe support solutions and grouted tees/epoxy sleeves which have minimised the need for excavation on Vent and Sealant Lines and have led to more efficient and cost-effective interventions.

- **Redundant assets** – our spend in 2023/24 was £10.2m, £11.1m lower than our year 3 allowances. Cumulatively spend is £21.8m against allowances of £47.2m. Although spend is slower than anticipated from delayed design and contractor selection, we are now well into demolition on many of our sites. In 2023/24 we have identified a number of sites where the customer still has a requirement to use the asset (Easington, Feeder 8, Feeder 17, Feeder 21, Goulceby, Hatton, Little Cawthorpe, St Fergus) and the associated allowance (£3.7m) has been identified and adjusted in table 4.3 TO PCDs. We currently forecast to spend £3.8m less than the adjusted allowances. Further details will be provided in 2024/25.
- **Bacton Site Redevelopment FEED** – our spend was £1.1m in 2023/24. Cumulatively spend is £3.7m and was £6.8m lower than allowances. Following our review of the options for Bacton Site redevelopment, CBA outcome and stakeholder feedback we evaluated the overall project direction and concluded that we needed to carry out further work before making the final option selection. We still expect further spend within RIIO-T2 which will bring spend in line with RIIO-T2 allowances of £10.5m.
- **Compressor emissions projects** - Lower spend occurred in year on the other MCPD compressor emissions projects (excluding Hatton) as we rephased spend to align with the delivery and contract strategy. This covers King's Lynn (£9.0m), St Fergus (£15.1m), Peterborough (£0.9m) and Wormington (£10.9m) currently underspent against allowances cumulatively. We expect spend to come in line with allowances at the end of RIIO-T2.
- **GRAID** - Our spend on GRAID was £2.5m below allowances due to needing to revise the project delivery schedule as we resolve complications with the GRAID sensor technology. The most appropriate sensor package has now been agreed and construction of the first access points will be commencing in Spring 2025.

The above underspend was partly offset by the following:

- **Hatton Emissions** – our spend in 2023/24 was £26.4m, £6.5m higher than our Year 3 allowance. Hatton has experienced programme slippage in three major areas; late design changes delaying construction; poor quality free-issue materials has led to re-work from other contractors and delay; and extreme volumes of rain in the region in 2023 and 2024. The programme slippage means the PCD will be delivered after the PCD delivery date of March 2025, with the latest schedule programme now highlighting an asset acceptance scheduled for July 2025. The slippage also results in a higher forecast project spend vs. allowances (£7.8m). Risk remains for the remainder of the delivery schedule as the project team strives to achieve all the remaining key programme dates.
- **Stopples** - Our 2023/24 spend on stopples (£4m) was £3.1m above allowance and represents recovery of our prior year under spend against allowances as we build on the success and experience gained from implementing stopples at previous sites and have expanded our delivery plan to include four additional sites.

- **Recompression** – Our 2023/24 spend on procuring new Recompression units was £1.4m higher than allowance, due to phasing, as this represents a partial recovery of prior year underspend.
- **St Fergus Asset Health** – For our Non-Load Uncertainty Mechanism (UM) we have incurred St Fergus Asset Health spend of £16.4m during 2023/24, which when added to the prior year spends of £27.8m resulting in a cumulative RIIO-T2 spend of £44.2m on this project. We have also spent a further £5.5m on other Asset Health UM categories. We have received a draft direction from Ofgem on 8 July and are in the process of finalising our response. We are currently assuming allowance matches spend.
- **RIIO T1 carry over** – In terms of RIIO-T1 carry over Non-Load Related Capex, we have incurred a further £12.1m of costs in 2023/24. Cumulatively, for RIIO-T2 we have incurred £85.8m of RIIO-T1 carry over Non-Load Related Capex. These costs cover the ongoing Peterborough and Huntingdon Compressor works (£76.0m), with further costs incurred on asset health RIIO-T1 carry over spend (£5.6m), Feeder 9 RIIO-T1 carry over spend (£1.7m) and DSEAR (£2.5m).

Compressor emissions

For NGT it is important to do the right thing for society by reducing the impact of our activities on the environment. We believe our nation should have a clean, reliable energy system to help address the effects of climate change, improve the quality of the air we breathe and power growth and prosperity in our economy for future generations.

This submission provides an update on the programme of works planned or currently in-flight on the gas NTS. These works ensure our assets are compliant with the Medium Combustion Plant Directive (MCPD) and Large Combustion Plant Directive (LCPD) elements of the Industrial Emissions Directive (IED) at the following sites: Peterborough, Huntingdon, Hatton, St Fergus, Wormington, and King's Lynn.

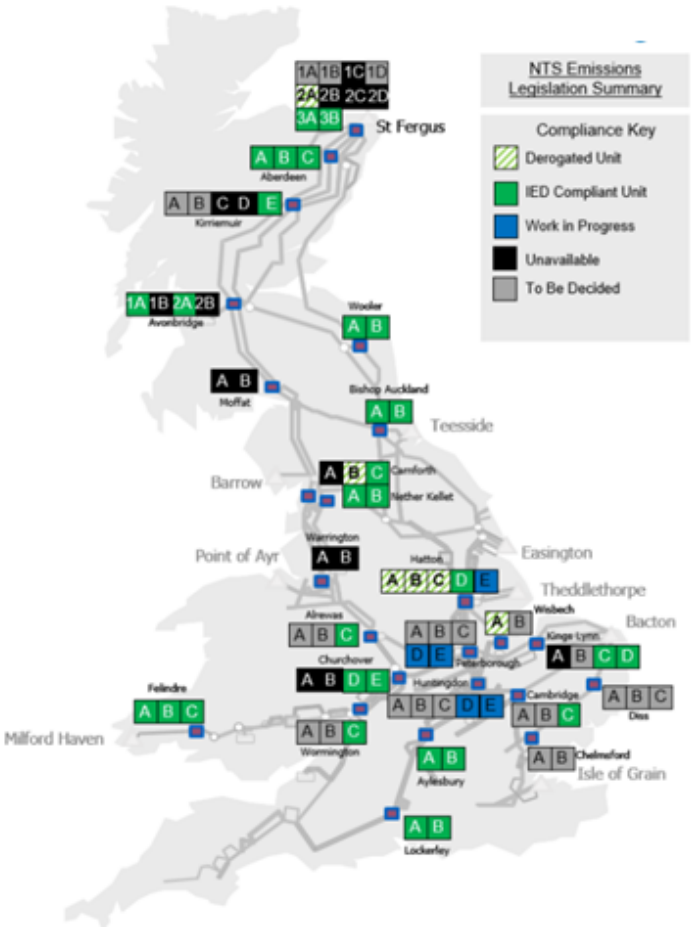


Figure 21 – NTS legislation summary

Compressor Emissions – Peterborough and Huntingdon (RIIO-T1)

Peterborough and Huntingdon Compressor stations support efficient transmission across the centre of the network and to support Southern demand. Peterborough provides essential North-to-South and West-to-East compression services while it works in tandem with Huntingdon to enable North-to-South gas flow which is important for balancing across the entire NTS.

At the start of the RIIO-T1 period, Peterborough and Huntingdon consisted of three Siemens (formally Rolls Royce) Avon machines each. The units run in parallel, meaning both machines take gas from the same suction header and deliver to a common discharge header.

Under RIIO-T1 allowances, two new gas turbine compressor units from Solar Turbines were approved for installation at both sites as part of the Emissions Reduction Project 3 (ERP3) initiative, which falls under Integrated Pollution Prevention and Control (IPPC) legislation. When commissioned, these two new Dry Low Emissions (DLE) compressor units will provide primary compression duty, leaving the existing Avon units on standby for resilience purposes.

At Peterborough during 2023/24, a number of key activities have been progressed as we move the new units into Operations. Initial noise trials have been completed and passed, in parallel running with further work being undertaken for single unit noise reduction. Solar performance testing has been satisfactorily completed on both Unit D and Unit E, and Unit D has been running well for extended periods on the network. Emissions testing has also been undertaken with positive results. In addition, the acoustic lagging work to support noise licencing conditions has been completed on both units.

The MWC has demobilised from site and is addressing the remaining snagging issues.

Figure 22 – Peterborough Site April 2024

At Peterborough, the remaining tasks to complete the project consist of further noise trials to measure noise levels at local receptors and assess both units D and E against planning requirements, completion of snagging, stack cladding (planned completion in Summer 2024) as well as the resolution of vibration issues on Unit E pipe work and the build of a waste storage area.

Figure 23 - Design for exhaust stack cladding at Peterborough

Like Peterborough, during 2023/24 a number of key activities have been progressed at Huntingdon as we move the new units into Operations. Both units at Huntingdon have been running under Gas Network Control Centre (GNCC) control, in preparation for handover. Solar Performance Testing and emission testing have also been completed on both Unit D and Unit E with positive results.

The MWC has demobilised from site and is addressing the small number of remaining snagging issues.

Figure 24 - Huntingdon Site

At Huntingdon, the remaining tasks include finalisation of the Armacell Class C acoustic lagging (five layers-scheduled for July 2024) and subsequent noise trial completion. In addition, a confirmation re-run of the test scripts is planned, following which there will be some minor software updates.

The next few months of 2024 will see the commissioning and operational acceptance of Units D and E at Peterborough and Huntingdon with remaining activities completed (snagging, acoustic lagging, waste storage area and exhaust stack cladding) and the project closed out by the end of the calendar year.

The Peterborough and Huntingdon ERP3 projects have experienced significant cost increases largely driven by the programme elongation as the project continued to identify several defects which required rectification, as well as inflation costs. In addition, the decision was taken to refurbish all valve actuators at both sites due to ongoing failure caused by the type of oil used which has also driven the cost up. This was funded through a combination of the Asset Health and IED part of the project.

Compressor Emissions – Hatton

Hatton compressor station is located in the east of the UK and facilitates transmission of high East flows to the wider network as well as supporting large directly connected loads and storage sites in the immediate vicinity. Hatton also facilitates North to South flows and is therefore vital to exit loads across the South of the country, international exports and 1-in-20 obligations. A geographical representation of Hatton's interaction with the NTS can be seen in Figure 25.

Figure 25- Geographical Importance of Hatton Compressor Site

Hatton compressor station consists of an electric VSD (Unit D), which is the lead compression unit, and three RB-211 machines (Units A, B and C) which supplement the VSD and provide backup capability. We are installing a new gas-powered 41MW compressor (Unit E), of equivalent capability to the 35MW Electric VSD.

Units A, B and C do not comply with the requirements of the Large Combustion Plant (LCP) Directive. On 1 January 2016, Units B and C were each placed on 17,500-hour Limited Life Derogation (LLD) and were due to be decommissioned from operational service by December 2023. However, as a result of the updated project delivery schedule, Units B and C were granted an extension by the Environmental Agency in Winter 2023 and are due to be taken out of service as of September 2024.

Unit A was placed on 500-hour Emergency Use Derogation (EUD). Entering one unit into the 500 hours' derogation provides flexibility in terms of the future solution for the site and extends the potential construction window for any new units.

The majority of the works performed at Hatton Compressor Station during 2023/24 have been associated with the installation of the new Siemens SGT-750 41MW compressor unit. This includes:

- **Civils, Pipework and Steel works**
    - The steel work has been erected around the GT compressor to form the noise attenuation building as seen in Figure 26, with noise cladding due to be installed over the next couple of months.
    - New suction and discharge tie-ins have been completed, connecting the new unit to the station, as seen in Figure 27.
    - Drainage and Drawpit installation are both ongoing and are due to be completed over the next few months.
    - The majority of main equipment foundations have been installed ready for equipment.

Figure 26 – Steel work to form the noise attenuation

Figure 27 – Tie ins being completed

- **Mechanical and Piping Contract**
    - The majority of the Siemens supply equipment has been installed, including the exhaust stack which has been erected and welded.
    - Offsite pipe fabrication is now complete and being brought to site ahead of installation.

Figure 28 - Exhaust stack erected around the GT compressor

- **Electrical and Instrumentation works**
    - Cable pulling has commenced, glanding and terminating within Balance of plant Local Equipment Rooms (LERS), Gas Turbine and Siemens LER.

Mechanical, Electrical and Instrumentation and piping works continue before commissioning works can begin. There are also still outstanding civil works (drainage and ductwork) before the project can be formally completed. The new compressor unit is planned to be operational in November 2024.

The Hatton LCPD project has experienced programme slippage, in part due to late design changes delaying construction, which has resulted in the increased management of several key areas. Due to the project delays and the need to complete as quickly as possible, a number of contractors works are all now taking place in and around the CAB at the same time, resulting in the management of simultaneous operations on a daily basis. Where there is a clash between two scopes of works occupying an area, there is a decision of who takes priority resulting in a delay to the other contractor until they are able to complete their scope safely. This is managed by looking at other scopes of works they can undertake to help reduce the impact of any delay. This combined with examples of poor quality free-issue materials from Original Equipment Manufacturer (OEM) suppliers has led to re-work from other contractors and delay. Once the work by the various contractors is complete, compensation claims will be raised against several suppliers in an attempt to recover material costs, and where possible contractually, the cost of associated rework. A letter of intent has been issued to the relevant contractors in respect of such claims and these will be pursued to closure during 2024.

The Hatton project has also been significantly impacted by extreme weather in 2023 and 2024, with the volume of rain experienced in the region resulting in ongoing pumping of excess water offsite. This has resulted in programme delays to ensure that safe working conditions are maintained at all times onsite.

Additionally, Ofgem's preference in the final determination for NGT to deliver one large unit rather than two smaller units has resulted in a continual review of the proposed OEM commissioning costs, as these were not fully understood at the beginning of the project. This is principally driven by the fact that limited installation experience is available from the OEM and contractors for such a large unit, as there are only a few compressors of this size globally and none at present in the UK. However, the project has been working closely with the OEM to develop a clear scope and cost for their activities, which are scheduled to commence in August 2024. Our previous experience with other compressors has shown it is essential that we take a cautious and collaborative approach with all the contractors to risk manage the commissioning programme and ensure we successfully deliver operational acceptance.

Figure 29 – Flooding from bad weather in October 2023

It should be noted that the EJP cost submission for Hatton in May 2020 included a project completion date of 2025 and requested total allowances of £80.0m, both of which were accelerated and/or reduced in the final determination. However, based on the collective risks that have materialised during project delivery and their impact on achievement of the accelerated programme, our EJP submission was more realistic in terms of time and cost, which is an important lesson learned for future Emissions projects.

The programme slippage means the PCD will be delivered after the PCD delivery date of March 2025, with the latest schedule programme now highlighting an asset acceptance scheduled for July 2025. The project is now forecasting a circa £7.8m cost increase over RIIO-T2 allowances, primarily driven by the extended delivery schedule and due to all the specific reasons noted above, but also as a result of unforeseen inflationary pressures during the construction phase (which has in particular impacted steel prices, labour rates and availability and more recently welding inspection rates). Significant risk remains for the remainder of the delivery schedule as the project team strives to achieve all the remaining key programme dates.

We are continuing to work with our contract partners to identify cost efficiency opportunities and to understand how to optimise the current programme.

Compressor Emissions – St Fergus (including subsidence)

The St Fergus Gas Terminal enables UK Continental Shelf (UKCS) and Norwegian gas supplies entry onto the NTS.

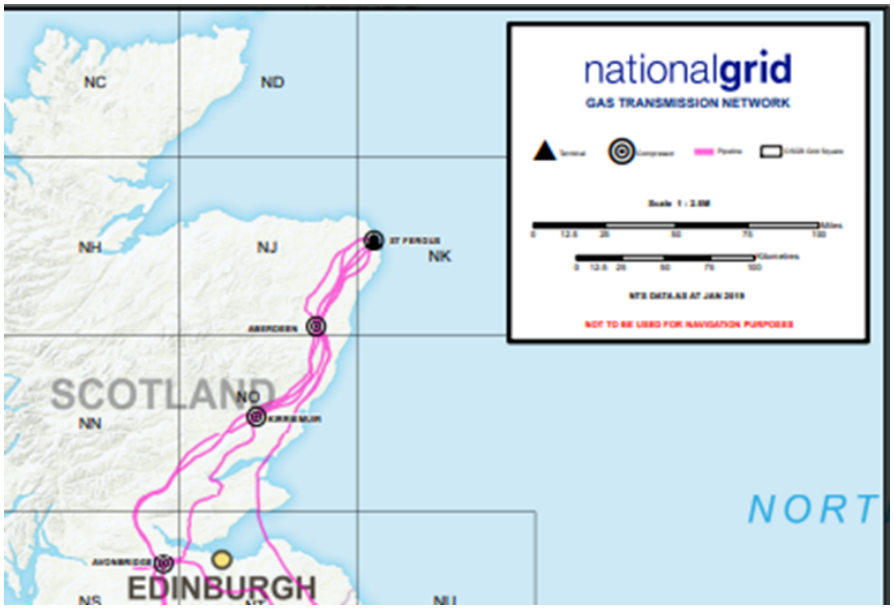


Figure 30 – Geographical location of St Fergus

St Fergus comprises of three plants. Plant 1 has four Avon units of which one (1C) is being decommissioned in RIIO-T2. Plant 2 has one Avon (2B) and one RB211 (2A) in addition to two other units (2C and 2D) which are also being decommissioned in RIIO-T2. Once the new units, set out in NGT's January 2023 emissions UM submission, are operational the decommissioning of further units no longer required will be completed. Plant 3 has two electric Variable Speed Drives (VSDs). Although described as a Plant area, it should be noted that Plant 3 consists of compressors only and use of these electric drive compressors relies upon the auxiliaries of either Plant 1 or Plant 2, and therefore cannot be used as an independent plant.

In developing our investment programmes at the St Fergus Gas Terminal, since the RIIO-T2 Final Determinations, we have adopted a two-phase strategy to ensure clarity between short-term asset health (AH) and long-term site operating strategy. Our St Fergus short-term strategy provides certainty on the terminal operation requirements, including minimum compression across Plant 1 and 2, for operation out to 2030. The long-term strategy will deliver the enduring terminal solution, including compression, required for operation beyond 2030.

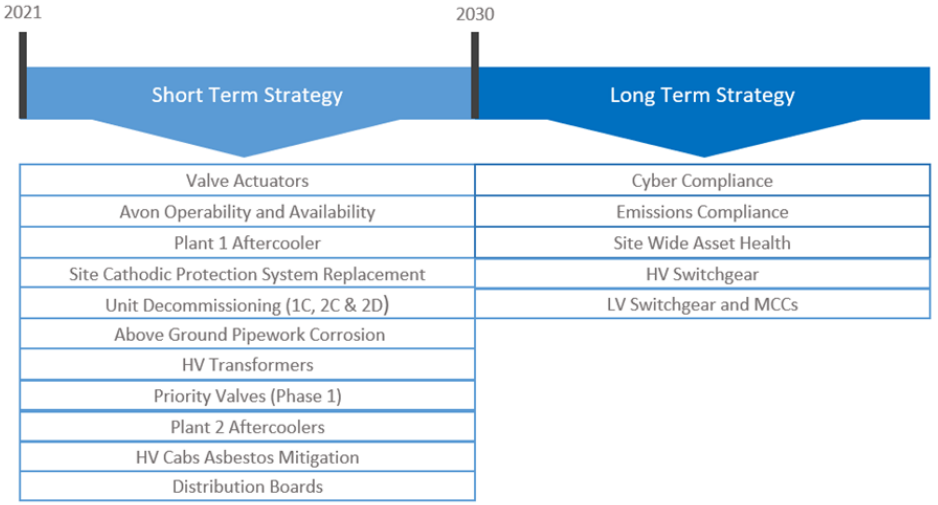


Figure 31 – St Fergus site strategies summary

Long Term Strategy

As stated in previous reports, in terms of LCPD, we gained approval from the Scottish Environment Protection Agency (SEPA) to enter the RB211 units (2A and 2D) into the Limited Life Derogation (LLD) from 1 January 2016.

With MCPD affecting the operation of the Avon units from 2030 onwards, we also investigated options on how best to utilise them until the end of 2029 and submitted a Final Option Selection Report to Ofgem in January 2023 detailing our preferred option to achieve MCPD compliance at the site.

