

GT&M Innovation

RIO-2 Progress & Strategy

Engagement

We will start at 13.02 to allow participants to finish previous meetings and join the call

Slido.com
#GT13

Welcome and Opening

Thank you for joining us today

The future of our gas network depends on finding a 'greener' alternative to natural gas that will continue to provide heat and power to homes, business and industry reliably, safely and placing an importance of delivering value for the consumer.



Antony Green
Hydrogen Director

Who will be speaking?

Ian Bennett

**Innovation Delivery
Manager**



David Hardman

**Innovation Strategy &
Implementation Manager**



Corinna Jones

Head of Innovation



Michelle Hocknull

**Customer & Stakeholder
Lead – Net Zero**



Logistics



Should last for approximately about 60 min



Questions and polling via slido.com #GT13



All callers will be placed on mute



We will circulate the slides and a recording of this webinar

Agenda

1. RIIO-2 Innovation – What Have We Done So Far

2. Strategy & Pipeline – How To Get Involved

3. Delivering Value – Our Promise To You

4. RIIO-3 Planning – Help Direct Us

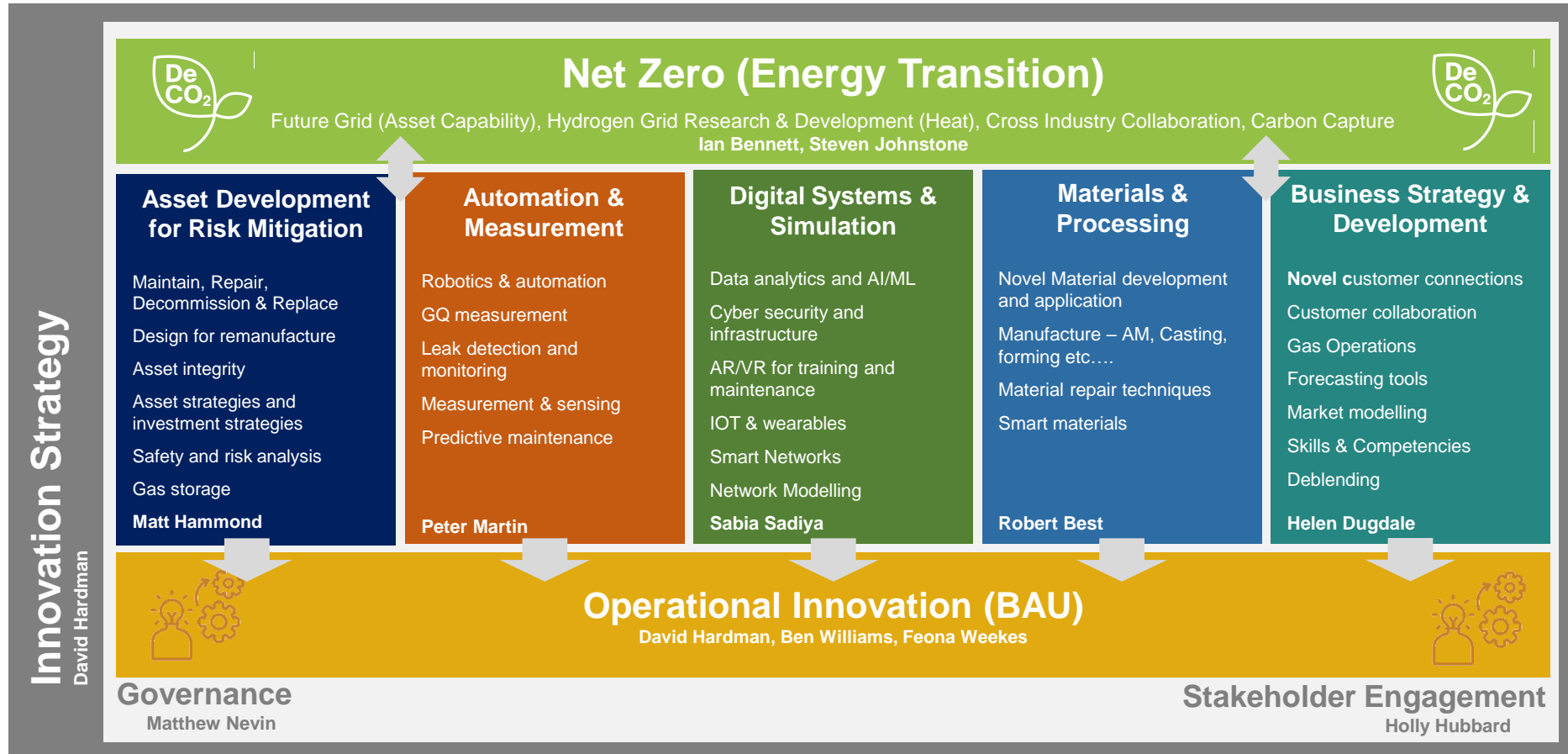
RIIO-2 Innovation

What Have We Done So Far

 Gas
Transmission



Innovation Team Structure



Our Strategy for RIIO-2: The Foundation



Fit for the Future

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



Ready for Decarbonisation

Focusing on how the NTS will transport net zero gases and where novel technology will enable us to accelerate our transition



Decarbonised Energy System

Developing our Net Zero Transmission system of the future, we'll explore how the gas will interact with the NTS and its customers

Question

Which of our strategic themes do you feel is most important?

Progress to Date

In Numbers...since December 2021

NIA

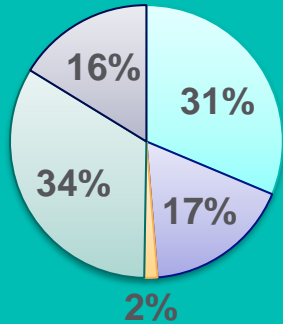
29

29 projects sanctioned
19 projects kicked off
7 projects completed

SIF

14

10 Discovery projects
4 Alpha projects



- Asset
- Digital
- Automation
- Materials
- Business Development

Compression

Deblending

Data

Pipeline protection

HyNTS Compression

SIF



→ Reference: SIF-Alpha

→ Status: Delivery

→ Supplier: DNV / Siemens / ITM Power

→ Funding: £559,035
(GT = 95,860)

→ Timeline: Aug 22 – Jan 23

Challenge:

One of the largest costs in the current assumptions for migrating the NTS to hydrogen is the cost to replace all the compressors, where a key output of this project is to get our current compressors to operate with hydrogen.

There is a need to understand the capability of the turbine to utilise hydrogen as a fuel gas, and to consider the compression opportunity with various hydrogen blends in order to provide the most cost-effective solution which is the focus of this work.

