

RIIO-GD2 Decarbonisation Stakeholder Group

Introduction



Pete Wightman, Head of Gas Distribution
Meeting 3: 24/10/18

Introductions (10:30 – 10:40) *(Pete Wightman, Head of Gas Distribution)*

- Overview of what we wish to achieve from the meeting.
- Run through of action log

Scenarios (10:40 – 11:40) *(WWU)*

- Delta EE Report – Findings
- Pathfinder Model interaction with business plans

Heat projects: Are there specific uncertainties that the RIIO Innovation Schemes would not capture in relation to heat projects and how should they be treated by the regulatory framework (11:40 – 12:30) *(SGN)*

Lunch (12:30 – 13:00)

Connections (13:00 – 15:00) *(All)*

Consider why and how (through regulatory mechanism(s)), different connections could be supported by RIIO2. What potential regulatory barriers are there?

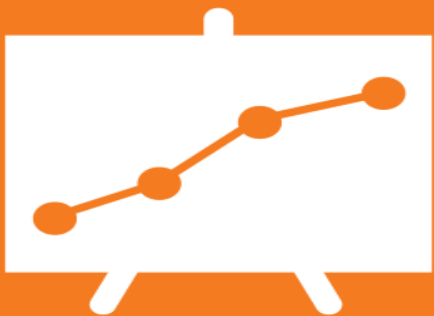
- Entry Gas (13:00 – 13:30) *(WWU)*
- Peaking Generation (13:30 – 14:00) *(SGN)*
- Off Gas Grid (14:00 – 14:30) *(Cadent)*
- Transport (14:30 – 15:00) *(NGN)*

Break (15:00 – 15:15)

The Environmental Package (15:15 – 16:15) *(Ofgem)*

Any other business (16:15 – 16:30)

Scenarios - WWU



Gas Demand Forecasting

GDN Project – Delta EE

Bethan Winter
System Operation Manager - WWU
October 2018



Long Term Forecasting Background:

Legacy processes assumed gas would continue to be used by similar customers for similar processes

Temperature as a key driver for gas usage

Sites forecast together based on size

Forecast GDP used as a driver for growth

Peak Daily Gas Demand derived from annuals

Process served us well:

Well understood

Consistent

Representative of reality

Key gaps considered in Phase 2

- 1. Consolidation of domestic measures
- 2. Locational impacts of demand
- 3. Electric and Gas Vehicles
- 4. Combined impact of Electric Vehicles and Heat Pumps
- 5. Review of annual to peak relationship
- 6. Future generation mix scenarios
- 7. Green gas injection
- 8. What if analysis on policy
- 9. Commercial / industrial analysis
- 10. Emerging technologies and business models

Key Outputs

- Demand change by component by year
 - Impacts on capacity investment incl. storage and compression
 - Peak, Storage and Annual
 - For a range of geographies
- Information on profiling within day for new load types e.g. Electric Vehicles
- Linkage between vectors e.g.
 - Electric Vehicle -> Electricity Generation -> Gas Fired Power Station
- Robust higher confidence forecasts in the short term ~ 10 years
- Consideration of sensitivities and scenarios for the longer term

EXAMPLE OUTPUTS













(PROJECT IS STILL IN PROGRESS)



Commercial demand future – breakdown by commercial sector

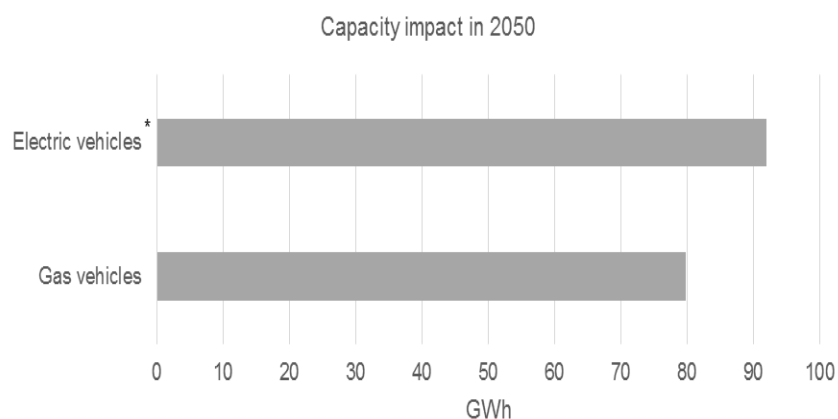
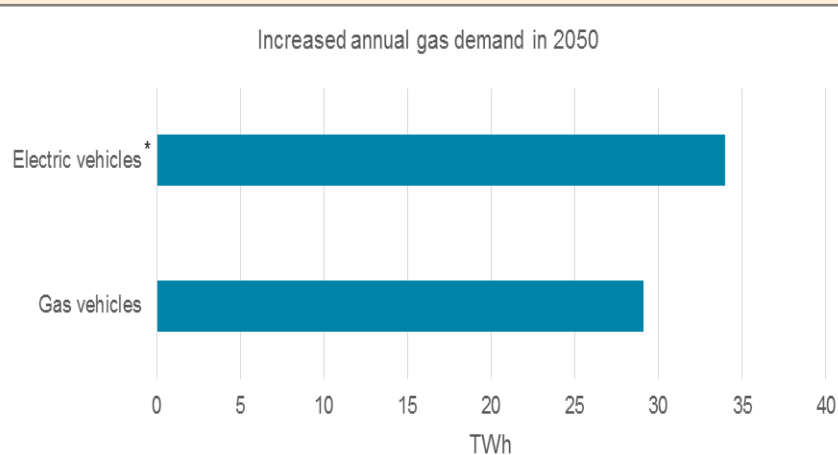
Key messages

- The table below summarises the expected changes within each commercial sector. Those sectors considered to have potentially most impact on gas demand are highlighted yellow. These sectors are looked at in more detail on the following slides. Please see appendix slide 29 for more detail on the factors that influence change in each sector.

Commercial sector	TODAY		Annual Market Growth (Floor space within a sector) (% / year)	Annual Improvement in Energy Efficiency for heating (% / year)	Primary Heat Technology and Potential Changes	Overall Change in Gas Demand – REFERENCE SCENARIO
	Total energy demand (TWh)	Gas demand (TWh)				
Education	26	16.4	 0.7% by 2030 0.3% by 2050	 1.2% by 2030 0.5% 2030-2050	- Gas boilers → <i>A larger shift in CHP and DH assumed due to projected demand from universities & larger schools. Assume for smaller schools more efficient boilers and some HPs</i>	 14% increase 2017-2050
Sources:	ECUK 2017		Delta-ee views based on construction industry reports e.g. Knight Frank Office Market 2018	Delta-ee views based on SMMT sustainability report 2015, ECUK historical energy use data	Delta-ee views based on ECUK 2017, SMMT sustainability report 2015	
Storage	21.4	6.5	 3.5% by 2030 1% by 2050	 0.5% by 2030 0.2% 2030-2050	- Gas boilers → <i>A large shift to HPs as technology of choice for warehouses, assuming lots of new buildings which will opt for low carbon heat generation</i>	 49% increase 2017-2050
Sources:	ECUK 2017		Delta-ee views based on construction industry reports e.g. Knight Frank Office Market 2018	Delta-ee views based on SMMT sustainability report 2015, ECUK historical energy use data	Delta-ee views based on ECUK 2017, SMMT sustainability report 2015	
Community arts & leisure	21	12.4	 0.1% by 2030 0.25% by 2050	 0.5% by 2030 0.2% 2030-2050	- Gas boilers  →   Gas CHP & HPs, larger shift to CHP assumed due to demand from leisure centres	 0.8% increase 2017-2050
Sources:	ECUK 2017		Delta-ee views based on construction industry reports e.g. Knight Frank Office Market 2018	Delta-ee views based on SMMT sustainability report 2015, ECUK historical energy use data	Delta-ee views based on ECUK 2017, SMMT sustainability report 2015	

Executive Summary: Gas demand considerable from gas vehicles

Gas vehicles' impact should not be underestimated: As can be seen below, forecasted numbers of ~243K gas vehicles have >80% as much impact on annual gas demand in 2050 and capacity impact in 2050 as ~27.5M electric vehicles.



*Based on an assumed 13% share of gas in the generation mix. On a cold day with no wind, we expect gas demand will increase roughly by a factor of 3.5

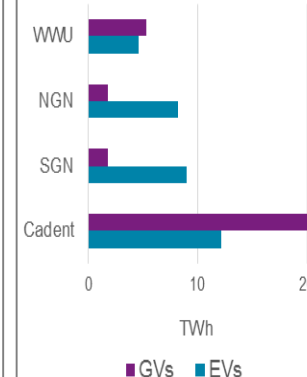
Greatest overall impact will likely be felt by Cadent

2050 likely combined EV and gas vehicle impact on:

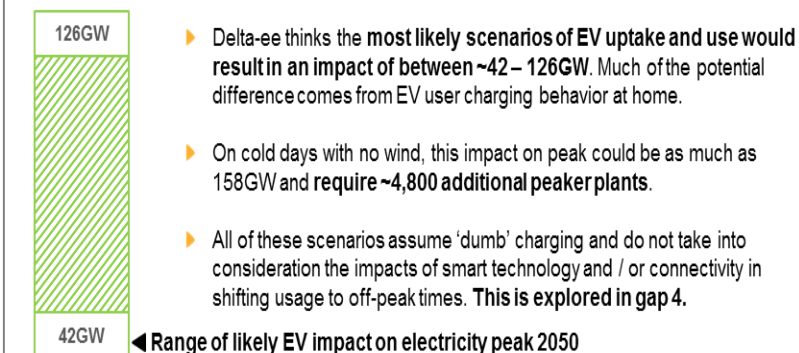
Cadent	SGN
▶ Annual – 32.5 TWh	▶ Annual – 10.8 TWh
▶ Capacity – 89.5 GWh	▶ Capacity – 29.6 GWh
▶ Storage – +~4.6 GWh	▶ Storage – +~3.1 GWh
NGN	WWU
▶ Annual – 10 TWh	▶ Annual – 9.9 TWh
▶ Capacity – 27.6 GWh	▶ Capacity – 27 GWh
▶ Storage – +~3.4 GWh	▶ Storage – +~1.8 GWh

Gas vehicles have greater impact than EVs in Cadent and WWU

Gas vehicle vs. EV annual impact:



Impact at daily electricity peak from EVs could be significant: If EV users tend to charge at home, during peak hours on a regular basis.

