Gas Transmission

A roadmap to Net Zero

20th August 2020

We will start at 09.33

nationalgrid

Logistics

- Should last for approximately about 60 min
- Questions and polling via slido #NetZero
- All callers will be placed on mute
- We will circulate the slides and a recording of this webinar

Agenda

1 Size of the opportunity

2 Key challenges

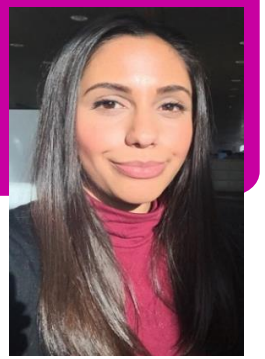
- Tony Green

3 Building the evidence to inform the future

- Danielle Stewart

4 What funding mechanisms are available for Net Zero?

- Charon Balrey



Gas Transmission

1

Size of the opportunity

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A reminder of what's at stake…

What is net zero?

'Net zero' refers to achieving an overall balance between the amount of greenhouse gas emissions (GHGs) produced and the amount removed from the atmosphere

Greenhouse Gases (GHGs)

- Water Vapour
- Carbon Dioxide
- Methane
- Nitrous Oxide
- Fluorinated Gases

Why is it important?

Excess GHGs in the atmosphere lead to global warming, which in turn is leading to climate change.

Climate change is resulting in droughts, floods, extreme weather, sea level rise and biodiversity loss.

"Just a 1.5°C average temperature rise may put 20-30% of species at risk of extinction. Beyond 2°C most ecosystems will struggle" (WWF, 2019).

The UK has committed to a legally-binding target of net zero greenhouse emissions by 2050

The Role of Gas in the UK

22m

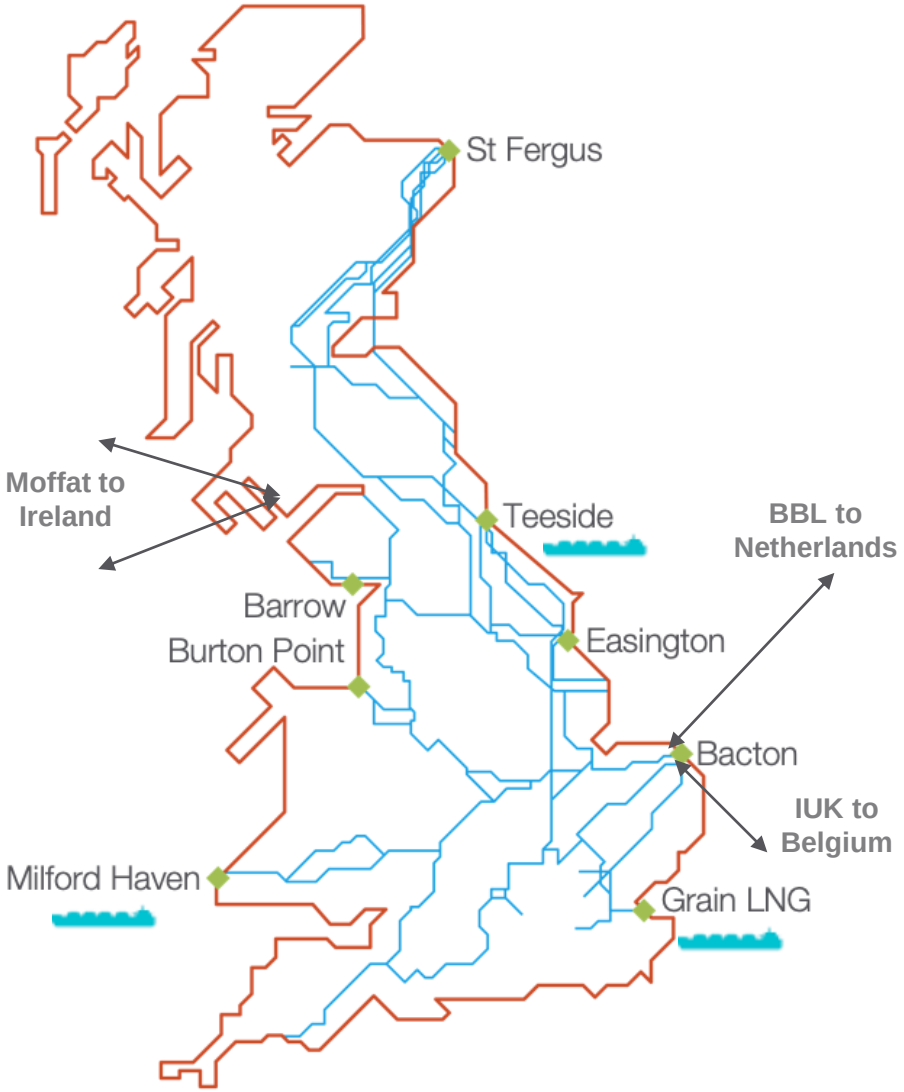
gas customers in the UK

85%

households are using gas for heat

881TWh

of energy is delivered by the NTS



39%

Power Generation

38%

Domestic Use

23%

Industrial & Commercial

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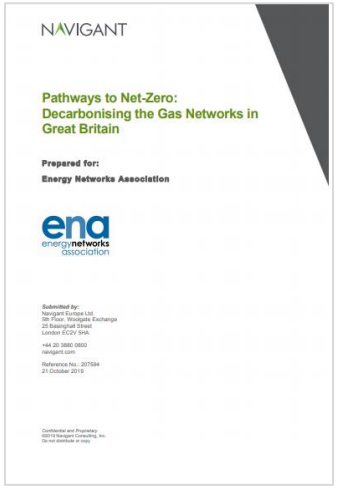
The Future Energy Mix?



