



# 17. I want you to facilitate the whole energy system of the future – innovating to meet the challenges ahead

## What is this stakeholder priority about?

This priority is about how we help the UK achieve net zero target by enabling decarbonisation of heat, transport and industry at the lowest cost to consumers. We will do this by collaborating to deliver whole energy systems of the future and utilising innovation. Our definition of the whole energy system includes the interactions and solutions between gas, electricity, transmission and distribution, and it takes account of the impacts of the heat and transport sectors.

## What have stakeholders told us?

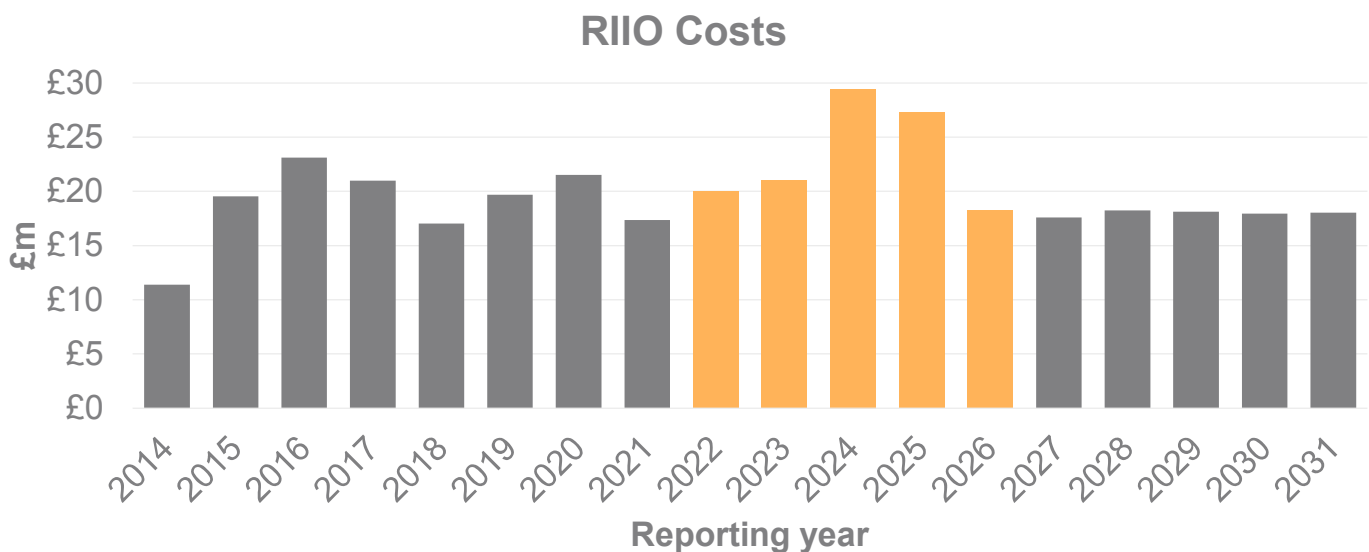
Stakeholders have said that they want us to take a leading role in driving and enabling the energy transition. We will lead on delivering the future energy system and, collaborating with others. They also want us to be innovative about how we meet the challenges involved, in particular the ones around decarbonising heat. We have had feedback from stakeholders that we were not clear enough on our role. We have clarified and tested with stakeholders through a webinar what we will lead versus collaborate on.

## During RIIO-2 we will:

- continue to **lead** the development of the gas markets framework by collaborating with others to enable the pathway to net zero
- **lead** the development of options for decarbonisation of the gas transmission system to facilitate the decarbonisation of heat, industry and transport, including **collaborating** with others on an agreed hydrogen workplan
- **collaborate** across the industry to lead innovation and deliver the solutions for whole energy and net zero
- **invest** in skilled people and IT systems so we can lead regulatory change, anticipate future regulatory developments and how these might affect stakeholders and our network.

To deliver our proposals for this priority, we plan to spend an average £23.2m annually with a total RIIO-2 spend of £115.9m. We are proposing that £30.9m of this will come from an innovation incentive allowance and is part of our non-controllable pass-through costs. Our RIIO-1 annualised spend was on average £18.8m each year. This increase in RIIO-2 is mainly due to a forecast increase in capex costs relating to our balancing and capacity system. This priority's expenditure accounts for 3% of the overall RIIO-2 expenditure.

**Figure 17.01 RIIO-1 and RIIO-2 spend profile 'I want you to facilitate the whole energy system of the future – innovating to meet the challenges ahead'**





## I want you to facilitate the whole energy system of the future - innovating to meet the challenges ahead

### What is this stakeholder priority about?

This priority is about how we, as gas transmission, will enable the gas industry to deliver net zero environmental targets in a way that delivers benefits to consumers. It sets out our ambitions in achieving GB's 2050 net zero goal. We look at how the industry can decarbonise heat, our role in this and how we can drive the decarbonisation of the whole energy system.

Stakeholders told us they want us to lead the whole energy system of the future, driving the decarbonisation agenda forward. Stakeholders recognise that we must play an important role in this uncertain energy future. They also expect us to look for innovative ways to meet the challenges ahead in the energy transition, especially in decarbonising heat.

We know that, as well as focusing on energy transition innovation projects, we also need to ensure that innovation is embedded as business as usual (BAU), wherever possible so that solutions are delivered efficiently for stakeholders and consumers benefit. Stakeholders also said we are well placed to have a 'say and influence' energy transition policy.

In RIIO-2, our proposals aim to deliver on decarbonisation and digitisation to support transition to a sustainable energy system, and ensure that all consumers enjoy reliable, affordable energy. We recognise that the pace of change and deployment of potential solutions may exceed the scale of existing funding mechanisms in the RIIO-2 timeframe. So, we will work with Ofgem and other stakeholders to address this. Our proposals will deliver on Ofgem's output category of 'delivering a sustainable network'. To facilitate the energy transition we will deliver this through three priority areas:

- **Markets:** continuing our increased engagement across the industry to lead and deliver market and regulatory change.
- **Decarbonisation of the gas transmission system:** developing options to enable decarbonisation of heat options using whole systems approaches.
- **Innovation:** driving innovation to help meet the challenges of the future while ensuring consumer bills remain affordable.
- **Systems:** enabling and supporting market and regulatory change, through developing the right systems to deliver a digital future.

### Our proposed costs for RIIO-2

**Table 17.02 summary whole energy system of the future – innovating to meet the challenges ahead costs by activity**

| Activity spend (£m in 18/19 prices)   | 2022        | 2023        | 2024        | 2025        | 2026        | Total RIIO-2 | Annual RIIO-2 | Annual RIIO-1 |
|---------------------------------------|-------------|-------------|-------------|-------------|-------------|--------------|---------------|---------------|
| <b>Xoserve costs<sup>83</sup></b>     | 5.5         | 5.5         | 13.5        | 11.5        | 3.0         | 38.9         | 7.8           | 4.5           |
| <b>IT applications</b>                | 1.9         | 2.5         | 2.6         | 2.3         | 1.7         | 11.0         | 2.2           | 1.8           |
| <b>Gas system operator activities</b> | 5.9         | 6.3         | 6.5         | 6.7         | 6.7         | 32.0         | 6.4           | 6.4           |
| <b>Decarbonisation activities</b>     | 0.5         | 0.5         | 0.6         | 0.6         | 0.6         | 2.8          | 0.6           | 0.5           |
| <b>Pension costs</b>                  | 0.1         | 0.1         | 0.1         | 0.1         | 0.1         | 0.4          | 0.1           | 0.0           |
| <b>Sub-total – controllable costs</b> | <b>13.8</b> | <b>14.8</b> | <b>23.2</b> | <b>21.1</b> | <b>12.0</b> | <b>85.0</b>  | <b>17.0</b>   | <b>13.5</b>   |
| <b>Innovation (NIA)<sup>84</sup></b>  | 6.2         | 6.2         | 6.2         | 6.2         | 6.2         | 30.9         | 6.2           | 5.3           |
| <b>Total spend</b>                    | <b>20.0</b> | <b>21.0</b> | <b>29.4</b> | <b>27.3</b> | <b>18.2</b> | <b>115.9</b> | <b>23.2</b>   | <b>18.8</b>   |