Objective:

- To determine whether the use of current compression assets on a hydrogen gas network is feasible to reduce the cost of the energy transition.
- To determine the technical and commercial feasibility, provide a technical demonstration and create a strategy for UK NTS Compression Systems.
- The technical demonstration is planned to be conducted at the FutureGrid Spadeadam, Cumbria site

Contact: Matt Hammond



Benefits:

- Determining the most cost-effective method of hydrogen compression for the NTS, reduction in consumer costs
- Develops a strategy for compression
- Developing UK capability, skills and competencies for net zero solutions
- Potential CO2 saving

Gas & Electricity Transmission Infrastructure Outlook 2050

NIA



→ Reference: NGGT0184

→ Status: Delivery

→ Supplier: Guidehouse

→ Funding: £353,333
(GT = £127,200)

→ Timeline: Jan 22 – Jan 23

Challenge:

The energy system of the future will need to be more integrated to deliver a reliable, flexible, affordable and sustainable energy.

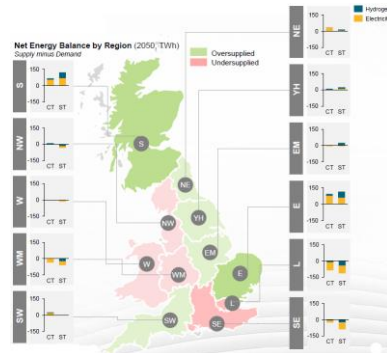
How these systems will interact and what changes are needed to facilitate this requires further consideration.

Objective:

This project will:

- Be a first step in understanding these interactions for the UK transmission networks
- Be a desktop study, with NGET and ESO, reviewing data from several sources from both the UK and Global activities to determine the optimum method for interaction

Contact: Ian Bennett



Benefits:

The results of the project will create knowledge in the transmission approach to whole systems that can be utilised as appropriate by UK networks to determine future strategies and approaches. The aligned collaborative approach will enable a more efficient transition to net zero.

Collaboration & communication

Project partners

69

- 9% Academia
- 14% Gas Networks
- 40% Private sector (small)
- 19% Private Sector (large)
- 18% Other (non-profit, public sector)



Results

Which of our strategic themes do you feel is most important?

2




Strategy & Pipeline

How To Get Involved

▶ Gas
Transmission



Our Strategy

 <p>Fit for the Future</p>	 <p>Ready for Decarbonisation</p>	 <p>Decarbonised Energy System</p>
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Safeguarding and preparing our assets for the challenges in operating for the next 50 years and towards a decarbonised future.

Focusing on how the NTS will transport net zero gases and where novel technology will enable us to accelerate our transition

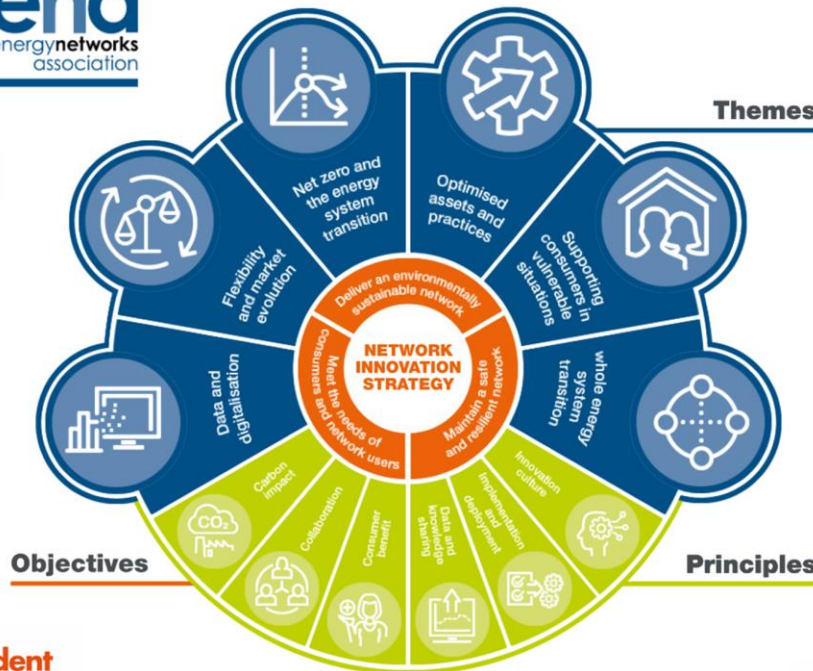
Developing our Net Zero Transmission system of the future, we'll explore how the gas will interact with the NTS and its customers



nationalgrid



nationalgridESO



Network of the future

(For illustrative purposes only)

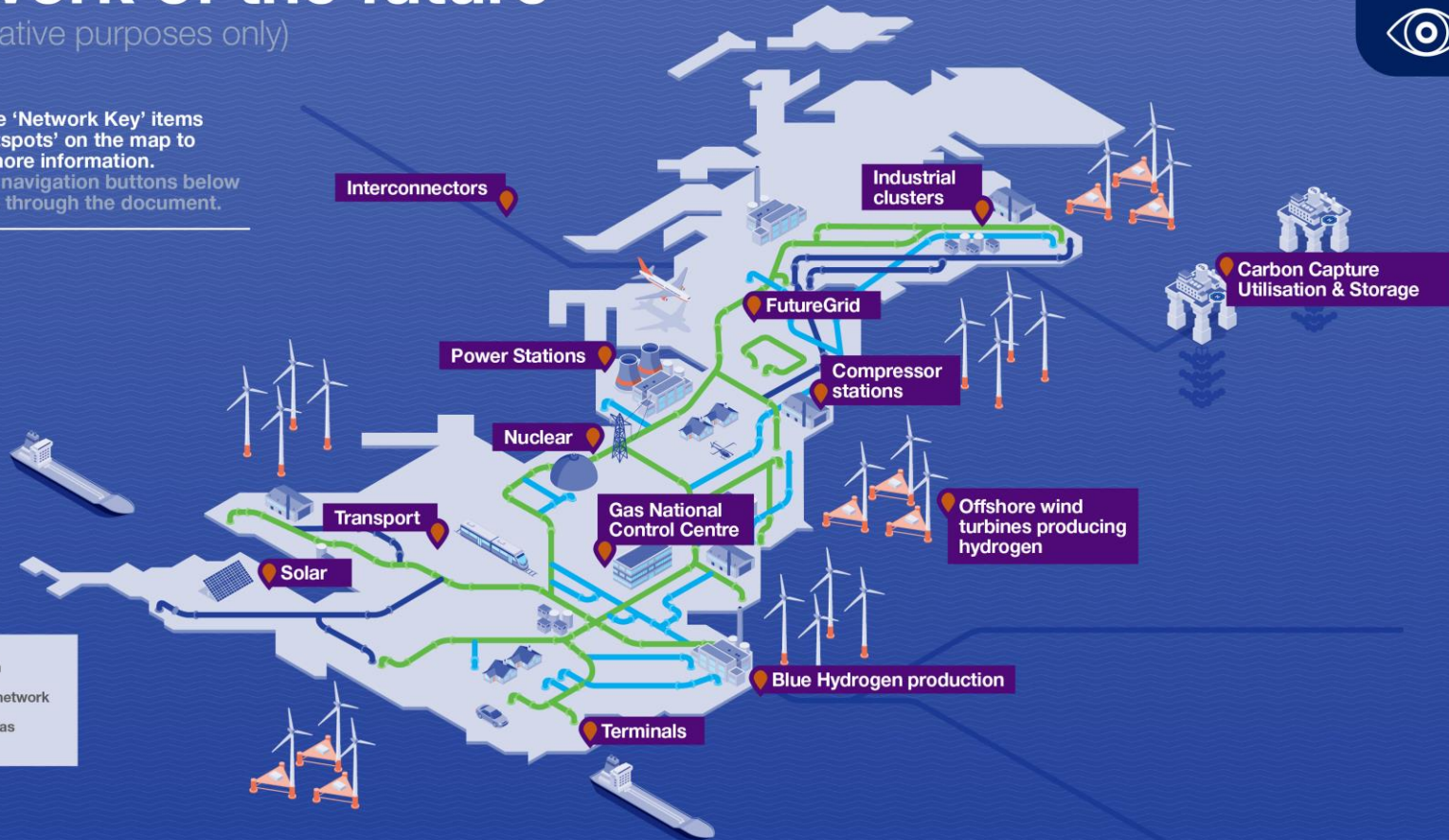
 [View the site of the future](#)

