Annex
A14.25 Gas System Operator Summary
December 2019

As a part of the NGGT Business Plan Submission

nationalgrid

System Operator Summary

Purpose of this annex

We have created a summary of our Gas System Operator (SO) to clearly articulate the role of the SO as part of the combined TSO (Transmission System Operator), our role in the UK's energy future and how we are setting ourselves up for success in RIIO-2 and beyond.

This information is currently embedded throughout the 200-page narrative, segmented by stakeholder priority; however, it was felt to be beneficial to have it articulated from a holistic system operator lens.

System Operator Overview

National Grid Gas Transmission (NGGT) is an entity entrusted with nationally transporting energy in the form of natural gas across fixed infrastructure. The SO, which is the focus of this annex, ensures Great Britain's gas is transported safely and efficiently from supply gas points (where it enters the NTS) to exit offtake points (where it is consumed or stored). The SO part of the wider Gas Transmission business ensures that supply and demand is balanced in real time and facilitates access to the assets for maintenance, replacement or for the connection of assets to the transmission network. Energy is at the core of everything we do and is the lifeblood of our economy and society. Through engagement with our customers and stakeholders we shape the energy market by providing analysis and insights into the ever-changing nature of energy. Our actions as the SO influence investment decisions and markets worth billions of pounds and more importantly we play our part in ensuring the GB energy consumer continues to receive safe, reliable and efficient service now, and for years to come.

As we head towards RIIO-2, our nationwide energy system is undergoing a revolution. Driven by rapidly advancing technology and policy, concurrent with trends towards decarbonisation, decentralisation and digitisation. These changes are industry-transforming and present huge challenges for both our existing network infrastructure and security of supply. The path ahead for energy is both exciting and uncertain and we must carefully navigate the upcoming period as an industry focussed on whole system solutions to ensure we continue to protect security of supply and act in the energy consumers' best interests (see ESO Future Energy Scenarios [FES] for a range of future options[1]).

Context around the changing environment for NGGT heading into RIIO-2

Our industry is undergoing a revolution which presents exciting opportunities as well as significant challenges for us as the SO, wider GT and the industry. This context is set out in part 2 of our main business plan document.

RIIO-1 – Our delivery track record

For each year of the price control Ofgem set NGGT's cost allowances making up its allowed totex to deliver agreed outputs and the incentives framework. As the SO, we track our financial performance via two main elements – totex and incentives. As totex refers to total controllable expenditure, it comprises both capex and opex. Therefore, we as NGGT are incentivised to deliver outputs based on total whole of life costs, rather than having a potential preference for either capex or opex. This better incentivises us to select the best overall solutions for customers.

A summary of our SO totex performance has been provided in the table below. For our incentives information, please refer to incentives annex A3.03 for further detail.

Activity	Spend	Allowance	Cost vs. allowance
	8-year forecast £m 2018/19	8-year forecast £m 2018/19	£m 2018/19
SO CAPEX	276	332	56
SO OPEX	501	525	24
Total	777	857	80

Table 1: SO totex performance

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[1] ESO Future Energy Scenarios July 2019 http://fes.nationalgrid.com/media/1409/fes-2019.pdf

CAPEX

The gas system operator's capex budget is invested in the computer systems we need to operate the network and the systems we use to manage the commercial arrangements across the market. The systems typically have a seven-year asset life and require replacing or refreshing to ensure they can continue to run efficiently, and to take advantage of new technology where appropriate. This capex investment allows us to maintain a safe and secure system as well as to upgrade our capabilities in order to continue to drive value for our customers and consumers.

Our capex spend covers both our own internal National Grid systems, and those operated and developed on our behalf. For example, the services we currently have contracted with Xoserve and the associated Gemini IT systems.

From a SO capex investment perspective, our forecast capex spend for RIIO-1 is £276m compared to an allowance of £332m. The reduction in forecasted expenditure is mainly attributable to the change in the Gemini investment proposal. Instead of doing a full systems replacement, we are in the process of re-platforming the system to extend the life of the existing Gemini platform. This was agreed following customer engagement, as we believe based on our cost-benefit analysis that this is the best value for consumers given the industry's rapidly changing technologies and overall rate of change. Telemetry costs are also below the original forecast as we have undertaken fewer telemetry separation projects at the Gas Distribution Network (GDN) offtakes, prioritising the sites and harvesting spares from the sites separated.

The RIIO-1 period has seen an unprecedented change in core systems required for the operation of our NTS. The key projects undertaken and forecasted in the RIIO-1 price control period are as follows:

- **Cyber security (£28m) and data centres (£47m) –** Continued vigilance to keep Great Britain's gas network flowing safely and reliably by investing in our critical national infrastructure's security and data, which remains one of National Grid Board's top risks. Our costs incorporate several elements of work across data resilience and security, data centres and operational activity.
- **Integrated Gas Management System (iGMS) (£68.7m)** - We delivered a new suite of fully supported operational monitoring and control, reporting and analytics systems (SCADA) to enable us to run the network in real-time in the most efficient and affordable manner possible. The upgraded Gas Control Suite (GCS) is built on modular architecture which reduces complexity of future enhancements. This "evergreen" approach will ensure both software and infrastructure can be kept up to date more easily with the latest maintenance releases and infrastructure components able to be introduced in an agile manner.
- **EU Projects (Gemini Development (£21.3m) & re-platforming (£16m)** - As a result of EU legislative changes and new legal and regulatory obligations, we have completed changes to our operational and commercial systems. These changes enable us to maintain our market facilitation role taking into account the new capacity, balancing, charging and transparency requirements introduced.
- **Telemetry Site Infrastructure Refresh (£22.7m)** – We refreshed our gas telemetry equipment (which links the Gas National Control Centre [GNCC] to our network compressors and other sites) in line with our asset refresh policy. This focussed on the replacement of the oldest Remote Telemetry Units (RTU) to maintain reliability, and additionally provided enhanced capability to support remote diagnostics to improve efficiency of maintenance operations.

We have delivered replacements and asset health refreshes on all our key systems. We have changed the system architecture of our key Gas Control Suite to reduce ongoing maintenance and refresh costs, and to deliver a platform that is more flexible to meet the needs of future consumers. For further information on the SO's IT capex and opex costs, please refer to Annexes A20.03 and A20.15, respectively.

OPEX

Our forecast opex spend is £501m compared to allowances of £525m. Our OPEX spend can be divided into three key categories (for a more detailed breakdown of our opex cost, please refer to Annex A20.15):

1. **Direct –** Our direct opex costs are the direct labour cost involved in operating the system – from network capacity planning through to running the control room in real-time. Our forecast cost in this area is £280m.
2. **Indirect –** Our indirect costs are predominately related to operational information technology telecommunications and cyber spend from the re-opener. Our forecast cost in this area is £78m.
3. **Business Support –** Our business support costs are those of our support functions such as HR, Finance, and Legal. National Grid Group runs a shared services model across all its entities to ensure efficient and affordable shared services for all its business, generating better for value for consumers. Our forecast cost in this area is £143m.