**Table 17.03 summary of whole energy system of the future – innovating to meet the challenges ahead costs by RRP category**

| RRP category (£m in 18/19 prices)  | 2022        | 2023        | 2024        | 2025        | 2026        | Total RIIO-2 | Annual RIIO-2 | Annual RIIO-1 |
|--|-------------|-------------|-------------|-------------|-------------|--------------|---------------|---------------|
| <b>Closely associated indirects (BPDT 2.02)</b>                            | 0.5         | 0.5         | 0.6         | 0.6         | 0.6         | 2.8          | 0.6           | 0.5           |
| <b>Direct costs (BPDT 2.02)</b>  | 5.9         | 6.3         | 6.5         | 6.7         | 6.7         | 32.0         | 6.4           | 6.4           |
| <b>SO capex total (BPDT 3.08)</b>  | 7.3         | 7.9         | 16.1        | 13.8        | 4.7         | 49.9         | 10.0          | 6.4           |
| <b>Items outside of totex including non-controllable costs (BPDT 2.02)</b> | 6.2         | 6.2         | 6.2         | 6.2         | 6.2         | 30.9         | 6.2           | 5.0           |
| <b>Controllable pension costs (BPDT 2.02)</b>                              | 0.1         | 0.1         | 0.1         | 0.1         | 0.1         | 0.4          | 0.1           | 0.0           |
| <b>Total non-controllable costs</b>  | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0          | 0.0           | 0.6           |
| <b>Grand total</b>   | <b>20.0</b> | <b>21.0</b> | <b>29.4</b> | <b>27.3</b> | <b>18.2</b> | <b>115.9</b> | <b>23.2</b>   | <b>18.8</b>   |

*Please note we have provided costs to one decimal place and hence some columns may not equal to the totals. Pension costs are based on proportion of total TOTEX.*

<sup>83</sup> This is the capex element only.

<sup>84</sup> This cost is only the cost that we forecast to be spent through Ofgem's network innovation allowance (NIA).



## I want you to facilitate the whole energy system of the future - innovating to meet the challenges ahead

### Markets

#### 1. What is this sub-topic about?

This subtopic is about how we are continuing our increased engagement across the industry to lead and deliver market and regulatory change.

#### 2. Our activities and current performance

##### Track record

During RIIO-1, we've been developing and delivering regulatory and market change, focused on GB market compliance with EU legislation driven by the commitment to deliver the Third Energy Package. The work we've done ensured changes benefited GB plc and are completed in the least disruptive and most efficient way possible. As the GB transmission owner and system operator, we were responsible for delivering this change on behalf of wider GB industry.

We have also shared the delivery of efficient and effective code governance, including adopting any future changes driven by Ofgem. To do this, we have taken a leading role in European Network of Transmission System Operators for Gas (ENTSO-G) work groups and we speak regularly at other industry events.

We have raised 61 Uniform Network Code (UNC) modifications. We have also supported customers by providing legal text and/or developing the solutions to their modifications for another 57 UNC modifications. Some of the deliverables that we have supported are:

- gas charging review
- development and implementation of EU codes including constraint management principles, capacity allocation methodologies, balancing and interoperability
- security of supply significant code review.

##### Learning for RIIO-2

During the latter parts of RIIO-1, we have led the Future of Gas programme<sup>85</sup>, exploring where the medium-to long-term focus should be for the gas industry. It concluded that gas has a critical role in the transition to a low carbon economy and set out several commitments and policy recommendations. This led to the creation of the Gas Markets Plan (GMAP) which we explain further in our proposals for RIIO-2<sup>86</sup>.

#### 3. What have stakeholders told us?

**Table 17.04 industry change stakeholder engagement**

| Engagement topic             | Industry change   |
|------------------------------|---|
| Stakeholder segments engaged | Shippers, customers, supply chain   |
| Objective                    | To understand the level of industry change stakeholders expected and the role they want us to take. |

|  |  |
|--|--|
| Channel/method                                   | Workshops, webinars, 1-2-1 meetings, industry forums, surveys.   |
| Key messages                                     | There will be a significant amount of industry change as we move through the RIIO-2 period. We should continue to lead the facilitation of industry change within the gas sector.                            |
| Trade-offs and stakeholder influence on the plan | We have engaged extensively with stakeholders to inform the development of the GMAP. This has led to the formation of an independent steering group of stakeholders that will drive the outputs of the GMAP. |

#### 4. Our proposals for RIIO-2

In RIIO-2, our regulatory change strategy continues to move from managing change to driving it. Stakeholders have said they recognise there will be a significant amount of industry change as we move into and through the RIIO-2 period. Stakeholders want us to continue to play a key role in improving the efficiency of the market through supporting customer modifications, improved modification governance and focusing on the changing need of the gas networks and markets over RIIO-2.

The RIIO-2 period will see increased focus on decarbonisation of the energy sectors, in which natural gas has traditionally met the energy demand, either through EU or UK policy drivers and/or changing industry trends. However, the direction and speed of change affecting gas markets and, importantly, efficient operation for end consumers, are all uncertain and this lack of certainty requires us to be flexible.

Decarbonisation drivers have had an impact on the role of gas and this will continue over the RIIO-2 period. The key question for now is how to maintain consumer value from the gas markets as energy markets transition to low carbon. Additionally, we need to start looking at what industry and market changes may occur in moving to a decarbonised world.

As a result of stakeholder feedback received during engagement on capacity baselines and general access arrangements, We have raised modification 0705R – NTS Capacity Access Review, which has the following purpose:

- to review the principles and establish long-term strategy for the NTS capacity access regime,
- ensuring the regime is appropriate for commercial behaviours experienced today, simplified and adaptable whilst being consistent with relevant obligations,
- to make recommendations for change and addressing short-term problems in accordance with the long-term ambition.<sup>87</sup>

<sup>85</sup> <https://futureofgas.uk/>

<sup>86</sup> <https://futureofgas.uk/news/the-future-of-gas-2/>

<sup>87</sup> <https://gasgov-mst-files.s3.eu-west-1.amazonaws.com/s3fs-public/ggf/book/2019-10/Request%200705R%20v2.0.pdf>



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**Table 17.05 market transformation proposals**

| What our stakeholders have told us                             | Commitment   | Output type | Consumer benefit   |
|--|--|-------------|--|
| Lead the facilitation of industry change within the gas sector | We will continue to lead the formation of GMaP framework, including a steering group to prioritise a programme of works.   | Commitment  | "I want you to facilitate delivery of a sustainable energy system" – supporting and delivering market changes and solutions will continue to deliver the future energy system. |
|  | Work with the industry to better understand the detail and impacts of the prioritised work programme and develop plans for potential implementation.                                   | Commitment  |  |
|  | We will continue to comply with our obligation to provide code administration for the gas market subject to the outcome of the Energy Code Review.                                     | Commitment  |  |
|  | We will continue to lead a review of gas transmission access arrangements in Transmission Workgroup 705R, and will develop appropriate modifications as required by that review group. | Commitment  |  |

### 5. How will we deliver?

To ensure we can lead the development of the GMaP framework, deliver the regulatory and market changes and provide code administration for the gas market, we need to invest in our capability. We have put resource into our business plan to undertake this. It is reflected in cost line 'gas system operator activities'.

The Gas Markets Plan (GMaP) is a programme for the industry to collaboratively develop and agree a roadmap of market change activities. The programme aims to:

- be as inclusive as possible
- improve transparency and visibility of potential market change
- create a stakeholder-led process for prioritising market change activities.

This will ensure market frameworks continue to provide the consumer with the greatest possible value throughout the energy transformation. A 'Future of Gas' forum will take place twice a year, bringing the industry together to share knowledge and input into the two to ten-year change plan.

A Future of Gas steering group has been formed, including a variety of stakeholders. The group will agree which projects should be progressed over the coming year, monitor and steer ongoing GMaP projects and set the strategic direction. More information is available on our website<sup>88</sup>.

Through the Joint Office of Gas Transporters, we will continue to comply with our obligation (with the distribution networks) to provide code administration for the gas market.

### Decarbonisation

#### 1. What is this sub-topic about?

This focus area is about actively working with the industry to decarbonise and enable whole system solutions through cross-sector collaboration. We highlight our commitments in investigating the options for decarbonisation and how this contributes to delivering our

net zero roadmap (in chapter 11), including what the options are for hydrogen transportation in the NTS.

