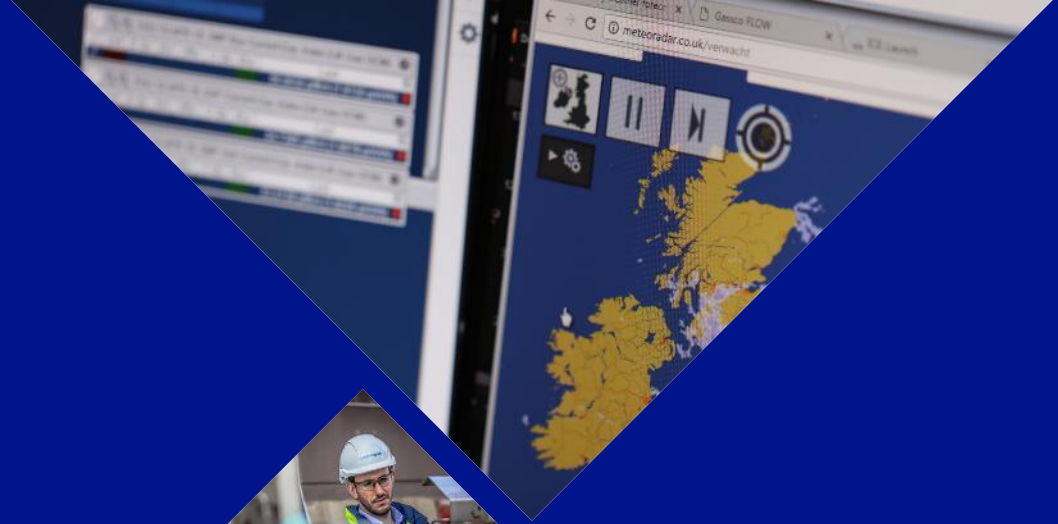
Gas Transmission

Environment workshop

5th December 2018



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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

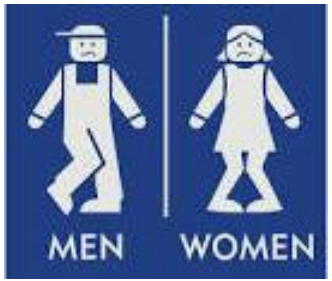
Environmental Assurance Manager

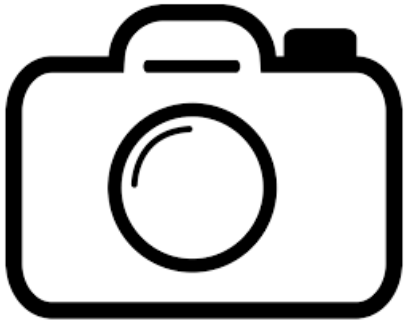
Alison Fulford

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

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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 Gas Transmission – the network

Our role

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

We own & operate

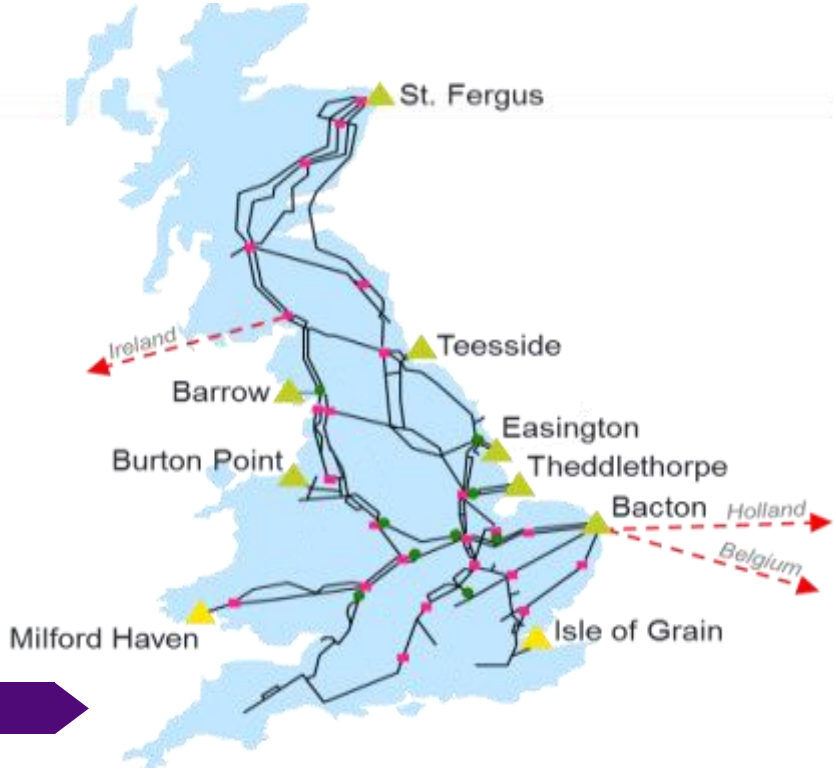
7,660km of high pressure pipelines, 24 compressor stations and over 600 above ground installations

We transport

Over 3 times the energy provided by electricity each year

810 TWh — 2017: **Total gas demand**

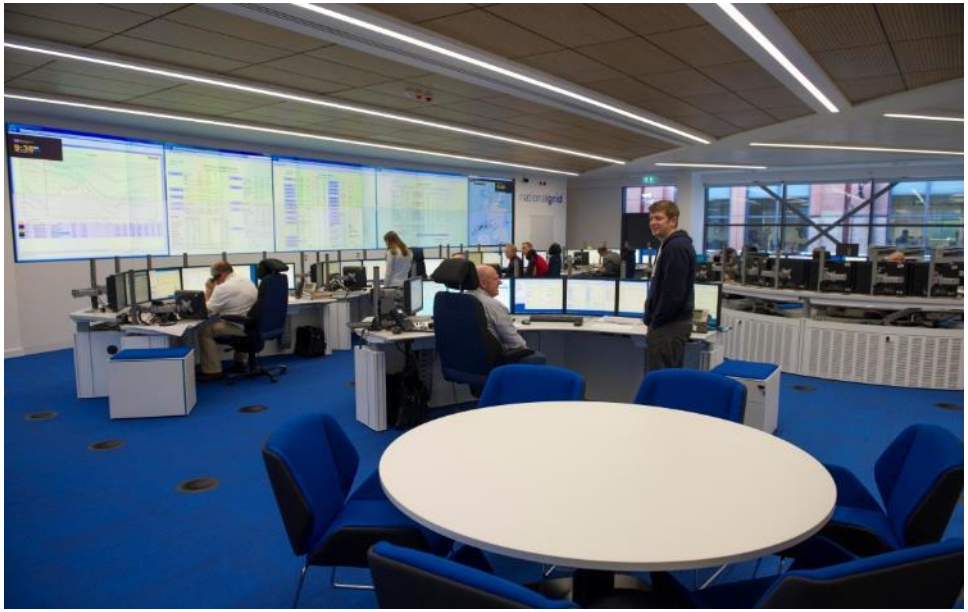
297 TWh — 2017: **Total electricity demand**



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	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
48% of Gas Transmission costs	**1%** of Gas Transmission costs	**2%** of Gas Transmission costs	**4%** of Gas Transmission costs
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
17% of Gas Transmission costs	**24%** of Gas Transmission costs	**5%** of Gas Transmission costs	