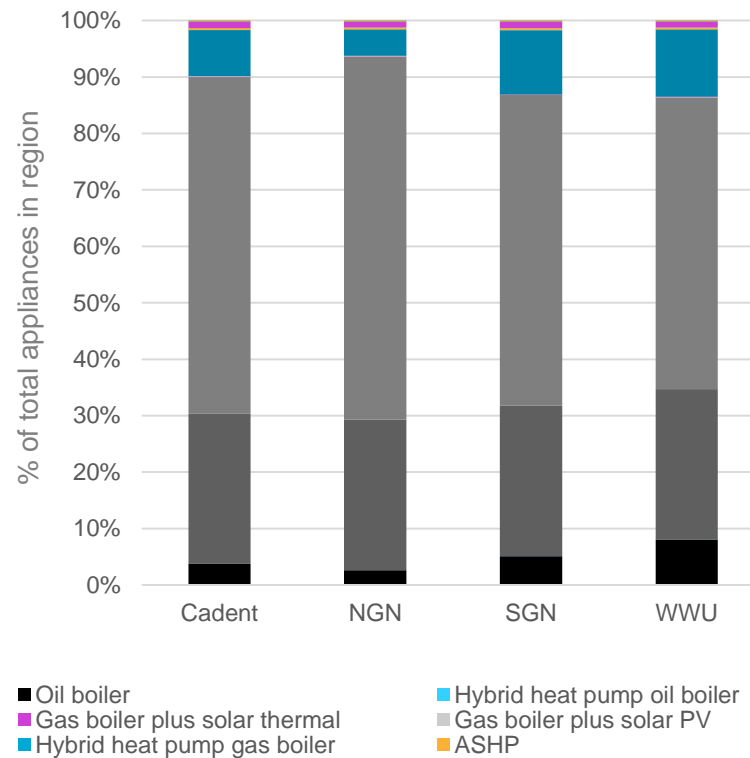


Changes in installed base are broadly consistent across the GDNs

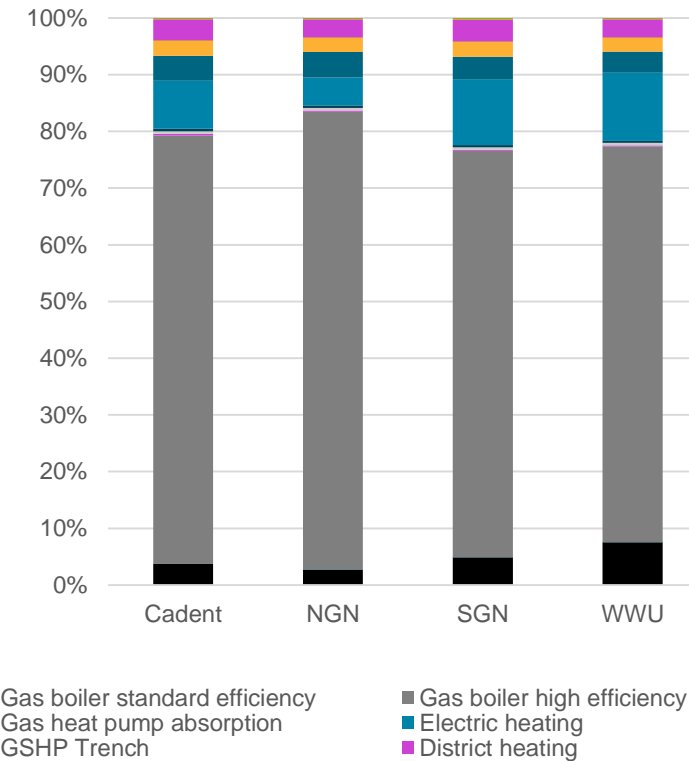
Key messages:

- ▶ The installed base of technologies is currently assumed to be similar across the four regions, with differences largely driven by the percentage of off gas grid houses in the region.

Installed base of technologies 2016



2030



Recommendations

- Review of data availability and sharing
 - More use of granular data by hour and location would improve results
- Better understand impacts on / limitations resulting from electricity network.
 - C&I grid connection constraints – could drive more CHP uptake?
 - Opportunity for collaborative piece of work on this? As a minimum share this study with DNOs?
- Generation mix - still uncertain – what can be done here?
 - What mix of generation needed to support the residential scenario? / C&I scenarios?
- Calculate Carbon impact

Conclusions and next steps

- Project completion
- Knowledge sharing with a wider range of stakeholders
- Further work to understand impacts on / limitations resulting from electricity network.
 - C&I grid connection constraints – could drive more CHP uptake?
 - Opportunity for collaborative piece of work on this? As a minimum share this study with DNOs?
- Impact on DNOs in ED2
- Use of data in current and new processes

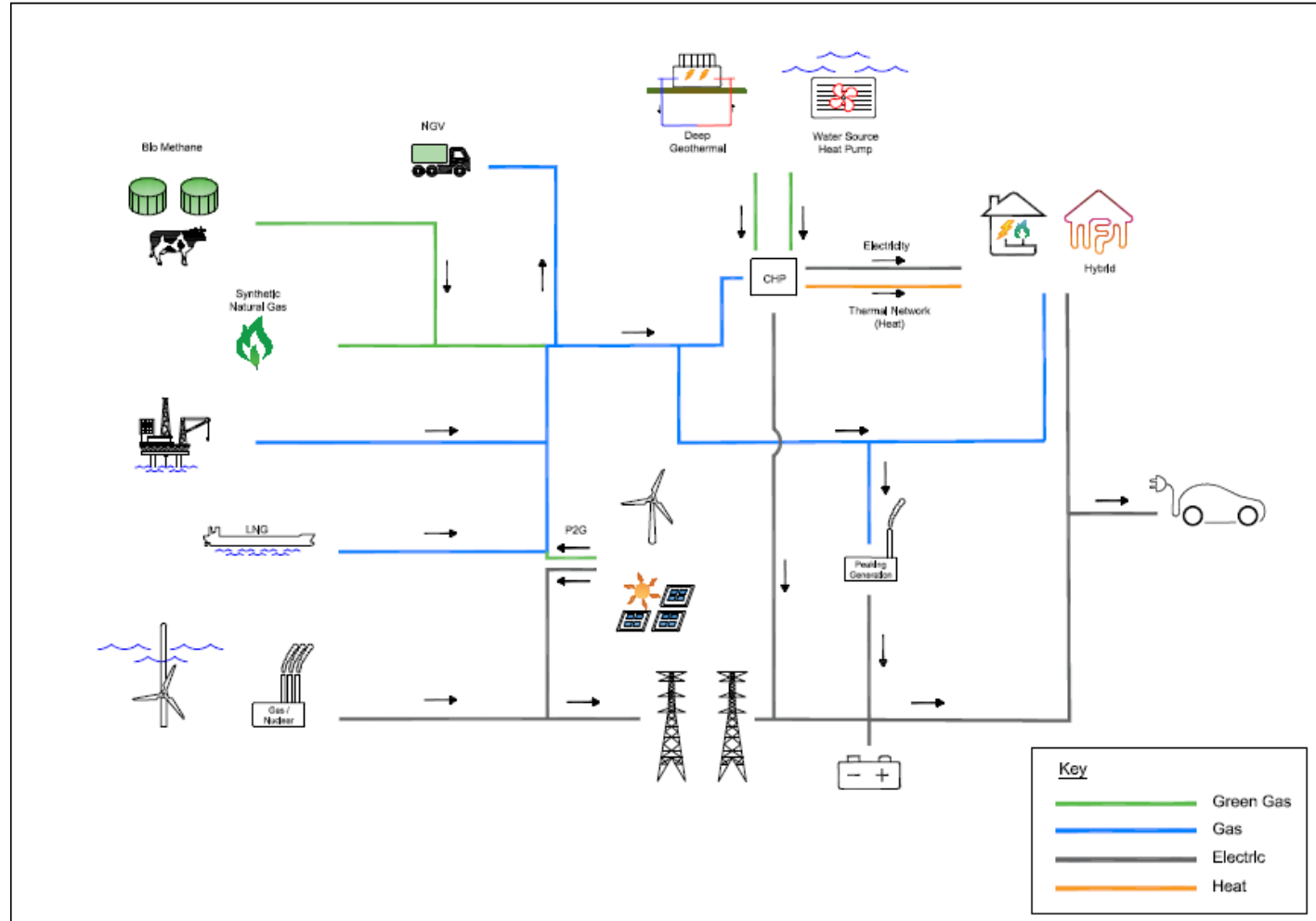
2050 Pathfinder – Whole System Simulator

Chris Clarke, @chrisclarkewwu
Energy Strategy Director



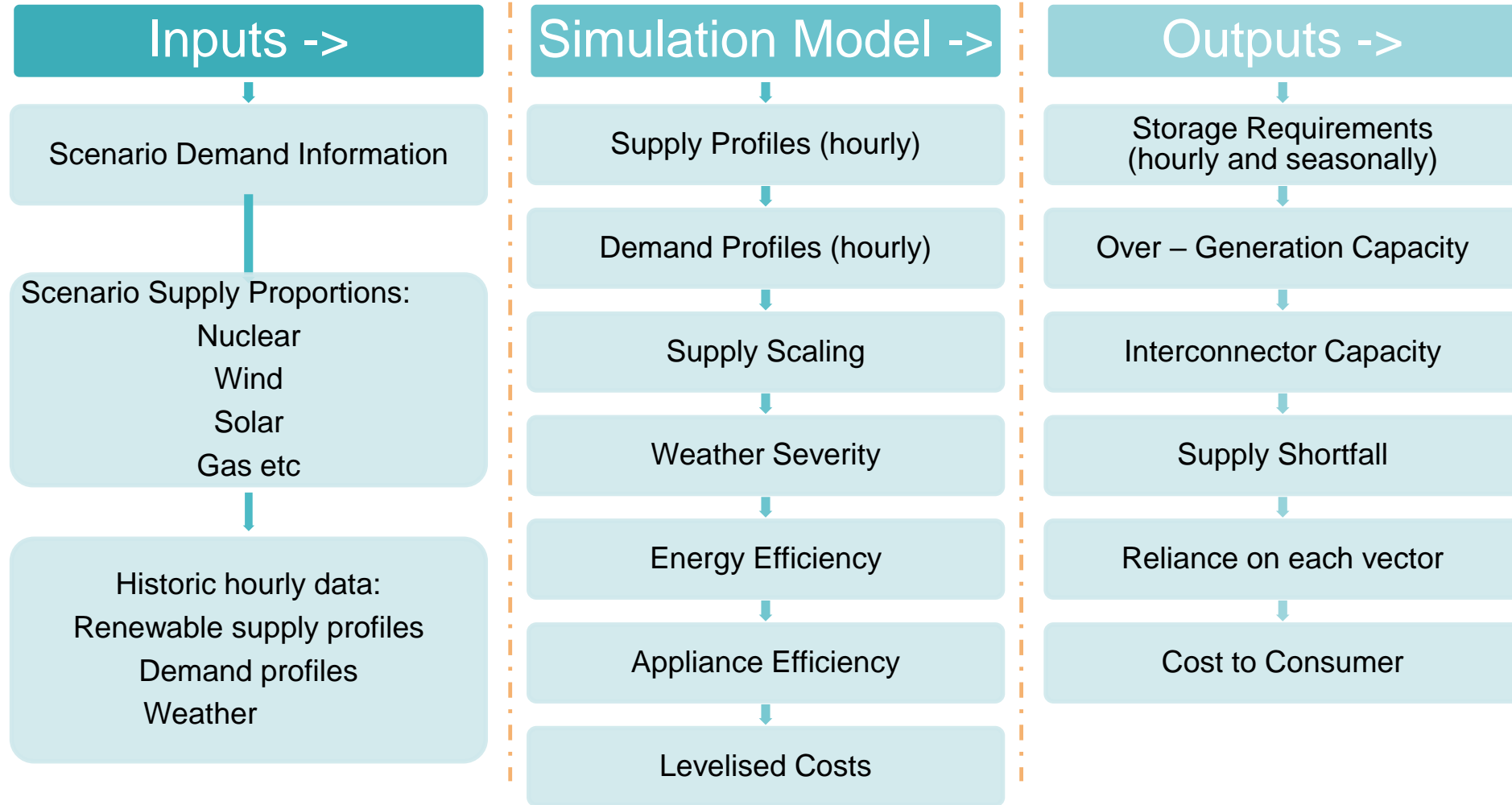
WALES & WEST
UTILITIES

Energy Network – last five years



Modelling this is the challenge

Combined gas & electric model



Application

- Pathfinder has been used in further external projects by 3rd parties:
 - IWA via Regen for the re-energising wales project
 - <https://www.regen.co.uk/wp-content/uploads/Swansea-Bay-City-Region-A-Renewable-Future-report-Final-v1.pdf>
 - See page 18
 - ZeroWest
 - http://www.bristolenergy.coop/uploads/8/0/3/6/8036407/a_west_of_england_model_for_low_carbon_energy_supply_and_demand.pdf
- And we are in discussion with a number of other parties including DNOs.

