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 national  
gas  
**FutureGrid**

A high-pressure hydrogen test facility using decommissioned transmission assets, to demonstrate the National Transmission System (NTS) can transport hydrogen safely and reliably.



# Shaping the future gas transmission system

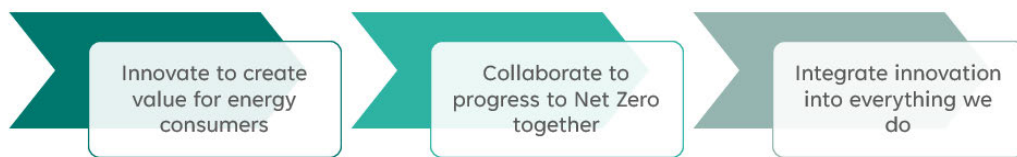
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# 1.0 Foreword



Welcome to the National Gas innovation annex, part of the RIIO-GT3 Business Plan. This outlines our RIIO-GT3 narrative for innovation in National Gas, which aims to provide robust optimised energy solutions for customers and communities, while being more agile, flexible, responsive, and maximising value. Innovation is about taking calculated risks that can drive change and deliver value to our customers. We ensure we manage these risks regardless of the funding mechanism, to ensure value in the end result.



Alongside our focus on the **energy transition**, we will ensure we continue the development of network resilience and prioritise delivering for our customers. Our approach to innovation in RIIO-GT3 looks to address key challenges identified in RIIO-T2 and will use stakeholder feedback to refine our approach and ensure alignment to the RIIO-GT3 ambition and strategy for the wider business.

**Innovation has continued to develop and embed** into National Gas' culture in RIIO-T2, and the team have developed their technical capability, while building strong relationships with internal and external stakeholders. Through the deployment of RIIO-1 innovation we have realised a total of £170m of benefit compared to the spend of £34m, exceeding our planned 4:1 return on spend. Looking ahead to RIIO-GT3, innovation plays a pivotal role in delivering and operating a safe, efficient, and reliable Gas Transmission Network of the future, that meets the needs of our stakeholders. We have **embedded innovation into our business programme** processes and have **expanded our network of collaborators**, working with a wider selection of third parties with expertise in a range of technical fields. Our approach is aligned to the wider business plan priorities and outcomes to ensure our network outputs through RIIO-GT3 provide the best value for the consumer. Innovation can be seen in all our business priorities:

- Shape the energy markets of the future
- Drive positive environmental and community impact
- Deliver sustainable value for customers and stakeholders
- Invest in our future, grow our capability, and value everyone's contribution
- Operate safely, reliably, and flexibly

Alongside expanding our capability, we believe it is vital to work more closely with the other gas and electricity networks to deliver **co-ordination across the innovation portfolios**, for maximum benefit to consumers. We believe we are in a unique position, as owners and operators of the National Transmission System (NTS), to be able to take a leading role on whole energy thinking, working across both gas and electricity vectors, and between transmission and distribution networks.

We welcome Ofgem's suggested improvements in innovation mechanisms and have built a proposed approach with the other networks which considers our stakeholder feedback. We would like to stress the importance of retaining an allowance for agile and responsive innovation that is currently facilitated through NIA in RIIO-T2 alongside our business as usual (BAU) innovation and Strategic Innovation Fund (SIF) projects.

Corinna Jones – Director Clean Power 2030 & Head of Innovation



# 2.0 Our Vision for the Future

## 2.1 Strategic Context

Our purpose is to deliver value for consumers and National Gas by creating new revenue opportunities that save time and cost, deliver value, and adhere to both safety and regulatory compliance. We aim to make things better for customers and communities by being more agile, flexible, responsive, and maximising value. We will engage with our stakeholders to ensure all innovation projects are meaningful, as innovation is an important factor in continuous improvement. We align our innovation to the five strategic priorities for National Gas and enable the business can deliver its goals throughout the period and into future price controls.

Innovation within RIIO-T2 has focused heavily on the energy transition and the drive towards the transport of net zero gases – such as hydrogen and carbon – around the transmission system. The UK needs to decarbonise by 2050, and the National Transmission System plays a vital role, as shown by several important statements previously released:

The 2<sup>nd</sup> National Infrastructure Assessment released in October 2023 from the National Infrastructure Commission, recommended that **"the Government should commit to the development of a core hydrogen pipeline network that is operating no later than 2035"**. This aligns to our proposed Project Union hydrogen backbone programme. It also states that **"core networks to transmit and store hydrogen, and 50 megatons of carbon dioxide a year, between key parts of the country, need to be in place by 2035"**.



We have a unique position at the heart of the energy system, which gives us the opportunity to facilitate engagement between people and organisations, to boost collaboration and find and implement solutions. Our focus for the NTS is to support industry and power to decarbonise, while also considering the opportunity of providing support for transport applications. Collaboration is at the heart of how we innovate. It allows us to branch out into wide-ranging innovation projects and develop a safe, reliable, and efficient gas network for the future. We are always on the lookout for new ways to engage with colleagues, stakeholders, and the wider gas industry.

**The gas transmission network will play a key role in the future and will support the transition to net zero for the following reasons:**

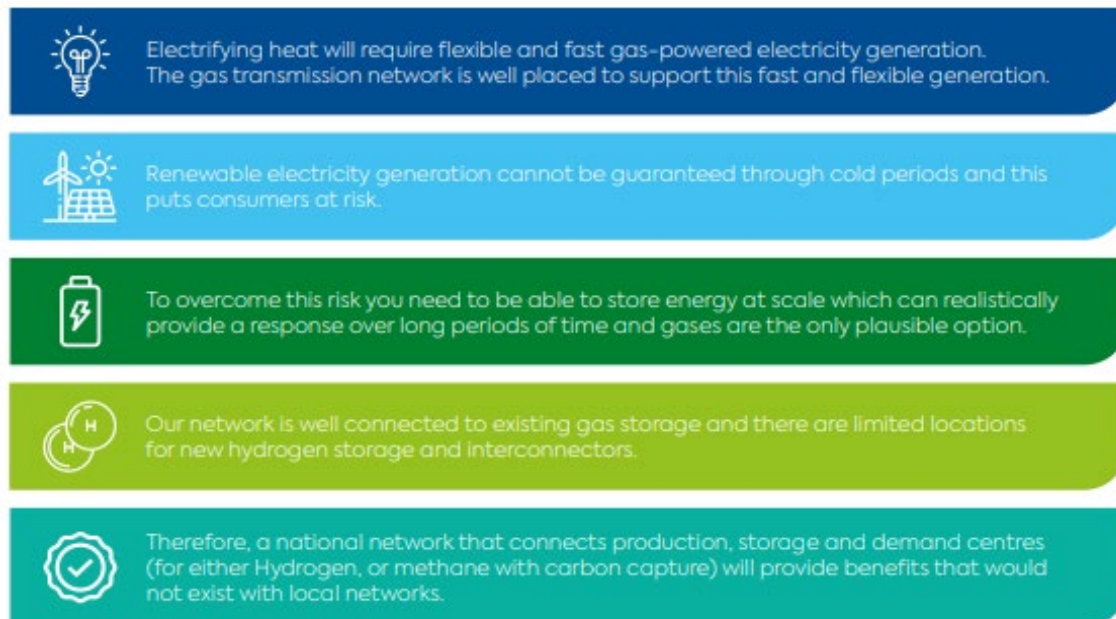


Figure 1 – The importance of the NTS and its role in the future



Our innovation portfolio develops strong collaborative links with the electricity transmission and distribution networks whilst ensuring robust links to the gas distribution networks to ensure a resilient supply of energy to the UK consumers. It is important that the NTS continues to provide a resilient natural gas supply through the transition whilst considering the opportunities for the future energy system. Our innovation portfolio in RIIO-GT3 focusses on the energy transition with this in mind and develops solutions to maintain network capability whilst also improving the efficiency and approach for the transition of the network to Net Zero options.

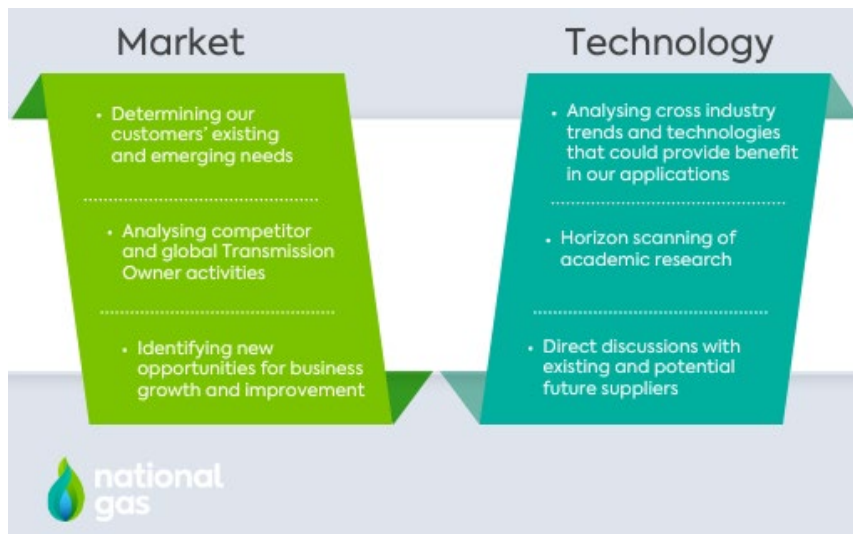
## 2.2 Our Vision

Our innovation vision has developed throughout the RIIO price control periods in response to stakeholder and community feedback and will continue to do so into RIIO-4 and beyond; from RIIO-T1 where innovation was being established, to RIIO-T2 where we built the evidence base for using the NTS for Net Zero, through to RIIO-GT3 and 4, where we will enable and deliver the transition.



Although an initial strategy is formulated at the beginning of each regulatory period, we believe flexibility is key to delivering real value to our consumers, therefore we continue developing our portfolio throughout this time, to ensure our work is relevant and continues to deliver value. The energy industry is quickly evolving to enable net zero and as a result, new products and technologies are continually entering the market. It is our responsibility to ensure we maintain an up-to-date view of this change and provide analysis on the impact to our business.

There are two key areas of data we utilise in our approach:



It is important that as UK gas networks we support each other and share best practice. This will ensure we provide clear value to the UK consumers and the wider energy industry. We meet monthly with all networks and bi-weekly with the gas networks to ensure alignment and prevent duplication. A focus for us is in ensuring the data from the projects is available and can be deployed in other networks, an example is our standardised Biomethane connection developed through our Customer Low-Cost Connections project or 'CLOCC' which has now been shared more widely to support accelerated connections.

We aim to engage with a range of innovators across the globe, to ensure the solutions we produce demonstrate the best options available to us. We achieve this by participating in working groups, as well as having direct interactions with global energy networks. Our team attends a selection of conferences, exhibitions, and workshops throughout the year, to share learning and connect with innovation partners. In December 2023, National Gas made a commitment to achieve net zero for our scope 1 and 2 emissions by 2050 – with an ambition to provide the hydrogen network by 2045 and enabling our site activities to be decarbonised by 2040, if possible. These milestones and our vision for a combined network allowing the movement of natural gas, hydrogen, carbon, and other net zero gases can be seen in our Net Zero Roadmap to 2050.

## 2.3 Net Zero Roadmap to 2050

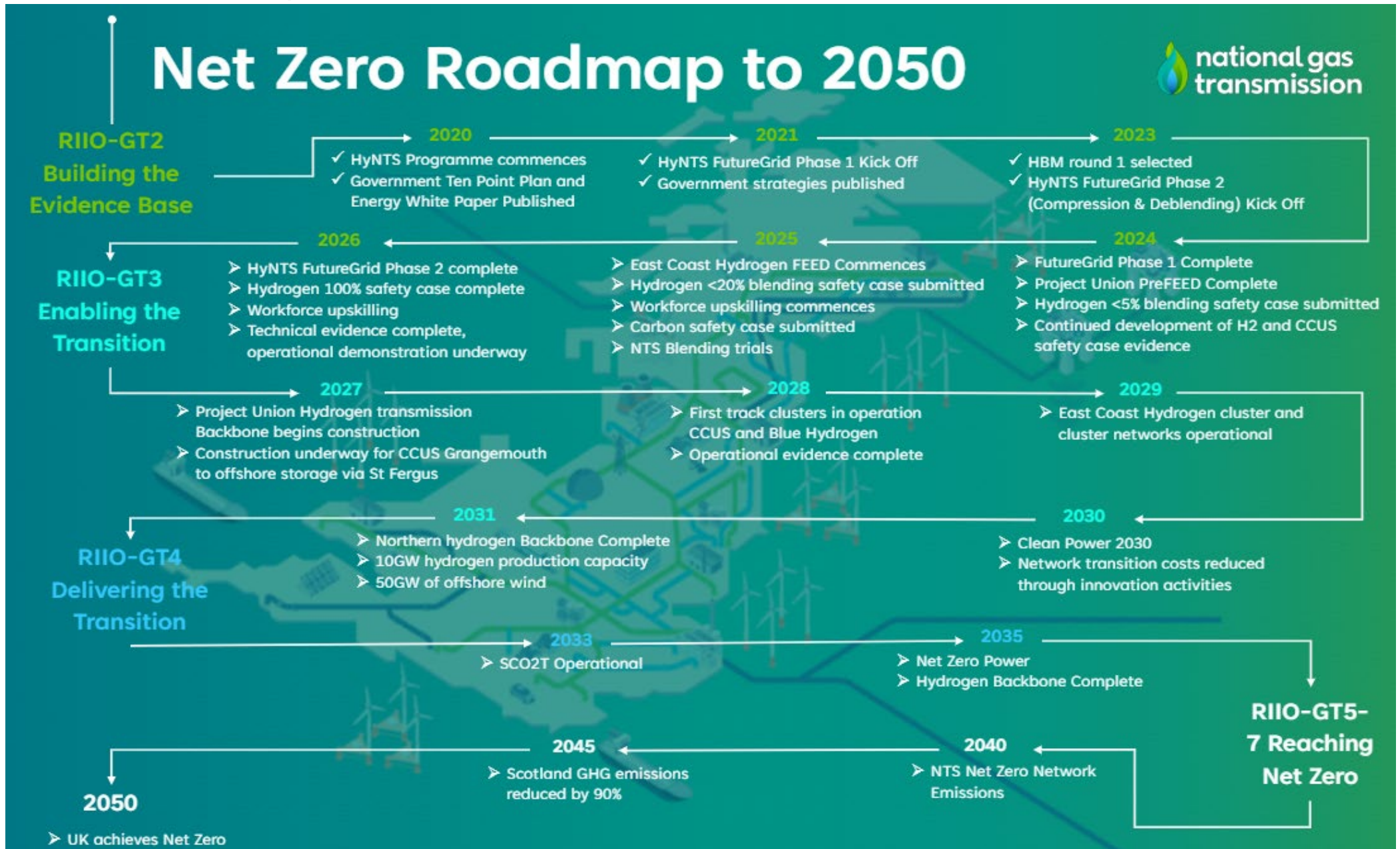


Figure 2 - National Gas Net Zero Roadmap for 2050



# 3.0 Building a Stakeholder-led Strategy

## 3.1 Stakeholder Engagement in RIIO-T2

Energy innovation cannot happen without collaboration and engagement across the energy system and cannot move at pace without taking learning from other industries and global innovators. Through RIIO-T1 and into RIIO-T2 we have been developing our stakeholder portfolio across the UK and the Global innovators. We have driven our approach in RIIO-GT3 working with our direct customers and those affected by our network, understanding their preferred direction of travel for innovation and the energy system of the future. These engagements made through events, webinars, surveys and coalitions have helped build our aspirations and vision for the next price control.

Our stakeholder map demonstrates some of the stakeholders we have engaged and worked with across our innovation themes to date. It is important to continue to grow our network and identify new players in the energy market. Within RIIO-2 to date we have worked with 84 direct project partners across NIA, SIF and BAU projects with 100s of other stakeholders engaged.

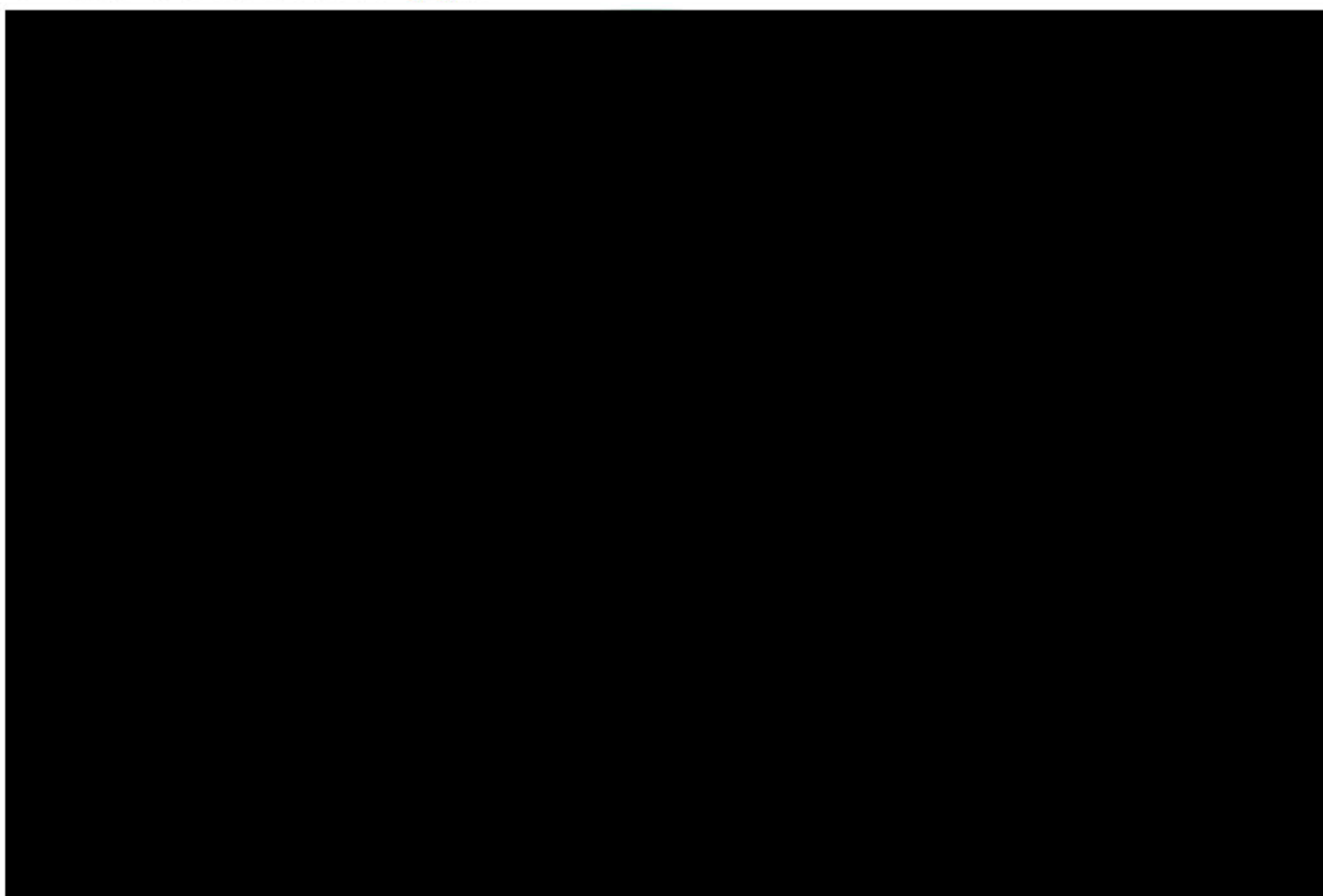


Figure 3 - Stakeholder map during RIIO-T2

The innovation ecosystem is vital to delivering robust outputs, and we have looked to develop our innovation stakeholder and collaborator map from RIIO-T1 into RIIO-T2, to include a greater number of subject matter experts (SMEs) and start-ups, alongside developing closer relationships with original equipment manufacturers (OEMs) and academics. We find that in the research phase of a project, working with consultants provides a broad view of the options and opportunities for development, however, to get a robust output through development and demonstration, we need to engage directly with SMEs and OEMs. We plan for this growth to continue through RIIO-GT3, as the wider energy industry look to us to lead on the transition and have expressed a desire to work with National Gas on the net zero challenge.



Building a baseline of academic knowledge is important to bringing novel solutions for the future. We are supporting the hydrogen hubs HyRES (Research Challenges in Hydrogen and Alternative Liquids) and Hi-ACT (Hydrogen Integration for Accelerated Energy Transitions), with the latter having the following mission statement:

*“The long-term mission of HI-ACT is to conduct multidisciplinary, qualitative, and quantitative research that will identify and map the complex relationships, interdependences, risks, expectations and needs of energy citizens and stakeholders.”*

Throughout RIIO-GT3, we will look to continue work with academic partners, building on the two PhD doctorates that we are currently supporting, looking into composite membranes for hydrogen purification and defect fatigue behaviour. Whilst the results for these projects will not be available for many years, we can help steer the research into real world challenges and support these early research concepts.

In RIIO-T2 the Strategic Innovation Fund (SIF) has enabled us to develop larger consortiums of innovators to help deliver solutions to more complex challenges. It has also encouraged collaboration across the networks and enabled a platform for innovators to access the networks more easily. We look to encourage this further in RIIO-GT3 and provide further routes for innovators to access our innovation team and activities.

### **3.2 Building on our Stakeholder Platform**

Working closely with our stakeholders we will continue to engage around our RIIO-GT3 plans, to ensure our strategy for innovation is fit for purpose, delivers what they need, and helps build the gas transmission network of the future. The Independent Stakeholder Group has played a pivotal role in the development of our Innovation Strategy for RIIO-T2. As we continue to develop the strategy, we will continue this engagement throughout RIIO-GT3.