 Click the 'Network Key' items and 'hotspots' on the map to reveal more information. Use the navigation buttons below to move through the document.



 Network key

-  Hydrogen
-  Blended network
-  Natural Gas



Site of the future

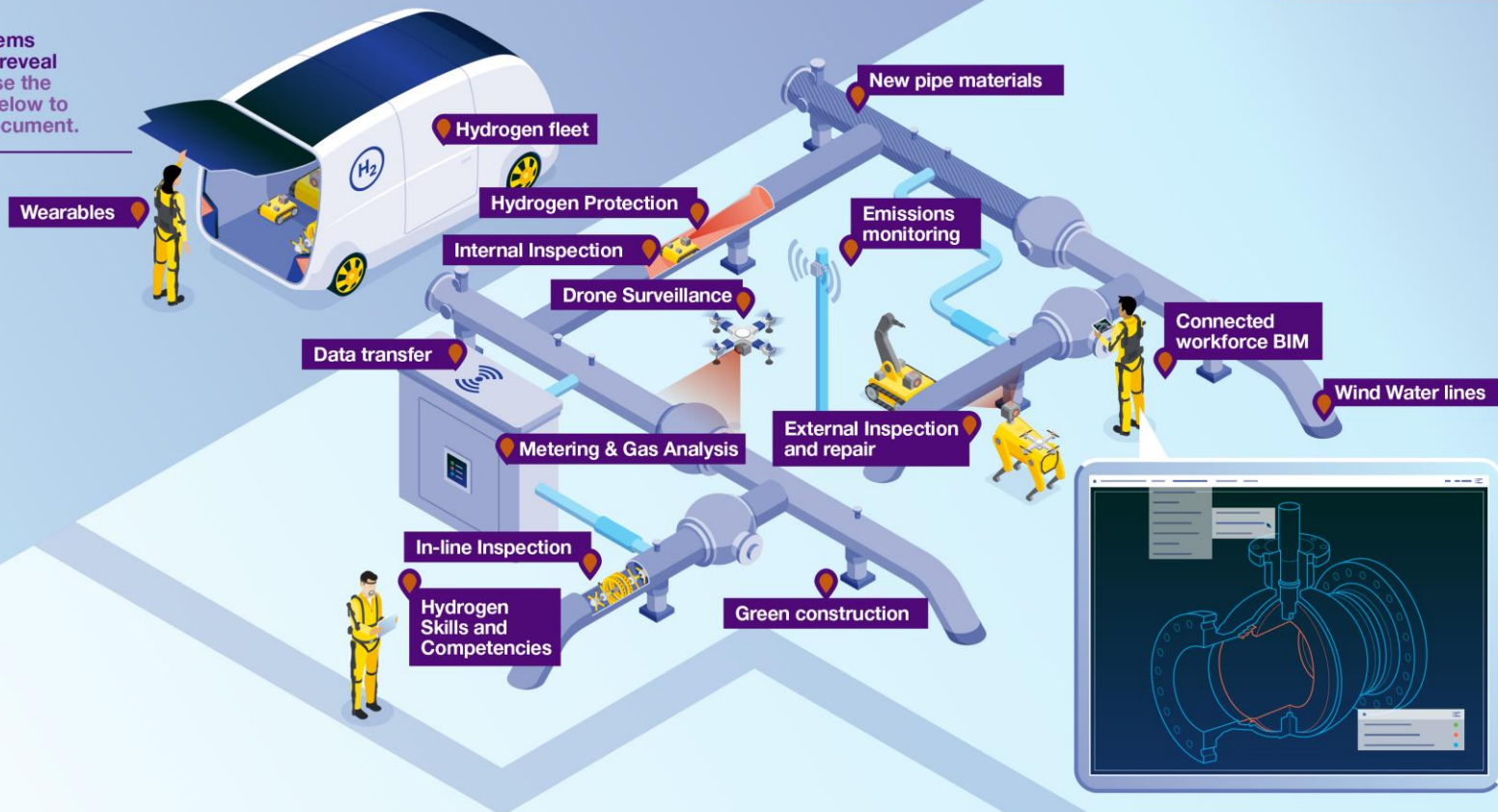
(For illustrative purposes only)



Back to
the network
of the future



Click the 'hotspot' items on the illustration to reveal more information. Use the navigation buttons below to move through the document.





1 Asset development for risk mitigation

Developing hydrogen ready resilient assets with optimise maintenance systems. The asset theme led by Lynsey Stevenson investigates how the NTS will be transitioned to Net Zero energy sources and the impact on investments, construction and operation of these networks.



"Innovation is key to developing the transmission system for transportation of hydrogen. 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 hydrogen transmission system."