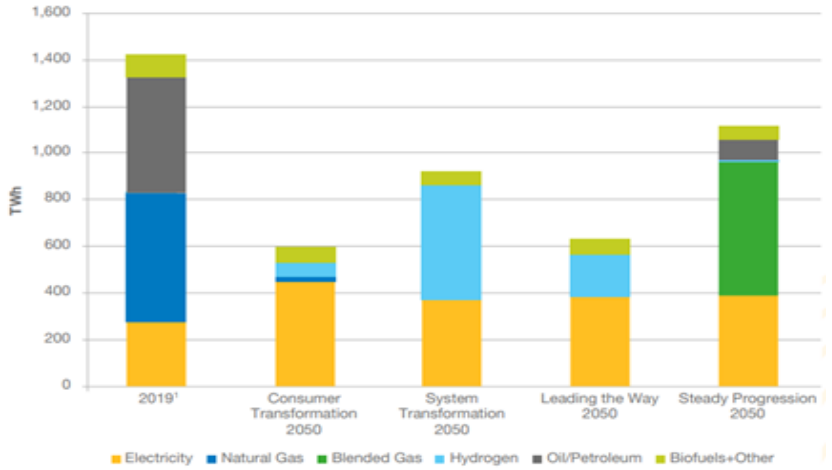
'A significant low-carbon hydrogen economy will be needed to help tackle the challenges of industry, peak power, peak heating, heavy goods vehicles, and shipping emissions' (CCC 2019)

'A balanced combination of low carbon gases and electricity is the optimal way to decarbonise the GB energy system and reach net-zero emissions by 2050' (Navigant 2019)

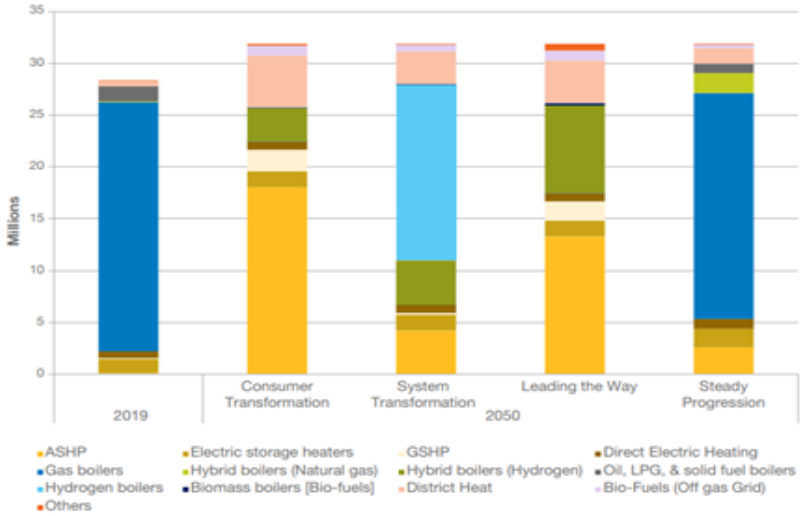
'Hydrogen plays a role in every net zero scenario. (FES 2020)

'Hydrogen provides between 21% and 59% of 2050 net zero end-user energy needs' (FES 2020)

Annual End Consumer Energy Demand in 2050 (FES 2020)



Overall home heating technology mix in 2050 (FES 2020)



Gas Transmission

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Challenges to establishing a clear future pathway for decarbonised gas networks

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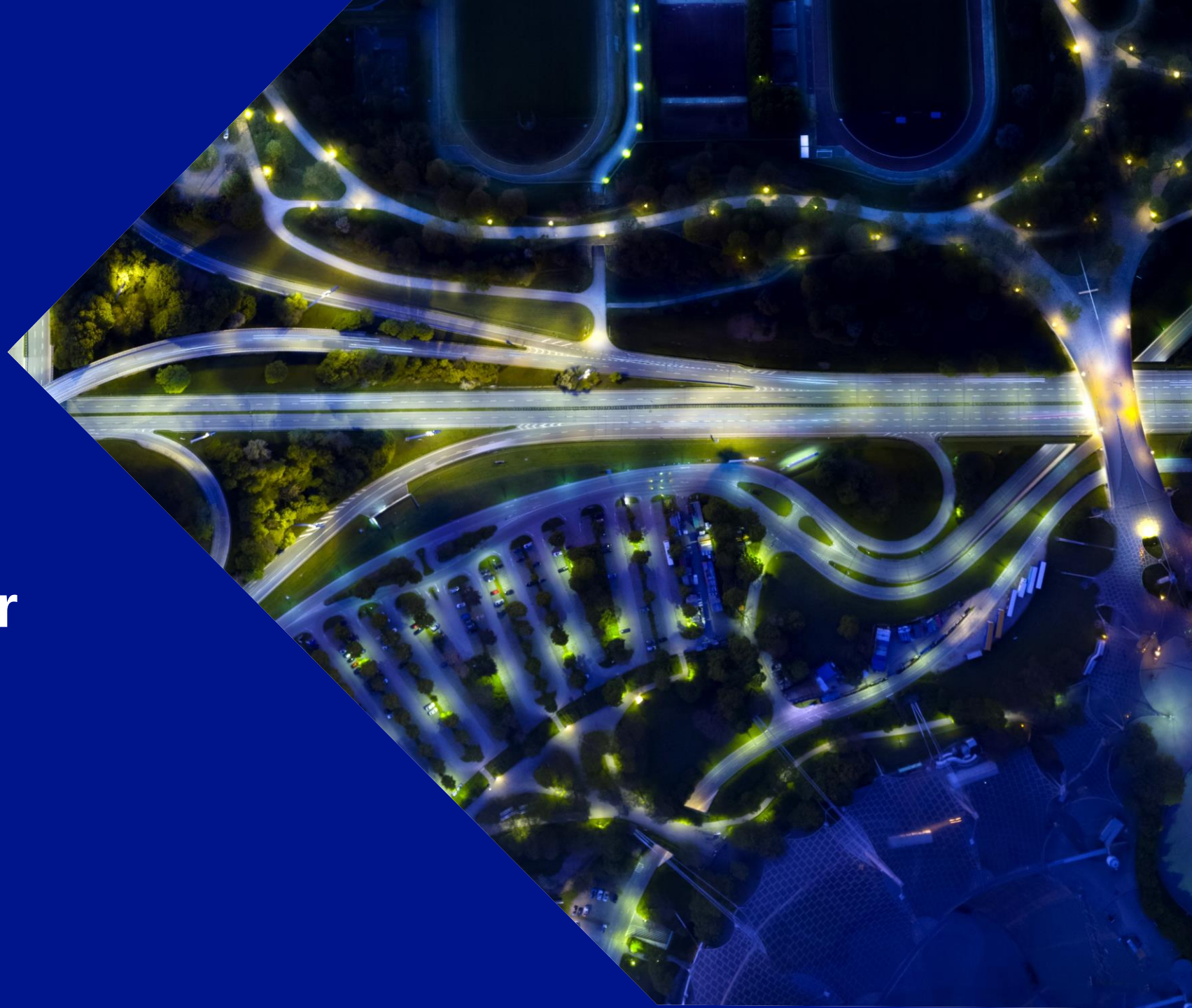