In RIIO-T2 we have engaged with our stakeholders, reaching out through both formal and informal channels, to ensure that our innovation priorities and activities have remained aligned to our stakeholder needs. These channels include direct emails and telephone calls, social media, and engagement through the Energy Networks Association. We have remained committed to being open with our stakeholders, to being accessible and reaching out at key moments, while ensuring we do not bombard them with excessive requests to engage and respond. We have issued stakeholder surveys to more than 100 of our external innovation partners and internal project leads, to help us understand our innovation performance and where we can improve. This helped us identify key areas of improvement including our processes for onboarding third parties and transitioning projects into the business.

In the run up to submitting this document the Innovation team have been involved in the ‘Summer of Engagement’ sessions which have included public focus group discussions.

*The majority (71%) of respondents were supportive of National Gas investing in innovation. Respondents acknowledged that without innovation, any business would become stagnant. Consumers were supportive of greater transparency around investment in innovation and the benefits that have been and could be delivered. Where there were concerns over our investment it was due to uncertainty in the future use of the networks and focus areas. We are therefore ensuring flexibility in our innovation approach to focus on the topics that are relevant in the RIIO-GT3 period.*

We also held coalition meetings with academic partners and two interactive webinars with our innovator communities. At each of these settings we discussed our proposed plans for RIIO-GT3, introduced suggested focus areas and sought feedback, which has been fed into this document.

In terms of our direct connected customers, such as power stations and large industry, there is a considerable amount of interest in hydrogen, storage, and carbon capture and transport. We have therefore included these topics in our Innovation Strategy for RIIO-GT3, as we look to move from building the evidence base to enabling the transition. Much of our stakeholder engagement activities have been carried out alongside the Project Union team, to prevent us asking the same stakeholders very similar questions.

What does the future look like for you?	
You said	We did / will do
'Combination of natural gas and hydrogen storage' 'Hydrogen' 'CCS and hydrogen' 'Hydrogen key for decarbonising' 'Resilient natural gas supply'	It is very clear from our stakeholders that they see a mix of natural gas and hydrogen in their future gas demand which is why we have built the evidence base for hydrogen in the NTS through RIIO-T2 and we will continue to work on how hydrogen could be delivered to our customers in RIIO-GT3. Carbon transport and storage is also a key area on our customers decarbonisation plans and as such we will carry out the necessary research and demonstration.

How transparent is our innovation work? Are you aware of FutureGrid and the wider HyNTS portfolio?	
You said	We did / will do
'Do a good job promoting FutureGrid' 'Lack of awareness of the other projects' 'Website is fairly useful' 'Heard of FutureGrid and Union' 'Aware of lots of innovation work being undertaken' 'Documents are good, when you find them'	From the feedback it is clear that messaging about our FutureGrid and Project Union projects has reached the stakeholder community but more could be done to discuss our wider innovation portfolio with this community. This will be an area of focus for us in the remaining RIIO-T2 window and into RIIO-GT3. Improvements in the ENA portal and progress with FEN will ensure the project database is more accessible and easy to use for all our stakeholders.

What topics should we focus on?	
You said	We did / will do
'More on codes and standards' 'Compression' 'Hydrogen Transport' 'NOx emissions' 'Electrolyser technology' 'Health and Safety'	All of the topics raised feature on our innovation radar for either RIIO-T2 or into RIIO-GT3 and more detail on these can be found in Chapter 4 & 5 of this report. Safety standards and procedures are a key output for the end of the RIIO-T2 period to enable the safety cases to be developed now that we have proven our asset capability. This will continue into the beginning of RIIO-GT3 as we finalise FutureGrid Phase 2.

Who should we collaborate with? What industries could we learn from?	
You said	We did / will do
'European hydrogen backbone' 'Electricity networks' 'Humber region' 'Storage operators'	National Gas are in close contact with our European counterparts through working groups such as H2GAR and the European Hydrogen Backbone consortium. Likewise, through innovation projects we are collaborating with many of the other energy networks across electricity and gas. Through our work on the East Coast Hydrogen project and Project Union we are collaborating with the Humber region and further afield we are in the early stages of talking to storage operators to understand how our interactions will change in the future. In RIIO-GT3 we will continue to grow the number of industries we work with and look globally for collaborations that can benefit the UK.

With the channels established to learn from external stakeholders and organisations, we have been able to feed this learning into our organisation. Utilising existing channels and developing new forms of engagement, we have developed our communications channels significantly for innovation.

### 3.3 Driving Collaboration

Collaboration – regardless of whether the project is funded through NIA, SIF, or the business – continues to be at the heart of how we innovate. It allows us to branch out into wide-ranging innovation projects and develop a safe, reliable, and efficient gas network for the future. Collaboration can help to share and reduce costs, where similar projects are required for multiple networks, also helping to reduce the risk of duplication. We are always looking for new ways to engage with colleagues, stakeholders, and the wider gas industry. Throughout RIIO-T2 we have developed strong partnerships and worked collaboratively to share learning between ourselves and other network licensees. Throughout our extensive engagement with stakeholders, National Gas has developed a set of Gas Transmission Stakeholder Priorities. These focus on delivering industrial and domestic consumer priorities, to ensure we have a business plan fit for our stakeholders.

We have continued to focus on collaborating with other UK networks, however, the distinct difference between the transmission and distribution systems has led to several NGT only projects. There are several projects that NGT, and conversely the GDNs, are non-funding participants in, contributing time and expertise for key strategic workshops, knowledge dissemination sessions and other project related activities but not direct partners in the project. Collaboration with the gas distribution networks in the UK is vital, not just because they are directly connected to us, but also because project learning can be shared, duplication can be prevented and a unified gas network approach to the energy transition can be fostered.

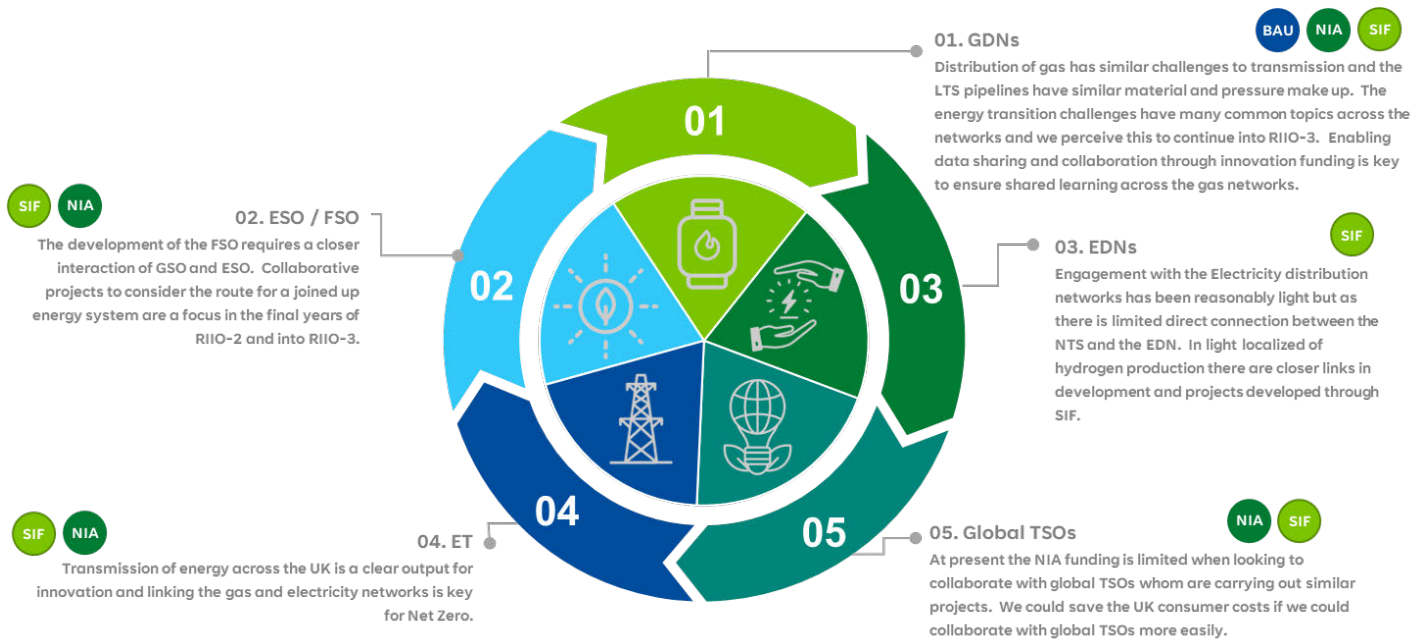


Figure 4 - RIIO-GT3 Network Collaborative Plan



We are keen to collaborate with the UK Electricity Transmission companies, as although National Gas has been separated from National Grid, our networks are still important to each other, and this relationship will strengthen as we look to develop the whole energy system. Some of the shared topics across Transmission that we will work on together include transmission system planning, impact of climate change, our fleet, cyber security, and automation. Where possible, we will collaborate with other Transmission System Owners in these and other areas, through our innovation mechanisms. The below infographic explains how engagement with other transmission energy networks will be fostered by the shared goal of the Clean Power 2030 target and will continue into RIIO-GT3:

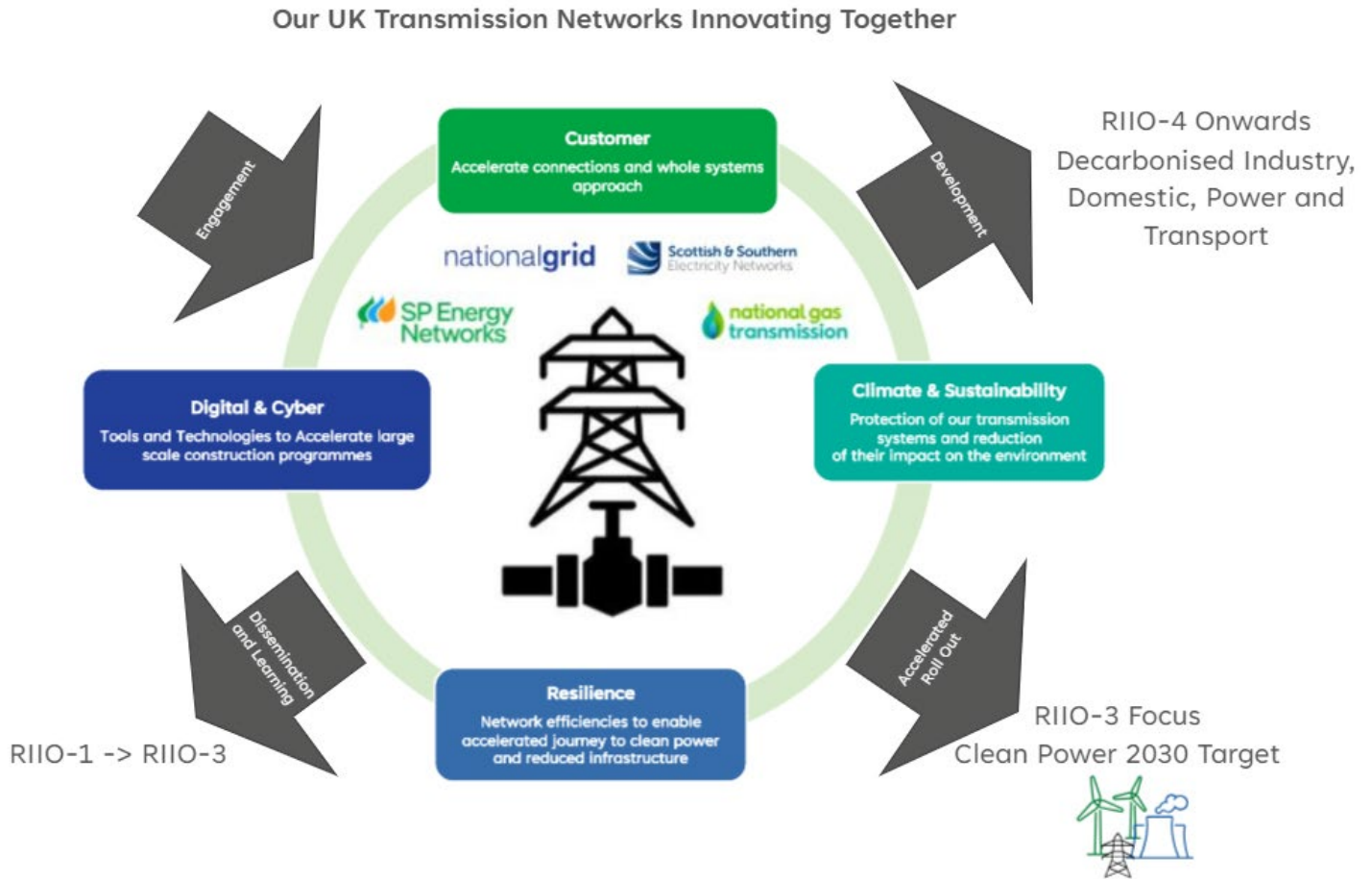


Figure 5 - Transmission network collaboration

As the only high-pressure gas transmission system in the UK, it is vital that we benchmark and collaborate with global transmission system operators (TSOs). Throughout RIIO-T2, we have developed close relationships with the European TSOs through the H2GAR and GERG (Hydrogen Gas Asset Readiness & European Gas Research Group) working groups. We have also engaged directly with wider global networks including Australia, South Korea, Japan, and America. We have looked to share knowledge where appropriate and develop collaborative activities to maximise innovation allowances. One such example is our collaboration on the European Hydrogen Backbone where we are representing the UK in the discussions for a Europe wide interconnected hydrogen network.

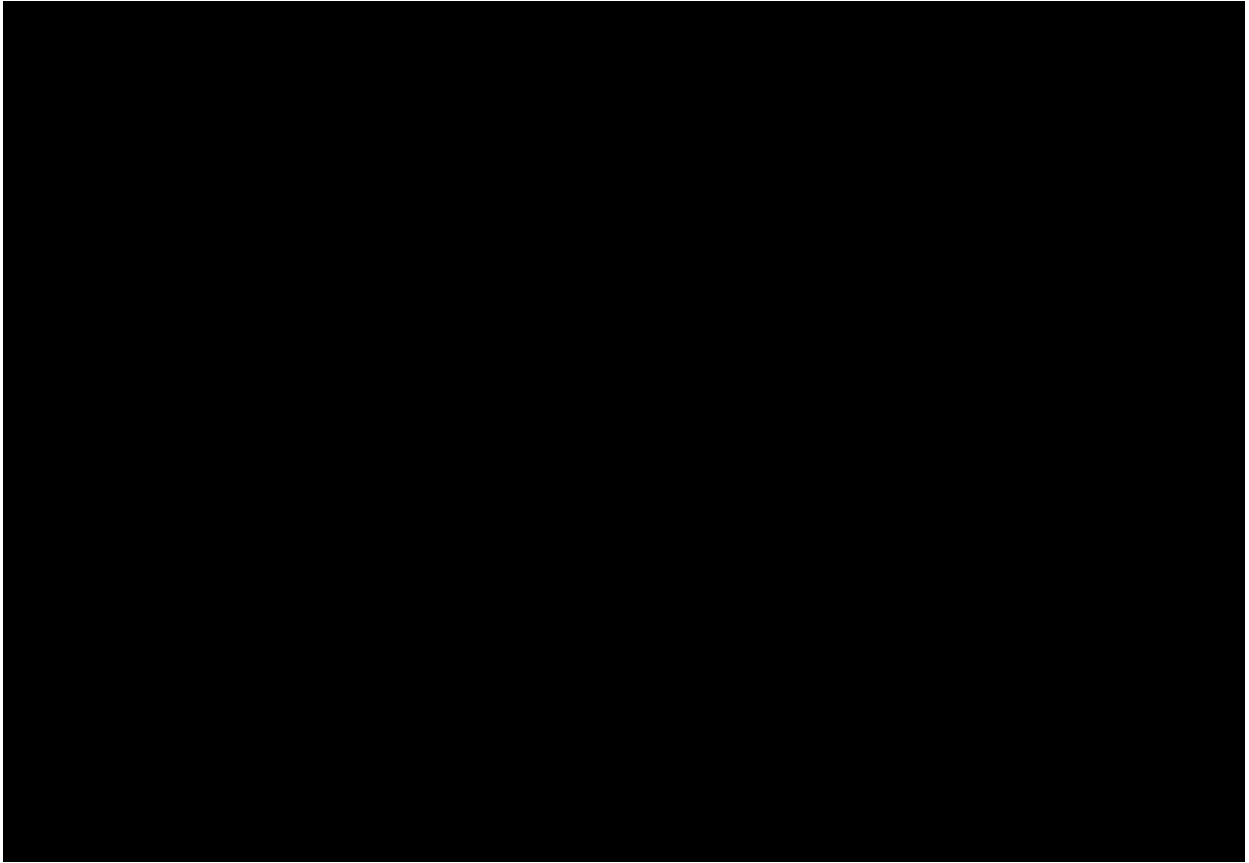


Figure 6 - European Hydrogen Backbone collaborators

Collaboration and engagements will continue into RIIO-GT3, and we are aspiring to exceed the current number of interactions we have with all parts of our stakeholder community. We want to increase the number surveys we conduct and the internal and external webinars and workshops we host, to ensure there are more opportunities for stakeholders to interact with the Innovation team. In RIIO-T2 we have requested for deviations for the NIA governance document to enable us to collaborate more closely with our European TSOs through joint industry projects. This has successfully saved the consumer money in preventing duplication of activity and sharing the cost of developing technologies and solutions for the energy transition. We wish to consider these engagements in RIIO-GT3 and request a mechanism to enable this.

### **Whole Systems Approach – ENA Strategy**

It is also important that we work closely with the gas distribution networks (Wales & West Utilities, Northern Gas Networks, Cadent and Scottish/Southern Gas Networks) as well as the electricity transmission and distribution networks, to prevent duplication and ensure consumer funding is utilised efficiently.

The innovation managers from across the UK energy networks meet monthly to review the project portfolio, develop joint strategic projects, improve our innovation processes, and disseminate learning to the wider energy system. These sessions are hosted by the Energy Networks Association (ENA) who help to deliver the Energy Networks Innovation Strategy and the Energy Networks Innovation Process (ENIP). As the gas networks work more closely with Future Energy Networks (FEN) we will continue to maintain these strong links with the electricity networks and build whole system approaches for the future energy system. An initial step in this is through a separate working group for the energy transmission networks to develop our connection and interactions through the energy transition.

Alignment of strategies across the energy networks is important and we work together to develop the energy networks innovation strategy. Our National Gas strategic themes align to the energy network strategy themes. Our projects are also aligned to these themes to enable project notifications to be easily shared with the other energy networks and potential collaborators and innovators.

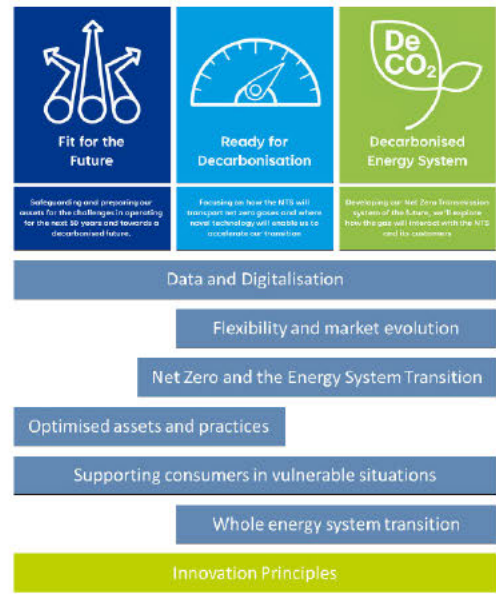
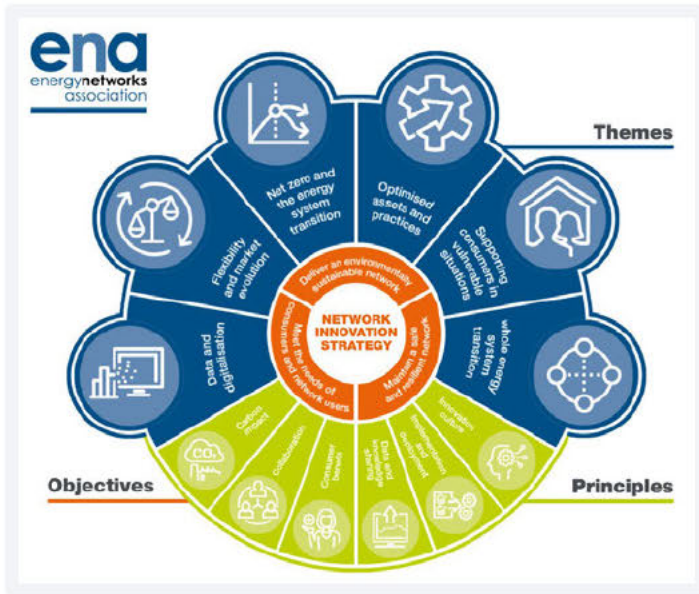


Figure 7 - The ENA shared Strategy

In November 2023, National Gas Transmission, in conjunction with the UK’s gas distribution networks, made the decision to end their membership with the Energy Networks Association (ENA). The ENA has served Great Britain’s gas networks well for several years, delivering industry-leading programmes including Gas Goes Green, which has advanced the discussion about the role of biomethane and hydrogen in the decarbonisation of heat. However, the size and scale of the energy transition now requires us to move away from the status quo so that we can focus our transformation activity to expedite the transition to net zero for our customers. As such, a new business called Future Energy Networks (FEN) has been set up to help the Gas networks collaborate with each other and with the wider energy communities.

**Case Study – Gas and Electricity Transmission Infrastructure Outlook, NIA\_NGGT0184**  
 This project was the first step in understanding the interactions for the UK transmission networks working collaboratively between National Gas, National Grid Electricity Transmission, and the Electricity System Operator (ESO). Thinking on whole energy has increasing relevance for operation and development of the gas and electricity transmission systems as we progress towards net zero and is a vital activity at this stage of our transition.



