

Gas
Transmission

Environment workshop

5th December 2018

nationalgrid



Why are we here?



Gain your views on key topics



Set the direction we go in



Inform our business plan

Who are we?



**Jenny
Pemberton**

Stakeholder
Engagement Manager



**Bridget
Hartley**

Gas Transmission
RIIO2 Manager



**Matthew
Goldberg**

Environmental Assurance
Manager

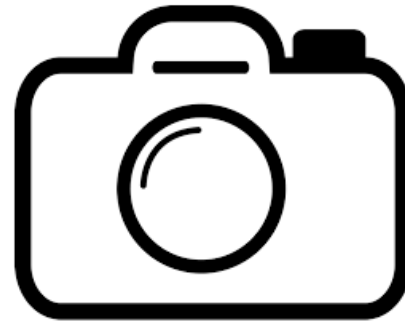
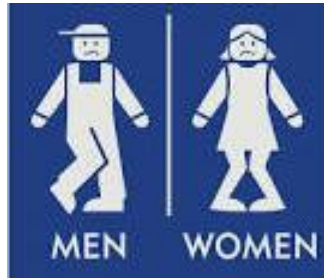


**Alison
Fulford**

Carbon Specialist

Housekeeping

Opportunities
board



Agenda for today

Time	Item
09.30 – 10.00	Welcome - Who we are and what we do
10.00 – 10.25	Our Contribution
10.25 – 10.40	Coffee Break
10.40 – 12.10	Operating the network
12.10 – 12.55	Lunch
12.55 – 13.30	Making the right investment
13.30 – 14.00	Construction
14.00 – 14.45	Responsible Demolition
14.45 – 15.00	Close
15.00	Goodbye

Quick Poll – Getting to know you

1. Please tell us your name

2. Which of the following best describes you / your organisation?

3. On a scale of 1 to 5, where 1 is know nothing and 5 is know a great deal, how much would you say you know about National Grid Gas Transmission's operational activities?

1. Know nothing
- 2.
- 3.
- 4.
5. Know a great deal

4. What three words would you use to describe National Grid Gas Transmission?

Gas
Transmission

01

Who we are
and what we
do

nationalgrid



National Grid: what we do

- **GB Gas TO & SO**
 - Own, maintain and operate the gas National Transmission System (NTS) in Great Britain, with day-to-day responsibility for balancing supply and demand.
- **England & Wales Electricity Transmission Owner (TO)**
 - own, build and maintain the network
- **GB Electricity System Operator (SO)**
 - balance the system and ensure that voltage and frequency are kept within acceptable limits
- **US interests**
 - generation, electricity Transmission and Distribution, gas Distribution in New York, Massachusetts and Rhode Island

- **Today is about Gas Transmission**

National Grid

Where we operate
Our UK network



National Grid Gas Transmission – the network

**Our
role**

To connect millions of people to the energy they use safely, reliably and efficiently

**We
own &
operate**

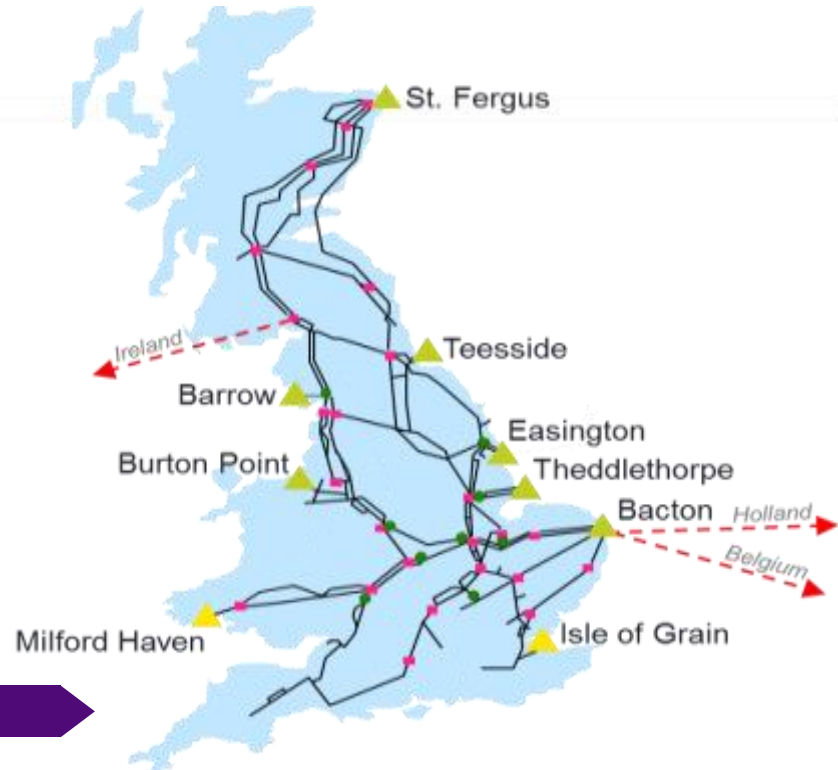
7,660km of high pressure pipelines, 24 compressor stations and over 600 above ground installations

**We
transport**

Over 3 times the energy provided by electricity each year

810 TWh 2017: Total gas demand

297 TWh 2017: Total electricity demand



National Grid Gas Transmission - TO/SO



Transmission Owner (TO)
Builds, maintains and owns assets



System Operator (SO)
Real-time operation of the network

Gas Transmission Stakeholder Priorities

Industrial and Domestic consumer priorities ...

I want an affordable energy bill

I want to use energy as and when I want

I want you to minimise disruption to my life

...are delivered through our stakeholder priorities...

I want to take gas on and off the Transmission system where and when I want

48% of Gas Transmission costs

I want all the information I need to run my business, and to understand what you do and why

1% of Gas Transmission costs

I want to connect to the Transmission System

2% of Gas Transmission costs

I want the gas system to be safe

4% of Gas Transmission costs

I want you to protect the Transmission system from cyber and external threats

17% of Gas Transmission costs

I want you to care for communities and the environment

24% of Gas Transmission costs

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

5% of Gas Transmission costs

I want you to be efficient and affordable

Quick poll

Do these priorities reflect your needs of the gas transmission system?

1. Yes

2. Somewhat

3. No

Please explain your answer

Quick Poll...

Please rank these priorities in order of importance to you and your business:

A

I want to take gas on and off the Transmission system where and when I want

B

I want all the information I need to run my business, and to understand what you do and why

C

I want to connect to the Transmission system

D

I want the gas system to be safe

I want you to protect the Transmission system from cyber and external threats

E

I want you to leave a positive impact on our communities and the environment

F

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

G

I want you to be efficient and affordable

H

Gas Transmission Stakeholder Priorities

Industrial and Domestic consumer priorities ...

I want an affordable energy bill

I want to use energy as and when I want

I want you to minimise disruption to my life

...are delivered through our stakeholder priorities...

I want to take gas on and off the Transmission system where and when I want

I want all the information I need to run my business, and to understand what you do and why