Validation and update

- Due to the interest in use of the model in 2018
 - Delta EE engaged to validate:
 - Calculations
 - Assumptions
 - Default parameters
 - And to provide a more 'user friendly' version for 3rd party use
 - WWU retain the IP

Simulator

- Fully transparent
- All hourly data incl. formula fully accessible
- No macros
- Considers a baseline and scenario
- Includes a flow chart to review any single hour

	Power Demand	Electric Vehicle Demand		Electric Heat Demand					
Date, Hour Start	Commercial and industrial light and power demand	Unconstrained vehicle electricity demand	Constrained vehicle electricity demand	Air source heat pump efficiency	Domestic direct electric heating demand	Domestic electrically powered heat pump demand	Domestic hybrid electricity/gas heat pump demand	Domestic hybrid electricity/oil heat pump demand	Domestic electricity/...
dd/mm hh:mm	MWh elec	MWh elec	MWh elec	(heat supplied)/ (electricity required)	MWh elec	MWh elec	MWh elec	MWh elec	MWh
01/01 06:00	14,394	7	1	2.70	1,480	219	219	55	
01/01 07:00	14,430	9	1	2.70	2,531	375	375	94	
01/01 08:00	14,719	15	2	2.70	2,851	422	422	106	
01/01 09:00	16,121	20	2	2.70	2,653	393	393	98	
01/01 10:00	17,463	23	3	2.70	2,586	383	383	96	
01/01 11:00	18,573	23	3	2.70	2,669	395	395	99	
01/01 12:00	19,199	23	3	2.70	2,662	394	394	99	
01/01 13:00	19,482	22	3	2.70	2,515	373	373	93	
01/01 14:00	19,540	22	3	2.70	2,419	358	358	90	
01/01 15:00	20,018	22	3	2.70	2,552	378	378	95	
01/01 16:00	21,677	24	0	2.70	2,933	434	434	109	
01/01 17:00	22,998	30	0	2.70	3,653	541	541	135	
01/01 18:00	22,308	28	0	2.70	3,877	574	574	144	

Cost Model

- Investment would be required as follows:
 - Cost of commodity (generation / gas)
 - Reinforcement of the electricity and / or gas distribution systems
 - Grid or local storage facilities (gas and electric)
- The following model is proposed for comparison with existing facilities:



- Costs which are excluded and have to be considered separately
 - Appliances
 - Insulation

Example outputs - Summary

Quick Results

Key results for the baseline and scenario (press F9 to update):

Last updated: 00:44 16/08/2018

	Baseline	Scenario	Units
Total annual electricity demand	268,111,389	268,111,389	MWh elec
Peak electricity demand	52,127	52,127	MW elec
Electricity shortfall - total annual	0	0	MWh elec
Total hours of blackout	0	0	Hours
Unusable electricity supply - total annual	0	0	MWh elec

Total annual gas demand	616,517,984	616,517,984	MWh gas
Peak gas demand	228,715	228,715	MW gas
Excess green gas supply - total annual	0	0	MWh gas

Total annual CO2 emissions	132,065,990	132,065,990	tonne CO2
Grid carbon emissions intensity	192	192	gCO2/kWh

Total annual household electricity bill	742	742	£/household/year
Total annual household gas bill	836	836	£/household/year

And others...

SWANSEA – WHOLE SYSTEM



Pathfinder demo

- Regen/Institute of Welsh Affairs - Swansea City Bay Region
- Aim for 'carbon neutral'
- Take the above scenario, then:
- Invest in
 - Grid Batteries
 - Insulation for homes
 - V2G and smart charging

Case Study – Swansea City Bay Region



Institute of Welsh Affairs - simulations

- Goal – carbon neutral via renewable generation;
- Decarbonise transport via smart charging E.Vs (V2G)
- Use of tidal lagoon; wind and solar
- Ambitious energy efficiency measures
- Simulator enablers:
 - Assessment of scenario
 - Comparison with baseline
 - Alternative scenarios

Live Demo

- Microsoft Excel

West Wales Case Study Results

	Baseline	Carbon Neutral	2040 Renewable	Gas back up (CCGT)	Green Hybrid
Smart EVs (Number)	500	110,000			
Efficiency	0%	20%			
Gas Boiler	80%	0%			
ASHP	2%	80%			
Hybrid	0%	0%			
Marine (MW)	0	320			
Solar (MW)	100	500			
Wind (MW)	100	500			
Storage (MWh)	0	3400			
Blackouts (Hrs)	0				
CO2 (Tonnes)	2,084,157	200,000			
Bill (£)	1,550				

West Wales Case Study Results

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Storage (MWh)	0	3400			
Blackouts (Hrs)	0	2028			
CO2 (Tonnes)	2,084,157	200,000			
Bill (£)	1,550	6,938			

West Wales Case Study Results

	Baseline	Carbon Neutral	2040 Renewable	Gas back up (CCGT)	Green Hybrid
Smart EVs (Number)	500	110,000	110,000		
Efficiency	0%	20%	12%		
Gas Boiler	80%	0%	65%		
ASHP	2%	80%	8%		
Hybrid	0%	0%	7%		
Marine (MW)	0	320	320		
Solar (MW)	100	500	1215		
Wind (MW)	100	500	1023		
Storage (MWh)	0	3400	6400		
Blackouts (Hrs)	0	2028			
CO2 (Tonnes)	2,084,157	200,000	673,753		
Bill (£)	1,550	6,938			

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Marine (MW)	0	320	320		
Solar (MW)	100	500	1215		
Wind (MW)	100	500	1023		
Storage (MWh)	0	3400	6400		
Blackouts (Hrs)	0	2028	7		
CO2 (Tonnes)	2,084,157	200,000	673,753		
Bill (£)	1,550	6,938	12,736		

West Wales Case Study Results

	Baseline	Carbon Neutral	2040 Renewable	Gas back up (CCGT)	Green Hybrid
Smart EVs (Number)	500	110,000	110,000	110,000	
Efficiency	0%	20%	12%	0%	
Gas Boiler	80%	0%	65%	65%	
ASHP	2%	80%	8%	8%	
Hybrid	0%	0%	7%	7%	
Marine (MW)	0	320	320	320	
Solar (MW)	100	500	1215	1215	
Wind (MW)	100	500	1023	1023	
Storage (MWh)	0	3400	6400	100	
Blackouts (Hrs)	0	2028	7	0	
CO2 (Tonnes)	2,084,157	200,000	673,753	860,035	
Bill (£)	1,550	6,938	12,736	2300	

West Wales Case Study Results

	Baseline	Carbon Neutral	2040 Renewable	Gas back up (CCGT)	Green Hybrid
Smart EVs (Number)	500	110,000	110,000	110,000	110,000
Efficiency	0%	20%	12%	0%	20%
Gas Boiler	80%	0%	65%	65%	0%
ASHP	2%	80%	8%	8%	10%
Hybrid	0%	0%	7%	7%	70%
Marine (MW)	0	320	320	320	320
Solar (MW)	100	500	1215	1215	500
Wind (MW)	100	500	1023	1023	500
Storage (MWh)	0	3400	6400	100	100
Blackouts (Hrs)	0	2028	7	0	0
CO2 (Tonnes)	2,084,157	200,000	673,753	860,035	368,362
Bill (£)	1,550	6,938	12,736	2300	1,700

Next Steps – Green City Vision – multi vector



Find the lowest cost pathway – GD2/ED2 impacts

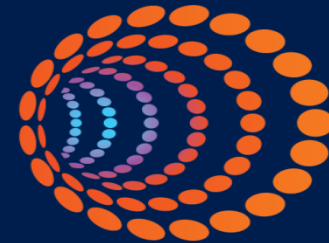


Heat projects

Are there specific uncertainties that the RIIO Innovation Schemes would not capture in relation to heat projects and how should they be treated by the regulatory framework?

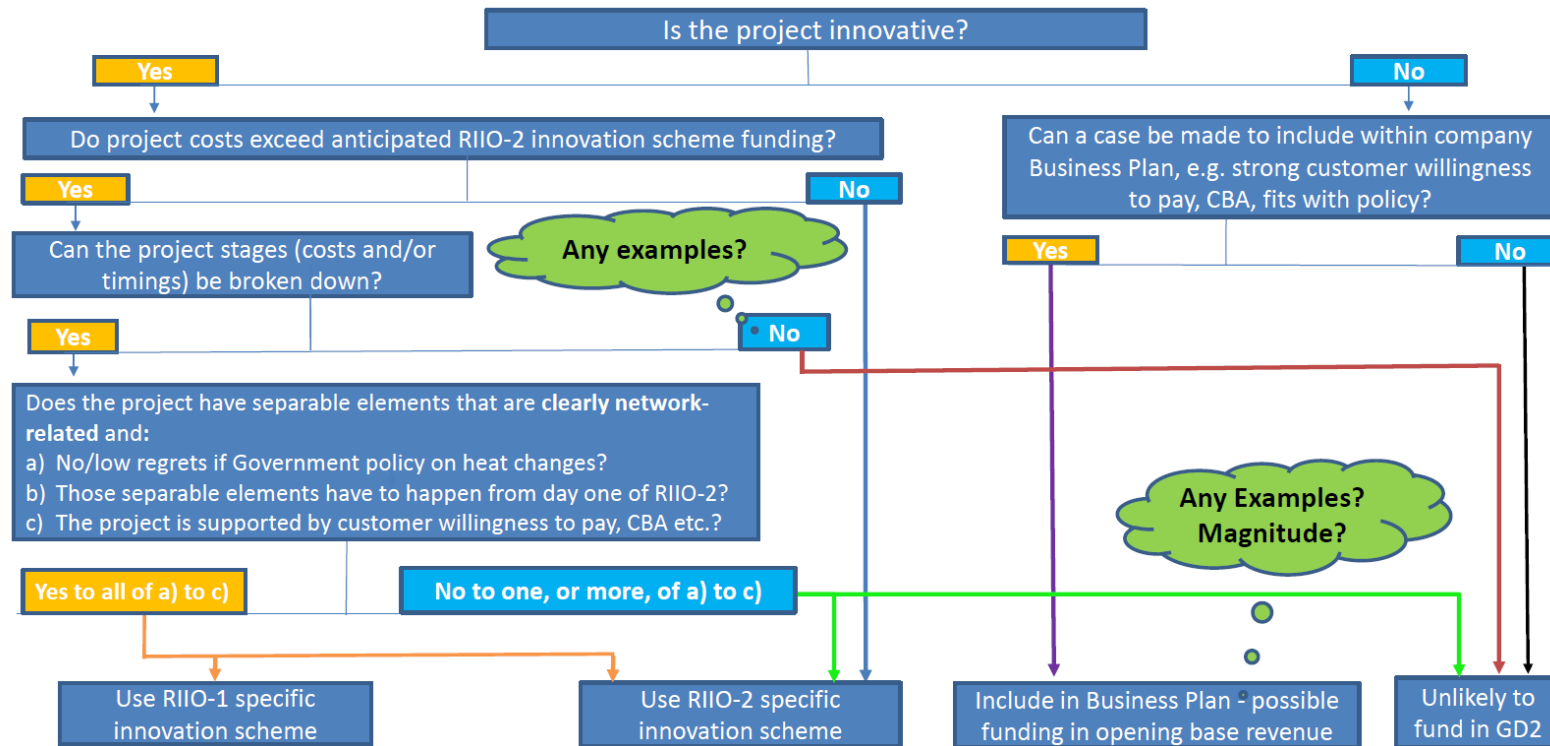


Innovation & Near Commercial Projects Decision Tree



SGN
Your gas. Our network.