Matt Hammond

The Challenge

- Impact of Hydrogen on Assets
- High level overview of impact of variation, gas composition, compression...

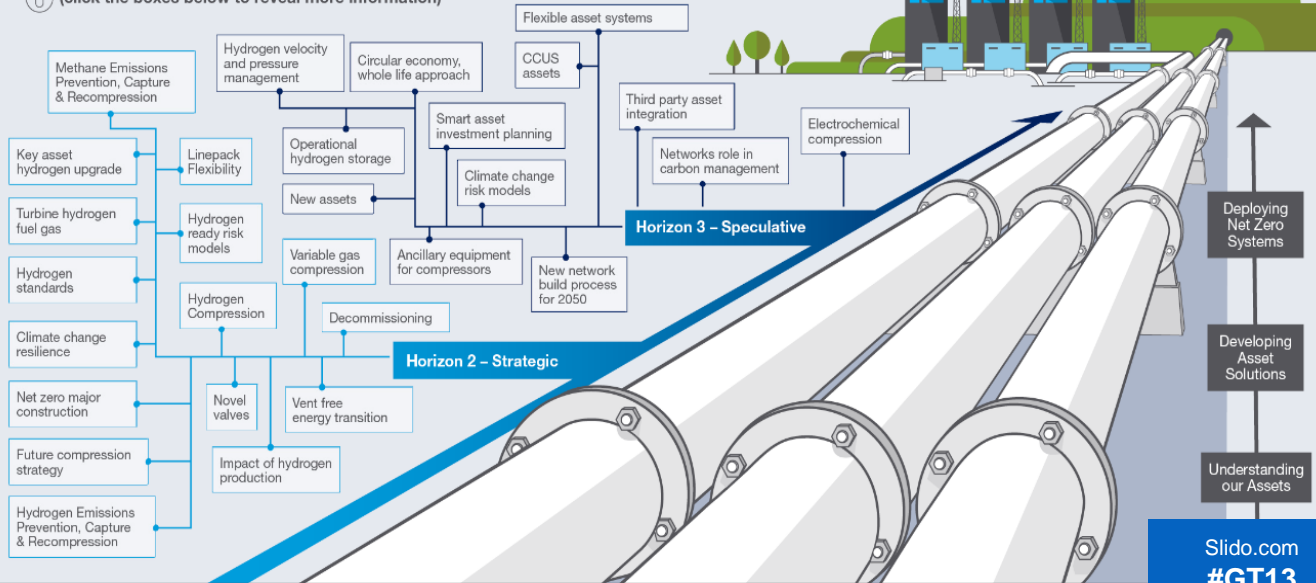
Our vision pipeline shows how we overcome the challenges. Click the vision tab to see this in detail.



Strategic Theme	Topic	Key areas
Fit for the Future	Decommissioning	Hydrogen repurposing and decommissioning strategy interactions, novel methods for decommissioning
Ready for decarbonisation	Compressor Strategy	Mobile compressor units
	Decarbonising Construction	Use of hydrogen machinery/generators
Decarbonised Energy System	Impact of Hydrogen on GT	All NTS asset hydrogen impact determination
	Pipeline Safety Case	QRA and safety case
	Hydrogen for compressors and power carbon capture, utilisation and storage	Hydrogen compression systems Innovative CCS, carbon mineralisation, carbon transport and storage

VISION: Hydrogen ready resilient assets with optimised maintenance

(click the boxes below to reveal more information)





2 Automation and Measurement

Developing the inspection and monitoring systems required for the future of gas. The Automation and Measurement theme led by Peter Martin determines the optimum systems for measurement and inspection of our networks, utilising autonomous and robotic systems where appropriate.



"The introduction of hydrogen into our network, in its pure form or blended with natural gas, alters the physical characteristics of the gas transported in our pipelines. Traditional technologies in use on the NTS do not have the required capability to measure or sense new hydrogen blends. Therefore, innovation is required in the area of automation and measurement to allow us to safely and efficiently manage a hydrogen network"

Peter Martin

The Challenge

The introduction of Hydrogen into our network, in its pure form or blended with Natural Gas, alters the physical characteristics of the gas transported in our pipelines. Current Natural Gas focussed technologies in use on the National Transmission System do not have the required capability to measure or sense these new Hydrogen blends. Therefore, we will require new devices that allow us to accurately measure the flow of energy and volume for a Hydrogen network.

- Impact of Hydrogen on Measurement
- High level overview of issues with metering and gas analysis etc...
- Robotics for safety etc...

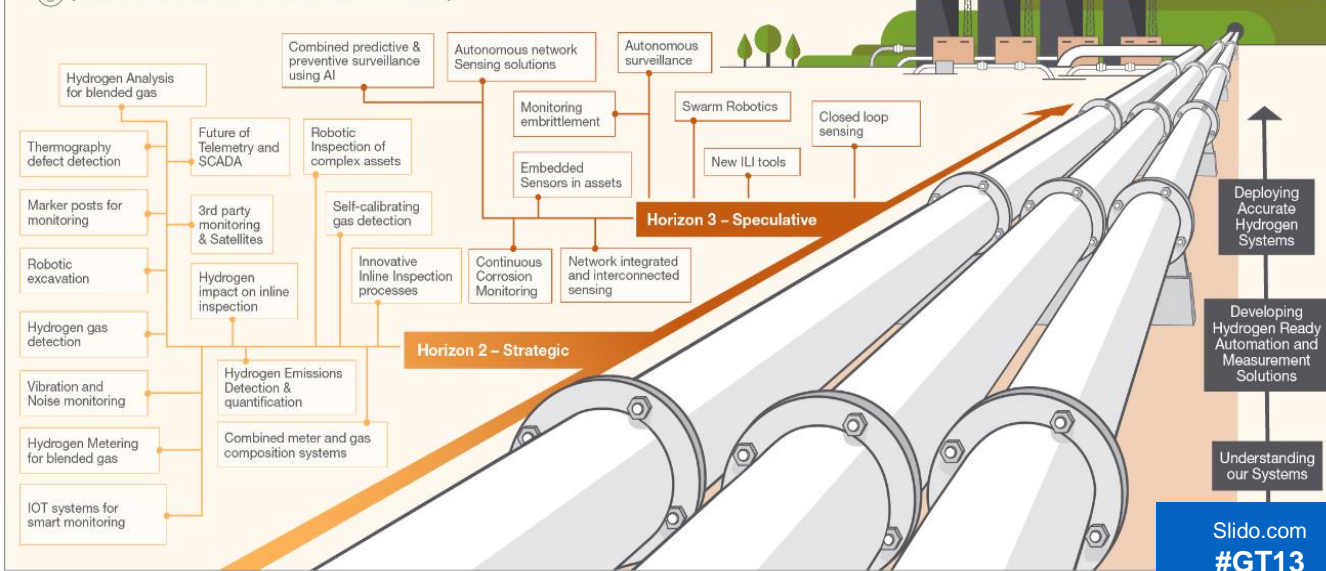
Our vision pipeline shows how we overcome the challenges. Click the vision tab to see this in detail.