Within their Final Determination (dated 3 November 2023), Ofgem agreed with NGT's investment recommendation to replace three non-MCPD compliant compressor units with three new gas driven compressor units. They also supported the retention of one existing Avon unit with significant asset health investment to improve unit availability. We continue to explore a possible trial of Dry Low Emissions (DLE) at St Fergus. However, this will only be progressed once we have confidence in the functionality of the technology.

In order to provide resilience and redundancy across Plant 1 and 2 (which provide back-up to the lead compression units on Plant 3), two new units are to be installed on Plant 2 and one new compressor on Plant 1 to supplement the retention of Unit 1A.

Units 1C, 2C and 2D are no longer operable and are planned for decommissioning in 2024/25. Therefore, it is currently planned to utilise these vacant berths to install the new compressor units starting circa 2026.

Over the past year, the St Fergus MCPD project has continued the development of the Final Preferred Option. A pre-FEED study to further refine engineering detail for the three new units has been completed and a Remnant Life Study was also performed on Unit 1A Siemens Avon unit to understand current asset condition, the feasibility of continued operation until 2050 and the levels of future investment required.

These studies were beneficial in positioning NGT to perform FEED studies from 2024. Also, during this time, the MCPD delivery and contract strategy were established and approved internally. A two-stage ECI (Early Contractor Involvement) contract model was agreed for Design and Build Phases as the most appropriate and effective model to use across MCPD projects to drive an early, collaborative relationship with the chosen Contractor. In parallel, a Compressor OEM (Original Equipment Manufacturer) would be selected to provide the Compressor package and both OEM and Contractor would work together to drive project efficiency. Both contracts will be awarded following competitively bid tender events.

As part of our ongoing development and assessment of the MCPD delivery strategy, we have reviewed our submission timelines and identified the optimum timings to submit high scope and cost confidence reopeners. As a result, the delivery dates of our MCPD reopener submissions will deviate slightly from our initial planned dates, with the majority being delivered in the latter part of 2025. We are in discussions with Ofgem to agree these amended timelines.

Short Term Strategy

In conjunction with the progression of our St Fergus compressor emissions FOSR, we have continued to develop the AH investment programme which maintains and, where necessary, replaces assets to ensure continued safe operation of the site. At this continuously operating terminal, the availability and optimisation of outages presents significant challenges due to incoming supply factors or NGT operations. Therefore we schedule and deliver investments to be as efficient as possible to limit outages and general impacts on the wider terminal and gas supply.

The intention of the short-term strategy is to ensure the continuity of the terminal operation requirements, including required compression across Plants 1 and 2, for operation to 2030. It recommends investments which maintain the integrity of the site and which reduces risk to site personnel, ensuring continued operation of the terminal and maintained compression. The initial five AH Engineering Justification Papers (EJPs) that were submitted in the AH UM reopener in January 2023 have received a regulatory 'minded to' judgement fully supporting the investment. A further eight EJP submissions were made in June 2023, three of which have received Ofgem 'minded to' support, with the remaining two to be agreed through the compressor emissions reopener. Further engagement is ongoing with Ofgem to reach final determination on these submissions.

Figure 32 – Cab 2B GT exhaust transition piece before re-life

Figure 33 - Cab 2B GT exhaust transition piece after re-life

The short-term strategy looked to retain flexibility of options for the long-term strategy solution by retaining the Avon until the results of the FOS pre-FEED were available last summer. As a result of the Preliminary FEED for the Emissions investment, it is now proposed to decommission Unit 1C.

The strategy supports demolishing Units 1C, 2C and 2D, replacing the Cathodic Protection System and initiating a site-wide painting programme. Continued operation of the wider terminal will require the delivery of the actuator replacement programme due for completion in RIIO-T2.

Compressor Emissions – Wormington

Compression requirements at Wormington Compressor Station are heavily influenced by entry flows at the Milford Haven terminals. NGT uses Felindre, Wormington and Churchover Compressor Stations, amongst other compressors, to move high volumes of gas (up to a third of Great Britain's daily demand) away from Milford Haven into the rest of the network.

Milford Haven is an Aggregated System Entry Point (ASEP), consisting of two Liquified Natural Gas (LNG) terminals (South Hook LNG and Dragon LNG). A gas fired power station is also located at Milford Haven (Pembroke). The LNG terminals can increase and decrease their supplies throughout the year depending on national and international market conditions. Due to its bi-directional flow capabilities, Wormington is also required to support demand extremities in South-Wales when Milford Haven inputs are low, and in the South-West when demand is high.

Wormington Compressor Station comprises two Siemens Avon compressors (Avon Units A and B) and one electric driven Siemens VSD compressor (Unit C) which is the lead unit. Units A and B are non-compliant with MCPD emissions legislation and if maintained past 2030 they will be placed under 500-hour restricted running (Emergency Use Derogation - EUD) from 1 January 2030.

We submitted the Wormington Final Option Selection Report (FOSR) in August 2022, which identified the Final Preferred Option for compliance with MCPD. Ofgem published their Final Determination in March 2023, which supported investment in one new gas-driven compressor unit at Wormington. An existing Avon compressor unit will be retained under EUD, with significant asset health investment to improve unit availability.

Over the past year, Wormington MCPD project has continued the development of the Final Preferred Option. A pre-FEED study to further refine engineering detail for the new unit and Remnant Life Study has been completed. The Remnant Life Study looked at discreet systems and subsystems:

- Rotating machinery
- Enclosure structural integrity
- Enclosure Ventilation
- Fire and Gas Detection and Suppression
- Piping and Valves including associated pipe supports
- Electrical

Based on the findings of the study, NGT were able to determine, for each of the existing Units A and B:

- Which of the two units (either or both) are fit to continue in-service and for how long, or, no longer viable to remain in service and should be considered for decommissioning, based on current condition and routine maintenance and inspection tasks.
- Whether each unit is compliant with health, safety and environmental legislation and functional requirements.
- Any additional integrity measures and life management improvements to provide adequate assurance of integrity during the remnant life period of each unit.
- Meet future expected environmental requirements.
- Future proofed (consideration for zero loss compressor seal, reducing emissions through Compressor casing gas capture, none venting valve actuators etc.).
- A preference for which unit shall be retained in service and which unit shall be decommissioned, if appropriate.

The surveys and Remnant Life Study were very beneficial in that they allowed NGT to target focussed investment needs cases on the Avon units to progress in the next stage of FEED. Detailed scope has been produced for MWCs to undertake more intrusive and detailed surveys and costing of remedial/replacement works in the summer of 2024 to inform our cost submission next year. In 2023/24, we have also been developing the delivery and contract strategy for our portfolio of MCPD projects. A two-stage ECI (Early Contractor Involvement) contract model was agreed for Design and Build Phases as the most appropriate and effective model to use across MCPD projects to drive an early, collaborative relationship with the Contractor. In parallel, a Compressor OEM (Original Equipment Manufacturer) will be selected to provide the Compressor package and both OEM and Contractor would work together to drive project efficiency. Both contracts will be awarded following competitively bid tender events.

As part of our development and assessment of the MCPD delivery strategy, we have reviewed our submission timelines and identified the optimum timings to submit high scope and cost confidence reopeners. As a result, we expect the delivery dates of our MCPD reopener submissions to deviate from our initial plans, with the majority being delivered in the latter part of 2025. We are in ongoing discussions with Ofgem to detail and agree these amended timelines.

Over the coming year we will be focussing on these procurement activities and the subsequent progression of FEED which will provide the necessary detail required to inform the Wormington Cost Reopener Submission.

Compressor Emissions – King's Lynn

King's Lynn plays an important role in ensuring gas can enter and exit the NTS through the Bacton terminal, including the European interconnector connections.

King's Lynn comprises four existing compressor units, two compliant Siemens SGT-400 compressors and two Avon units, Unit A (disconnected) and Unit B (operational), which are non-compliant with MCPD. Unit B is over 50 years old and now operating well beyond its original design life. Failure to meet emissions legislation means that Unit B would be limited to 500-hours running per year, restricting the operation of the site.

We submitted the King's Lynn Final Option Selection Report (FOSR) in January 2023, which identified our Final Preferred Option for compliance with MCPD. Ofgem published their final determination in November 2023, confirming that the existing Avon compressor unit will be retained under the 500-hour Emergency Use Derogation, with significant asset health investment to improve unit availability. To ensure operation mapping alignment across all site compressors, this option will also consider the case for a re-wheel of the existing SGT-400s before or during FEED.

Over the past year, King's Lynn MCPD project has continued the development of the Final Preferred Option. A pre-FEED study to further refine engineering detail for the new unit has been completed. A Remnant Life Study has also been conducted on the Siemens Avon unit to understand current asset condition, the feasibility of continued operation until 2050 and the levels of future investment required. These studies were beneficial in positioning NGT to undertake FEED studies from 2024.

The MCPD Emissions project team have had several engagements with the Original Equipment Manufacturer (OEM), Siemens, to review the suitability of the current compressor performance against the latest process duty specification. Siemens have provided a technical description of their re-wheel proposal; this includes a review of the current compressor wheeling against the latest process duty points. The benefit of the proposal compressor re-wheel is that all operating points can be achieved by the SGT400 units, reducing reliance on Unit B which will be placed on EUD regime from 2030.

As part of our development and assessment of the MCPD delivery strategy, we have reviewed our submission timelines and identified the optimum timings to submit high scope and cost confidence reopeners. As a result, we expect the delivery dates of our MCPD reopener submissions to deviate from our initial plans, with the majority being delivered in the latter part of 2025. We are in ongoing discussions with Ofgem to detail and agree these amended timelines.

In 2023/24, we will be conducting further condition-based surveys which will provide the required level of detail to inform the King's Lynn Cost reopener.

Compressor Emissions – Peterborough and Huntingdon

At the start of the RIIO-T1 period, Peterborough and Huntingdon consisted of three Siemens (formally Rolls Royce) Avon machines each. The units can operate in series or parallel. Under RIIO-T1 allowances, two new gas turbine compressor units (D and E) from Solar Turbines were approved for installation at both sites as part of the Emissions Reduction Project 3 (ERP3) initiative, which falls under Integrated Pollution Prevention and Control (IPPC) legislation. When commissioned, these two new DLE compressor units will provide primary compression duty, leaving the existing Avon unit on standby. This remaining unit will be non-compliant with MCPD legislation as of 2030, which will be addressed by the 2025 reopener.

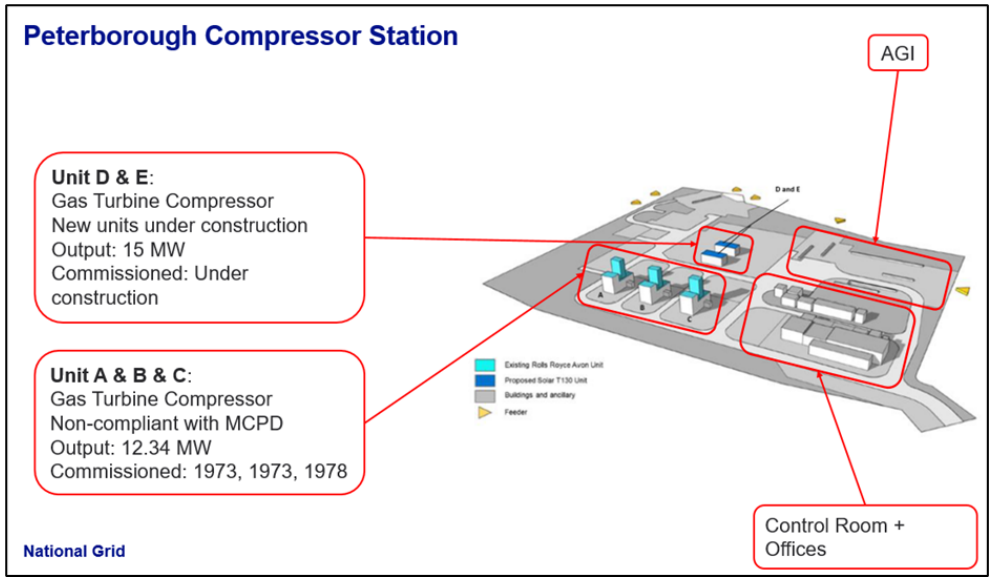


Figure 34 – Peterborough Compressor Station site layout

We submitted the Peterborough and Huntingdon Final Option Selection Report (FOSR) in January 2023, which identified our Final Preferred Options for compliance with MCPD. Ofgem published their Final Determination in November 2023, which supported investment in one new gas-driven compressor unit at Peterborough and investment in significant asset health works at Huntingdon.

Over the past year, Peterborough and Huntingdon MCPD project has continued the development of the Final Preferred Option. A pre-FEED study to further refine engineering detail for the new unit at Peterborough has been completed. In addition a Remnant Life Study has been conducted on the Siemens Avon units at both sites to understand current asset condition, the feasibility of continued operation until 2050 and the levels of future investment required. These studies were beneficial in positioning NGT to perform FEED studies from 2024.

During this time, we have also been developing the delivery and contract strategy for our portfolio of MCPD projects. As part of our assessment, we have reviewed our submission timelines and identified the optimum timings to submit high scope and cost confidence reopeners. As a result, we expect the delivery dates of our MCPD reopener submissions to deviate from our initial plans, with the majority being delivered in the latter part of 2025. We are in ongoing discussions with Ofgem to detail and agree these amended timelines.

This coming year will see the project team focussing on these procurement activities and the subsequent progression of FEED which will provide the necessary detail required to inform the Peterborough and Huntingdon Cost Reopener Submission.

Compressor Emissions – Recompression

The use of recompression equipment to reduce methane venting from planned maintenance outages supports our aim of reducing the impact that our activities have on the environment. The existing machines can only reduce the pressure in the isolated pipeline section to ~7barg pressure, then we have to vent the remainder to atmosphere. The new machinery can reduce the pressure in the isolated pipeline section to 1barg before venting, thereby saving a huge amount of gas from being vented. We are investing in portable pipeline recompression equipment which will have the capacity to reduce pipeline pressures in isolated sections down to circa 1 bar pressure.

Since the challenges we highlighted in our 2022/23 submission in gaining type approval from the supplier of the engines, we have made considerable progress. In June 2023, after exhausting all options to get type approval derogation for the caterpillar engines, we made the decision to change to a different engine manufacturer who would be willing to supply the engine without type approval. We have thoroughly investigated the implications of purchasing an engine without type approval and we are confident that the lack of type approval will not result in any operational limitations on using the new machinery.

In July 2023 a contract amendment was signed and following this, detailed design commenced on the machine and the engines were ordered in December 2023. The engines are being manufactured in the USA with manufacture of the main compressor components beginning in March 2024. All main components are expected to be complete by June 2024 with assembly starting in July 2024.

Total spend to date on the project is £2.4m (2018/19 prices) and we expect further costs in 2024/25 as the project progresses.

The current expected delivery date of the machines is Winter 2024/25. The intention is to commission the machines by trial running them alongside the existing recompression machines in early 2025 with the aim of using them independently once proven later in summer 2025.

Compressor Emissions – Methane Detection and Quantification

Within the RIIO-T2 final determination NGT were awarded funding for the rollout of the Monitoring of Realtime Fugitive Emissions (MoRFE) continuous fugitive emission detection system.

In the 2021/22 reporting period it was agreed with Ofgem, while working on a Net Zero reopener submission, that methane detection and quantification needed to go beyond commitments made in the RIIO-T2 business plan. As such it was agreed that the funding awarded for MoRFE rollout would be more appropriately used for periodic detection equipment.

In line with this agreement, NGT progressed shortlisting of suitable periodic detection equipment and placed orders at the end of March 2023. This equipment was received and receipted in the 2023/24 reporting period with £316k (spend to date - 2018/19 price base) appearing in the NLR Capex spend table 6.1.

The funding has been used to purchase handheld instrumentation for the detection and quantification of fugitive gas escapes from ground level accessible pressurised assets. In addition, optical gas imaging cameras have been purchased for the detection and indicative quantification of fugitive gas escapes from elevated sources, a brand new capability for NGT.

Figure 35 – example of an optical gas imaging camera

Within the reporting period this equipment has been used to deliver seven compressor and terminal fugitive leak detection surveys in house rather than using third parties as well as a survey at Future Grid supporting research and development at the facility. In addition, NGT have rolled out further training on the equipment and planning has commenced for delivering the expanded periodic leak detection and repair programme that was proposed in the Net Zero reopener submitted to OFGEM in October 2022. This activity puts NGT in a good position to deliver on its expanded leak detection and repair programme which it will report on in subsequent reporting periods.

Further spend is expected as delivery of the expanded leak detection and repair programme gathers pace during the 2024/25 reporting period.

Asset Health

	Allowance	Actuals	Forecast	2023/24 Outputs	Outputs delivered to date
Compressors	79.3	37.4	25.6	32	75
Cabs	14	12.4	5.1	16.2	47.2
Valves	51.3	27.3	28.8	296.4	429.4
Pipelines	147.7	48.9	69	3311.9	4120.2
Plant and Equipment	80	48.8	37.9	293	424
Civils	38.5	11.2	17.9	710.1	898.1
Electrical	22.8	8.2	17.6	40	44
Total	**433.5**	**194.2**	**201.9**	**4699.6**	**6037.9**

Table 9 – Asset Health outputs

Work has continued to deliver our asset health programme in 2023/24, which is vital to mitigate the risks of an ageing asset base so that we can continue to provide a safe and reliable network for our customers and stakeholders. Many of these assets have been in operation for more than their original design life of 40 years.

In Year 3, we have delivered a significant increase in volumes, marking a positive shift in delivery from the previous two years of the price control. We have achieved this by leveraging the comprehensive survey work conducted in the initial years of the price control to develop a robust programme of works. In addition, the transition from relying largely on external contractors to a blend of internal and external execution, through our Operations and National Gas Services teams, and MWCs, has yielded invaluable benefits. These include enhanced project control, improved efficiency, and a higher volume of successfully completed interventions. This strategic approach not only accelerated our delivery in Year 3 (2023/24) but also enabled us to clearly define our delivery objectives for Year 4 (2024/25) and Year 5 (2025/26).

Although delivery has been positive, there remain a number of key challenges which continue to impact our performance:

- A continued challenging global supply chain landscape, influencing availability and procurement of critical materials. For example, with regards to asset health, current global economic conditions have increased lead times for valves to 52 weeks, a 50% increase on pre-COVID times,
- Increased material costs since the start of the price control, particularly on electrical assets across the work streams, with the difference in allowance forming part of necessary risk trading across the wider NARMs reporting portfolio, and
- A shortage of skilled labour available in the market, with strong competition from the wider industry in attracting and retaining personnel.

Despite these challenges, we have taken positive steps to accelerate delivery, implementing a change to the delivery strategy to increase the portion of the asset health interventions that can be delivered by in-house resources and expanding our team through the recruitment of additional project engineers, project managers, and work supervisors. We have also tripled our early career intake of graduates and apprentices, with a focus on engineering and operational roles. These initiatives, combined with the strategic planning we undertook in the first two years of the price control, mean we are overcoming these challenges and will continue to ramp up delivery for the remainder of the price control.

One of the primary factors influencing how we manage and execute the asset health workbook is the strategic development of the annual outage plan. This plan has been particularly impacted by the change in network flows, most notably the switch from West to East to a more traditional North to South configuration from June, highlighting the requirement for operational flexibility across the NTS. NGT has to cover a range of potential scenarios that occur when it comes to outage planning and asset availability, ensuring an adequate amount of assets are available at the right times. Due to these shifts in flow patterns, we have been compelled to re-evaluate our outage planning programme to accommodate the evolving needs of our customers while ensuring effective execution of our asset health interventions. This annual review and optimisation process has transitioned us towards a hybrid approach in asset management, blending proactive and reactive strategies. The objective of this approach is to maximise the efficiency of outages and bundle work tasks to drive operational efficiencies across all levels of our asset management processes.

This strategic planning underpinned our request for additional allowances, via two Uncertainty Mechanisms (UM): the Cabs Infrastructure UM and Plant and Equipment UM, to accommodate the critical works on our network . We are working closely with Ofgem to provide any additional information required and expect a minded to decision by end of June 2024. The achievement of positive UM outcomes remains essential to effectively deliver on our RIIO-T2 plan.

Our asset health allowance is broken down into seven categories and the key work delivered in 2023/24 for each category is covered in the following narratives. The allowances for our asset health work spans across our NARM allowance and non-lead allowances.