I want to connect to the Transmission System

I want the gas system to be safe

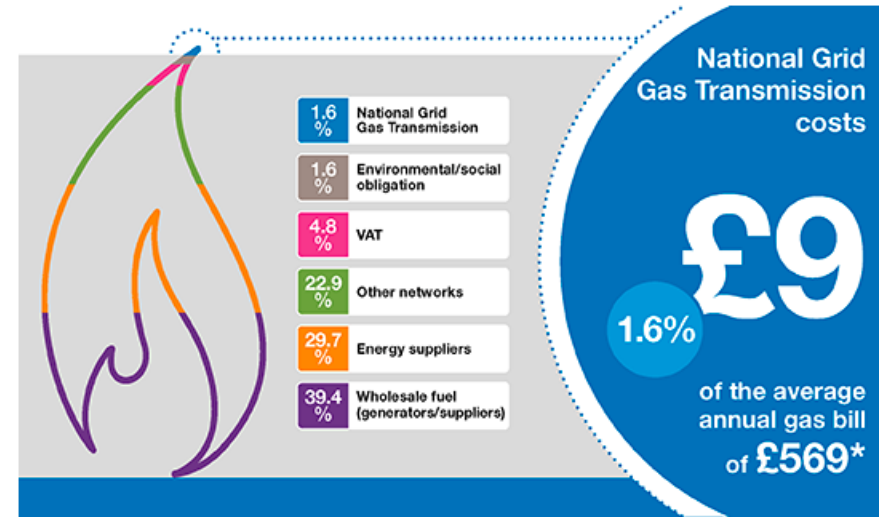
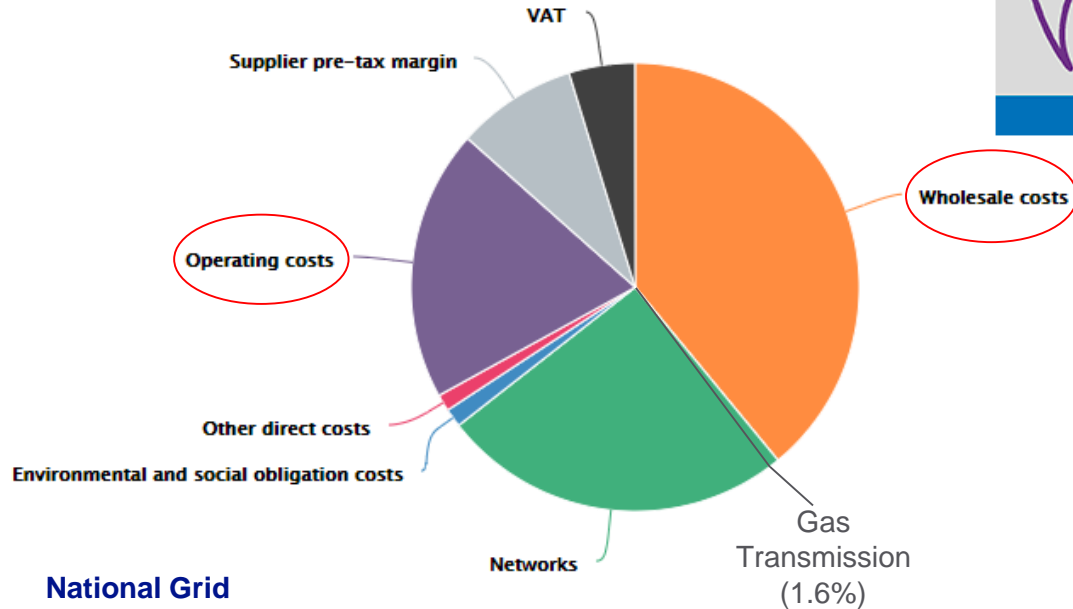
I want you to protect the Transmission system from cyber and external threats

I want you to care for communities and the environment

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

I want you to be efficient and affordable

Our impact on a domestic consumer bill



We also have the potential to influence other aspects of the bill through the services we deliver

Gas System
Operator

02

RIIO Framework

What does it mean?

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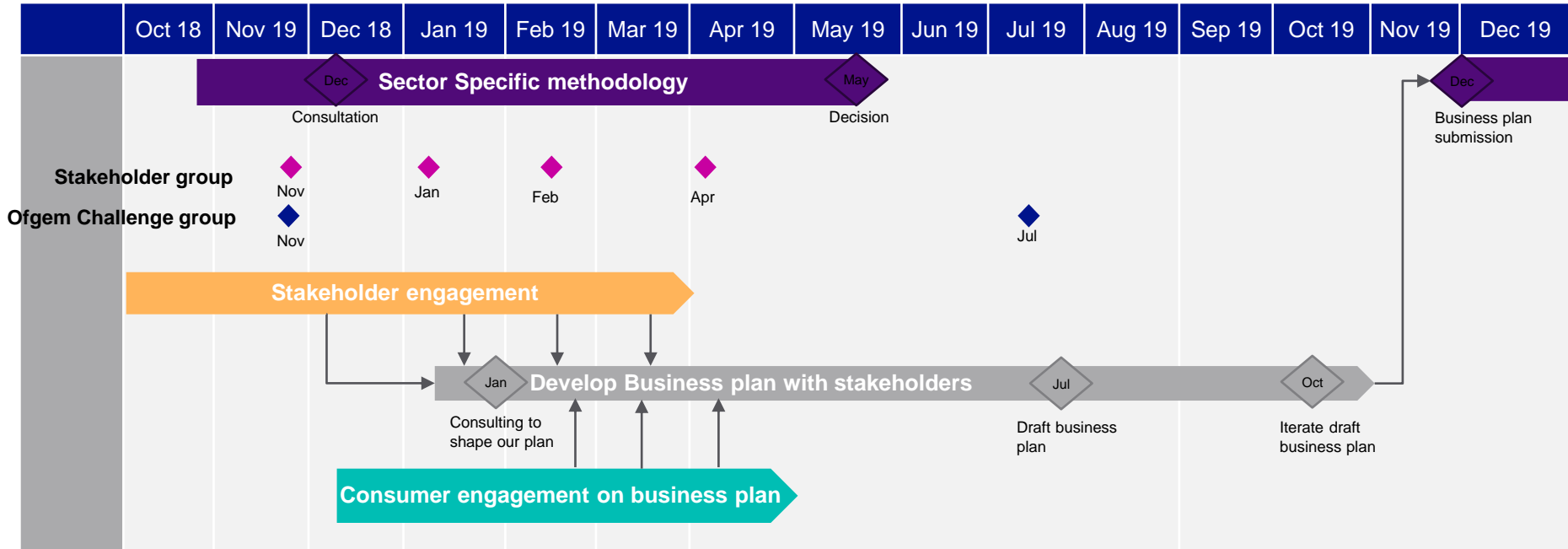
What is RIIO?



Constructive Engagement



Timeline – Business plan consultation



Our Environmental Regulators



Cyfoeth Naturiol Cymru
Natural Resources Wales

Obligations
Local Air Emissions
Greenhouse Gas Emissions
Planning
Environmental Protection
Waste legislation

Gas
Transmission

03

Our
Sustainability
Commitments

nationalgrid



Decarbonisation



The changing energy landscape

Planning for a low-carbon future – helping decarbonise society's energy needs

Connecting low-carbon generation

How we'll operate the system
in the future

The big picture – Global impacts



Impact of climate change
Extreme weather



Paris Agreement COP 21



Clean Growth Strategy
Clean Air Act



Companies reporting to the UN
Sustainable Development
Goals

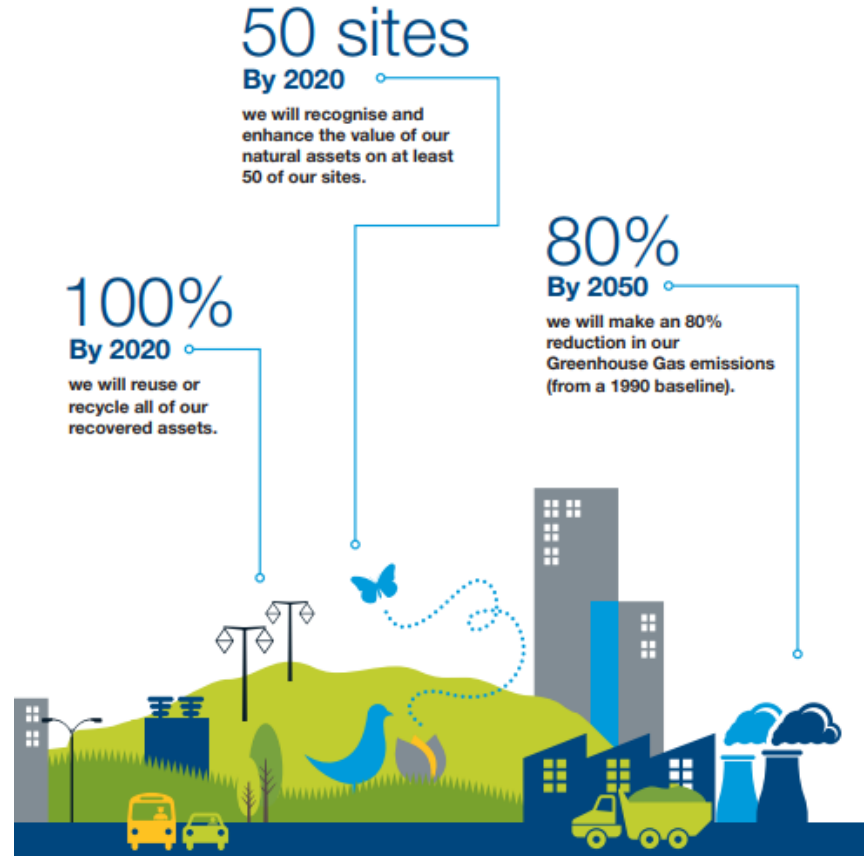


25 Year Environment Plan

What are we doing?

Environmental Sustainability Strategy – Our Contribution

- Our climate commitment
- Responsible resource use
- Caring for the natural environment



Our Contribution – National Grid Group targets

Our Climate Commitment:

- 80% reduction in GHG emissions by 2050.
- 45% reduction in GHG emissions by 2020.
- Implement carbon pricing on all major investment decisions by 2020.
- Reduce capital carbon of our major construction projects by 50% by 2020.
- Increase energy efficiency of our property portfolio by 10% by 2020.