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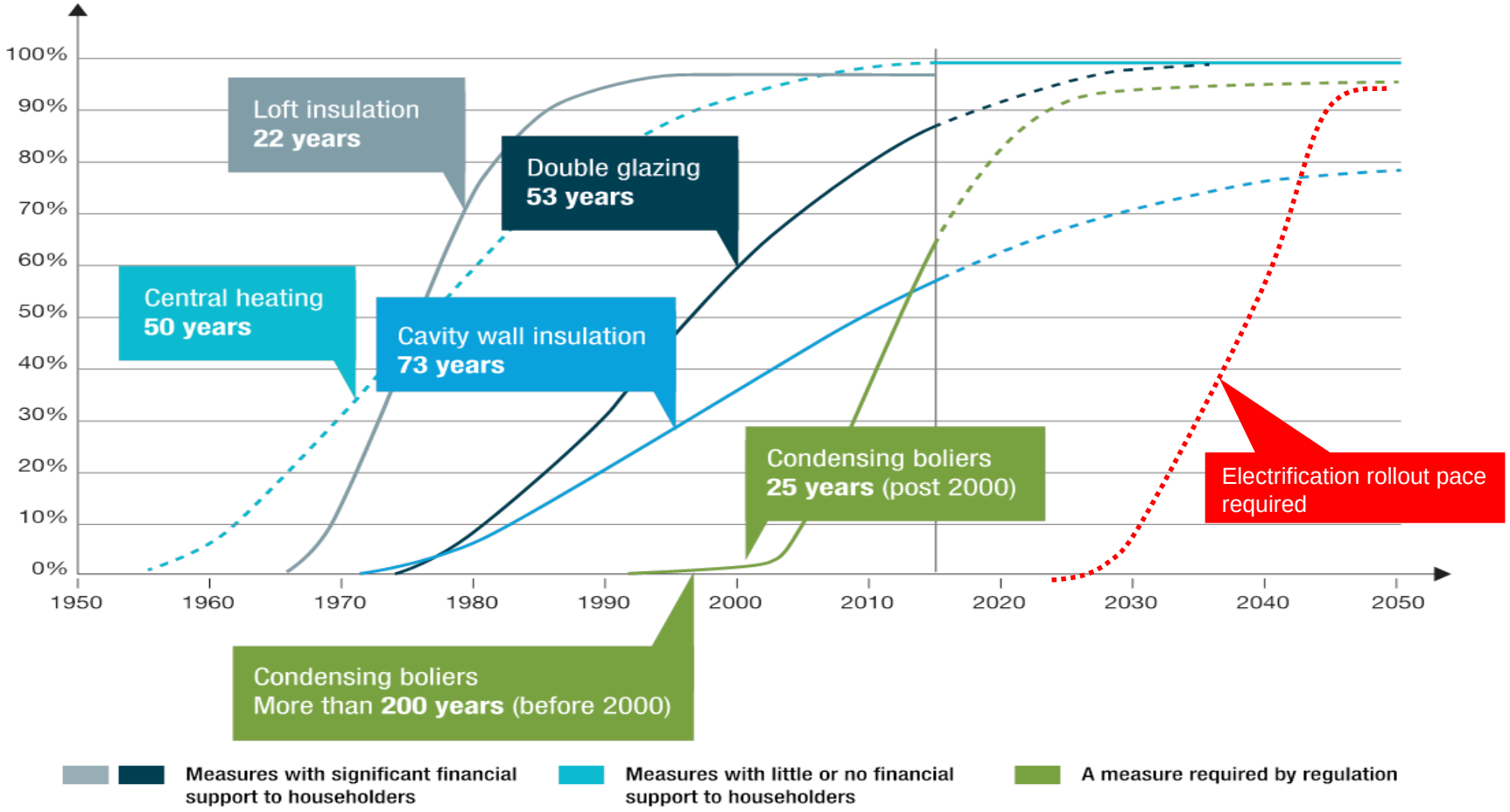
Consumer acceptance

History indicates that there can be huge challenges in changes to home heating - time and cost



Heat

- Around 20,000 homes will have to be insulated each week between now and 2035, compared to 2,400 in 2017

Heat

- 15,000 homes will have to transfer to a low-carbon heating system every week until 2050, compared to 220 today

Transport

- 20,000 internal combustion engine vehicles will have to be exchanged for alternative-fuelled ones each week from now to 2050, compared to 1,200 in 2018

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Could Hydrogen drive the future of heat?

There are key enablers that within our control:

1

Safety is paramount

Prove that hydrogen can be safely, produced, stored, distributed and utilized by customers.

2

Innovation must accelerate

Funding is vital to driving the necessary hydrogen trials and enabling R&D into key technologies.

3

Learn from others

Internationally there is a lot of development in hydrogen – are we maximising the benefit for a UK application?

4

Collaboration is key

Working with other sectors such as industry and transport, as well as exploiting Whole Systems Thinking.

5

A consumer first approach

Keep consumer promises of transparency and affordability. Bring consumers and stakeholders along the journey.

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Over to you…

What do you believe the biggest barriers are to meeting net zero?