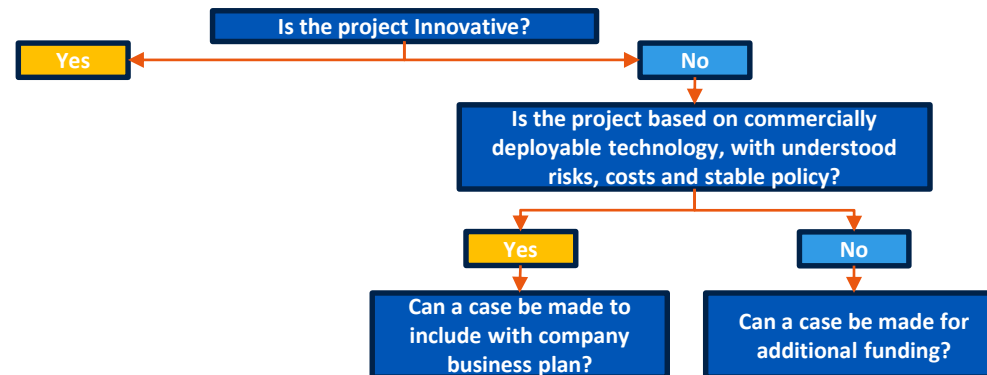
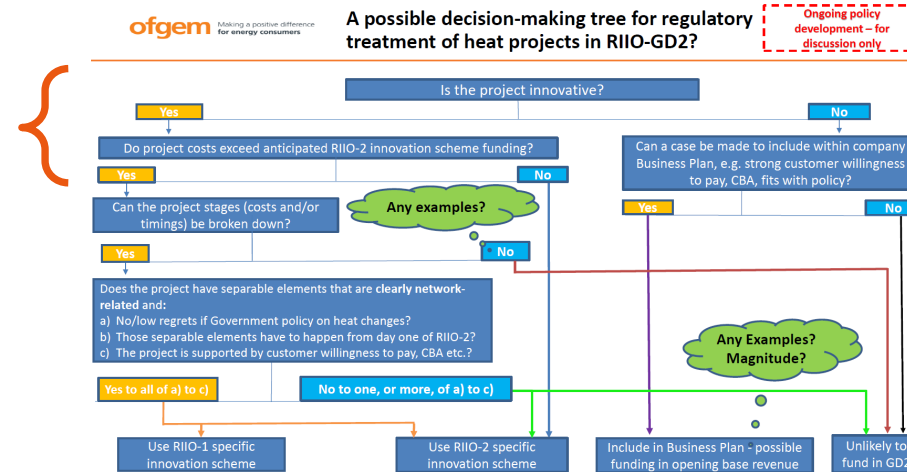
Original Decision Tree



1st & 2nd Level: Innovation

Near commercial projects

- Decision tree highlights a gap between innovation and business as usual projects.
- There is a category of projects at an early commercial stage that do not fit into either of these categories.
- These projects can be applied to a range of projects, not only heat (ie heat transport, biomethane enabling work, waste).
- These project are characterised by a higher level of uncertainty – Policy, Cost, Technical and Demand uncertainty
- Examples include supporting and responding to
 - Local Authorities desire for heat networks in MOBs
 - Regional Government clean air plans.
 - National heat strategies.
 - Changes in RHI / Biomethane policy
 - Zero emissions zones - eg City of London zero emission zone



1st & 2nd Level: Near Commercial Projects

Support for Near Commercial Projects

- These are hard to include in a BAU plan;
 - due to the risks identified
 - Rate of change in the policy landscape - networks should be enablers rather than blockers (having to wait to the next price control to engage)
- They may not be of sufficient scale to warrant a one-off RIIO-1 style reopener.
- The capital expenditure associated with an individual project may be £0.5 to £5m. With the majority of projects distributed around the £1-3m range.
- Propose that for these projects which have a high level of uncertainty surrounding them we should be able to secure funding either from an re-opener mechanism with a low threshold or a 'use-it-or-lose-it' funding pot.
- The advantage of the latter 'use-it-or-lose-it' funding pot is that it will present less of a barrier to investment and encourages networks to be responsive to stakeholder needs.
- Uncertainty surrounding the projects eligibility for a re-opener (due to size threshold) or qualifying criteria (ie an innovation fund) then it will discourage networks from being responsive to stakeholder needs.
- We don't think that the projects can be sufficiently defined in 3 to 7 years in advance (allowing for plan submission in advance of a 5 year price control) to suitably define in a price control deliverable.

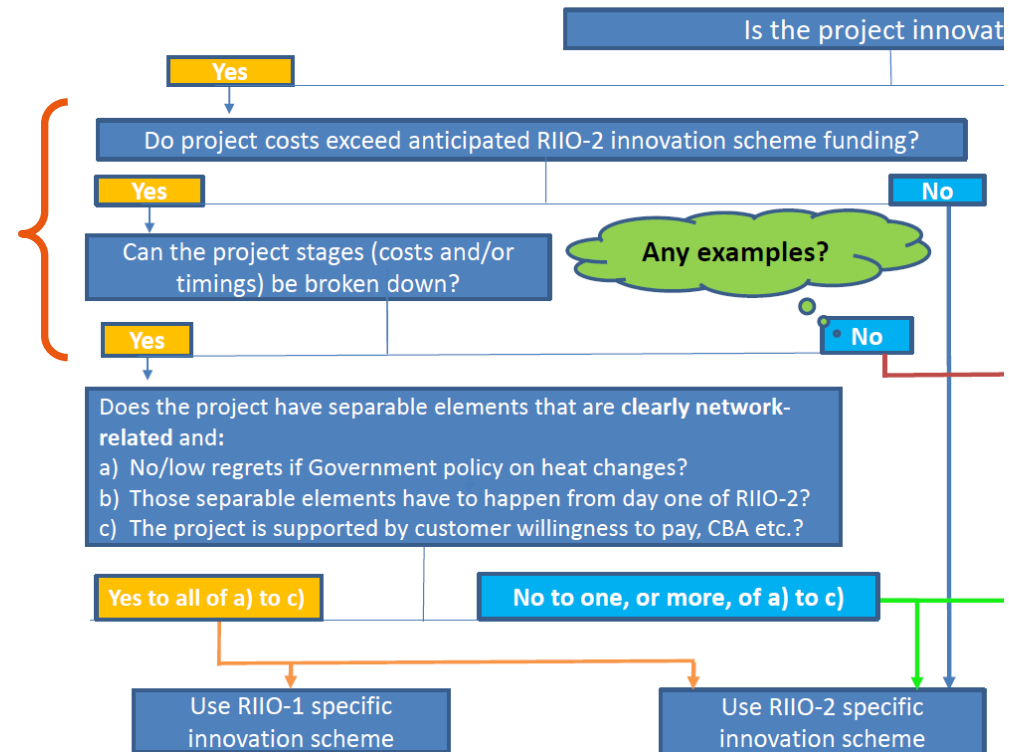
2nd & 3rd Level: Large Projects

Large Projects

- There is an important distinction is set according to whether the project can be broken down.
- We believe there aren't many examples where a project can not be broken to some degree. However, benefits case will depend on the full project being completed.
- Breaking down the project is likely to align with progress decision stages and the benefits case will also evolve in each of those stages.
- Large projects are likely to span more than one price control period from inception to completion.
- Front-end design and project work for delivery can cost £ms and may need to be carried out in a different price control period to delivery.

ofgem Making a positive difference for energy consumers

A possible decision-making treatment of heat projects



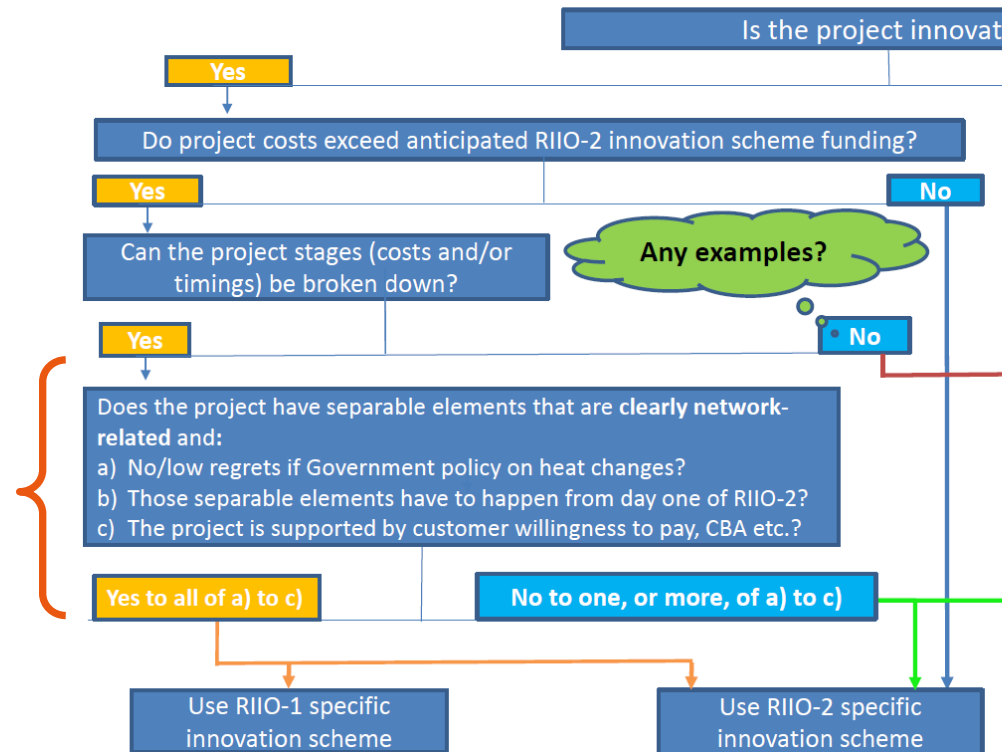
4th Level: Assessment

Assessment

- We are not clear on the bullet points and whether they are appropriate.
- 1st bullet point – No regrets
 - What is the appropriate time frame for a government policy change risk to be considered? (nb after 15 years most values will be heavily discounted)
 - Should be evaluated at each stage according to the value at risk.
- 2nd bullet point – Separable elements
 - Does this mean any that large project has to be identified in the business plan to secure funding? Is this appropriate and what is the level of definition required?
- 3rd bullet point – supported by WTP
 - Is this appropriate for a strategic project that is driven by government objectives?
 - The complexity of the project means an effective assessment needs to be undertaken by informed stakeholders.



A possible decision-making treatment of heat projects



Lunch

Connections

Consider why and how (through regulatory mechanism(s)), different connections could be supported by RII02. What potential regulatory barriers are there?




24th October 2018

Wales & West Utilities Gas Entry


Chris Clarke
Energy Strategy Director




Why is biomethane/syngas/shale entry important?



Decarbonising heat is essential if UK is to meet its Climate Change Act obligations




85% of households use gas to heat their homes therefore decarbonising gas supply chain is essential



WWU has 19 biomethane plants connected providing enough gas for 127,000 homes



Estimates indicate over 100TWh per annum of green gas could be feasible.



Shale could provide the back up energy for power generation instead of relying on imports and provide feedstock for hydrogen cities.

If we don't use the gas network what are our options?

If we don't use the gas network to heat homes then the options are:

- **Electricity** for which the marginal generation source will be coal/gas plus need to reinforce electricity distribution systems
- **Heat networks** for which heat source is probably gas
- **Biomass** – air quality and feedstock issues
- **Hybrid heat pumps** which also use gas network for green gas

Moving to alternatives to the gas network will be disruptive and costly for consumers

There is also the cost of decommissioning the gas network

Ofgem statutory duty (Gas Act 4AA)

The principal objective of the Secretary of State and the Gas and Electricity Markets Authority (in this Act referred to as “the Authority”) in carrying out their respective functions under this Part is to protect the interests of existing and future consumers in relation to gas conveyed through pipes.

- (1A) Those interests of existing and future consumers are their interests taken as a whole, including—
 - (a) their interests in the reduction of gas-supply emissions of targeted greenhouse gases;
 - (b) their interests in the security of the supply of gas to them; and
 - (c) their interests in the fulfilment by the Authority, when carrying out its functions as designated regulatory authority for Great Britain, of the objectives set out in Article 40(a) to (h) of the Gas Directive.

What have we done to facilitate green gas entry?

At no additional cost to consumers...