Responsible Resource Use:

- Reuse or recycle 100% of recovered assets by 2020.
- Send zero office waste to landfill by 2020.

Caring for the Natural Environment:

- Recognise and enhance the value of our natural assets on at least 50 sites by 2020.
- Drive net gain in environmental value (including biodiversity) on major construction projects by 2020.

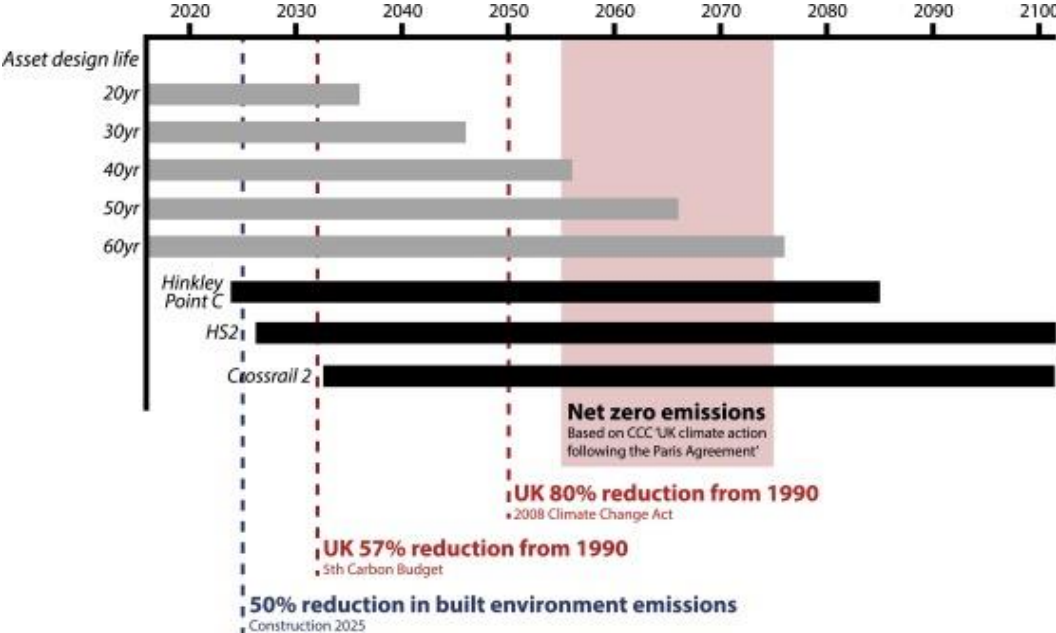


Our climate commitment

- 70% reduction by 2030
- Group target but all businesses must play a part

Case study: Carbon pricing

- We will be making decisions using a carbon price
- Helps us choose lowest carbon asset for the future
- Helps mitigate risk

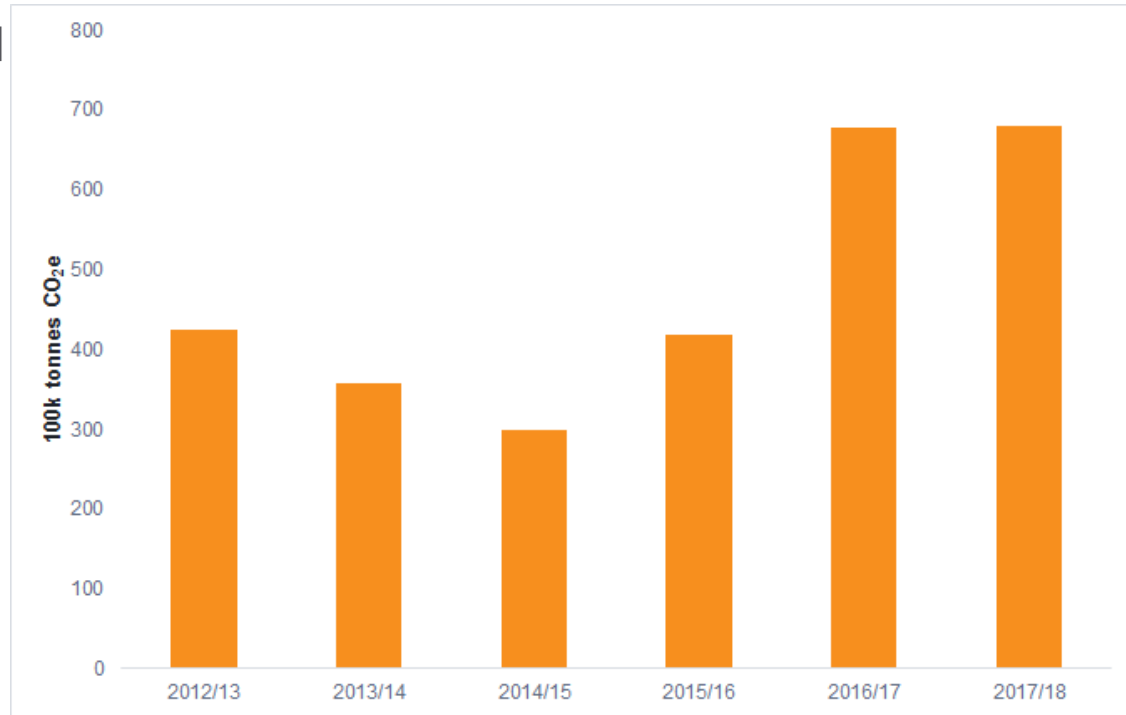


Our climate commitment: Gas Transmission

National Grid Group has **reduced** emissions by 65% overall

We have **increased** overall emissions due to reasons largely out of our control:

- Colder winters mean longer running of gas turbines
- Changing location of gas imports and moving it to where it's needed



Resources

- Metallic assets are re-used / re-cycled
- Next step is to create a re-use plan
- In 2017/2018, 96% of waste was diverted from landfill across the UK
- Target on construction waste of 100% diversion from landfill by 2020
- New target to remove single use plastics from our offices by 2020

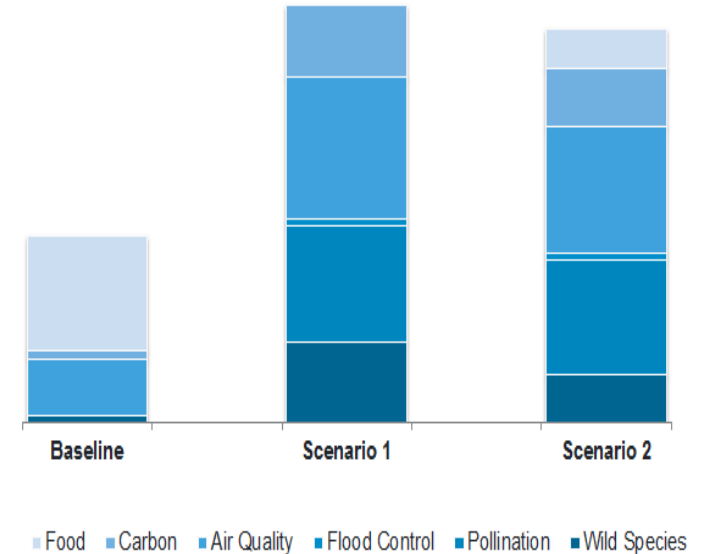


Caring for the Natural Environment

- The UK is one of the most nature-depleted countries in the world
- Benefits and services provided by Nature
- We are working to manage our land in a way better for the environment and communities



Ecosystem Service Flows



Discussion questions

Is there anything you would like to know more about?

Is there anything else we should be thinking about?

What are the areas that are most important to you?