Faced with continuous upward cost pressures, the SO reviewed its operating model and organisation structures in FY18/19 as part of the legal separation of the electricity system operator. In order to embrace the changing external environment, continue to deliver on our customer and stakeholder expectations and maximise value for consumers, we restructured our business to realign accountabilities, introduce new capabilities to help set ourselves up for RIIO-2 delivery and beyond, and optimised our support functions.

The main area of performance in our direct opex costs relates to Xoserve opex costs where allowances were increased due to a reallocation from capex as part of Ofgem's 2016/17 review of Funding, Governance & Ownership (FGO) of Xoserve. This has been partially offset by higher costs in other areas, for example European change including Brexit, where the work has not been fully funded and the requirements have grown. Headcount has been broadly stable with total FTEs in 2013/14 of 277 compared to 266 FTEs in 2018/19.

A few of the wider improvement initiatives we delivered in RIIO-1 have been highlighted below:
- Delivery of the NIC Project CLoCC (Customer Low Cost Connections) which resulted in a pre-approved and pre-appraised connection designs for a range of flows at existing sites, a new application portal and simplified templates and processes. This was to address some of the feedback we were receiving from stakeholder where you told us that our costs and timescales could be a blocker to connecting to the NTS.
- Development and provision of "free to use" meter validation software application (NGage) to meter asset owners as part of our innovation projects, which supports future meter assurance activities.
- PARCA reform – The Planning and Advanced Reservation of Capacity Agreement (PARCA) process was developed during the early years of RIIO-1. This was an important commercial regime development for industry looking to connect to the network. PARCA helped mitigate the risk created for developers of the connection and capacity processes being separate. The process now allows users to be confident in the availability of capacity once their connection is concluded as it allows a reservation of capacity prior to the financial commitment to that capacity on the network.
- Future of Gas programme[2] – An 18-month stakeholder led programme of work to determine the medium to long term role of gas under a range of credible scenarios in the UK's transition to a low carbon economy. This programme concluded that gas has a critical role in the transition to a low carbon economy in all scenarios and set out a number of National Grid commitments and policy recommendations. One such commitment was the development of the Gas Market Plan.

Despite increased uncertainty regarding costs and demands for our services, overall we are forecasting to underspend against our allowance.

Our Mission
Our mission as the SO for Great Britain is to enable transformation to a sustainable energy system across the country and ensure the delivery of reliable and affordable energy for all consumers.

Success for us looks like[3]:
► Playing our role in supporting the UK's commitments towards Net Zero through low carbon electricity, heat, industry and transport
► Collaborating on a strategy for clean heat and progress against that plan
► Providing reliable and flexible support for the growth of renewable generation
► Competition everywhere
► The system operator seen as a trusted partner

We will achieve this by focusing on five key areas:
1. **Engineering Transformation** – ensuring reliable, secure system operation to deliver energy when consumers need it
2. **Market Transformation** – unlocking consumer value through competition
3. **Sustainable Transformation** – enabling and supporting the drive towards a sustainable whole energy future
4. **SMART Transformation** – driving innovation and increased participation across the energy landscape
5. **Capability Transformation** – developing the right people and systems to deliver the future

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[2] Future of Gas - https://futureofgas.uk/
[3] Towards 2030 – A System Operator for Great Britain's Energy Future April 2019 https://www.nationalgridgas.com/news/towards-2030-system-operator-gbs-energy-future

Consumer Benefits

In all that we do, our aim is to deliver the highest possible benefit for consumers; while we do not have direct contact with consumers, they benefit from our activities in the following five ways against which we measure our success:

Improved safety and reliability
Today, gas delivers three times as much energy as electricity; it keeps 80% of the UK's 28 million homes[4] warm and comfortable. We will continue to focus on system balancing and security at optimum cost in line with expectations that Government, the regulators and the consumer have of us.

Improved quality of services
We have been working hard to transform how we engage with stakeholders by listening to what stakeholders want from us and delivering what we can, explaining why we can't in certain situations. This more collaborative approach is enabling us to shape how we do things, enables us to prioritise our work and improve our quality of service. Our engagement to date is a great example of this and we will continue engage with our stakeholders throughout the next regulatory period to improve service quality. This in turn improves the end-to-end value chain across the industry making it more seamless, efficient and effective which ultimately benefits the end consumer.

Lower bills than otherwise the case
We take a strategic approach to our investments across the gas network, working with the Gas Transmission Owner and customers so that long-term economic and efficient outcomes are being selected and driven when planning, developing and investing in the network. Nearer real-time, we manage balancing costs by focusing on controlling, reducing and optimising our spend on balancing and operating the system for which we are also incentivised (please refer to Annex A3.03 for further detail on our regulatory incentives framework). We are therefore lowering consumer bills by working to control, reduce and optimise elements of the system charges which we may impact and influence.

Reduced environmental damage
We are committed to doing the right thing every day, which includes supporting the nation reduce its greenhouse gas emissions and journey towards Net Zero 2050. We will look for new and innovative ways to run our network safely and securely while reducing our overall emissions and impact on the environment and communities.

Benefits for society as a whole
Creating a cleaner, more efficient energy system (a decarbonised energy system), could add 19 million jobs and $52 trillion of gross domestic product (GDP) to the global economy[5]. Proportionate economic benefits would be experienced across Great Britain as well as general environmental and health benefits such as physical health benefits from reduced air pollution, and mental health benefits from greener living and more liveable cities (co-benefits of GHG emission reduction).

In this next section, we have summarised how we will be setting ourselves up for success to achieve our mission whilst collaborating closely with the Electricity System Operator to ensure whole system thinking, critical to this next phase in our industry's development during RIIO-2 and beyond. Noting we will respect all business separation requirements and any other legal and regulatory obligations.

What we are proposing as part of our RIIO-2 plan
The below section is intended to summarise our role as the SO in supporting the RIIO-2 business plan and demonstrating how our SO priority areas, as set out in the Towards 2030 document, align with our business plan proposal.

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[4] Department for Business, Energy & Industrial Strategy, Energy Consumption in the UK (ECUK) 1970 to 2018 July 2019 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/820843/Energy_Consumption_in_the_UK__ECUK__MASTER_COPY.pdf

[5] Towards 2030 – A System Operator for Great Britain's Energy Future April 2019 https://www.nationalgridgas.com/news/towards-2030-system-operator-gbs-energy-future

Figure 1: NGGT business plan stakeholder priority areas and SO focus area alignment