- We manage pressures on 13 governors to facilitate green gas entry
- We have utilised other work on the network to increase our network size and accommodate biomethane plant injects

Nonetheless we estimate that...

- Eight schemes have not connected at all due to lack of capacity
- Other sites did not connect due to pipeline distances. *Though they might have been able to had compression been an option at the time

In GD2 we could have another 20 green gas plants connected to our network providing enough gas for a further 642k homes.

We will need to invest in our network to achieve this.

Indirect barriers to green gas entry...

Some barriers are not directly related to networks:

- Technical issues such as propanation. These are being explored
- Uncertainty over RHI after 31st March 2021 makes it difficult for developers to commit to future schemes

Direct barriers to green gas entry...

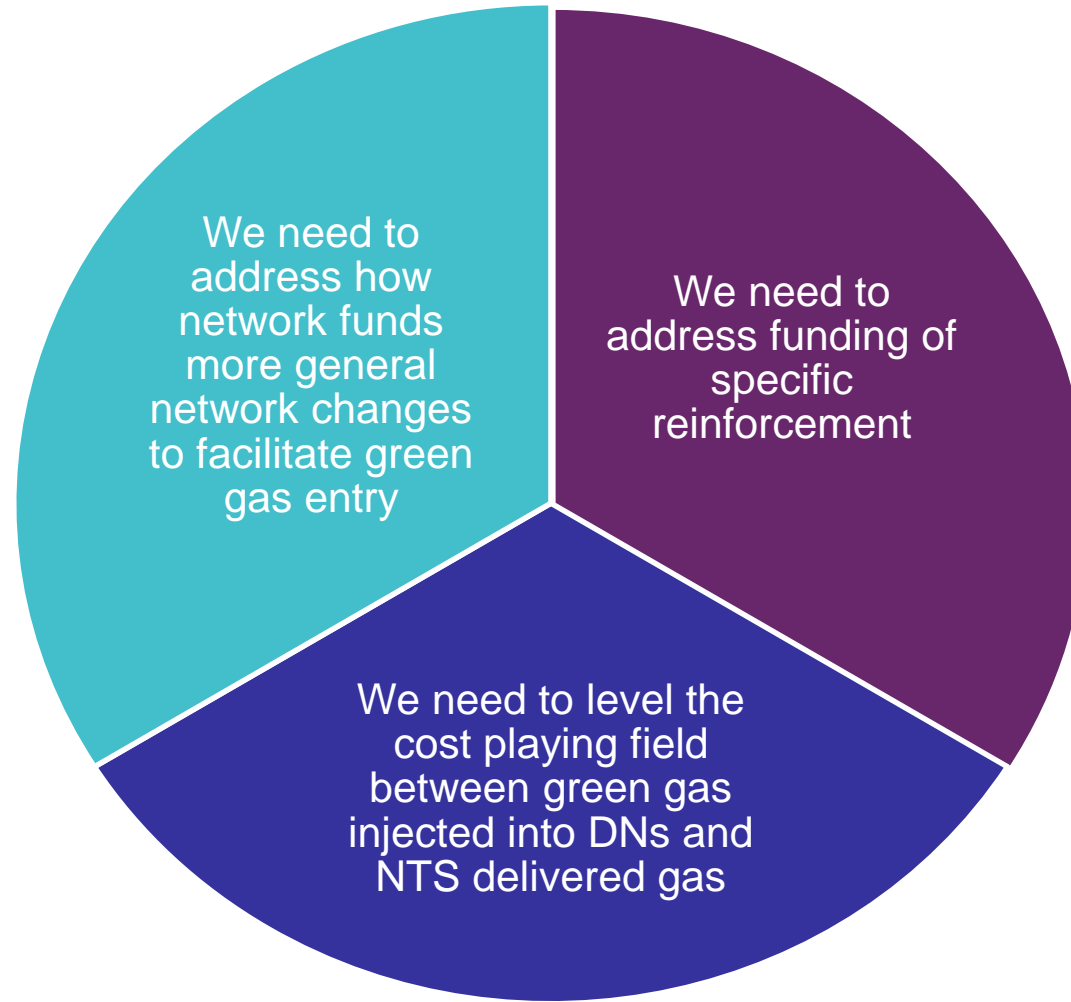
Specific reinforcement is required for some schemes to provide capacity (compression back up system or daily storage)

- No equivalent of exit Economic Test which would support specific reinforcement for entry connections
- Biomethane connections have not proceeded due to need for reinforcement

When carrying out other necessary works it will not always be possible to incorporate changes at no cost, making networks more accessible for green gas entry.

When we get to about 30% green gas we will need seasonal storage if green gas is injected on flat profile throughout year

So what is required?



Possible regulatory mechanisms to address barriers?

- 1) Introduce Economic Test for entry Req A
- 2) Change commercial arrangements to transfer Shipper credit to Green gas provider Req C
- 3) Direct funding via GDN to support each connection (based on criteria) Req B, and A if (1) not used
- 4) Upfront use or lose it pot (based on criteria) Req B, and A if (1) not used
- 5) Low carbon incentive based on volume of low carbon gas injected Req B and A if (1) not used
- 6) GDNs owning some of the upstream assets such as Grid Entry Unit Req C
- 7) Volume driver (funding per connection) Req B, and A if (1) not used

Summary of options

Option	Advantages	Disadvantage	Develop
1) Develop Economic Test for entry	Provides funding for specific reinforcement	Removes Shipper credit	Yes
2) Pass Shipper credit to green gas producer		No direct mechanism to do this	No, prefer option 1
3) Direct funding via GDN for each connection approved for each connection based on criteria	Has clear criteria	Adds another step in process Only indirectly drives volumes of green gas	No, prefer options 4 or 5
4) Upfront use it or lose it pot based on criteria	Has clear criteria Doesn't have approval stage of option 3	Might be limited to reinforcement	Yes
5) Low carbon incentive based on volume injected	Directly rewards higher volumes based on benefit of decarbonisation Not a specific incentive could result in various changes		Yes
6) GDNs own upstream assets such as Grid Entry Unit	Reduces cost to producers and socialises cost to consumers	Licence restrictions on gas production	Yes
7) Volume driver (funding per connection)	Not a specific incentive could result in various changes	Only indirectly drives volumes of green gas	No, prefer option 5

Recommendation

Develop options

- No. 1) Introduce Economic Test for entry
 - This will provide support to fund specific reinforcement for entry
- No. 6) GDNs owning some of the upstream assets such as Grid Entry Unit
 - This would make DN entry consistent with entry from the NTS

Plus either...

- No. 5) low carbon incentive based on volume of low carbon gas injected; or
- No. 4) Upfront use or lose it pot (based on criteria)
 - This will provide a method of funding network improvements to support further green gas injection

APPENDICES

More detail on each option



WALES & WEST
UTILITIES

1) Current arrangements – no ET for entry

- If gas enters system into medium pressure tier for example then that gas flows down the system and does not use higher pressure tiers
- Currently the Shipper gets a credit each year for the charges for the parts of the system this gas does not use
- As Shippers only pay for transportation to exit customers the credit appears as a reduction from the Shipper's exit charges
- If a new entry connection requires network reinforcement they pay all the cost, there is no Economic Test for Entry because there is no transportation revenue from Entry to set against the cost of reinforcement

1) Economic Test for entry

- Remove the credit paid to Shippers each year and use as a revenue stream to use in an Economic Test for entry
- 300m³/hour Load factor 80% gives 23GWh a year, typical credit for SW LDZ 0.05 to 0.1p/kWh discounted over 20 years is £150k to £300k
- Requires UNC modification could start as soon as modification implemented do not need to wait for start of GD2
- Incorporation of Carbon benefit into Economic Test requires reinterpretation of “Economic” legally not straightforward
- Assume change to Gas Act section 9 not achievable in time

1) Is ET proposal Gas Act compliant?

- Gas Act requirement for connections that they are Economical for exit customers
- Current arrangements
 - If new entry site then Shipper gets credit for entry volumes
 - Exit customers pay a bit more to fund this rebate
- Proposed arrangements
 - If new entry site then as there is no rebate exit customers pay less than currently
 - If reinforcement required then Economic Test for entry used. Maximum reinforcement funded equals NPV of future value of credit. This goes into RAV and results in increase in transportation charges equal to current credit
- With proposed arrangement exit customers no worse off than currently and so it is Gas Act compliant

2) Pass Shipper credit to green gas producer

- No direct mechanism to do this
- Shipper has contract with producer so we would expect value of credit to be reflected in payment producer receives for gas
- Option 1 seems a better approach if there is to be a change to treatment of Shipper credit

3) Direct funding GDN for each connection

- Need to develop criteria to assess what spend is justified
- Decision to proceed with connection would depend on whether GDN funding approved so may add delays
- More connections do not directly lead to higher volumes of green gas

4) Upfront use it or lose it pot for reinforcement

- Would provide funds to draw on to fund investment to support green gas entry
- Subject to criteria to be developed
- Justified on a case by case basis

5) Low carbon incentive for DNs based on volume injected

- Directly incentivises increased volumes of green gas
- Incentivises GDNs to encourage green gas entry but is not specific
 - Could drive easier connections process
 - Network changes to enable more to be injected
- Could drive virtuous circle of green gas injection providing funds for investment that results in more green gas injection

5) Possible incentive

BEIS updated short-term traded sector carbon values for policy appraisal in real 2017 terms, £/tCO₂e

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/671194/Updated_short-term_traded_carbon_values_for_appraisal_purposes.pdf

Year	Low	Central	High
2017	0.00	4.13	4.79
2018	0.00	4.19	6.51
2019	0.00	4.37	7.92
2020	0.00	4.56	9.83
2021	3.97	12.05	20.76
2022	7.91	19.53	31.69
2023	11.83	26.99	42.63
2024	15.73	34.45	53.56
2025	19.60	41.90	64.49
2026	23.46	49.34	75.42
2027	27.29	56.77	86.35
2028	31.12	64.20	97.28
2029	34.93	71.62	108.21
2030	39.72	79.43	119.15

We can calculate value of kWh of biomethane or syngas in terms of CO₂ abated, this about 0.085p/kWh using central 2017 price or 1.64p/kWh at central 2030 prices

Using same volumes as for Economic Test example this would be worth £2M in 2017 alone

Network would then be allow to invest a **share** of this benefit to use for further network enhancements to support further renewable gas injection and decarbonisation of gas supply chain

6) GDNs own Grid Entry Unit

- Analogy GDNs own NTS offtakes
- GDNs would not own whole of green gas facility only the entry facility
- Grid entry unit typically costs £450k
- Cost (together with GDN owned entry facilities) would go into RAV and be paid for by generality of customers
- Licence restrictions (A36) on transporters producing gas would need to be relaxed

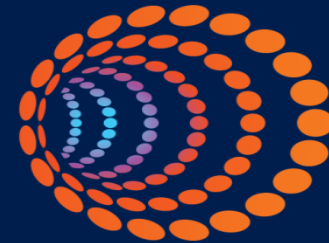
7) Volume driver - increase in allowed revenue for each connection

- Incentivises GDNs to encourage green gas entry but is not specific
 - Could drive easier connections process
 - Network changes to enable more to be injected
- More connections do not directly lead to higher volumes of green gas

Adjustment to connections process –

Strawman

Peaking Generation



SGN
Your gas. Our network.