Gas
Transmission

03

Coffee Break

Back at 10:45

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Embedding environmental considerations into our decision making

Operating the network

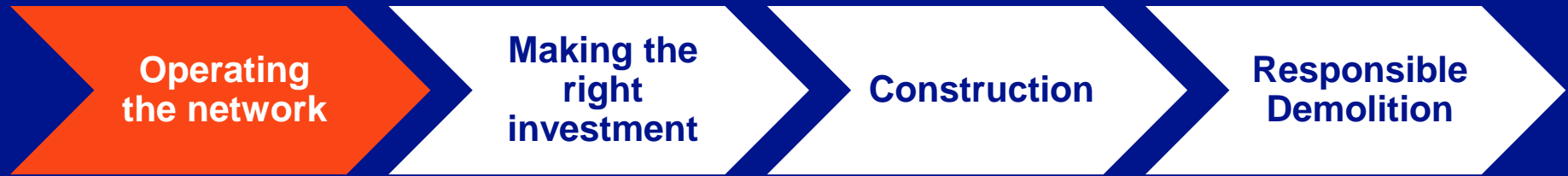
Making the right investment

Construction

Responsible Demolition

- Emissions management
- Mitigating environmental impacts to our network
- Environmental Stewardship
- Compressor emissions
- Other investment decisions
- Reducing the impact of construction
- Responsible demolition of redundant assets

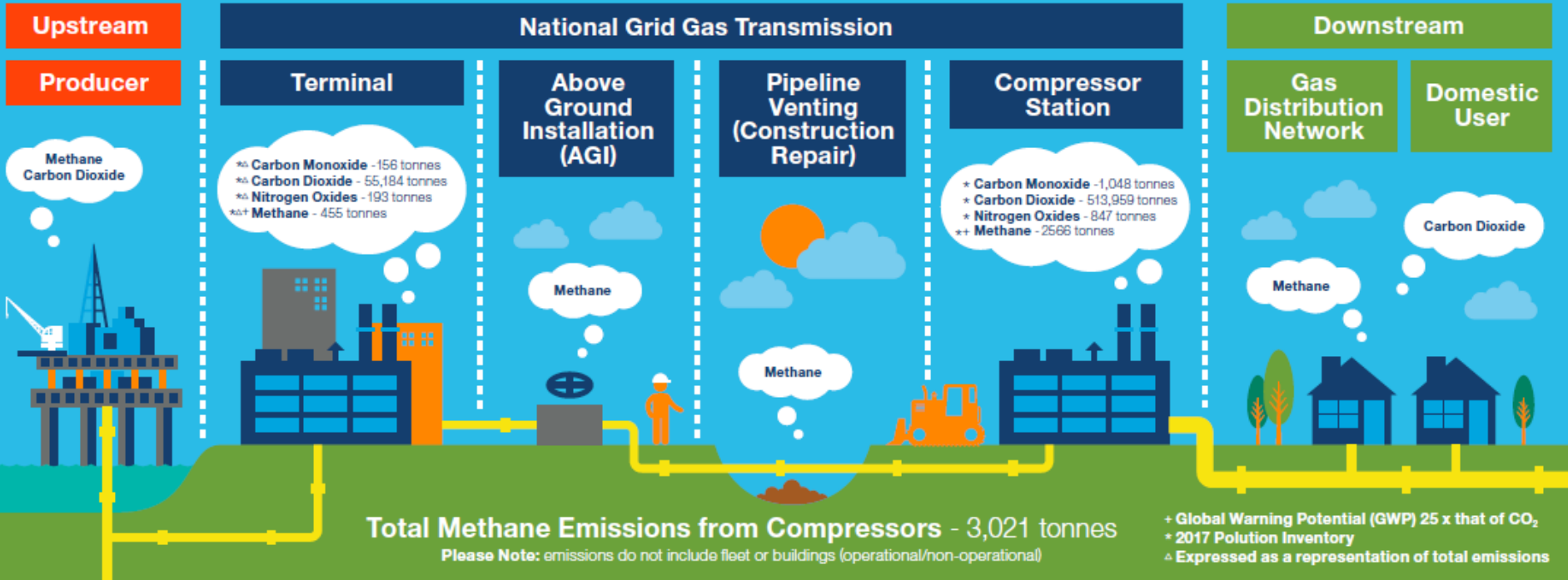
Embedding environmental considerations into our decision making



1. Emissions management
2. Mitigating environmental impacts to our network
3. Environmental Stewardship

Sources of emissions

Emissions from the National Transmission System (NTS)



How we're managing our emissions

Which emissions:

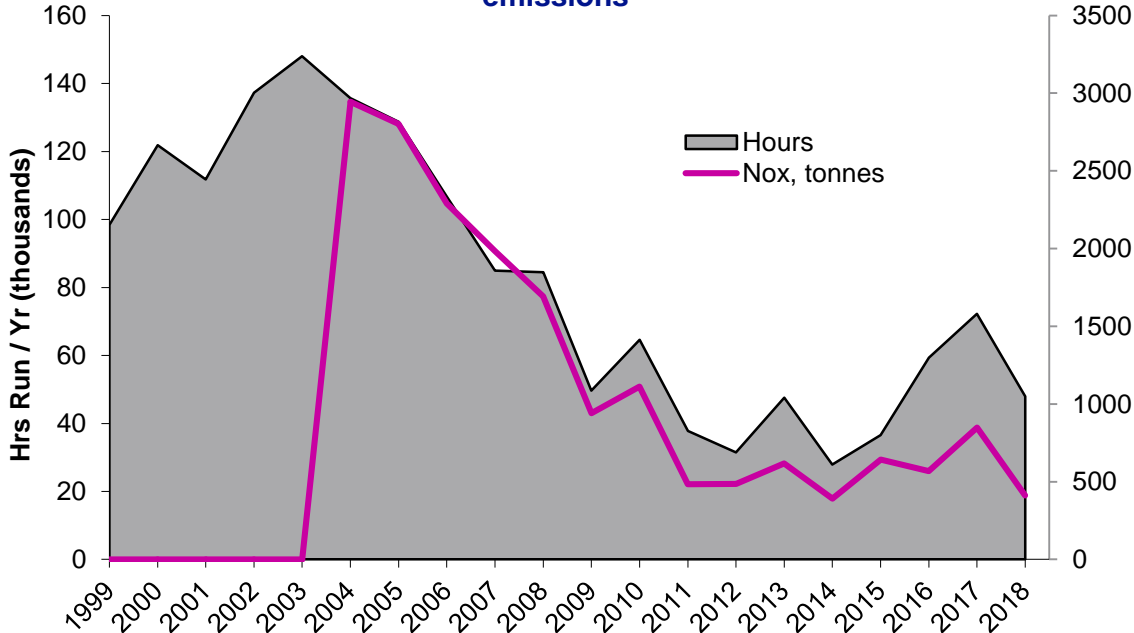
- **Carbon dioxide (CO₂):** is a greenhouse gas linked to global warming
- **Nitrogen Oxide (NO_x):** can decompose and produce ozone at low levels which is bad for air quality
- **Methane (CH₄):** is 25x more potent than CO₂ as a greenhouse gas



How we're currently managing our emissions

- **Targeted investment:** aimed at reducing biggest polluting compressors and removing them from the network
- **This reduces both carbon dioxide and NOx emissions (graph)**
- **We're also continually innovating to reduce our impact:**
 - Advanced recompression;
 - Improving detection and monitoring of methane

A chart to show the compressor running hours and NOx emissions



Quick Poll – Impact and Interest

On a scale of 1 to 5, where 1 is not impacted at all and 5 is impacted a great deal, how impacted are you or those you represent) by what we've just spoken about?

1. Not impacted at all
- 2.
- 3.
- 4.
5. Impacted a great deal

On a scale of 1 to 5, where 1 is not interested at all and 5 is interested a great deal, how interested are you (or those you represent) by what we've just spoken about?

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Questions for discussion

What further information would you like about emissions management?

How important is it that we manage emissions?

Should this be a focus of innovation going forward?



Quick poll

Should National Grid Gas Transmission...

1. Do more to
manage emissions

2. Continue as is

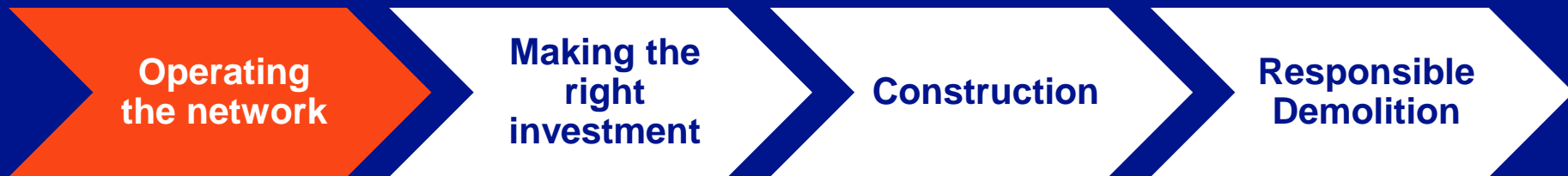
3. Do less to
manage emissions

What further information do you need to help inform your view?

Wall chart

- 1. *Grab a card and write Emissions for the topic***
- 2. *Add your initials***
- 3. *Add any comments or questions***
- 4. *Add when you think we need to invest or change what we do***
 - 1. Now*
 - 2. 2021 – 2026*
 - 3. After 2026*
- 5. *Place post it on the relevant place on the topics wall chart***

Embedding environmental considerations into our decision making



1. Emissions management
2. Mitigating environmental impacts to our network
3. Environmental Stewardship

Uncertainty

“The UK could face harsher and more frequent winter storms if global greenhouse gas emissions aren’t curbed, a new study says.”