Gas
Transmission

3

Building the evidence to inform the future

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RIIO-2 Roadmap & Commitments

We will be ready to start conversion to hydrogen by 2026

We will facilitate the use of green gas

We can provide resilience to renewable generation

We will reduce our business carbon footprint

Consumer-first approach to ensure no-one gets left behind

We will deliver the transition as a responsible business

2020 – we will make the first low cost, low carbon green gas connections to our network

2023 – Science based targets for scope 1 & 2 emissions

2024 – identified physical modifications needed for hydrogen and blending

2026 – Net zero construction on major projects

2024 – identified plans for new market regimes and market modification

2026 – 100% alternative fuel fleet where there is a market alternative in 2019

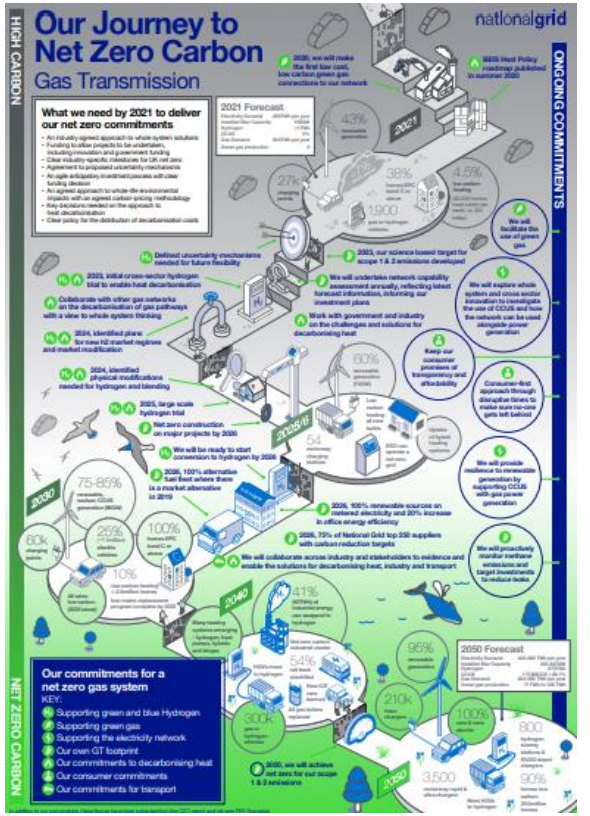
2025 – large scale hydrogen trial

2026 – 100% renewable sources on metered electricity & 20% increase in office efficiency

2026 – we will be ready to start conversion to hydrogen

2050 - we will achieve net zero for our scope 1 & 2 emissions

2050 – UK Net Zero



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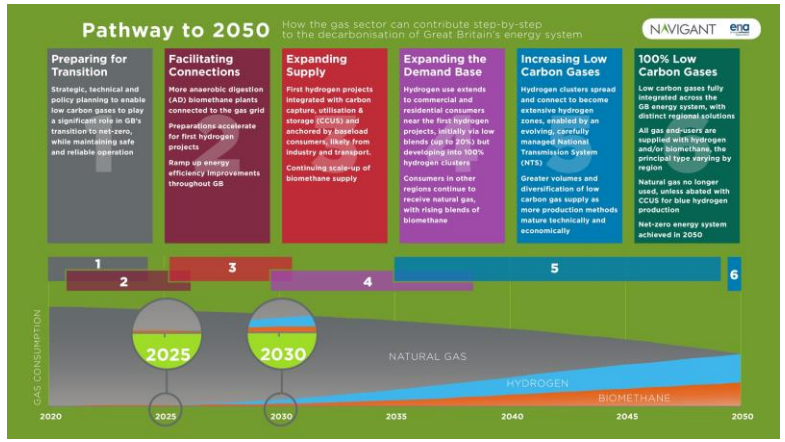
Gas Network collaboration to Net Zero

Pathways to Net Zero

In October 2019, the ‘Pathways to Net Zero’ report, produced by Navigant and peer reviewed by Imperial College, was published on behalf of the ENA and the gas networks. Informed by extensive modelling and stakeholder engagement, it sets out a detailed plan to deliver a zero carbon gas grid, with clear technical, operational and regulatory actions that need to take place to achieve it.



Gas Goes Green

https://www.energynetworks.org/gas/futures/gas-goes-green.html

Reflecting the ambition of gas networks to support the UK’s net zero target and going beyond the Pathways recommendations, ‘Gas Goes Green’ was launched last month by the ENA and the gas networks. It is a comprehensive and collaborative programme to transform our networks to deliver green gas to consumers across the UK. It will build on the foundations of our existing grid infrastructure and innovation programmes.

* Branding tbc

Gas Goes Green has allocated the scope of work across six workstreams, each of which supports the net zero drive:

Investment	Gas Quality & Safety	Consumer Options	System Enhancement	Hydrogen Transformation	Communication & Stakeholder Engagement

Hydrogen Programme Development Group (HPDG)

‘The Group will help ensure a fully co-ordinated and appropriately governed joint Government and industry programme is established to enable the impacts of introducing a hydrogen grid to be investigated objectively, comprehensively, rigorously, efficiently and in a timely fashion.’

A collaborative and comprehensive programme of work to provide the necessary evidence to assess key issues for hydrogen in networks including safety, feasibility, costs and benefits and the overall consumer experience

Network Sub-programmes

Safety & Network Impacts

Building the case for safety and understanding the impact of H2 on existing and new assets

Integrated Hydrogen Trials

Consumer Trials

System Transformation

Physical gas network design and rollout strategy options with technical, economic, market and operational impact assessments