The SO cost to achieve our RIIO-2 business plan is represented below, organised by stakeholder priority. For each stakeholder priority area, we have outlined the role that we play in supporting this priority and specifically what we are planning to deliver as part of RIIO-2. Our average annualised direct opex manpower costs are forecast to be lower in RIIO-2 than RIIO-1, reflecting the processes optimisation and capability development work we have undertaken in during this past regulatory period. We are proposing an increase in our overall IT investment for RIIO-2 to protect and strengthen our core systems. This will also allow us to harness the value of the increased volumes of data and information available.
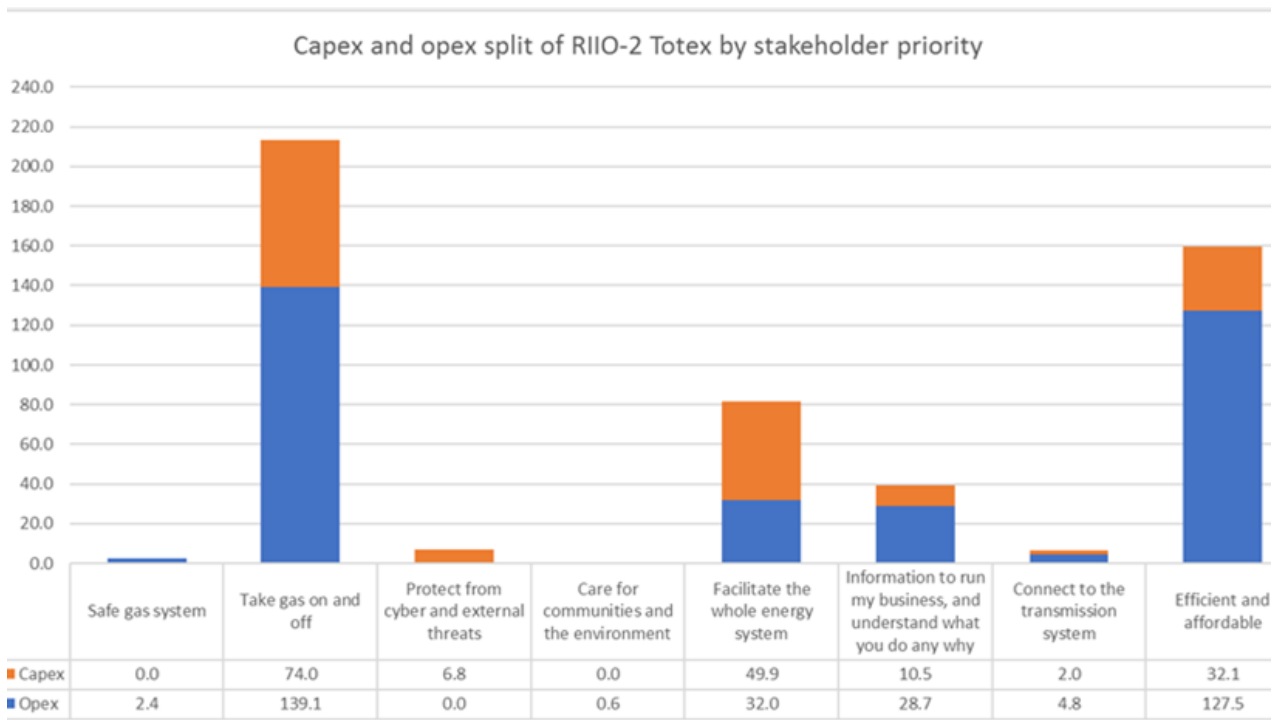

Figure 2: Capex and opex split of RIIO-2 totex by stakeholder priority

Additional detail on costs and items outlined below can be found in the main body of the business plan narrative and annexes. Sections below have been referenced throughout for ease of use.

1. I want the gas system to be safe [Safe system]

SO component	Description
Our role as the SO	We ensure we have the right capabilities and capacity to respond to challenging gas network situations (incidents and emergencies) safely and efficiently across the NTS. This is also strongly linked to our role as the National Emergency Co-ordinator (NEC).
SO Plan for RIIO-2	While the core activities of how we keep the gas system safe by preparing and managing incidents and emergencies remains the same, the level of emergency preparedness needs to increase. In RIIO-2 consideration needs to be given to the amount of change we are seeing across the industry. We have: - Ever-increasing operational challenges due to diversifying supply and demand patterns – evolving role of thermal generation in the energy ecosystem - Potential changes to the network gas supply emergency framework associated with moves towards decentralisation and decarbonisation e.g. decentralisation of the network – how do we ensure enough visibility to maintain security of supply - Evolving forms of cyber and physical threats for which to prepare Specifically, in RIIO-2 this will require us to: - Adapt to new tools and techniques being used across the network requiring us to change and upgrade our processes and technology to support - Increase our coordination activities with other Gas Transmission Operators across Europe to ensure we can manage the network holistically ensuring network availability and reliability Therefore, it is crucial that the NEC and National Grid's incident response processes are able to maintain sufficient capability to manage incidents in these ever-evolving conditions.
Links to wider business plan	For more information see: - Chapter 13 - I want the gas system to be safe - Chapter 15 - I want you to protect the transmission system from cyber and external threats - Annex A15.01 – National Grid UK cyber security strategy
Consumer Benefit outcome	

2. I want to take gas on and off the transmission system where and when I want [Gas on and off]

SO component	Description
Our role as the SO	We are responsible for defining the level of network capability Great Britain requires in consultation with the regulator, our customers and consumers. This involves comprehensive network analysis and scenario modelling to ensure we have enough capacity to maintain gas flows across all areas of the NTS. This also includes network access planning to ensure new connections can be brought onto the network safely as well as outage planning to enable critical maintenance and upgrades to be done on the network to maintain its safety and reliability. We are then also responsible for the activities associated with the real-time operation of the NTS and market facilitation. We are responsible for delivering an effective operational strategy on the day to maximise the level of operational flexibility and service we can provide our customers and accommodate their requirements by making optimal decisions considering prevailing market conditions, available NTS assets and operational tools on any given day. We optimise the access plan for taking NTS assets out of service to allow work on them to be safely undertaken, or to facilitate customers undertaking work on their assets.
SO Plan for RIIO-2	Feedback received has told us you value the ability to flow gas without restriction, and want us to continue to maintain a safe, reliable operating system. In order to achieve this, in RIIO-2 we will: - Deliver a step change in analytics and dynamic operational and commercial strategies to extract maximum flexibility from our physical system. We will do this via enhanced forecasting of energy requirements, enhanced real-time and forward simulation and evaluation of scenarios, greater market intelligence, increased monitoring and optimisation - Require greater automation of currently manual processes pertaining to complex, large datasets in order to achieve the above - Continue to ensure our core systems are maintained as a secure facility for 24/7 continuity of gas system operation - Ensure we facilitate the anticipated increase in work to be conducted on the NTS (linked to the proposed CAPEX plan) by scaling the existing facilitation process - Ensure we have the right capabilities to continue to support industry innovation via increased network capability modelling and scenario analysis capabilities. This would be to support the industry in its ongoing investment decisions and energy network futureproofing (e.g. introduction of new fuels using existing network infrastructure) It is worthwhile noting the increased complexity in running the NTS throughout the RIIO-2 period with the uncertain energy pathways, changing weather patterns, changing market and plant preferences and an ageing asset infrastructure largely at the end of its collective design life.
Links to wider business plan	For more information see: - Chapter 12 – Network capability - Annex A12.02 - Network capability report. - Chapter 14 - I want to take gas on and off the transmission system where and when I want - Chapter 15 - I want you to protect the transmission system from cyber and external threats
Consumer Benefit outcome	