Asset Health – Plant and Equipment, Valves and Civils

The asset health categories of Plant and Equipment, Valves and Civils (Structural Integrity) are primarily addressed through our National AGI Renovation Campaign (NARC), and as a result, they are grouped together in this section.

Valves play a critical role in the NTS, ensuring the safe flow of gas and providing necessary isolation for operational and integrity related interventions. Together with associated plant, equipment, and structural integrity assets, it is imperative to proactively intervene to mitigate risks, avoid adverse impacts on NTS safety, operations, and availability, and ensure compliance with legislative requirements.

Plant and Equipment encompass both above and below-ground pipework and related assets, whilst Valves include actuators and associated equipment for local, remote, or process-operated valves. Additionally, some Plant and Equipment works fall under other investment programmes, such as Asset Health works at St Fergus and Bacton, as well as works delivered by Operations. Further valve campaigns that do not align with the NARC delivery model due to their specific delivery requirements were delivered in year 3, including the Non-Return Valve and Actuator campaign managed by Operations.

The Structural Integrity (Civils) assets support our pipelines and sites to ensure they are safely operated, protected and limit the environmental impact of our assets. Civil assets include site access, drainage, ducting, pipe supports, pits and pit covers, plinths, and security fences on National Gas Transmission AGIs.

Our RIIO-T2 business plan encompasses a proactive intervention programme for the Plant and Equipment, Valves and Civils (Structural Integrity) assets. The sites and assets included in the project scopes have been surveyed, and interventions have been selected and prioritised based on risk assessment. Investment in this area forms an integral part of our RIIO-T2 programme to manage network risk on our AGI assets, aligning with the NARM output as outlined in our business plan.

Our investments over the opening three years of the price control have resulted in a total of 1,751.5 interventions, with 1,299.5 during the 2023/24 delivery year. These investments were funded through baseline asset health allocations within the Plant and Equipment, Valves and Civils Asset Health Theme.

Asset Health Theme	Sub-Theme	2021/22 Volume Interventions	2022/23 Volume Interventions	2023/24 Volume Interventions
AGIs	Above ground pipework	15	32	176
	Pipework protection	13	31	0
	Cathodic Protection	0	0	1
	Cladding replacement	0	0	2
	Filters/ scrubbers	12	17	13
	Flow or pressure regulators	0	0	15
	Preheaters	0	9	19
Valves	Actuators	8	22	97
	Valve refurbishments and replacement	44	56	189
	Valve removal	1	3	6
	Valve new additions	0	0	67
	Non-return valves	0	0	4.4
Structural Integrity	Drainage	5	4	5
	Ducting	3	3	7
	Pipe Supports	35	68	445
	Plinths	8	17	0
	Security	10	12	93
	Access	11	3	79.1
	Buildings	0	1	52
	Fuel tanks and bunds	6	3	29
TOTAL		**171**	**281**	**1,299.5**

Table 10 - Asset health plant and equipment, valves and civils PCD volumes delivery

NARC Delivery Strategy

NARC works are strategically assigned to deliver most efficiently through National Gas Services (NGS) or tendered to external MWCs, depending on the size and nature of the project. NGS primarily focuses on refurbishment scopes using innovative techniques, while replacement scopes are tendered to external MWCs. Operations will also be involved in the self-delivery of additional campaigns that fall outside the NARC model, where they can execute less complex scopes more efficiently than MWCs. The aim is to deliver more work in-house through Operations and National Gas Services and build this capability.

Our chosen delivery approach involves bundling interventions across Valves, Plant and Equipment, and Structural Integrity asset health themes at Above Ground Installation (AGI) sites. By creating these discrete bundles of work and aligning them with decommissioning efforts, we can achieve cost savings and maximise the utilisation of network outages. Tailored tenders are issued for each delivery strategy, distinguishing between internal delivery and MWC involvement.

The selection of sites delivered in the 2023/24 period focuses on Valves, Plant and Equipment, and Structural Integrity themes, prioritising sites with a high number of known defects and specific plant statuses. Our RIIO-T2 strategy aims to align NARC outage works with in-line inspections (ILI) Dig programmes and outage schedules, enabling efficient bundling, optimising outage schedules, reducing recompression requirements, and minimising customer disruption. Site surveys were conducted by the AGI team with support from NGS depots for valve investigations and external contractors for tasks like Cathodic Protection Insulation Joints (CPIJ) investigations, 3D point cloud scanning, and feasibility analysis. Funding approvals were based on a comparison of delivery costs and the long-term risk-benefit analysis.

NARC has continued its momentum from previous years, facilitating accelerated asset health works across the NTS in 2023/24. Through the NARC22 and NARC23 campaigns, a total of 1,299.5 volumes have been delivered across 129 sites. This represents a substantial increase of 1,018 (in volumes) delivered in 2023/24, compared to delivery of 281 volumes at 54 sites in Year 2022/23, demonstrating the campaign's growth and impact.

For the Structural Integrity assets, 29 interventions on fuel tanks and bunds in 2023/24 have been delivered. A full professional technical and risk assessment was undertaken at 42 sites, delivering 204 Monitoring of Structural Integrity Asset Volumes. These surveys will be used to assess and select intervention options prior to conceptual design and delivery in RIIO-T3.

A total of 20 actuator interventions have been delivered at Longtown, Towton, Medway and Crank throughout 2023/24 with further volumes scheduled to be delivered in the next years.

Four Non-Return Valves have been delivered at Hatton (Unit A) and Wormington (Units A, B and Station). Further interventions have been scheduled to be delivered in Year 4 in line with 2024 summer outages.

NARC23 Highlights

The works which have been carried out so far include a number of interventions at distinctive sites including:

- **Yafforth AGI** - At Yafforth AGI, we successfully completed a comprehensive maintenance and upgrades programme. This included grit blasting and full site repaint, with recoating of wind and water lines. We conducted thorough inspections of the pipework, including pipe supports and replaced pipework flange band and bolt. Additionally, we replaced all adjustable pipe support on both bypasses with galvanised split steel for mainline pipe supports, enhancing durability and reducing long-term maintenance and replacement costs. The site also saw an Insulation Joint replacement and CP installation, further ensuring the integrity and efficiency of our infrastructure.

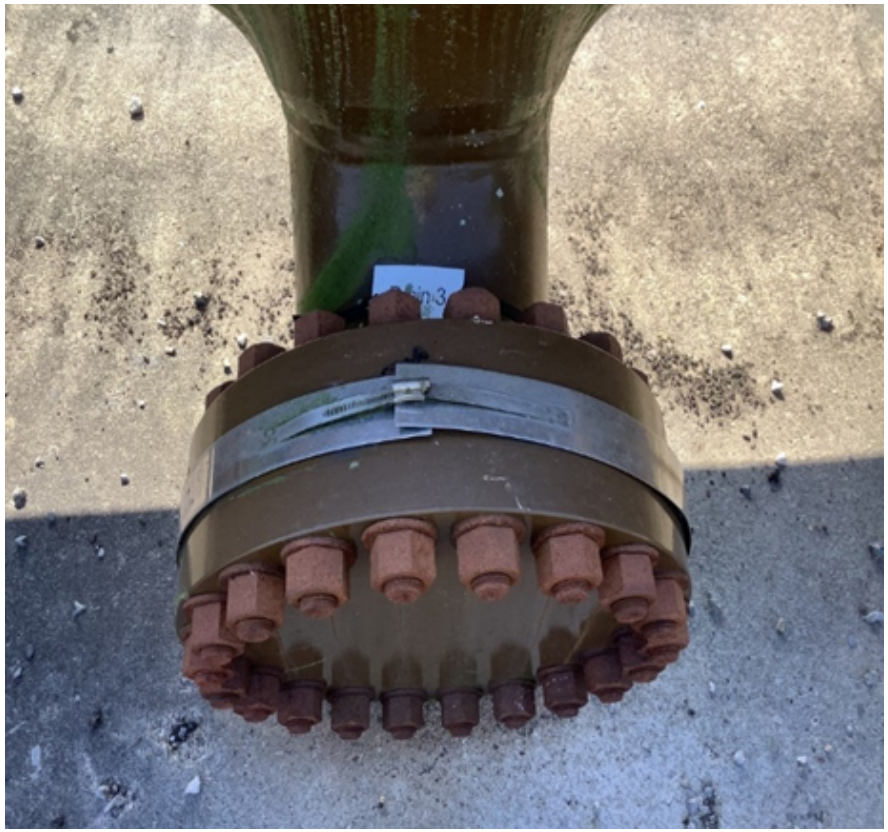


Figure 36 - Site condition photos before asset health works commenced

Figures 37 - Site condition photos before asset health works commenced

Figure 38 - Site condition photos before asset health works commenced

Figure 39 - Site condition photos before asset health works commenced

Figure 40 - After photos of Yafforth AGI

Figure 41 - After photos of Yafforth AGI

- Peterborough and Carnforth AGI – At Peterborough and Carnforth AGI, the steel tanks and associated concrete bunds are over 30 years old. The steel tanks had been subject to both internal and external corrosion. The bunds around the steel tanks on the older sites are subject to deterioration with spalling of the concrete and a potential for total failure. The plastic, internally bunded, tanks have a fixed design life and need to be replaced, to maintain the integrity of the tanks and bunds. This is essential to manage the risk of the loss of containment of fluids that are potentially harmful to the environment. These works have extended the life of these structural integrity assets meaning that these sites should not require further investment within this price control period.

Figure 42 – New tanks installed at Peterborough AGI

Future NARC development

Through the execution of NARC23 and our forward-looking strategies, we remain committed to maintaining the integrity, reliability, and safety of our assets while efficiently utilising resources to deliver value to our stakeholders and customers.

Building on the successful implementation of previous NARC campaigns, the NARC24 site projects have been meticulously developed throughout the 2023/24 period. Through thorough site surveys and careful risk-based prioritisation, we have selected and planned interventions that address the specific needs and challenges of each asset and focuses on maintaining our delivery momentum. These projects are being executed internally and through external MWCs, with considerations given to the size and scope of the works.

Our strategy is further supported by the UM submission made for Plant and Equipment in February 2024. This submission requests funding for asset health work planned for delivery in 2024/25 and 2025/26. Following the submission we have been working closely with Ofgem to address supplementary questions and to work towards securing a positive final outcome for this UM.

Further works have been scheduled in for the remaining years of the price control:

- Refurbishment and replacement of further actuators.
- Non-Return Valve Overhaul interventions have been scheduled in Year 4 inline with 2024 summer outages.
- Structural Integrity (Civils) interventions are scheduled for delivery in Years 4 2024-25 and 5 2025/26 of the price control period, with the majority of these interventions to be delivered through NARC schemes of investment.
- Plant and Equipment spending is also associated with planned Cathodic Protection, Flow and Pressure Control, and Preheat works at AGIs, which have undergone feasibility and conceptual design studies and are scheduled for detailed design and construction (build) for external delivery in the 2024/25 delivery year. In addition, surveys, and Cathodic Protection systems assessments are also scheduled in to identify the additional sites with defects for remediation intervention and scope development to inform the T3_ CP_AGIs Batch 2 programme.

Asset Health – Compressor

Asset Health Theme	Sub-Theme	2021/22 Volume Interventions	2022/23 Volume Interventions	2023/24 Volume Interventions
Compressor Train	Compressors	1	0	3
	Gas Generator Power Train	5	4	4
	Variable Speed Drive	1	4	0
	Vent System	0	0	0
	Compressor Breakdown	24	4	25
TOTAL		**31**	**12**	**32**

Table 11 - Asset health compressor PCD volumes delivery

The compressor machinery, comprising the gas generator, power turbine, and centrifugal compressor, plays a critical role in our gas turbine-driven compressor units. In 2023/24 we focused on several key investments related to the compressor components and breakdowns which resulted in a total of 32 volumes being delivered.

Gas Generator

There are five different types of gas generator making up the fleet currently in operation across the NTS. In addition, we hold spare gas generators to provide resilience to the operational units. There are 66 gas generators plus 10 spares of five different types making up the National Transmission System fleet. The gas generators are a combination of light industrial and aero-derivative gas turbines and are monitored and maintained routinely through a series of work and management procedures carried out by our operational field force. Gas generators provide heated and pressurised exhaust gas that drives the power turbine which then drives the compressor.

Gas generator major maintenance interventions are typically carried out every 25,000 consumed hours, unless the annual borescope inspection determines that condition has deteriorated to a point that early intervention is required.

In 2023/24, we completed two gas generator overhauls out of 15 volumes in the Final Determinations plan. This brings our total number of gas generator overhauls completed over the RIIO-T2 period to eight.

There is also one overhaul currently in progress at Wormington which is due to be completed in 2024/25.

The Baker Hughes LM2500+ DLE fleet has experienced low utilisation, resulting in good condition of the installed engines. In 2023/24, a life expired engine from Bishop Auckland Unit B was exchanged for an overhauled upgraded engine.

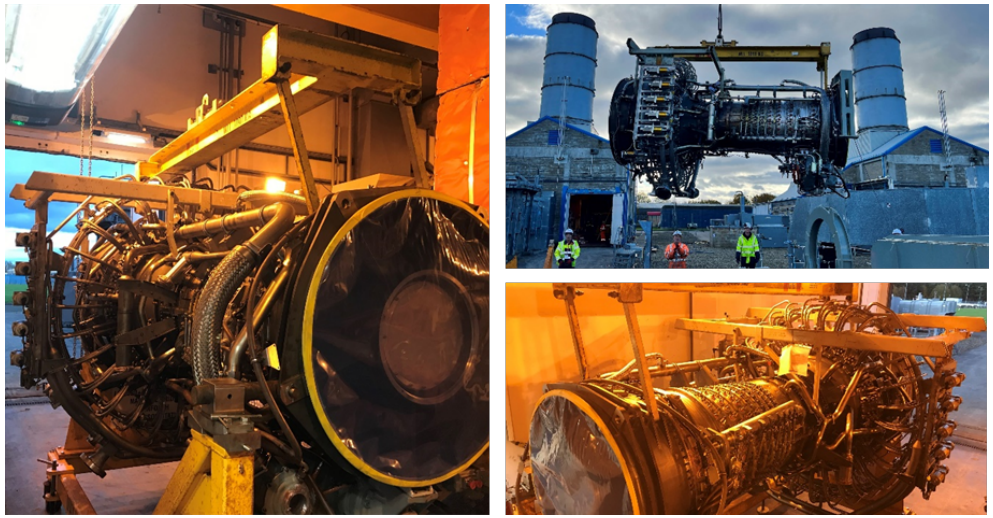


Figure 43 - Engine exchange at Bishop Auckland.

The Solar Titan DLE fleet has experienced a significant increase in utilisation over the past few years. These units play a critical role in supporting gas flows from the Milford Haven LNG terminals. In 2023/24, an overhaul project for one Solar Titan unit at Churchover has been completed.

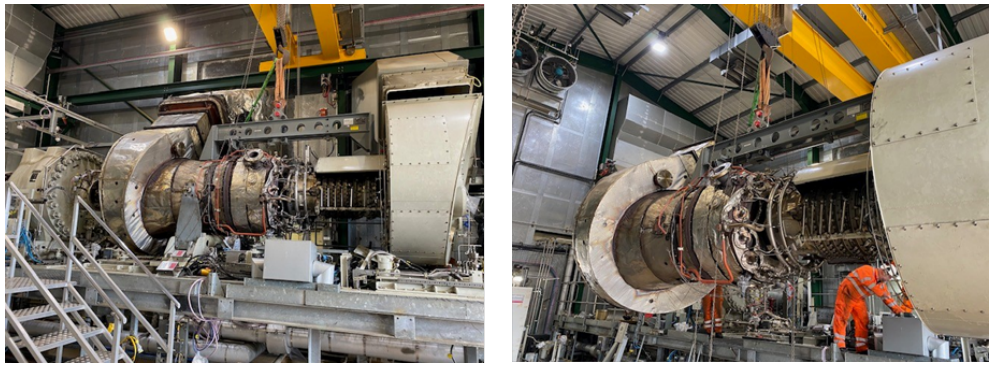


Figure 44 - New engine being installed at Churchover.

Within the SGT400 DLE fleet, one unit overhaul at Nether Kellet was completed in 2023/24. The spare SGT400 DLE engine has commenced overhaul and is scheduled to be completed in 2024/25. The long lead time is due to supply chain issues for critical gas generator components. A proactive approach has been taken where we are looking to order components now for outages that are planned for two years' time to avoid these delays in the future.

Most of the SGT A-20 engine (Rolls-Royce Avon) fleet is in good condition following the overhaul of seven engines in the last three years of RIIO-T1, with four additional engines overhauled in 2021/22, and two in 2022/23. The engine at Wormington Unit A is currently being overhauled and due to be completed 2024/25. There is one Avon at Huntingdon Unit B and one at Peterborough Unit C which is approaching the overhaul interval and damage. In 2023/24, a repair on one Avon at Peterborough Unit A was completed.

No work was carried out on the SGT-A35 (Rolls-Royce RB211) gas generators due to all scheduled work in RIIO-2 being completed in 2021/22.

Power Turbine

Within the national fleet operating across the NTS, there are eight different types of power turbines. Additionally, we maintain spare power turbines to ensure operational resilience. Power turbines play a crucial role in converting the hot, pressurised exhaust gases from the gas generator into the torque needed to drive the compressor. Maintenance and overhaul requirements for power turbines, like other components of the machine train, are influenced by factors such as run hours, number of starts, and installed time.

Within the RT48 (Rolls-Royce) fleet, we were able to facilitate an additional overhaul at Huntingdon Unit C. The overhaul was not initially scheduled for this year but by working closely with the on-site team we were able to take advantage of an existing outage window and minimise disruption for our customers.

Figure 45 - Huntington Unit C: RT48S on Receipt Inspection

One SGT400 power turbine has commenced being overhauled and is due to be completed in 2024/25.

The components required for the overhaul of King's Lynn B failed in manufacture. A temporary solution was put in place using spare part-life assets from a decommissioned unit at St Fergus. The overhaul will be completed in 2024/25, when the new components are successfully manufactured.

Centrifugal Gas Compressors

Compressors are integral to the transportation of natural gas through the NTS. Each compressor is driven by either a dedicated high-voltage (HV) electric motor or a gas generator and power turbine. All NTS compressors are of the centrifugal type, predominantly single stage but occasionally two or three stage where higher pressure ratios are required.

During 2023/24, work was completed on Aberdeen Unit A and Avonbridge Unit 1A with both involving a dry gas and barrier seal change. Dry gas and barrier seal is also currently being replaced on Aberdeen Unit B following seal failure. This is due to be completed in 2024/25.

Figure 46 - Aberdeen Unit A Casing: (Top right) Rust and corrosion identified bottom halve part of the outer flange of the compressor cartridge. (Bottom right) This was removed as much as possible to make correct assembly possible.

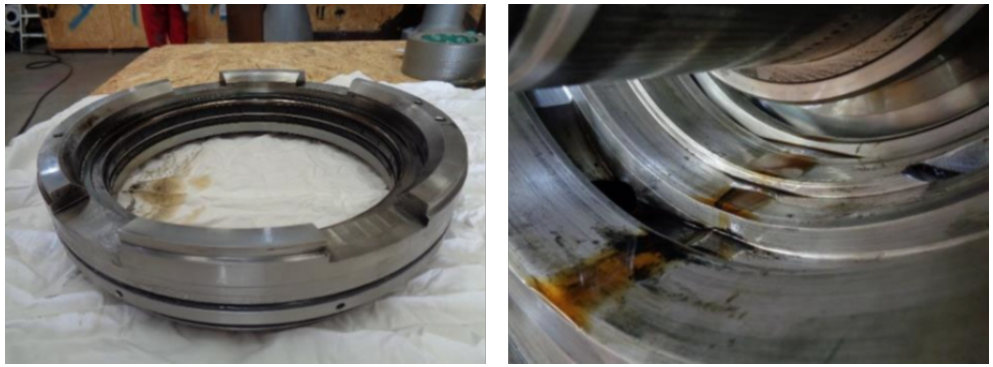


Figure 47 - Liquid identified when removing barrier seal. Seal gland cleaned prior to the installation of a new barrier seal.