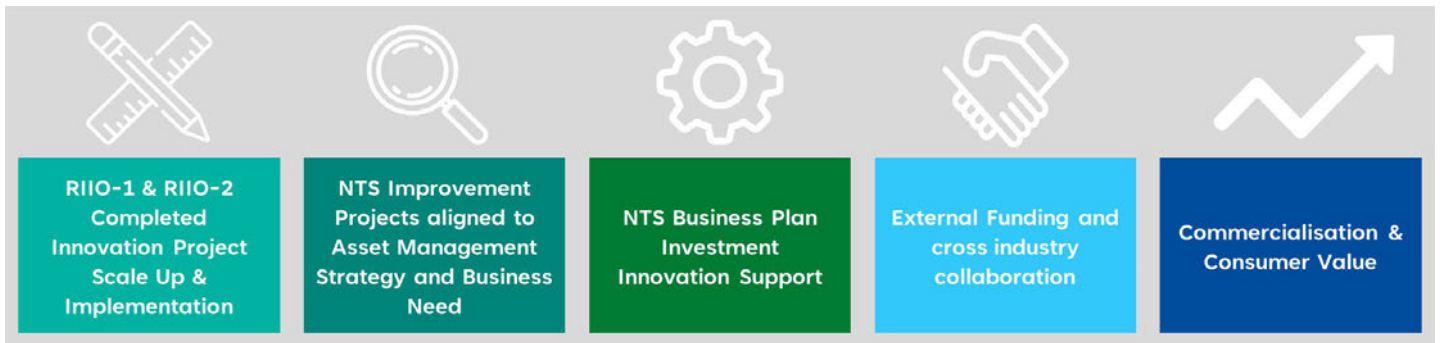
# 4.0 Business as Usual

## 4.1 RIIO-T2 Summary - BAU

National Gas has built innovation into its day-to-day operations since before RIIO and is proud of the culture (see Chapter 6.5) that has been fostered, to always look for new ways of carrying out our role in the gas industry. As such, the concept of BAU Innovation is embedded within the National Gas workforce. Innovation often happens without people realising, for example, small changes to a process that save time, increase safety, or save money.

RIIO-T2 has seen no shortage in these ideas, from the clever use of low-cost magnets to mark a repair, to large scale demonstrations of Inline Isolation Plugs and everything in between. The Innovation team are always on hand to help support our colleagues to develop their ideas into embedded concepts or simply to help spread the message about a tool that could be used on the wider network.

In RIIO-T2 we have identified the need for a team to focus on the delivery of innovation back into our business and to support projects outside of the incentives provided by Ofgem. It has taken time to resource the team and robustly progress activities, but they are now leading in five key areas of activity:



### RIIO-T1 & RIIO-T2 completed innovation project scale up & implementation

Projects delivered through NIA and SIF will have associated implementation plans to support the project as it moves from Ofgem incentive funding into implementation. The sorts of activities undertaken in this stage are policy updates, training of staff and the extrapolation of findings.

### NTS improvement projects aligned to the asset management strategy and business needs

We have been reviewing the individual assets strategies developed by the Asset Health team, as these highlight areas of improvement and can generate innovation projects alongside other ideation sessions and competitions run internally. Commercially ready concepts and tools have been demonstrated back to the business through BAU funded projects.

### NTS business plan investment innovation support

The businesses process for Investment has been updated to include innovation as part of the scoping and closure of every project. In this, the innovation team support the investment programmes to identify relevant innovations that could be deployed in their programmes and work with them where needed to deploy them into the business.

### External funding and cross industry collaboration

Whilst the majority of the BAU innovation projects developed are high TRL and low risk there are opportunities for more challenging projects that are not directly associated with the energy transition. We are looking at collaboration with other industries and through other funding routes to help develop these projects for the business.

### Commercialisation & consumer value

In developing technologies with consumer funding, we believe that maximising the value past the deployment into the UK networks is appropriate. In this, we have had several discussions with Ofgem in RIIO-T2 around the level of public dissemination and how we can utilise our IP to enable royalties to be claimed by the consumer.

## 4.2 BAU Innovation in RIIO-GT3

The concept of BAU Innovation will grow in importance throughout RIIO-GT3 as the team starts to drive real benefit back into the business, continuing to utilise funds outside of the standard innovation mechanisms provided by Ofgem. The objective of the BAU Innovation Team is to support National Gas Business Units to develop and implement network wide improvements that are considered low risk, high Technology Readiness Level (TRL).

We will continue to focus on involving people throughout the whole innovation lifecycle, using flexible innovation processes and change management principles to progress strong ideas into BAU. Alongside left field ideas and concepts that colleagues and 3<sup>rd</sup> party collaborators have for innovation, the Asset Health team have been speaking to subject matter experts across the business to develop a suite of Specific Asset Strategies. These documents detail each asset type and their future strategy, specifically including any innovation in that area that is on the horizon. This list has been compiled and will form the basis for work in the remaining RIIO-T2 period and into RIIO-GT3.

To date in RIIO-T2 we spent [REDACTED] on research and development across the business and developed [REDACTED] business-as-usual innovation projects. Within RIIO-GT3 National Gas is committing to spend [REDACTED] on non-totex funded work under the theme of business-as-usual innovation alongside our ongoing business wide research and development activities. This funding will be sourced from the profits of the business and will be available to access from the start of RIIO-GT3, so that we can demonstrate returnable benefits back to the business within this price control and into the next. This funding will be made available to all the themes under BAU Innovation and will be flexible in which areas it can be spent.

### Building on past innovation projects

Ideas that fall under BAU innovation will be a combination of those that come from internal and external sources, but also from previous work completed in RIIO-T1 and RIIO-T2. We will ensure that projects can be implemented from previous price controls, and we will use BAU funds to bridge any gaps needed in completing a successful implementation. This includes updating standards and policies to allow innovation to be implemented and to demonstrate tools that have been developed under past NIA projects.

We will also ensure that BAU Innovation projects can be developed from other energy network NIA projects from the past and ensure we do not duplicate work done by other networks previously. A focus for this is in the themes of digital systems and simulation and automation and measurement where many of the technologies can be duplicated across a variety of use cases. It should be noted there are unique challenges with high pressure gas transmission that other networks would not have addressed.

#### Case Study – Stress Concentration Tomography (SCT) Trial

One such example of using BAU funding in RIIO-T2 based on NIA innovation conducted in RIIO-T1 is Stress Concentration Tomography (NIA\_NGGT0044 & 67). SCT tools, collect the magnetic data of a buried pipeline without the need for excavation and this data can be analysed for leakage and stress applications. Through business investment we were able to secure a trial of new SCT technology on National Gas assets with the idea being raised by our Engineering Leads within the business. By conducting above-ground assessments, this technology not only minimises impact on assets but also provides valuable insights into asset conditions, aiding in future investment decisions. The trial was a success and further uses of the tool have already been arranged to increase our understanding of the buried assets.

### Potential impacts on consumers in vulnerable situations

Customer Vulnerability has been treated differently in transmission compared to distribution because our direct connected customers are large industries, storage, power stations and the distribution networks themselves. That said we have joined other energy networks in customer vulnerability projects including the Wales & West Utilities led Consumer Vulnerability Impact Assessment Tool (NIA\_WWU\_2\_06). We will continue to work in this way in

RIIO-GT3 and ensure that any BAU Innovation projects we run consider and mitigate any impacts on consumers in vulnerable situations.

### How the related benefits and costs are reflected back

The cost for BAU Innovation in RIIO-GT3 will be funded through non Totex funds to the value of [REDACTED]. It will be made available across the price control evenly ([REDACTED] per year), however projects will be sanctioned based on their business cases, meaning that if more than [REDACTED] funding is required in a year this can be made available. This will allow a 'ring fenced' amount of money to be spent on BAU Innovation outside of the Totex requested funds. Whilst these projects are still classed as innovation and will trial unproven technology, the TRL is sufficiently high to have a certain level of comfort that the benefit case will be realised (otherwise NIA will be utilised). Any realised benefits from these projects will be put back into the business to either fund additional BAU innovation or help to drive down the costs to deliver the RIIO-GT3 Asset Management Plan (AMP).

To aid in the implementation of innovation, our BAU themes match those for NIA and are Asset Development, Materials and Processing, Automation and Measurement, Digital Systems and Simulation and Business Development.

#### 4.2.1 Asset Development for Risk Mitigation - BAU

We need to continually innovate on our asset base to ensure it is as efficient and reliable as possible to support the gas network. We are confident of our position within the net zero energy landscape and our network is required for the next 50 years, much like it has been relied on for the past 50. We will use BAU Innovation projects to trial and demonstrate tools, techniques and new assets that increase safety, improve efficiencies, and reduce the cost to the consumer. Some focus areas for RIIO-GT3 include:

**Cladding** which is currently used on our network to help with noise mitigation and other aspects, however this can cause an issue when the asset requires inspection, resulting in the cladding being removed and re-applied. It is our aspiration to remove as much cladding as possible from our assets within RIIO-GT3 and replace it with new and novel alternative noise attenuation measures. This will allow free access to inspect the assets and maintain them as required without the need for expensive cladding works.

**Vibration monitoring** is key for our assets as any slight changes in the frequency of vibration can indicate a potential failure may occur. If we can record these vibration frequencies and learn from the patterns throughout a year of operation, we can use AI to 'listen' for vibration induced fatigue failures and warn the teams if an asset might need replacing. We have carried out several NIA projects in RIIO-T1 (NIA\_NGGT0008 and 0038) on this topic, so within BAU Innovation we want to build on this, use the latest AI technology and sensors to roll out a full demonstration of how vibration can be monitored on our assets.

#### 4.2.2 Materials and Processing

We will continue to focus on innovation projects related to our materials within BAU, acknowledging that the steel which makes up much of our pipeline material base needs to be kept in good condition, having been exposed to the elements for 40 years. Novel pipeline coating methods will be researched that are ready to be deployed and can help prevent corrosion. Following on from a previously completed NIA project (NIA\_NGGT0182) we will look to demonstrate the use of graphene in our paints which not only helps prevent corrosion but can offer monitoring capabilities as well.

The condition of our below ground pipework on our sites is currently monitored by the cathodic protection (CP) system, as the pipes cannot be inspected by pipeline inspection gauges or PIGs. This CP system is assessed on a regular basis during in-depth surveys. During RIIO-GT3 we would like to identify new and innovative solutions to be able to capture more frequent and accurate data on the cathodic protection system so we can intervene and make repairs at the

#### Case Study – Mechanical Pipe Connection

National Gas identified a technology called 'LOKRING', a method of pipe joining, which is weldless and threadless. Utilising the mechanical pipe connection technology as part of the corrosion management application on site has led to the installation being performed within 1 hour which is a 50% reduction in time from the equivalent welding process and making it safer due to the reduction in hot works. The utilisation of the equipment results in improvements across multiple areas, including safety, cost, and efficiency. Using the mechanical pipe connection across our network will significantly reduce the risk associated with hot work such as welding.



optimal time. Within this theme we would also like to investigate new material types for the pipeline sections including composites and new steel manufacturing processes.

**4.2.3 Automation and Measurement**

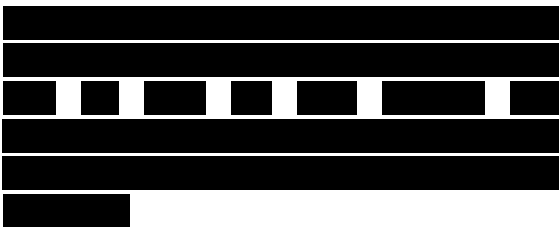
Within the theme of Automation and Measurement, the BAU team will focus on commercially ready solutions to demonstrate and implement into the business. We will be looking for sensors that can be installed on our network to measure a range of variables and analyse trends, helping National Gas to move from reactive to predictive maintenance. Automation will include reducing the time it takes to carry out processes and deliver robotic solutions that can save time and money for the consumer. There were also a significant number of improvements highlighted for our metering and gas analyser assets such as remotely collecting data, new ultrasonic meters, and condition-based maintenance.

A Surveillance Strategy has been developed, which sets out the aim to increase the efficiency of our pipeline monitoring system. As a result, projects regarding the use of drones, and sensing technologies, along with the use of digital systems to manage store and respond to the data inputs of these technologies, will feature within the RIIO-GT3 project pipeline. We would also like to deliver some satellite-based innovation projects under this theme, making use of the vast quantity of data that is collected across the UK today. There are several companies who are looking to use this technology for preventing third party infringements across our easements and we are working with SGN on their project in this area.

Robotics has always been a hot topic for innovation throughout RIIO-T1 and 2. We would like to build on the work previously carried out on the Gas Robotic Agile Inspection Device (GRAID) and carry out more inspections of our below ground site pipework through our deployed innovation programme. There are also new tools in the site inspection industry that we would like to demonstrate, including snake robotics and using automation for other areas like security and excavation.

**4.2.4 Digital Systems and Simulation**

RIIO-GT3 will see concepts such as digital and data twins being embedded into business as usual, and the relevant teams are already working on what features and use cases can be deployed. This is a continuation of several projects from RIIO-T2 (NIA\_NGGT0178 & 0214). Our Collaborative Visual Data Twin (CVDT) work has led to a demonstration of digital twins at our FutureGrid site, and we are now working within BAU to bring that IT architecture in house to develop it further.



Data analytics is a huge industry and an area that can make a real difference to how we work. The concept of AI is only just beginning, but in such a fast-paced area there are already tools we can implement straight away to save time and money for National Gas. The BAU team in this theme will focus on identifying these technologies and showcasing their potential back to the business. Examples include

**Case Study – iStock247**

Across its depot's National Gas Services had no way of tracking levels of stock or equipment and its location. This led to inefficiencies and wasted costs, including time spent trying to locate equipment that was needed for operational works or for maintenance activities. The absence of a stock management system also led to perishable stock going out of date or more stock being ordered than what was required. Working with the supplier, our depots and IT team, we implemented a simple to use system utilising tags installed on equipment. These tags either communicate with base units installed in the depots to advise if equipment is located at the depot, or GPS tags showing exact location, either on the move or on operation sites. The system allows technicians to assign equipment to specific jobs and return when works are complete. It also allows technicians to report on the condition of the equipment, so if maintenance is required before it's used again, this can be flagged, and equipment can be quarantined until it is fit for use again.

The stock management aspect of the system allows operational managers to check a central system showing stock across all depots. Meaning if perishable items are due to go out of date, but are in stock at another location, these can be used to reduce wastage. It reduces our costs for re-ordering when it's not required and allows us to control value of stock assets. Apart from adding and removing stock from the system, it is completely autonomous and operates with little input from the workforce.

data dashboards that are fed from our central data stores, tools that can analyse our entire document suite to find the answers we need, or systems to track and manage our physical spares.

#### 4.2.5 Business Development

We are looking to work with Procurement and the Supply Chain to embed digital tools into National Gas' processes, to increase the efficiency of the systems we have available. Additionally, workforce skills, training and the demonstration of competency will be an increased focus area as the company moves towards operating hydrogen and carbon pipelines. We will also work closely with other internal teams across National Gas including HR, System Operations, Finance and Construction, to develop and suggest new innovations to their processes.

The use of novel training methods and ways of demonstrating proficiency in a cost-effective, efficient, manner will be investigated and deployed. Training is an area where BAU Innovation can have a large impact as there are already several tools and systems we could look to rollout, that will not only help to develop the training packages but deploy them in new ways that encourages knowledge retention. Within NIA in RIIO-T2, we have looked at the use of virtual and augmented reality for training, but in an industry that moves at a rapid pace some of these methods are already beginning to be implemented. This area is closely linked to our future training needs for operating a hydrogen and carbon network of the future.

During RIIO-T2, our fleet has begun its transition to net zero. There is scope in RIIO-GT3 to further embed things like zero emission cars, vans, and lorries within our own fleet, to help us reach net zero at National Gas. How these vehicles are charged at our sites using green energy sources and how our reliability needs to remain at the same level it is today, will be challenges for the BAU team and our fleet colleagues.

*“Our role in the Innovation team is one of the most important in ensuring that everything we do progresses into reality. Innovation is vital to all aspects of our lives and ensures we are always striving to improve what we are doing and develop opportunities to improve. By engaging subject matter experts who experience this work every day we can understand issues or key focuses and explore options to change ways of working.”* Helen Dugdale Innovation Implementation Manager

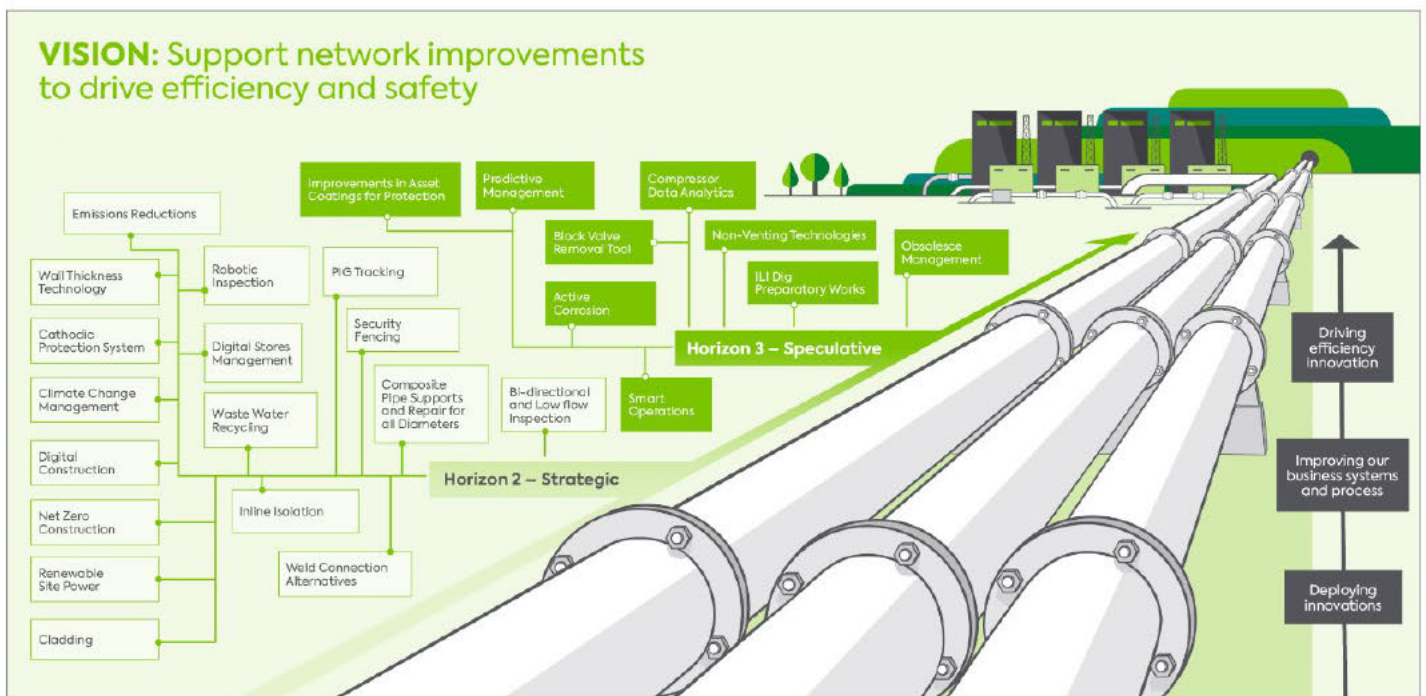


Figure 8 - Our horizon vision for the Business-as-Usual theme



Following our engagement across the stakeholder community and internally with the relevant teams some additional key topics for this theme are as follows:

<p><b>Predictive Management</b></p> <p><i>Techniques such as condition based monitoring are utilised to assess assets based on current conditions rather than forecasted regimes. Predictive management will ensure that required work is completed promptly and costs are saved as maintenance is planned and managed better.</i></p>	<p><b>Security Fences</b></p> <p><i>Security fences are a key component of the transmission system to ensure we are able to maintain supply whilst maintaining safety for everyone. Upcoming work to review past security data for high issue areas and testing equipment to understand material degradation and other opportunities.</i></p>	<p><b>Climate Change management</b></p> <p><i>Climate change is affecting all industries, extreme weather is becoming more frequent ranging from flooding to storms and heatwaves. Whilst many of our assets are buried we still need ways to protect our above ground assets to prevent outages.</i></p>	<p><b>Smart Operation</b></p> <p><i>The process of operating our compression fleet does not currently account for the impact of operational actions/decisions on the lifecycle of our assets. Employing new technologies that aid the efficient operation of our assets, can ensure compressor units are run within their optimal settings</i></p>	<p><b>Active Corrosion</b></p> <p><i>Innovative opportunity to prioritise and target defects that present the greatest risk, using both historical and current dig data to assess and determine active corrosion. This will enable the optimisation of rectification works based on enhanced risk understanding compliance.</i></p>
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### 4.3 Deployed Innovation

National Gas is pleased to report on the below successful innovation projects which have been embedded into the RIIO-GT3 plan as fully deployed and embedded. We will not be requesting any additional Totex allowance in RIIO-GT3 to cover the costs to deploy these concepts, they will be delivered alongside the rest of our workbook in the Asset Management Plan.

- Mobile Condensate Tanks - NGT\_EJP18\_Pressure Vessels\_RIIO-GT3**

  - Baseline funding, replacement of [redacted] fixed condensate tanks to the mobile version ([redacted])
- Composite Transition pieces (CTP) - NGT\_EJP02\_Site Assets - Preheating, Filters & Pipework\_RIIO-GT3**

  - Baseline funding, CTP will be considered as an option for the replacement of [redacted] pit wall transitions
- GRAID - NGT\_EJP02\_Site Assets - Preheating, Filters & Pipework\_RIIO-GT3**

  - Baseline funding, a further [redacted] planned for RIIO-GT3 ([redacted])
- Geopolymer Injection - NGT\_EJP02\_Site Assets - Preheating, Filters & Pipework\_RIIO-GT3**

  - No direct application in RIIO-GT3 although technology is ready to deploy when required
- Ch4rge - NGT\_EJP21\_Network Decarbonisation\_RIIO-GT3**

  - [redacted] installations planned under Uncertainty Mechanism pot ([redacted])
  - Zero Loss seals - [redacted] planned under Uncertainty Mechanism ([redacted])
- Autotune DLE - NGT\_EJP21\_Network Decarbonisation\_RIIO-GT3**

  - Baseline funding, [redacted] installations in total - [redacted] units at [redacted] and [redacted] at [redacted] 1A ([redacted])
- Mobile flaring for recompression - NGT\_EJP21\_Network Decarbonisation\_RIIO-GT3**

  - [redacted] instances under Uncertainty Mechanism - Flaring gas that would be otherwise vented during recompression ([redacted])
- Various IT investments - IT 024, IT 033, IT 035, IT 061 and IT 070**

  - Previous innovation projects such as digital twin, artificial intelligence and digital construction all part of IT investments



In RIIO-T2 we have focused our effort to ensure innovation is no longer an add-on, but a key component when planning anything from large construction projects to ad-hoc works on site. This will help ensure we are embedding innovation within existing business processes so that successful projects are implemented wherever relevant.