Strategic Theme	Topic	Key areas
Fit for the Future	<ul style="list-style-type: none"> • Modernising our Systems • Asset Integrity Management • Robotics • Leak Detection and Emissions Monitoring 	<ul style="list-style-type: none"> • New methods of inspection • Hydrogen ready inspection tools • Robotic inspection and continuous inspection • Leak detection remote and in situ
	Ready for decarbonisation	<ul style="list-style-type: none"> • Smart Networks
Decarbonised Energy System	<ul style="list-style-type: none"> • Robotics • Metering and analysis 	<ul style="list-style-type: none"> • Swarm Robotics • Autonomous surveillance • Combined hydrogen metering and analysis

VISION: Robust, Accurate and Safe Measurement Technologies and Systems

(click the boxes below to reveal more information)





3 Materials and Processing

Ensuring robust materials and processes extend the lifetime of our assets and enable repurposing of the network for hydrogen. The materials and processing theme led by Robert Best has a focus on the enablement of our National Transmission System assets to accept hydrogen whilst delivering improved robustness and maintenance.



"Innovation is key to understanding the risks associated with re-purposing the existing network for hydrogen 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 hydrogen future."

Robert Best

The Challenge

- Impact of Hydrogen on Materials
- High level overview of hydrogen embrittlement etc...

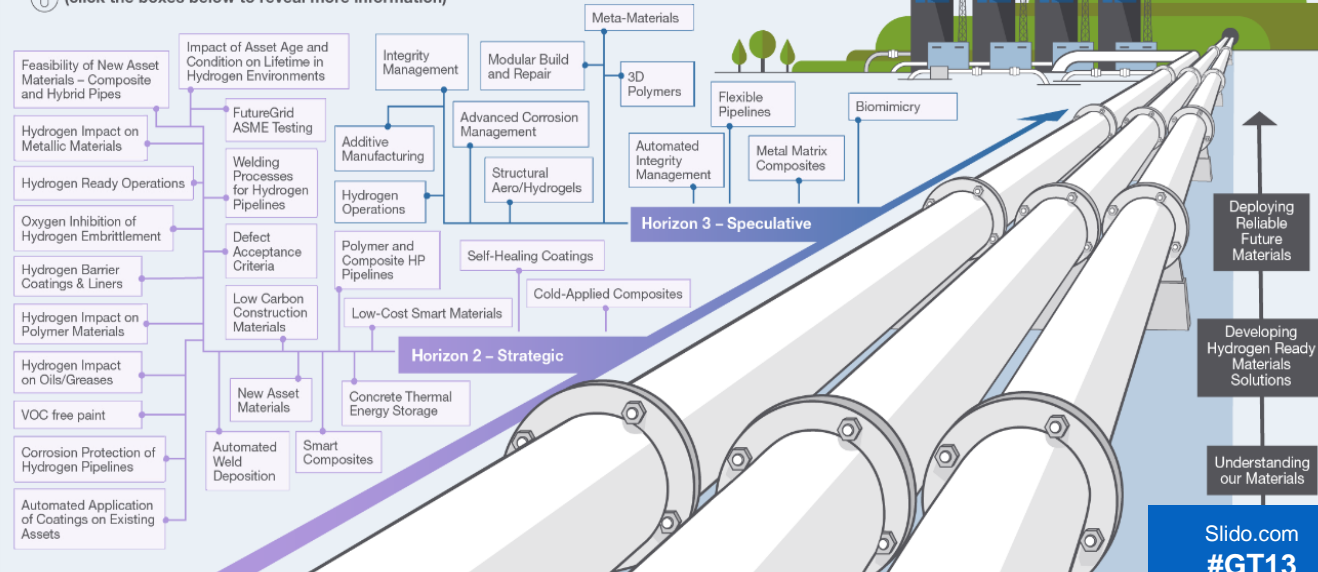
Our vision pipeline shows how we overcome the challenges. Click the vision tab to see this in detail.



Strategic Theme	Topic	Key areas
Fit for the Future	New materials and printing parts	<ul style="list-style-type: none"> • 3D printing techniques • Printing out in the field • Self healing paint • Maintenance free pipeline materials
	Decarbonising construction	<ul style="list-style-type: none"> • BIM deployment • New techniques and materials
Decarbonised Energy System	Impact of Hydrogen on GT	<ul style="list-style-type: none"> • Hydrogen impact on materials

VISION: Hydrogen ready resilient assets with optimised maintenance

(click the boxes below to reveal more information)





4 Digital Systems and Simulation

Providing accessible accurate data models of the UK Energy Network improving network efficiency. The Digital Systems and Simulation theme led by Sabia Sadiya supports the digitalisation of our network and the associated assets.



"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

The Challenge

- Impact of Digital systems on Hydrogen transition
- High level overview of hydrogen embrittlement etc...

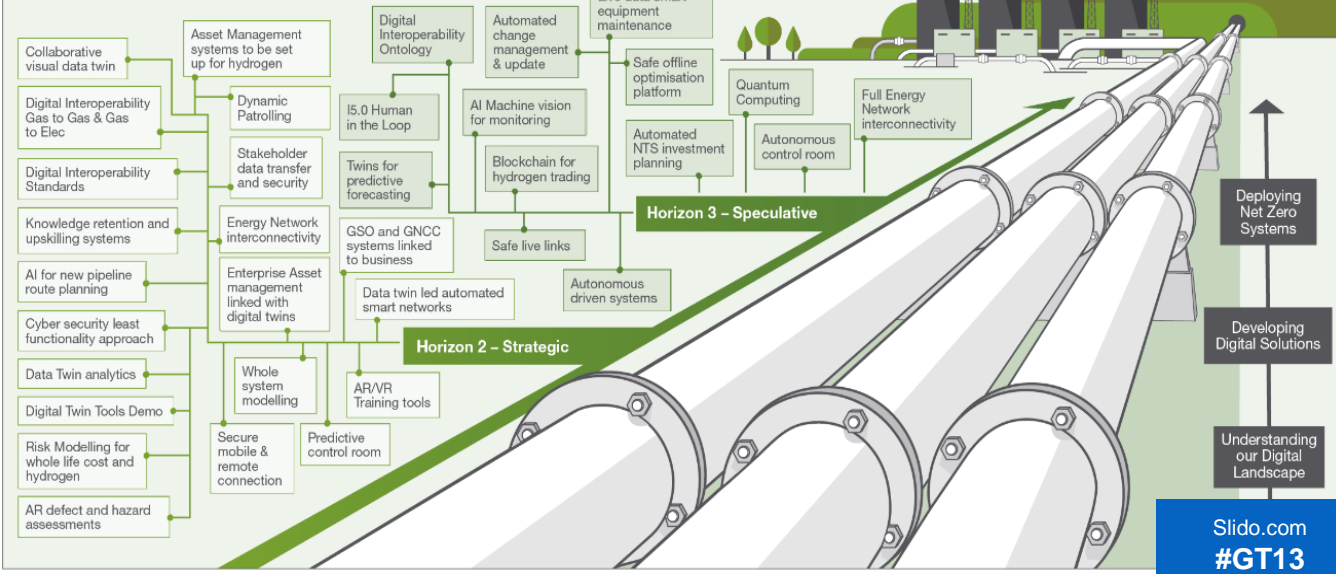
Our vision pipeline shows how we overcome the challenges. Click the vision tab to see this in detail.