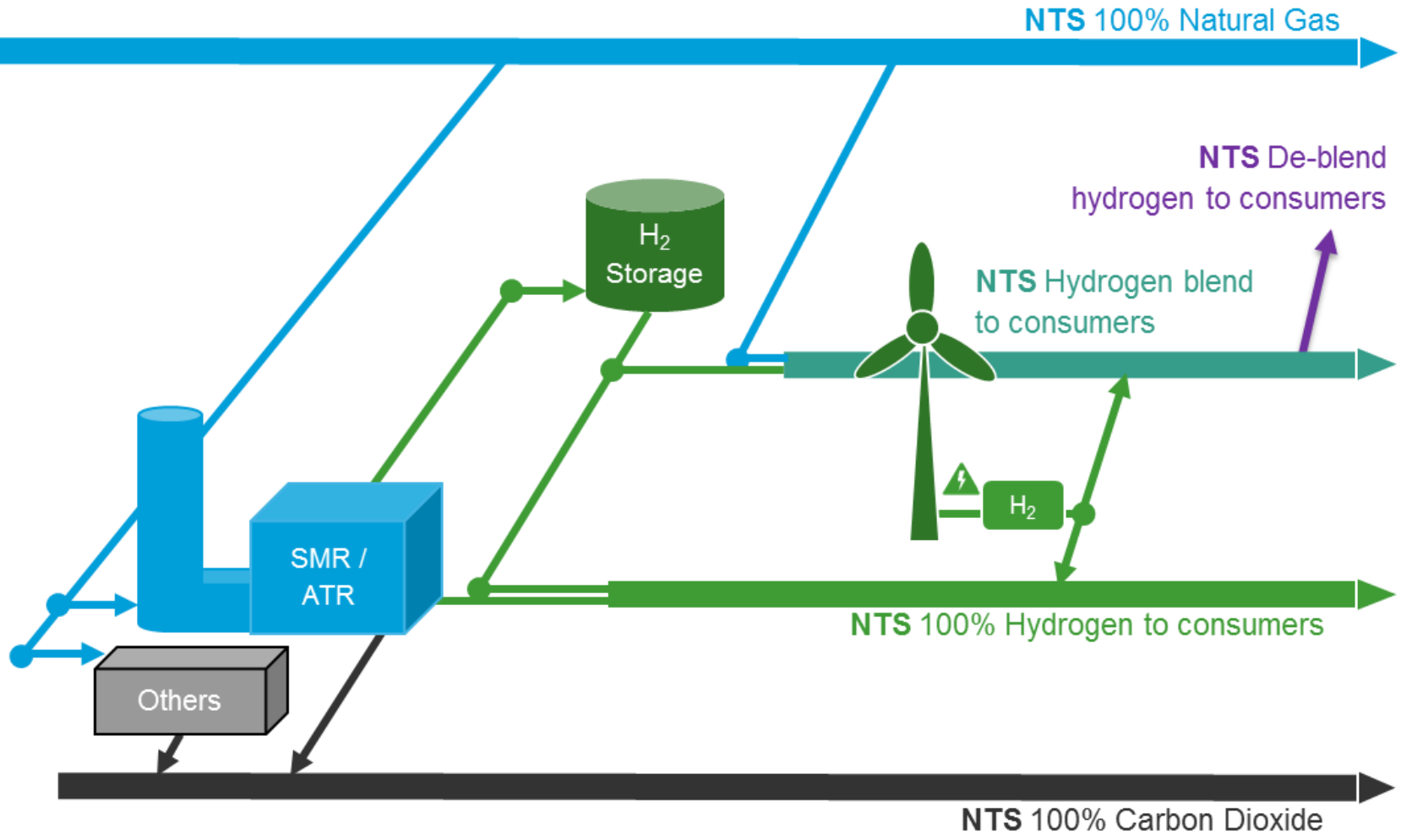
Collaborative Working

Gas National Transmission System (NTS) Futures

Our projects are informing options for the NTS

Options include:

- Keeping the NTS as natural gas
- Hydrogen conversion through either blending or 100% injection
- Evaluation of the option to build a new Hydrogen NTS
- Reapplication of the NTS assets e.g. CO_2 transport



HyNTS nationalgrid

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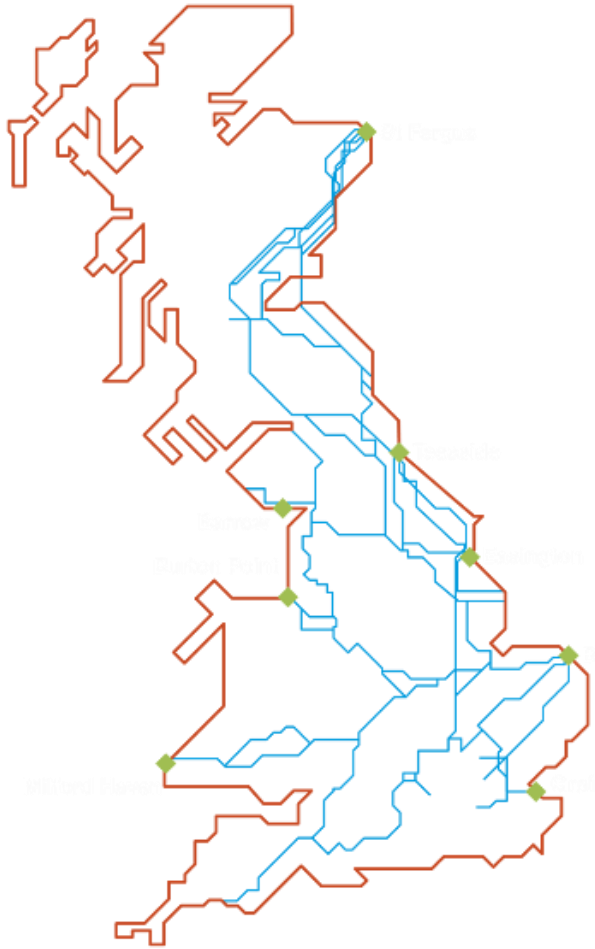
HyNTS is a programme of work that seeks to identify the opportunities and address the challenges that transporting hydrogen within the National Transmission System (NTS) presents. This will unlock the potential of Hydrogen to deliver the UK's 2050 Net Zero targets.



National Grid

Our live projects currently include:

HyNTS FutureGrid **Roadmap to FutureGrid**	Pre work supporting the NGGT bid for the 2020 NIC fund. The project aims to build an offline test facility comprising of decommissioned NTS assets to test the impact of up to 100% hydrogen.
NTS Hydrogen Injection	To identify the requirements to enable a physical trial of Hydrogen injection into the NTS, identifying the gaps in the safety case and indicating the most suitable NTS location for a live small-scale trial.
Hydrogen Deblending	To assess a variety of hydrogen recovery technologies and develop concept designs for selected options including a techno-economic review and identify the requirements for a demonstration project.
Feasibility of H_2 in the NTS	A feasibility study with the aim of determining the capability of the NTS to transport hydrogen. Includes a review of relevant assets, pipeline case study and draft scope for offline trials.

HyNTS Strategy and Modelling	Development of asset risk model Strategic modelling studies for hydrogen production, transport and use
Hydrogen Flow Loop	Offline test loop to evaluate metallurgy changes on existing NTS steel pipe and new MASIP pipe when exposed to 30% hydrogen, identifying next steps to assess the NTS' suitability to transport hydrogen.
Project Cavendish	A review of the potential of the Isle of Grain region to use existing infrastructure to supply hydrogen to London & the South East including generation, storage, transport and CCS.
Aberdeen Vision	A feasibility study for the generation of hydrogen at St Fergus using the NTS (up to 2%) to supply the city of Aberdeen. Includes generation, injection, separation and transport.