The Facts:

- Scotland is 27% wetter since 1961
- November 2015 and January 2016 we saw most severe floods in 100 years
- In the last year we have seen periods of extreme weather
 - Beast from the east
 - Summer drought



Storm clouds rolling in over Glyder Fawr, Snowdonia, Wales, 06/2009.

Credit: Nature Photographers Ltd/Alamy Stock Photo.

Our sites

A large proportion of our sites sit within a High – Medium Flood Risk Zone

- Gas site within flood zone



The impact of climate change

What does it mean for the Gas National Transmission System?

- Extreme weather events
- Severe flood events with geographic impacts (land/rivers)
- Challenging access to assets
- Operability challenges e.g. ice, snow, hot weather
- Greater difference between peak and off peak demand



Options for managing these impacts

Proactive

- Strategic and tactical risk assessment, produce plans, mitigate issues

- Cost: X 1

Reactive

- Insurance
- Deal with clean up
- Remediate to prevent future incidents

- Cost: ~ X 2.5

Quick Poll – Impact and Interest

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Questions for discussion



Are you seeing similar issues?

How should we manage these impacts?

Under what circumstances should we take a proactive v's reactive approach?

What information would help inform your view?

Quick poll

Should we be proactive or reactive in managing these impacts?

1. Proactive: mitigate against flooding by investing in flood defences etc..

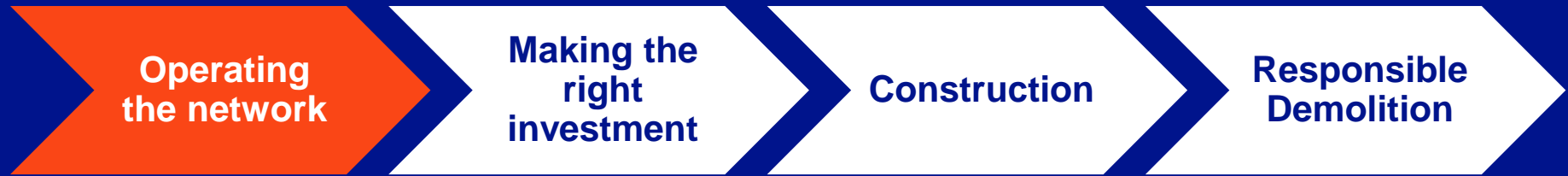
2. Risk based: Mitigate high risk sites and manage remaining as appropriate

3. Reactive: insure against these impacts and manage the clean up

Wall chart

- 1. Grab a card and write ‘Mitigating environmental impacts to our network’***
- 2. Add your initials***
- 3. Add any comments or questions***
- 4. Add when you think we need to invest or change what we do***
 - 1. Now*
 - 2. 2021 – 2026*
 - 3. After 2026*
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Embedding environmental considerations into our decision making



1. Emissions management
2. Mitigating environmental impacts to our network
3. Environmental Stewardship

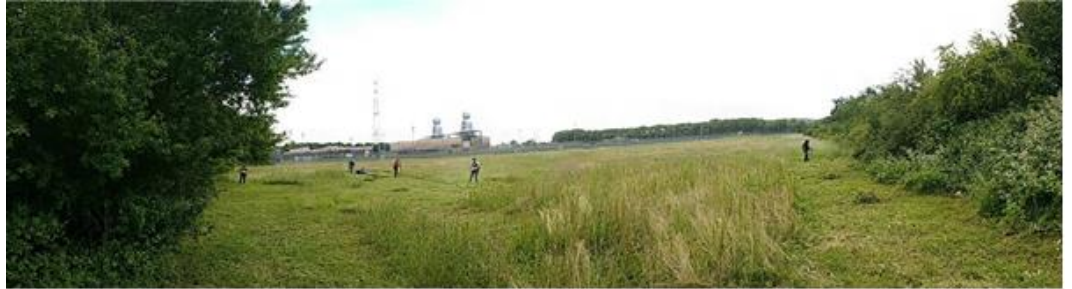
Environmental stewardship

Our sites are built away from urban areas

We have land around these sites to minimise impact to the local community:

- Noise
- Visual screening
- Local air quality

We believe we have a role to play in protecting the environment



Our *Natural Grid* approach across our network

We collaborate and partner with third parties to implement more sustainable approaches to land use and management

Our ambition:

- 50 sites by the end of RIIO-T1 (2021) across National Grid
- 3 Gas sites out of 31 main sites
- 235 smaller sites



Costs

Ongoing costs will be equal to traditional land management costs

Set up costs average £800/site

- For all main sites = £23k
- For smaller 266 sites = £212k

Benefits

- Reactive management costs reduced
- Safety & environmental risks reduced
- Natural Capital value increased
- Positive community / stakeholder engagement



Our role in the community - Environmental education centres



Skelton Grange Environment Centre
Skelton Grange Road
Stourton
Leeds
LS10 1RS



West Boldon Environmental Education
West Boldon Substation
Newcastle Rd
West Boldon
Tyne & Wear
NE36 0BG



Bishops Wood Environmental Centre
Crossway Green
Stourport-on-Severn
Worcester
DY13 9SE



Iver Environment Centre
Slough Road
Iver Heath
SL0 0EB



Environmental education centres



Visitor satisfaction
9.6 / 10

25,000 educational visits

26,000 volunteer hours

46,542 visitors last year

Supports access to nature



100% of adults said increased wellbeing/learnt new skills

Running cost of ~£32k per centre per year

New centre ~£500k construction

Less than 1/2p on the bill per year per household

Quick Poll – Impact and Interest

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Question for discussion

What do you think about our current approach to environmental stewardship?

What should we do in the future in relation to the environment as part of our wider corporate social responsibility work?

Who should pay for these types of activities?



Quick poll

Are our current environmental stewardship activities relevant and appropriate?

1. Yes

2. Mostly

3. No

Please explain your answer

Should National Grid Gas Transmission?

1. Do more on environmental stewardship

2. Continue as it

3. Do less on environmental stewardship

Wall chart

- 1. Grab a card and write ‘Environmental Stewardship’***
- 2. Add your initials***
- 3. Add any comments or questions***
- 4. Add when you think we need to invest or change what we do***
 - 1. Now*
 - 2. 2021 – 2026*
 - 3. After 2026*
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Gas
Transmission

03

Lunch and
networking

Back at 12:50

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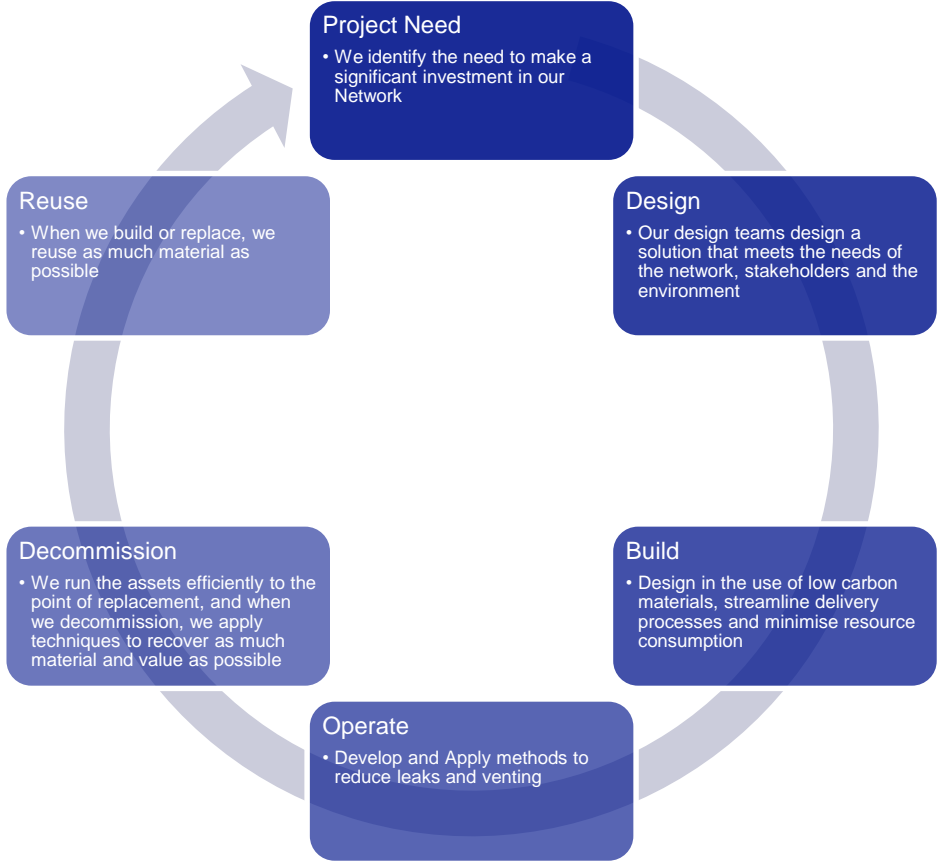
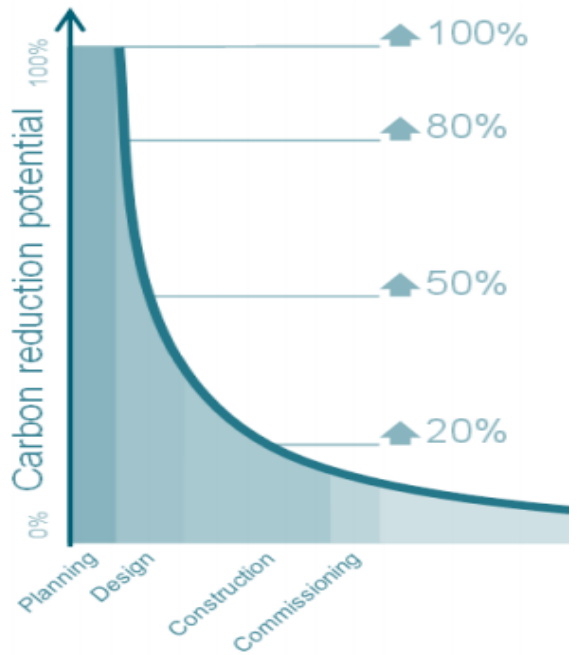