*excluding business support costs

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

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

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

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

H. I want you to be efficient and affordable

Gas Transmission Stakeholder Priorities

Industrial and Domestic consumer priorities …

- I want an affordable energy bill
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- 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
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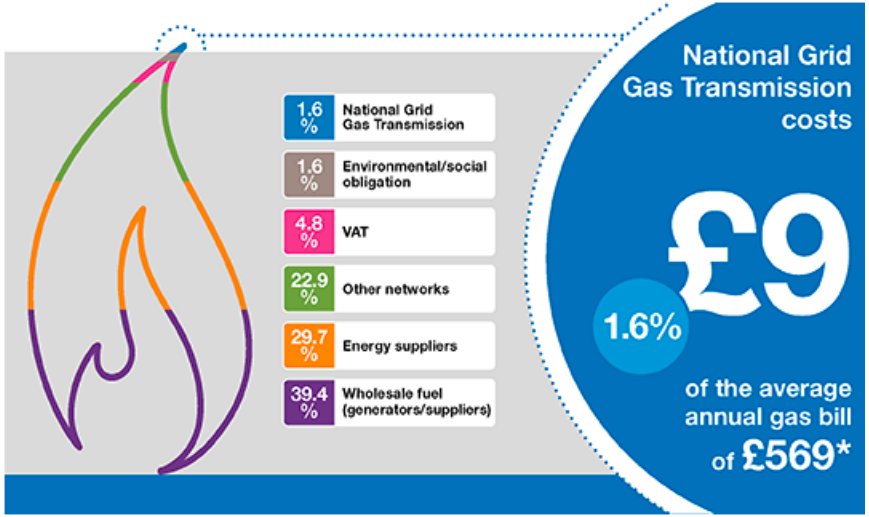
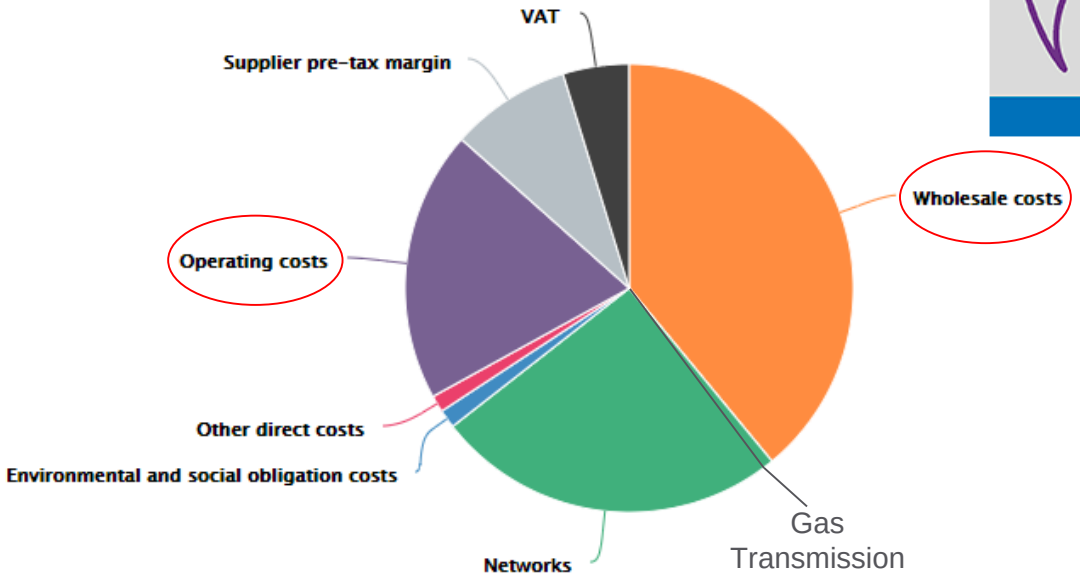
- I want to connect to the Transmission System
- I want the gas system to be safe
- I want you to protect the Transmission system from cyber and external threats
- I want you to care for communities and the environment
- I want you to facilitate the whole energy system of the future – Innovating to meet 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

https://www.ofgem.gov.uk/consumers/household-gas-and-electricity-guide/understand-your-gas-and-electricity-bills

Gas System Operator

02

RIIO Framework

What does it mean?

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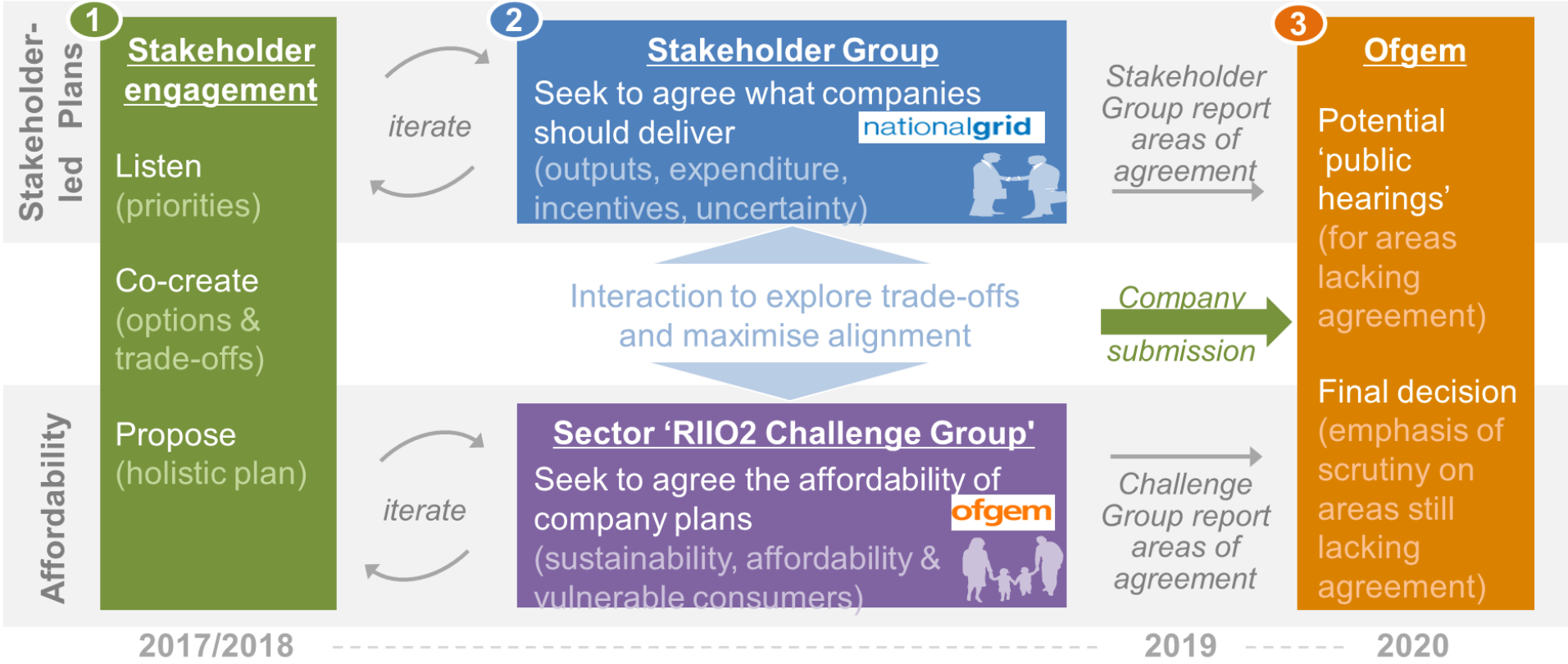
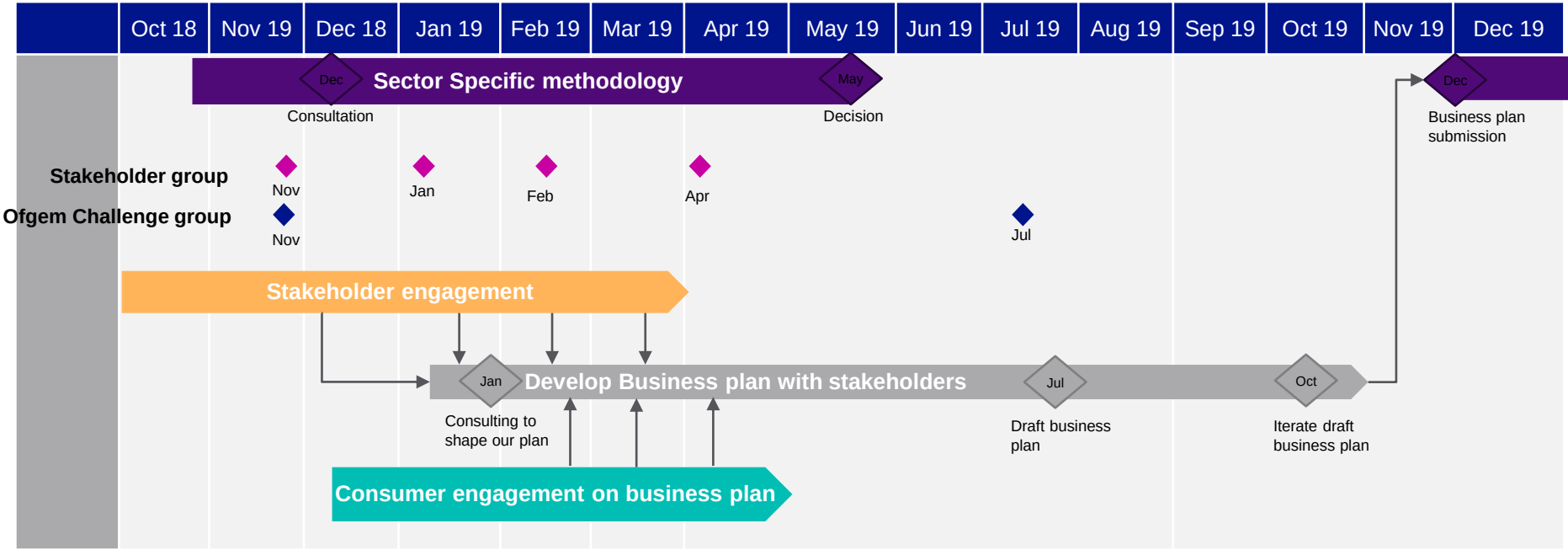
What is RIIO?