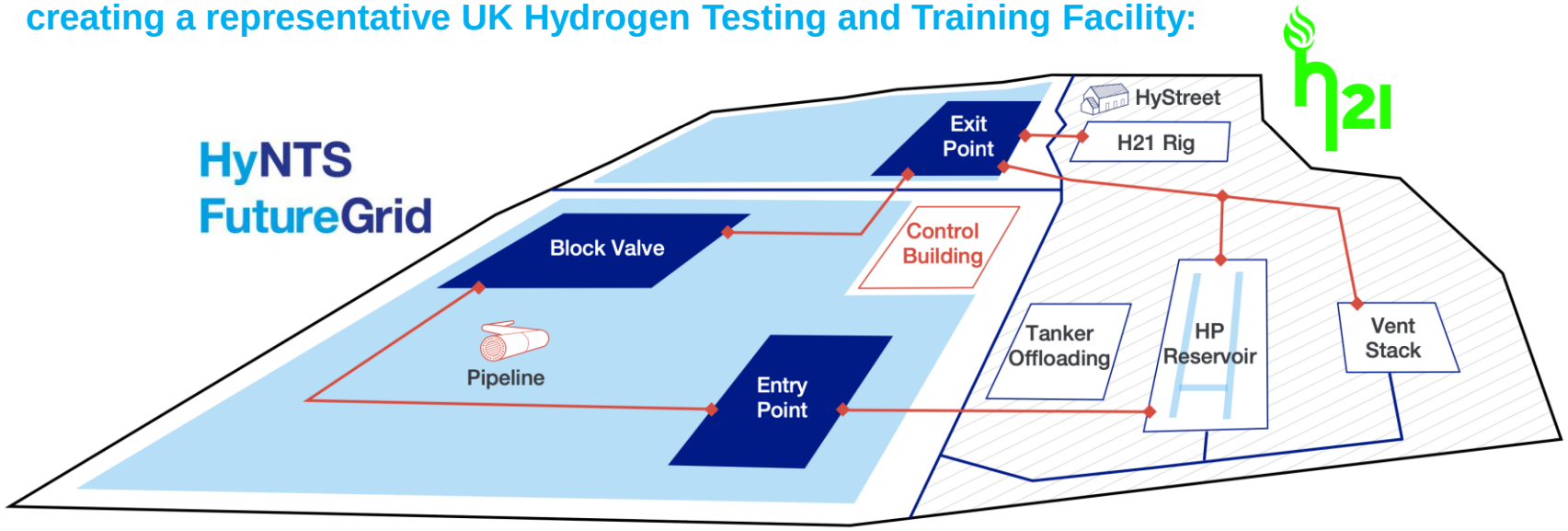
HyNTS FutureGrid

Building a Testing & Training Facility for the UK

The FutureGrid test rig will be built at DNV GL's Spadeadam Facility:

DNV GL's Spadeadam Testing and Research facility is located in a remote part of northern England and offers the opportunity to carry out rarely available trials in a controlled and secure "real-life" environment. It has large-scale test facilities which can be tailored to meet specific customer requirements and support a unique range of test scenarios.

The FutureGrid test rig will connect to the H21 distribution rig creating a representative UK Hydrogen Testing and Training Facility:



GAS GOES GREEN

Testing & Training Facility

Representative UK Network with gas transmission and distribution assets providing a safe and flexible test environment

Open to the UK Gas Industry, this facility will accelerate technology development and facilitate third party access cost effectively

With onsite facilities and virtual capabilities, the facility provides a platform to train and upskill our future hydrogen engineers

Gas Market Plan (GMaP)

Three focus areas:

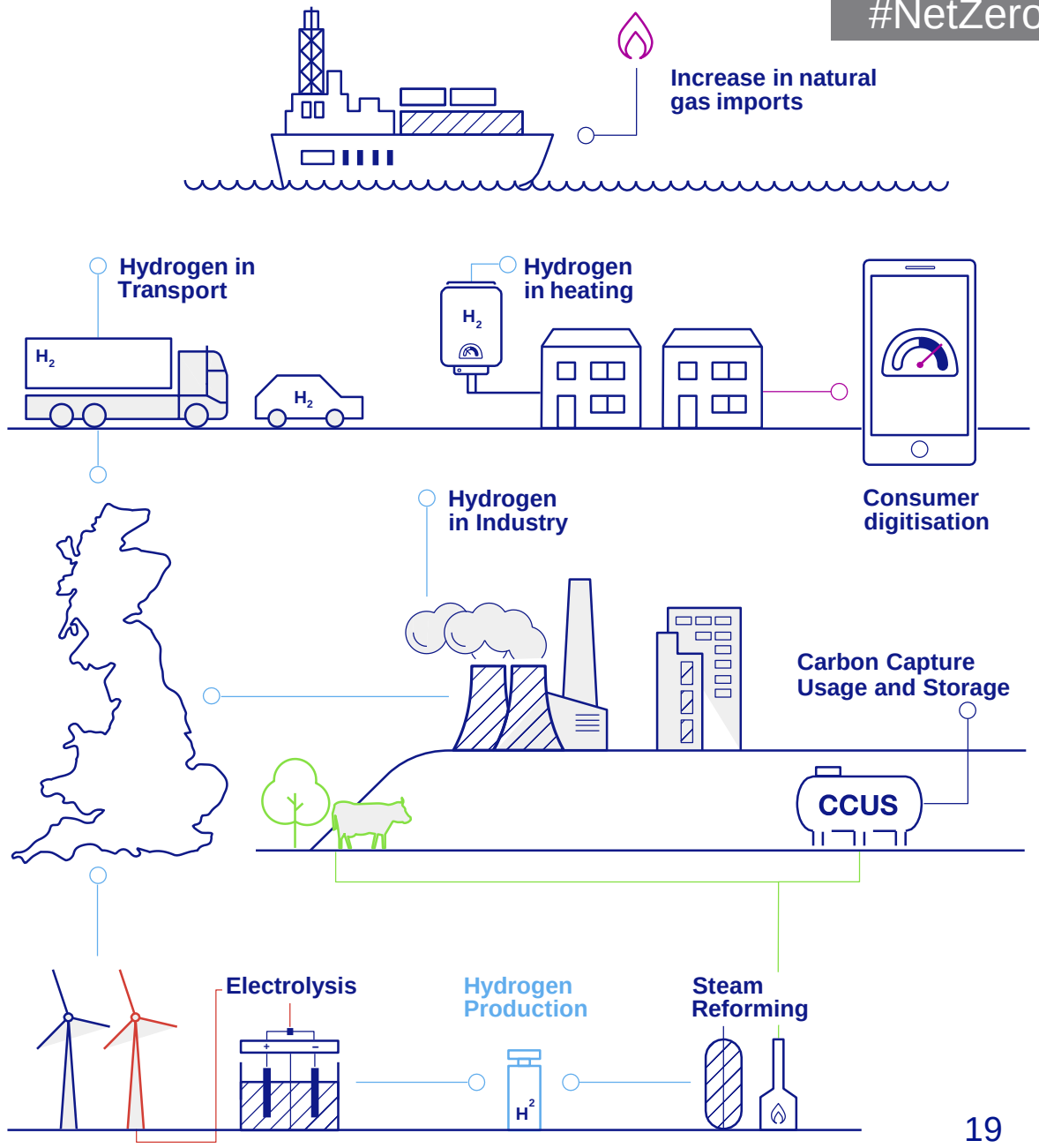
Gas quality | **Balancing** | **Hydrogen**