### 2. Our activities and current performance

#### Track record

During RIIO-1 and in preparation for RIIO-2, we have engaged more in discussions about decarbonisation of the gas industry, what the future of the energy system may be and what challenges we should expect around meeting these potential changes.

We speak regularly with the gas distribution and electricity transmission networks and meet with regulators, collaborating to deliver benefits to customers and consumers. Below, we've listed some of the topics that we have worked on, and they are described in more detail in our whole energy system engagement log annex A17.01.

- Future of Gas (FOG)<sup>89</sup>
- Gas Future Operability Planning (GFOP)<sup>90</sup>
- Energy Networks Association (ENA) Gas Futures Group (GFG)
- Hydrogen Programme Development Group (HPDG)

At round-table events, we've talked with industry partners, promoting how we can work together to enable whole energy system outcomes for consumers and exploring ideas about decarbonising heat, transport and industry. Senior representatives from Ofgem, BEIS, networks, innovators and other energy industry experts joined us for these events. Through the ENA working groups, we've also contributed to various initiatives from innovation projects to the Future Gas Pathways.

One of the key areas that stakeholders have said we should focus on is the decarbonisation of heat. Through the ENA, and alongside the GDNs, a piece of work from consultancy firm Navigant was commissioned, looking at the potential pathways for enabling a net zero gas network. The results of which were published recently at an ENA launch event<sup>91</sup>.

<sup>88</sup> <http://futureofgas.uk/news/the-future-of-gas-2/>

<sup>89</sup> <http://futureofgas.uk/news/the-future-of-gas-2/>

<sup>90</sup> <https://www.nationalgridgas.com/insight-and-innovation/gas-future-operability-planning-gfop>

<sup>91</sup> <http://www.energynetworks.org/gas/futures/gas-decarbonisation-pathways/pathways-to-net-zero-report.html>



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### Innovation in RIIO-1

Through the ENA Gas Innovation Governance group we've been able to get involved in more collaborative projects with GDNs and third parties, and to share learning between each other. We are involved in several innovation projects looking at the transportation of hydrogen as a means to 'greener gas' – it's a cleaner fuel that can help to decarbonise heat. The table below summarises some of the projects we have undertaken during RIIO-1. These projects have helped inform our workplan on hydrogen for RIIO-2.

**Table 17.06 innovation in RIIO-1**

| Example   | Description   |
|---|---|
| Feasibility of hydrogen ready NTS (HyNTS) <sup>92</sup> | The project assessed the feasibility of a hydrogen transmission system using the existing assets. The work was a desk based approach undertaken by the health and safety laboratory (HSL). The results have indicated that re-purposing of the NTS to transport hydrogen is technically feasible, from a materials perspective, pending the outcome of the further work. This has fed into our workplan for RIIO-2. |
| Flow Loop   | A physical trial of hydrogen in an offline test loop using representative grade steel pipeline to the NTS. Learning from this project will help in the evidence case for transporting hydrogen in the network.  |
| Aberdeen Vision <sup>93</sup> :                         | A joint project with SGN looking at a feasibility study into 2% hydrogen blending at St Fergus and H2 pipeline and hub at Aberdeen. This work will continue into RIIO-2.  |
| Project Cavendish <sup>94</sup> :                       | A joint project with SGN and Cadent undertaking a feasibility study to explore the Isle of Grain's potential to act as a catalyst for hydrogen production and storage, to supply hydrogen to London and the South East of England. Early results from this are positive and the next stages of trials will be undertaken in RIIO-2.   |

### Learning for RIIO-2

Throughout RIIO-1, we have shown we consider whole system approaches when assessing options. One example of this in RIIO-1 is with SGN, on options to continue to meet our Scotland 1 in 20 winter demand obligations. As described in more detail in our gas ten year statement<sup>95</sup> (GTYS), we have taken these steps to arrive at the best option to meet our obligation:

- SGN assessed the impact and confirmed options on its network
- we explored options on our network and combined these with SGN's options
- we completed cost benefit analysis (CBA) for all options
- we identified preferred options and agreed the timing of investment.

This whole system approach highlighted that the best option is for works on our network, because this will provide the most benefit to customers and consumers.

Following changes to external drivers, we undertook a review and decided that it was not in consumers' interests to proceed now. We will review the need for this and other similar works each year. We will also ensure these processes are embedded into our future ways of working. We have also engaged with NGN on our whole system works and more details on this can be found in a joint annex A17.06

Additionally, through forums such as the Gas Transmission Benchmarking Initiative (GTBI), we will increase our understanding of how other European TSOs are tackling decarbonisation. We will bring ideas over from our colleagues in our US business where possible.

### 3. What have stakeholders told us?

We have clarified what we will lead, collaborate and facilitate on. We tested our proposals on a webinar with ~30 stakeholders, ranging from GDNs to industry trade bodies and regulators, on 2 September 2019. Below is a summary of results:

- Do you agree with our view of what we are leading, collaborating/facilitating on? Yes – 65%; Somewhat –24%; No – 1%.
- Do our proposals meet your needs? Yes – 50%; Somewhat–50%.

**Table 17.07 decarbonisation stakeholder engagement**

| Engagement topic             | Decarbonisation   |
|------------------------------|---|
| Stakeholder segments engaged | Networks, customers, think-tanks and industry bodies, regulators, major energy users, consumers.  |
| Objective                    | Understand what our stakeholders expect us to undertake during RIIO-2 to enable the energy transition.  |
| Channel/method               | Workshops (including one hosted jointly with the GDNs), webinars and online consultation with major energy users and consumer research.   |
| Key messages                 | 1. Support the need for networks and industry to work more collaboratively across sectors, develop regulatory framework mechanisms and influence government policy as part of the cost-effective transition to a low carbon energy future.<br>2. Stakeholders would be interested in us playing a stronger role in driving the debate over the future of the UK system. They recognise that networks are in a unique position to drive the decarbonisation agenda forward. This led us to organise round-table discussions with industry, networks, regulators and policy makers on discussing the challenges and next steps to facilitate the energy transition. |

<sup>92</sup> [https://www.smarternetworks.org/project/nia\\_nggt0139](https://www.smarternetworks.org/project/nia_nggt0139)

<sup>93</sup> [http://www.smarternetworks.org/project/nia\\_sgn0134](http://www.smarternetworks.org/project/nia_sgn0134)

<sup>94</sup> [http://www.smarternetworks.org/project/nia\\_nggt0143](http://www.smarternetworks.org/project/nia_nggt0143)

<sup>95</sup> <https://www.nationalgridgas.com/insight-and-innovation/gas-ten-year-statement-gtys>



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|  |  |
|--|--|
|  | 3. Decarbonisation of heat is an area of particular challenge and we should support it. <sup>96</sup>  |
| Trade-offs and stakeholder influence on the plan | We have worked with stakeholders to understand and test what we should be leading, collaborating on during RIIO-2. We have provided more information on the specifics which stakeholders have requested. |
| SUG and Challenge Group feedback                 | We have been challenged to be clear on our role in decarbonisation, in particular with what we are leading on, which we have continually improved in all iterations of our plan.                         |

For more information on our engagement see annex A17.01.

### 4. Our proposals for RIIO-2

Stakeholders have said they expect us to take a leading role in driving and delivering the future energy system. Stakeholders also expect us to continue to work more collaboratively with industry and regulators to develop regulatory framework mechanisms and to influence government policy as part of the cost-effective transition to a net zero future.<sup>97</sup> The Committee on Climate Change (CCC) and the government, in turn, have said that GB plc should commit to achieving net zero by 2050. We have already explained in chapter 11 our view of the potential pathway to net zero and what this means for our plan. Our proposals reflect what we are planning to do to enable the decarbonisation of heat.