Constructive Engagement



Timeline – Business plan consultation



Our Environmental Regulators

Environment Agency

SEPA
Scottish Environment Protection Agency

Cyfoeth Naturiol Cymru
Natural Resources Wales

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

Gas
Transmission

03

Our Sustainability Commitments

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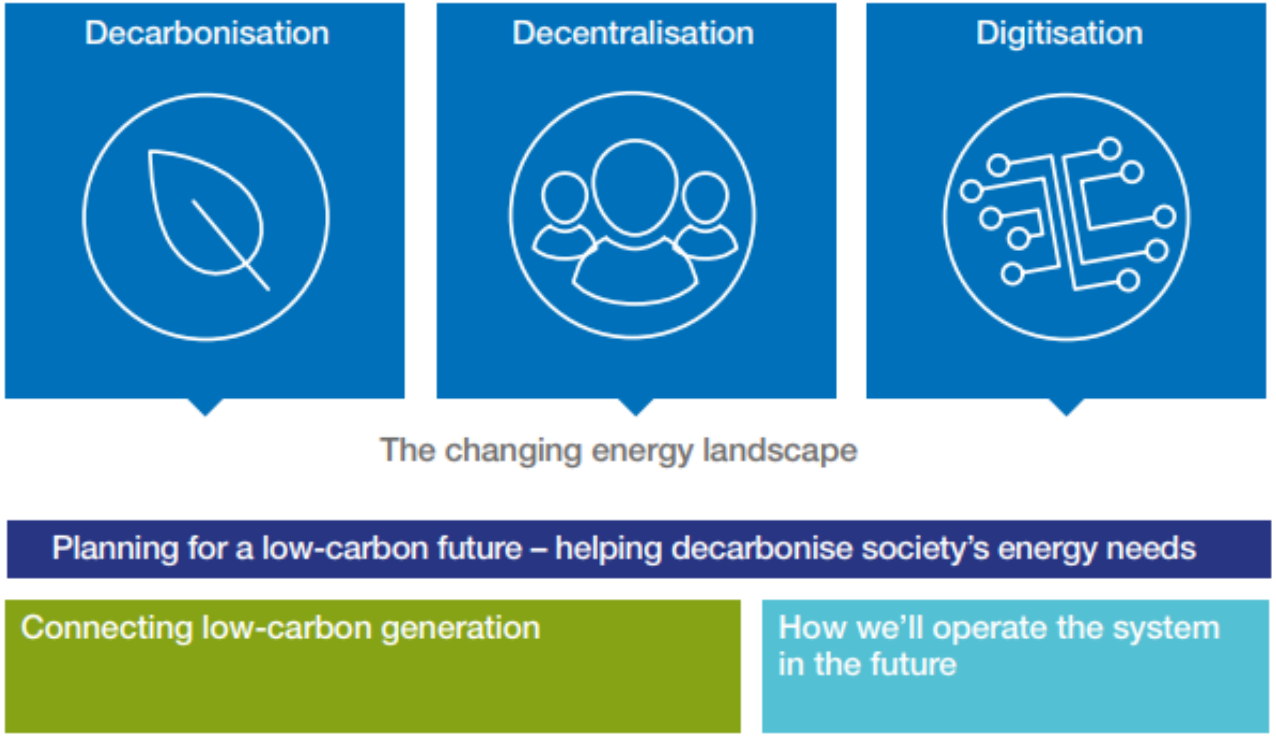
Decarbonisation



The big picture – Global impacts

Impact of climate change
Extreme weather

Paris Agreement COP 21

Clean Growth Strategy
Clean Air Act

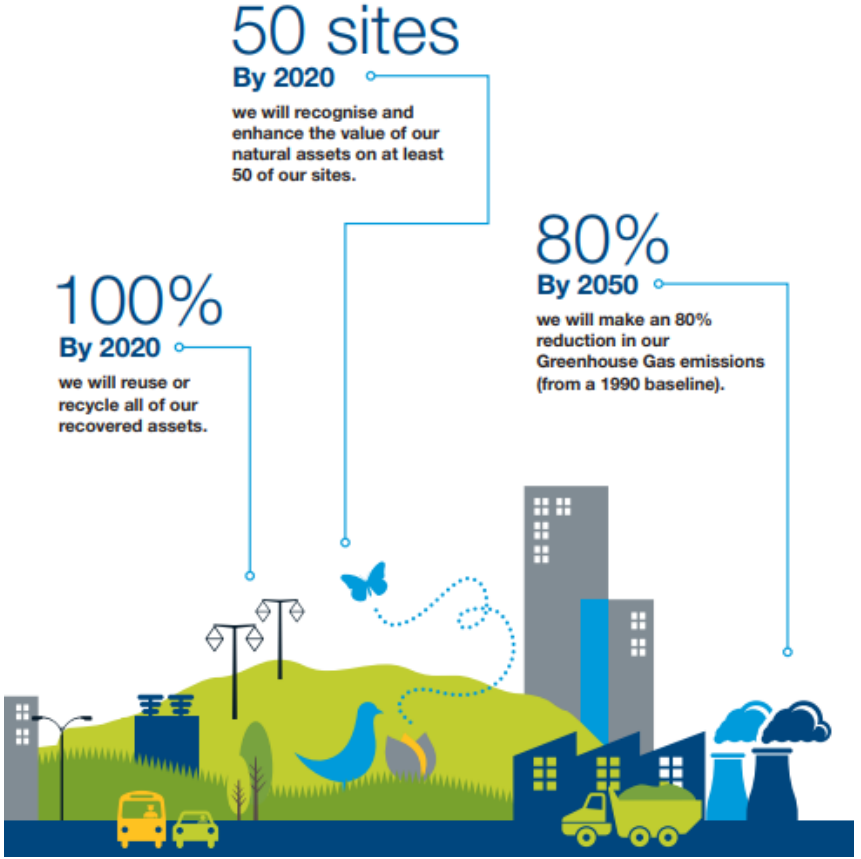
Companies reporting to the UN Sustainable Development Goals

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:

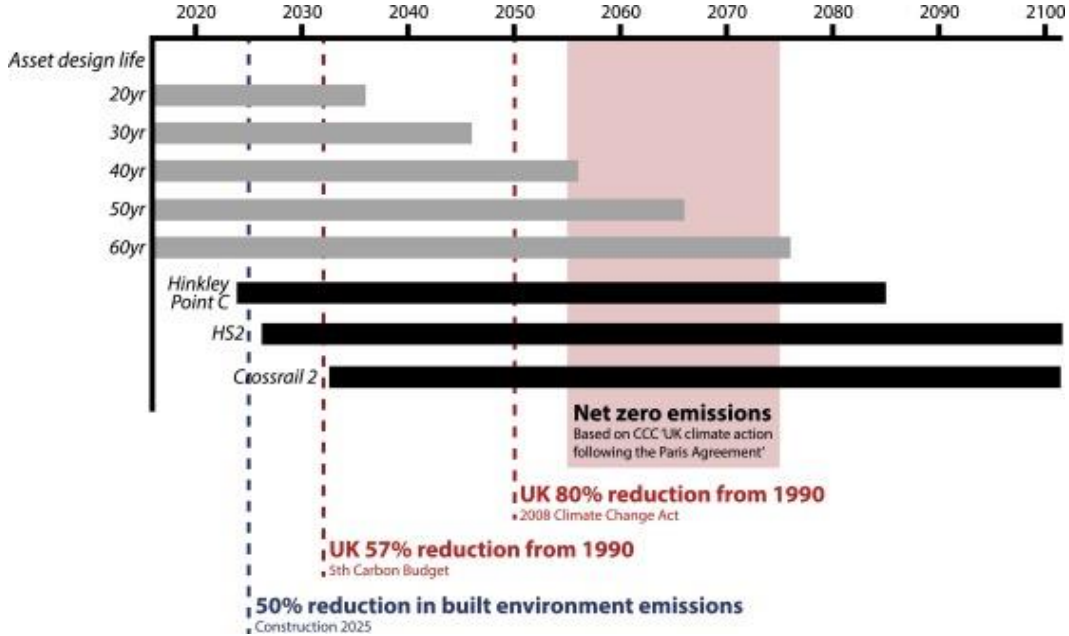
- Recognise and enhance the value of our natural assets on at least 50 sites by 2020.
- Drive net gain in environmental value (including biodiversity) on major construction projects by 2020.