Basic Structure

Proposed Change	Rationale
Re-inforcement to be based on a modified forecast year 5 model (FY5)	<ul style="list-style-type: none"> - Current analysis model used is forecast year 1 (FY1) and connection capacity study analysis does not reflect committed capacity with a longer lead time (FY5 or greater). - Moving to a modified FY5 provides a more accurate reflection of actual capacity available and lead times to any major reinforcement work.
Modified FY5 model to run on actual capacity bookings.	<ul style="list-style-type: none"> - Current year 5 model includes a reasonable expectation of capacity changes over the period. - Modified FY5 will include committed capacity but exclude forecast potential
Bring forward connection dates where possible	<ul style="list-style-type: none"> - Where no reinforcement is identified at FY5, connection could be brought forward as capacity is available. - Where reinforcement is identified it maybe is possible to bring forward connections – for example if there are shorter lead times for reinforcement work.
Deposit / letters of credit on capacity agreement to the value of [20%] of total cost.	<ul style="list-style-type: none"> - Currently no deposit is payable, so reinforcement work can be completed without commitment by the customer to utilise that connection. - Deposit / Letter of credit / PCG (or equivalent) on a proportion [20%] of the total cost of the reinforcement cost above a defined threshold [£500k] to protect the customer from no-shows (proposed that the deposit should be against the full cost - customer charge and socialised charge). - If customer withdraws they recover the deposit minus cost expenditure (design and capital costs)

Basic Structure

Pros	Cons
<ul style="list-style-type: none">• More accurate reflection of actual connection cost• Greater protection for consumers on socialised costs• Greater protection for customer that have longer lead time / phased projection.• Greater visibility for the purpose of network planning• Maintains the principle of non-discrimination.• Avoids complexity of changing the economic test	<ul style="list-style-type: none">• Require a separate run of the FY5 model without expected capacity & associated resource requirement.• Introducing appropriate processes surrounding the letter of credit / deposits.• A 20% deposit may not give sufficient protection for all costs incurred.• Requires an additional model set of analysis (using existing models).• T&Cs of connection agreement may need to be update (this may be necessary anyway)• Doesn't resolve all the timing issues around the SCJ

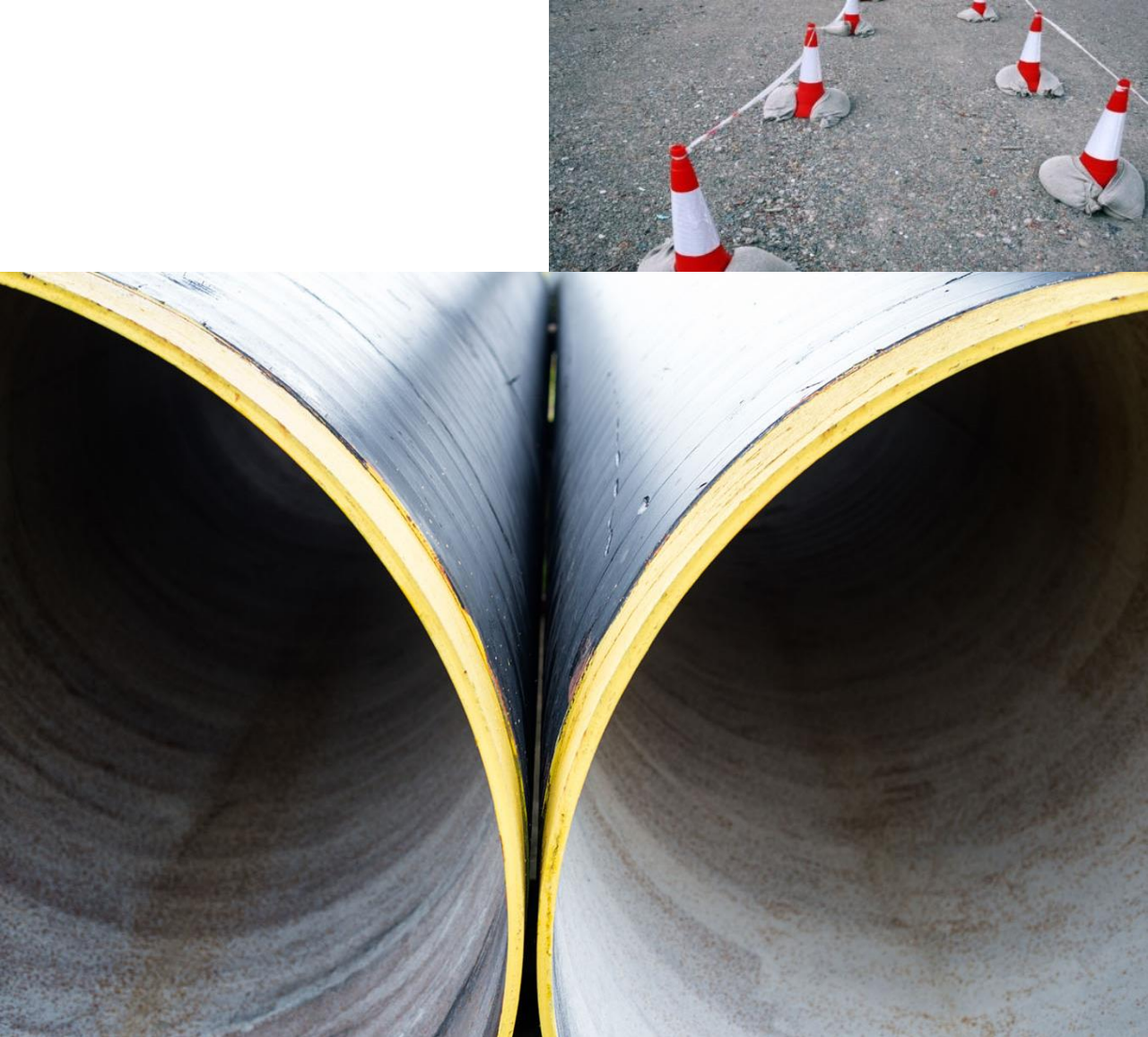
What would need to change

Changes required

- Most changes can be accommodated within the existing 4b Statement
- Check would need to be made against NP14 (Adoption process)
- Deposit may require some replication of PARCA (currently set out in the UNC – para 45) or ARCA processes.
- No changes to the economic test (unless a lifetime reduction is proposed) .
- May need to check the original Transco Connection Policy documents to confirm whether we are aligned with the original principles.

Reminder of the constraint

- Gas Act 1986 (Section 9)
 - (2) It shall also be the duty of a gas transporter to avoid any undue preference or undue discrimination: -
 - (a) in the connection of premises or a pipe-line system operated by an authorised transporter to any pipe-line system operated by him; and
 - (b) in the terms of which he undertakes the conveyance of gas by means of such a system.



Off Gas Grid Decarbonisation
RIO2 Ofgem Stakeholder Workshop
24 October 2018

Stuart Easterbrook
Future Gas Strategy Manager

Driver for change?

Government are currently reviewing how to decarbonise high carbon fossil fuelled domestic heating systems and may publish their plans in the next few months.

An argument the energy networks have submitted to BEIS is that for a community, a holistic whole system approach should be taken and the preferred option for the community as a whole identified.

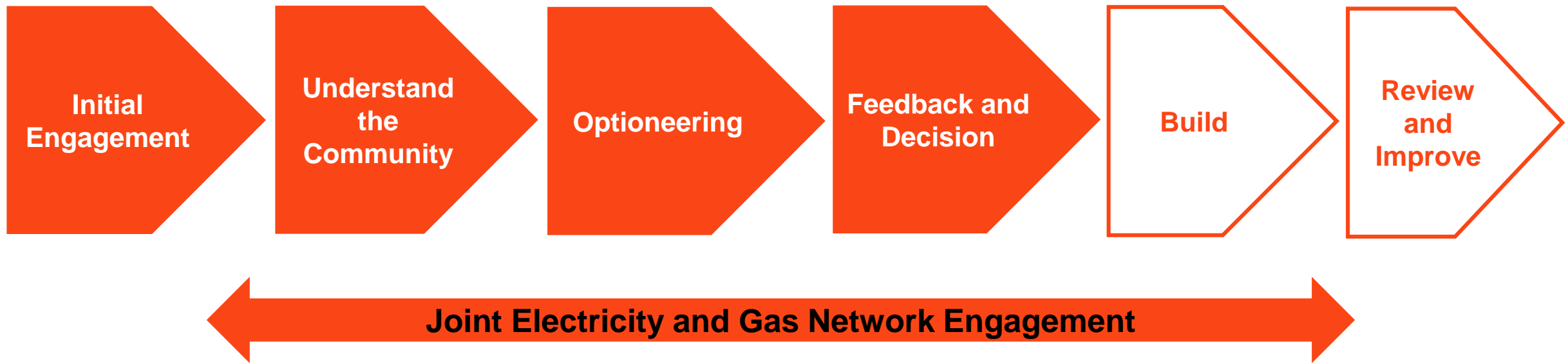
How different decisions on policy, drive change for RII02:

Oil / Coal Boilers Banned from 20XX (Non Specific)	Oil / Coal banned and rules defined for when gas grid should be extended (Specific)
Revised economic test where gas network extension built if it can be demonstrated to the preferred option against next best.	Policy/legislation sets out what is paid, who does what and who pays. Licences and charging statements aligned.
Networks to consult on pricing regime to define new test.	RIIO2 includes capex and opex to support + ability to offset government funding
RIIO2 includes capex and opex to support + ability to offset government funding	
COMMUNITY ENGAGEMENT	

Process

Assumption

Approach would be via development and engagement to deliver whole community solutions.



What is role of Suppliers when connecting to gas for the first time?
Default community supplier for whole community – time limited?

Off gas grid network extensions in RII02 (Specific policy)

Assumption: Government policy to decarbonise high carbon fossil fuelled domestic heating systems will support extensions of the gas grid to communities where it is demonstrated that this represents the least cost option to reduce carbon emissions.

Policy and legislation will set out how the extensions and conversions will be delivered, how it would be funded, and who would undertake the work

RIIO2 Framework would need to accommodate:

- Funding for any stakeholder engagement to apply government test, complete optioneering with communities, and recognising that many schemes may not result in a gas connection. **Flexible funding per household**
- Engagement through construction and handover (to suppliers?)
- Flexible funding for network extensions including services and any other “new” in scope works e.g. replacing boilers: **Flexible structured revenue driver**
- Ability to net off government funding – **Factor in revenue formula**
- Networks to consult on new pricing methodology (4B and transportation)

**Winter
2018/19?**

Off gas grid network extensions in RII02 (Non-specific)

Assumption: Gas network extensions will be constructed to off gas grid communities where it is demonstrated that this represents the least cost replacement option to reduce carbon emissions over the next [10] years (subject to a minimum threshold)

Consumers pay any costs above the cost of the next best alternative

Cost comparison to include (NPV where ongoing rather than one off):