Strategic Theme	Topic	Key areas
Fit for the Future	System Readiness and Advanced Analytics	Smart drawings
	Field data capture	Smart drawings
Ready for decarbonisation	Digitalisation and digital twin	Smart drawings
	Cyber and infrastructure	Smart drawings
Decarbonised Energy System	Artificial Intelligence and Machine Learning	Smart drawings
	Augmented Reality	Smart drawings

VISION: Hydrogen ready resilient assets with optimised maintenance

(click the boxes below to reveal more information)





5 Business Development

Enabling future markets and customers of the gas network by ensuring business systems and processes are relevant for net zero. The business development theme led by Helen Dugdale supports the development of system and network solutions to enable the deployment of hydrogen for Net Zero by 2050.



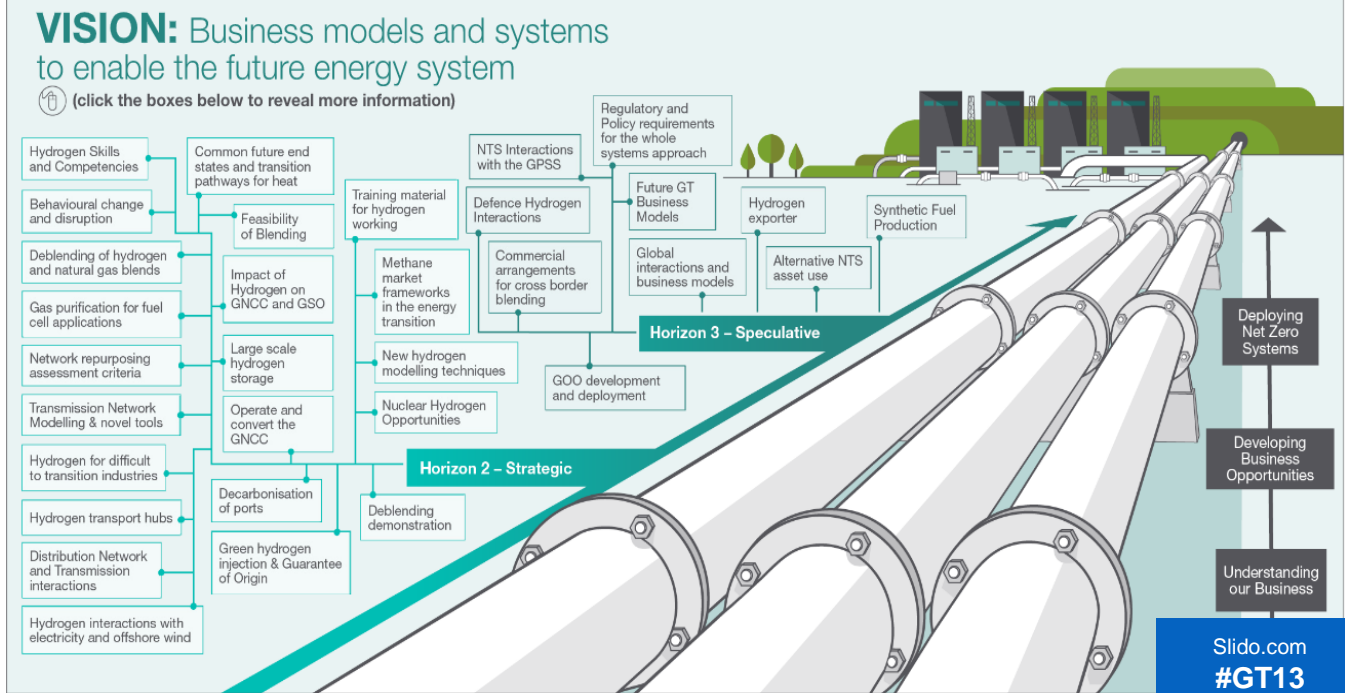
"Innovation creates change by extending the capability of technology and developing new applications. In turn, this technical advancement drives the need for innovation in supporting frameworks, such as the development of an appropriately skilled workforce and creates the opportunity to seek out potential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

Helen Dugdale

The Challenge
 - Impact of Hydrogen on Systems
 - High level overview of system complexity, new customers etc...
 Our vision pipeline shows how we overcome the challenges, Click the vision tab to see this in detail.



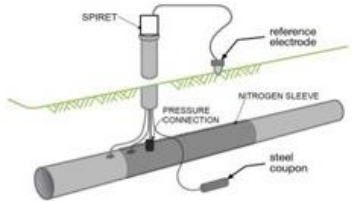
Strategic Theme	Topic	Key areas
Decarbonised Energy System	Hydrogen mix / blending / deblending	• NTS system transformation and management for blends and 100% hydrogen
	Whole systems demand forecasting	• New demand forecasting techniques and processes
	Hydrogen for Transport and Industry	• Multi scale trials of connecting customers to a supply of hydrogen
	Future Markets	• Carbon management and market management
	Hydrogen for Compressors and Power	• Power and Transport network solutions
		• Domestic heat network
	Hydrogen transport hubs	• Decarbonisation of ports
	Distribution Network and Transmission interactions	• Green hydrogen injection & Guarantee of Origin
	Hydrogen interactions with electricity and offshore wind	• Deblending demonstration
		• Operate and convert the GNCC