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

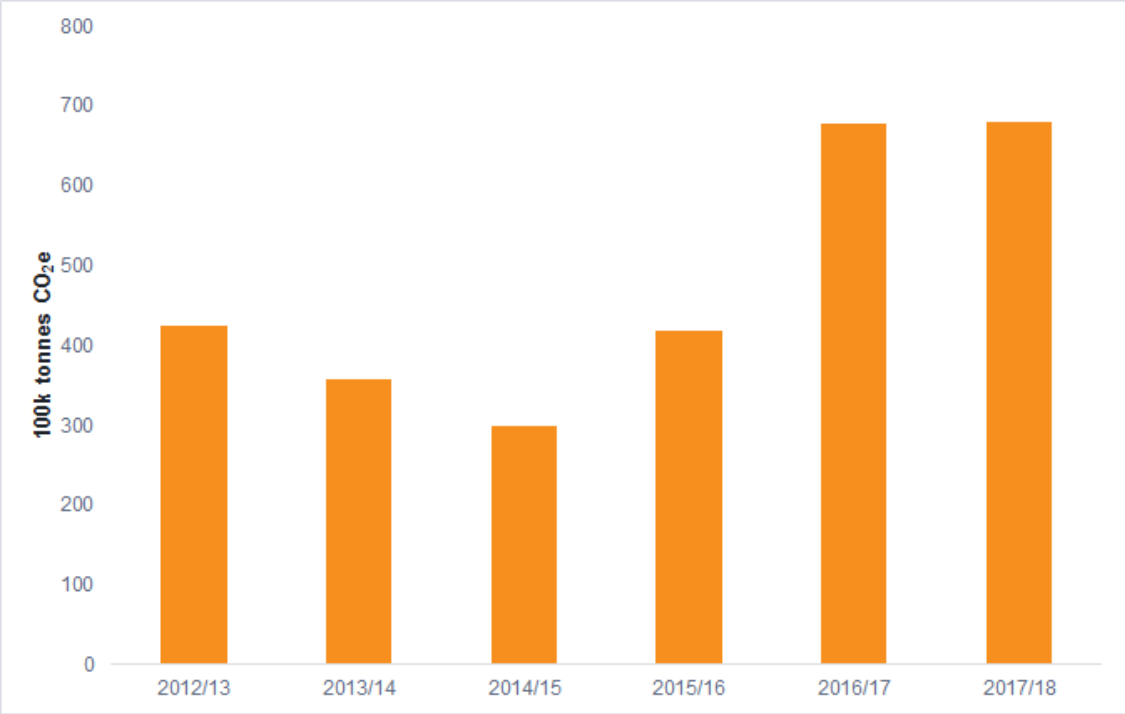


Our climate commitment: Gas Transmission

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

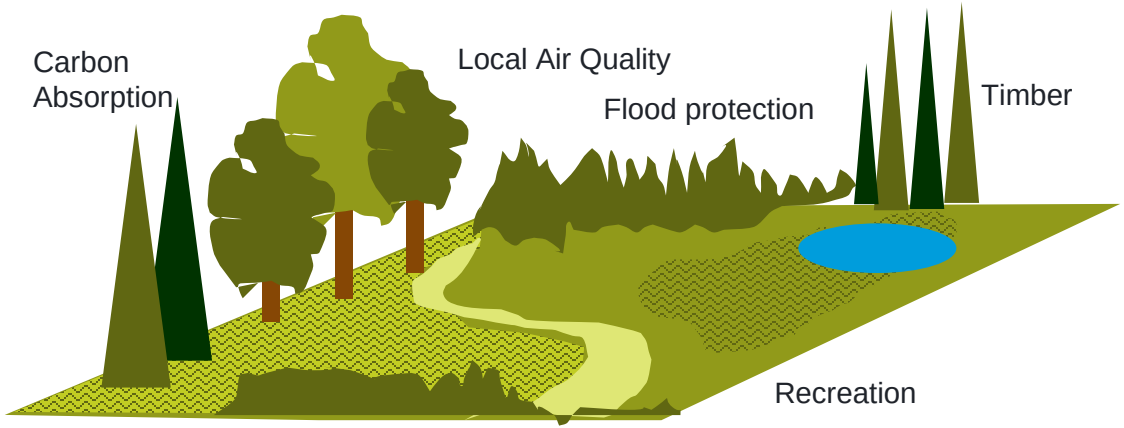


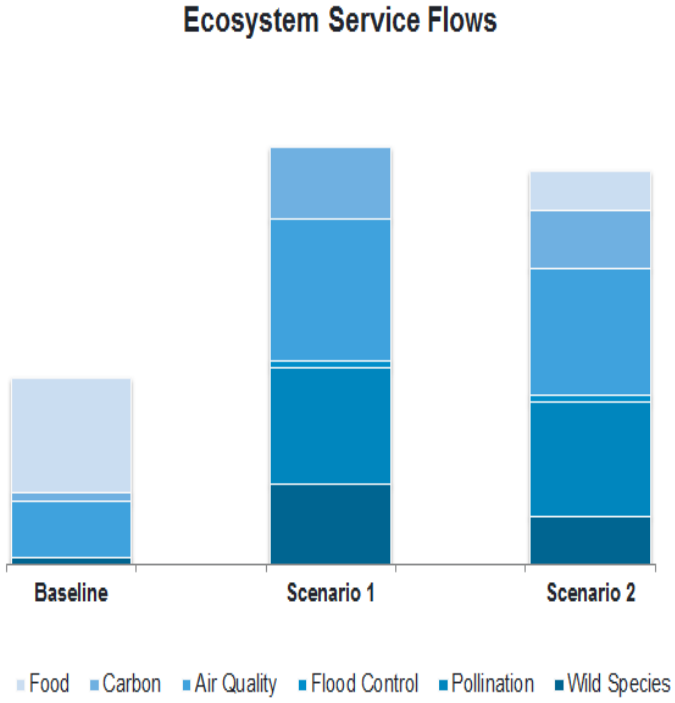
Resources

- 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





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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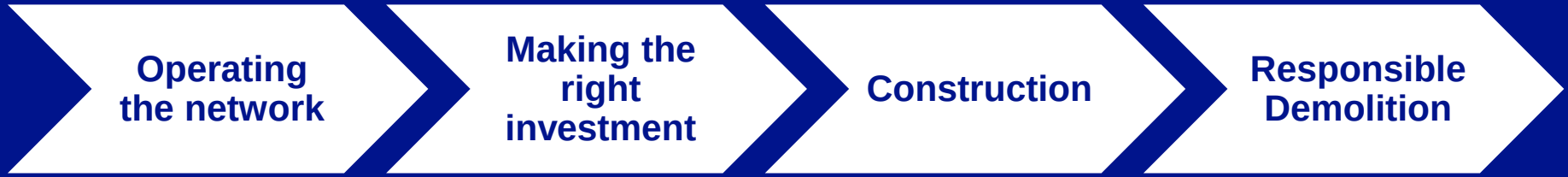
Embedding environmental considerations into our decision making



- 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

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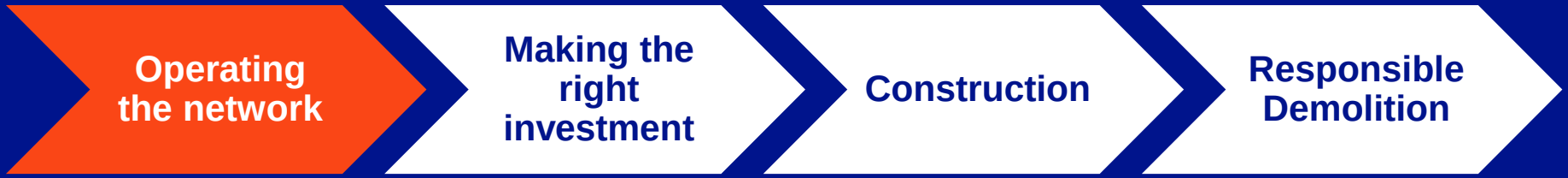
Embedding environmental considerations into our decision making