Embedding environmental considerations into our decision making



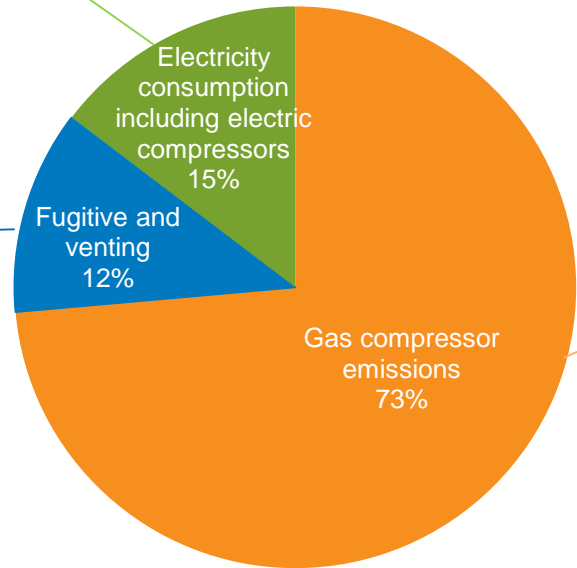
1. Compressor emissions
2. Other investment decisions

We have opportunity throughout the project lifecycle to reduce emissions



GHG emissions from Operating the Gas Transmission System 2017-2018

Emissions from the electricity we use



The emissions produced as a result of venting the network to allow access e.g. to perform maintenance; and leaks from assets such as valves

The energy we use to move gas from entry point to where it's needed

0.7 m tonnes

We reduce the impact of our compressors through BAT

- Our largest impact on the environment is emissions from our compressors
- These are under strict environmental legislation to manage and mitigate their impact
- We manage this through the Best Available Techniques (BAT) approach
- BAT attaches a weighting to different impacts:

Nitrogen Oxides (NOx)	Carbon Dioxide (CO2)	Visual
Nuisance	Cost	Operability
Location	Sensitive Receptors	Stakeholders

- We'd like to understand your views to help inform our decision making approach

Quick Poll – Impact and Interest

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Question for discussion - Compressor BAT assessment

How would you prioritise these impacts?

- Discuss on your table how you would weight these elements, what is most important to you?
- Is there anything missing?



Wall chart

- 1. *Grab a card and write ‘making the right decisions’***
- 2. *Add your initials***
- 3. *Add any comments or questions***
- 4. *Add when you think we need to invest or change what we do***
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Embedding environmental considerations into our decision making



1. Compressor emissions
2. Other investment decisions

Other impacts

The rest of our network has an impact on the environment but isn't covered by BAT

As technology continues to improve and reduce in cost, we are investigating how to apply these to our network to get an accurate picture of our true emissions and enable improvement

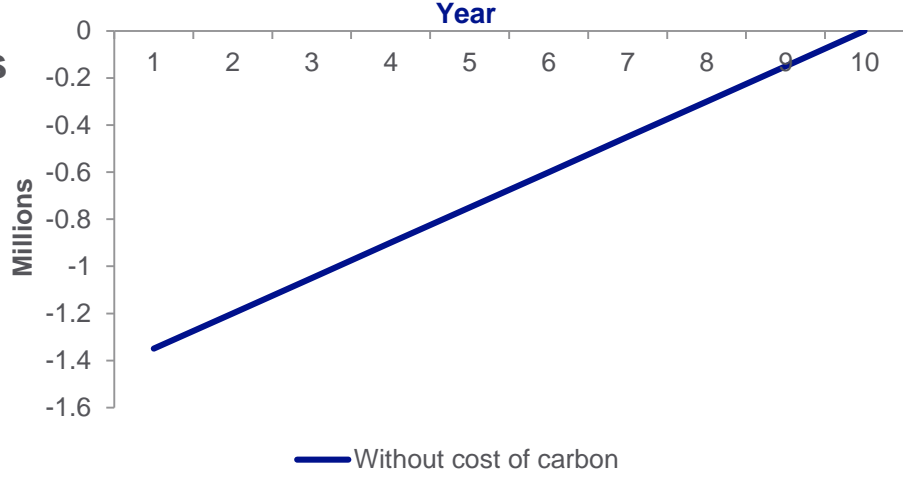
	Size	Potential for improvement
Pipelines - Vented - leaks (valves)	Medium	High
Other assets e.g. Above Ground Installations - Vented and leaks	Low	High
Fleet vehicles	Low	Medium
Impact of our operational buildings	Medium	High

For example... Carbon Price

- We vent gas when we work on pipelines
- We could utilise recompression equipment to reduce the amount of gas we vent

Case study – Recompression
Cost of vented gas per year: £155k - £255k
Cost of recompression unit: £1.5m
Pay back time: up to 10 years

Payback without cost of carbon

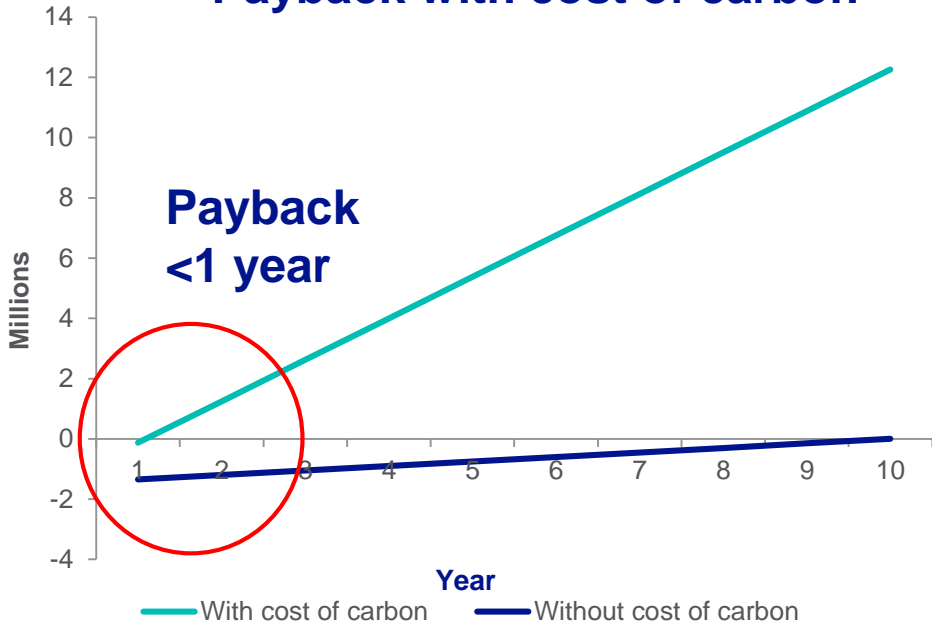


Reduced payback period

Including a carbon price significantly reduces payback period

- Add cost of carbon of £45 per tCO₂
- Pay back time: less than 1 year

Payback with cost of carbon



Quick Poll – Impact and Interest

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Question for discussion – Other impacts

Of the options shown in the table, pick one or two areas and discuss:

- What could we do to reduce their impact
- Add these to the opportunities board
- Are there any other areas we should be looking at?