A key success has been the update to our ND500 process for construction. We have embedded innovation requirements within the process, ensuring that as part of the planning process, all completed innovation projects are considered for their suitability to be deployed as part of the work. We are also working closely with the teams, to develop a more robust process to identify areas where innovation could be developed to support specific issues that arise. To date, we have submitted into over 20 investments ranging from new connections to compressor replacements.

#### 4.4 BAU Innovation within our Business Plan

Innovation can take many different forms in an organisation the size of National Gas' and whilst this Annex covers Innovation projects either funded by the business or by Ofgem incentive mechanisms, there are also other instances of where innovation is in action throughout our Business Plan submission. These might not take the form of a 'project' but be simply where teams and departments are aiming to be more efficient, safer or save money for the consumer in their day-to-day activities. This Innovation Culture has been developed over the price controls and the following table highlights some of the areas this can be seen within our wider Business Plan.

BAU Innovation topic	Ref	Document Reference
Cladding	6.2.3	NGT_EJP02_Site Assets - Preheating, Filters & Pipework_RIIO-GT3
Vibration	6.1.6	NGT_EJP02_Site Assets - Preheating, Filters & Pipework_RIIO-GT3
Coatings	6.1.3	NGT_EJP02_Site Assets - Preheating, Filters & Pipework_RIIO-GT3
Robotics	6.1.7	NGT_EJP02_Site Assets - Preheating, Filters & Pipework_RIIO-GT3
Cathodic Protection Sites	3.1.3	NGT_EJP09_Sites Cathodic Protection_RIIO-GT3
Cathodic Protection Pipelines	3.1.7	NGT_EJP20_Pipeline Cathodic Protection_RIIO-GT3
Marker Posts	3.1.2 & 3.1.5	NGT_EJP26_Pipeline Protection_RIIO-GT3
Metering	5.2.1	NGT_EJP06_Gas Quality, Metering and Telemetry_RIIO-GT3
Site Security	5.3.2	NGT_EJP19_Civils_RIIO-GT3

Table 1 - Location of potential BAU Innovation within the wider Business Plan

# 5.0 Network Innovation Allowance

## 5.1 RIIO-T2 Summary – NIA

The RIIO-T2 price control has been a hugely successful period to date, with planned spend in all areas to surpass RIIO-T1. We are on track to spend our total NIA allowance by 2026, delivering vital innovation projects to build our evidence basis for transitioning the company to net zero. In order to complete the full suite of evidence required for our hydrogen safety case we have applied for the NIA HyINT funding increase, this will increase our total to £30m (18/19 prices) for innovation funding and aligned to our original request for RIIO-T2. This demonstrates that our proposed innovation allowances in RIIO-T2 were accurate and realistic. This significant growth has helped the team in leading the way for innovation research and delivery within the gas industry, not just in the UK, but globally. Transmission operators around the world are now looking to the UK for ways to transition their networks ready for net zero.

Under RIIO-T2, our NIA allowance annually was awarded at £25m over the 5-year period. This was justified on continued performance from RIIO-T1 of spend across innovation activities. Spend across the themes has been varied, with the largest number of projects focused on the Asset and Business Development theme. This focus has been to meet the challenges of several novel business approaches for the energy transition and the effect the energy transition could have on our asset base.

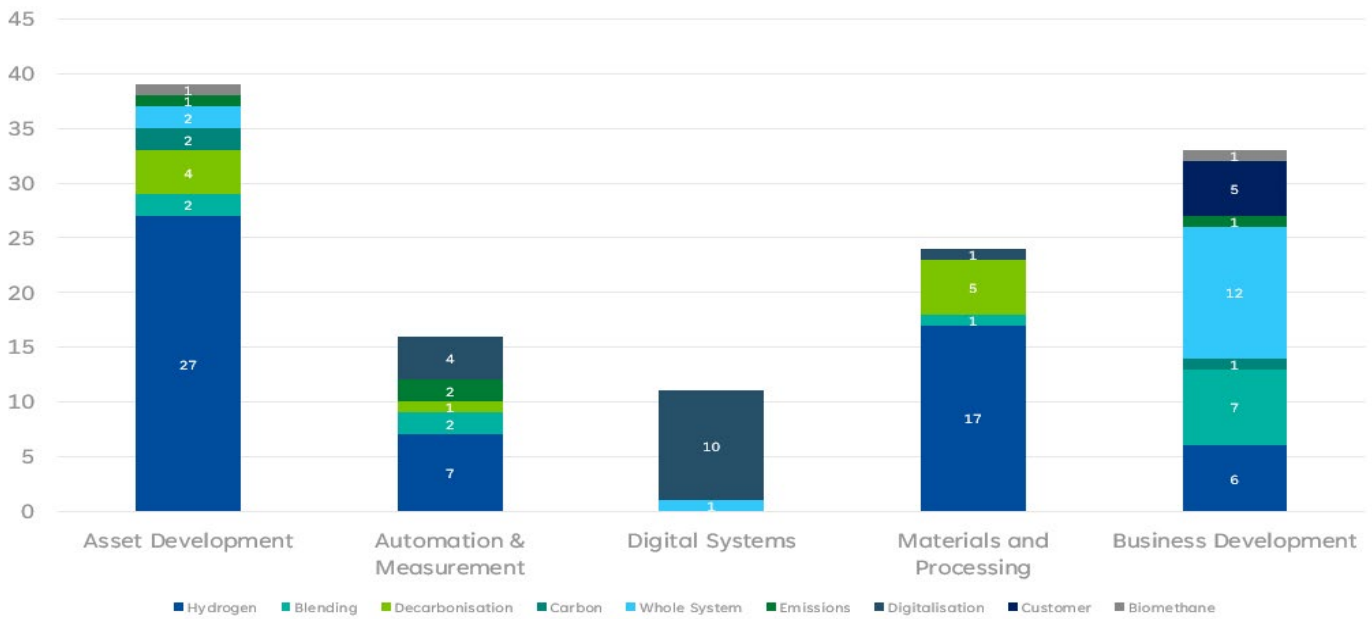


Figure 9 - NIA Projects by technology theme

Our Annual Summaries cover progress to date in much more detail and can be found here: <https://www.nationalgas.com/insight-and-innovation/transmission-innovation>. Our innovation strategy details the key elements of focus for our future work and innovation activities. The value of our innovation portfolio in RIIO-T2 is targeting the same level of return as that proposed in RIIO-T1; 4:1. In RIIO-T2 we have successfully delivered £170m of benefits from the £34m of RIIO-T1 innovation incentive funding. The innovation funding in RIIO-T2 is focussed on energy transition projects and will be delivered through RIIO-GT3 and 4.

## 5.2 NIA Innovation in RIIO-GT3

RIIO-T1 and RIIO-T2 have provided a robust foundation for us to further innovation across the gas transmission system. The team has developed from simply supporting innovation across the business, to driving change within the business and across our external stakeholder groups. The team have become experts in their technology areas and are developing novel solutions to the energy transition with our partners across energy and other sectors. We believe that RIIO-GT3 will be the price control that begins enabling the energy transition and as such, the Innovation team need to cover a wider breadth of areas including but not limited to hydrogen transportation.

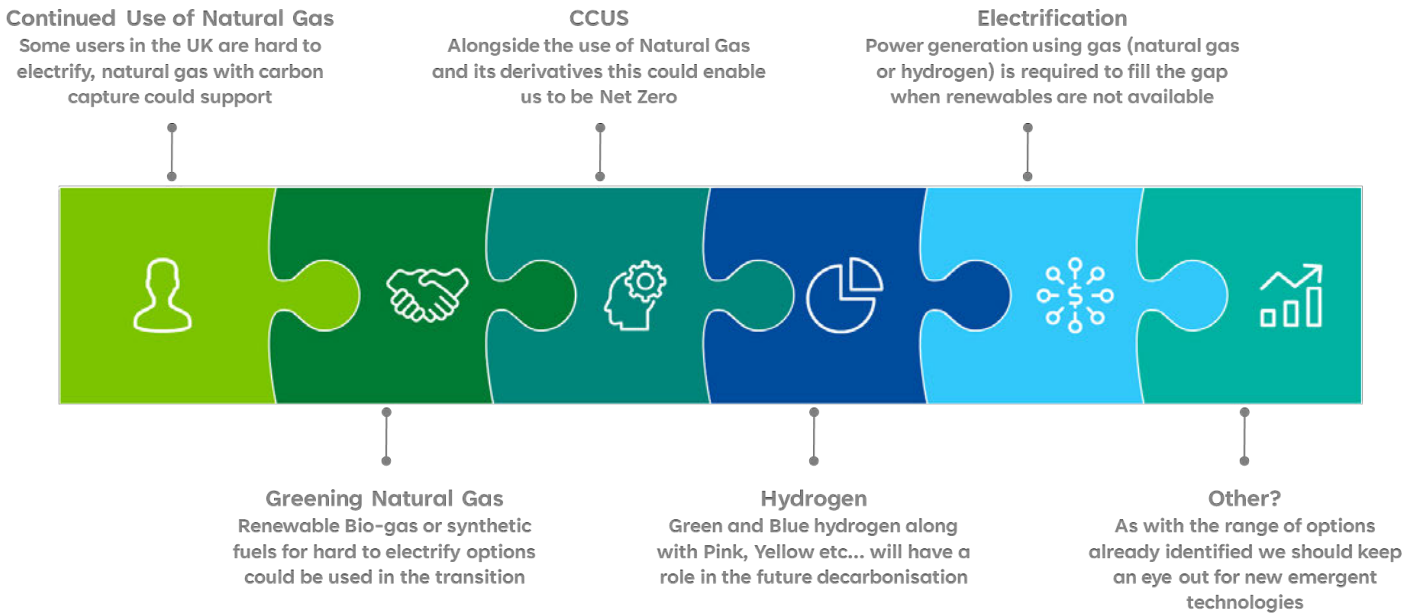


Figure 10 - Focus areas for RIIO-GT3

We will use NIA to fund projects and concepts that are lower down the Technology Readiness Levels (TRL), which the business would still consider as being too high risk for our BAU funds, acknowledging this was the purpose of NIA funding.

To deliver our NIA portfolio for RIIO-GT3 we will require [REDACTED] across the 5-year price control, which equates to [REDACTED] per year. Similarly, to RIIO-T2 and to allow for greater flexibility in managing these funds, they will be spread across all our themes and National Gas will have access to the full [REDACTED] from the first year.

Our innovation activities are focussed around 3 Strategic Themes which align to the Horizon model. Each horizon describes the maturity and relative risk of projects and is how we manage our portfolio of projects for current and future growth.

- **Fit for the Future** (Horizon 1 extend and optimise core business)  
Safeguarding and preparing our assets for the challenges in operating for the next 50 years and towards a decarbonised future.
- **Ready for Decarbonisation** (Horizon 2 build emerging business)  
Focusing on how the NTS will transport net zero gases and where novel technology will enable us to accelerate our transition.
- **Decarbonised Energy System** (Horizon 3 Create viable future options)  
Developing our Net Zero Transmission system of the future, we'll explore how the gas will interact with the NTS and its customers.



The following diagram depicts the strategic themes aligned to their horizon and how this maps into market and technology readiness. We aim to have a balanced portfolio across the areas to provide solutions at all levels and timelines as appropriate.

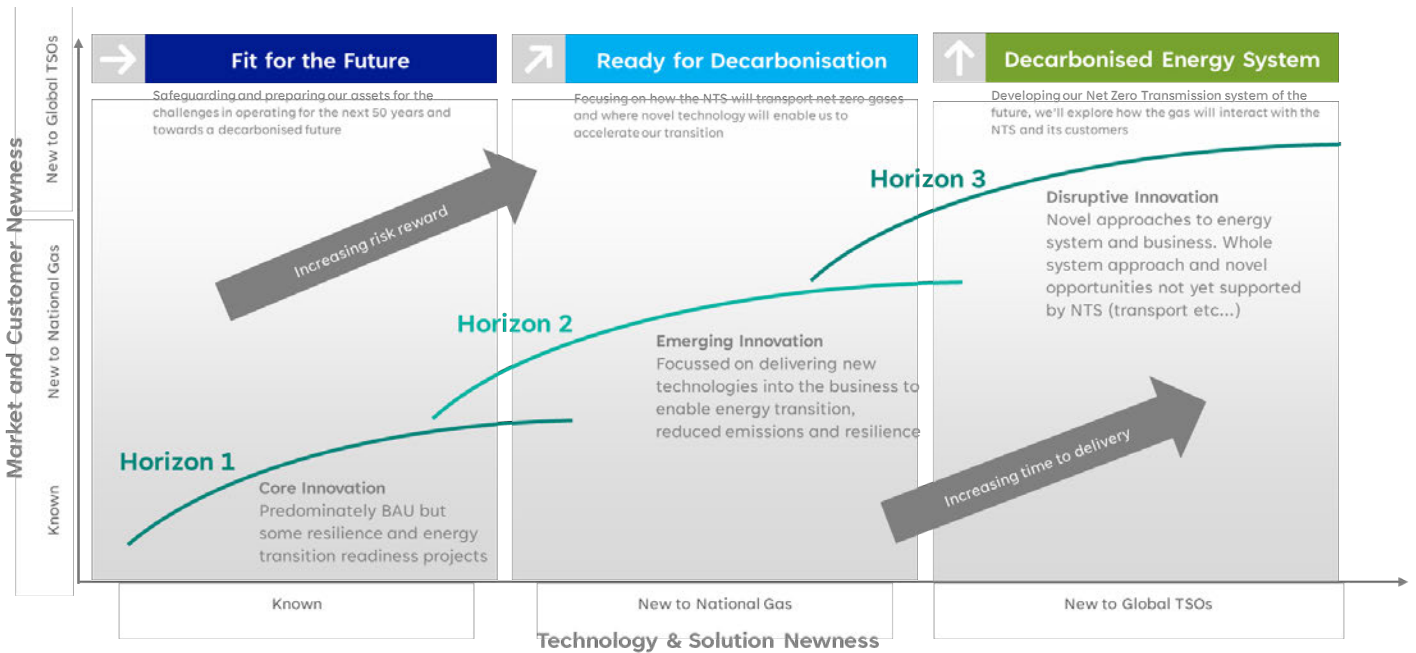


Figure 11 - Horizon mapping against our Strategic Themes

In addition to the alignment of strategic themes to horizons, we have identified how the themes will develop over time and where our focus will be as we progress through to 2050. Further information on this and a full breakdown of our strategy can be found in our published [Interactive Innovation Strategy](#).

The innovation team is structured around technology portfolios, which enables them to build expertise in a defined technology area, become a key expert for the gas industry and a point of contact for both internal and external stakeholders. The following diagram showcases the themes and their key focus area.

	<b>Asset Development for Risk Management</b>	Focused on developing our understanding of our current asset landscape and its capability with future net zero gases.
	<b>Materials and Processing</b>	Focused on solutions to help improve our materials resistance for current and future scenarios, while developing novel techniques to maintain our National Transmission System assets.
	<b>Automation and Measurement</b>	Focused on all sensing systems within the gas transmission network, as well as assessment methodologies such as pipeline inspection gauges and robotic assessments.
	<b>Digital Systems and Simulation</b>	Focused on all aspects of digitalisation and data management, ensuring that our systems are ready for the future and can handle large quantities of data providing real insights for our teams.
	<b>Business Development</b>	Focused on the operation of the National Transmission System and builds an understanding of how this may evolve with market changes through the energy transition.

As we did in RIIO-T2, we have aligned key technology areas with the strategic themes which will remain consistent as we progress to RIIO-GT3 with some additional technologies being considered, and TRL changes for those already developed:

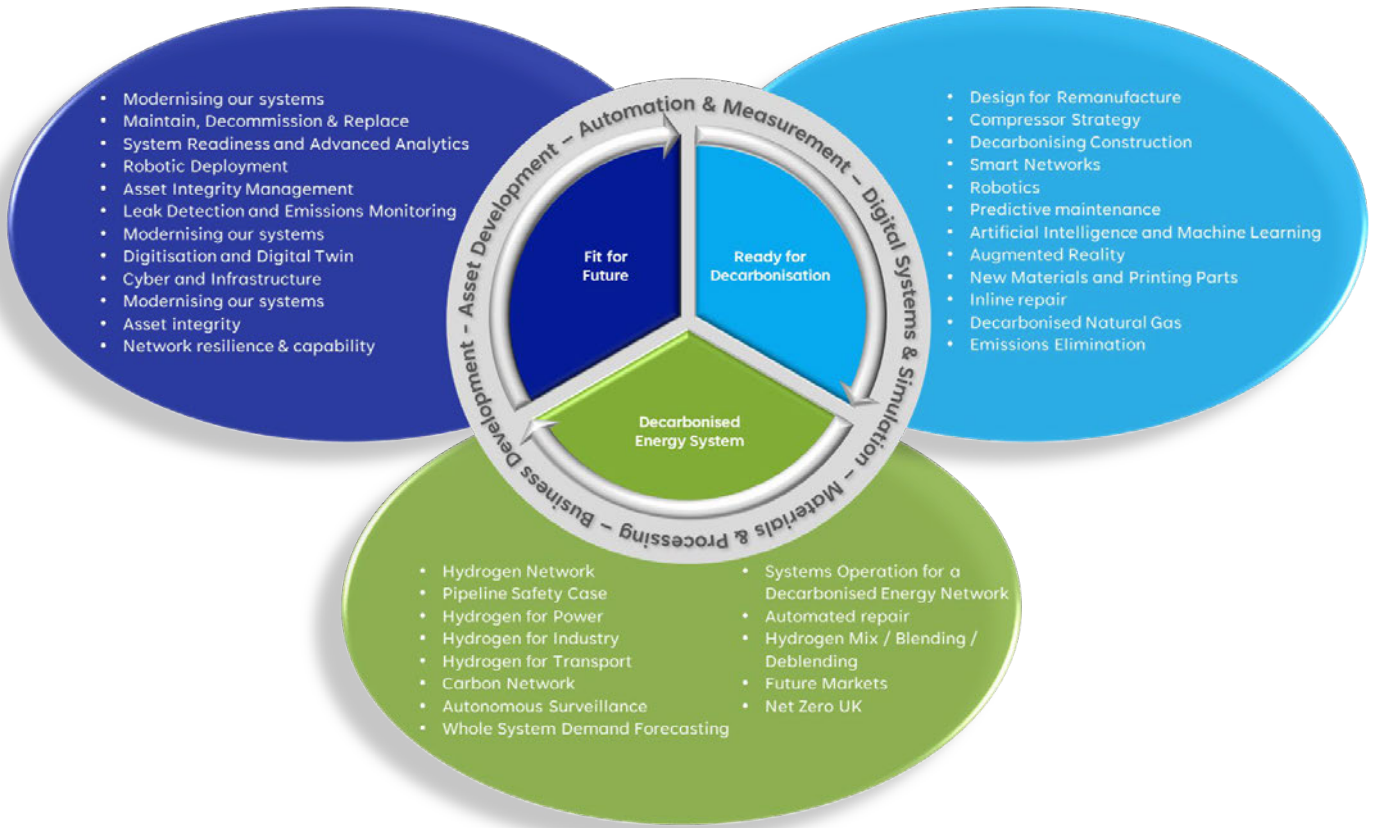


Figure 12 - Key technology areas mapped to themes

We recognise and support the need for a Network Innovation Allowance fund to continue into RIIO-GT3, allowing baseline funding for concept development, consortium identification project creation, collaboration, and dissemination, alongside the delivery of research and development projects prior to them moving into demonstration and implementation. The Network Innovation Allowance will stimulate and encourage innovation throughout RIIO-GT3 at a vital time in the energy transition when networks are beginning to not only demonstrate what the future will be like, but also be starting to repurpose and build the net zero network.

While we have focussed on providing the evidence base for the energy transition in RIIO-T2 we have identified that network resilience and safety is key to enabling any future for the network. National Gas hosted a resilience summit with Ofgem in 2023, which has proven the need to invest in maintaining our current network. As we progress into RIIO-GT3, we believe that the innovation criteria need to be expanded to enable projects that develop our existing network whilst also ensuring that it is future proofed. Focusing on network resilience, emissions reduction, and safety for example, will develop our decarbonised natural gas network (biomethane, synthetic gas) to provide energy to customers through to 2050. As such, these types of projects will be embedded into our themes during RIIO-GT3.

As we have a proposed pipeline of activities required in RIIO-GT3 we will not restrict the work to focus solely on these topics. It is vital that we have flexibility in our approach. We review and update our roadmaps and strategy regularly and publish a version for our collaboration partners to utilise every two years.

**5.2.1 Asset Development for Risk Mitigation**

Through the RIIO-T2 period, this theme has focussed on demonstrating the capability of our assets with net zero gases, developed technologies and processes to enable us to utilise our UK assets for the energy transition and developed an understanding of failure modes and risk levels associated with the networks transition.



### Case Study – FutureGrid NIC

In RIIO-T2 we commenced the HyNTS FutureGrid Phase 1 Network Innovation Competition (NIC) project. This project was the first of many steps towards a full-scale conversion of the existing NTS to transport hydrogen. The project involved constructing a test facility from decommissioned assets that was 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.

Through rigorous testing, the HyNTS FutureGrid project allowed National Gas to gain an understanding of how the gas network will need to be developed and operated, to deliver sufficient quantities of hydrogen to our customers. Project partners included [REDACTED]

[REDACTED] The project was successfully managed through to testing and was completed in April 2024.