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

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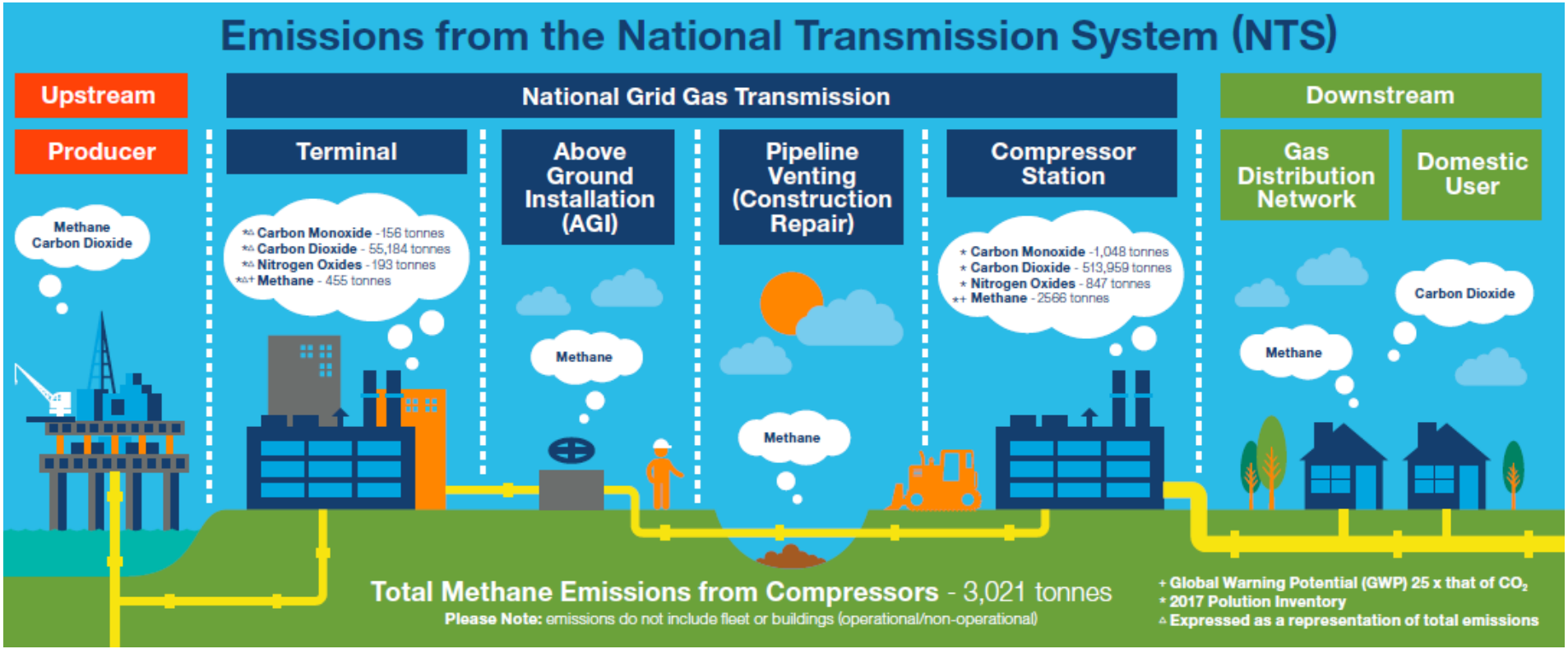
Sources of emissions



How we're managing our emissions

Which emissions:

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

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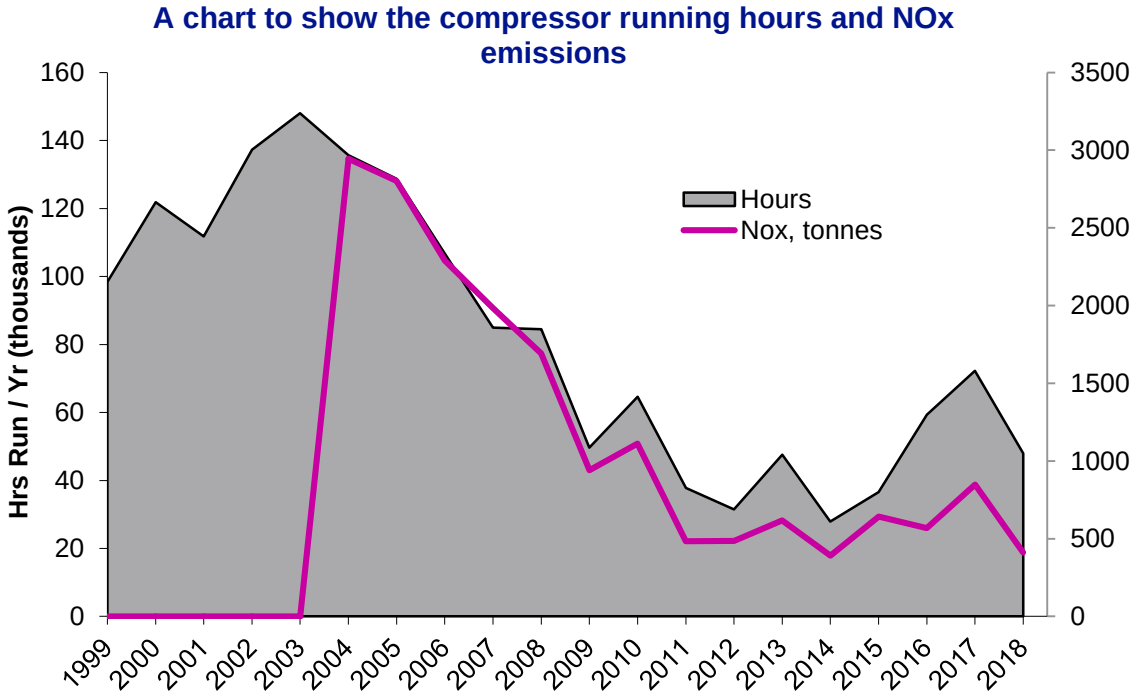
How we're currently managing our emissions

- **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



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

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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***

Gas Transmission

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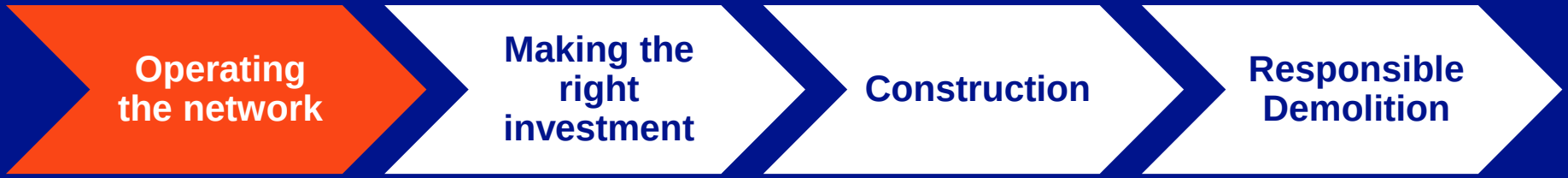
Embedding environmental considerations into our decision making



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.