Each focus area will explore how likely and potential changes to the way gas is supplied and used could impact the need for market evolution

① Gas Quality focus area will consider how the changing sources of gas could require market rules changes in order to allow diverse, local and low carbon gases in the GB

② Balancing focus area will consider how the rules that incentivise the gas industry to balance the supply and demand of gas may need to change to ensure efficient operation of the market, as gas supply and demand becomes more variable

③ Hydrogen focus area will consider the possible market rules given the potential production methods, how hydrogen will integrate with natural gas and the end uses



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Over to you…

What specific policy changes do you think will be needed to create a hydrogen economy?

Gas Transmission

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What funding mechanisms are available for Net Zero?

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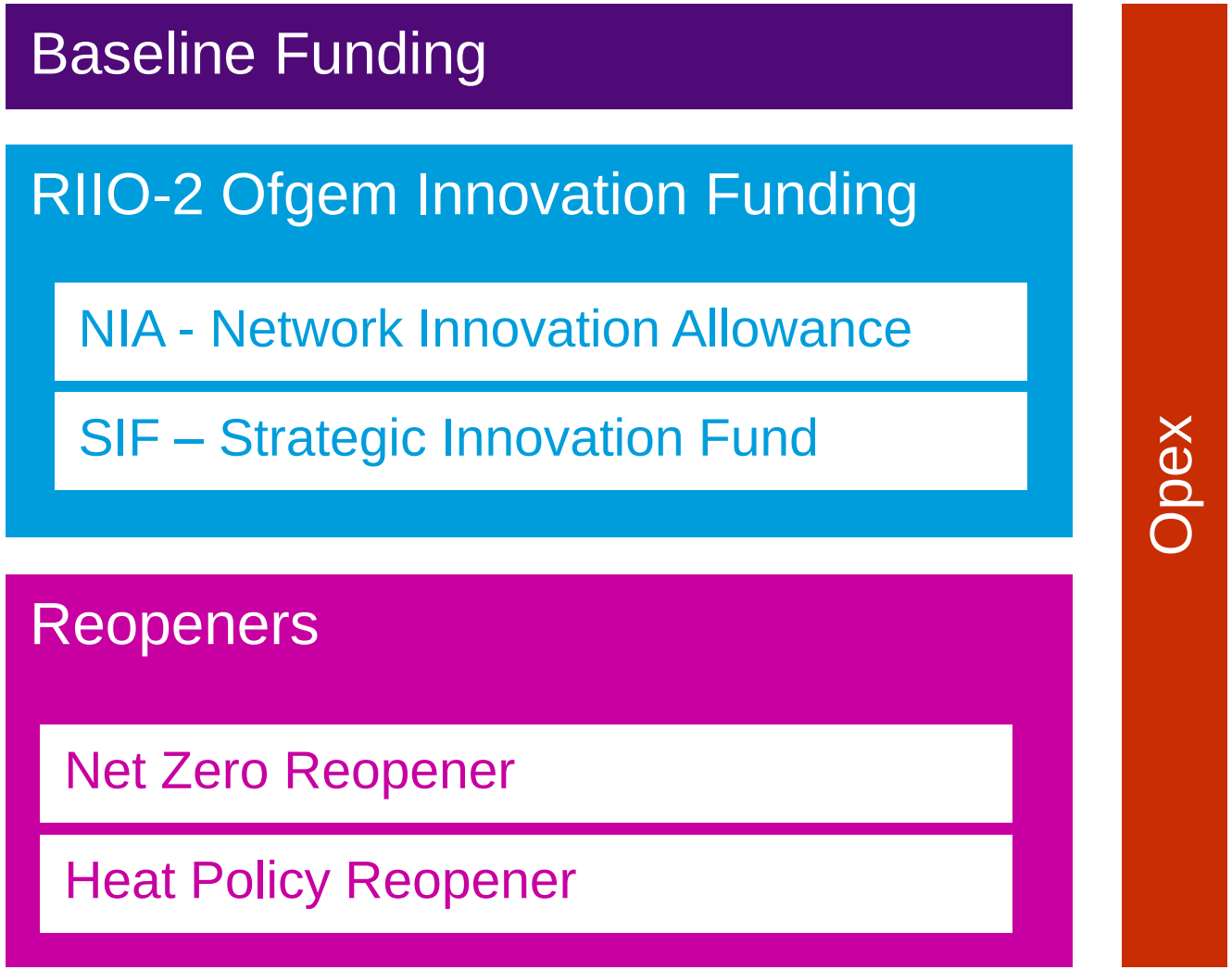
What funding Mechanisms are available for Net Zero?