3. I want you to protect the transmission system from cyber and external threats [Cyber and External]

SO component	Description
Our role as the SO	The NTS is subject to a multitude of security threats, including a rapidly growing threat to Industrial Control Systems (ICS) from cyber attacks. The systems and processes we use in operating the NTS need to be secure and resilient to physical or cyber external threats. Physical threats and security requirements are increasingly driven by government policy, and critical systems need to be protected from increasing cyber threats. To support the secure primary energy needs of Great Britain, we need to ensure there continues to be effective business continuity arrangements which are adapted to meet a changing energy landscape. This is to ensure energy can continue to flow following external events or fault conditions.
SO Plan for RIIO-2	For RIIO-2 we will facilitate access to upgrade / replace key NTS asset control systems to ensure we continue to protect our energy network. We will achieve this by: - Maintaining a fully functioning control system (SCADA) and telemetry service which is required to operate the network. The SCADA system, from both a hardware and software / functionality point of view must be kept up to date to ensure fully functioning operation. As the gas network physically changes (new connected customers, revisions to plant, construction of new plant etc.) this needs to be reflected in the SCADA system in order to ensure safe and effective operations - Facilitating network access to ensure key planned physical and cyber security upgrades can occur across our asset footprint with the transmission part of our NGGT business as part of our site prioritisation plan - Seeking to develop key cyber skills as part of our workforce in the next couple of years as our enhanced cyber planning matures - Generally updating and modernising our systems to minimise our susceptibility to cyber threats, as well as utilities AI and machine learning to support threat detection and prevention As our network is part of Great Britain's Critical National Infrastructure it is of national interest that the appropriate level of physical and cyber security resilience is achieved, which will be made possible through via a number of people and IT systems initiatives as outlined in Annex 15.01.
Links to wider business plan	For more information see: - Chapter 14 - I want to take gas on and off the transmission system where and when I want - Chapter 15 - I want you to protect the transmission system from cyber and external threats - Annex A15.01 – National Grid UK cyber security strategy
Consumer Benefit outcome	

4. I want you to care for the environment and communities [Environment]

SO component	Description
Our role as the SO	We care about the environment and the communities we serve. In order to support the achievement of a decarbonised energy landscape by 2050, our energy infrastructure will have to fundamentally change, with significantly more energy coming from renewables, backed by nuclear and lower or zero-carbon gases. During the RIIO-2 period, a time of transition, we will need to continue to support the fundamental changes occurring across the industry that are required to drive innovation and harness emerging technologies. We will need to continue to think whole system and plan and manage our networks to be smarter and more agile. We will continue to drive this through our network capability strategy and analysis across multiple time horizons to ensure Great Britain has clearly articulated network capability requirements to meet energy consumers demands, both now and in the future. Concurrently, we will facilitate access to replace assets that do not meet forward-looking environmental legislative requirements.
SO Plan for RIIO-2	As part of the wider National Grid Group strategy, we will shift our focus from environmental protection to environmental enhancement and will: - Work across industry to identify and develop innovations that would support the range of decarbonisation futures. In particular, NGGT will aim to facilitate early adopters of hydrogen within the transport and industrial areas to support reduced carbon emissions - Continue to monitor legislative uncertainty e.g. EU Emissions Trading scheme and ensure the right solutions are progressed based on detailed cost benefit investment analysis SO is committed to caring for our environment and communities and will actively support our initiatives across NGGT and National Grid, playing our role in decarbonising Great Britain's energy landscape.
Links to wider business plan	For more information see: - Chapter 16 - I want you to care for the environment and communities - Annex A16.05 - Compressor emissions compliance strategy
Consumer Benefit outcome	

5. I want you to facilitate the whole energy system of the future – innovating to meet the challenges ahead [Whole system]

SO component	Description
Our role as the SO	We are in the privileged position to take the lead in ensuring that interconnected EU markets, networks and frameworks are design to deliver consumer value and aligned with Great Britain's energy ambitions. We also seek to drive industry conversation to understand the most efficient options for future whole gas system networks, markets and frameworks and to explore responsibilities across boundaries and timeframes to deliver consumer benefits.
SO Plan for RIIO-2	Working with industry players across energy vectors, we will play a leading role in delivering the future energy system. During RIIO-2 we will: - Lead (as NGGT) the development of options for decarbonisation of heat, industry and transport for gas transmission – A national issue when you consider the implications to the entire energy ecosystem and end to end value chain - Continue to lead the formation of the gas markets plan framework, which commenced March 2019 - Proactively explore solutions for whole energy and Net Zero, working closely with the Electricity System Operator and collaborating across the industry - Explore new commercial frameworks and markets supporting whole system flexibility and operability, as well as potential new vectors (hydrogen, CO_2) - Increase investment in incremental BAU innovation by dedicating resources to progress initiatives and seek funding in order to scale - Ensure we invest in our systems to ensure they can adapt to change, for example 'Gemini' our current balancing and capacity system - Continue to invest in skilled people and IT systems to enable us to lead the debate around regulatory change, now and in the future e.g. wider access review and EU 4th Package By playing this leading role, it will allow us to ensure codes, frameworks and governance that enable competitive and efficient markets to be developed and maintained, as the pace of change increases and the number of market participants grow.
Links to wider business plan	For more information see: - Chapter 17 - I want you to facilitate the whole energy system of the future – innovating to meet the challenges ahead - Annex A17.03 - GT Innovation RIIO-2 Strategy
Consumer Benefit outcome	

6. I want all the information I need to run my business, and to understand what you do and why [Information]

SO component	Description
Our role as the SO	The information we provide to the market supports the efficient functioning of the gas market by allowing market participants to make informed commercial decisions, as well as enabling the efficient physical operation of the network by allowing connected parties to optimise their operations based on network conditions. We provide this information in different formats – data, information and insights across multiple time horizons. For example, our Seasonal Outlooks (medium term) vs. Market Information Provision Initiative (MIPI) front page (short term). We ensure effective energy balance, capacity, and commodity operations as well as setting charges to support accurate invoicing. This forms part of our UNC obligations.
SO Plan for RIIO-2	Quality, timely information in RIIO-2 will continue to help ensure the gas market operates smoothly by enabling network participants to plan, prepare and operate effectively and efficiently. During RIIO-2, we will: - Champion open data sharing and governance across industry as demonstrated by our current and continued involvement in the "energy data taskforce" - Continue to invest in our people and IT systems in order to leverage better data sharing opportunities - Continue to provide as much relevant information as possible with our regulatory reporting (cognisant of network security and our legal and regulatory obligations) and business plan progress and achievements Our desire is to openly share data where possible to inform competitive and efficient markets, enable innovation and inform change across industry.
Links to wider business plan	For more information see: - Chapter 18 - I want all the information I need to run my business, and to understand what you do and why
Consumer Benefit outcome	👍 📄 ⚡