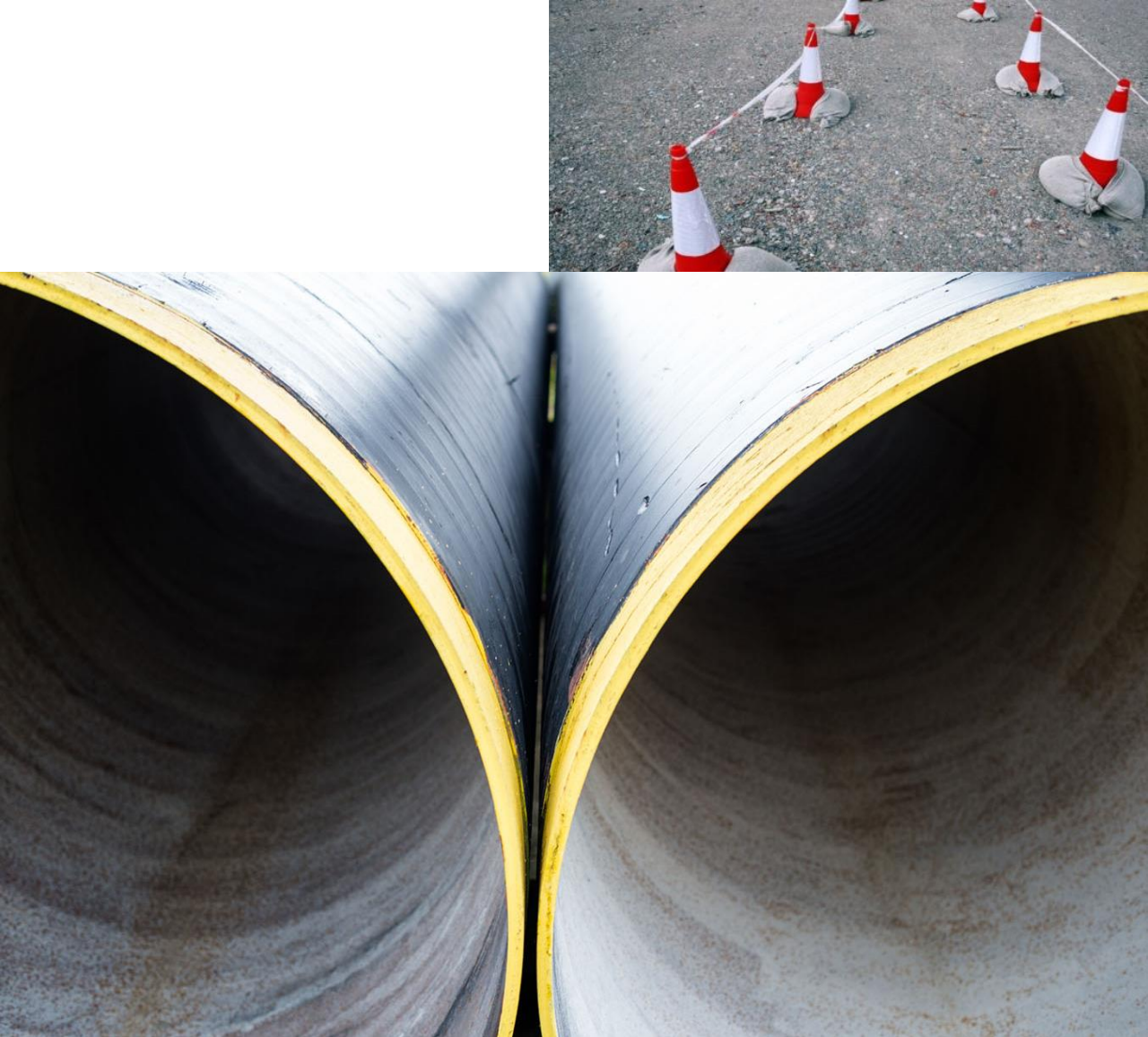
- Energy Network connection and reinforcement capital costs + NPV of opex
- Indirect network costs
- NPV of consumer energy costs
- Cost of heating system replacement
- Cost of insulation to premises (EPC Rating and/or guaranteed minimum °C)
- Incremental cost of energy production and cost of carbon emissions
- Adjustment to reflect wider future benefits e.g. new developments, EVs, green gas

RII02 requirements as Specific above

Engagement and Consultation (Non-specific)

- Engagement with individuals on the ground in their communities and understand what they would want and when e.g. mains+service+boiler on day 1, mains+service, mains only? Assume fair degree of customer choice will be fundamental.
- GDN NIA Project under development – to inform how individuals and communities would approach and prioritise their the options.
- New economic test to be constructed and consulted on – part of Condition 4B Connection Charging Methodology Statement.
- Role of suppliers and IGTs would need to be considered.

**Change is driven by Government policy,
but highly likely to be ahead of RII02**



Off Gas Grid Decarbonisation RIIO2 Ofgem Stakeholder Workshop 24 October 2018

*Stuart Easterbrook
Future Gas Strategy Manager*

Cadent
Your Gas Network

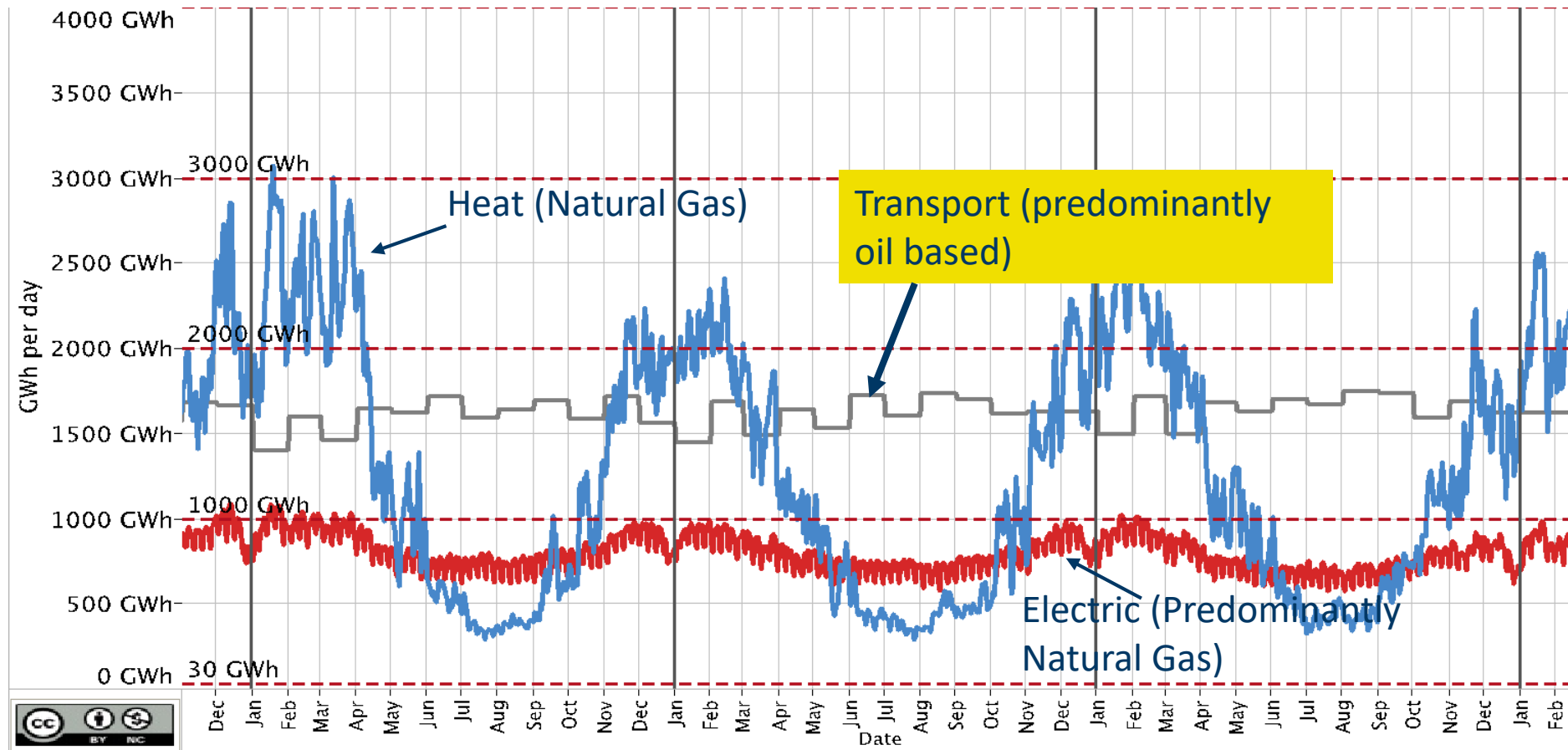
Exit connections to support decarbonisation of Transport

Nick Phillips – Northern Gas Networks



Decarbonise Transport - why?

Over 1,500 GWh energy daily from hydrocarbon fuels



grant.wilson@sheffield.ac.uk

2013

2014

2015

Improving air quality is a more immediate outcome and could be influenced by regional government policy

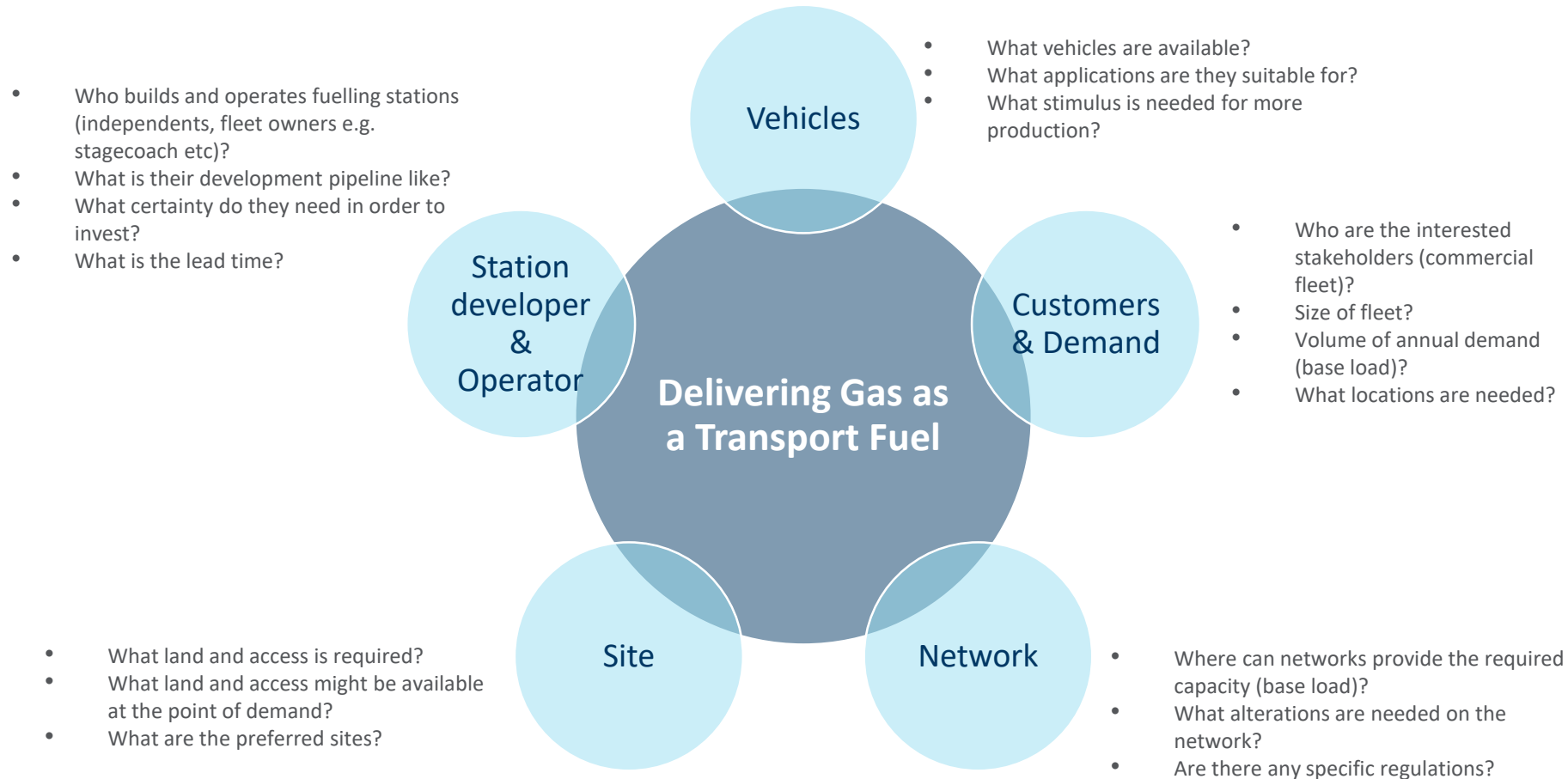
Decarbonising Transport – how?