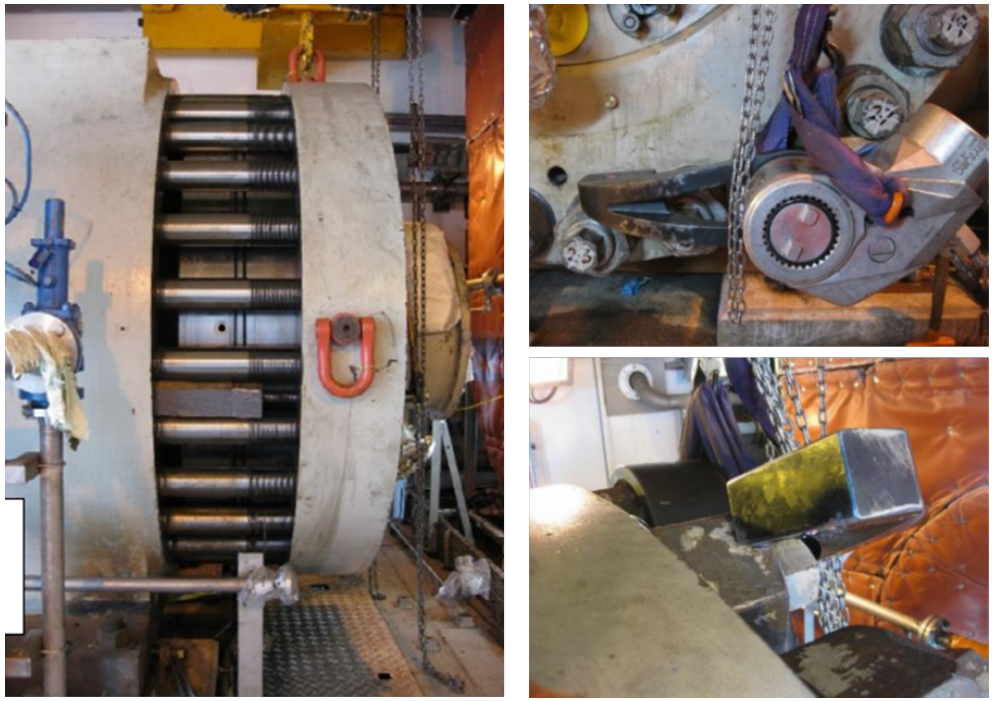


Figure 48 - New compressor assembly being installed at Aberdeen Unit A following dry gas seal change.

Electric Variable Speed Drive Compressors

The electric compressor systems are equipped with high-voltage supplies, typically at 132 kV, 33 kV, or 11 kV. Frequency converters, known as variable speed drives, are powered through dedicated converter transformers, supplying variable frequency and speed to the high-voltage motor. Harmonic filters are often used to ensure compliance with electricity distribution network operator (DNO) connection agreement terms and conditions.

The national fleet includes two types of high-voltage motors operating on the National Gas Transmission System. These systems consist of either a six-phase Ex p synchronous motor coupled to a centrifugal compressor (as discussed above) or a motor in pipeline compressor (MAN MOPICO) configuration. MAN MOPICO units feature an integrated pipeline-mounted induction motor connected to compressor units at either end, utilising magnetic bearings.

This year investigations have been ongoing into issues on the cooling systems on HV motors at both Wormington and Churchover. To protect the motors from overheating there is currently a speed restriction in place on the machines when the ambient temperature goes above 15 degrees Celsius. Surveys are being carried out to determine whether the performance of the existing equipment can be improved, however it is anticipated that a redesign of the cooling system will be required to enable the speed restriction to be removed.

Asset Health – Pipelines

Asset Health Theme	Sub-Theme	2021/22 Volume Interventions	2022/23 Volume Interventions	2023/24 Volume Interventions
PSSR	Pig Trap Defect Resolution - Minor	0	0	7
	Pig Trap Major Inspection	10	12	6
	Pig Trap Defect Resolution - Major	0	0	1
Pipelines	Watercourse crossings defects	0	0	0
	Watercourse crossings (Duddon)	0	0	0
	Depth of cover defects	0	17	14
	Nitrogen Sleeve - Minor	0	0	5
	Nitrogen Sleeve - Grouting	0	0	13
	In Line Inspection	22	15	17
	In Line Inspection Defects	0	57	61
	Cathodic Protection Digs	0	21	0
	AC mitigation	0	0	0
	Remote Monitoring	0	0	0
	Replace existing Transformer Rectifier	0	0	6
	Repair/Replace existing CP test posts	0	48	179
	Install new Transformer Rectifier	0	0	1
	CIPS for Capital Refurbishment	0	586.4	2960.4
	OLI/4 Inspections	0	0	34.4
	OLI/4 Pipeline Defects	20	0	7
Total		**52**	**756.7**	**3311.9**

Table 12 - Asset health pipelines PCD volumes delivery

The pipeline asset health programme delivers investment on the pipeline assets on the NTS that connect AGIs and terminals, aiming to maintain and improve their condition. Improving the lifespan of the current network is critical to maintaining low costs to consumers, as replacement of part of the network would entail extreme expense and a significant disruption to the UK economy. Throughout the programme, several techniques which measure degradation, integrity and mechanical characteristics are implemented together with any remediation regimes which could help in maintaining a safe, operational pipeline. These techniques are listed below:

- **Pressure Systems Safety Regulations (PSSR) In Line Inspections (ILI)**: These inspections utilise advanced tools including Pipeline Inspection Gauge (PIG) to assess parameters such as wall thickness, geometry, and ground cover depth. The collected data informs our ILI Digs/ Interventions Programme enabling targeted remediations where necessary. Concurrently, compulsory PSSR inspections ensure the integrity of our PIG Traps and other pressure containing vessels on our sites.
- **In Line Inspection Digs**: Excavations are carried out at specific pipelines locations identified as having features of interest such as corrosion or dents, during ILI inspections. These characteristics are categorised and prioritised with remediation actions undertaken as needed including re-coating or the use of epoxy filled repair sleeves.
- **Closed Interval Potential Surveys (CIPS) and Interventions**: CIPS surveys evaluate the health and integrity of our Cathodic Protection (CP) systems, which act as a secondary defence against corrosion. Any identified CP defects are carefully analysed, and interventions are applied to ensure compliance with safety regulations and maintain the effectiveness of the CP systems.
- **Pipeline Impact Protection**: This includes measures such as Reduced Depth of Cover (RDoC), River Crossings and Nitrogen Sleeves. These strategies are implemented in areas where the pipeline is closer to the surface than expected, such as in ditches that have been extensively cleaned or eroded over time. Remediation actions can involve compensations to landowners, installation of proactive measures.
- **Alternating Current Mitigation**: Assessing the alternating current risk from overhead lines and other third party assets that induce current on the pipelines and can act as an accelerating factor for corrosion.

- **Remote monitoring upgrade**: Updating the previous 3G remote monitoring system to the mobile 4G network to avoid losing communication when the 3G networks are shut down.

Throughout 2023/24, a comprehensive series of inspections and interventions were conducted as part of the asset health programme:

- Pressure Systems Safety Regulations (PSSR) and ILI Runs - During 2023/24 the National Gas Services team have delivered the RIIO-T2 plan for PSSR inspections on PIG Traps, Heat Exchangers and Filters. This includes work on minor repairs to PIG Traps and a PIG trap removal and replacement with temporary PIG trap pipework.
- ILI Runs - During 2023/24 National Gas performed the planned ILI run inspection programme. The inspections have been implemented on portions of pipeline which are driven by a risk-based approach, considering pipeline condition, criticality and performance of its corrosion prevention system.
- In Line Inspections (ILI) Digs - ILI Digs: We have delivered over 60 intervention volumes across all investments related to this UID in 2023/24. It is the second year that on site refurbishment teams have helped deliver pipelines scope that has helped to drive down unit costs from the start of RIIO-T2 by minimising mobilisation costs.
- Pipeline Impact Protection – This is our first year of claims for nitrogen sleeve grouting and minor repairs along with continued claims for reduced depth of cover. There had previously been a delay with the river crossing delivery because of contracting issues which have now been resolved and the contract awarded.
- Close Interval Potential Surveys (CIPS) - In 2023/24 we delivered and claimed a significant increase in outputs compared to the last two years (586 to 2960), reaching 70% of our overall RIIO-T2 target for CIPS and all our OLI/4 surveys target. Some volumes were delivered in the previous reporting year but completion of the claim process was within this reporting year. Furthermore, there are additional volumes to claim from work delivered in late 2023/24 because CIPS can have a three month post-survey review and processing of output claims. A much larger volume of test post work has been claimed than before. Similar to this year there have been more volumes delivered than reported due to some lags in the claims process as the evidence is being compiled.
- Closed Interval Potential Surveys (CIPS) Interventions – New and replacement transformer rectifier volumes have now had their first volumes claimed and additional OLI/4 intervention volumes have also been claimed. The lack of CP Digs claims is a result of delays in CIPS from previous years, over 300 features have had designs developed over this year and are expected to be implemented and closed over the next two years.
- Alternating Current Mitigation – We are expecting to deliver all site reports and potentially up to two on-site remediations that will provide valuable experience for future remediations in the next regulatory period.
- Remote monitoring upgrade - The team has been developing the plan for the replacement assets and working with the operations teams on a delivery plan utilising our internal teams with contractor support and is aiming to deliver significant volumes of replacement units in FY25.

These comprehensive inspections, interventions, and remediation efforts demonstrate our commitment to ensuring the health, safety, and reliability of our pipeline assets. By proactively implementing these techniques, we are able to effectively manage degradation, maintain operational efficiency, and mitigate the risks associated with pipeline infrastructure. This approach not only ensures compliance with regulatory obligations but also safeguards the interests of our customers and stakeholders.

Asset Health – Electrical

Asset Health Theme	Sub-Theme	2021/22 Volume Interventions	2022/23 Volume Interventions	2023/24 Volume Interventions
	Auxiliary equipment	0	0	1
	Distribution boards	0	0	9
	Uninterruptible power supply	0	2	3
	Battery charger	0	0	3
	Battery	0	2	9
	Lighting	0	0	10
	Transformer	0	0	5
TOTAL		**0**	**4**	**40**

Table 13 - Asset health electrical PCD volumes delivery

The National Electrical Asset Health Campaign was initiated to review asset condition on a series of sites, agree prioritised condition-based interventions, tender, then deliver the programme of works utilising our existing procurement frameworks. These works entail differing interventions upon:

- High Voltage and Low Voltage switchgear
- Low voltage distribution systems
- Uninterruptible Power Supply (UPS) systems
- Battery charger systems and associated batteries
- Standby generator systems
- Power transformers
- Lighting systems

We are delivering the majority of the national electrical Asset Health within two main work packages: Compressor station national electrical campaign and Above Ground Installations (AGIs) national electrical campaign.

We also have two other work streams delivering some volumes of electrical work:

- Lockerley Electrical, Control, Instrumentation (ECI) delivery programme.
- Operations Area Form process.

In 2023/24, expenditure on our National Asset Health electrical project has been £6.0m. Over the RIIO-T2 period we are currently forecasting to spend circa £19.6m on this project against a complete electrical allowance of £22.7m. We expect our total expenditure on electrical assets across the work streams to be in the region of £25m with any NARM related work being managed as part of our overall delivery programmes to efficiently delivery our network risk outputs.

Our forecast remains largely similar to 2022/23, and we are expecting to deliver less volumes on some interventions whilst delivering greater volumes of other interventions. A number of factors influence this, some associated with costs in the marketplace and others more closely aligned to the technicalities associated with the investment and the outline assumptions on deliverability of work types that we have not previously undertaken on an asset health basis. Our intervention prioritisation has remained focussed on asset health condition and associated compelling need.

An example of additional work we have identified is associated with our AGIs. Our original intent had been to undertake condition surveys to better gauge condition beyond routine maintenance inspections. In our Business Plan any minor repairs were presumed to be affected at the same time as the survey. We had made no Business Plan provision for major refurbishment, nor replacement of the systems we planned to survey. In practice condition concerns, largely based on the aged nature of the installations, has necessitated replacement of a number of AGI distribution systems. Some of the AGI distribution systems which we plan to replace are currently 57 years old. We are mindful that a number of the Distribution Network operators have also identified this matter and have an ongoing rolling plan similar to the one we are about to commence.

During 2023/24 we have let the main contract for the compressor station national electrical campaign and commenced detailed design and fabrication processes for the main works. Some minor work was delivered in the reporting period where the design process, materials procurement and manufacture has been possible to achieve. Examples of the work delivered are shown in Figures 49 and 50.

Figure 49 - New batteries and charger system installation at Wooler Compressor

Figure 50 - Replacement Fire/Gas uninterruptible power supply at Nether Kellett Compressor.

We have been fully engaged with our selected MWC for the significant ramp up in delivery of site works aligned to pre-arranged outages for our 2024/25 construction period. A number of the panels and switchgear have been in fabrication over winter.

Figure 51 – Switchgear being fabricated for delivery and installation summer 2024

The information gained as we have entered the detailed design phase has resulted in slight alterations to approach and intervention types in order to de-risk project delivery whilst ensuring the long-term viability of the technical solution delivered. This intelligence continues to be incorporated in to our RIIO-T3 plans.

An example of an intervention issue faced during detailed design, has been the requirement to replace some additional transformers, rather than refurbish them. We had an initial plan to undertake minor refurbishment of three transformers and replace two. During detailed design it became apparent that minor refurbishment was not going to be sufficient for some of the transformers identified. Reasons include:

- Evaluation of environmental containment inadequate, requiring additional testing to confirm and subsequent remediation to meet current requirements.
- Refurbishment no longer able to be undertaken on-site and would require disconnection and return to manufacturing workshop. In addition, any further unknown condition issues have the potential to require additional works impacting return to service times.
- More detailed condition assessment of switch room buildings uncovered building fabric concerns increasing scope deliverables.
- Having re-considered additional condition-based findings in relation to overrun of programme and impact on subsequently scheduled control system works, a containerised transformer package has been selected in place of the original 46 year old transformers. This will permit works to continue to deliver original needs case objective whilst not impacting the next critical project that follows.

Towards the end of 2023/24 we have commenced discussions with framework contractors for delivery of the less complex works we have identified at our AGIs.

We had previously identified constraints with contractor capacity, with some suppliers unable to take on further work. To overcome this, we have maintained ongoing dialogue with preferred companies, and we have rationalised the intervention types and approach with the likely delivery cadence that we seek to achieve. By the end of the 2023/24 reporting period, we have submitted enquiries to framework contractors seeking tender returns so that we can commence this programme, seeking to target sites with minimal network outage requirements.

The UK labour market remains particularly competitive, with recruitment and churn in key stakeholder departments presenting an ongoing challenge. As such we continue to be mindful of our own capacity constraints and work is actively ongoing to recruit skilled electrical engineers in to a number of vacant positions immediately associated with electrical projects.

Cost run-rate on our National Asset Health electrical project remains within our expectations for these works at the commencement of the 2023/24 reporting period – these costs remain aligned to our earlier findings from contractor tenders: with some marginally favourable to our unit cost assumptions whilst others considerably more expensive than our original working assumptions. Cost increases are emerging on other electrical works that we have ongoing in a combined delivery project at Lockerley Compressor Station, these are largely being driven by technicalities associated with the scope of the project.

Some minor electrical works which are less technically involved are being undertaken by Operational teams. Delivering these types of works using operational teams has the benefit of bringing enhanced project control and improved efficiency. Examples of these projects include the replacement of battery systems, replacement of light fittings not entailing major civil works, and replacement of component parts of other electrical systems.

In the next reporting year 2024/25 we expect our national electrical compressor project to have delivered around 75% of our forecast volumes. The electrical volumes associated with our work at Lockerley compressor are not forecast to be in build stage until 2025/26. We will continue to progress minor electrical interventions with Operational teams to maximise efficient delivery.

Asset Health - Cab Infrastructure

Asset Health Intervention type	2021/22 Volume Outputs	2022/23 Volume Outputs	2023/24 Volume Outputs
Air Intake	5	1	2
Cab Ventilation	5	1	1
Cab Structure	3	3	6
Exhausts	5	4	1
Fire suppression	4	0	6
TOTAL	**22**	**9**	**16**

Table 14 - Asset health cabs PCD volumes delivery

For RIIO-T2 we established a rolling campaign to bring our Cabs into compliance with current gas turbine safety standards, BS ISO 21789 and T/SP/COMP/33 which looked to remediate deterioration over a 10-year period. The proposed interventions on 30 Cabs across the NTS are balanced between refurbishment and replacement from robust condition-based assessments to extend the life of the assets by 30 years. This is unless the unit is in the decommissioning plan for RIIO-T2 or RIIO-T3, in which case only safety and operationally critical work is carried out.

The key investment drivers are outlined below:

- HSE Publication PM84: The HSE guidance note, known as PM84, along with the more recent BS ISO 21789 standard, addresses the risks associated with gas turbine enclosures. While most compressor cabs were constructed before the publication of these standards, the following scoped elements have been identified as measures to reduce risks: refurbishment of Cab Exhaust System, Air Intake System, Cab Ventilation System and Cab Structure (including Gas Detection).
- Fire Suppression Systems: Fire suppression is the final element of the fire and gas system designed to protect the asset in the event of a fire. However, due to the age, condition, and design of some of our systems, they are no longer adequate and require investment to enhance their integrity.
- Emission Sample Lines: Upgrades to emission sample lines are driven by Environmental Agency Legislation requirements for homogenous emissions sampling of gas turbines, ensuring compliance with the IED. These upgrades are necessary to achieve compliance and eliminate any non-compliance issues.

In 2023/24 we have undertaken physical delivery of Cabs Infrastructure works and claimed a total of 16 volume outputs at the following sites:

Chelmsford (Unit A and B)

Fire suppression re-life work has been undertaken to enhance the systems operational life and improve integrity requirements. Water tanks have been replaced with new equivalent and have been certified to allow for fire suppression in the event of fire. Cab structure minor refurbishment works were also carried out on Units A and B and there was installation of drainage louvres and corrosion repairs work completed on the roof as well as replacement of Air Intake filters.

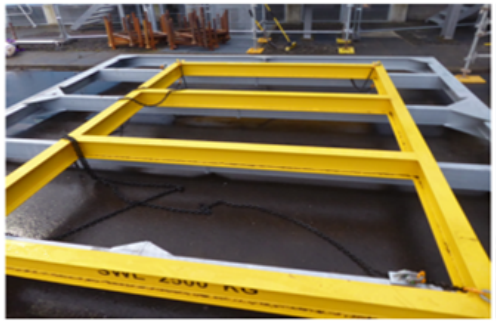
Hatton (Unit A)

Fire suppression re-life work was undertaken on Unit A. There was also an Air intake filter house replacement completed with stairs platform and replacement of exhaust stacks.

Figure 52 - Air intake filter house and exhaust works

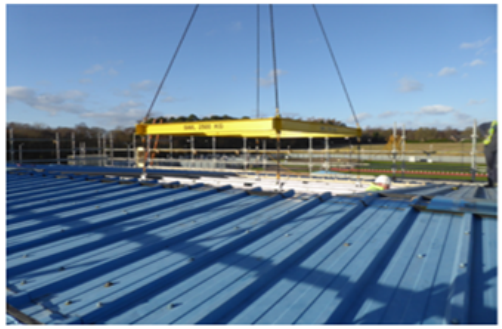
Kirriemuir (Unit E)

Kirriemuir (Unit E) roof hatch works were undertaken to allow for removal of the engine as part of the engine overhaul which forms part of our maintenance programme. No existing facilities were available to take the engine out and so this work was required to support maintenance delivery.



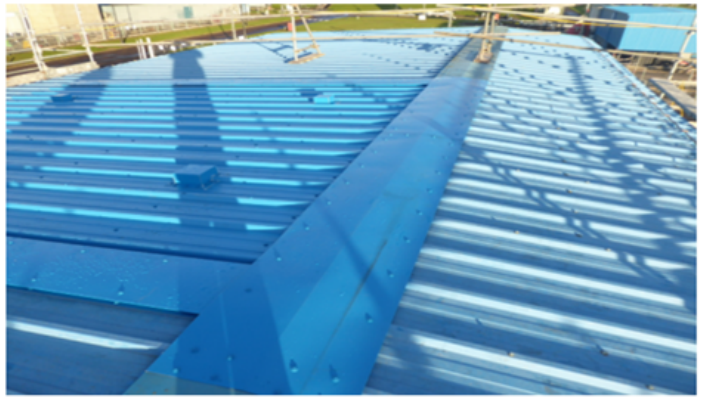
New hatch fabricated in readiness for install.