7. I want to connect to the transmission system [Connect]

SO component	Description
Our role as the SO	We are responsible for the contracts and commercial activities associated with new and existing connections to the NTS, operator and shipper agreement management, and NTS diversions governed by our operating licence and UNC obligations.
SO Plan for RIIO-2	Our priority is to continue to connect, modify and disconnect new and existing services of gas supply and demand as our customers' requirements change in order to best serve the end consumer. We will do this by: - Supporting the overall liquidity of the energy market by providing an efficient process for connection and capacity applications by developing and implementing initiatives such as CLoCC (Customer Low Cost Connections), as our stakeholder engagement has informed us our NTS connection and capacity reservation costs and timescales can be potential blockers - Supporting the expected increase in modification requests as NTS customers seek to maximise their existing site and assets - Preparing for the anticipated increase in disconnections and decommissioning activities that will be triggered given the changing role of gas in the energy landscape - Making best use of the existing network and simplifying processes to substitute unused capacity - Seeking to increase capacity where demand is underpinned by customer commitment or robust options analysis - Enabling the UK's Clean Growth Strategy by promoting new connections to new classes of customers - Digitising the connections applications process to absorb the anticipated 50% increase in applications whilst maintain the same Team headcount (currently trialling a "Self-Connect" initiative) Based on stakeholder feedback and considering market conditions, we are seeking to enhance our existing new connections and modifications processes to the NTS via incremental enhancement leveraging new technologies.
Links to wider business plan	For more information see: - Chapter 19 - I want to connect to the transmission system - Annex A19.01 – Non-Customer Funded Diversions
Consumer Benefit outcome	❤️ 👍 📄 🍃 ⚡

8. I want you to be efficient and affordable [Efficient and affordable]

SO component	Description
Our role as the SO	Besides running an efficient and affordable business model, one of the ways we contribute to domestic consumers' energy bills being efficient and affordable is through ensuring transparency about our network costs.
SO Plan for RIIO-2	Our plan for RIIO-2 is to continue to deliver accurate energy balance bills, capacity bills and commodity bills. During RIIO-2 we will: - Continue to implement and improve our processes, upskill our people and improve our technology to meet changing customer requirements and keep the gas flowing safely and reliably across Great Britain
Links to wider business plan	For more information see: - Chapter 20 – I want you to be efficient and affordable - Annex A21.01 - Sustainable workforce strategy - Annex A20.03 – IT Investment Plan - Annex A20.15- Opex Annex
Consumer Benefit outcome	

Additionally, as part of our regulatory framework there are economic incentives in place, agreed in consultation with the wider industry. These are designed to mimic a competitive environment to support driving performance and innovation. We operate in accordance with licence obligations and several financial and reputational incentive arrangements that are important in delivering the objectives of the regulatory framework.

Figure 3 below summarises the existing and new incentives we are proposing as part of our RIIO-2 business plan. These will be subject to further consultation. Further detailed information can be found in Annex A3.03.
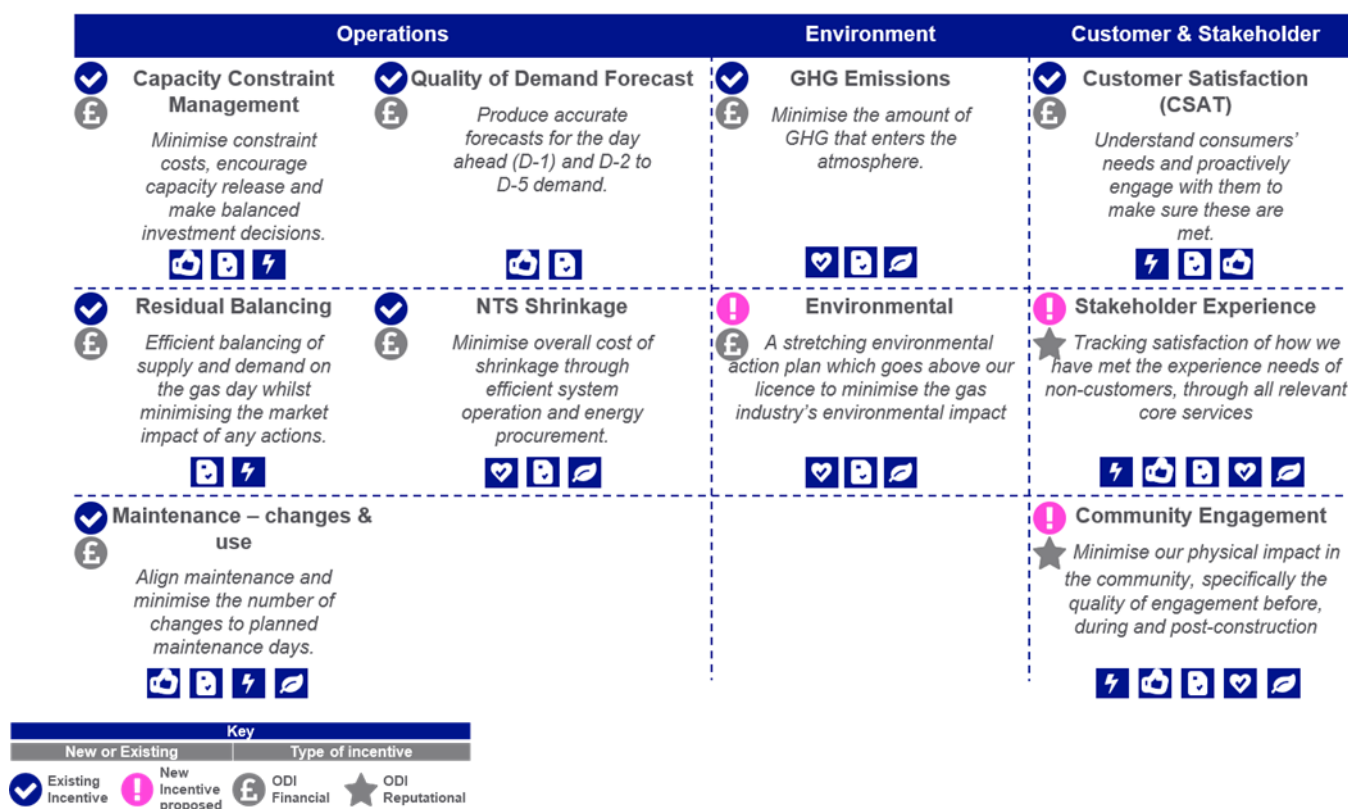

Figure 3: Incentive proposal summary

Incentives must remain a core part of the RIIO-2 package to ensure continued positive, effective transformation of our business in the rapidly changing energy landscape.

How we are setting ourselves up to deliver this transformation

As part of RIIO-2, and to meet the demands of a transforming industry, we need to ensure our operating model is fit for purpose. This means we must evolve our processes, ensure we have the right people with the skills and capabilities we need to deliver our plan, and enable ourselves with the right systems and data to help us achieve our ambition.

SO People profile and capabilities

As a services organisation, our greatest assets are undoubtedly our people. Operating in a rapidly changing environment like ours will require us to have the right people and capabilities in order to deliver our RIIO-2 plan successfully. More detail on how we build, attract, train, motivate and engage our people can be found in A21.01 – Sustainable workforce strategy annex.