Figure 13 - FutureGrid Infographic

The main test programme focused on evaluating the performance of the key assets found on the NTS such as valves, filters and pipework. Significantly, the team tested both the integrity of the assets and their performance in varying network conditions and hydrogen blends (2%, 20% and 100%) alongside 5%, which was funded under a separate NIA project. Each hydrogen concentration was tested in the facility, operating at representative NTS flow rates to generate conditions seen on our network. Throughout the testing we concentrated on vibration, noise, and permeation across the facility alongside leak monitoring compared at each blend.

The results from this world first, at scale hydrogen transmission test facility have been published in the summer of 2024 and are very positive following reaching 100% hydrogen operation in early 2024. The future is very bright for FutureGrid as we move into the next stages of the facility, funded through the Strategic Innovation Fund (SIF). The next phase of works focuses on demonstrating Compression and Deblending technologies. The HyNTS FutureGrid Phase 2 project extends into the beginning of RIIO-GT3. The output from the project alongside that of the business-as-usual work will be integrated into our compression equipment strategy to ensure a future proofed network. We are working closely with Project Union to ensure the solutions developed are suitable and aligned to their network repurposing plans. Further to this we will continue to develop our approach to repurposing through using digital tools, novel materials and equipment, improved asset monitoring and other solutions developed both in RIIO-T2 and RIIO-GT3.

As we move into RIIO-GT3 the asset theme will focus on several key areas ensuring our equipment is ready for any of the different net zero scenarios that the network is required to support. At the beginning of RIIO-GT3 in 2026/27, we will be required to present our hydrogen safety case that will enable Project Union to commence construction. This safety case will include evidence for all our key asset classes such as valves, compression, metering, and filters, alongside the pipeline itself.

Whilst we have been working to understand our network assets and provide an optimised approach to repurposing our network, we know that novel technologies and processes will be developed across the globe, through to 2050. We will be looking to benchmark, develop and deploy solutions to ensure that we continuously reduce the cost of the energy transition for the consumer while ensuring safety across the UK.



“Innovation is key to developing the transmission system for transportation of decarbonised gases. The use of innovative techniques and technologies will allow us to repurpose our assets where possible, ensure new assets are fit for purpose and enable safe operation and maintenance of our future transmission system” Matthew Hammond – Innovation Engineer for Asset



Figure 14 - Our horizon vision for the Asset development for risk mitigation theme

Following our engagement across the stakeholder community and internally with the relevant teams our key topics for this theme are as follows:

<p><b>Variable gas compression</b></p> <p><i>Modifications will be required to enable compression of variable blends, such as an automated system which can sense the composition of the gas upstream and feedback to the compressor, enabling the compressor to adapt operation for the gas blend within the pipeline.</i></p>	<p><b>Key asset upgrades</b></p> <p><i>Many of our key assets that we use today such as valves, filters and actuators could be used in a net zero future with some modifications and upgrades. This topic will research what these upgrades are and if new asset classes are needed.</i></p>	<p><b>Hydrogen fuel gas for turbines</b></p> <p><i>As part of our target to be a net zero business, we are looking at ways to reduce our own use of fossil fuels, one way we are doing this is to investigate if our turbines can be fuelled by hydrogen or a blend of gas. This will enable us to determine if existing turbines can be upgraded rather than replaced.</i></p>	<p><b>Climate change resilience</b></p> <p><i>Higher temperatures, flooding and storms are all examples of how our climate is changing. Climate change resilience focuses on how we can adapt to the changes to ensure our assets are not affected leading to possible outages which affect the consumer negatively.</i></p>	<p><b>Carbon Transmission</b></p> <p><i>As our position in the CCUS landscape is becoming more understood we will need to build the evidence case for using the NTS to transport carbon. Our network will require innovative modification to transport carbon but early studies show the repurposing is technically achievable.</i></p>
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**5.2.2 Materials and Processing**

Through the RIIO-T2 period, this theme has focussed on determining the impact of net zero gases on the network materials. This has been challenging as the network has been constructed over several years and is made up of a variety of materials, manufacturers, and asset types. Additionally, any previously completed research on materials will not have considered a buried pipeline that has been operational with natural gas for 40 years prior.

National Gas operates in a highly specialised industry, operating at high pressures, with metallic pipelines, compared to the much lower pressures of the Distribution network, which utilises predominantly PE (polyurethane) plastic pipe. A significant number of the challenges faced by the Gas Distribution Networks do not



apply to NGT and are associated with their domestic customer base, including street works, repairs, and mains replacement. As a result, we have ensured we have developed strong relationships with global transmission network operators (TSOs) and are building collaborative projects with them on their materials and processes. In the RIIO-T2 period, we requested deviations from the NIA governance document to enable us to maximise UK funding, by collaborating with European TSOs (GERG/H2GAR). We believe this should be an option in RIIO-GT3, to ensure we do not duplicate work and enable access to work already completed by other networks on the material science of repurposing a gas network.

**Case Study – Impact of Hydrogen on NTS Polymer/Elastomer Materials, NIA\_NGGT0194**  
 Feasibility study examining the current uncertainty as to the risk posed by degradation of polymeric and elastomeric materials when exposed to high pressure hydrogen. The project looked to document all the different material types and review the literature on hydrogen impact. In summary our polymers/elastomers generally expected to be suitable for high-pressure service, however more research is recommended where gaps in knowledge are present.

Research and innovation projects within the theme of materials and processes will become vital as we move from providing the evidence base for decarbonised gases in our network, to fully enabling our transition. We need to not only understand how hydrogen or carbon could affect our materials, but also look to the materials of the future for gas networks, such as composites, additive manufacturing and special coatings that could be applied. Understanding the impact of net zero gases on new materials is often well understood from the manufacturer, but trials and demonstrations will be needed to realise the impacts on our existing network. This is one of the key reasons why our FutureGrid test facility was built and will continue to be used in RIIO-GT3 for material and process projects. RIIO-GT3 could see new construction on the network with new ways of welding and low carbon construction methodologies being applied.

UK Steel is considered a vital industry for this country, and we need to work with the various steel manufacturers in this country closely to ensure our requirements are met, allowing any new build pipelines for the future to be procured from the UK supporting that industry. Additionally, we will require a full understand of the current state of our materials such as defects and any stresses in order to carry out our impact assessments of hydrogen.

*“Innovation is key to understanding the risks associated with re-purposing the existing network for hydrogen and other net zero gases and providing mitigation strategies where needed. There are also opportunities to explore the use of new novel materials to improve the operational efficiency of the assets in a decarbonised future.”* Rob Best – Innovation Engineer for Materials and Processing



Figure 15 - Our horizon vision for the Materials and Processing theme



Following our engagement across the stakeholder community and internally with the relevant teams our key topics for this theme are as follows:

#### New Asset Materials

*As the technology for new asset materials improves, the amount of pressure they can hold is increasing allowing the use for transmission applications. This topic will further the understanding of the potential ahead of taking the technology to demonstration.*

#### Barrier Coatings & Liners

*As the understanding of the impact net zero gases have on our materials increases there may be need for localised coatings or barriers to be applied. This topic will focus on the different types of coating available and significantly how they can be applied in-field on a buried asset for example.*

#### Integrity Management

*We understand the integrity management of our existing natural gas network well and have a suite of documents and processes to do this, however these will need amending or rewriting as net zero gases are introduced to the network bring different integrity challenges.*

#### Net Zero Operations

*How we operate our network will completely change in the future and each aspect needs to be researched and understood so that the change can be seamless and safe. Our operational staff will need to have the right tools and materials available from day 1 to operate the decarbonised system.*

#### Proactive corrosion management

*We currently monitor our network for corrosion using cathodic protection however a network of the future could include smart materials that notify us at the presence of corrosion allowing proactive maintenance instead of reactively fixing defects when found.*

### 5.2.3 Automation & Measurement

Through the RIIO-T2 period, this theme has focussed on developing technologies for measurement of net zero gases through metering and gas analyser systems, alongside novel gas detection solutions. A key challenge identified with hydrogen is the need to survey and inspect the network on a more regular basis to ensure third party interaction is safe and that network defects are identified and resolved quickly.

#### Case Study – Variable Gas Blend Measurement System Development, NIA\_NGGT0201

With the introduction of a variety of net zero gases our network could become even more complex to manage, meaning we will need an increasing number of accurate measurement systems that are better connected and can respond quickly to the possibility of varying blends. The resulting test plan enables National Gas to efficiently progress the technologies that are likely to be most suited to hydrogen applications and concentrate efforts on the most mature of these technologies. The findings of this project have fed into the FutureGrid metering skid design which looks to test meter assets with 100% hydrogen at high pressure.

In RIIO-GT3, we will continue to develop and demonstrate gas quality and measurement tools that are optimised to reduce the time associated with collection, data analysis and the results allowing us to manage a highly variable network of the future. New pipeline inspection techniques will be trialled and implemented as we look to understand a greater level of detail about the integrity and condition of our network, ahead of new gases being introduced. During the RIIO-GT3 period, National Gas Transmission will seek to investigate the leak potential of a repurposed hydrogen transmission network, with further consideration given to how existing operation and maintenance procedures should remain fit for purpose, to ensure reliable and safe transportation of hydrogen.

The way that we monitor our pipeline corridors is also likely to change over the RIIO-GT3 timeline. In response to increased pressure surrounding our helicopter flights, we have developed a surveillance strategy. Our focus at the beginning RIIO-GT3 will be to demonstrate a combined approach of technologies, along with a central data platform to collate various data inputs, that can provide a dynamic risk-based approach to surveillance that does not increase risk for pipeline monitoring. We will show the use of satellite and radar capabilities alongside AI and machine learning, to increase the efficiency of our operational teams and give a more detailed understanding of activity around our pipelines. We will also continue to work closely with the CAA and third-party suppliers, offering drone capability for surveillance, to introduce drone technology into our strategy.

Robotics will also be a key topic for RIIO-GT3. By understanding our user cases for robots, we can go out to market and seek the best tools for the job, whether that is for corrosion inspection, excavations, or repair. There



are several commercially available robots that could produce significant benefits for National Gas, providing they are tested and safe to use in gaseous, high-pressure environments. We are planning to continue our campaign of making our above ground installations (AGIs) robot ready, by constructing access points that will allow entry to our un-piggable site pipework, facilitating inspections by our own tool; GRAID (Gas Robotic Agile Inspection Device) and others.

“The introduction of net zero gases into our network, in their pure form or blended with natural gas, alters the physical characteristics of the gas flowing in our pipelines. Traditional techniques in use on our network do not have the required capability to measure all the different variables. Therefore, innovation is required in automation and measurement to allow us to manage a decarbonised network safely and efficiently.” Alistair Carvell – Innovation Engineer Automation and Measurement

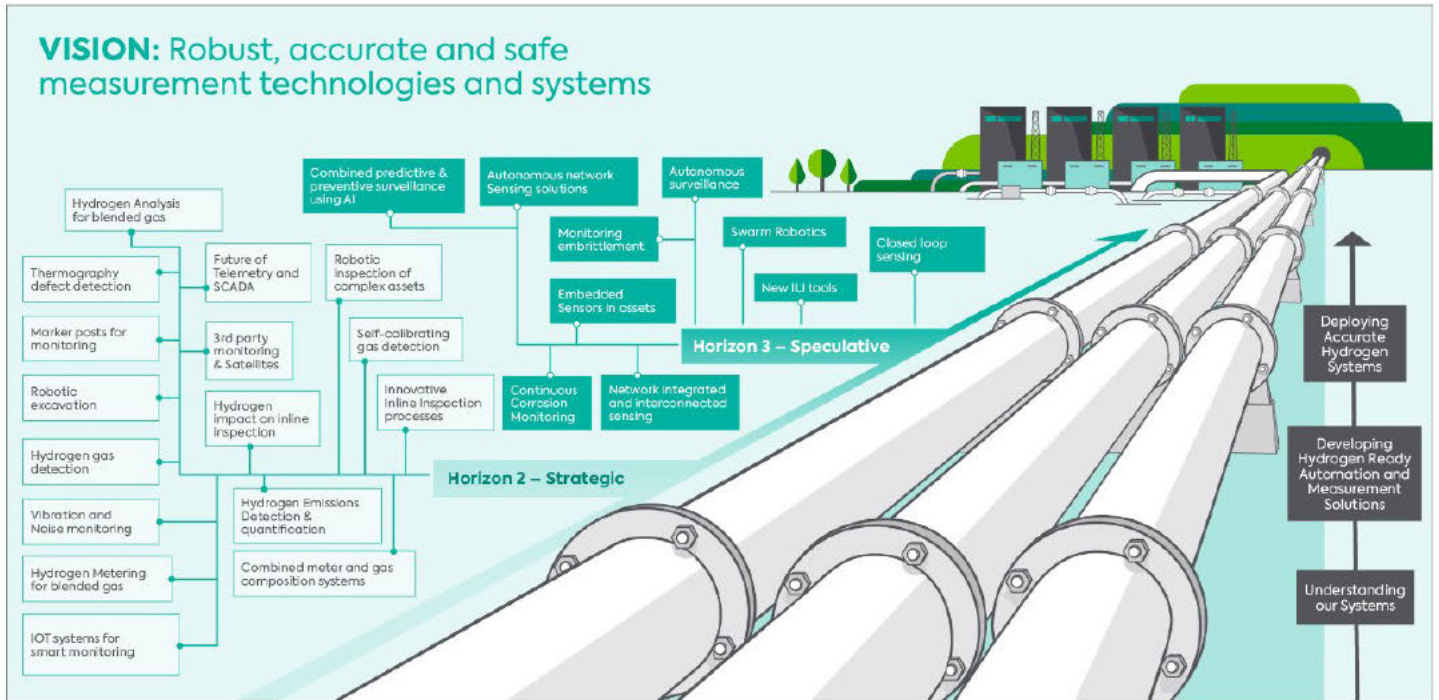


Figure 16 - Our horizon vision for the Automation and Measurement theme

Following our engagement across the stakeholder community and internally with the relevant teams our key topics for this theme are as follows:

**Analysis for blended gas**

As hydrogen levels increase in a blended mix, gas analysis hardware and software will need to be adapted to continue measuring the energy content of blends accurately. Additionally this will need to be carried out in more locations at a greater frequency than today.

**IOT systems for smart monitoring**

Internet of Things (IOT) refers to connecting assets and equipment to the internet in order that they can be monitored quickly and remotely. These IOT systems are becoming very accessible and we will need to look into the ways these sensors can be used on our asset

**Robotic Inspection of complex assets**

Robotic inspection tools will need to be developed and further tools designed, trialled and implemented to inspect our complex assets allowing their condition ahead of introducing hydrogen or other net zero gases.

**Surveillance using AI**

We will be looking at the use of satellite surveillance combined with artificial intelligence to be able to automatically monitor the route corridor and be able to 'ignore' threats which would not affect the pipeline such as cattle movement and alert on threats such as digging equipment.

**Robotic excavation**

Excavation on or near our pipelines and sites is treated as one of the most hazardous activities and as such can be very costly to complete. Robotic excavation tools are in their development, with the concept being that an accurate excavation can remove hazards to personnel and reduce the overall cost.

### 5.2.4 Digital Systems & Simulation

Through the RIIO-T2 period this theme has focussed on developing digital tools to enable accelerated network repurposing and to provide all stakeholders with improved insight into the network, using the technology of ‘digital twin’.

A digital twin of an asset or a network can be defined in several ways, and this was one of the tasks during RIIO-T2, to understand the parameters and value case for the technology. Ultimately for National Gas, a digital or data twin is a virtual representation of an asset, part of the network or the full system, with as much data and information attached to it as possible. This will allow teams to make modifications, understand maintenance, work through failure scenarios, and balance the network with new net zero gases such as hydrogen or carbon as a few examples. A key aspect of all these solutions is interoperability with both internal digital systems and the wider energy system data/digital solutions. We have worked on several collaborative projects and are engaged in the Data and Digitalisation Steering Group (DDSG) interoperability and ESO Virtual Energy System programmes of work.

In RIIO-GT3, we will be further developing the solutions created in RIIO-T2 alongside our IT and data teams to introduce smarter features using machine learning and artificial intelligent solutions. The Digital Twin solution developed in RIIO-T2 will integrate with our Digital Asset Management (DAM) and Digital Construction tools, delivered by IT, to provide a clear picture of the NTS without the need for development of a separate twin.

The Digital technology portfolio projects have been developed in co-ordination with the Data and IT teams. We have aligned our activities to the three digital value streams:

#### Trusted Data Management

The focus for innovation through RIIO-GT3 on data will be providing easy to interpret data quality information to the data users and supporting the HyNTS Dataset scale up and roll out activities. In RIIO-T2, we started to consider how to automate and optimise data gathering and assessment processes, to accelerate the digitalisation of network assets. Whilst we have found some available tools, the variation in data source requires smarter tools using AI based systems, that will continue to be developed into RIIO-GT3.

Interoperability of data across the networks, energy system and wider industries is key to the decarbonisation of the UK, but also to minimising consumer cost and ensuring efficiency and resilience. We have investigated this topic in RIIO-T2 and are supporting the digital spine and its deployment. As we move into RIIO-GT3, we will consider how this is impacted by some of the future systems we are considering and how we can incorporate other relevant data points.

The National Gas operations team have been developing their approach to digital solutions and will be supported by our CVDT Digital twin project and HyNTS Dataset in RIIO-GT3. We must improve the context of the information provided, to make the usability of the

#### Case Study – Collaborative Visual Data Twin (CVDT) NIA\_NGGT0178 & NIA\_NGGT0214

This project is the first phase in determining what a digital twin may look like for the NTS. To develop a strategy, we are considering the system in its current halves, the data twin, and the visual twin, and then considering the options to combine and develop them against several applications across the network and users. The outcomes of the project are being used in a second phase, to build and demonstrate the digital twin using the FutureGrid test facility as a model. This model will be used to visualise and better understand any asset changes that occur because of exposure to hydrogen. The future of these projects will ultimately help us make more robust asset management decisions, allow us to make predictions on future scenarios and conduct risk analysis using improved analytics and linked datasets. Multiple follow-on phases have been proposed and the Innovation and Data teams within National Gas are working closely together to embed this technology, using the FutureGrid example as a blueprint for the NTS.

#### Case Study – Virtual Energy System (collaborative with ESO & National Grid), NIA\_NGESO028

A National Grid ESO led project supported by National Grid and National Gas which carried out an industry-wide initiative to enable the creation of an ecosystem of connected digital twins of the entire energy system of Great Britain - the Virtual Energy System (VirtualES). The hope was this will unlock the modelling of system interactions across the energy sector. VirtualES will be an enduring programme over several years and will provide users across the sector with access to data and integrated modelling capabilities, to improve data-driven decision making for investments and operations.



systems and the efficiency of data gathering align to the speed of activities in operations. This also must consider the accessibility to digital information on site, where signal and safety could restrict the teams.

**Enterprise Artificial Intelligence (AI) Capability, Intelligence and Efficiencies**

In RIIO-T2 we have considered the use of AI in surveillance activities and for understanding our historical data and determining optimised project approaches. As these tools become more prevalent and used across our IT systems, we will need to support the teams with some of the more radical transformation applications of AI. We have initially identified three topics of focus and will develop these as we progress into the price control period:

- **Predictive Outage management and rapid support dispatch**  
AI use case to combine outage management forecasts with mobilising technicians, engineers for rapid resilience and asset intervention.
- **Spatial Asset Protection** – predictive vegetation growth, assisted line search activities  
Composite model to predict vegetation growth around critical installations using multiple data inputs (weather, soil, flora/fauna conditions, GIS info, etc) Helping to filter line search dial before you dig (LSBUD) enquiries
- **IOT Use cases**  
Understanding and analysing significant quantities of telemetry and sensor data in near-real time.

The concept of AI was covered heavily in our Summer of Engagement workshops with our innovator community, it was agreed that in such a fast-paced environment, energy networks need to be very clear on the user cases of AI before investment is carried out, as tools can be out of date very quickly. AI will have an important role but careful consideration of where at National Gas specifically will be important for the team.

**Derived Productivity and Harmonisation**

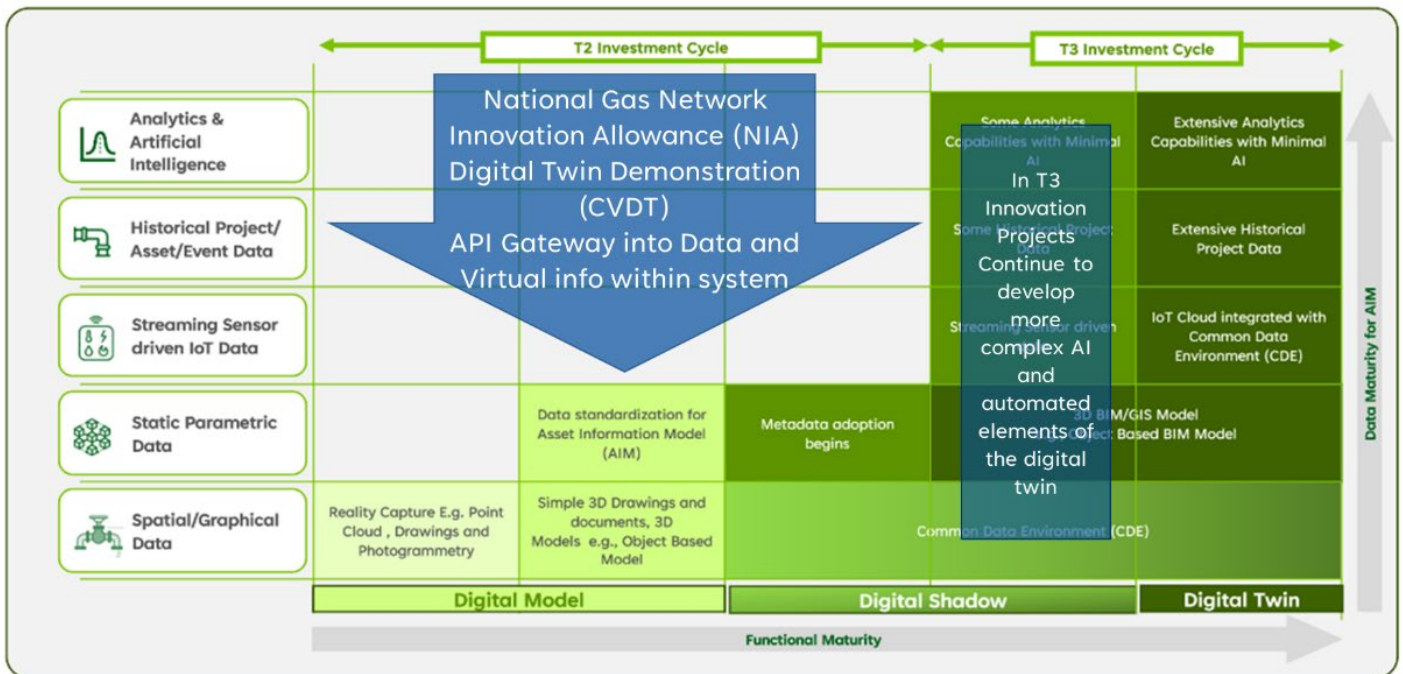


Figure 17 - Our Digital Twin Approach

Through RIIO-T2 we have developed the Digital Twin approach through the CVDT project, while the business has developed base systems to enable it to be deployed in RIIO-GT3. In RIIO-GT3 we will focus on the development of the Digital Twin automations, simulation, AI integration and operational capability, to then enable implementation later in the RIIO-GT3 period and into RIIO-4. The National Gas digital twin will enable an interface across the wider energy system and networks, ensuring interoperability in the decarbonised energy system.