Hatch being lifted into position



Hatch aligned into position

Roof prepared for new hatch to be installed



Hatch installed – all works complete

Figure 53 - Roof hatch installation works completed at Kirriemuir Unit E

Alrewas (Unit A, B and C)

Fire suppression re-life was undertaken on Units A and B. There were major works done on the exhaust to replace the exhaust compensator and fire suppression on Unit C.

Wormington (Unit A and B)

Ventilation upgrades have been completed for Units A and B. The interventions involved complete replacement of all ventilation fans to ensure sufficient air circulation along with allocation of staircase and platform access to the fans to comply with the current British gas turbine safety standard ISO 21789 requirements.

Preparatory Work

In addition to the infrastructure works, this year we have developed the Cab Infrastructure scope for Huntingdon (Unit C), Aylesbury (Unit A and Unit B), Churchover (Unit D), Cambridge (Unit C), Aberdeen (Unit A and Unit B) Kings Lynn (Unit B).

The scope development involved undertaking intrusive and non-intrusive site surveys, understanding asset functionality, developing Feasibility Design to outline the full extent of scope that encompasses Hardware replacements, modifications on each site to address remedial works and upgrading functionality of the replacement assets interfacing with existing plant. In addition, we have been undertaking procurement activities to select the most competitive contractors and launched the Detailed Design and Build phase in readiness for 2024 and 2025 delivery.

As part of Ofgem's RIIO-T2 Final determinations we were awarded a Cab Infrastructure allowance for the first three-year years of the price control. We have subsequently submitted the Cab Infrastructure and Fire Suppression Engineering Justification Paper to Ofgem as part of the June 2023 Asset Health reopener requesting allowances for Years four and five delivery. We have been working closely with Ofgem to address supplementary questions and resolve issues and we expect a final determination for this reopener within this financial year.

These comprehensive initiatives in Cab Infrastructure demonstrate our commitment to ensuring the safety and compliance of our gas turbine compressor cabs. By addressing compliance issues, we are actively enhancing the integrity and reliability of our cab infrastructure assets. These works not only contribute to the safety of our operations but also ensure compliance with environmental regulations, resulting in a robust and reliable gas transmission network.

Other Asset Health - Bacton site terminal redevelopment

Work in RIIO-T1 to develop strategic options for the future of Bacton terminal identified brownfield redevelopment as the preferred option and this was the basis for our RIIO-T2 business plan submission. Our RIIO-T2 deal requires us to carry out additional assessments and reconsider the options, before returning with a FOSR.

The FEED feasibility study during 2021 assumed a date of 2035 for cessation of all supplies through the Bacton UKCS incomers, based on the 2020 Future Energy Scenarios (FES) report. The study identified our previously recommended option of brownfield redevelopment as unviable. Following our review of the options, CBA outcome and stakeholder feedback we checked the overall project direction and concluded that we needed to carry out further work before making the final option selection. Following discussion with Ofgem we therefore delayed our FOSR submission date. In July 2022 a revised FOSR submission date of February 2024 was agreed with Ofgem.

The subsequent remnant life studies, surveys to assess the effectiveness of the cathodic protection (CP) system and excavations to confirm whether there is any below ground corrosion have all been completed in the last year. This additional work confirmed our final option selection and the FOSR was submitted on time as per the revised submission date at the end of February 2024. The shortlisted options are:

- **Option 1 Base Case Asset Health** - Retaining the site in its current configuration with an asset health and replacement programme.
- **Option 2 Major Rationalisation and Reduce Inventory** - As Option 1 to mid-2030s, potential removal of UKCS assets aligned with reducing UKCS flows through the 2030s (subject to customer application).
- **Option 3.1 New build, within existing site** - As Option 1 to mid-2030s, then above ground, modular build, minimal reuse of assets.
- **Option 3.2 New build, with site extension/offsite developmen**t - As Option 1 to mid-2030s, then above ground, modular build, minimal reuse of assets.

Option 1 Baseline Asset Health was selected as our preferred option as it represents the lowest cost to consumers. Other short list options provide the same ability to flow gas as required, and meet resilience requirements, but at considerably higher cost.

Since submission of the FOSR we have been responding to Ofgem's SQs and starting to prepare for the cost reopener, which we plan to submit in September 2024, earlier than the date previously agreed (window of May to August 2025). This means we are on track to deliver the PCD for Bacton Terminal Redevelopment, which is to submit a FOSR and a cost reopener (February 2024 and August 2025 respectively). Our expenditure is forecast to be within the Baseline allowance for the FEED studies.

In addition to the Bacton Terminal Redevelopment FOSR, we submitted two EJPs under the Asset Health reopener in June 2023, for work at Bacton that was not known at the time of the RIIO-T2 submission.

Bacton Terminal Filtration Enhancement

Incidences of dust in gas flows via the Interconnector to Europe initiated work to consider the installation of filters on the NTS feeders entering Bacton Terminal. Enhancements to the existing filtration on the incomer feeds were also identified that would facilitate operational mitigations to address the impact of dust. This process, referred to as 'double filtration', utilises our bypass pipework and filters on one of several incomers to remove any solid/dust residue from the gas. This configuration means that a proportion of the gas at site can be filtered to prevent onward dust issues to customers.

We submitted our Need Case and Option Selection for Bacton Terminal Filtration Enhancement in the January 2023 reopener window, and the EJP in the June 2023 window. The incomer filtration enhancements have been completed and we continue to use them as operational mitigation for the impact of dust. However, this is limited to a 40% maximum by the capacity of the ring main and reduces operational flexibility of the site.

Bacton Overpressure Protection

Assessment of pressure protection systems at Bacton Terminal identified that there was high risk of over-pressurisation from upstream suppliers at three of the incoming pipelines. Improved protection systems needed to be in operation by August 2023 to comply with Health and Safety Executive (HSE) requirements. To achieve this, work had commenced on site prior to our Bacton Overpressure Protection EJP submission.

In May 2023 there was a loss of containment incident during the excavation works for the overpressure protection project, when a temporary trench support impacted on a small-bore pipeline fitting. The pipework was quickly isolated, there were no injuries and gas supplies were not affected. This led to work on the pressure protection system being halted for four months whilst investigations took place and the recommendations of the findings were implemented. Subsequently a revised completion date of August 2024 was agreed with the HSE. Work on two of the incomers has been completed; the third is on track to be completed by August 2024. The forecast full cost is in line with the total installed cost estimate in our EJP submission.

Figure 54 – Original control relays for Perenco 1 and 2 incomes. These have been replaced with a Safety Instrumental System (SIS) panel and Safety Logic System (SLS)

Figure 55 – New SIS control panel installed in Bacton switch room

Figure 56 – Perenco 1 incomer – final impulse line install for new pressure transmitters. Individual feeds to three independent transmitters with a 2 out of 3 voting system.

Bacton Stakeholders

Stakeholder engagement has continued, particularly to discuss dust issues and to inform and support the FOSR submission. We have run individual sessions for directly connected parties and issued newsletters to the wider stakeholder community. Also during the year we have highlighted the key role of the Bacton Terminal with a visit to site by the Prime Minister and by supporting a round table at the Houses of Parliament.

Other Asset Health – Stopples

Stopples, an effective intervention technique enabling intrusive operations while keeping the plant live, have been implemented at Longtown and Lockerbie. These projects were commenced in 2022/23 and have been successfully completed in 2023/24. Building on the success and experience gained from implementing stopples at previous sites, we have expanded our delivery plan to include four additional sites. Felindre Multijunction which has complex access challenges, has already begun, and is scheduled to be completed within RIIO-T2.

As part of our ongoing efforts, we have also explored alternative isolation methods, including the utilisation of Remote Techno Plug and BISEP tools, which will be incorporated where needed. These developments and design enhancements reflect our commitment to advancing operational efficiency and ensuring the seamless execution of future interventions.

Figure 57 - Longtown Stopple intervention

Figure 58 - Lockerbie Stopple intervention

Other Asset Health - GRAID

The Gas Robotic Agile Inspection Device (GRAID) robotic platform was designed and built to inspect unpiggable transmission assets during live gas flow conditions and has previously been funded under the NIC and NIA mechanisms.

An additional innovation project was commissioned to both improve the accuracy and quality of the generated data from the onboard sensors. This project concluded in 2022 with the team experiencing some challenges using the new acoustic resonance technology on the robot due to the ultra-sensitive sensors picking up background noise from the robot interfering with the received sound waves. This ultimately meant that the pressure of the gas would need to be above 80 bar to achieve reliable data. However, this pressure is not seen on our ground installations and so an alternative sensor package was required for the robot.

In 2022/2023 further discussions were held with interested parties to understand how best to resolve the sensor challenge and how to enable GRAID to become a commercial system for future use.

This focus on overcoming the sensor challenge continued in 2023 /24, where we have now identified the most appropriate sensor package to install once essential maintenance has taken place on the robot. This maintenance and upgrade operation (without which the GRAID deployments cannot take place) has now been incorporated into the GRAID Connections project that is constructing the access points, with the maintenance scheduled to be completed before the time construction of the first access points commences in April 2025. The period between the completion of the robot maintenance and the construction of the first access points will be used to re-certify the robot and its performance, and to train drivers in the operation of the equipment, preparing for the handover of the infrastructure from Innovation to National Gas Services at the end of RIIO-T2.

In addition to these activities, we have also been progressing the design and build of robot access points across the NTS. In 2022/23 we used a variety of metrics including consequence of failure, defects, cathodic protection score and overall site age to identify a list of 48 possible locations to be further developed reducing the list to those that can be delivered within RIIO-T2.

In 2023/24 our focus has been on surveying the 48 possible locations identified and further refining our metrics to create a narrowed down list of 20 connection points at 12 sites. This development and planning related activity is essential before construction of the access points can begin but it has meant that there has been minimal spend against allowances over this financial year, totalling circa £50k and constituting mostly staff costs and the cost of the site surveys. These sites are being prioritised for commencement of design and construction, with construction expected to commence on the first sites in April 2025.

Section contents

XII. Non operational capital expenditure (TO and SO)

TO non-operational Capex

In 2023/24, our RIIO-T2 Non-Operational Capex (TO) spend is £14.9m (excluding Small tools, equipment, plant and machinery - STEPM), which was £2.5m below 2023/24 allowances of £17.4m.

Cumulatively, our spend of £46.8m (or £39.4m excluding a prior year one-off property charge) is £12.0m below allowances of £58.8m.

Our spend on IT (TO) baseline programmes continues to track lower than previously forecast, however spend increased by £4.3m in 2023/24 (from £7.2m to £11.5m) as we accelerate our IT activities now we are a standalone business. There is an underspend against year three allowances, of £2.7m. The significant driver of this underspend is costs being expensed under SaaS accounting rules. SaaS contract costs of £1.6m relating to this programme were expensed in year three, with underlying spend only £1.1m below allowances.

Our 2023/24 spend of £3.4m on vehicles and property was £0.7m higher than allowances, partly due to phasing of vehicle purchases. Cumulatively spend is £14.2m against allowances of £11m.

Spend on IT (TO) programmes, together with vehicles and property (excluding one-off costs incurred in 2021/22) is expected to further ramp up across the remaining RIIO-T2 period. Delivery of elements of our RIIO-T2 IT programme are closely interwoven with delivering our separation from National Grid. With the core activity for separation reaching a peak over years 3 and 4 of RIIO-T2, we expect our RIIO-T2 deliverables to continue to gather pace and hence recover to closer to forecast levels. However, we do forecast some underspend against allowances across the five year horizon of c£20m which is largely driven by the impact of SaaS and cloud computing related spend that has to be expensed under our accounting policies (this will be offset by higher spend in Indirect Opex).

In 2023/24, spend of £1.2m has been applied against our submitted Non-Operational Capex Uncertainty Mechanism. Cumulatively this totals £1.5m, against awarded allowances to this point of £2.1m. Ofgem directed RIIO-T2 UM allowances of £5m during the year for this category, which are still forecast to be spent by the end of year five.

We incurred no further expenditure for RIIO-T1 Non-Operational Capital Expenditure. These costs, cumulatively total £1.8m, and relate to the implementation of a new ERP system (SAP4 Hana), which is often referred to as MyFinance.

SO non-operational Capex

In 2023/24, non-operational SO Capex was £22.1m, which was £12.1m lower than our year three allowances. Cumulatively, our RIIO-T2 spend is £50.0m against allowances of £83.0m.

This variance was principally driven by lower spend in IT Capex, with the drivers for this being savings realised on the Gemini programme and increased spend expensed under SaaS accounting rules, in addition to a slower ramp up in spend than previously forecast. The Gemini programme spent c£7m less than year three allowances, due to savings being realised, in part due to a lower volume of regulatory change. In relation to SaaS contract costs, £2.0m of such spend was expensed in year three. The remaining underspend being linked to the ramp up of our separation programme as noted in the TO non-operational Capex section above.

Our RIIO-T2 SO Capital Expenditure forecast indicates c£23m of underspend against allowances over the five year period. This is driven by further expected savings on the Gemini programme, cumulatively c£16.6m, driven by efficiencies expected from implementation of the new platform and the impact of SaaS and cloud computing related spend that has to be expensed under our accounting policies (this will be offset by higher spend in Indirect Opex).

In 2023/24, spend of £2.9m has been attributed against our submitted Non-Operational Capex Uncertainty Mechanism. Cumulatively this totals £3.6m against allowances to this point of £8.9m. Ofgem directed RIIO-T2 UM allowances of £22.1m during the year for this category, which is still expected to be spent by the end of year five. The underspend to date being driven by the timing of hardware orders expected to now land in year four.

There were no additional unfunded costs incurred in 2023/24 for RIIO-T1 Capital Expenditure (SO) projects, all relating to SO Non-Operational Capex RIIO-T1 work for MyFinance. This is a cumulative cost of £4.2m.

IT and Telecoms

At the end of year three our investments in new strategic platforms are beginning to move to implementation. The Digital Asset Management (DAM) Programme delivers a step-change in our Enterprise Asset Management (EAM) capability, replacing life-expired systems that both constrained our ability to support change and our ability to support wider digitised data ingestion, transparency and coordination.

A key area of focus for our RIIO-T2 investments has been in National Gas's Data and Insights platform. We have identified different types of data consumers (Stakeholder personas) as part of our digitalisation strategy and continue to develop the platform to support them as part of our RIIO-T2 investments and adhering to data standards. Our investments in AI will build upon work with Machine Learning that we have undertaken in RIIO-T2 and will continue to be guided by best practice to ensure that our AI investments are both ethical, accurate, and reliable.

Alongside our RIIO-T2 investment programme, we have also undertaken work to separate from National Grid. This has provided us with the opportunity to move away from National Grid's legacy IT estate and to renew much of our architecture. Outside of our Critical National Infrastructure (CNI) systems we have moved completely to a Cloud IT architecture, enabling greater flexibility as we move towards the end of the RIIO-T2 period. Our new security architecture enables us to more easily onboard SaaS solutions, for example, and our Secure by Design framework improves our security posture and brings a greater depth of security to our internal networks with much greater segmentation and monitoring. In addition, we have undertaken initiatives to consolidate asset information in a single EAM system, paving the way for easier EAM to Enterprise Resource Planning (ERP).

Within the telecoms space we are consolidating the work that we have done with the introduction of Microsoft Teams and moving much of our telecoms focus away from legacy technologies towards the capabilities offered on this platform. We continue to monitor the opportunities offered by Low Earth Orbit (LEO) platforms and are investing in solutions to improve mobile data connectivity at our operational sites.

This flexibility, extensibility, and openness will also put us in a strong place to support the implementation of the NESO which will be required to support the evolving energy challenges for Great Britain. This evolution will require flexibility and fleetness by all industry participants. Our changes from RIIO-T2, separation from National Grid, and our future RIIO-T3 plans ensure that National Gas will be able to support the development of NESO and the wider industry.

Commercial, regulatory and markets

The industry wide commitment to deliver the Gemini Sustain Plus programme sustaining and enhancing Gemini Application work remains on track for delivery in 2024/25. It will provide enhanced reliability of the system alongside the continued support of the platform.

The regulatory driven Gemini System Enhancements programme encompasses the delivery of regulatory changes reflecting formalised requirements through the appropriate industry governance boards. GSO Regulatory and market driven changes encompasses industry changes that also typically impact non-Gemini systems. These include changes to support information provision and operational processes which are managed by Market Information Provision Initiative (MIPI) and Google Cloud Services platforms respectively.

Optimised system operations

A number of programmes are being delivered relating to optimised system operations, including:

- **Modelling and simulation (MASS)** - to build further on the National Gas Data and Insights Platform we have mobilised a modelling and simulation (MASS) programme of work which will enhance our network modelling capabilities and optimise decision-making tools within the Gas System Operator and Gas Transmission.
- **Data Science** - a data science workstream will deliver a prioritised set of modelling projects which includes enhanced Supply and Demand forecasting models for SO and improvements to managing unstructured data across the estate. A review of the Simone Online and Offline modelling systems will ensure there is a robust roadmap that aligns with National Gas strategy, to ensure the enablement of mobilisation of programmes and resource for any replacement or wholescale system enhancements in future years.
- **Safety and compliance** - this programme is a continuous delivery programme managing improvements to the suite of SO systems, and key changes were made in the power platform space enabling improved analytics and network analysis, improved reporting, and process improvements.
- **Gas Control Suite** - within the Gas Control Suite, we have rationalised the application estate and are reducing the number of virtual machines used, enabling us to safely minimise the environmental impact of running the suite. Core platform build on the new infrastructure is complete and scheduled for implementation in Summer 2024, with decommissioning of redundant support platforms to follow.
- **National Control Centre (NCC)**- the NCC video display wall replacement programme of works will ensure NCC technical and operational CNI capability in line with the evergreen strategy. The new hardware and software will be used to show a wider range of selectable data which supports the network operation displaying improved data visualisation of physical, commercial, team information.
- **Gas Telemetry** - the Gas Telemetry Network Refresh Programme will replace GTN telemetry network and core connectivity. This includes replacing GTN hardware at all remote sites refreshing Core Data Centre Connectivity allowing the real time monitoring and control of the NTS to ensure safety and adherence to license conditions.

Market and customer insights

To further support customers and stakeholders, we have continued our planned investment in New Information Provision this financial year and went live in Summer 2023 with enhancements to support data availability including a new custom download tool, improved data discoverability through user interface and reporting enhancements, and data visibility improvements via the creation of a Gas Transmission data portal, to help our stakeholders use the information that is available. We have also developed a new app based on Operational data that is provided in a simple and digestible format and is available to all customers and stakeholders.

Operations enablement

We have been working on migrating our Asset Protection processes to our customer relationship management System (CRM) platform and are due to go-live in Summer 2024. This will enable us to better manage relationships and unlock self-serve capability for landowners, ultimately enabling us to better protect our assets through enhanced data capture and be more proactive in identifying and managing risks.

We have mobilised a programme focused on improving field force systems and processes and building further on the capability of our Digitalised Workforce Management (DWM) system, expanding digitisation. Currently under development is additional time recording capability that will support our goal to achieve greater accuracy in time spent maintaining asset types for regulatory reporting. We have invested in tech health of our DWM system and as part of this have begun a rollout of connectivity solutions to ensure our workforce are always connected resulting in greater accuracy and validity of data captured out in the field. We have also recently gone-live with a new Competency Management system so that we can better manage skills and competencies of the workforce to improve safety

Data driven asset management

Our Digitalised Asset Management Programme will deliver new EAM capability as well as refreshed Drawings Management and Geospatial Information Systems Capabilities, along with adoption of BIM format for Digital construction, are progressing well with go-live anticipated in Summer 2024. We have further plans to continue to build on this core capability to align to our continued asset management maturity aspirations.

- **Enhanced Asset Design** - We have successfully procured and configured the Common Data Environment platform, ready to host the drawing data and onboard projects. To further support the onboarding of projects and upskilling the team, we have ran training sessions on the CDE system. Admin guides have been created and are currently in review to support the training scaling up activities going forward.