Our average workforce profile for the first six years of RIIO-1 was 272.0 FTE. We acknowledge that based on the changing external environment and what needs to be achieved during the RIIO-2 period, the balance of people and capabilities will need to change. Based on our current RIIO-2 business plan our FTE profile is anticipated to be as follows:
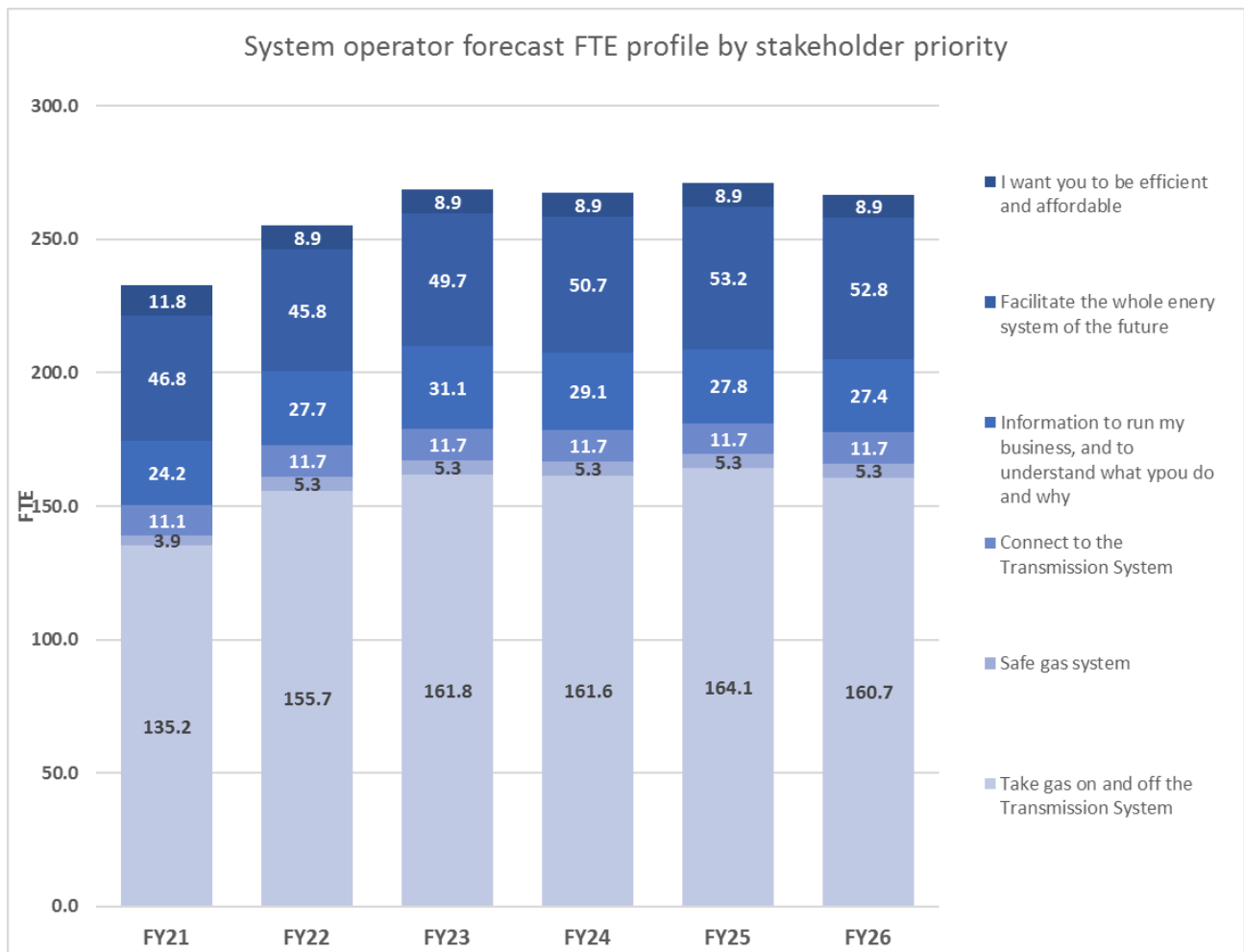

Figure 4: SO forecast RIIO-2 FTE profile by stakeholder priority

Our average workforce profile throughout RIIO-2 will be approximately 265.7 FTE. Through increasing our capabilities via upskilling, process improvements and systems and data investments, we are holding a relatively consistent resource profile (slightly lower than RIIO-1) to deliver more activities in RIIO-2 in an increasing complex and dynamic environment. Areas across the business plan where we are increasing our resource profile relative to RIIO-1 include:

- **Take gas on and off the transmission system** – We are anticipating an increase in the amount of work being conducted across the NTS. This is predominately driven by an increase in maintenance needing to be done on the NTS without impacting the constraint management process and putting the security of supply for our customers at risk.

- **Connect to the transmission system** – As in RIIO-1, we are anticipating a continued increase in connections and capacity application workload driven by ongoing interest from new entrants with smaller flow rates, customer modifying terms, customers aligning gas connections and capacity reservations with electricity capacity market timelines and increased activities around disconnections and decommissioning.
- **Facilitate the whole energy system of the future and hydrogen** – In RIIO-2, we will be supporting three key priority areas as part of the rapidly changing energy landscape – whole system transformation, innovation transformation and market and system transformation. Please refer to Chapter 17 for further information.

The next part of this section is focused on summarising the key capability changes we have included in our business plan, which are required in order to fulfil our commitments in the business plan.

Capabilities we have today remain important, but we need to continuously evolve in order to tackle growing challenges and be flexible in an uncertain and ambiguous environment. We will require both breadth and depth in our chosen capabilities (skills, knowledge and experience). The below tables describe five focus capabilities for the SO, why they are important to us, what they mean for the SO and to which parts of the business plan they are critically linked.

Engineering **Data & Analytics** **Leading the Debate** **Change Management** **Innovation**

Please note all capabilities will contribute to part of the business plan to a greater or lesser extent; the below is intended to highlight where we see the largest step change.

	Engineering capability	**Business Plan Alignment**
Why it is important	Core foundational capability to meet our responsibilities for the activities associated with the real-time operation of the NTS and market facilitation, which is becoming increasingly complex due to changing network dynamics, ageing infrastructure and technological advancements.	- Safe system - Gas on & off - Cyber and External threats - Environment - Whole system - Information - Connect - Efficient and affordable
What it means for the SO	Engineering remains at the heart of everything we do and one of our core capabilities. It is essential both in terms of network capability forecasting and analysis, and network planning including outages and real-time operations. Engineers will be dealing with unprecedented amounts of data which will need to be processed. Greater automation will be required; however, our engineers will need to be increasingly data literate including a step change in our analytics capabilities in order to make informed decisions.	