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Funding Innovation in RIIO-2

SIF
Strategic Innovation Fund

Larger scale innovation challenges and calls for ideas aligned to a cross vector strategy. More agile and flexible.

£450m pot for RIIO-2 across gas and electricity

HyNTS FutureGrid

NIA
Network Innovation Allowance

RIIO-2 allowance for innovation projects focused on Energy System Transition and Customer Vulnerability.

One lump sum rather than annual allowance.

More emphasis on Other Innovation Funding Mechanisms

BUSINESS AS USUAL.

nationalgrid partners

Innovate UK

Department for Business, Energy & Industrial Strategy

Reopeners

Net Zero Reopener

To allow changes in policy, the role of network companies, as well as technological or market developments to be reflected in company allowances.

Heat Policy Reopener

To respond to policy decisions on the future of gas and heat within Gas Distribution currently.

- There are 5 defined triggers for this reopener

Net Zero Response

- Welcome the flexible approach to the package of uncertainty mechanisms
- More detail needed to understand the drivers, triggers and scope e.g. anticipatory investments
- Believe that either Ofgem or the Licensee should be able to trigger the Net Zero Reopener

Heat Policy Response

- Should be applicable to Gas Transmission as well as Gas Distribution
- Two of the five defined triggers are applicable:

  Changes to the regulations related to the quality and composition

  The future role of gas networks in the heat sector as determined by government policy that may result in parts of the existing network either being decommissioned or made ready to convey hydrogen

Q & A

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Over to you…

What topics would you like to see in future sessions?

Thank you

Net Zero Advisory Group (NZAG)

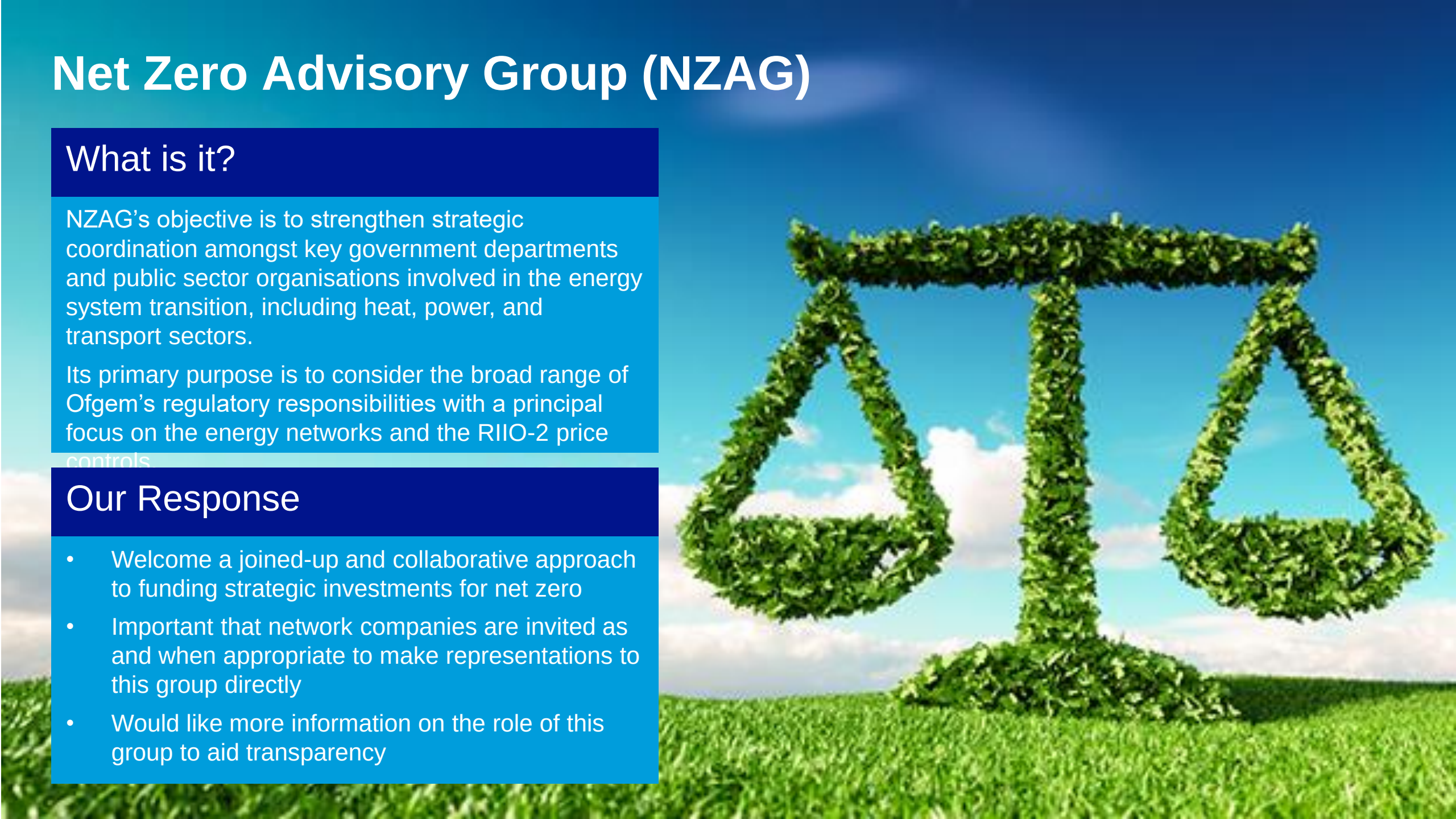
What is it?

NZAG's objective is to strengthen strategic coordination amongst key government departments and public sector organisations involved in the energy system transition, including heat, power, and transport sectors.

Its primary purpose is to consider the broad range of Ofgem's regulatory responsibilities with a principal focus on the energy networks and the RIIO-2 price controls.

Our Response

- Welcome a joined-up and collaborative approach to funding strategic investments for net zero
- Important that network companies are invited as and when appropriate to make representations to this group directly
- Would like more information on the role of this group to aid transparency



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

Net zero – reduction in our innovation allowance to enable energy transition work, delays in new mechanisms and risk around net zero reopener being only triggered by Ofgem.

Concern that we won't be able to provide timely investment needed to accelerate net zero projects.