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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	Reactive
• Strategic and tactical risk assessment, produce plans, mitigate issues	• Insurance • Deal with clean up • Remediate to prevent future incidents
• Cost: X 1	• Cost: ~ X 2.5

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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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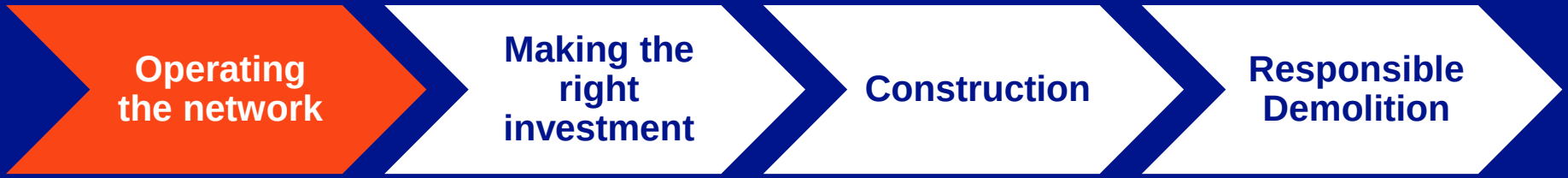
Embedding environmental considerations into our decision making



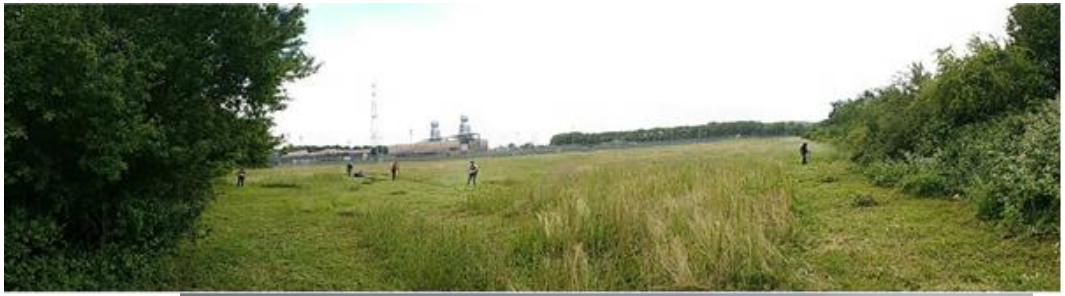
1. Emissions management
2. Mitigating environmental impacts to our network
3. Environmental Stewardship

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

25,000 educational visits

46,542 visitors last year

Visitor satisfaction 9.6 / 10

26,000 volunteer hours

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 ½p 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*
5. ***Place post it on the relevant place on the topics wall chart***

Gas Transmission

03

Lunch and networking

Back at 12:50

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Gas Transmission

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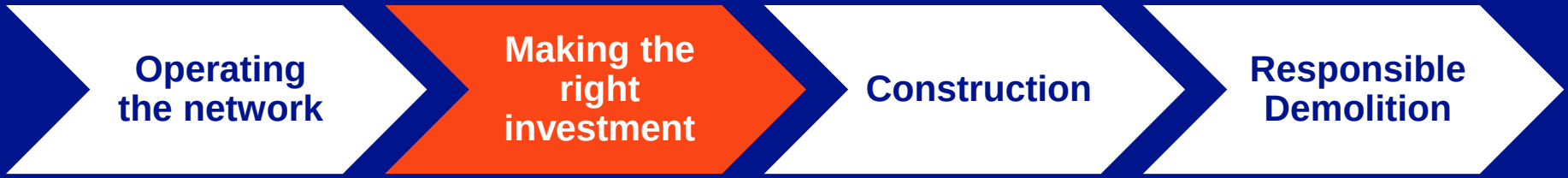
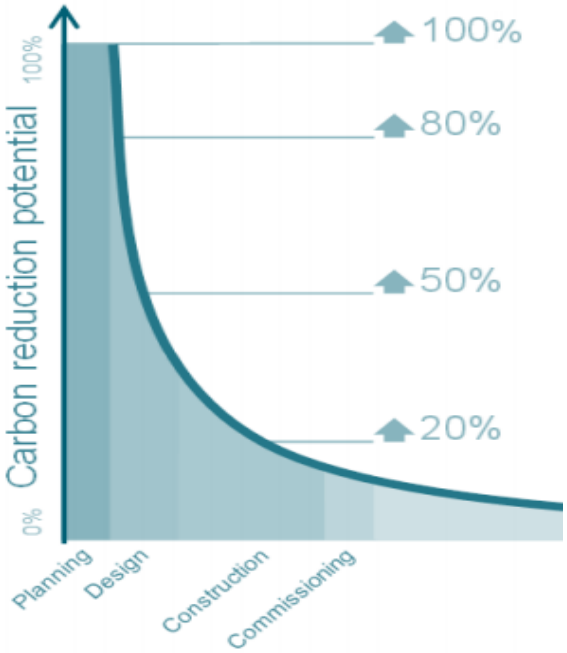
Embedding environmental considerations into our decision making



1. Compressor emissions
2. Other investment decisions

We have opportunity throughout the project lifecycle to reduce emissions



Project Need
- We identify the need to make a significant investment in our Network

Design
- Our design teams design a solution that meets the needs of the network, stakeholders and the environment

Build
- Design in the use of low carbon materials, streamline delivery processes and minimise resource consumption

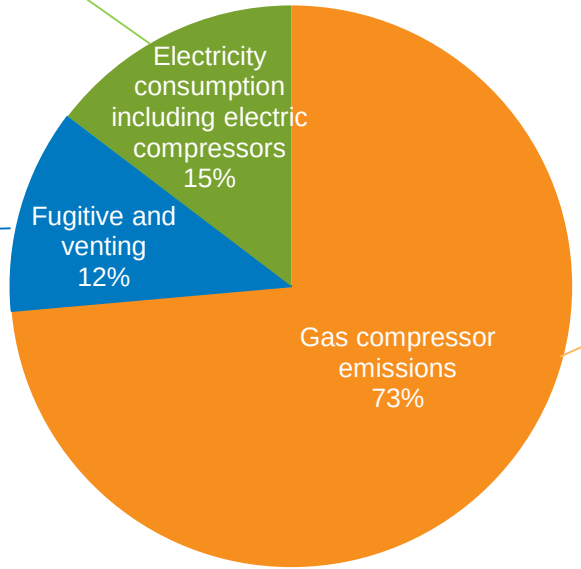
Operate
- Develop and Apply methods to reduce leaks and venting

Decommission
- We run the assets efficiently to the point of replacement, and when we decommission, we apply techniques to recover as much material and value as possible

Reuse
- When we build or replace, we reuse as much material as possible

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

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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***
    1. *Now*
    2. *2021 – 2026*
    3. *After 2026*
5. ***Place post it on the relevant place on the topics wall chart***

Gas Transmission

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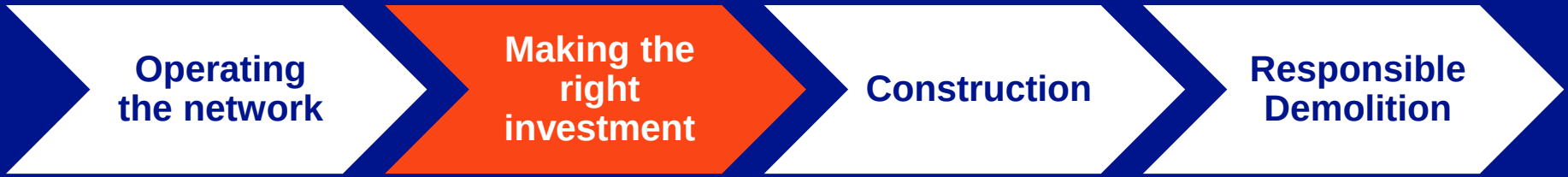
Embedding environmental considerations into our decision making



1. Compressor emissions
2. Other investment decisions

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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

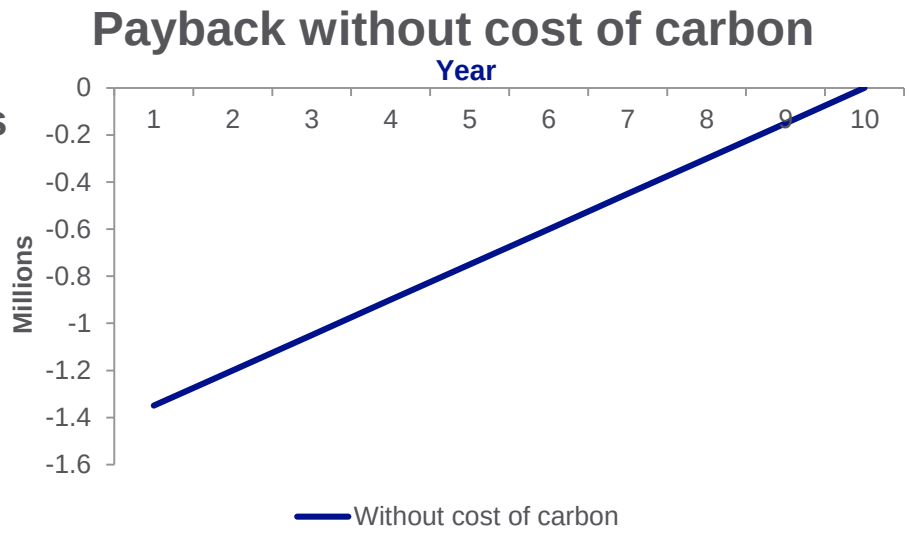
- We vent gas when we work on pipelines
- We could utilise recompression equipment to reduce the amount of gas we vent