	Data and analytics capability	**Business Plan Alignment**
Why it is important	To maximise our existing and new data to provide raw data, information and insights both internally and externally to support the efficient functioning of the gas markets by allowing us and market participants to make informed decisions.	- Safe system - Gas on & off - Cyber and External threats - Environment - Whole system - Information - Connect - Efficient and affordable
What it means for the SO	Enhancing our data and analytics capabilities requires a solid grounding in mathematics, statistical modelling, programming and analytical thinking. This can then be coupled with technological advancement such as AI, machine learning etc. This capability touches all areas of our operating model and our business plan from long-term strategy activities to real-time operations. By enhancing our capability in this area, we will be able to make more informed decisions and provide enhanced data, information and insights to the market. There is increasing demand for this capability across both the breadth of our business and the depth of capability required to support key SO processes. For example, to forecast significant peaks and swings in demand, managing constraint volatility and modelling hydrogen repurposing possibilities. Additionally, we need to enable ourselves to analyse mass quantities of data in real time via integrated IT and consistently use said analysis to steer decisions in predictive way. This means we need to have people with the right skills and expertise and, as an organisation, need to be rigours in our data management. We are already starting to need and build these capabilities as we take a leading role in the energy industry data task force.	

	Leading the debate capability	**Business Plan Alignment**
Why it is important	To shape and guide the energy revolution by having a distinct and leading voice across the industry and political landscape on key energy matters such as economic development, technology advancements and our evolving energy ecosystem's business model. Doing so allows us to champion consumers' best interests, ensuring value for money and security of supply.	- Safe system - Environment - Whole system - Information - Efficient and affordable
What it means for the SO	Using our expertise to collaborate with energy leaders across public and private sector to shape Great Britain's energy ecosystem so that it is fit for the future, and to define our role within it. To achieve this, we will need to demonstrate strategic thinking across the energy landscape, articulate how the landscape is evolving (threats and opportunities) and be able to articulate these ideas to raise awareness and influence key stakeholders around these points. Skills, knowledge and experience required are: - Strategic understanding of our regulatory environment, local and global energy markets and our evolving energy ecosystem - Mastery of the policy-making process and how to bring about policy change - Ability to influence stakeholders to drive forward change	

	Change management capability	**Business Plan Alignment**
Why it is important	To ensure we are able to meet our business plan commitments and adapt to the change energy landscape we need to become better, faster and more agile in the way we absorb change across our business and facilitate change across the market.	- Safe system - Gas on & off - Cyber and External threats - Environment - Whole system - Connect - Efficient and affordable
What it means for the SO	We are seeing unprecedented amounts of change across the industry which is resulting in changes to our overall business model and underlying operating model. In order to embrace the change, we need to professionalise and be more agile in our approach to implementing and absorbing this change across our business and the wider industry. This means: - Our leadership and senior management team will need to lead us through the change, enabling and empowering our people to deliver through these periods of great uncertainty - Strong change leadership to empower us to deliver the people, process and technology changes required to deliver what is outlined in our business plan, and resilience to deal with the "unknowns" to come. - We will need to approach this with agility and pace, requiring us to upskill in agile project and change management techniques to prioritise our efforts to ensure the best outcome for stakeholders and consumers.	

	Innovation capability	**Business Plan Alignment**
Why it is important	Innovation needs to become second nature to us and be part of everything we do in order to keep pace with the evolving energy ecosystem, and to harness the potential of new technologies, new value sources, new energy participants, and changes to existing and future regulation	- Environment - Whole system - Connect - Efficient and affordable
What it means for the SO	Innovation will become part of the backbone of what we do given the rate of industry change, encompassing incremental through to disruptive types of innovation. It is important that we equip our teams with innovation management skills in order to embrace and lead the change; this includes: - Developing and understanding the importance of contextual innovation and how to apply specific approaches to different contexts - Increasing our knowledge and skills in structuring, writing and delivering innovation plans to support Great Britain's energy agenda to decarbonise and decentralise our industry	

We will also need to enhance our existing capabilities:
- ► **Commerciality** – Our dedicated experienced commercial managers and cross-functional teams will enhance their commercial awareness and skills to execute from planning through to implementation to assess changing commercial frameworks, optimising them for the benefit of our customers and the end consumer, as well as preparing and designing future commercial options e.g. introduction of new sources
- ► **Stakeholder engagement** – Our stakeholder engagement has told us you expect us to be more proactive with our engagement activities, particularly around our network capability plans and our incentives schemes. We will continue our existing momentum leading into RIIO-2 and shape our engagement activities to ensure we have clearly defined strategies which align with the business plan priorities. In parallel, we will ensure our activities are highly integrated and systematic across the gas system operator to ensure consistency and clarity around our activities.

Additionally, given the scale of technology change needing to be delivered within RIIO-2 to enable us to achieve our RIIO-2 commitments, we have provided a brief outline below of how the we with the dedicated IT resources within our National Grid IT shared service model.

The SO will have dedicated IT support to uphold critical processes such as strategy development, enterprise architecture, investment planning and portfolio management. We will then also use a combination of dedicated and leveraged group resources to ensure we can deliver key activities such as solution development, infrastructure and operations, security, and data. Dedicated technology annexes have been written to outline the proposal for RIIO-2 – refer to Annex A20.03 for further detail.

It is recognised that our IT capability will need to be strengthened in order to deliver RIIO-2. We are proposing our IT transformation programme apply the Scaled Agile Framework (SAFe) and Agile scrum; we will need to ensure our leaders are equipped to work in this environment. In order to deliver in an agile manner, the following new roles are being introduced into our IT teams – Scrum Masters, Agile Coaches, Product Owners and Product Managers. See IT Annex A20.03 for further detail.

Culture shift
As part of embracing change and continuously improving our business to better serve consumers and Great Britain's energy market, we need to continue to develop our people, process and technology capabilities as well as our organisational culture to empower the business.

To keep pace with the ever-changing external environment and our GB Energy consumers' needs, we are proposing the following behavioural shifts:

Figure 5: SO key behavioural shifts

As well as the key behavioural shifts, the SO culture will need to continue to be underpinned by strong core leadership values to ensure collaboration, and to take bold and decisive actions to enable innovation and create for the future, bringing employees and industry alike along the change journey.

Technology enablement
Aligned with our people capability requirements, the system and data changes we are proposing are crucial to the success of our RIIO-2 business plan in order to unlock the value and being able to meet our commitments.

In RIIO-2, we plan to invest around £180.1m to consolidate and modernise our IT systems and capabilities across the NGGT business. This will enable us to continue to maintain and operate a safe, efficient and reliable network and provide capability to meet the needs of our customers and stakeholders. This investment includes the core applications for National Grid Gas System Operator as well as the National Grid core IT services which includes general business services, security, infrastructure and critical national infrastructure (CNI). These select services are provided as shared service across National Grid's regulated businesses to minimise cost for consumers for example for where we procure general computing products at a reduced cost leveraging our economy of scale.

System Operator

Similar to all businesses today, we need to continue to invest in the underlying health of our IT systems and their protection to ensure we can continue gas safely and securely across Great Britain.

We have provided a high-level summary of the top six CAPEX IT investment requests for the SO. Further detail on our full IT investment plan, please refer to annex A20.03.