We have made good progress on standardisation, both in data and ways of working; while adopting ISO 19650 standards for Business Information Modelling (BIM), we have updated existing Exchange Information Requirement (EIR) and RE-21 documents along with all other Information Requirement (IR) templates (OIR, PIR, AIR) as well as pre-BIM Execution Plan (Pre-BEP), enabling us to be compliant with the ISO standard. These templates will be going through a business sign-off process in order to achieve a plan for adoption of the BIM standards.

We have continued to invest in tech health and refinements of our Asset investment planning system to increase the accuracy of our risk modelling capability.

Enterprise IT

- **ERP/SAP** - the SAP environment has continued to be maintained whilst planning and development of the future platform takes place in parallel. National Gas instance will be in production in Q2 of 2024/25.
- **ServiceNow** – we have implemented a National Gas instance of IT Service Management which has been developed with a focus on using built in features rather than customisable ones. This will help to reduce the cost and complexity of any future upgrades. It will provide a platform to enable the support team to better manage support services and puts the structure in place for an employee service centre to be released to users.

For digital workplace services we have carried on with the replacement and refresh of end user devices ensuring users have a modern device appropriate to their role.

Small tools, equipment, plant and machinery (STEPM)

In 2023/24, total STEPM Capex was £4.6m, which is in line with our Year 3 allowances.

Our spend in the first three years of RIIO-T2 has totalled £10.7m against allowances of £13.9m, with our current RIIO-T2 Capital Expenditure forecast remaining in line with allowances.

Non Operational Property

Non-operational property is made up by the core estate excluding any operational sites such as compressor stations etc. Following separation from National Grid, the core estate now includes the dedicated NGT floorplates in National Grid House (NGH, Warwick), the Warrington Archives and a workspace in London.

Non operational property allowances utilised for capital investment works (including refurbishment) at operational sites also has no separate RIIO-T2 operational property allowances. In 2023/24 works were undertaken at NGH, St Fergus, Cambridge, Chelmsford, Bacton and Churchover.

In 2023/24, non-operational property expenditure was £1.7m against Year 3 allowances of £2.9m. This compares to spend of £1.8m in 2022/23 across TO and SO. In 2023/24 planning and tender processes for procurement and frameworks for site refurbishments were in progress and spend is expected to ramp up in 2024/25 and 2025/26 on key operational sites, which require refurbishment to ensure continued safe and reliable workplaces for our people. .

Cumulatively we have spent £4.7m across TO and SO against allowances of £9.3m. Our total allowances for RIIO-T2 is £13.3m and we expect to spend this as spend catches up in the next 2 years.

Vehicle Fleet

The market conditions that have disrupted the vehicle manufacturing industry in recent years have largely abated, and in 2023/24 we have seen a reduction in vehicle lead times and stock being more readily available for the ad-hoc requirements of National Gas (such as vehicle write-offs).

The commercial vehicles ordered from mid-2022 have been delivered and whilst not all vehicles are out into operations yet, they have all been delivered to the convertor, who will brand and retrofit the vehicle on our behalf, to our specifications. We have not yet ordered the next round of replacements, but due to the length of time taken for the existing replacements to arrive, we are ordering two years' worth of vehicles at once to make up for the shortfall, and these will arrive within the RIIO-T2 period. This year we have received 20 Ford Rangers, 17 Toyota Hilux, two Ford Transit Customs, five Mercedes Sprinters and one Mercedes eCitan (EV).

Figure 59 - Converted 4x4 Toyota Hilux

Conversions over and above the vehicles stated above for this year have included:

- Two Nissan eNV200s (EV) that were delivered last year (previous years RRP data table)
- 11 Ford Transits (L2H2 Mechanical Technician specification)

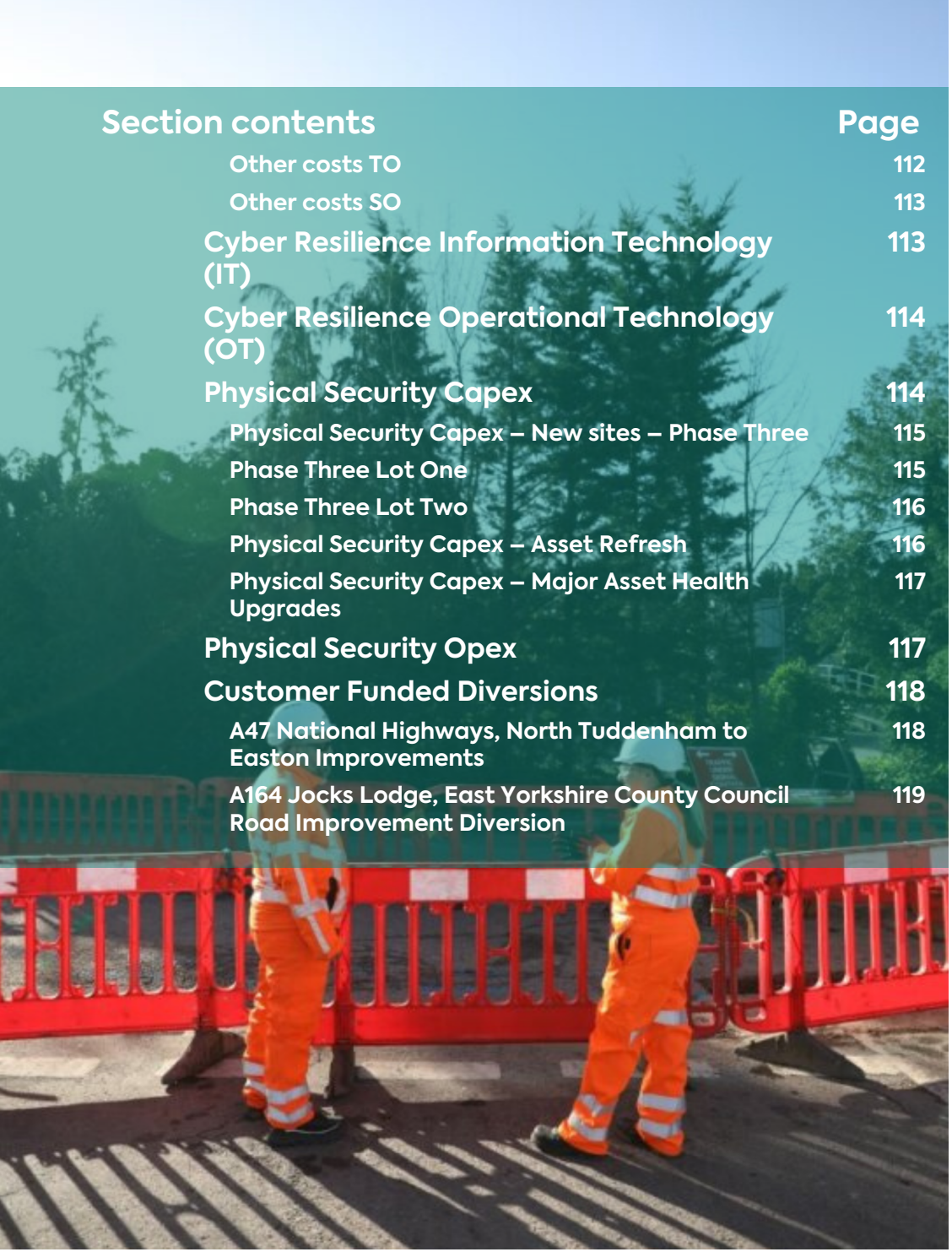
Vehicle numbers delivered are based on what has been invoiced in 2023/24 and will show on the RRP data table. This is the same for vehicle conversions, meaning that some vehicle conversions won't show on the RRP data table this year, as they have not yet been invoiced. Not all vehicles will be showing on the 2023/24 RRP data table (6.10) either, due to Ford not invoicing us for the vehicles in time. These will show up on the 2024/25 RRP data table. This includes 27 Ford Transits.

Over the first three years of the price control we have spent £2.7m. We anticipate that over the remaining years of the price control spend will be in line with our RIIO-T2 allowances.

Whilst delivery times for vehicles have improved, there are still some delays which are being driven by increased demand from Operations due to high volumes of vehicles at the conversion stage, as well as co-ordination with new suppliers fitting telematics devices and dashcams. To mitigate this we are speaking to our suppliers about developing a more co-ordinated approach between manufacturers/dealerships, convertors, and ancillary suppliers to make sure our build schedules are met going forward.

This year we have made good use of our telematics system, analysing vehicle mileage and travel patterns to ascertain if they are suitable for AFV (Alternatively Fuelled Vehicle) use or not. We have determined that our small panel van population are the most suitable at this time and we are looking to transition these over to BEVs (Battery Electric Vehicles). We are also planning to increase our EV charging infrastructure by introducing chargers to operational sites, based on the replacement cycles of the small panel vans. This should aid operational productivity and ease of use whilst maintaining resilience for our network. We will continue to use telematics to drive efficiencies in fuel costs, travel, and reducing emissions.

In addition, we plan to trial our first Hydrogen commercial vehicle this year through Stellantis (Vauxhall) to see how this works in an operational setting. This will be a large panel van, as we see Hydrogen working better in this area, as opposed to BEVs.



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XIII. Other costs

Other Costs includes Cyber IT and OT, Opex and Capex (table 6.9), Physical Security Opex (table 5.7) and Capex (table 6.6). This chapter also reports on Customer Funded Diversions (table 4.15).

Other costs TO

In 2023/24, our Other Costs (TO) Capex baseline spend was £76.4m, which was £29.2m below adjusted allowances of £105.6m. This was driven by an overspend in Physical Security Resilience (£3.9m), offset by underspend in Cyber Resilience IT (£0.8m) and Cyber Resilience OT (£32.6m).

Cumulatively for RIIO-T2, our Other Costs (TO) Capex spend is £160.4m, which is £44.0m below adjusted allowances of £204.4m, driven by underspend in Physical Security Resilience (£13.1m), Cyber Resilience IT (£1.9m), Cyber Resilience OT (£29.0m).

In 2023/24 we have also spent £6.9m against a £78.8m (£7.5m cumulatively to year 3) Cyber OT Capex Uncertainty Mechanism which was agreed by Ofgem during the year. We also spent a further £0.4m on T1 related spend, bringing the total to £7.3m: £1.8m Cyber IT and £5.5m PSUP.

For Other Costs (TO) Opex, our baseline spend in 2023/24 was £17.8m, which was £4.6m below Year 3 allowances of £22.4m. This was largely driven by underspend in Cyber Resilience OT (£3.5m), and Physical Security Resilience (£1.2m).

Cumulatively for RIIO-T2, our Other Costs (TO) Opex is £42.2m, which is £9.2m below allowances of £51.4m, largely driven by underspend in Physical Security Resilience (£1.8m), Cyber Resilience IT (£4.1m) and Cyber Resilience OT (£3.3m).

In 2023/24 we have also spent £0.5m against a £19.1m (£6.7m cumulatively to year 3) Cyber OT Opex Uncertainty Mechanism which was agreed by Ofgem during the year.

Overall on Cyber OT, National Gas is delivering the outcomes in line with the business plan as demonstrated through our reporting to the Competent Authority. The business plan was designed with complimentary workstreams introducing incremental controls alongside strategic asset replacements. Where challenges have been faced in strategic asset replacements, cyber resilience mitigations have been introduced through incremental controls and further design works to accommodate the outage restrictions. With the strategic asset replacement works behind programme, the cost phasing is also currently behind. This gap is forecast to close over the remainder of RIIO-T2 as outage mitigations are employed to deliver the works. We continue to engage with Ofgem throughout this process to deliver this programme of works.

PSUP is also a critical programme in RIIO-T2 and significant time has been spent evaluating alternative methodologies with the aim of delivering the most economic and efficient solution across the site portfolio. Lot 1 main site works are progressing well with Lot 2 main site works being mobilised.

Our (TO) Other Costs forecast remains broadly in line with RIIO-T2 allowances.

Other costs SO

In 2023/24, our Other Costs (SO) Capex is £1.1m, which was £1.4m below 2023/24 allowances of £2.5m. This was driven by an underspend on our Cyber Resilience IT programmes.

Cumulatively for RIIO-T2, our Other Costs (SO) Capex is £3.1m, which was £4.4m below allowances of £7.5m, again driven by lower Cyber Resilience IT spend.

Our RIIO-T2 forecast for this programme remains broadly in line with allowances.

There were no unfunded costs incurred in 2023/24 for Other Costs (SO).

Other Costs (SO) Opex spend was £1.6m, which was £0.1m below allowances of £1.7m. Cumulatively spend was £5.0m, in line with allowances. This spend all relates to Cyber IT.

Cyber Resilience Information Technology (IT)

The overall NGT cyber strategy is to eliminate, and where not achievable, reduce our cyber risks through pragmatic mitigation.

This is the third year of performance reporting for the category of Cyber IT, noting we have provided ongoing progress updates to the Competent Authority, alongside regular Network and Information Systems Regulations (NIS) advisory sessions. We have delivered on our Year 3 regulatory commitments, as detailed in our PCD submission. This includes delivery in areas including Vulnerability Management, and Security Orchestration, Automation and Response and Platform (SOAR) cyber controls.

Our Cyber IT PCDs are specified as a shared function under the National Grid Group led programme while we operate under a Transitional Service Agreement (TSA) following divestment to a consortium of Macquarie Asset Management and British Columbia Investment Management Corporation which completed on 31 January 2023. Our periodic PCD reports reflect the progress as reported by National Grid who remain responsible for delivery of these shared PCDs on behalf of the affected entities including National Gas, National Grid Electricity Transmission (ET), System Operator and Transmission Owner entities.

This divestment of our business and the associated steps to separate from National Grid continues in parallel with delivery of the Cyber IT PCDs and associated risk reduction and Cyber Assessment Framework (CAF) compliance. National Grid continues to deliver and report on the Cyber IT PCDs that they are responsible for under TSA. This ensures continuity while we stand up our own independent cyber capability.

Following divestment in 2023 we have stood up our own Security team and cyber strategy appropriate for our business, bringing all Security environments under our Chief Information Security Officer (CISO). We have used the January 2024 cyber resilience reopener to apply for relevant amendments to Cyber IT PCDs, to reflect the transition of security activities into our new stand alone business. These changes also update the deliverables within RIIO-T2.

In the 2023/24 financial year, £28.1m has been spent in total across existing and former National Grid entities relating to Cyber IT, of which £4.4m was attributable to NGT under the TSA. Furthermore, an additional charge of £0.2m was billed under the TSA, for which NGT is due a credit in 2024/25. In addition, we have initiated our own programme of work aligned to the Cyber Assessment Framework Enhanced Profile, a total of £1.8m has been spent.

Our total expenditure therefore is a sum of: National Grid Group Cyber IT (NGT allocated share) and NGT Cyber IT (projects delivered 100% by NGT for NGT).

Full details of the Cyber IT expenditure for 2023/24 are contained within our summer 2024 cyber resilience PCD status reports.

Cyber Resilience Operational Technology (OT)

The overall NGT cyber strategy is to eliminate, and where not achievable, reduce our operational technology cyber risks through pragmatic and timely intervention. We follow good practice from the Construction Design and Management (CDM) Regulations and apply the eliminate, reduce, isolate and control (ERIC) risk concept. This is framed by our objective to comply with the CAF and align with relevant international standards. We are particularly aligned to IEC 62443 for Operational Technology, which addresses technology that comprises control systems, work processes, countermeasures, and human interfaces in a holistic approach.

We continue to provide annual PCD reports to Ofgem with granular detail on progress, alongside our Network and Information System (NIS) advisory sessions and annual NIS self assessment. In addition, in 2023 we were subject to two NIS inspections by the Competent Authority, as we hold two Operator of Essential Service positions for the System Operator and Transmission Operator.

In the 2023/24 financial year, £84.3m was spent on delivering our RIIO-T2 Cyber OT activities. This represents a material increase compared to the previous year's spend of £55.8m but, remains lower than our forecast year 3 spend due to the confluence of a number of factors. Although we flagged risks around delivery including: supply chain; cost pressures; and skilled labour in both the 2023 reopener submission and through four cycles of PCD reporting, we did not fully appreciate the extent to which these challenges would interact and reinforce one another, or that many of these pressures were not transient.

This extends the programme and increases costs through "stage 2" contractor build. The high complexity of the projects has also led to difficulties completing all works in the permitted outage windows. This, in turn, is exacerbated by difficulties in obtaining additional outage windows or extending existing windows due to operational priorities. The underspend this year therefore represents a rephasing of spend as opposed to a real reduction. The activity of rephasing the programme of works will conclude in summer 2024. The resulting programme will impact RIIO-T2 and RIIO-T3.

In March 2023/24 NGT initiated a European Benchmarking Initiative with EU peers. The initiative seeks to capture data on major control system replacement projects, across a variety of European gas networks, in order to compare and contrast recent challenges in areas such as Technology, Supply Chain, Design, Labour Market and Subject Matter Expertise. It is hoped the study will eventually contribute to a wider understanding of post Brexit/Covid and Ukraine impacts on major network projects and infrastructure, and contribute to a shared "lessons learned".

As well as Control System Replacement projects, we have managed to improve Cyber OT resilience and accelerate compensating controls programmes, such as logical and physical detection, and access and barrier controls.

The implementation of the innovative 'least functionality' strategy on remotely operable valves (ROVs), whereby non-strategic remote valves are converted to local control, thus removing the 'threat surface' and the risk of a cyber-attack causing a security of supply incident, continues to deliver efficiencies in addition to being a more effective solution. This successful strategy is now being extended to other assets including gas quality and boundary control. We have completed the initial realignment of all boundary control systems across all sites and have worked with Ofgem and the GDN's to rationalise our gas quality assets.

The ongoing pilot project to understand the feasibility of running compressor stations and AGI's in 'island mode' has yielded valuable insight. This initiative (beyond original PCD's and baseline funding) has been integrated into the OT delivery programme. A full test was conducted at a compressor station in the north-west, with lessons learnt (including time-motion studies), captured and embedded.

Strong progress continues to be made in the roll out of the cyber PIN concept (an internal innovation concept), using access control incorporated into the telemetry system. This concept has been expanded with successful development of a cyber PIN equivalent for our metering systems.

Physical Security Capex

Our network is subject to a multitude of security threats, which are continually evolving and often increasing in sophistication and persistence. The Enhanced Physical Security (EPS) Programme is a government mandated initiative to enhance physical site security with all works closely evaluated by the DESNZ.

These enhancements were split into three phases. Phase One, was completed in March 2018. Phase Two, which included enhanced physical security at 20 sites was completed March 2022. Total spend on project closure in 2022/23 was £0.7m and £0.1m in 2023/24.

Physical Security Capex – New sites – Phase Three

As part of a review in 2014, a number of sites with shared ownership between GDNs and NGT were classified as requiring enhanced physical security (EPS) solutions to be delivered in RIIO-T2.

All these sites contain NGT assets that drive the requirement for enhanced physical security to DESNZ and National Protective Security Authority (NPSA) standards.

In 2023/24 steady progress has been made with a total spend of £6.1m (18/19 prices) compared to £8.1m in 2022/23. The total spend on Lot 1 sites in 2023/24 was £3.1m and spend on Lot 2 sites was £3.0m (18/19 prices).

Phase Three Lot One

The works have been split into two lots. All Lot 1 sites were progressed into construction and works have been completed with only commissioning remaining. All sites were powered up in November 2023.

Delays with fibre installation and commissioning by third party providers have meant that commissioning is delayed on all of the Lot 1 sites. Consequently, no output volumes have been claimed, due to this delay. The forecast completion date, including commissioning of all sites, is Summer 2024.

Figure 60 - Fencing and pedestrian gate

Figure 61 - Security tower with access platform comprising of CCTV, thermal cameras, audio challenge speakers and infrared and white lighting

Phase Three Lot Two

Designs for the Lot 2 sites have been completed and the work packages have all been awarded.

As part of the design, we have incorporated the use of an industry leading technology which has negated some construction works and the potential need for land acquisition.

Mobilisation of all sites is scheduled to start at the end of May 2024. During mobilisation of Lot 1, all sites were mobilised at the same time. The caused issues with GDN permits which impacted the contracted programme and cost.