Operational Innovation



Implementation of Innovation into the business



Commercialisation

New projects



Gas Transmission



3

Delivering Value

Our Promise to You

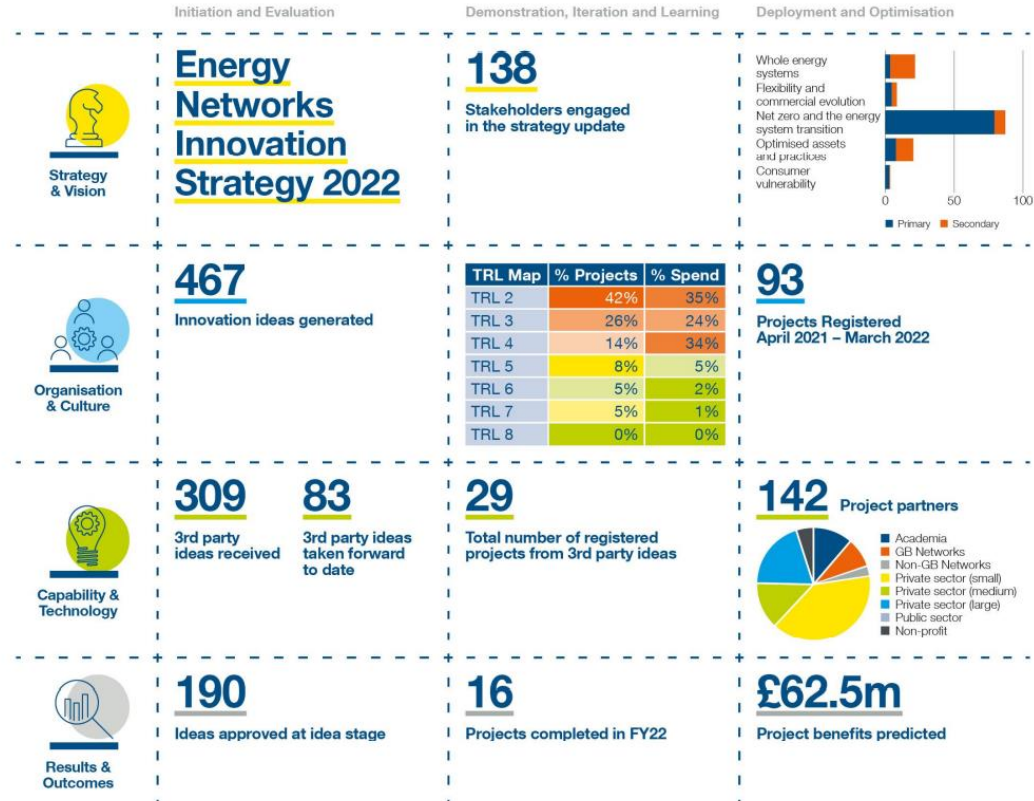


Question

What can we do to improve the value delivered from our innovation projects?

Annual Report 2022

- FY22 is the first year of the new price control RIIO-2
- RIIO-2 innovation funding (NIA and SIF) focuses on the energy system transition and consumers in vulnerable situations.
- This year's Annual Report will focus on innovation project idea development, progress, and predicted value as many projects are just beginning, and at this stage of RIIO-2, only a few have progressed right through to deployment.



https://smarter.energynetworks.org/media/w3qdnw1/energy-networks-annual-innovation-report-2022_final.pdf

Value Tracking at GT&M

- Maturity / TRL
- Opportunity
- Innovation Cost
- Deployment Cost
- Financial Savings
- Safety Improvement
- Environmental Impact
- Compliance
- Skills & Competencies
- Future Proofing

Proposed Benefits
PEA & Sanction Documentation

Project Delivery
Regular Check Up

Project Closure Status & Implementation Plan
Close Down Documentation

Engagement & Planning
Ownership of Benefits Deployment

Data Point Definition
Benefits measurement KPIs

Case Study Development
Formal Documentation

Case Study Approval & Publication
Review process and data

Case Study Cadenced Review
Follow up to check progress

Value Realised to Date:
£89m

Results

What can we do to improve the value delivered from our innovation projects?