Gemini Re-platforming [Xoserve Asset Health]

Why it is important	The Gemini system is at the core of how the gas market operates. It is the main interface between shippers and the National Grid Gas System Operator. It is used by shippers to balance their portfolios and to book capacity on the network. National Grid owns the current Gemini system, and Xoserve (the Central Data Services Provider (CDSP)) manages it on our behalf.
What it means for the SO	The current Gemini system will become unsupported in 2025. Coupled with this is a need to have a system which is agile to industry change whilst also responding to feedback received from stakeholders throughout this RIIO-2 business planning process. We are proposing to sustain the current system through re-platforming it onto cloud-based infrastructure as well as delivering enhancements to rectify the external user's requirements to improve performance and stability of the application. More information on our plans and the options we have considered can be found in A17.04 Gemini Justification Report.

Telemetry Network Refresh [Run]

Why it is important	The Gas National Control Centre (GNCC) controls and monitors the National Transmission system (NTS), utilising several IT systems. The Gas Control Suite (GCS) is the core suite system used within GNCC for operational planning through to real-time operation, review and reporting on the NTS. GCS is dependent upon a number of supporting infrastructure services which will need to be refreshed as part of the normal asset health maintenance cycles. One of these investments is the "Telemetry Network refresh" investment.
What it means for the SO	During RIIO-1, we replaced our legacy Ulysses Telemetry Network (UTN) and refreshed it with the Gas Remote Sites Communications (GRSC) solution, which is part of the Critical National Infrastructure (CNI). It links the IT systems used by the gas control rooms with the outstation equipment installed at remote sites to monitor and regulate the flow of gas. The contract for the support service with our current telecommunications provider was put in place in May 2014, with a seven-year deal agreed with an option to extend for another three years. There is therefore a need to refresh the current service at the end of the contractual period, taking the opportunity to deliver the latest security features. Additional investment funding will seek to replace the systems hub and remote sites equipment before the end of RIIO-2 to ensure we can maintain the operational level of these services. As part of the refresh, we will also take the opportunity to: - Understand any advantage of potential 5G communications equipment - Review and update the security posture of remote sites and their communications - Understand the latest remote sites equipment, which may be more cost efficient and provide a robust, futureproof solution for our telemetry needs - Reduce risk of operational failure

Regulatory Driven Gemini System Enhancements [Xoserve regulatory]

Why it is important	As the Gas System Operator we play an important role in supporting the development of the UK and EU market. As part of our Market Facilitation role, we must deliver the IT system changes required by our customers and by Great Britain and EU regulatory change to enable the market to continue to function.
What it means for the SO	While it is impossible to be certain on the exact level and nature of changes we will implement across the RIIO-2 period, we do anticipate a significant amount of industry change as we move into and through the RIIO-2 period. During RIIO-1, we have implemented regulation enhancements to Gemini through annual releases; for planning purposes we assume the same through RIIO-2 as this represents a realistic deliverable level of change that the industry can support. To cater for the anticipated increased level of change through RIIO-2, we propose year-on-year Gemini investment in line with the highest annual investment in Gemini in RIIO-1, less 10% (to reflect a target to increase efficiency).

Gas Control Systems Functional Risk & Safety Compliance [Run]

Why it is important	The Gas Control Suite (GCS) is the core suite system used for operational planning through to real-time operation, review and reporting on the NTS within the Gas National Control Centre (GNCC). The platform is built to meet Critical National Infrastructure (CNI) standards ensuring service and security of its operation. We require the investment throughout RIIO-2 to ensure the system continues to meet operational and safety requirements as key components of the network continue to evolve. This includes reflecting evolving configuration requirements and the behaviour of the NTS as well as operational learning and automation to remove the risk of human error.
What it means for the SO	We need to maintain a secure baseline of IT investment to provide incremental changes to the GCS suite. This will enable us to continue to develop core systems to respond to changes in business processes and requirements, and integrate currently unsupported offline tools. Costs are based on similar outturns in RIIO-1 and reflect the cost of the team currently delivering GCS changes to address operational compliance and safety. It is assumed that the demand in RIIO-2 changes will be of a similar scale experienced since the implementation of GCS.

GSO Modelling Services [Transform]

Why it is important	To plan and operate the NTS efficiently we need to be able to forecast the requirements to flow gas on and off the system (supply and demand) and assess the network and commercial options to meet them. This applies to processes covering all timescales from investment decisions (e.g. replacement or decommission of a compressor or placing a contract) to a decision on the day (e.g. to run a compressor or to undertake an energy trade).
What it means for the SO	The SO have a suite of tools which allow us to store, manipulate and analyse data to support these processes. Whilst their level of accuracy is sufficient for our current needs, they require significant manual intervention and do not allow us to take advantage of the latest technology. This leads to a risk that we are not efficient in our decision making, and that we will not drive the most effective outcomes for consumers. In an increasingly complex environment with more data, more change and more risk, it is essential that we improve our capabilities in this area to be able to mitigate this risk. This requires an ability for us to be able to handle larger volumes of data in shorter timescales, using more sophisticated analytical and modelling techniques than we have needed to date. We need to invest in building this capability which will involve people, process and systems. Linked to the data and advanced analytics capability build outlined in the People capability section, the IT investment proposed as part of the GSO Modelling services investment is to build a custom intelligent network modelling solution integrated with SIMONE (our network simulation tool). This would enable the SO to develop an intelligent network modelling solution built using a combination of the insights and information platforms, modern machine learning and AI tools to deliver the following enhancements: - Upgrading our existing system SIMONE to develop an automated solution which identifies network solutions that meet supply and demand requirements and overall timescales from investment planning to on-the-day decisions creating advance intelligent network modelling - Develop an automated solution to support our supply and demand analysis to generate hourly supply and demand profiles from our Future Energy Scenarios (FES) data to support network analysis across all network timescales - Develop a solution to better predict the behaviour of the network based on a wider range of changing variables that impact the operation and commercial running of the gas network. This would enhance our supply and demand forecasting - General enhancement of our DevOps capability to support the end-to-end development and operations lifecycle for analytics and modelling. This includes the use of mainly opensource tools to automate the build to deployment process as well as test automation and both code and version management.

Regulatory and Market Driven Changes - Non-Gemini [Run - Regulatory]

Why it is important	As the Gas System Operator we play an important role in supporting the development of the UK and EU market. As part of our Market Facilitation role, we must deliver the IT system changes required by our customers and by Great Britain and EU regulatory change to enable to market to continue to function.
What it means for the SO	Regulatory and Market changes don't just impact our Gemini system. During RIIO-1, investment in regulatory-driven changes on our National Grid IT systems has been approximately 75% of the equivalent investment on Gemini. We have assumed this will continue in RIIO-2 and have reflected this in our costs above.

How do we drive the execution of our plan?

Our business plan sets our strategic intent for the next five years. This has been tested with a wide range of stakeholders to ensure we refined the requirements and the proposed approach on how to achieve our targets. As part of building our business plan we have reviewed our current state, understood the desired state, and completed the financial evaluations of the options proposed to achieve the desired state. As part of development, we have also completed high level change impact and gap analyses to inform our deliverability assessments. We believe the SO components of the RIIO-2 business plan are deliverable and achievable, noting key assumptions, dependencies and risks.