For Lot 2, mobilisation has been staggered, with sites starting two weeks apart. Although this means a longer delivery programme, the benefit is better control of challenges during start up and avoidance of additional costs.

Tender returns for Lot 2 sites were higher than anticipated but still within the final determination allowances. This increase is due to both inflation, which impacted material and labour costs, and the requirement for additional equipment identified during detailed design.

We remain on track to deliver the Lot 2 programme within the RIIO-T2 price control period.

Total spend to date for the nine new build sites in RIIO-T2 is £15.3m compared to the baseline allowance of £25.5m (18/19 prices). Lot 1 was delivered efficiently, with savings achieved through long lead procurement, construction of the ISS kiosk off-site and innovative retrofit fencing. Lessons learnt from Lot 1 were incorporated in Lot 2, including using a staggered delivery approach to reduce resources, and ensuring that the Lot 1 MWC was involved in the design process for Lot 2 making the scope more comprehensive and the build techniques more favourable for suppliers, which in turn reduced overall risk exposure for all parties.

Furthermore, where appropriate we are utilising cam-post technology, to reduce the need for fence re-positioning and land purchase, to provide physical space and address operational hazard constraints.

Despite the increase in MWC costs (compared to baseline allowances) due to inflation, we anticipate that spend will be broadly in line with allowances and that we will deliver the nine new build sites by the end of RIIO-T2.

Physical Security Capex – Asset Refresh

The Asset Refresh Programme is targeting the upgrade of both technology and hardware assets at legacy Integrated Security Solution (ISS) sites. This programme is delivering upgrades to key infrastructure and equipment to ensure continued compliance with DESNZ and NPSA standards as well as ensuring that the optimum solution is installed to reflect advances in technology.

The total Asset Refresh programme consists of 35 sites and works are split across multiple geographic lots on a detailed design and build basis.

The construction contract for five sites, designated as priority sites by UK NPSA, was awarded in October 2023. Detailed design commenced for all sites in November 2023, with mobilisation planned for May 2024 and a forecast construction completion date of November 2024.

A further tender and construction contract award took place in March 2024 for a further 15 sites split into Lot 1 (10 sites) and Lot 2 (Five sites). The target completion date for these sites is March 2025.

To ensure delivery and completion of construction in RIIO-T2, the 15 sites will now be split into three separate Lots with different completion dates – Lot 3 (five sites), Lot 4 (seven sites) and Lot 5 (three sites). This arrangement allows us to manage supply chain and resource challenges by splitting the work between different suppliers.

We will hold a tender event in 2024/25 for Lots 3 and 4 with a target construction completion date of March 2025.

Three Lot 5 sites will be awarded, designed and materials procured in RIIO-T2, with construction and closure taking place in RIIO-T3. This Lot will be funded as part of our RIIO-T3 business plan.

In 2023/24 we spent £1.0m on Asset Refresh activities compared to £1.3m in 2022/23 (18/19 prices). Overall spend to date in RIIO-T2 is £2.3m compared to the baseline allowance of £8.0m (18/19 prices). We are anticipating delivery of the RIIO-T2 Asset Refresh works will be broadly in line within allowances.

This is achieved by bulk procurement of network switches, combining works with the Physical Security for OT programme and accelerating Fence Perimeter Intrusion Technology utilising triggered risk funds within PCD-P. Without these savings and efficiencies, the project could not deliver within allowances.

Physical Security Capex – Major Asset Health Upgrades

The major asset health upgrades are being executed as part of the asset refresh works, albeit via a separate investment sanction. These works are centred on upgrading elements of the security systems at two sites.

At the first site, works have been split into three phases: Phase 1 – Vehicle Gates A and B, Phase 2- Access Control and Muster System and Phase 3- Remaining Asset Refresh.

Gate A was completed in December 2023. For Gate B, design is underway and works are planned to start in the first financial quarter of 2024/25.

The Access Control and Muster System works were directly awarded due to efficiencies with mobilisation and site experience. Design is underway and works are expected to be completed by October 2024.

For the second site, the Site-Specific Operational Requirement (SSOR) document is being reviewed internally by our Cyber team to align with Asset Refresh and explore an opportunity for joint tender to achieve procurement cost savings.

Total spend on Asset refresh Major Asset Health Upgrade (Sites 118 and 174) in 2023/24 was £0.6m compared to £0.3m in 2022/23 (18/19 prices). Overall spend to date in RIIO-T2 is £1.0m compared to the baseline allowance of £3.9m (18/19 prices).

Physical Security Opex

The aim of the Enhanced Physical Site Security solution is to deter, delay, detect and gather evidence of unauthorized access to our sites. This guides both the selection of equipment and our asset management throughout the solution lifecycle.

Enhanced Physical Site Security services and support commence upon completion of the Enhanced Physical Security solution. At National Gas Transmission sites, these services are managed by the National Grid Security Control Centre (SCC).

Operational expenditure for the Physical Security estate is categorised into either ‘fixed’ or ‘variable’ charges. ‘Fixed’ charges relate to sites which are supported by the SCC and cover non-time sheet staff, procurement costs, and asset maintenance (e.g., security assets in the SCC).

’Variable’ expenses, cover completed work, hardware and services delivered to our offices.

Our expenditure for 2023/24 amounted to £5.4m compared to an Ofgem allowance of £6.6m. Our five year forecast remains unchanged, with a total of nine ISS sites forecasted for this period.

Customer Funded Diversions

National Gas has an obligation to protect the NTS from any adverse impacts caused by third party construction activities. Third-party activities can include road improvement schemes by National Highways or new housing developments requiring us to divert the NTS away from planned works.

During 2023/24 we completed two diversions; the A47 National Highways road improvement scheme and the A164 Jocks Lodge, East Yorkshire County Council road improvement scheme.

In addition, we have advanced the development of a further two customer funded diversions which are due to take place over 2024/2025.

A47 National Highways, North Tuddenham to Easton Improvements

Feeder 3 has been undergoing a diversion, to maintain the integrity of our pipeline in compliance with requirements, as part of the A47 dual carriageway upgrade by National Highways.

The works began in July 2023. The diversion and pipeline installation occurred between September 2023 and February 2024. This comprised of 330m open-cut and 130m micro-tunnelling to complete the full 460m diversion. Permanent pipeline protection slabs were laid above the pipeline as part of the diversion, to mitigate subsequent loading from the future A47 road scheme and construction activities.

To facilitate the successful delivery of the project, we held a joint planning session to align the project key activities and milestones. This session identified misalignments which were discussed and addressed enabling quick resolution and helping to avoid potential issues.

The necessary pipeline tie ins are now complete, and the feeder is back in operation. All remaining activities will be completed in 2024/25, with reinstatement of the pipeline and demobilisation of the site expected in June 2024.

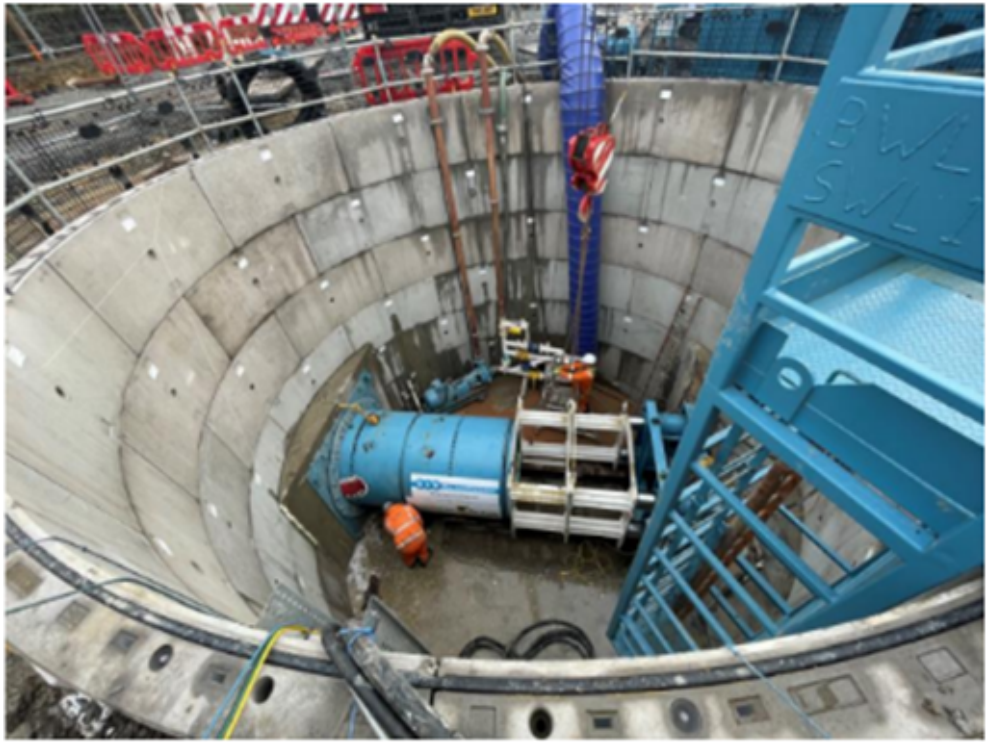


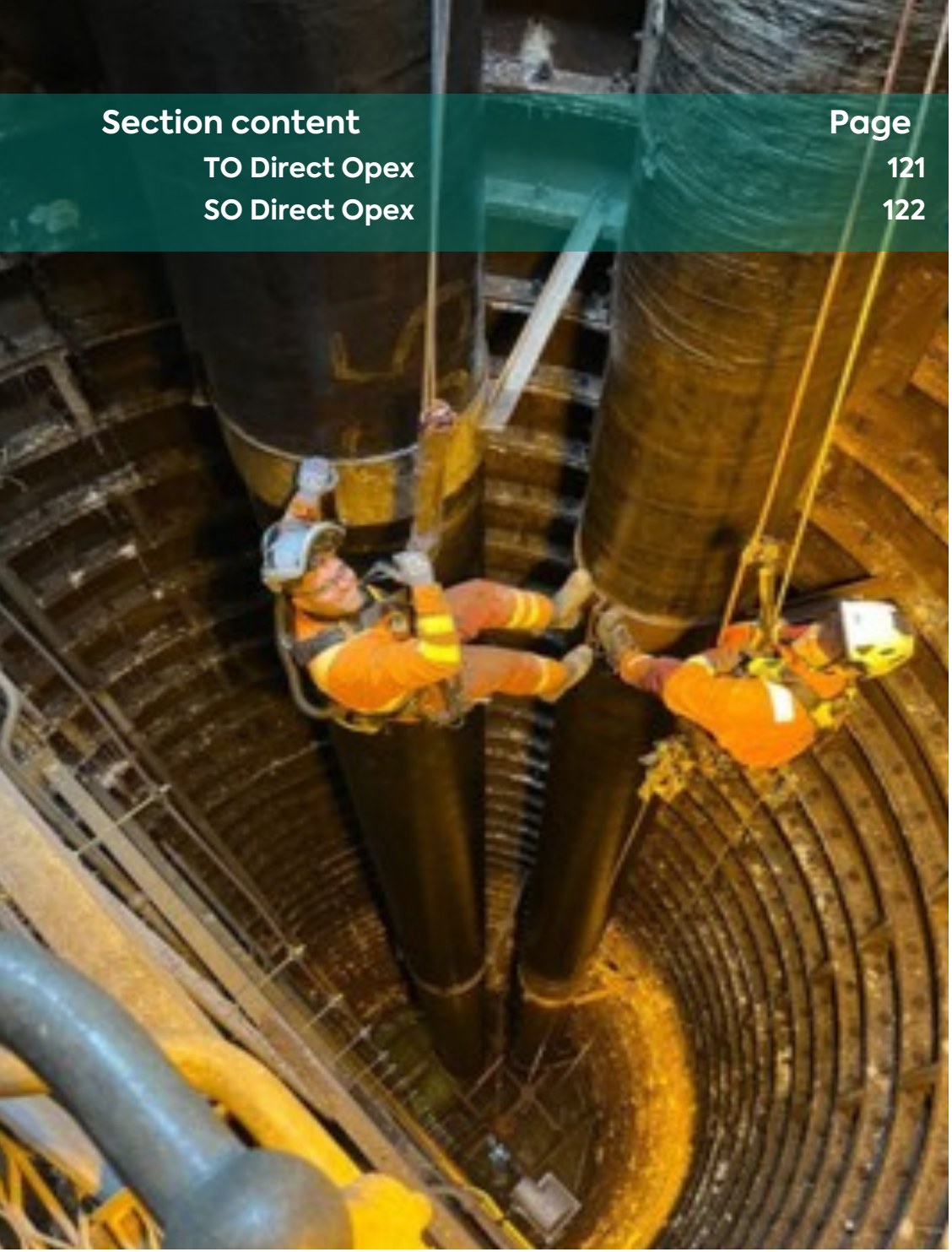
Figure 62 - Micro tunnelling at the A47 National Highways project

Figure 63 - Tunnel pipe insertion

A164 Jocks Lodge, East Yorkshire County Council Road Improvement Diversion

The diversion of Feeder 29 was undertaken using the open cut method moving the existing pipeline away from the proposed A164 road improvement scheme. The MWC completed the 216m diversion in December 2023 and successfully handed over to allow the road improvements scheme to begin.

Figure 64 - Jocks Lodge A164 diversion



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VII. Network operating costs (Direct Opex)

TO Direct Opex

In 2023/24, Total Direct Opex costs were £35.7m, £0.3m above allowances of £35.4m. Note: PSUP Opex is being covered in Other costs in XIII Other Costs section. The breakdown of costs is as follows:

- Planned maintenance represents £17.1m of the total cost, which was £8.4m below allowances of £25.5m
- Unplanned Maintenance (Faults) were £9.2m, £4.3m above allowances of £4.9m
- Therefore, the net maintenance costs were £4.1m below allowances of £30.4m.
- Operational Property costs were £9.5m, £4.5m above allowances of £5m.

Cumulatively Direct Opex costs were £108.5m, £0.6m above allowances of £107.9m. Planned Maintenance related to £59.3m of cumulative spend, £18.5m below allowances and Unplanned Maintenance was £23.9m, £8.8m above allowances. Operational Property costs were cumulatively £25.3m, £10.3m above allowances.

Reduced Planned Maintenance costs were driven by a broad mix of factors including the following:

- Increased capitalisation of labour costs due to greater involvement from Gas Operations in delivery of the capital programme
- Capitalisation of costs associated with Marker Post replacements
- Continued labour cost savings through reduction in agency staff costs across Operations, plus control and governance around both overtime usage and operating within headcount mandates
- Procurement efficiencies year-on-year, improved cross-team working, insourcing where possible and a focus on productivity (through increased work order completion and utilisation on project work) have also contributed to savings
- Improved cost visibility (via focused reporting on key cost lines) has also contributed to Opex savings, providing actionable insights over third party cost allocations and timesheet compliance

- Planned maintenance costs have reduced year-on-year by £2.8m driven by the above factors.

Savings on Planned Maintenance were offset by increased Fault Maintenance costs:

- The higher fault costs were primarily driven by an increase in DSEAR defects and higher than expected levels of unplanned Line-walking.
- High levels of Valve related defects were also resolved, having identified issues following the standard 1-2 yearly checks on these assets. This was further influenced by resolution of a backlog of defects built up since Covid-19 disruptions
- To safe-guard assets against prior year's winter resilience risks and network criticality requirements, additional expenditure was incurred for strategic spares and non-routine maintenance to mitigate breakdown risks
- These factors have also contributed to higher year-on-year Fault related costs (£1.1m increase)

Operational Property costs were £4.5m above allowances, primarily driven by higher costs associated with Own Use Electricity:

The increases in unit costs have been significantly above the average rate of inflation

- Compared to 2021/22 unit rates (where there was greater price stability), the 2023/24 rates for the spring/summer period saw a +155% increase in average and +27% increase for the autumn/winter period.
- Electricity usage has not increased substantially versus prior years, with the increase in cost against allowances (and year-on-year) attributable to the high energy prices experienced since 2022/23.

SO Direct Opex

Total SO direct controllable Opex costs for 2023/24 were £22.4m (compared to £22.8m in 2022/23), which is £7.0m lower than the RIIO-T2 allowance of £29.4m. The underspend is driven by a challenging recruitment environment with high competition for skilled labour but the need to increase headcount continues and is reflected in the RIIO-T3 plan.

During 2023/24 there was an average of 24 vacancies within the SO - due to recruitment challenges. The vacancies were primarily in specialist areas such as, Markets, Commercial and Incentives and Energy Resilience. The SO has seen improved recruitment at the start of 2024/25, with only nine currently vacant roles remaining in May.

Going forwards and into RIIO-T3, further recruitment is expected in the SO to support NESO, National Control Centre Capabilities, Safety, Risk and Compliance, Market Modelling and Emergency Response.

When compared to 2022/23, 2023/24 spend was £0.4m lower largely reflecting £0.9m lower Xoserve costs for the running of the Gemini application, and £0.5m reclassification of GT President Costs from this table to CEO (tables 5.9/5.2) partly offset by (£0.6m) ramp up in teams as we prepare for RIIO-T3 and (£0.4m) new Energy Resilience capability.

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XV. Indirect Opex

In 2023/24, total Indirect Opex Costs (across TO and SO for Business support costs, Closely Associated and Quarry and Loss) were £103.3m, compared to a total allowance of £91.9m.

The majority of this overspend is related to IT expenditure where the full year impact of TSA and increased project spend has been driven by the implementation of SaaS and cloud-based solutions as part of our RIIO-T2 investments, which cannot be capitalised.

Cumulatively total Indirect Opex Costs were £270.4m against allowances of £279.3m.

NGT TO BSC

TO Business Support costs were £41.6m for 2023/24 which is £11.4m higher than allowances. Cumulative spend was £98.0m compared to allowances of £93.6m. This largely relates to increases in IT costs, reflecting increased project spend relating to SaaS and cloud-based solution which cannot be capitalised and a full year operating under TSA arrangements. Property costs have also increased following the introduction of an LTA (Long Term Agreement). Finance and Regulation costs have also increased as we prepare for additional workload required to develop the RIIO-T3 submission. In addition to this, changes in our allocations relating to our Corporate 4-point measure profile (Turnover, Operating Profit, Net Assets and Headcount) since separation have seen an increase in TO headcount, offset by reductions in SO headcount.

When compared to the previous year, costs are £14.3m higher, reflecting higher IT costs (£4.3m), Finance costs (£3.6m), CEO costs (£3.5m), Property costs (£1.4m), HR costs (£1m) and Procurements costs (£0.5m).

NGT SO BSC

SO Business Support costs were £24.4m for 2023/24 which is £3.7m higher than allowances. Cumulative spend was £60.1m compared to allowances of £63.6m.

When compared to 2022/23 costs were £6.1m higher reflecting a £5.9m increase in IT costs reflecting increased project spend relating to SaaS and cloud-based solution which cannot be capitalised and a full year operating under TSA arrangements.

NGT TO CAI

TO Closely Associated costs were £25.8m for 2023/24, which is £1.5m lower than allowances. For the RIIO-T2 period spend so far is £73.8m, £7.1m lower than allowances. Year-on-year costs are £0.3m lower, with some offsetting variances.

NGT SO CAI

SO Closely Associated costs were £5.5m, which is lower than allowances of £8.8m. This is largely due to lower CNI spend in 2023/24. Cumulatively spend is £21.1m compared to allowances of £26.7m. When compared to 2023/24 spend was £0.9m lower largely due to IT costs.

Quarry and Loss

Quarry and Loss costs were £3.1m for 2023/24 which is £1.8m higher than allowances of £1.3m, largely due to the continued high level of drainage claims. Year-on-year costs and volumes of drainage claims have reduced by £1.2m and volumes from 266 to 246 in 2023/24.

The provision has been increased by £3m in the year to reflect the expected higher costs of claims, particularly in the Southwest of England.