**Table 17.08 whole energy system collaboration proposals**

| What our stakeholders have told us  | Our commitment   | Output type   | Consumer benefit  |
|---|--|---|---|
| Take a leading role in driving and delivering the future energy system, including how we can meet net zero targets. | We will <b>lead</b> on developing what the options are for gas transmission in relation to the decarbonisation of heat.  | Commitment  | <p>"I want an affordable energy bill" – whole system collaboration offers networks the potential to respond to changing needs, reduce consumer costs and deliver a sustainable network.</p> <p>"I want you to facilitate delivery of a sustainable energy system" – working with other networks, regulators and third parties to determine the future pathways for the energy industry, including decarbonising heat while keeping disruption to a minimum for consumers.</p> <p><b>Taking a leading role in decarbonisation of heat for gas transmission could provide a consumer value proposition of £2.2m (for more information on CVP7 please see annex A10.05).</b></p> |
|   | We are proposing a reopener relating to net zero to ensure we are able to respond quickly to work towards net zero goals.  | Uncertainty mechanism<br><b>Trigger: End of year 2, 1% baseline revenue threshold</b><br>More information to be found in annex A3.02. |   |
| Continue to work more collaboratively with industry and regulators to develop regulatory framework.                 | We will <b>collaborate</b> with GDNs, BEIS and others on an agreed hydrogen workplan.  | Commitment  |   |
| Continue to work more collaboratively with industry and regulators to develop a regulatory framework.               | We will build on the work done through the ENA whole system working group, working across sectors to develop the options and solutions required to achieve net zero. Collaborate with ESO to support BEIS in developing the Clean Heat strategy from a whole system operability perspective. | Commitment  |   |

Achieving net zero will require extensive collaboration across the whole system to identify, scale and deploy the right solutions for consumers for electricity, transport, heat and industry.

Through the Hydrogen Programme Development Group (HPDG), we are developing a forward workplan for hydrogen projects with the ambition of agreeing this in the early 2020. This forum includes members from BEIS (who Chair the group), Cadent, Wales & West Utilities, Northern Gas Networks, Ofgem, Energy Networks Association (ENA), National Grid, the Institution of Gas Engineers and Managers (IGEM), Health and Safety Executive (HSE) and Heating and Hotwater Industry Council (HHIC). The main aim of the workplan is to provide evidence that the gas network is able to support

the widespread conversion to hydrogen and is a viable pathway to decarbonisation of heat.

We will lead the following workstreams as part of the HPDG:

- Developing market services for system operation and developing the future system operator – this will identify the modifications of existing and creation of new market regimes and the timelines to achieve this for the system operation of a hydrogen network by April 2024.
- Using the NTS for hydrogen transportation – this will identify any physical modifications needed, including NTS operational practices, blending and de-blending options for a hydrogen transmission through the NTS by April 2024. Including a hydrogen trial from 2025.

<sup>96</sup> "While half of electricity generation is fuelled by gas, there is a huge interaction. The choice between gas and electric heating for the future will be interesting." ENA workshop

<sup>97</sup> "We support National Grid Gas's proposal to have a greater coordination and facilitation role in the industry and across sectors" consumer body



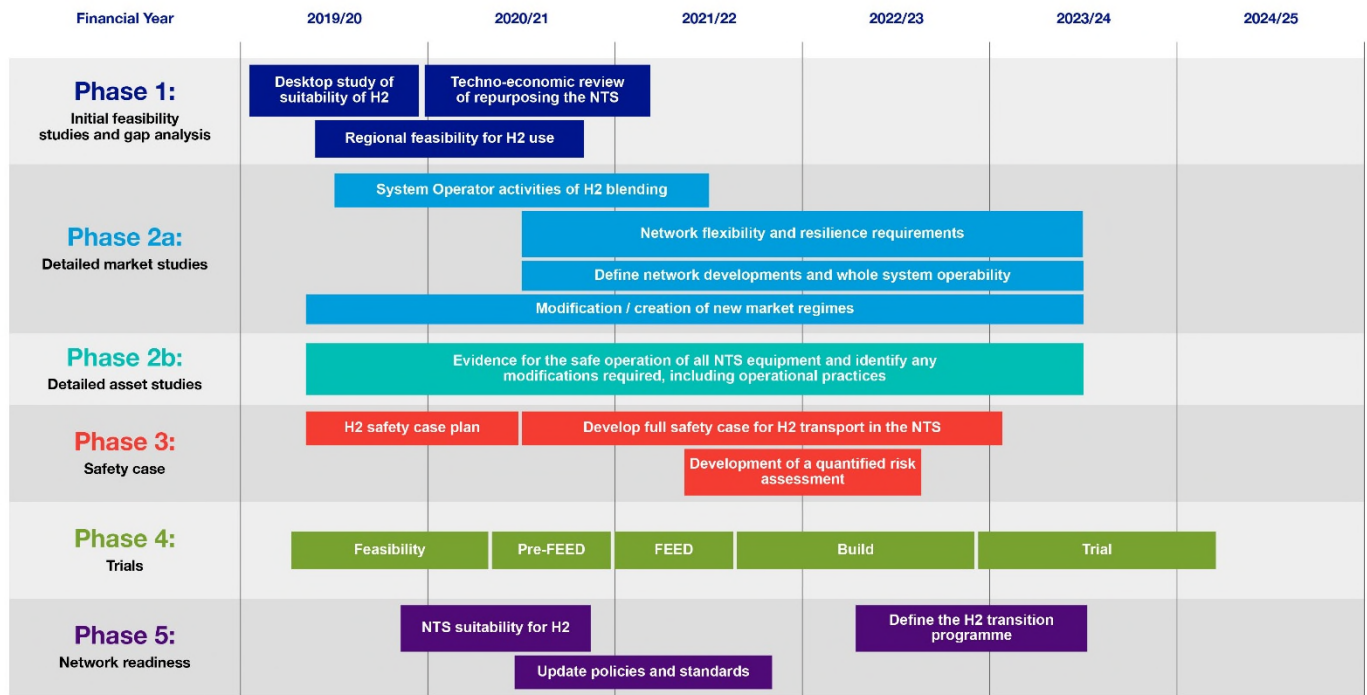
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Through our work, we will be ready to start conversion to hydrogen by 2026. Our initial work has shown this is technically feasible and we will be identifying the modifications and market changes required and undertaking trials during RIIO-2.

Our projects don't just focus on the asset elements but also on the market elements, as we see it is important that all stakeholders understand the scale of the transition

to hydrogen from both an asset and a regulatory and market side. Below is a draft timeline of our works. As the pace of work on decarbonising industry increases, we will look to adapt our plans and timescales accordingly. We will also support other workstreams that are being led by the GDN's and other stakeholders. The outputs of these projects will help with meeting the deliverables of BEIS heat strategy roadmap that is due to be published in summer 2020.

**Figure 17.09 draft timeline of our hydrogen workplan for RIIO-2**



As well as playing our role on hydrogen, we believe we should also collaborate on other potential solutions, especially for heat but also for industry, transport and electricity. Examples could include (but aren't limited to) other heat pathways, biogas and industrial cluster decarbonisation.

We are committed to ensuring whole system solutions are considered where possible and we understand that all networks are in a position where we should be working together to drive options forward. We will build on the work done through the ENA whole system working group. The workgroup is exploring three main workstreams:

- Collaboration between network companies across gas/electricity and transmission/distribution.
- Principles for a whole energy system CBA methodology for investment across energy vectors.
- Opportunities to embed the principles of the Energy Data Taskforce. We will continue to collaborate with partners and stakeholders as the industry drives ahead with the Energy Data Taskforce's recommendations on digitalisation and data transparency.

We will ensure that there is a clear process in place for ensuring whole system solutions are considered in our investment decisions. This will include updating our

internal processes to reflect this as well as developing further processes through ENA working groups. We will collaborate to find and enable the best whole systems solutions working across all sectors and vectors. For example, whole system costs will be reduced at Cadent's Blackrod site to improve security of supply for [REDACTED] consumers and this improvement has been achieved through collaboration, with Cadent, at the Blackrod DN offtake. We will deliver this solution in RIIO-2 and it is covered in more detail in chapter 14.

We have also been working with industry stakeholders including BEIS and the Committee for Climate Change to develop a strategy for clean heat. We have worked with BEIS to understand their approach and identify which areas should be explored in greater depth. We have identified the areas where we can add most value collaborating with the ESO, which will primarily focus on how the decarbonisation of heat impacts on whole system operability issues.

### 5. How will we deliver?

To deliver our work on decarbonisation, we need to ensure we have the right capability to undertake this work. Our work on delivering our hydrogen projects will require funding to be available. We envisage that BEIS would provide a source of funding. Additionally, we feel



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some of the projects, such as feasibility studies, could be delivered through the Network Innovation Allowance (NIA), while some of the larger projects could use the new strategic energy transition fund that Ofgem has proposed. We would also seek to look at alternative external funding to progress some of these projects.