“Digital systems will play a massive part in the energy transition, with complexity of the network increasing with the introduction of net zero gases, novel tools to ensure we can access and manage our data and therefore the gas network is vital. Interoperability with other energy networks and providers will be key to ensuring a robust reliable network.” Sabia Sadiya – Innovation Engineer Digital Systems and Simulation

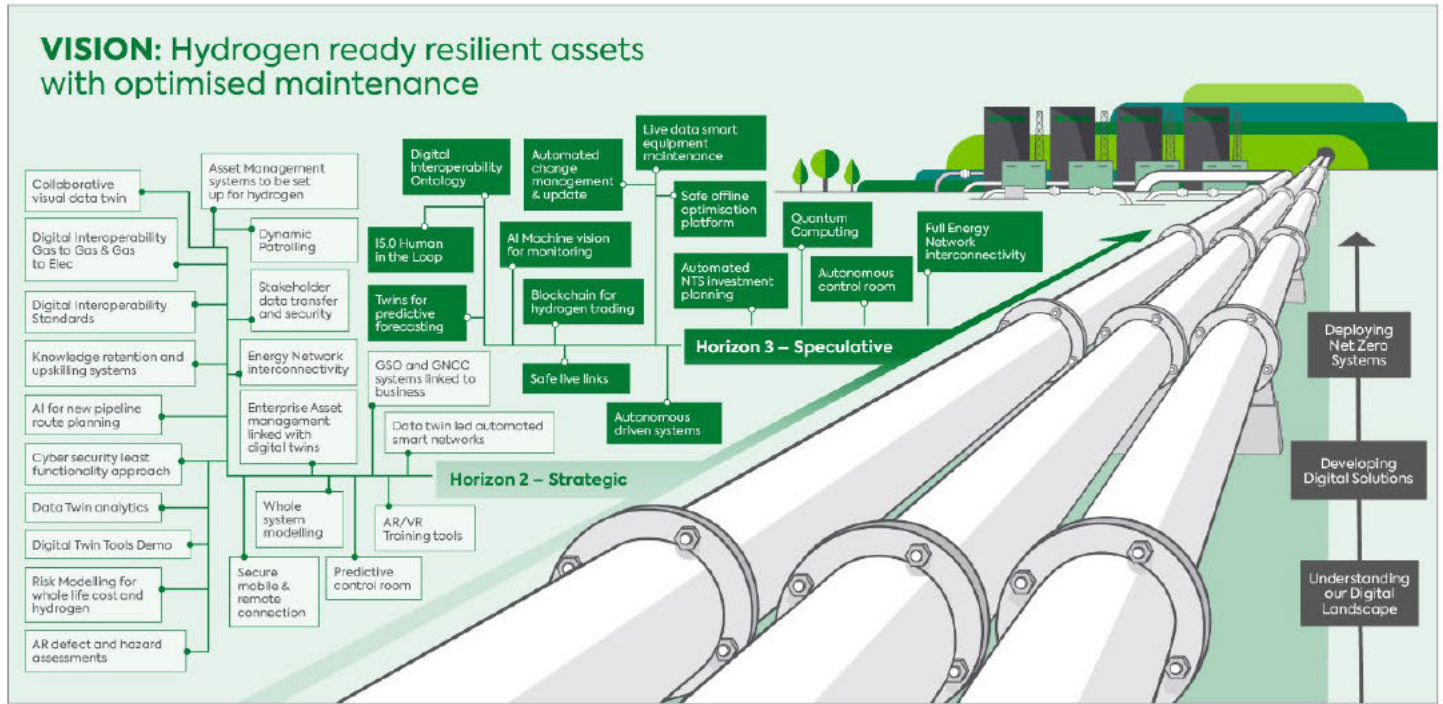


Figure 18 - Our horizon vision for the Digital Systems and Simulation theme

Following our engagement across the stakeholder community and internally with the relevant teams our key topics for this theme are as follows:

**AR defect and hazard assessments**

Augmented reality can be used for defect and hazard assessment. For example a Technician at site wearing an AR headset looking at the pipeline and the technology recognising defect areas and assessing them, suggesting possible next steps and remediation.

**Energy Network interconnectivity**

Digital interconnectivity between the different energy can be in many forms such as data transfers, passing of information between two or more systems and shared models for whole system assets, this can be very complex and relies on companies working together to agree the process.

**Secure mobile & remote connection**

As systems and hardware become more remote and mobile such as iPad and Toughbook devices to input and view data so to must the software be made secure so that the data is not intercepted or the systems compromised.

**Quantum Computing**

In order to deal with the huge increase in data that will be collected from systems and assets of the future then computing power will also need to increase to be able to run and handle the digital twin models. We will need to understand our IT systems to make the most of this technology.

**Autonomous control room**

This topic looks specifically at whether a control room could be automated and if that is something that the business would be accepting of. Certain aspects of the control room processes could be automated to help take simple tasks off the engineers even if the whole network is not run autonomously

### 5.2.5 Business Development

Through the RIIO-T2 period, the Business Development theme included a huge variety of topics as we recognised new markets that National Gas could be involved in, and how some of the existing markets would be developed. A large focus was placed on hydrogen and answering questions on how this net zero gas might interact with our network, through concepts of blending, deblending and pure hydrogen transmission. We have looked at linepack and storage for the network, how the control centre might change, invested in PhD studies, supported the other energy networks, and looked at how our internal skills and competencies might need to change in the future. Outside of the gas industry, we have shared learning with the water, nuclear, electricity, maritime and aviation industries to share and support their net zero aspirations.

#### Case Study – Hydrogen Skills & Competencies, NIA\_NGGT0185

This project looked to develop methodologies for skills training and the development of hydrogen competencies in the gas transmission industry. Work had been undertaken through Hy4Heat to develop a hydrogen competence framework including an interim training specification and an interim assessment module for hydrogen. The project will be considered as a baseline for the activities in this workstream and provides an insight into the current state of the art in hydrogen competence for National Gas. The output of this study bridges the current knowledge gap and provide the recommendations to ensure the workforce is suitably experienced, qualified, and equipped to transition to hydrogen.

RIIO-GT3 will develop our understanding of what the gas transmission business will be like in a net zero future and will focus on several important areas:

- The Future System Operator interactions with the UK gas networks and developing a whole systems approach to network planning and management.
- The hydrogen transportation safety case, detailing how the network will operate safely with ever increasing levels of hydrogen blended with natural gas. This work will be vital for Project Union – our 100% hydrogen backbone throughout the UK which will begin construction in RIIO-GT3.
- Interactions with blended hydrogen and our European neighbours as they look to decarbonise their networks. National Gas are connected via interconnectors and there may be scope to become a net exporter of hydrogen.
- Further work on repurposing our network for carbon transportation as the CCUS (Carbon capture utilisation and storage) market grows in the UK. Our net zero network could well be a combination of many different types of gas and we as the transmission network need to be able to transport them all safely. Carbon transportation will be a key area for RIIO-GT3 as projects such as SCOT2 move to construction, and we need to provide the safety case for this alongside hydrogen and natural gas.
- Alternative fuels that we could transport from production to demand including but not limited to Methanol, Ammonia and Synthetic Aviation Fuel. We need to understand how our network can help these markets as we are already supplying natural gas.
- New market connections which will need innovative ideas to link production from a wide range of sources to demand centres anywhere in the UK. For example, nuclear derived hydrogen from one part of the country to maritime ports or rail depots, helping to drive the hydrogen for transport sectors in large and heavy haulage areas.
- Helping to support the gas distribution networks for the policy decision on hydrogen for domestic heat.
- National Gas have also committed to achieve net zero for our own scope 1 and 2 emissions by 2050, with an ambition to get there by 2040 so there will be a need for many innovative solutions to help track and achieve this target.

*“Innovation creates change by extending the capability of technology and developing new applications. In turn, this technical advancement drives the need for innovation in supporting frameworks, such as the development of an appropriately skilled workforce and creates the opportunity to seek out potential new business relationships.”*

Harriet Guiry Innovation Engineer Business Development



The business development theme works closely with our business development, customer and stakeholder department to understand our customers’ needs and develop solutions that align to them. Our innovation and technical experts join customer meetings to share insight into the work we are doing and identify key collaboration points.

This theme looks at some of the more challenging issues associated to the energy transition and the methods to achieving an efficient whole system approach. Aligning to the governmental targets and considering innovative approaches to accelerating our activities to meet Clean Power 2030 with the wider energy system. Skills and competencies is one of those focus areas to enable acceleration we need the business and wider supply chain to understand the opportunities and challenges ahead.

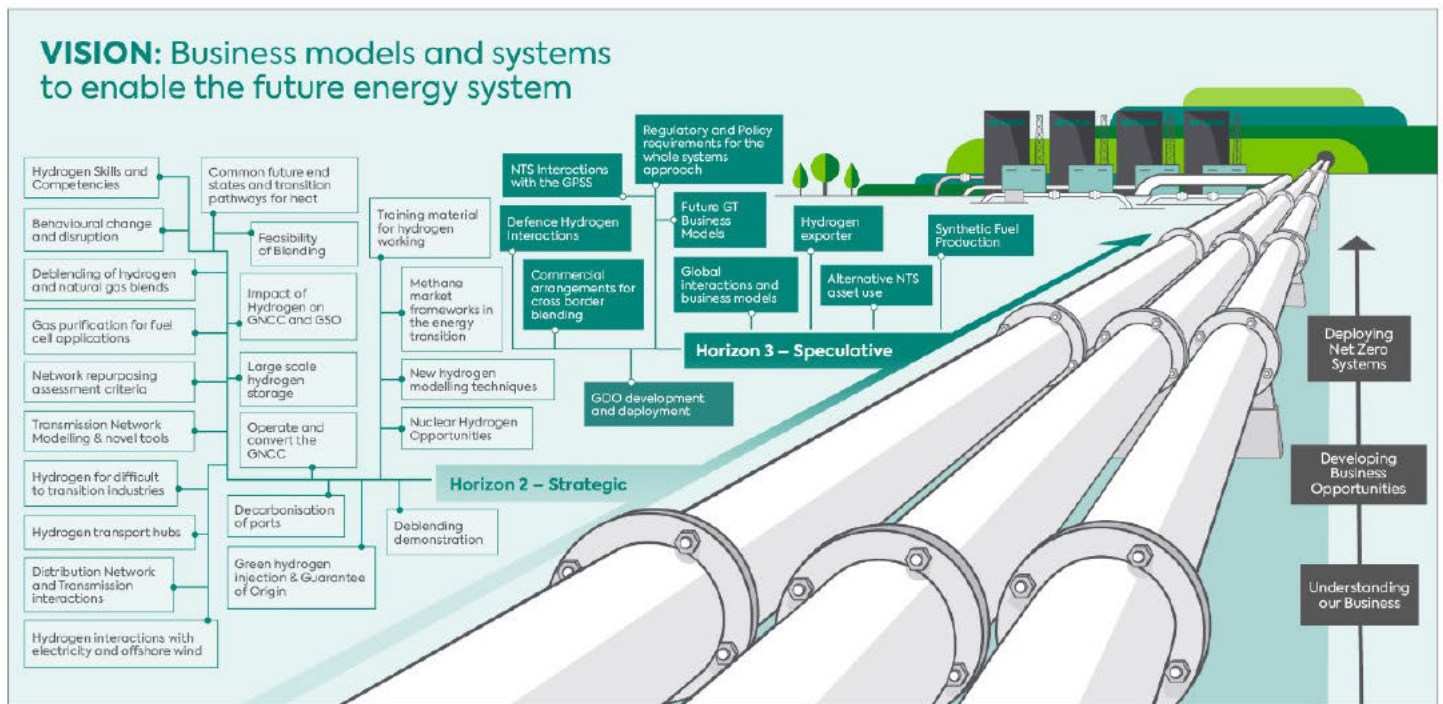


Figure 19 – Our horizon vision for the Business Development theme

Following our engagement across the stakeholder community and internally with the relevant teams our key topics for this theme are as follows:

**Hydrogen Skills & Competencies**

*The skills and competencies of our workforce must not be overlooked, new jobs will be created and existing roles will require new skills and understanding to complete. How this training is delivered, where the knowledge comes from and at what point should the training be provided are all challenges that need addressing.*

**Network repurposing assessment criteria**

*When assessing whether the network can be repurposed for net zero gases an agreed assessment criteria will be needed to ensure all factors are taken into consideration. We need to provide reassurance that the network is capable of handling the new gases*

**Hydrogen transport hubs**

*Hydrogen for transport is a rapidly expanding market and in a future decarbonised energy system the transport sector is likely to provide a significant demand for gas, either for fuel cells or hydrogen combustion directly.*

**Global interactions and business models**

*Hydrogen is a global challenge and both developed and developing countries are looking into its potential as a fuel source or as a commodity to trade. Interactions with this global market could include buying hydrogen produced around the world and shipping it to our terminals for use in the UK.*

**Future GT Business Models**

*National Gas is now separate from National Grid and so we can develop our business model ourselves, this will mean that we could get involved in new industries and markets relating to gas such as transport or storage that compliment and use our existing skills.*



## 5.3 NIA Concluding statements

### NIA Eligibility Criteria

We believe that all our topics under the five key themes are applicable to the eligibility criteria, as set out in the RIIO-GT3 Business Plan Guidance (Energy Transition and Customer Vulnerability). We are also happy to support any planned consultation by Ofgem on changes to these criteria for the next price control. While the energy transition is an obvious focus for innovation, we must continue to provide a resilient and robust network for natural gas through the transition. Innovation in RIIO-GT3 must allow innovation to cover resilience, energy transition, consumer vulnerability, emissions, and environmental impact.

### Preventing Duplication

While many of our projects are specific to transmission as they are looking at high pressure and/or large diameter gas pipelines, there are occasions where we overlap into areas of interest for the gas distribution companies or on the electricity side. When this occurs, we as energy networks can lean on the relationships developed throughout RIIO-T1 and RIIO-T2 and utilise the project notification trackers at the early statement of work stages, to check for duplication. This process will continue into RIIO-GT3, and it acts, not only as a duplication check, but also to seek out any collaborators for our projects, to share expertise and work together on a shared goal. During the early project scoping we will check through internal and external resources such as the Smarter Networks Portal (ENA) and in the future FEN Portal to ensure we are not duplicating any previous work. Additionally, during our pre sanctioning stages we present the project internally so colleagues can flag aspects of a project which might have been completed before.

### Why innovation cannot be funded by Totex allowance

We believe that the following reasons require the above highlighted innovation projects to be funded by NIA and not included in our Totex allowance:

- By its nature, innovation projects carry a certain level of risk and this would prevent the project from going ahead if we were to seek business funding.
- Project work relating to hydrogen and carbon transportation have been limited in our business plan submission, ahead of a decision on the future of gas from DESNZ in 2026. As such, any preparation and safety case evidence work for hydrogen and carbon will have to be funded through innovation, either NIA, SIF, or Use-it-or-lose-it (UIOLI). We are confident that the gas transmission network will be required in the future, and therefore work is required to provide the evidence case ahead of a positive outcome from the DESNZ consultation. Preventing work in hydrogen and carbon could delay the energy transition.

### Compulsory contribution

National Gas will retain the minimum contribution of 10% for innovation projects as agreed during RIIO-T1 and RIIO-T2, as we believe this is a realistic contribution to activities which are considered high risk, low TRL and at risk of decisions within UK Government. As noted, in RIIO-GT3 we are ring fencing £10m of business funds which are non-totex, to invest in innovation across the network in a variety of areas.

### Additional support mechanisms

National Gas welcome the ability to support their flexible allowance funding through other mechanisms such as reopeners within RIIO-GT3. We believe topics such as hydrogen blending, and carbon transportation will become significant in RIIO-GT3 and whilst these cannot be included in our Business Plan, we will use tools such as reopeners to fund the work, should the decision be positive. We also welcome the ability to reassess the level of flexible allowance throughout the RIIO-GT3 price control, to enable flexibility in reacting to changes within the 5-year period such as consultation responses from DESNZ.

**Funding across the focus areas**

Allocation of the NIA funding available to National Gas will not be set per theme in RIIO-GT3, instead the amount of funding each theme receives will be based on where the key focus is within the price control. As an example, in RIIO-T2 a focus on the energy transition towards hydrogen and carbon capture has led to more projects being funded in the asset and business themes than in others. To remain agile and focus on the governmental priorities there will be no set funding amount per theme. In RIIO-GT3 there is likely to be continued focus on enabling the energy transition with a focus on Clean Power 2030 but also on the resilience and flexibility of the current network to ensure it is available when renewables are not.

# 6.0 Delivering Innovation

## 6.1 RIIO-GT3 Innovation Team & Funding

Our Innovation team has developed over the previous two price controls from a small group of people working on innovation projects to a collection of theme leads, who are experts in their areas and who the business can lean on for advice and knowledge on all areas of the energy transition. With the introduction of the BAU Innovation team, it has been key to align both the BAU and NIA teams per theme, so there are now matching pairs encouraging collaboration. The result will be an increase in successful NIA projects moving to being embedded and implemented in the business. We are proud of how the team has grown and acknowledging that we need to attract the gas engineers of the future, have proposed to increase the team size to 44 including several new graduate positions.

Our submitted request for RIIO-GT3 funding totals £50m (NIA and UIOLI) across the RIIO-GT3 period and when taking into consideration the SIF and BAU, this will increase to £130m. The requested value is a continuation of the levels of funding achieved through the RIIO-T2 period, with an increase in predicted SIF spend and the inclusion of our dedicated BAU funding to enable an accelerated transition of innovation into business as usual.

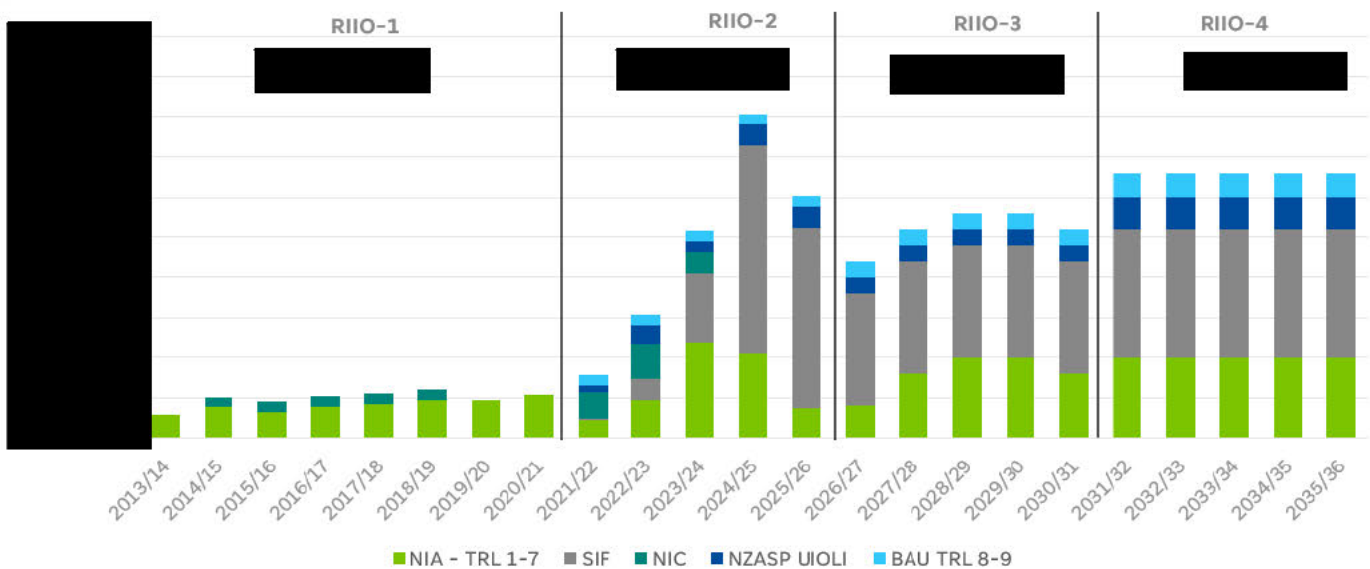


Figure 20 - RIIO-T1 to RIIO-GT3 Innovation Funding

	NIA	NIC	SIF	NZASP UIOLI	BAU	Totals
RIIO-T1	█	█	-	-		█
RIIO-T2*	█	█	█	█	█	█
RIIO-GT3	█	-	█	█	█	█
RIIO-4	█	-	█	█	█	█

\*Note - RIIO-T2 numbers include a mix of known and predicted amounts



Our proposal is to continue with a similar level of innovation funding as for RIIO-T2. We request that the funding is allocated across the RIIO period to enable projects to be robustly managed through different financial years. The RIIO-T2 innovation incentive funding has required the networks to think about their likely portfolio and plan ahead, while also providing flexibility to bring in new technology entries to the market and deprioritise lower benefit projects.