Appendix I – Totex Table

Regulatory Reporting Pack
Price base - 2018/19
Regulatory Year: April 2023 - March 2024
Totex Summary

TO/	TIM	Cost Cap	Cost Cost Area	Cap/Op	Cost Cat	Unit	2018/19 prices RIIO-T2 2022	2023	2024	2025	2026
Total Totex Performance TO & SO - Variance Summary						£m 18/19	**- 49.3**	**- 116.8**	**- 110.2**	**66.7**	**167.4**
Total Totex Forecast Spend TO & SO						£m 18/19	**364.4**	**411.5**	**483.2**	**854.4**	**1,066.7**
Total Totex Allowances TO & SO						£m 18/19	**413.7**	**528.3**	**593.3**	**787.7**	**899.3**
Transmission Owner											
Actual / Forecast Totex											
TO	Act/Fcnet	Cost	Load Related	Capex		£m 18/19	5.1	4.0	2.4	4.0	1.7
TO	Act/Fcnet	Cost	Non-load related	Capex	Compressor emissions	£m 18/19	16.8	26.5	31.8	29.2	35.8
TO	Act/Fcnet	Cost	Non-load related	Capex	Asset Health	£m 18/19	44.9	65.5	83.8	89.4	112.5
TO	Act/Fcnet	Cost	Non-load related	Capex	Other Non-load	£m 18/19	43.5	46.4	27.5	31.2	47.8
TO	Act/Fcnet	Cost	Non-operational capex	Capex		£m 18/19	31.4	8.3	19.6	26.7	13.0
TO	Act/Fcnet	Cost	Other	Capex		£m 18/19	31.7	59.6	76.4	90.5	96.9
TO	Act/Fcnet	Cost	Indirect	Opex		£m 18/19	59.6	69.1	85.6	74.6	69.5
TO	Act/Fcnet	Cost	Network operating costs	Opex		£m 18/19	41.2	42.8	41.1	64.3	78.0
					Total	£m 18/19	**274.2**	**322.2**	**368.2**	**410.0**	**455.2**
TO	Act/Fcnet	Cost	Load Related	Capex		£m 18/19	2.4	6.8	8.4	10.1	50.5
TO	Act/Fcnet	Cost	Non-load related	Capex	Compressor emissions	£m 18/19	-	-	0.7	8.6	17.4
TO	Act/Fcnet	Cost	Non-load related	Capex	Asset Health	£m 18/19	16.4	16.1	17.2	-	-
TO	Act/Fcnet	Cost	Non-load related	Capex	Other Non-load	£m 18/19	-	-	-	-	-
TO	Act/Fcnet	Cost	Non-operational capex	Capex		£m 18/19	-	0.3	1.2	2.0	1.4
TO	Act/Fcnet	Cost	Other	Capex		£m 18/19	-	-	6.8	32.8	39.1
TO	Act/Fcnet	Cost	Indirect	Opex		£m 18/19	-	-	0.6	2.0	16.6
TO	Act/Fcnet	Cost	Network operating costs	Opex		£m 18/19	-	-	-	-	-
					Total UM	£m 18/19	**18.8**	**23.2**	**34.9**	**55.4**	**125.2**
					Total Actual/Forecast Spend	£m 18/19	**293.0**	**345.4**	**403.1**	**465.4**	**580.4**
				No	**Additional UMs per Pipeline log**	£m 18/19	-	-	- 0.0	280.4	383.0
					Total Totex Forecast Spend	£m 18/19	**293.0**	**345.4**	**403.1**	**745.8**	**963.4**
TO	Non-TIM	Act/Fcnet	Cost	Non-TIM Totex Memo	Total	£m 18/19	26.2	57.7	84.9	-	-

Allowances											
TO	Allwn net	Cost	Load Related	Capex		£m 18/19	2.0	2.9	2.4	2.0	1.7
TO	Allwn net	Cost	Non-load related	Capex	Compressor emissions	£m 18/19	12.2	34.7	59.7	20.6	1.1
TO	Allwn net	Cost	Non-load related	Capex	Asset Health	£m 18/19	80.6	105.7	104.2	65.2	77.8
TO	Allwn net	Cost	Non-load related	Capex	Other Non-load	£m 18/19	18.4	28.6	24.7	21.3	20.4
TO	Allwn net	Cost	Non-operational capex	Capex		£m 18/19	26.1	24.6	22.0	20.0	18.9
TO	Allwn net	Cost	Other	Capex		£m 18/19	40.5	75.3	121.4	114.4	78.5
TO	Allwn net	Cost	Indirect	Opex		£m 18/19	62.6	63.8	62.2	54.1	52.2
TO	Allwn net	Cost	Network operating costs	Opex		£m 18/19	42.4	42.1	42.0	43.7	40.2
					Total	£m 18/19	**284.7**	**377.8**	**438.6**	**341.3**	**290.8**
TO	Allwn net	Cost	Load Related	Capex		£m 18/19	2.4	7.0	7.4	11.6	48.4
TO	Allwn net	Cost	Non-load related	Capex	Compressor emissions	£m 18/19	-	-	0.7	8.6	17.4
TO	Allwn net	Cost	Non-load related	Capex	Asset Health	£m 18/19	16.4	16.1	17.2	-	-
TO	Allwn net	Cost	Non-load related	Capex	Other Non-load	£m 18/19	-	-	-	-	-
TO	Allwn net	Cost	Non-operational capex	Capex		£m 18/19	-	0.5	1.6	1.6	1.3
TO	Allwn net	Cost	Other	Capex		£m 18/19	0.5	1.2	5.9	25.2	46.0
TO	Allwn net	Cost	Indirect	Opex		£m 18/19	0.0	2.1	4.6	5.6	6.8
TO	Allwn net	Cost	Network operating costs	Opex		£m 18/19	-	-	-	-	-
					Total UM	£m 18/19	**19.4**	**26.9**	**37.3**	**52.6**	**119.9**
				No	**Additional UMs per Pipeline log**	£m 18/19	-	-	- 0.0	280.4	383.0
TO	Allwn net	Cost	Load Related	Capex		£m 18/19	0.0	0.1	0.0	0.0	-
TO	Allwn net	Cost	Non-load related	Capex	Compressor emissions	£m 18/19	-	-	-	-	-
TO	Allwn net	Cost	Non-load related	Capex	Asset Health	£m 18/19	-	-	-	-	-
TO	Allwn net	Cost	Non-load related	Capex	Other Non-load	£m 18/19	8.2	15.0	6.2	3.3	3.9
TO	Allwn net	Cost	Non-operational capex	Capex		£m 18/19	1.9	2.2	0.7	0.6	0.7
TO	Allwn net	Cost	Other	Capex		£m 18/19	1.6	2.6	0.5	0.3	0.3
TO	Allwn net	Cost	Indirect	Opex		£m 18/19	7.3	8.9	3.2	2.8	3.4
TO	Allwn net	Cost	Network operating costs	Opex		£m 18/19	-	-	-	-	-
					RPEs	£m 18/19	**19.0**	**28.8**	**10.7**	**7.0**	**8.4**
					Total Allowances	£m 18/19	**323.0**	**433.5**	**486.7**	**681.3**	**802.1**
Performance vs Allowance											
TO	variar net	Cost	Load Related	Capex		£m 18/19	3.0	0.8	1.0	0.5	2.2
TO	variar net	Cost	Non-load related	Capex	Compressor emissions	£m 18/19	4.6	- 8.2	- 27.9	8.6	34.7
TO	variar net	Cost	Non-load related	Capex	Asset Health	£m 18/19	- 35.7	- 40.2	- 20.4	24.2	34.6
TO	variar net	Cost	Non-load related	Capex	Other Non-load	£m 18/19	16.9	2.7	- 3.5	6.6	23.5
TO	variar net	Cost	Non-operational capex	Capex	Non-operational capex	£m 18/19	3.4	- 18.6	- 3.6	6.6	- 6.5
TO	variar net	Cost	Other	Capex		£m 18/19	- 10.8	- 19.6	- 44.6	- 16.6	11.2
TO	variar net	Cost	Indirect	Opex		£m 18/19	- 10.4	- 5.7	16.2	14.1	23.7
TO	variar net	Cost	Network operating costs	Opex		£m 18/19	- 1.1	0.7	- 0.8	20.6	37.8
					Additional UMs per Pipeline log	£m 18/19	-	-	-	-	-
					Total	£m 18/19	**- 30.0**	**- 88.1**	**- 83.6**	**64.5**	**161.3**

System Operator

Actual / Forecast Totex

SO	Act/Fi net	Cost	Non-operational capex	Capex		£m 18/19	16.2	16.0	22.1	37.6	14.8
SO	Act/Fi net	Cost	Other	Capex		£m 18/19	1.8	0.3	0.7	2.3	2.3
SO	Act/Fi net	Cost	Indirect	Opex		£m 18/19	28.7	26.2	31.6	29.9	32.6
SO	Act/Fi net	Cost	Network operating costs	Opex		£m 18/19	24.7	22.8	22.4	22.2	24.3
					Total Baseline	£m 18/19	**71.4**	**65.2**	**76.7**	**92.0**	**74.0**
SO	Act/Fi net	Cost	Non-operational capex	Capex		£m 18/19	0.0	0.8	2.9	6.6	11.9
SO	Act/Fi net	Cost	Other	Capex		£m 18/19	-	-	0.4	-	-
SO	Act/Fi net	Cost	Indirect	Opex		£m 18/19	-	-	0.1	-	-
SO	Act/Fi net	Cost	Network operating costs	Opex		£m 18/19	-	-	-	-	-
					Total UM	£m 18/19	**0.0**	**0.8**	**3.4**	**6.6**	**11.9**
					Total Actual/Forecast Spend	£m 18/19	**71.4**	**66.0**	**80.1**	**98.6**	**85.9**
				No	**Additional UMs per Pipeline log**	£m 18/19	-	-	-	10.0	17.4
					Total Totex Forecast Spend	£m 18/19	**71.4**	**66.0**	**80.1**	**108.6**	**103.3**

Allowances

SO	Allwn net	Cost	Non-operational capex	Capex		£m 18/19	23.7	25.1	34.2	26.7	15.7
SO	Allwn net	Cost	Other	Capex		£m 18/19	3.1	5.1	4.2	-	-
SO	Allwn net	Cost	Indirect	Opex		£m 18/19	30.8	30.3	29.7	30.6	30.3
SO	Allwn net	Cost	Network operating costs	Opex		£m 18/19	29.3	29.6	29.4	29.2	28.6
					Total Baseline	£m 18/19	**86.8**	**90.1**	**97.6**	**86.5**	**74.6**
SO	Allwn net	Cost	Non-operational capex	Capex		£m 18/19	0.0	0.7	8.2	9.1	4.1
SO	Allwn net	Cost	Other	Capex		£m 18/19	-	-	-	-	-
SO	Allwn net	Cost	Indirect	Opex		£m 18/19	-	-	-	-	-
SO	Allwn net	Cost	Network operating costs	Opex		£m 18/19	-	-	-	-	-
					Total UM	£m 18/19	**0.0**	**0.7**	**8.2**	**9.1**	**4.1**
				No	**Additional UMs per Pipeline log**	£m 18/19	-	-	-	10.0	17.4
SO	Allwn net	Cost	Non-operational capex	Capex		£m 18/19	1.1	1.2	0.4	0.2	0.2
SO	Allwn net	Cost	Other	Capex		£m 18/19					
SO	Allwn net	Cost	Indirect	Opex		£m 18/19	2.7	2.7	0.6	0.5	0.9
SO	Allwn net	Cost	Network operating costs	Opex		£m 18/19					
					Total RPE	£m 18/19	**3.8**	**3.9**	**0.9**	**0.7**	**1.1**
					Total	£m 18/19	**90.7**	**94.7**	**106.7**	**106.4**	**97.2**

Performance vs Allowance

SO	variar net	Cost	Non-operational capex	Capex		£m 18/19	- 8.7	- 10.3	- 17.8	8.1	6.6
SO	variar net	Cost	Other	Capex		£m 18/19	- 1.3	- 4.9	- 3.1	2.3	2.3
SO	variar net	Cost	Indirect	Opex		£m 18/19	- 4.7	- 6.7	1.4	- 1.2	1.4
SO	variar net	Cost	Network Operating Costs	Opex		£m 18/19	- 4.5	- 6.8	- 7.1	- 6.9	- 4.3
					Additional UMs per Pipeline log	£m 18/19	-	-	-	-	-
					Total	£m 18/19	**- 19.3**	**- 28.7**	**- 26.6**	**2.2**	**6.1**

Appendix II – Published Outputs

Regulatory Reporting Pack
Price base - 2018/19
Regulatory Year: April 2023 - March 2024
Customer and Stakeholder Satisfaction Survey Scores

				Actual	Actual	Actual	Fcast	Fcast
				RIIO-T2				
			Unit	2022	2023	2024	2025	2026
Survey Results								
Customer Satisfaction (CSAT)								
CSAT Score								
Que 1	Gas Markets Policy and Change Service		num	8.5	8.5	7.4		
Que 2	Connections Service		Num	8.2	8.6	8.6		
Que 3	Gas National Control Centre (GNCC) service		Num	10.0	9.0	7.5		
Que 4	Energy Balancing Services		Num	8.9	9.0	9.0		
Que 5	Maintenance Service		Num	9.1	9.3	9.0		
Que 6	National Gas Events		Num	8.5	8.6	8.4		
Que 7	Capacity Auction Service		Num	8.4	8.3	8.6		
Que 8	Project Union (2023 onwards)		Num	n/a	n/a	9.0		
Que 9	Operational Liaison		Num	n/a	n/a	9.1		
Que 10	Diversions (included in Connections from 20/21 onwards)		Num	n/a	n/a	n/a		
Que 11	Day to Day Account Management (Operational Liaison 2023 onwards)		Num	8.4	8.2	n/a		
Que 12	Construction Service (Maintenance 2022 onwards)		Num	9.5	n/a	n/a		
Incentives	Customer Satisfaction Survey Score	CSPt	Score	8.6	8.6	8.6	8.5	8.5
CSAT Count								
Que 1	Gas Markets Policy and Change Service		Num	13	12	10.0		
Que 2	Connections Service		Num	5	14	8.0		
Que 3	Gas National Control Centre (GNCC) service		Num	1	1	2.0		
Que 4	Energy Balancing Services		Num	11	10	6.0		
Que 5	Maintenance Service		Num	14	7	7.0		
Que 6	National Gas Events		Num	27	46	17.0		
Que 7	Capacity Auction Service		Num	6	6	11.0		
Que 8	Project Union (2023 onwards)		Num	n/a	n/a	2.0		
Que 9	Operational Liaison		Num	n/a	n/a	14.0		
Que 10	Diversions (included in Connections from 20/21 onwards)		Num	n/a	n/a	n/a		
Que 11	Day to Day Account Management (Operational Liaison 2023 onwards)		Num	16	17	n/a		
Que 12	Construction Service (Maintenance 2022 onwards)		Num	2	n/a	n/a		
Incentives	Customer Satisfaction Survey Count	CSPt	Count	95	113	77	-	-
Stakeholder Satisfaction								
SSAT Score								
Que 1	Capacity Auction Service		Num	10.0	n/a	n/a		
Que 2	National Gas Events		Num	8.5	8.7	8.5		
Que 3	Gas Markets Policy and Change Service		Num	8.7	8.8	9.0		
Que 4	Operational Liaison		Num	n/a	n/a	10.0		
	Stakeholder Satisfaction Survey Score		Score	8.5	8.7	8.8	-	-
SSAT Count								
Que 1	Capacity Auction Service		Num	1	n/a	n/a		
Que 2	National Gas Events		Num	55	76	21.0		
Que 3	Gas Markets Policy and Change Service		Num	15	8	18.0		
Que 4	Operational Liaison		Num	n/a	n/a	1.0		
	Stakeholder Satisfaction Survey Count		Count	71	84	40	-	-

Regulatory Reporting Pack
Price base - 2018/19
Regulatory Year: April 2023 - March 2024
Gas Constraints

					Actual			Projection	
	Revenue Streams	**Licence Terms**	**Entry/Exit**	**Units**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**
Constraint management revenues	Sale of Non-obligated Entry Capacity (incl accelerated release)	RNOEC	Entry	£m	1.9	2.7	**2.5**	**-**	**-**
	*(RNOEC*0.14)*		Entry	£m	0.3	0.4	0.3	-	-
	Sale of Non-obligated capacity forming accelerated release	RAREnCA	Entry	£m	-	-	**-**	**-**	**-**
	*(RAREnCA*0.14)*		Entry	£m	-	-	-	-	-
	Locational sell actions	RLOC	Entry	£m	3.3	1.2	-		
	Locational sell actions	RLOC	Exit	£m			-	-	-
	Physical renomination incentive charges	RLOC	Entry	£m	-	0.0	-		
	Total RLOC		Entry	£m	3.3	1.2	-	-	-
	Sale of Non-obligated Exit Capacity	RNOExC	Exit	£m	**8.8**	**20.6**	**4.7**	**-**	**-**
	*(RNOExC*0.14)*		Exit	£m	1.2	2.9	0.7	-	-
	Any further revenues derived by the licensee that the Authority directs to include	RADD		£m	**-**	**-**	**-**	**-**	**-**
	Total CM Revenues (with 14% scaling)			£m	4.9	4.5	1.0		

				Actual			Projection	
Constraint management costs	**Licence Terms**	**Entry/Exit**	**Units**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**
Operational buying back of entry capacity	EnCMOpC	Entry	£m	-	-	-	-	-
Locational buy actions	EnCMOpC	Entry	£m	-	1.2	-	-	-
Locational buy actions (regarding an Entry constraint)	EnCMOpC	Exit	£m			-	-	-
Turnup or turndown contracts	EnCMOpC	Entry	£m	-	-	-	-	-
Total EnCMOpC		Entry	£m	-	1.2	-	-	-
Operational Buying back of exit capacity	ExCMOpC	Exit	£m	-	-	-	-	-
Locational buy actions (regarding an exit constraint)	ExCMOpC	Entry	£m	-	-	-	-	-
Locational buy actions (regarding an exit constraint)	ExCMOpC	Exit	£m	-	-	-	-	-
Turnup or turndown contracts (at an Exit point)	ExCMOpC	Exit	£m	-	-	-	-	-
Offtake flow reductions	ExCMOpC	Exit	£m	-	-	-	-	-
Total ExCMOpC		Exit	£m	-	-	-	-	-
Total CMOpC			£m	-	1.2	-		
Total ExBBCNLRA	ExBBCNLRA	Exit	£m	**-**	**-**	**-**	**-**	**-**
Investment constraint management costs (entry)	EnCMInvC	Entry	£m	-	-	**-**	**-**	**-**
Investment constraint management (exit)	ExCMInvC	Exit	£m	-	-	**-**	**-**	**-**
Total CMInvC			£m	-	-	-		
CMOpPM	**CMOpC-ExBBCNLRA-[Total CM Revenues]**		**£m**	**-** **4.9**	**-** **3.3**	**-** **1.0**		

		Variation to the Constraint Management target	**CMOpDTt**			**-** **-**
Constraint Management incentive revenue (CMIR)	**0.39*(8.5-CMOpPM)-CMInvC**	**£m**		**5.2**	**4.6**	**3.7**

The Constraint Management Cost Allocation Rules (RIIO-2)
Entry Capacity Constraint Management costs will consist of (a) the costs incurred in respect of any Constraint Management actions taken in relation to Entry Capacity (including those related to capacity management relating to the surrender of Firm Entry Capacity) and (b) the costs incurred in respect of any payments made to gas shippers or DN Operators in exchange for agreeing to offtake gas from the NTS at National Grid's request and in respect of any costs incurred in undertaking any other commercial or physical actions to manage Entry Capacity, including the costs of any locational actions.

Exit Capacity Constraint Management costs will consist of (a) the costs incurred in respect of accepted offtake reduction offers (as defined in the Network Code) and (b) the costs incurred in respect of any Exit Capacity Constraint Management actions taken (including those related to Exit Constraint Management Charges and NTS Exit Capacity surrender charges) (as defined in the Network Code) and in respect of any costs incurred in undertaking any other commercial or physical actions to manage Exit Capacity.

Revenues	Capacities	Derivation of Revenues
For terms RNOECt and RNOExCt, this revenue shall be "derived by the licensee" from sales of the respective non-obligated capacities that feed into the CCM incentive. For the avoidance of doubt, the derivation of these revenues here will take account of applicable storage discounts, but exclude discounts from Shorthaul and charges associated with the Revenue Recovery Charge. The licensee shall record in this pack how the derivation of this revenue has been met in accordance with these principles.	RNOECt	Includes... Excludes...
	RNOExCt	Includes... Excludes...