### Net zero UM

We believe in a regulatory framework that enables and incentivises networks to collaborate and work together and make changes easily when policy decisions are made<sup>98</sup>. These plans may have to be adapted as there is still uncertainty about how to decarbonise the energy landscape. We are proposing a reopener uncertainty mechanism for net zero to ensure we can respond quickly to work towards net zero goals. We propose a materiality threshold of 1% with a trigger in year 2 of the price control. The reopener would be applicable across multiple areas, from emissions reduction to large-scale projects on hydrogen. For example, this mechanism could be used for the next steps of Project Cavendish, where there could be a potential for a new NTS hydrogen pipeline to be built from Isle of Grain to Shorne, linking in with SGN proposal of a new hydrogen distribution pipeline from Shorne to Dartford. For further details on our UM proposal, please see annex A3.02.

### Whole system UM

We will look to work with Ofgem and stakeholders to develop the whole system re-opener 'coordinated adjustment mechanism'. This will be used to support the reallocation of project revenues to networks best placed to deliver these whole system projects.

## Innovation

### 1. What is this sub-topic about?

Innovation is integral to our business. Innovation has continued to develop and embed into our organisation across RIIO-1, and we intend this to continue during RIIO-2. In this sub-topic, we highlight our strategy for and bring together how innovation is embedded across our whole business plan. Innovation has been incorporated in each chapter, highlighting RIIO-1 innovation and what we are doing in RIIO-2. Our board have signed on to our RIIO-2 innovation strategy through an innovation charter which commits the board to:

- the ambition and approach of our RIIO-2 business plan
- responsibility for setting a baseline and a five year measurable target for increasing the innovative culture of the organisation
- an annual deep dive of progress against target, forward innovation workplan, tracking of innovation benefits, and embedding lessons learned.

### 2. Our activities and current performance

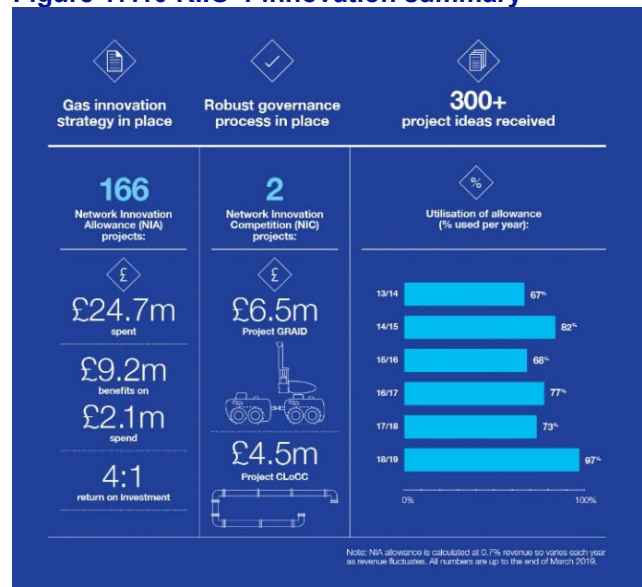
#### Track record

During RIIO-1, we set out with an ambition to embed innovation into what we do. We've expanded our network

of collaborators, working with a wider range of third-parties with expertise in many technical fields. We have also worked more closely with the other gas and electricity networks to co-ordinate innovation portfolios for maximum benefit to consumers. We have provided value of £4 for every £1 we invested in implemented innovation<sup>99</sup>. We have run innovation calls and attended events to talk to third parties and help them understand the opportunities for innovation and how they could get involved. Figure 17.10 summarises our activities, spend, and the benefits during RIIO-1 so far. Project CLoCC (Customer Low Cost Connections) is an example of how we have innovated to respond to stakeholder needs. Stakeholders told us that our costs and timescales can be a blocker to connecting to our network, particularly for smaller, non-traditional gas producers and consumers. In response, we initiated this National Innovation Competition (NIC) project collaborating with three small and medium-sized enterprises (SMEs). The project concluded in 2018, having met its goals of enabling SMEs to connect for less than £1m and in less than 12 months from initial enquiry to 'gas on'. Read more in chapter 19.

In RIIO-1, our annual NIA was 0.7 per cent base revenue, resulting in an allowance ranging from £4.3m to £5.5m per annum. The allowance is reset at the start of each financial year, which means unused allowance in a given year does not roll over to the following year. Our strategy has been focused on identifying innovation ideas that could develop into projects that deliver value to our customer and satisfy a business need. Our utilisation of the allowance has not been 100 per cent, however innovation spend year-on-year has increased demonstrating how our capabilities have developed.

Figure 17.10 RIIO-1 innovation summary



### Embedding a culture of innovation

At the core of our culture we seek to **do the right thing** and **find a better way**, and this is where innovation is

<sup>98</sup> "It is therefore vital that the business plan is flexible enough to be able to accommodate these developments in a customer-friendly manner – both for those obtaining grid connections and for users of the gas " industry body

<sup>99</sup> <https://www.nationalgridgas.com/insight-and-innovation/transmission-innovation/delivering-value-innovation>





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key. 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-1 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 in many geographical locations. We have also recently held a joint event with the GDNs, independently facilitated by 'Workplace Innovation', on how we innovate. This specifically looked at four themes; emotional intelligence, making change happen, engaging to innovate and disrupting the future. The outputs of these sessions will be used to shape how we innovate in the future.

### Learning for RIIO-2

Due to the nature of innovation, projects have not always been successful. But when they aren't, we take learning from it and update our processes and organisational structures to make sure we can innovate more successfully in future. There is opportunity for a more coordinated and focused effort on innovation across our organisation. In RIIO-2, we will collaborate internally with:

- National Grid Electricity Transmission – focusing on innovating to overcome the challenges and exploit the opportunities for the whole energy system.
- National Grid US – sharing knowledge and experiences and focusing on best practice across the organisation, whilst exploiting opportunities to collaborate with US utilities.
- National Grid Partners (NGP) – disrupting our ways of working seeking the most cutting edge and challenging innovations that have the potential for game-changing impact across our organisation.

### Benefits measurement framework

The gas and electricity networks have agreed to detail a common way forward for benefits reporting. We will use the benefits measurement framework developed by Baringa as a starting point and develop it further to ensure it meets the needs of stakeholders. We're also considering how to summarise UK-wide benefits from innovation. For more details of this framework, please see page 19 of annex A17.03.

## 3. What have stakeholders told us?

**Table 17.11 innovation stakeholder engagement**

| Engagement topic                                 | Innovation  |
|--|---|
| Stakeholder segments engaged                     | Supply chain, shippers, academics, customers, industry trade bodies, networks, think-tanks and consumers.   |
| Objective  | Understand what and how we should be innovating during RIIO-2.  |
| Channel/method                                   | Conferences, seminars, workshops, 1-2-1 meetings and consumer research.   |
| Key messages                                     | Networks should be looking to provide information to policy-makers through innovation projects or horizon-scanning, decarbonisation of heat is an area of challenge that we should be supporting. |
| Trade-offs and stakeholder influence on the plan | We have worked with stakeholders on 'how' we innovate and this information is feeding into our RIIO-2 strategy and our innovation culture.  |
| SUG and Challenge Group feedback                 | The NGG board has signed up to an innovation charter which address how throughout our organisation we are approaching innovation, following direct SUG feedback.                                  |

More detailed information is available in annex A17.03.

## 4. Our proposals for RIIO-2

**Table 17.12 innovation transformation proposals**

| What our stakeholders have told us   | Commitment   | Output type | Consumer benefit  |
|--|--|-------------|---|
| Networks should do more to embed innovation business as usual culture.   | We will invest in BAU innovation, driving continuous improvement across all our activities   | Commitment  | "I want an affordable energy bill" – delivering innovative solutions to deliver the energy transition, will minimise consumer bills |
| Networks should provide information to policy-makers through innovation projects or horizon-scanning. Decarbonisation of heat is a priority. | We will collaborate and partner with third parties on wider energy transition innovation projects that will help determine the energy transition options to a net zero future. | Commitment  |   |

The criteria for an innovation project to be funded via either BAU or allowance funding is outlined below:

- **BAU Totex funding:** higher technology readiness level (TRL), lower risk, benefit within RIIO-2 and greater certainty of success.
- **Allowance funding (NIA):** lower TRL, high risk, benefit beyond RIIO-2, less certainty of success, collaborative large-scale projects and decarbonised energy system.