### **Strategic Innovation Fund**

In RIIO-T2, Ofgem introduced a new Strategic Innovation Fund (SIF), administered by UKRI, to replace the previous Network Innovation Competition (NIC). This programme aims to drive ambitious, innovative projects with the potential to accelerate the transition to net zero using yearly Innovation Challenge Rounds to set the strategic direction.

To date, National Gas have led on a total of 29 SIF projects, playing a significant role in the rounds of SIF administered by UKRI. We have additionally supported a further 29 projects led by other energy networks. Within Round 1 we were successful in securing 2 Beta projects, to further the work and research carried out at FutureGrid. These projects are focusing on Compression and Deblending within a hydrogen transmission network and are aiming to deliver results in 2027/28.

### **Net Zero Use-It-Or-Lose-It (UIOLI)**

The Net Zero UIOLI fund has been utilised by the innovation and hydrogen teams at National Gas and has assisted in developing the approach for our first deployment of hydrogen on the UK network (Project Union). Going forward, we believe Project Union will be funded by several potential routes outside of the Innovation allowances. As defined in the Sector Specific Methodology Decision, National Gas have been awarded a UIOLI allowance of £10m, this will continue to be used to fund small net zero facilitation projects and early development work in RIIO-GT3.

### **Other Funding**

National Gas are keen to develop our portfolio outside of Ofgem innovation incentives to enable global collaboration and funding in areas outside the topics of energy transition and vulnerable customers.

EPSRC (Engineering & Physical Sciences Research Council) funding for academic work supported by industry has enabled us to support very low TRL activities at universities, that could become larger scale projects in future price controls. This funding can also support PhDs which is a good way to develop future talent for our UK networks.

Horizon Europe is the EU's key funding programme for research and innovation, and with a budget of €95.5 billion, the world's largest research collaboration programme. Under a bespoke deal negotiated in 2023, the UK will be participating as a fully associated member for the remaining life of the programme to 2027. Using the UK's guarantee scheme, we successfully applied for NGT's first Horizon Europe project investigating the use of 'industrial' grade hydrogen for ground support equipment at aviation and marine ports.

We have also supported projects entering submissions for other InnovateUK funds and BEIS (DESNZ) funding. As networks, we have been unable to attain funding directly from these programmes as they generally do not include transportation, but we believe it is important that we support and provide data where possible.

## 6.2 Ensuring value for money

It is vital that the networks ensure the funding is maximised and spent efficiently. Through RIIO-T2 we have further developed our processes to ensure competition in the project bidding process and enable evidence of the selection process. Whilst we believe this should be common across all projects, we also propose a level of flexibility for new market entrants and areas where single source is the only reasonable approach. Project proposals are scrutinised by the team during the development stage, to ensure no duplication of effort or delivery of outputs which do not benefit the consumer. Our proposals then require sign off at our investment committee, made up of subject matter experts across the business who again will assess the project cost vs proposed benefit.

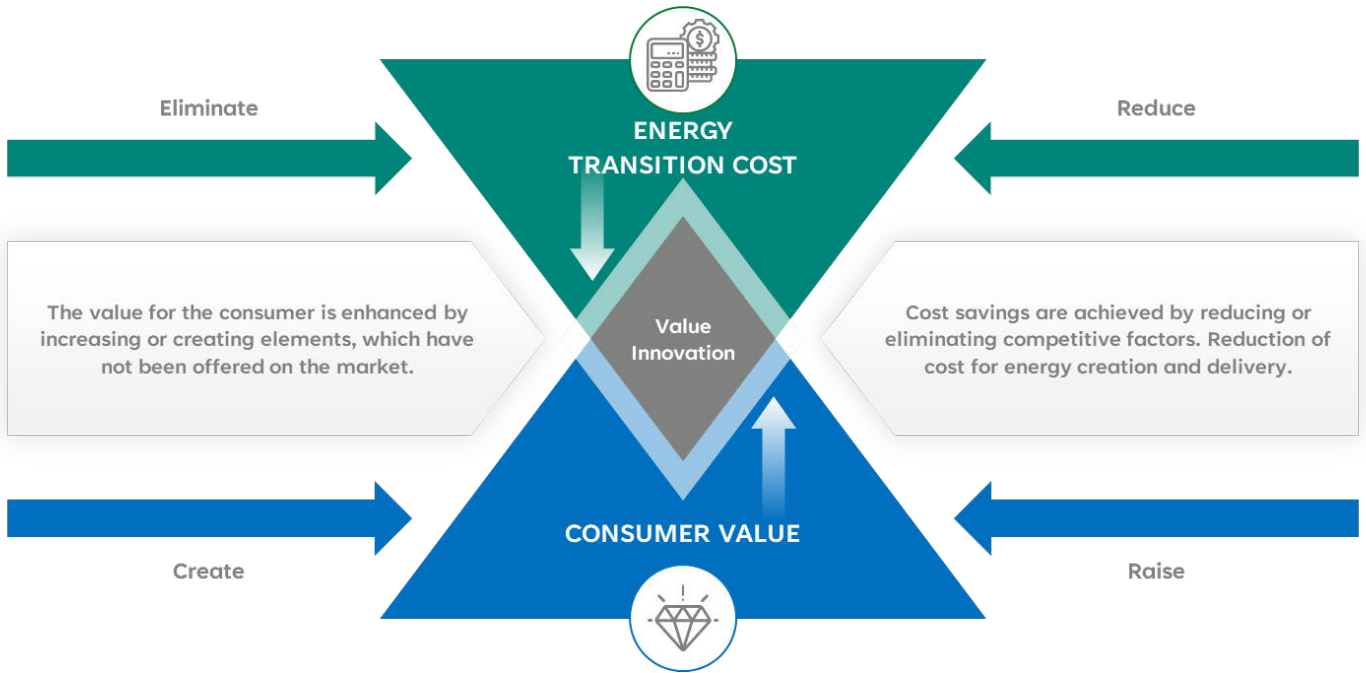
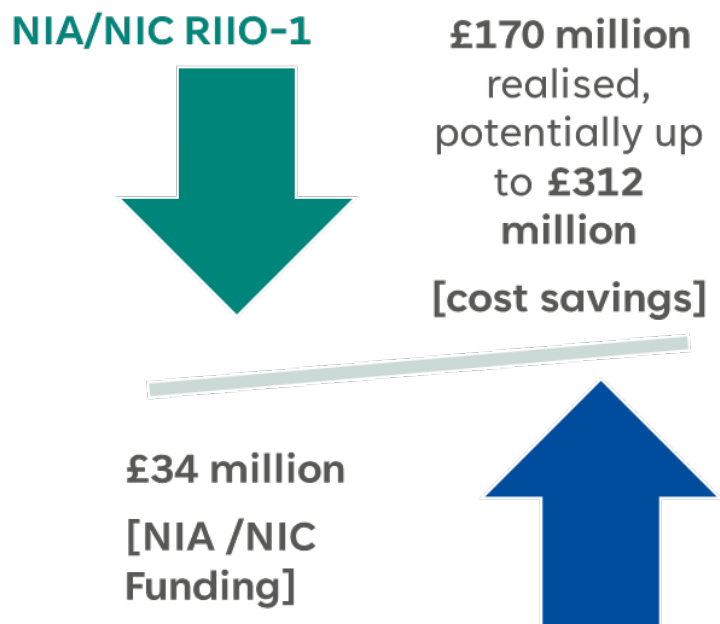


Figure 21 - Energy Transition cost vs Consumer Value

Quantifying the value of innovation can be a challenge, especially when working in the early phases of development, where non-financial benefits are generated, or where projects are deployed across price control periods. In the RIIO-T2 period, we have focussed on ensuring the RIIO-T1 projects are deployed robustly into the business, whilst also ensuring clear value tracking is in place for RIIO-T2 projects.

Our focus for value delivery across the innovation portfolio is 4:1 on innovation spend. For RIIO-T1, we are currently on track to meet and exceed the 4:1 ratio, although it will take time to fully realise the benefits of all the projects. Based on project predictions we could see benefits up to £300m from our initial 32.9m investment.





### 6.3 Value Tracking Process

The implementation of both our RIIO-T1 and RIIO-T2 projects is key to realising the benefits that we have forecast and to promote their use as Business as Usual. At the end of every project, we determine its implementation route and approach, and once the project is implemented, we produce a case study to be published. These can be found on our website [Innovation Value Tracking | National Gas](#).

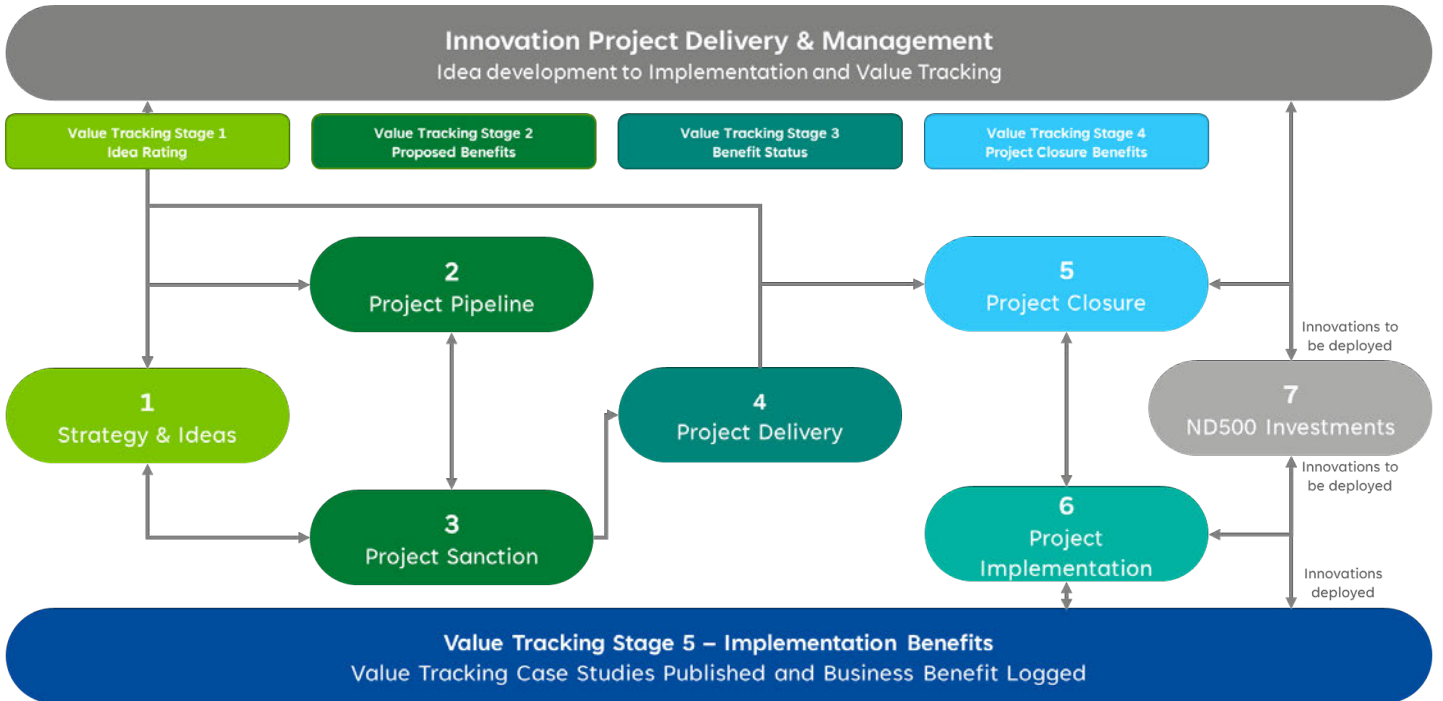


Figure 22 - Innovation Value Tracking Process

Some example projects include:

**Case Study – Mobile Condensate Tank, NIA\_NGGT0134**

Traditionally, a condensate tank is permanently installed to hold condensate and compressor oils removed from the NTS by the scrubbers. However, it was noticed that some sites collected little to no condensate over the past 25 years. As the condensate tanks are classified as pressure vessels, their presence increases the number of hazardous areas onsite. This project designed and fabricated two mobile condensate tanks that can be stored in a central location and transported to the required site when the scrubbers require emptying. Alongside the development of the tanks, processes and specifications were produced and a successful trial completed. Cost savings of £250,000 per permanent tank that is not replaced will be realised, however, innovation is also continuing to improve the mobile solution.

**Case Study – ValveCare Toolbox, NIA\_NGGT0115, NIA\_NGGT0142, NIA\_NGGT0168**

The National Transmission System (NTS) has over 10,000 valves, many of which are over 40 years old. Buried valves are at risk of corrosion, due to their stem extensions lacking internal protection coatings, which can potentially block end stops and compromise valve performance and life. When a failure was identified, the valve would need to be excavated and remediated or replaced. The Valve Care Toolbox allows valves to be inspected, assessed and (if needs be) repaired without the need for excavation. The valve can be assessed to determine the reasons for failure and repairs carried out. This means that the number of excavations and valve replacements will be reduced, leading to potential cost savings of £3m during RIIO-T2.

Through RIIO-T2, we have reinforced our value led approach. Ideas and projects are assessed against value criteria and prioritised based on value to the business and consumer. There is no one-size-fits-all method for value tracking, so our approach has been focused on how we develop a robust methodology that allows the flexibility to capture a range of benefits, while providing assurance and accurate data. All ideas and projects are assessed against the following criteria;

- **Maturity** – This measures the technology readiness level (TRL) of the solution but also allows for digital readiness, business readiness, manufacturing readiness levels to be considered.
- **Time to Implement** – This measure allows us to identify the correct funding route for a project but tends to be closely aligned to the maturity of the project.
- **Network opportunity** – This measure looks at the impact of the project and considers if it can be deployed to the whole network or just one site.
- **Cost to deploy** – This measure considers what likely costs would be associated to deployment. It is important to understand as this could be a blocker to implementation.
- **Innovation cost** – This measure considers the full cost of development of a solution across research, development and demonstration which could be through multiple projects.
- **Financial savings** – This measure determines the current baseline if the project was not continued, develops the method(s) costs resulting from the project and provides the difference as the financial benefit. This is then considered against the cost of the project.
- **Safety** – This measure considers the reduction in incidents or impact on safety across the UK.
- **Environmental** – This measure determines the CO2 reduction, emissions reduction, waste reduction or other relevant environmental impact.
- **Compliance** -This measure looks at the impact on the networks ability to meet its regulatory requirements.
- **Skills & Competencies** -This measure considers the impact on skills across the business and is measured on the likely level of skills change from individuals to business wide.
- **Future Proof** –This measure looks at how the project aligns to the business and governmental strategies and the associated milestones.

Alongside the detailed data point definition, we undertake a high-level benefits review. This takes the current baseline approach and compares it to the output method from the project. This provides the value to be delivered by the project.

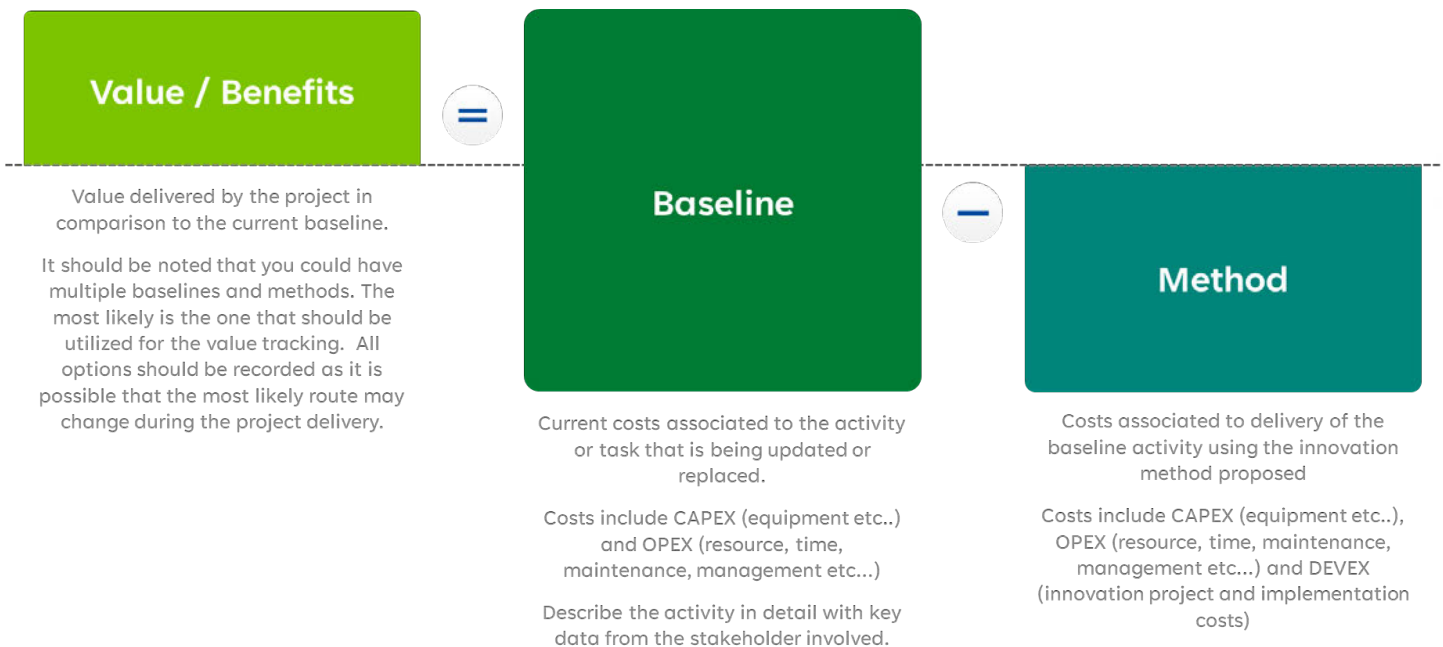


Figure 23 - Value Tracking data point definition process

At an idea stage, the projects are assessed against the criteria in five set ranges. As we progress projects into delivery and implementation and the benefits become clearer, we move away from ranges to more accurate predictions and calculations. The outcome is a high-level table as seen below, with associated calculation/detail within a data point definition. In this example project, you can see a change in the scoring from idea through to project closure.



Idea Score

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Value Tracking

Title	Project Score	Maturity	Opportunity	Deployment Cost	Cost	Financial Savings	Safety	Environmental	Compliance	Skills & Competencies	Future Proof
Proposed Benefits	42	● TRL 2-3 (NIA)	● 100% of single asset class	£0	£710,000	£0	100%	0.0 tonnes of Co2	● Ensures compliance	● Individuals	● Supports business strategy
Benefits Status	85	● TRL 2-3 (NIA)	● 100% of single asset class	£2,000,000	£710,000	£20,000,000	100%	1,000,000,000.0 tonnes of Co2	● Ensures compliance	● Departmental	● Must Have for the business strategy
Project Closure Benefits	73	● TRL 2-3 (NIA)	● 100% of single asset class	£2,500,000	£710,000	£17,500,000	100%	1,000,000.0 tonnes of Co2	● Ensures compliance	● Departmental	● Must Have for the business strategy

Figure 24 - An example of tracking project benefits across the lifecycle

We worked closely with PwC to establish the checks and balances to verify our approach and have developed our processes to allow us to roll out the methodology across our projects when they are implemented.

Value Tracking Development Process																
Phase	0 Pre-Value Tracking		1 Research		2 Engagement & Planning			3 Producing Case Study		4 Case Study Review		5 Case Study Completion		6 Case Study Review Cycle		7 No Value Tracking
	I	II	I	II	I	II	III	I	II	I	II	I	II	I	II	0

Using our portfolio management tool, we track these and review the implementation process at pre-defined times, depending on usage expectation. Where projects have been implemented, they are categorised in three ways:

- Implementation Complete – Fully implemented and no further value is expected.
- Annually Accruing – Each year we expect a recurring value achieved. A validation exercise is undertaken to confirm the additional benefit has been achieved.
- Per Use – There have been specific applications that have been quantified and recorded, but further applications would require specific analysis.

Each project that is completed and is due to be implemented has a case study, which is backed up by the source data, checks and balances checklist and a ‘Data Point Definition’. This case study is reviewed on an annual basis and once the benefits become consistent, we publish the case study onto the National Gas website <https://www.nationalgas.com/innovation-value-tracking>.

Alongside our internal process for value tracking, we have also provided data for RIIO-T1 directly to Ofgem via the RFI spreadsheet which we have continued to maintain, and for RIIO-T2 through the Innovation Measurement Framework (IMF) spreadsheet and annual report. These documents enable us to provide insight into value tacking at stages prior to case study publication.