Case study – Recompression

Cost of vented gas per year: £155k - £255k

Cost of recompression unit: £1.5m

Pay back time: up to 10 years



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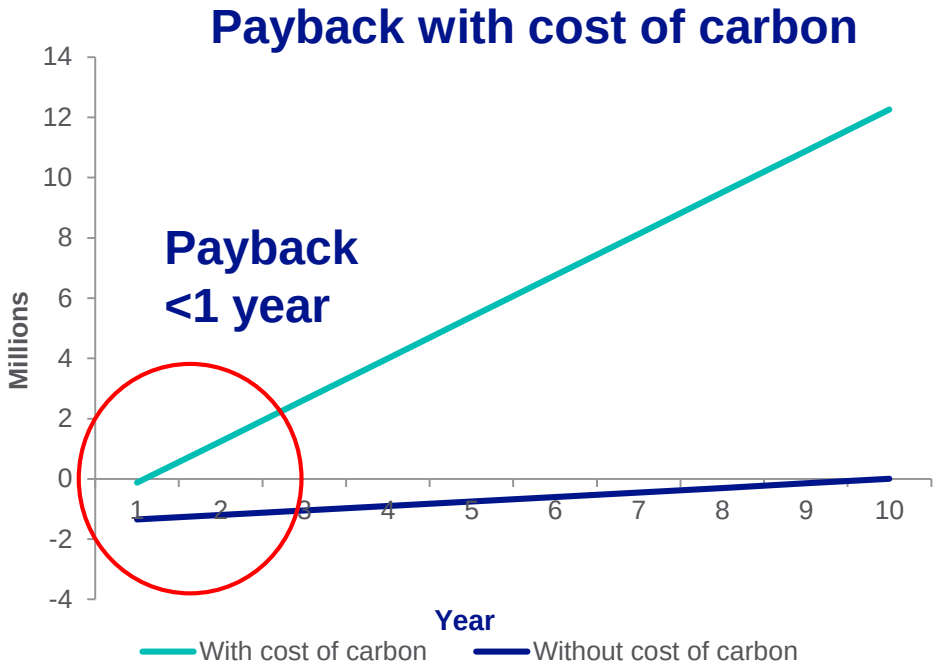
Reduced payback period

Including a carbon price significantly reduces payback period

- **Add cost of carbon of £45 per tCO_2**
- **Pay back time: less than 1 year**



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 their 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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Gas Transmission

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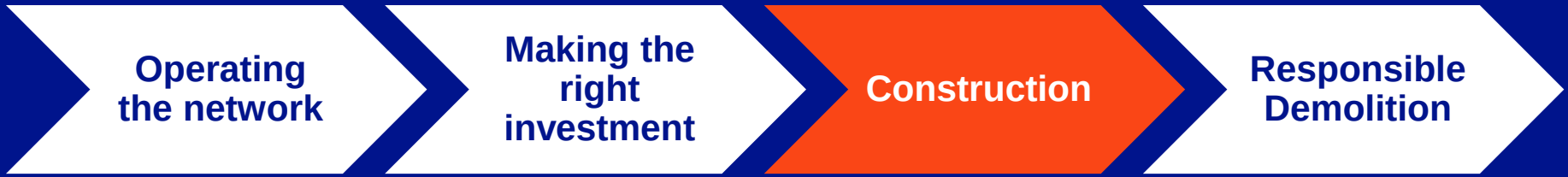
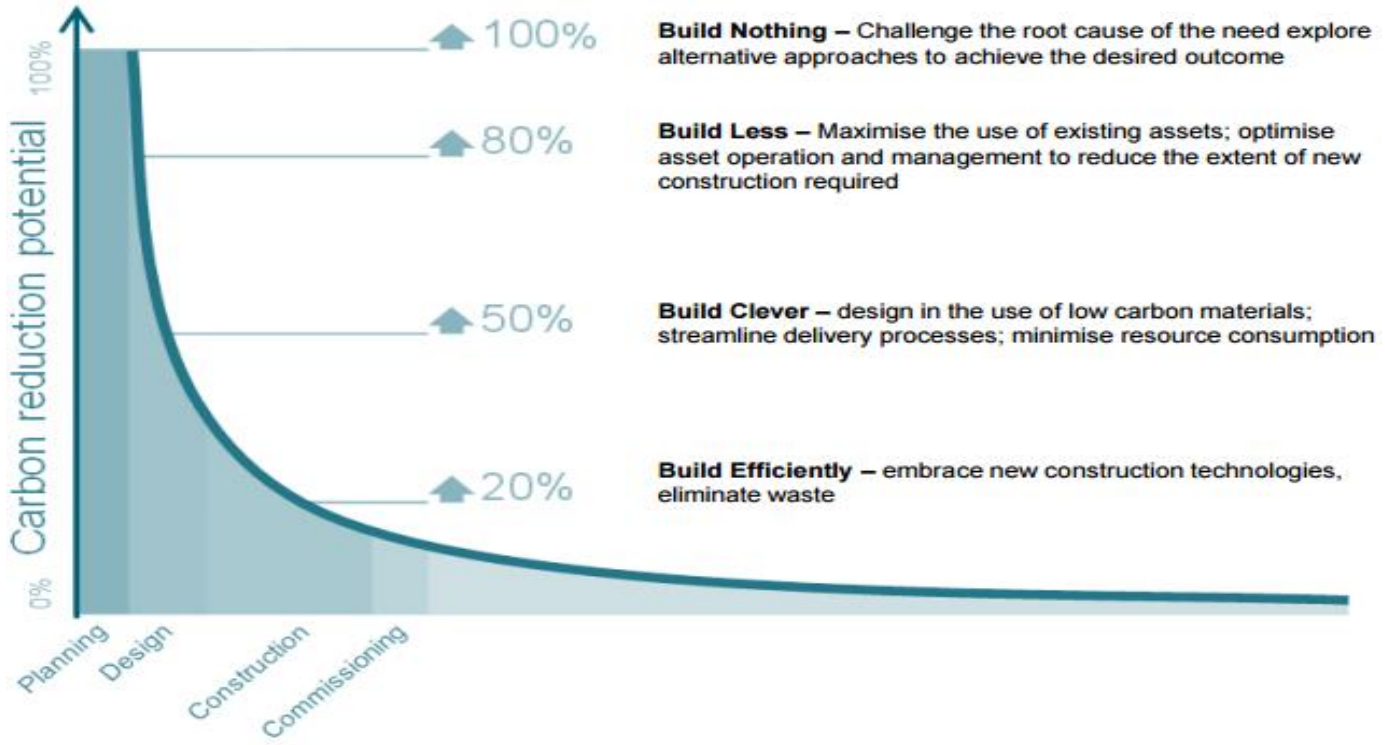


1. Reducing the impact of construction

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 tCO_2 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

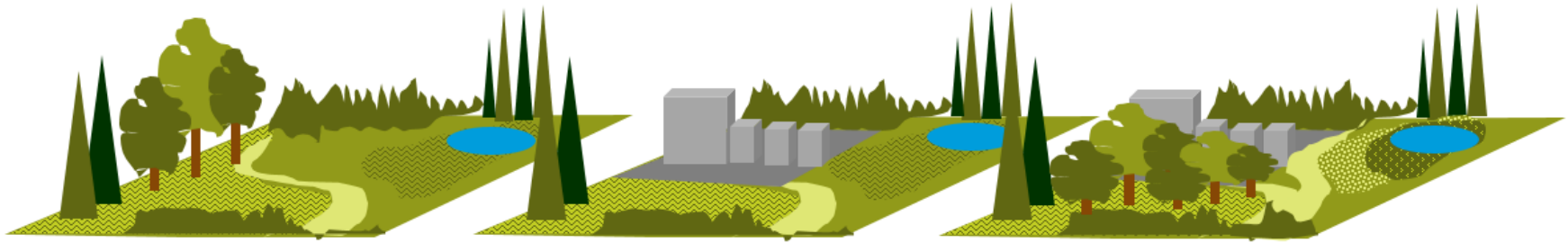
Mod: Broadleaved Woodland
Mod: Plantation Woodland
Poor: Wetland / Marsh
Mod: Semi improved Grassland
Poor: Bridleway