Quick poll

For non compliance activities, National Grid Gas Transmission should?

1. Do more

2. Continue as is

3. Do less

Please explain your answer

Wall chart

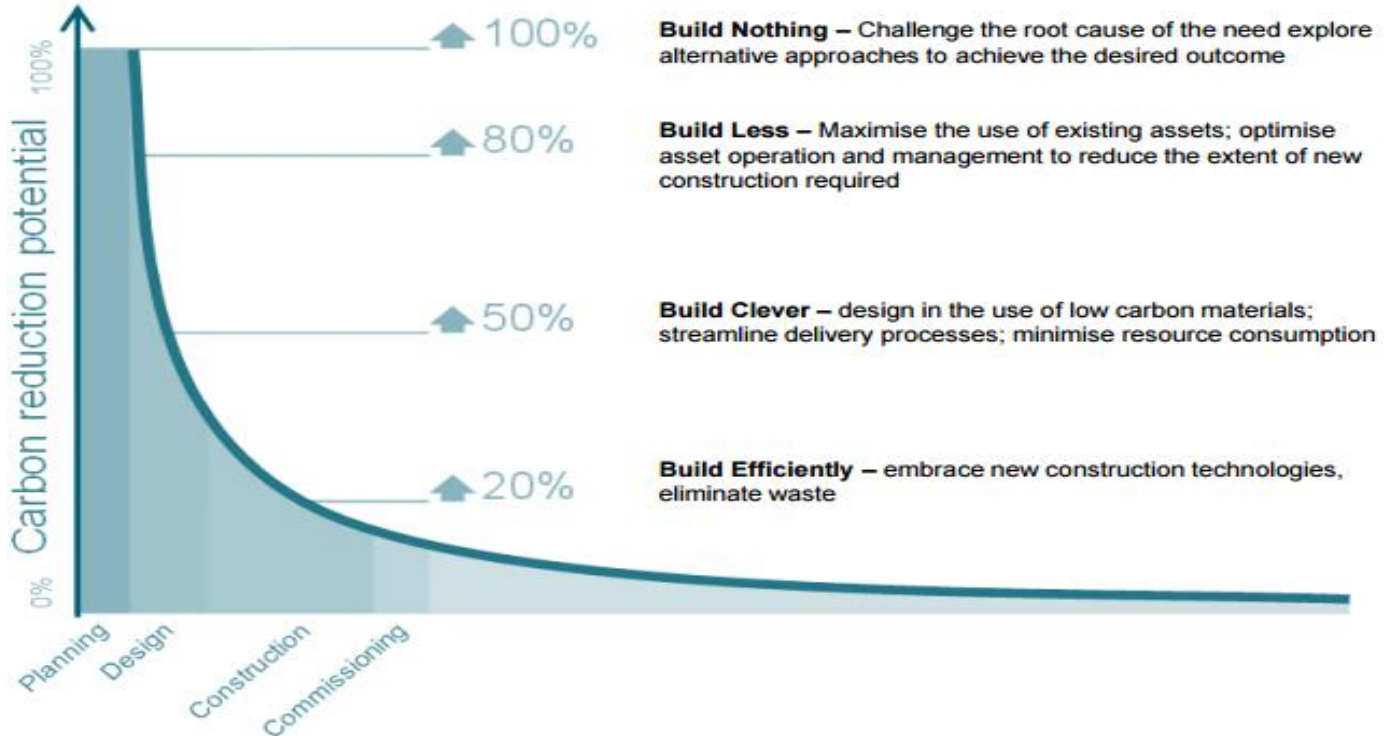
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Embedding environmental considerations into our decision making



1. Reducing the impact of construction

We have opportunity throughout the project lifecycle to reduce emissions



How we build...Embedded Carbon

There is carbon associated with our construction projects:

- Concrete
- Materials
- Transportation

We minimise this where possible

Include different types of |

Should we be aiming for



Carbon
Neutral
PAS 2060



What does going Carbon Neutral mean?

1. What it is

Having net zero carbon emissions

2. How it's done (how we'd do it)

Minimise our carbon footprint as much as possible, then offset the remaining by investing in projects to reduce carbon impacts elsewhere

3. Benefits of it

Reduces our impact on the environment and helps limit climate change

4. Drawbacks of it

If not done properly, it can be seen as shifting the burden. To ensure this doesn't happen we will use the carbon neutral standard and appropriate projects.



Carbon
Neutral

PAS 2060

Our aspirations

50% reduction in carbon intensity from 2015-2020

Case study – Offsetting Construction Emissions

A typical compressor replacement project creates 13,240 tCO₂ capital carbon

To offset this would cost ~£173k

~0.2% of the capital cost of the project



Carbon
Neutral

PAS 2060

How we build...Biodiversity Net Gain

We have defined an approach to quantify loss and drive positive outcomes for biodiversity and ecosystems as efficiently as possible.

During construction we follow the approach outlined below:

Baseline 100 units

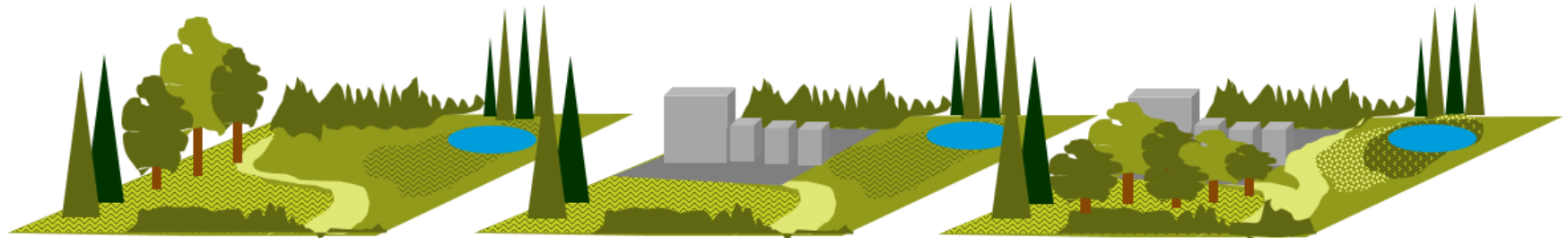
- Mod: Broadleaved Woodland
- Mod: Plantation Woodland
- Poor: Wetland / Marsh
- Mod: Semi improved Grassland
- Poor: Bridleway

Loss of 20 units

- Mod: Broadleaved Woodland
- Mod: Semi improved grassland
- Poor: Bridleway

Creation of 25 units

- Broadleaved Woodland – Target GOOD + 10
- Wetland / Marsh + 5
- Semi improved Grassland – Target GOOD +5*
- Re routed bridleway – Target Con GOOD + 5*



Quick Poll – Impact and Interest

On a scale of 1 to 5, where 1 is not impacted at all and 5 is impacted a great deal, how impacted are you or those you represent) by what we've just spoken about?

1. Not impacted at all
- 2.
- 3.
- 4.
5. Impacted a great deal

On a scale of 1 to 5, where 1 is not interested at all and 5 is interested a great deal, how interested are you (or those you represent) by what we've just spoken about?

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Question for discussion – Considerate Construction

How far should we go to protect our environment through our construction activities

- Should we go as far as carbon neutral?
- Should we ensure we deliver net gain or is 'putting back' enough?



Quick poll

Should we look to have carbon neutral construction projects, where we reduce and then offset our carbon emissions?

1. Yes, you should reduce emissions and offset all construction activity

2. Yes, you should reduce emissions and offset on major projects

3. You should focus on reducing emissions but not pay to offset

4. No, deliver the project at minimal cost

Please explain your answer

Wall chart

- 1. *Grab a card and write ‘construction’***
- 2. *Add your initials***
- 3. *Add any comments or questions***
- 4. *Add when you think we need to invest or change what we do***
 - 1. Now*
 - 2. 2021 – 2026*
 - 3. After 2026*
- 5. *Place post it on the relevant place on the topics wall chart***

Embedding environmental considerations into our decision making



1. Responsible demolition of redundant assets

Environmental Requirements - Process



Remove environmental hazards that potentially risk polluting the land (and to an extent other environmental media)



Remove/ Remediate pollution which may have occurred during the life of the permit



Demonstrate that the site is in the same state as at the start of the permit

What do we mean by...

Decommissioning

Isolate / Mothball

- Plant and equipment is separated from every source of energy
- A positive isolation from the NTS and the Customer, involving a physical air-gap between the two assets
- Ongoing maintenance needed

Demolish

- Redundant assets have been fully removed from the site
- Useful spares have been harvested
- Land returned to brownfield/ greenfield and potential alternative use where possible.