4

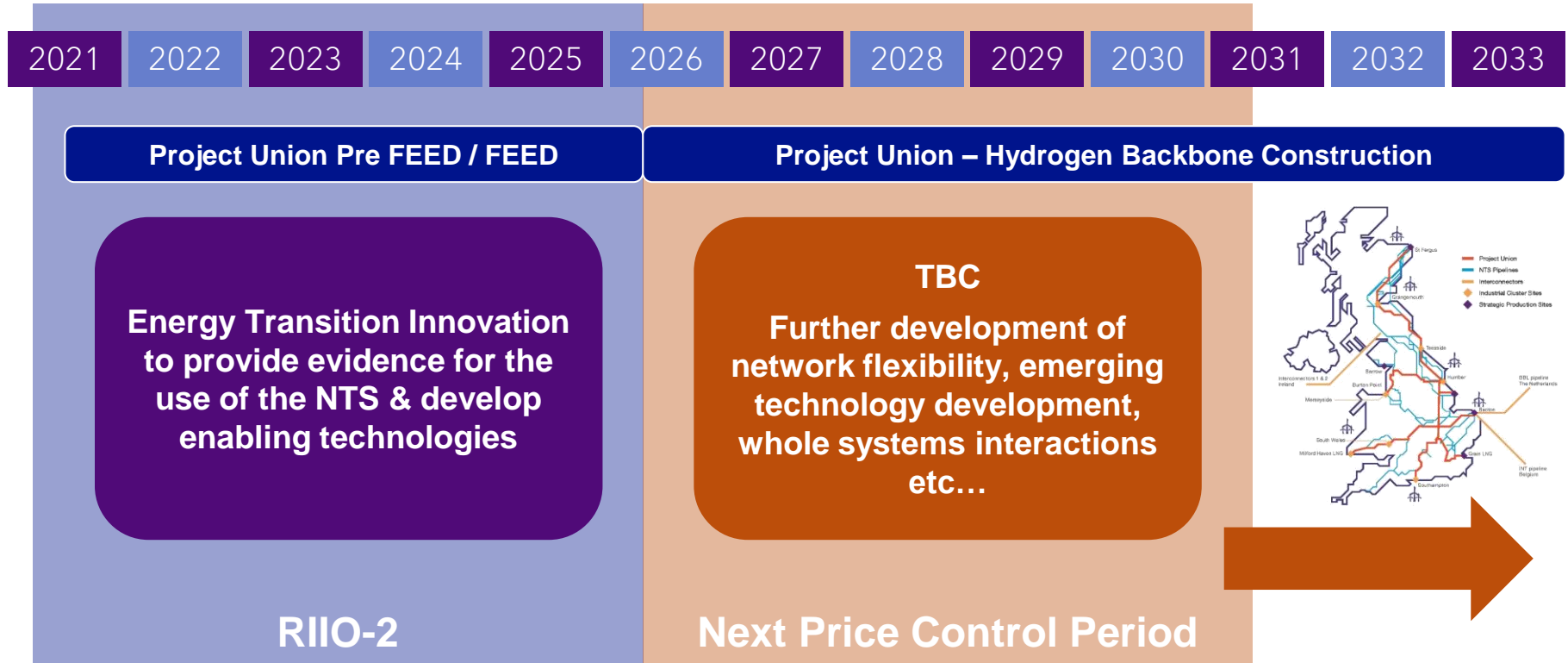
Beyond RII0-2 Planning

Help Direct Us

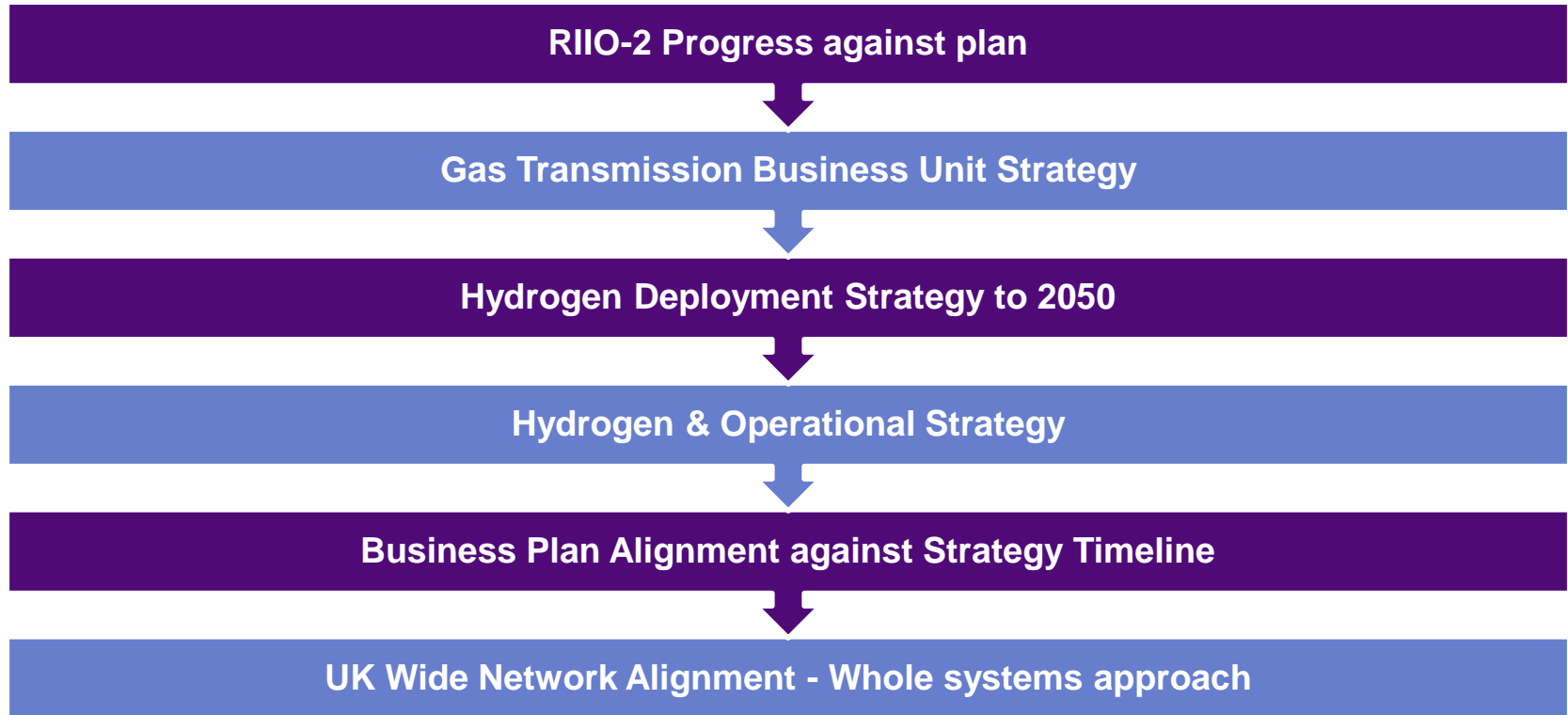
▶ Gas
Transmission



Beyond RIIO-2



Beyond RIIO-2 – Key Considerations



Question

To help us refine our future business plans are there any key projects or topics you feel are missing?

Please provide your suggestions via Slido

▶ Gas Transmission and Metering

Get in touch



box.GT.innovation@nationalgrid.com



www.nationalgrid.com/gasinnovation



Innovation at National Grid

Questions



Results

To help us refine our future business plans are there any key projects or topics you feel are missing? Please give us your suggestions.

Webinar Programme

<https://ngrid.com/3ESgN1t>



Event Name	Date / Time	Presenters
Facilitating Commercial & Regulatory Change	Tuesday 29th November @ 09:30	Ian Radley, System Operations Director
Sustainable Construction	Wednesday 30th November @ 09:00	Mark Lissimore, Construction Director
Accessing Energy Data	Thursday 1st December @ 11:00	Mark Lissimore, Construction Director
Operating the Network	Friday 2nd December @ 13:00	Ian Radley, System Operations Director
Blending	Monday 5th December @ 10:00	Tony Green, Hydrogen Director
Transitioning to 100%	Tuesday 6th December @ 11:00	Martin Cook, Commercial Director
Hydrogen Regulatory Framework	Wednesday 7th December @ 12:00	Tony Nixon, Regulation Director
Monitoring and Mitigating Methane Emissions	Thursday 8th December @ 13:00	Steven Vallender, Asset Director
Future of Heat	Friday 9th December @ 13:30	Tony Green, Hydrogen Director
FutureGrid - Progress Report	Monday 12th December @ 14:00	Tony Green, Hydrogen Director
Innovation	Tuesday 13th December @ 13:00	Tony Green, Hydrogen Director
Driving a Positive Environmental & Community Impact	Wednesday 14th December @ 10:00	Jake Tudge, Corporate Affairs Director

What next?



You will receive the recording and material from today's session



If you have any further questions or would like to discuss anything specific please get in touch with the innovation team

E Mail: box.GT.innovation@nationalgrid.com



Feedback is important to us, therefore if you have not already taken part, we would like to put you forward for a survey

Thank you for joining us





Gas Transmission