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Figure 17.13 our innovation ambition

nationalgrid

# Our Innovation Ambition

Innovating to create your network of the future and facilitate UK decarbonisation.

It's our ambition in Gas Transmission Innovation to build and develop the innovation completed in RIIO-1, learn from the successes and failures of the past, and ensure that collaboration and dissemination across the utilities grows and flourishes. All of this will help us deliver a decarbonised energy system. By working closely with our stakeholders and third parties, we can address these challenges and help build the decarbonised energy system of the future. We plan to innovate through business-funded innovation as well as Ofgem's proposed allowances – and really drive forward the energy system transition. Our ambitious plans for RIIO-2 see an accelerated plan to develop and deliver innovation to meet our decarbonisation challenges.

**Our strategy looks out to 2050 and consists of three main themes:**



**Fit for the Future**  
Safeguarding and preparing our assets for the challenges in operating for the next 50 years and towards a decarbonised future.

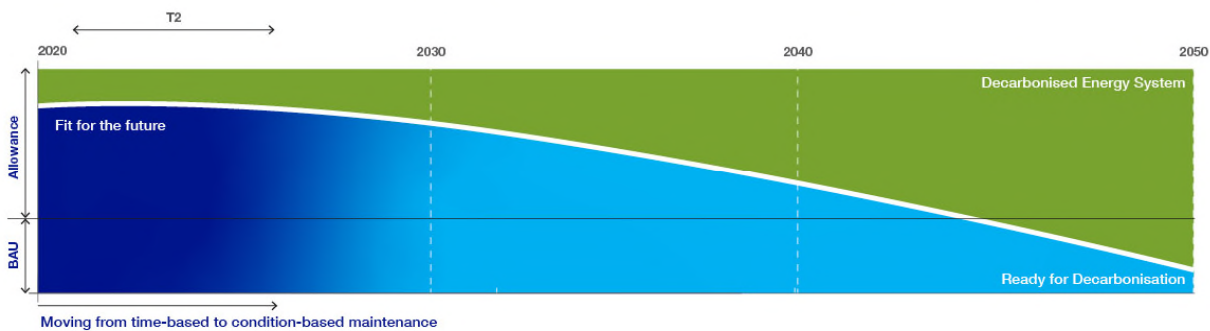


**Decarbonised Energy System**  
Working predominantly on hydrogen, we'll explore how the gas will interact with the NTS, how trading could be managed, and whether direct offtakes for hydrogen can support the transport and commercial markets.



**Ready for Decarbonisation**  
Focusing strongly on how the NTS will transport a blended mix of 'green' gases and focus on future technology to better manage the assets we own.

RIIO-2 Innovation Theme interaction – The graphical representation below shows the interaction between our three innovation themes. Between 2025-2030 there is a transition of focus from 'Fit for the Future' to 'Ready for Decarbonisation'. Innovation projects relating to 'Decarbonised Energy System' have already begun and will continue to develop at an increased rate between present day and 2050.

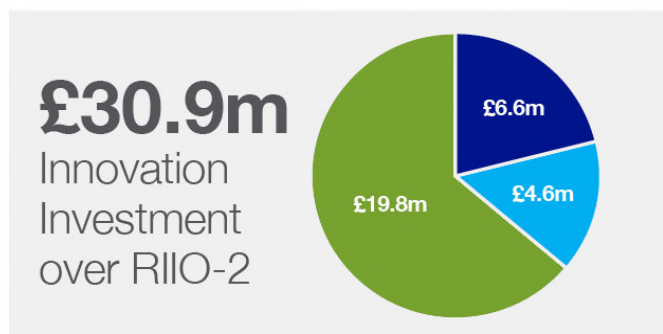


### Funding Our Innovation Ambition

Our plans consist of a strong level of BAU funded innovation, building on the success of RIIO-1. We also require funding from Ofgem in the form of an allowance to facilitate the groundbreaking innovation required to deliver a decarbonised energy system.

Building a system that is fit for the future is key, but in parallel we need to continue to develop and innovate on how this future system will operate. In order to derive the topics that fall under these themes, we've worked closely across our business, to understand the challenges we face.

This has resulted in the following set of focused topics under our themes.





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Figure 17.14 our innovation themes

|  <b>Fit for the Future (2021 – 2030)</b><br>Safeguarding and preparing our assets for the challenges in operating for the next 50 years and towards a decarbonised future. |   |  |   |
|---|---|--|---|
| Sub Topic   | Description   | BAU Innovation   | Allowance Innovation  |
| Modernising Our Systems   | Ensuring National Grid is operated utilising the latest in software and hardware across all its business functions. This also includes advances in wearable technology & smart PPE.   | <ul style="list-style-type: none"> <li>Innovative modules and additions to existing core software packages</li> <li>Asset data collection techniques</li> <li>Pigging and corrosion monitoring</li> <li>Storage solutions and data capture</li> <li>Core systems updated</li> <li>Drone applications</li> <li>Monitor leaks from aircraft or drones</li> <li>New methods of removing hazardous materials from site.</li> </ul> | <ul style="list-style-type: none"> <li>Implement new systems specific to the gas industry</li> <li>Bespoke analytics software</li> <li>New methods of inspection</li> <li>Studies into the effect hydrogen could have on the NTS</li> <li>Smart drawings</li> <li>'In-field' data capture and visualisation</li> <li>Digital twins and shadow control rooms</li> <li>Research and trials into the latest prevention software</li> <li>Swarm Robotics</li> <li>Tools that remain in the network</li> <li>Autonomous robotics on site, in-pipeline repair</li> <li>Networks capable of notifying when a leak is occurring</li> <li>Remote monitoring of emissions using AI driven solutions</li> <li>Research and development centre on the site of a decommissioned site.</li> </ul> |
| System Readiness and Advanced Analytics   | Embedded systems require a feed of rich data, leading to the ability to drive advanced analytics. Innovative solutions are required to collect huge quantities of high quality data and analyse it to provide business insight. |  |   |
| Asset Integrity Management  | Confirming and maintaining the integrity of the National Transmission System (NTS) as the move towards a decarbonised energy system begins.   |  |   |
| Digitisation and Digital Twin   | Migrating the large amount of hard-copy data and processes across GT and GSO into a digital format to facilitate more efficient interrogation. Investigating the part artificial intelligence can play in digitalisation.       |  |   |
| Cyber and Infrastructure  | Protecting National Grid from the threat of cyber terrorism to all its operations.  |  |   |
| Robotics  | Apply robotics to the operations of National Grid to automate functions or remove the need for the workforce to operate in hazardous environments.  |  |   |
| Leak Detection and Emissions Monitoring   | Early detection of leaks on the network and effective methods of monitoring emissions across the network.   |  |   |
| Decommissioning   | The safe, controlled and efficient decommissioning of redundant assets. Effective use of decommissioned assets to aid in the understanding of the NTS and decision-making for its future.                                       |  |   |