New Build

- Having removed the asset, a new asset is required in the future

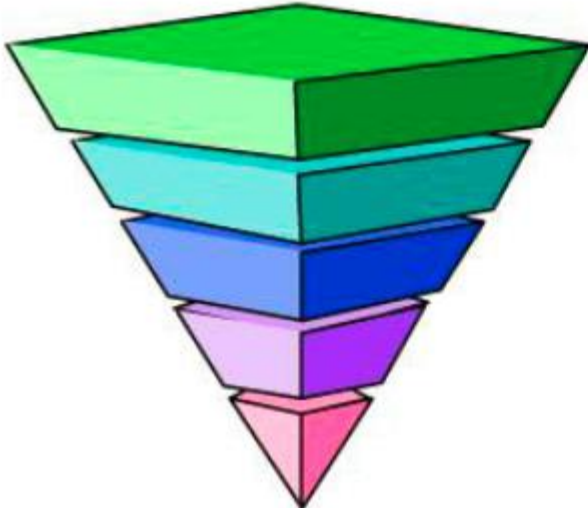
Relative costs of 100km Pipeline



Relative costs for a Compressor



Waste hierarchy



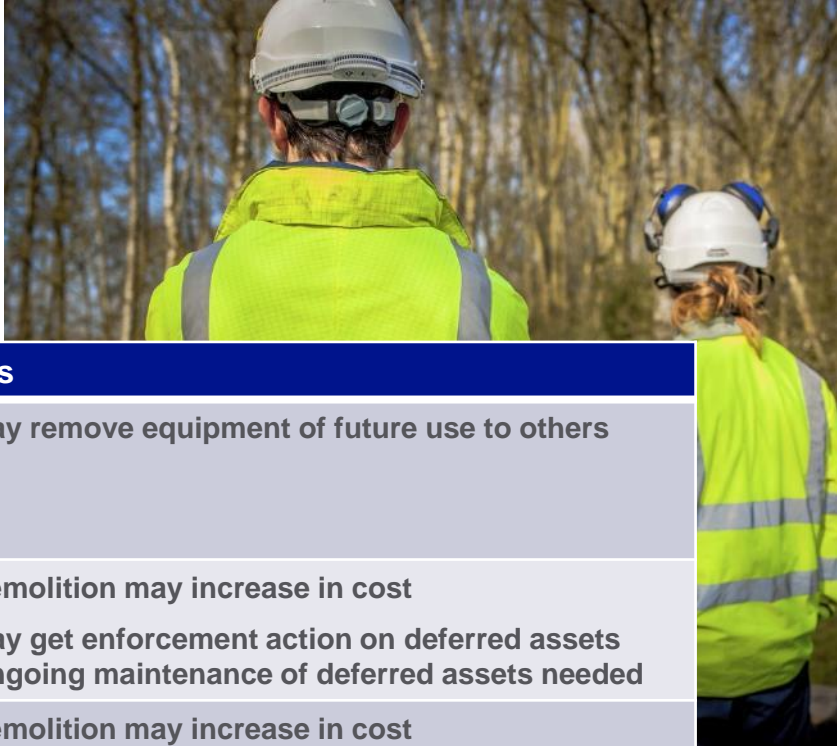
- Prevention**
If you can't prevent, then....
- Prepare for reuse**
If you can't prepare for reuse, then....
- Recycle**
If you can't recycle, then....
- Recover other value (e.g. energy)**
If you can't recover value, then....
- Disposal**
Landfill if no alternative available.



When should we do this work?

■ Timing needs consideration

- Managing operational risks
- Which consumers should pay?
- Can we or others re-use assets?
- Phasing of work & decisions



Option	Benefits	Risks
Deliver all in T2	<ul style="list-style-type: none"> • Current consumers pay for assets they benefited from • No ongoing risk to manage • No ongoing maintenance costs 	<ul style="list-style-type: none"> • May remove equipment of future use to others
Prioritise high risk projects and maintain remaining	<ul style="list-style-type: none"> • Costs are split between current and future consumers • Lower costs in T2 	<ul style="list-style-type: none"> • Demolition may increase in cost • May get enforcement action on deferred assets • Ongoing maintenance of deferred assets needed
Defer all works and manage risk	<ul style="list-style-type: none"> • Minimises costs in T2 	<ul style="list-style-type: none"> • Demolition may increase in cost • Future consumers pay • Significant maintenance costs required to manage risk • Likely to get some enforcement action

Quick Poll – Impact and Interest

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5. Interested a great deal

Question for discussion

What factors should we consider when we no longer require assets for operational use?

Please consider your answer from the following viewpoints:

- Customer
- End consumer
- Local community



Quick poll

As a principle should current or future consumers pay for demolition of assets that are no longer required for operational use?

1. Deliver all in T2
Current consumers pay

2. Prioritise projects based on risk and maintain remaining
Cost is shared between current and future consumers

3. Defer all works and manage risk
Majority of cost is picked up by future consumers

Wall chart

- 1. Grab a card and write ‘Responsible Demolition’***
- 2. Add your initials***
- 3. Add any comments or questions***
- 4. Add when you think we need to invest or change what we do***
 - 1. Now*
 - 2. 2021 – 2026*
 - 3. After 2026*
- 5. Place post it on the relevant place on the topics wall chart***

Review of opportunities board



Questions



What happens next - Our commitment

- We'll process everything you've told us today
- We'll combine your feedback with the insights we've gained from other engagement activities
- We'll ask our Stakeholder Group to scrutinise this and we'll use it to inform our RIIO-2 business plan
- We'll publish our plan and all updates on our website, and keep you informed through our webinars and newsletters

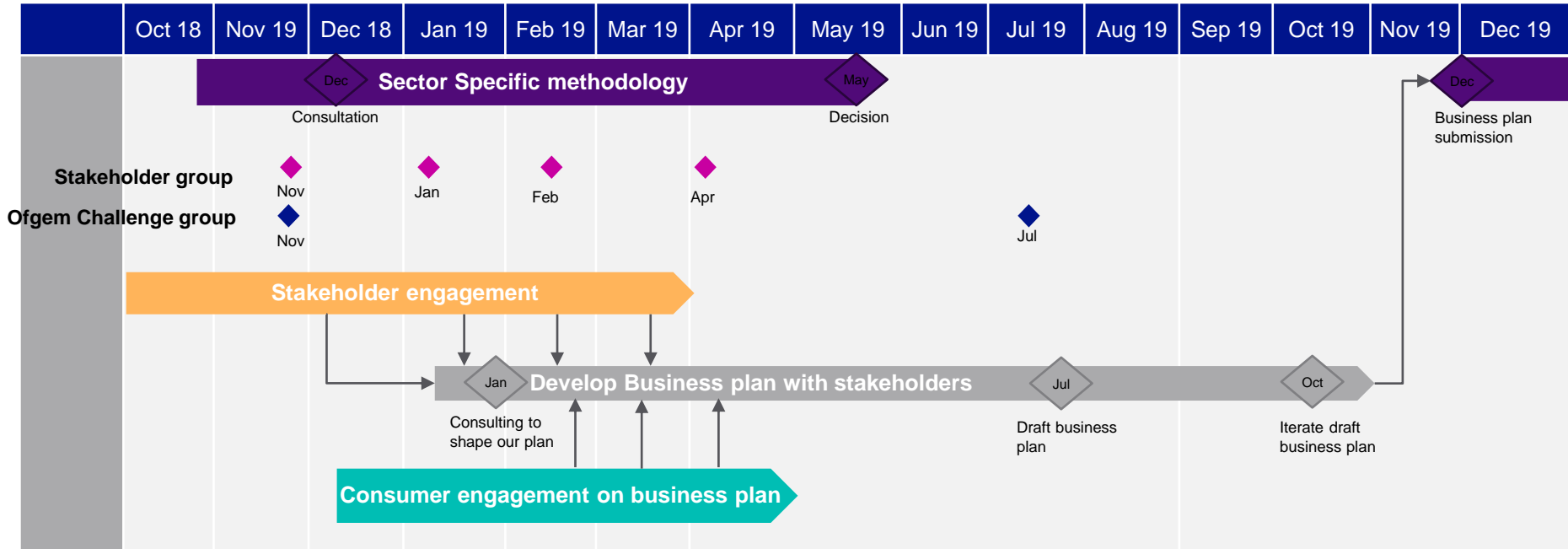
Quick Poll – and finally

1. On a scale of 1 to 5, where 1 is know nothing and 5 is know a great deal, how much would you say you know about National Grid's operational activities?

1. Know nothing
- 2.
- 3.
- 4.
5. Know a great deal

2. What three words would you use to describe National Grid Gas Transmission?

Timeline





Thank You