RIIO 1

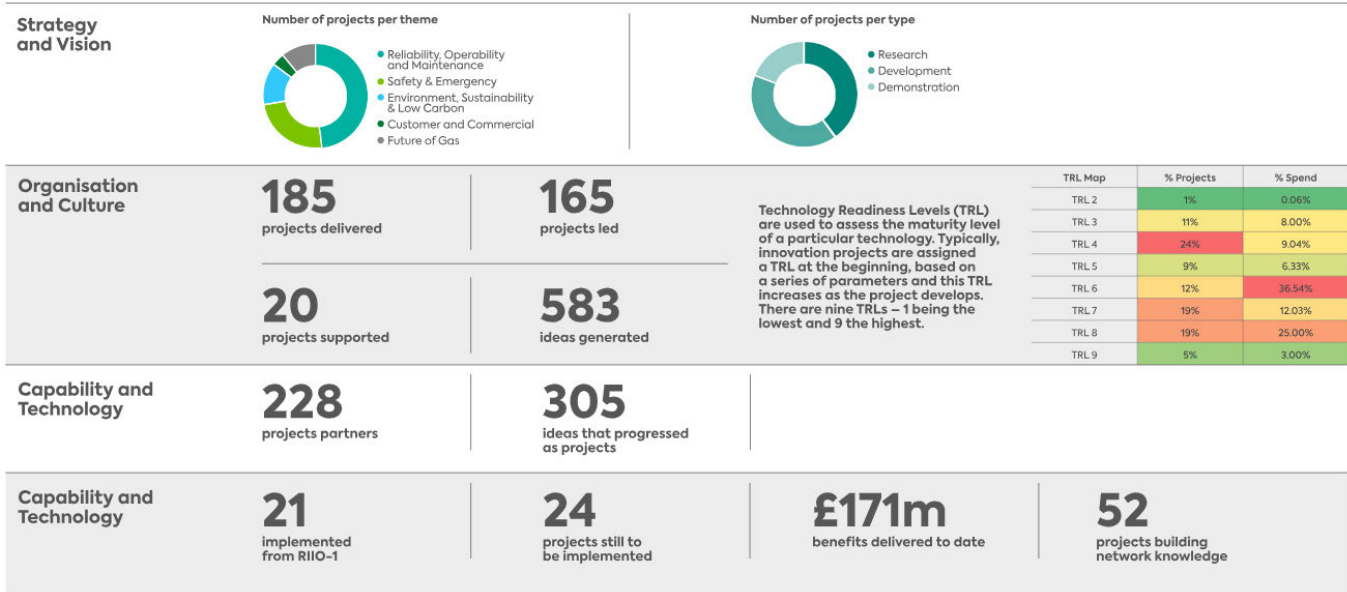


Figure 25 - RIIO-T1 Value Tracking 2023/24

Following the close out of RIIO-T1, we carried out an assessment of the projects undertaken during this price control period and have considered the learning from both the successful and unsuccessful outcomes. Our BAU Innovation team is now supporting the business to implement these projects and share successes through our published case studies. The IMF is continually updated with our current RIIO-T2 position as shown.

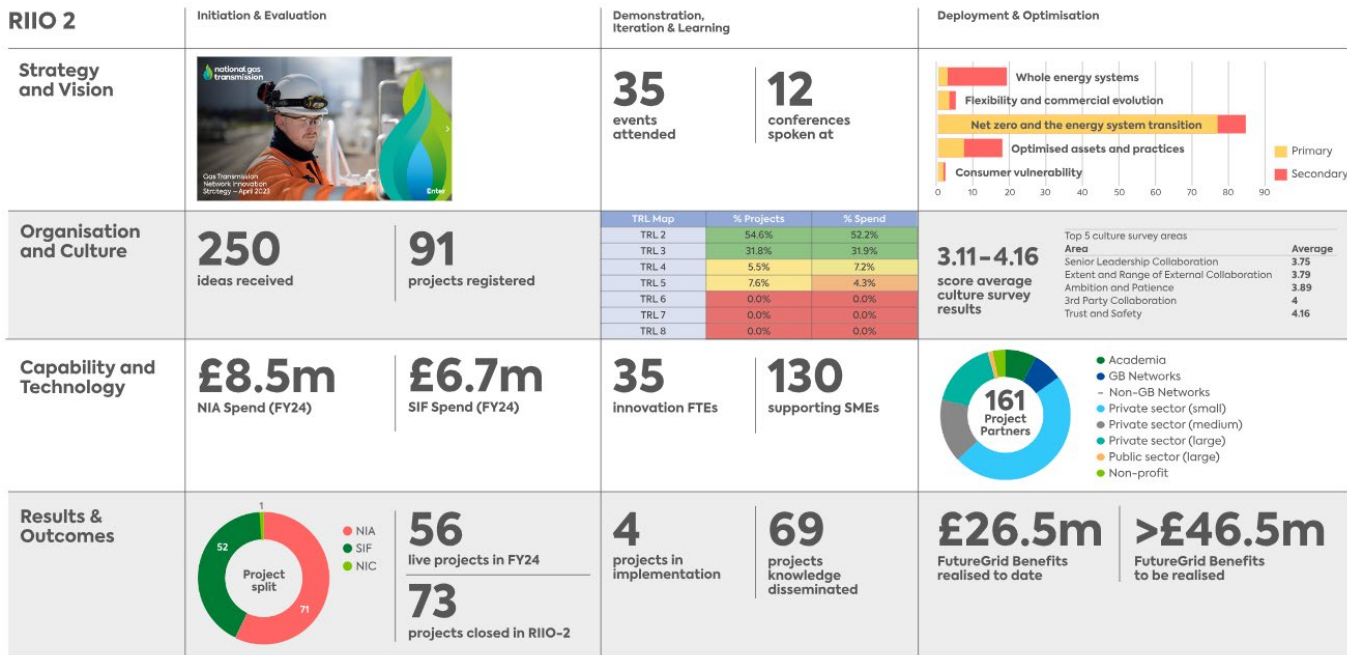


Figure 26 - RIIO-T2 Value Tracking 2023/24

The value tracking approach changes as you develop through from research projects to implementation. At the research level you need to consider the development costs for the technologies alongside the initial project costs. At the research phase we may not have all the information to run a full cost benefit analysis. We make predictions at this stage which we then check once the technology is implemented to improve our future assumptions for project business cases.





Figure 27 - Value case creation across the funding streams

## 6.4 Dissemination & Feedback

### Internal

Throughout RIIO-T2, the innovation team has participated in several internal team conferences and townhalls. We provide regular updates to our internal teams on the progress of HyNTS FutureGrid and Project Union and how we are supporting the activity with NIA and SIF projects. Whilst the larger business townhall sessions provide a good platform for communication, we find that visiting individual team meetings and forums provides a better opportunity for the teams to engage and ask questions.

In July 2022, we organised our first internal hydrogen summit and exhibition, where internal stakeholders could come along and find out more about our wider hydrogen work and associated projects, through a series of mini 'exhibition stands'. We have repeated this since through exhibitions in the office and leadership summits. Internally, we also provide a monthly hydrogen newsletter, stories into Engage and our central communications channels.

### External

Externally we have seen a reduction in the number of virtual events that we have participated in – this is mainly due to the relaxation of the previous Covid-19 restrictions. This has been replaced by a steady increase in face-to-face sessions and events, and we have ramped up our efforts to get out and about and participate in these opportunities and have a prioritisation system to enable optimised impact from each activity supported.

Annually, we support the Energy Innovation Summit and the Basecamp events hosted by the ENA, which offer a fantastic opportunity to speak to the innovation community, discuss ideas, collaborate on projects, and hear what other networks are focusing on. Whilst the virtual conference from 2020 and 2021 provided us a platform to disseminate to a much broader global set of stakeholders, the ability to collaborate in person since has provided some fantastic results. As the gas networks, we have developed a gas networks stand that enables us to demonstrate and disseminate a more joined up approach between the networks. Each year we disseminate projects that are ongoing through NIA, NIC and SIF funding, whilst also demonstrating the wider strategy and approach for National Gas.



Figure 28 – Innovation Zero 2024 shared Gas stand

Annually we also disseminate at other conferences such as Utility Week Live and Innovation Zero, to minimise cost, we have repurposed our gas stand through RIIO-T2 at all conferences, providing a greener, more sustainable solution to dissemination.

We have found that external communication through LinkedIn has greater impact than through our website and other channels. We have increased the number of webinars and podcasts we create, to deliver a more regular update on our projects and activities in a more approachable manner than common text formats.

In early 2023, following the sale of National Grid Gas Transmission and Metering, and the resulting creation of National Gas, we simplified our communications strategy and associated plans, to help new stakeholders better understand who we are as a business and what our role in Innovation means. This has resulted in a central LinkedIn for National Gas and centralised communications plan.

Alongside sharing on LinkedIn, we publish stories about some of our projects to our website, to give an overview of some of the challenges we're focused on and how we're researching and innovating to overcome these. So far, these stories have been well received by our stakeholders.

As mentioned above we have also published our latest Innovation Strategy document in 2023 which provides an insight into our innovation portfolio and covers our focus areas, key technologies we want to further investigate and some of the challenges we face as we work to decarbonise our network.

## 6.5 Our Innovation Culture

Over the past year, we've continued to embed our innovations within our core business, through subject-matter-expert forums and internal conferences. Building a culture of innovation across the business and ensuring engagement with wider teams within the business is vital to ensuring successful implementation. We are actively benchmarking our innovation approach against other companies across the energy sectors, to ensure we provide value to UK energy consumers.

Culture is the underlying assumptions, values, and beliefs in an organisation, which are manifested in people's behaviours and the way things get done. Culture is vital to enabling innovation across the business and we are working towards developing a strong innovative culture in everything we do. Understanding how others innovate and how we can improve, we also needed a focus on developing and nurturing a culture of innovation within our organisation.



Across National Gas we have a core set of values, which drive our culture and help us deliver for our stakeholders and communities. We know that how we deliver is as important as what we deliver. If our purpose is the ‘why’, our values are the ‘how’. They help shape our spirit, attitude and what guides us. We must adapt and develop our values to align with the expectations of our customers and communities, without losing sight of the things that make us strong today. These are the three values which drive our business culture and provide a foundation for innovation to play a key role:

- **Ownership** - Recognising we’re all responsible for success and can share in the benefits.
- **Simplicity** - Making sure we don’t over complicate things when they can be simple, with safety continuing to be paramount
- **Progress** - Keeping our eyes firmly on moving forward, taking accountability and making decisions in an agile way.

Our values build on and protect our strong foundations while looking to the future. They are aligned to our purpose and help our people understand how we are expected to achieve our purpose and vision for our customers and each other.

Innovation can unlock the potential and allow us to maximise the opportunities in everything we do. Embedding a cultural change such as innovation does not have a defined period. The efforts we have made over RIIO-T1 to date have clearly begun to embed innovation into our core culture but there is still some way to go.

We have implemented clearer processes and lines of accountability to empower our teams and develop a diverse portfolio of projects with third parties of all sizes and geographical locations. Within certain areas of our business, we have found a cluster of innovation has occurred. This may be for several reasons including:

- different challenges within this area
- a wider range of third parties with feasible ideas
- colleagues with a greater focus and freedom to work on innovative programmes.

We have learned from how these successful clusters of innovation have developed, to help areas of the business with little or no innovation to engage further to develop successful projects and identify new opportunities to innovate. We have also implemented clearer processes and lines of accountability to empower our teams and develop a diverse portfolio of projects with third parties of all sizes and geographical locations.

The recent innovation culture assessment ([Link](#)) undertaken with UKRI and PA consulting enabled us to benchmark our activities against other networks and businesses.



Figure 29 - Three phase approach to the Innovation Culture project

The results showed that trust, safety, and third-party collaboration were strong cultural aspects in National Gas and supported by the Innovation team. We believe that this collaborative open approach could not have been achieved without the NIA funding available through RIIO-T1 and RIIO-T2 and the focus of a team to drive innovation into the business.

As we progress into the remainder of RIIO-T2 we are developing an action plan from the results of the innovation culture assessment that will be delivered prior to RIIO-GT3 to put us in the best position to commence the novel innovation mechanisms from 2026. Some of our focus areas are as follows aligned to the culture map below:

**Stories & Symbols** – communications both internally and externally have been improved through RIIO-T2; we utilise multiple mechanisms to reach as many stakeholders as possible but still need to improve. We are looking to undertake more regular team briefings and provide a broader external communications platform whilst also enabling a targeted approach with key stakeholders.

**Hard Dimensions (Time and Space)** – Our lowest rated area is in enabling time and space, within the innovation team, the innovation funding enables the team to focus on projects however the volume and pace of the energy transition can still be limiting. Across the business, focus on core activities can limit innovation activities or slow progression.

**Hard Dimensions (Roles and Responsibilities)** – we have been working on encouraging innovation across the business but with this there is potential for duplication across teams. Communication and sharing of activities along with roles and responsibilities will help prevent this and drive efficiency in our innovation delivery.

**Relationships** – Whilst this is a highly rated area, we have seen indication that there are individuals that would want to be engaged by innovation but have not to date, we will look to ensure access to our team and capability is open both internally and externally through RIIO-GT3.

## 6.6 NGT Innovation Process

The Innovation team for National Gas has developed over time and is based around the 5 strategic themes which then have several key technology areas that are then supported by a technology portfolio lead. These portfolio leads ensure the delivery of the projects under each theme and support the development of a robust strategy for the pipeline of projects alongside the strategic team. The leads are supported by innovation engineers who work across the themes providing links between projects and developing their technical knowledge to then progress into a lead role in the future.

The wider Innovation team focus on the below funding opportunities:

- 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. These projects tend to then be demonstrated through SIF projects or developed to implementation through BAU activities.
- Strategic Innovation Fund (SIF) - The SIF is a competitive process which 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.
- Business as Usual (BAU) – BAU Innovation funding will come from non-totex sources within the business and will be used to trial and demonstrate commercially available products and tools or those of low risk, high TRL. The BAU team will also work on implementing previously completed innovation from RIIO-T1 & 2 to realise the proposed benefits.
- Net Zero Use It or Lose It - enabling us to develop our reopener projects for novel emissions management systems and our major hydrogen programmes such as Project Union. As hydrogen is not included in the business plan it is vital these funds continue to enable us to prepare for reopeners for FEED, construction, and deployment of the hydrogen backbone.
- Other - We also look to support and lead projects through other external funding opportunities such as EPSRC, Innovate UK, EU Horizon Europe etc, that enable our knowledge to support energy system development.



The diagram below shows how these funding mechanisms are utilised across the innovation process to deliver projects and drive collaboration and idea generation.

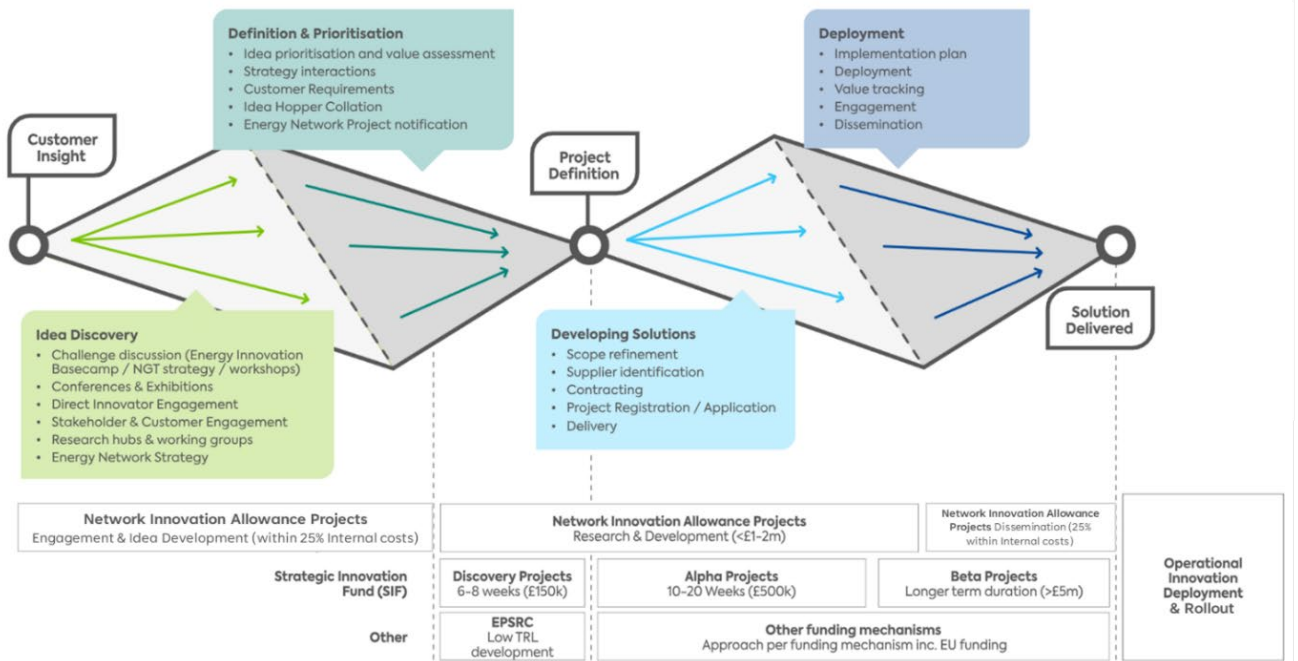


Figure 30 - Funding route mapped to the Innovation Process

## 6.7 Governance and Assurance

Robust governance and assurance approaches ensure that projects meet the specified regulatory criteria and are enabled to produce the best end outcome. At National Gas our projects go through several stages or assurance and governance.

**Idea selection** – ideas are scored against the value criteria and aligned to our strategies to determine those to progress and prioritisation.

**Statement of Work** – project scope, timeline and plan are created, including a RASIC (Responsible, Approving, Supporting, Informed and Consulted) where possible. This scope is reviewed by internal stakeholders and innovation management to ensure it aligns to business needs and is deliverable. It is then submitted to collaborators to quote against.

**Proposal assessment** – The quotations are reviewed against the procurement innovation assessment tool to identify the best proposal to progress

**Project Notification** – The project is raised and discussed either with just the gas networks or the wider Innovation Strategy Group (ISG).

**Gas Transmission Innovation Governance Group (GTIGG)** – The project is then formalised with the relevant Ofgem and internal documentation to then be assessed by a cross-business forum chaired by a member of the National Gas Regulation team. This provides insight into the project, helps share ideas internally and ultimately signs off the project to begin.

## 6.8 National Gas Services

Whilst we do not fund National Gas Services development projects with Ofgem incentive funding we do support innovation in their activities and have a close connection with their innovation lead. National Gas Services (NGS) has been hugely supportive of demonstration and implementation of innovation across the business for many years. As with the BAU Innovation this team invest in their own innovation projects to support their operational delivery and their future business.

NGS previously known as the Pipeline Maintenance Centre have over 45 years' experience as the Emergency Response unit, servicing the national and local network of gas pipelines. Today, the technicians and engineers continue to work across the pipeline network from strategically positioned depots across England, Scotland, and Wales.

NGS's large portfolio of skills and experience means they are leading on emergency and planned solutions in the field of pipeline repair, replacement, maintenance, and intervention.

Innovation is regularly deployed across NGS with a need to regularly create bespoke solutions for specific pipeline issues. Innovation leads constantly engage with technicians to understand problems they face while undertaking their role and look to utilise their expertise in our innovation projects. Through NGS we encourage idea/problem identification from our operational colleagues as a ground-up innovation methodology.

Within RIIO-T2 National Gas Services have continued to work alongside our innovation teams whether that be through specialised project input or implementing projects completed in RIIO-T1 into business as usual. NGS have:

- Trained and implemented the use of the 'Valvecare Toolbox', a non-intrusive method of checking the condition of our valves without the need to excavate.
- Led the way on use of 3D laser scanners as standard to improve accuracy and reduce time spent measuring pipeline damage.
- Deployed epoxy grout to fit epoxy sleeves, which is an approved pipeline repair technique for NGT. This is an alternative to welding, which is time consuming and labour intensive.
- Self-funded an innovation project working with a supplier (Steer Energy) to develop a tool that can clearly and concisely determine cavity leak rates during routine valve maintenance work. Previously, this activity was subjective and relied on a technician's experience interpreting the sounds during ball valve cavity vent operations. This tool will not only give us additional data on the integrity of our valves, but also an ability to monitor any deterioration of the valve, performance and provide the required evidence and data to inform future investment decisions.
- Developed efficiency improvements through plant tracking, stock management, systems for planning and billing as well as a more regional approach to resource management. With more to do throughout RIIO-T2 our aim is to modernise the business and use data to inform decision making in RIIO-GT3 and beyond.

While NGS is a service delivery division of National Gas Transmission and our strategy is aligned to the wider business', we also serve a wide range of external customers and to ensure we are delivering value to those customers our innovation strategy focuses on the three key themes below.



Work with partners to enable exclusivity over products and services to increase unlicensed profit



Working with strategic partners to develop products and services for commercial purposes



Identifying market opportunities and develop products and services to meet them

We have continued to work with our gas distribution companies to determine what is important for them and strive to drive new products and services into the market that will deliver safety improvements, efficiencies, and financial savings.

We are driving the use of novel medium pressure flow stopping equipment not widely used in the UK to improve health and safety and increase efficiencies on site. UK gas distribution companies have been receptive to trialling this new equipment developed in the Netherlands and are in the process of gaining formal approval for use through the G23 process. We have demonstrated that the use of this equipment not only shows clear cost savings due to reduced time on site and smaller excavation sizes, but it also reduces risk associated to the work.

In RIIO-GT3 we will continue to work closely with partners and the supply chain to develop products and expand our services for our customers. We plan to invest in new and novel equipment across our range of services to drive efficiencies and continue to provide a safe and cost-effective service to our customers.



Figure 31 - Example site installation

Our below 7 bar workstream will focus on flow stopping and drilling equipment particularly the double block and bleed solutions that are available on the market and trialling these with our gas distribution customers. These can provide multiple benefits including delivery efficiencies, smaller excavations, reduction in cost of materials/fittings and reduction in additional risk onto the pipework having sacrificial fittings left on the pipeline.

Our above 7 bar workstream will also focus on investment in equipment, particularly enhancing our welding capabilities with semi-automatic machines allowing us to undertake more welding work both within our Ambergate depot, our satellite depots and in the field. Our recompression fleet will be growing as we invest in state-of-the-art recompression machines to reduce the need to vent in large scale operations.

Through RIIO-GT3, National Gas Services will continue their efforts to help develop the safety case for hydrogen through demonstration of all aspects of pipeline repair, replacement, maintenance, and intervention. We will ensure our field force are trained and have the required equipment to continue leading on all emergency and planned solutions.

In RIIO-GT3 NGS will focus on supporting the deployment and maintenance of hydrogen pipelines. NGS have already begun to upskill in this area and see this as a key requirement to enabling all UK networks to quickly progress. NGS supports both transmission and distribution networks in the UK and will continue to provide robust reliable services in the RIIO-GT3 period and beyond.

Moving forward we aim to ensure our workforce are at the forefront of the energy transition. We stand ready to support the National Gas mission to repurpose the NTS through Project Union, whilst also supporting the conversation of the gas distribution networks. Both networks will enable the decarbonisation of business, power stations, industry, and homes with low carbon hydrogen, whilst supporting the interconnectivity with future hydrogen storage to enable continued system resilience.





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