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



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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***
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nationalgrid

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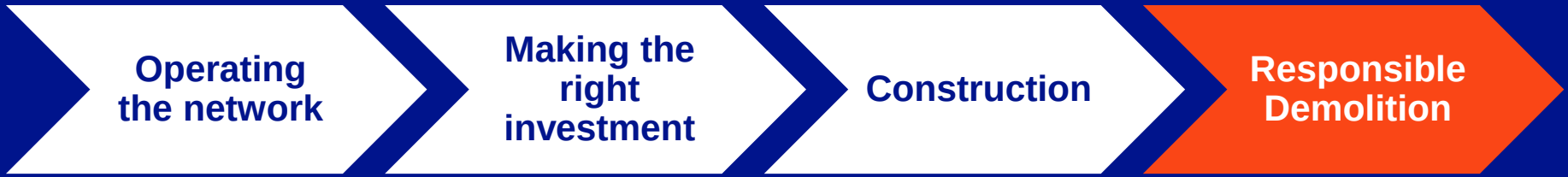

1. Responsible demolition of redundant assets

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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

x1	X 88	X 124

Relative costs for a Compressor

X 1	X 17	X 333+

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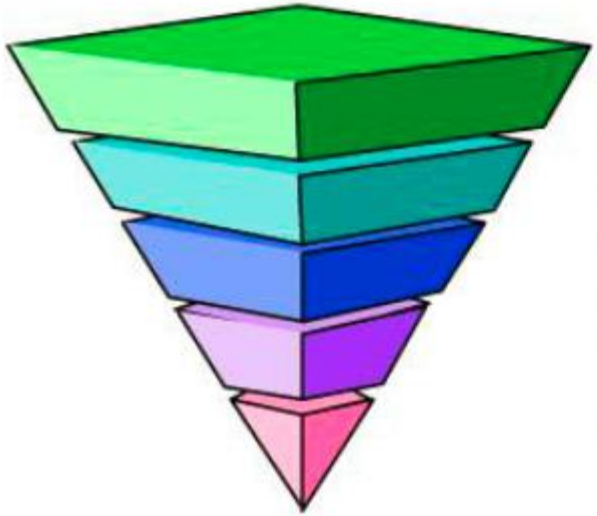
Waste hierarchy



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....

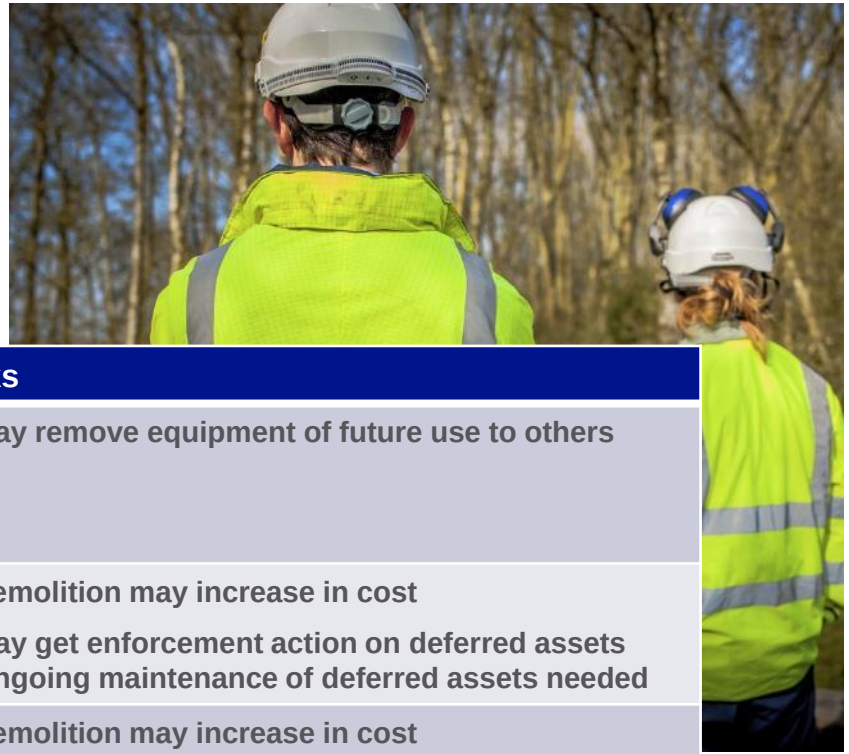
Disposal
Landfill if no alternative available.

Sustainable by Choice

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	• Current consumers pay for assets they benefited from • No ongoing risk to manage • No ongoing maintenance costs	• May remove equipment of future use to others
Prioritise high risk projects and maintain remaining	• Costs are split between current and future consumers • Lower costs in T2	• Demolition may increase in cost • May get enforcement action on deferred assets • Ongoing maintenance of deferred assets needed
Defer all works and manage risk	• Minimises costs in T2	• Demolition may increase in cost • Future consumers pay • Significant maintenance costs required to manage risk • Likely to get some enforcement action

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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

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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

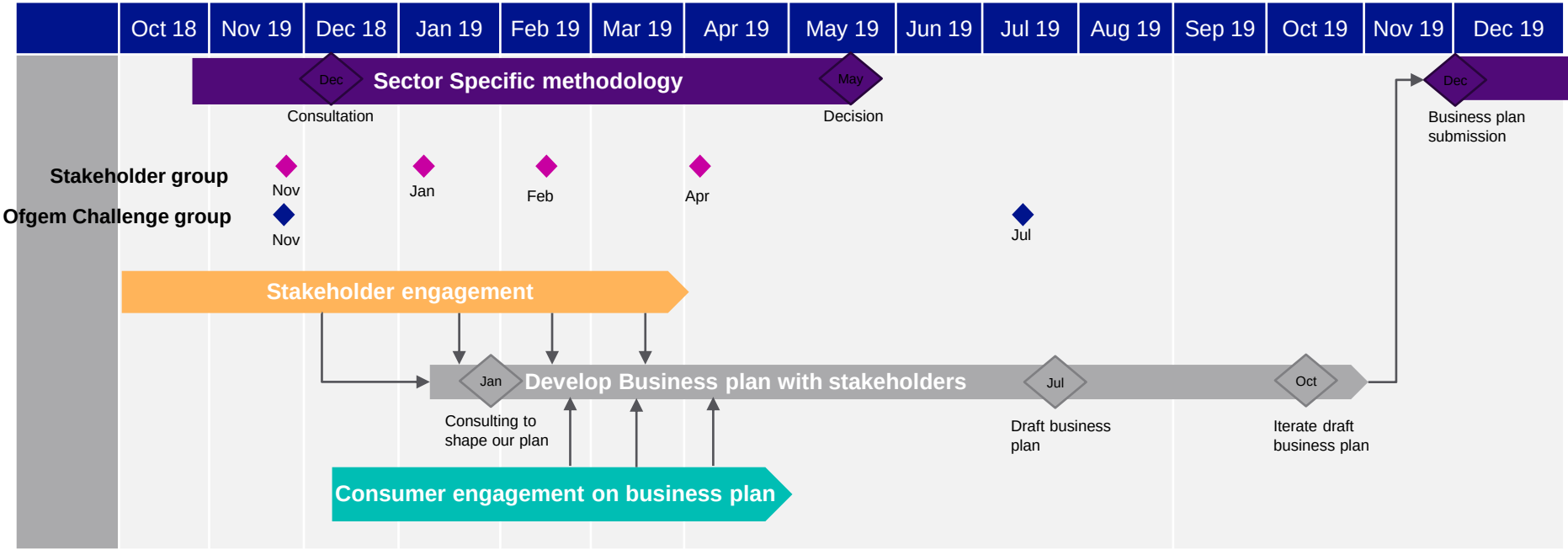
Quick Poll – and finally

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


Oct 18
Nov 19
Dec 18
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May 19
Jun 19
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Aug 19
Sep 19
Oct 19
Nov 19
Dec 19
Dec
Sector Specific methodology
May
Consultation
Decision
Dec
Business plan submission
Stakeholder group
Ofgem Challenge group
Nov
Nov
Jan
Feb
Apr
Jul
Stakeholder engagement
Jan
Develop Business plan with stakeholders
Jul
Oct
Consulting to shape our plan
Draft business plan
Iterate draft business plan
Consumer engagement on business plan


Thank You