|  <b>Ready for Decarbonisation (2025 – 2050)</b><br>Focus strongly on how the National Transmission System (NTS) will transport a blended mix of 'green' gases and focus on future technology to better manage the assets we own. |  |  |   |
|---|--|--|---|
| Sub Topic   | Description  | BAU Innovation   | Allowance Innovation  |
| Compressor Strategy   | Making full use of the existing compressors to handle the changes in flow of gases around the NTS and looking towards mobile compressors.  | <ul style="list-style-type: none"> <li>Small scale amendments to the existing compressor strategy</li> <li>Data collection techniques</li> </ul>   | <ul style="list-style-type: none"> <li>Mobile compressor units</li> <li>Innovative algorithms</li> </ul>  |
| Artificial Intelligence (AI) and Machine Learning (ML)  | Using machines to automate tasks and making smart devices (AI) and for them to learn from the initial input of commands or information so they can make ongoing decisions without human intervention (ML). | <ul style="list-style-type: none"> <li>Proven and safe AR equipment for National Grid examples</li> <li>On site 'smart' assets</li> <li>Develop 3D printing techniques</li> <li>Address legality issues</li> <li>Small scale studies and trials</li> <li>Increased use of Building Information Modelling (BIM).</li> </ul> | <ul style="list-style-type: none"> <li>AI / ML packages</li> <li>Investigating AI solutions to drive equipment reliability</li> <li>Further applications of AR in the Utilities industry</li> <li>Embedded sensors / wires on the pipeline</li> <li>Integrated smart assets and dashboards</li> <li>Printing out in the field</li> <li>Self-healing paint</li> <li>Alternative and maintenance free pipeline materials</li> <li>New techniques and materials</li> <li>Digital twins</li> <li>Use of hydrogen machinery / generators.</li> </ul> |
| Augmented Reality (AR)  | Accessing a virtual data source whilst carrying out a task by wearing a device the user can interact with.   |  |   |
| Smart Networks  | Build on the sensor, robotics and new material industries to create a network that is aware of itself in terms of its operation and integrity.   |  |   |
| New Materials and Printing Parts  | Research and trials into new materials that mimic the strengths of a material but none of the weaknesses. 3D printing of parts for the NTS both in workshops and out in the field.                         |  |   |
| Decarbonising Construction  | Driving down carbon emissions during all stages of construction from design, through build to considering the operation and maintenance once completed.  |  |   |

|  <b>Decarbonised Energy System (2021 – 2050)</b><br>Working predominantly on hydrogen: how hydrogen will interact with the National Transmission System (NTS), how trading could be managed and whether direct offtakes for hydrogen can support the transport and commercial market. |   |  |   |
|--|---|--|---|
| Sub Topic  | Description   | BAU Innovation   | Allowance Innovation  |
| Hydrogen Mix / Blending / De-blending  | Understand the full potential of the NTS in terms of what blend of gases can be transported, how this will be facilitated, where will it come from and how it will be extracted.  | <ul style="list-style-type: none"> <li>Transportation of a low per cent of blended gas across the UK</li> <li>Extension of allowance funded projects to up-scale across the NTS</li> <li>Small scale studies into transmission specific challenges</li> <li>Small scale advances in current modelling technologies</li> <li>Extension of allowance funded projects to up-scale across the NTS</li> <li>Feasibility studies into potential connection points</li> <li>Small scale studies into the impact of new markets</li> <li>Studies into whether this technology is available</li> <li>Feasibility studies into the impact and application of this technology.</li> </ul> | <ul style="list-style-type: none"> <li>Can the NTS be used to transport up to 100 per cent hydrogen</li> <li>Allow specific quantities of a blended gas to be extracted</li> <li>Hydrogen connection and offtake studies</li> <li>Detailed studies into the effect of hydrogen within the NTS</li> <li>Detailed studies that would benefit the wider high pressure gas transportation industries</li> <li>New demand forecasting techniques and processes</li> <li>New modelling techniques</li> <li>Specific studies on key areas that need to be addressed</li> <li>Innovative software advancements for the SO business</li> <li>Multi-scale trials of connecting customers to a supply of hydrogen</li> <li>Research into ways the NTS could facilitate the trade of carbon and hydrogen around the UK or globally</li> <li>Pilot schemes to trial the technology</li> <li>Innovative CCS techniques including carbon mineralisation</li> <li>Transport of carbon through the NTS</li> <li>CO<sub>2</sub> removal from the atmosphere.</li> </ul> |
| Impact of Hydrogen on NGGT   | On a molecular level, hydrogen is very different to natural gas and its impact will need to be fully understood on all aspects of the network. This includes but is not limited to, gas velocities, energy densities and impact on electrical and mechanical equipment.                     |  |   |
| Pipeline Safety Case   | Our current safety case to transport natural gas has been established, however significant investment is required to prove the safety case with hydrogen in areas such as fracture propagation, thermodynamics and proximity distances.   |  |   |
| Whole System Demand Forecasting  | Operating in a decarbonised energy system will require a full review of demand forecasting techniques and procedures. This will cover modelling scenarios with both hydrogen and natural gas, increased variability in supply and demand and network configuration options into the future. |  |   |
| System Operation for a Decarbonised Energy Network   | The current System Operator (SO) business is based around a natural gas market which will be subject to potential changes. This will cover metering, gas quality sampling, flow measurement, SCADA, billing, software and training.   |  |   |
| Hydrogen for Transport and Industry  | Provide hydrogen or blended gases to fuel heavy transport networks such as rail, air, maritime and haulage industries. Provide large commercial customers with a direct supply of hydrogen or blended gases for their industries.   |  |   |
| Future Markets   | Play an active role in any new gas markets that are set up to trade biogases, hydrogen or carbon dioxide.   |  |   |
| Hydrogen for Compressors and Power   | Use of hydrogen within a compressor turbine and to power the prime movers used in compressor units. Providing hydrogen to power generation.   |  |   |
| Carbon Capture, Utilisation and Storage  | The process of capturing waste carbon dioxide, transporting it to a storage location and safely locking it away to prevent the release into the atmosphere.   |  |   |



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### 5. How will we deliver?

In our approach for RIIO-2, we are expecting that more innovation will be undertaken as business as usual (BAU). We are not asking for any additional innovation stimulus funds for this area, as this will be funded entirely through our baseline totex allowance. Benefits will be derived through the totex incentive mechanism which shares benefits with consumers. We are committing that we will provide a value of £4 for every £1 we invest in implemented innovation during the RIIO-2 period. However, there will still be a requirement for an innovation incentive allowance (NIA) to deliver the higher risk energy transition projects; for example, innovation for the transition to a net zero future. We are proposing that we would require £30.9m of NIA funding for the RIIO-2 period. We believe that rules that are applied to it currently should apply for RIIO-2. i.e. we propose that 10% of this is funded by us.

The role of the RIIO-2 independent stakeholder user group has been crucial to the development of our business plans and has added significant value, in particular to the development of this strategy. As we progress into RIIO-2, we are committed to securing an independent panel to challenge our innovation ambition, performance and strategy. Discussions around the role of the independent stakeholder user group are ongoing. Once the role and outcome are confirmed we will seek to engage with this group or establish an offshoot panel with key representatives.

### Systems

#### 1. What is this sub-topic about?

This subtopic is about how we are developing the systems our customers need to flow gas, and about how we unlock consumer value through enhancing our IT systems.

#### 2. Our activities and current performance

##### Balancing capacity services and systems - track record

Shippers are required to book space (known as 'capacity') on the network so they can flow gas. We also need them to tell us when and where they are going to flow the gas, so we can balance the network safely. The balancing and capacity processes and services we provide are our main interface with shippers, and they are at the core of how the gas industry operates. They support the efficient functioning of the gas market by allowing market participants to balance their portfolio daily and manage their capacity bookings up to 17 years ahead, making informed commercial decisions as well as enabling the efficient physical operation of the network.

Gemini is the main system we use to communicate commercial information to/from shippers. Gemini is a system owned by us but managed and operated on our behalf by Xoserve, the gas industry's central data service

provider (CDSP). They deliver a full suite of vital services to gas suppliers, shippers and transporters.

Our services must reflect emerging market rules and requirements. Our ability to update our systems and services to adapt to the changing energy landscape is critical in delivering what stakeholders need from us. How we deliver these changes is particularly important for stakeholders, as any changes can affect their connected systems and processes. The lifespan of our systems are dependent upon vendors' support policies. **The average lifespan is five to seven years**, at which point we need to plan to refresh or replace the system. This means a decision before each price control period has to be made on whether the system needs replacing or replatforming. We build our plans (RIIO-1 and RIIO-2) on this basis and because RIIO-1 lasted eight years, we included two investments in that period due to the lifespan of the system.

#### Learning for RIIO-2

In our RIIO-1 business plan we said we'd re-platform Gemini at the beginning of the period, replace in the middle and refresh at the end. Instead, we carried out the re-platform forecast at the beginning of RIIO-1 and then a more substantial re-platform at the end of RIIO-1 without replacing the system in the middle.

We chose this option because:

- The volume of regulatory change that would drive the need to replace Gemini did not materialise. In RIIO-1 our strategy was to manage the change process to ensure implementation was at minimum cost (and required minimum system change). The fact that we didn't have to replace the system demonstrates that we were effective at executing this strategy.
- A re-platform for the Gemini system was enough to maintain support of the system and there were no other technical reasons to replace and was endorsed by stakeholders at the Gas Operational Forum.<sup>100</sup>
- Re-platform rather than replacement has the extra benefit that our options for replacement are kept open for longer, ensuring the solution is as future-proof as possible.
- Our stakeholders and Ofgem expect us to explore the most cost-effective approach. We have again applied this approach to our proposal for RIIO-2.

Additionally, one of the fundamental principles of the RIIO regime is the totex incentive mechanism (TIM). It incentivises us to ensure we make the right decisions in the best interests of consumers. Through this mechanism, during RIIO-1 we have shared the outperformance we achieved with our consumers.

<sup>100</sup><https://www.nationalgridgas.com/sites/gas/files/documents/Gas%20Ops%20Forum%20full%20pack%20-%20-%20February%202018.pdf>



## I want you to facilitate the whole energy system of the future - innovating to meet the challenges ahead

### 3. What have stakeholders told us?

**Table 17.15 balancing capacity services and systems engagement**

| Engagement topic                                 | Balancing capacity services and systems  |
|--|--|
| Stakeholder segments engaged                     | Shippers, customers, supply chain.   |
| Objective  | We have talked in detail about the current capacity and balancing services and system as well as about users' requirements for their provision in the future. We asked how useful the current capacity and balancing services are and also what their functional and non-functional requirements are for a future capacity and balancing system. |
| Channel/method                                   | Workshops, webinars, 1-2-1 meetings, industry forums, surveys.   |
| Key messages                                     | Do the basics well, make it easier for stakeholders through greater automation and increased reporting functionality whilst minimising the impact of change.   |
| Trade-offs and stakeholder influence on the plan | We have worked with stakeholders to understand their requirements to help us determine if what was most economical for consumers, is either replacement or re-platforming.   |
| SUG and challenge group feedback                 | Challenge on what could be required during RIIO-3. We have stated in both the next section and in annex A17.04 the potential future options for RIIO-3.  |

We have talked in detail about the current capacity and balancing services and system as well as about users' requirements for their provision in the future. We've asked stakeholders how useful the current capacity and balancing services are and what their functional and non-functional requirements are for a future capacity and balancing system.

We targeted specific groups of stakeholders based on their level of interest/impact and influence on this topic, and we reached them through several channels including a specific workshop, webinars, one-to-one meetings, attending industry forums and surveys.

More recently, we shared our updated proposals for Gemini at the operational gas forum. Out of the 20 attendees, 10 completed the survey, out of this 6 stated their preferred option was the 'enhanced solution' and 2 said their preferred option was 're-write with commercial off-the-shelf products'. Two other attendees highlighted 're-write with bespoke application' as their preference. For more details about this, please see the engagement log in annex A17.02.

### 4. Our proposals for RIIO-2

**Table 17.16 system transformation proposals**

| What our stakeholders have told us  | Commitment   | Output type | Consumer benefit   |
|---|--|-------------|--|
| In relation to Gemini: do the basics well, make our lives easier through greater automation and increased reporting functionality, and minimise the impact of change. | We will invest in our Gemini system as it needs to be refreshed due to lifespan ensuring it continues to function and also deliver the enhancements our stakeholders want. | Commitment  | "I want to use energy as and when I want" – investing in the digital systems so the gas market and industry is able to continue providing energy to consumers. |
| Through RIIO-2 we need to ensure they can facilitate the industry change that stakeholders require, which will be at heart of the energy transition                   | Our IT systems play a central role in how the gas market operates. We will invest in IT systems that support our delivery of market change.                                | Commitment  |  |

The current Gemini system will become unsupported in 2025. Coupled with this is the need to have a system which is agile in response to industry change and can also respond to feedback received from stakeholders throughout this RIIO-2 business planning process. To maintain supportability and deliver on stakeholders' requirements, we have considered five options for investment in RIIO-2. These options build in terms of the level of intervention, and therefore costs. The options considered are:

1. sustain (invest in system to maintain current capability and functionality) (£13.6m)
2. hosting modernity (cloud-based hosting) (£19.6m)
3. enhanced solution (invest to improve capability and functionality to meet stakeholder needs) (£24m)
4. re-write the application using commercial off-the-shelf products (£25m)
5. re-write with bespoke application. (£37m).

Because cost isn't the only deciding factor, we've developed a series of metrics to assess the quantifiable and non-quantifiable benefits of each option, and these are described in detail in the justification paper annex A17.04. Briefly, these metrics are:

- implementation costs
- service & performance risk
- change delivery ease/cost
- user experience/interface
- customer impact
- subsequent operating costs.

Following assessment against these metrics, the preferred option is the '**enhanced solution**' – **option 3**, which is £24m over the RIIO-2 period with a completion date of 2025. Although this is not the least cost option, it is believed this solution will give the greatest benefits to consumers as it will improve quality of service by



## I want you to facilitate the whole energy system of the future - innovating to meet the challenges ahead

delivering the enhancements that industry have identified, making shippers' businesses more efficient which will ultimately lower consumer bills. The additional enhancements from delivering this option meet the requirements of a better user experience, system optimisation and making the application easier to change.

This option would:

- enable easier and faster delivery of change to the application and reduce the run of the business costs associated with the system
- improve the user interface
- provide better and more flexible access to the underlying data
- introduce process automation to reduce setup times for auctions and other processes.

For further details, see our EJP annex A17.04 and our CBA annex A17.05.

**Table 17.17 cost certainty**

| Cost realised from RIIO-1 actuals  | Cost forecast based on competitive process | External Benchmark | NARM or Volume driven PCD |
|------------------------------------|--|--------------------|---------------------------|
| Yes-sustain element of options 3), | No   | No                 | No                        |

The forecast costs for each option have been derived by using historical project costs, this has included re-platforming costs incurred within RIIO-1, application change costs (e.g. GB Charging Reforms) and previous enhancements delivered. These costs have then been scaled up or down depending on the level of intervention required for the delivery of each option and efficiencies applied where appropriate. Market estimates have also been used to forecast costs of the Oracle upgrade and cloud migration. These costs have been validated with WIPRO, a leading global information technology, consulting and outsourcing company.

The Gemini system requires a technical refresh every 5 years to ensure that vendor support is maintained regardless of whether this is following a previous sustain or system replacement. Therefore, even if either of the 2 replacement options were carried out in RIIO-2, the system would require a further sustain in RIIO-3 (circa 2030). As outlined in the justification paper and highlighted in the heat map, the "enhanced solution" option provides the benefits of a supported system whilst meeting stakeholders needs in the most cost efficient way. At this stage, there are no signals (e.g. stakeholder requirements, industry change) that require a replacement system to deliver additional capability in RIIO-2. More information on this is included in annex A17.04.

Additionally, we need to ensure our IT systems which support commercial and market processes facilitate the gas regulatory change to enable the decarbonisation pathways. As we have stated before we expect a significant amount of industry change that we will be expected to deliver and enable for our stakeholders. We expect to have to do additional regulatory driven Gemini system enhancements (~£14.9m). The balancing and capacity processes and services which the Gemini system supports are at the centre of the GB gas market. Additional there are some regulatory and market driven non-Gemini changes that we anticipate will impact some of our other IT systems (~£11.0m). These include changes to support information provision and operational processes which are supported by MIPI and GCS respectively. This investment covers delivery of changes to the system to reflect industry change to these areas and more detail can be found in the IT investment annex A20.03.

### Native competition

Currently, the Gemini enhancement work will be undertaken through Xoserve. This is because it is the only company in the CDSP role. However, as we approach the more detailed scoping of works<sup>101</sup> we will try to ensure they are the most efficient company to deliver our requirements. Additionally, Xoserve's costs already face a high degree of scrutiny through their annual business planning process and, ultimately, by the Xoserve Board.

### 5. How will we deliver?

The Gemini work will be delivered through an upfront allowance. This will allow us to explore other options for their provision, ensuring that these services are efficient, fit for the future, and will benefit the industry and end consumers.

### 6. Risks and uncertainty

There are risks around the assumptions, primarily associated with the cost of implementing change. There is the added possibility that customers may seek to recharge costs to us to adapt their systems and processes if we are driving levels of change that are beyond what they may have costed into their contracts. We have detailed our risks and associated mitigations in our EJP annex A17.04.

<sup>101</sup> This has not been done before the December business plan submission.