The role gas can play

- CNG fuel vehicles
 - large commercial and Heavy Good Vehicles
 - Improve air quality
- Hydrogen fuel cell electric vehicles
 - Remove carbon emissions
 - Improve air quality
- Supply gas for additional electricity to support EVs
 - To be determined through 2030 cross sector single scenario work with DNOs
 - Currently only viable for small vehicles
- Hydrogen for non-electrified rail
 - Early concepts and discussions
 - Remove carbon emissions & improve air quality

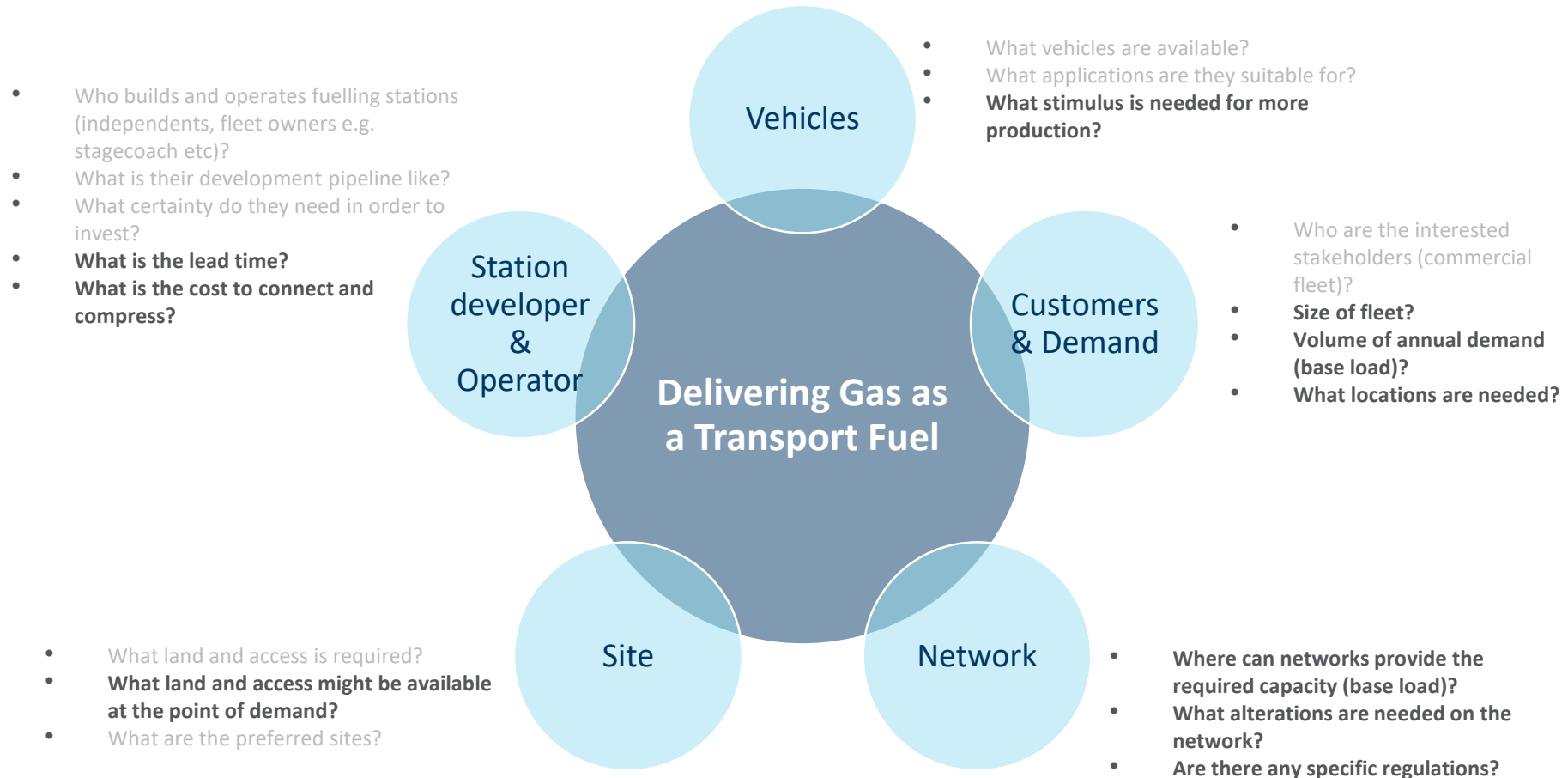
Challenges to Gas as a Transport fuel

A wide range of factors and stakeholders



What can the networks help with?

Be a facilitator not a blocker



Role of the networks

Helping the creation of low carbon infrastructure to displace traditional carbon intensive alternatives

Improving the following is dependent on funding mechanisms in the GD2 framework:

- Making capacity available – reinforcement & storage
- Reducing cost of connection – all pressure tiers
- GDN role in compression – going beyond the connection
- Access to land – site rationalisation/reconfiguration

Independent of GD2 framework networks can work to improve:

- Application and delivery process
- Standards of Service and lead times

The alternative is for GDNs to view these in the same way as every other exit connection

Role of the networks

Being a facilitator and catalyst

Improving the following is dependent on mechanisms in the GD2 framework:

- Helping to identify demand
 - Regional commercial fleet operator engagement
- Creating regional plans with investors/operators
 - Create regional plans for CNG / hydrogen fuelling networks
- Making information accessible
 - Network, capacity, reliability

Fulfilling these demands will require investment in specific roles / skills

How can the GD2 framework support?

Potential Funding & Mechanisms

Base revenue	Economic test	Charging model	Use it or lose it revenue	Central bidding fund	Uncertainty mechanism
Specific project based revenue in GD2 – time of submission	Revised economic test	Networks to own and operate compression and storage assets at CNG / hydrogen fuelling stations	Included in allowed revenue	Central fund managed by Ofgem	Workload, demand or £ triggers and thresholds agreed
To fund reinforcement, storage and compression work	Standard, flat connection cost for a CNG station (capacity linked)	Networks to charge CNG owners for this service	Annual or 5 years value for the pot	Ongoing / rolling bidding process allows networks to bid as required	Revenue allowed based on trigger values
To fund specific roles / skills needed to facilitate and lead the market as it becomes established	Remaining costs to be socialised up to a cap – pressure tier agnostic?? <i>Would need to be consistent for all other exit loads</i>	Could be done through non-reg businesses today	Criteria to assess specific applications / projects against <i>Similar to approach for NIA funding in GD1</i>	Assessed on carbon benefits and strength of demand in bid <i>Similar to approach for NIC funding in GD1</i>	Need to consider lag on funding

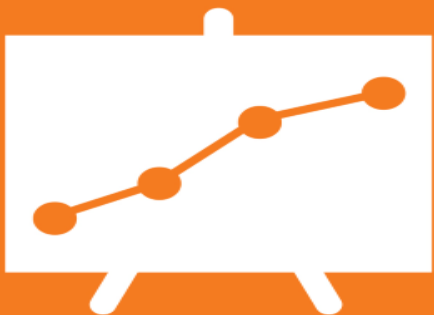
How can the GD2 framework support?

If GDNs are going to play a greater role in creating low carbon infrastructure for transport

Base revenue	Economic test	Charging model	Use it or lose it revenue	Central bidding fund	Uncertainty mechanism
<p>Specific project based revenue in GD2 – time of submission</p> <p>To fund reinforcement, storage and compression work</p> <p>To fund specific roles / skills needed to facilitate and lead the market as it becomes established</p>	<p>Revised economic test</p> <p>Standard, flat connection cost for a CNG station (capacity linked)</p> <p>Remaining costs to be socialised up to a cap – pressure tier agnostic??</p> <p><i>Would need to be consistent for all other exit loads</i></p>	<p>Networks to own and operate compression and storage assets at CNG / hydrogen fuelling stations</p> <p>Networks to charge CNG owners for this service</p> <p>Could be done through non-reg businesses today</p>	<p>Included in allowed revenue</p> <p>Annual or 5 years value for the pot</p> <p>Criteria to assess specific applications / projects against</p> <p><i>Similar to approach for NIA funding in GD1</i></p>	<p>Central fund managed by Ofgem</p> <p>Ongoing / rolling bidding process allows networks to bid as required</p> <p>Assessed on carbon benefits and strength of demand in bid</p> <p><i>Similar to approach for NIC funding in GD1</i></p>	<p>Workload, demand or £ triggers and thresholds agreed</p> <p>Revenue allowed based on trigger values</p> <p>Need to consider lag on funding</p>

Break

Environmental outputs for RII02



Clothilde Cantegreil
Head of ET Policy

Cross sector stakeholder views on the environmental outputs for RII02

- RII01 incentives are disparate, process oriented, and not pushing companies enough
- Reputational incentives could be strengthened
- RII02 needs to consider the right balance between driving competition and encouraging collaboration
- Stakeholders want an incentive that recognises and rewards thinking across sectors

Stakeholders want an environmental package that

- Drives overall efficiency and transparency in achieving a carbon reduction/environmentally responsible practices
- Is more holistic, cohesive and increases consistency across sectors
- Looks at ways to integrate our environmental metrics better
- Has more upfront interplay with the business plan
- Continues to focus on driving behavioural change
- Ensures focus on what's in company control and company ability to influence, not areas out of company control
- Ensures that where we have reputational incentives they have greater impact

Incentive	Type of incentive	Description	Comments
Business Carbon Footprint (BCF)	Reputational (Cross sector incentive)	This measure separately identifies emissions related to day-to-day business activities, operating the network (including losses), and third party contractor work.	<ul style="list-style-type: none"> The reputational impact of this incentive is weak because the information isn't clearly reported and isn't comparable across companies.
Gas Discretionary Reward (GDR)	Qualitative – judged by a panel every 3 years	Covers action to address social, carbon monoxide and environmental issues. The environmental initiatives can span daily operations, an innovative approach to network planning and initiatives that tackle environmental impacts such as leakage / shrinkage.	<ul style="list-style-type: none"> There are limitations associated with the use of a subjective panel to set the level of reward
Provision of biomethane connections	Reputational	This focusses on the delivery of effective process and reporting on numbers of connections.	<ul style="list-style-type: none"> What connections should we be supporting in RII02? (Discussed earlier in WG)
Shrinkage incentive and the Environmental Emissions Incentive (EEI)	Quantitative (linked to price of gas)	Encourages reduced leakage through pipes, delivering environmental and cost benefits	(Discussed in previous WGs)

RIIO2 price control objective

To ensure that regulated network companies deliver the value for money services that both existing and future consumers want

In particular, that the price controls:

- Give due attention to mitigating the impact of networks on the environment
- They should develop and maintain a reliable, safe and secure network that is flexible in supporting the transition to a low-carbon future

Purpose of RII02 environmental package

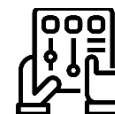
Drive networks to support the transition to a low carbon future, further integrate environmental awareness into business practices, and to continue contributing to the UK's broader energy and environmental objectives

RIIO2 environmental objectives



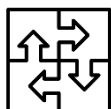
Drive effective and efficient carbon reduction (LCT) and environmentally responsible practices

Focus on areas in company control to influence, not areas out of company control



Improve transparency of performance – good and bad

Are holistic and consistent across sectors where suitable



Encourage companies to integrate environmental and low carbon commitments in their RII02 business plan

	Low carbon incentive	Sustainability + low carbon
Description	<ul style="list-style-type: none"> Single financial incentive on GDNs contribution to low carbon objective Combination of metrics and qualitative indicators of network companies activities and impact Potential to roll out across all sectors 	<p>Three part framework to cover sustainability and LCT:</p> <ol style="list-style-type: none"> Baseline funding and PCDs for well-justified initiatives ODI on environmental outcomes that satisfy output principles <i>Discussion: Is there anything you think wouldn't be covered as a PCD that could be included as an ODI?</i> ODI for exceptional contribution to LCT – See next slide <p>Framework could be suited for cross sector application</p>
Rationale	<ul style="list-style-type: none"> Climate change is the biggest environmental issue Need single message on networks role in decarbonisation of energy system LCI a comprehensive and cohesive approach to reducing carbon in the energy system 	<p>GDNs should be:</p> <ul style="list-style-type: none"> accountable for well-defined deliverables that are low risk and in consumers' interests. Consumers should only pay efficient costs. incentivised to improve operational practices to efficiently deliver well-defined output. Incentive value to be based on economic value of output to consumer. incentivise to play full role in LC transition with value based on benefits/impact.
Scope	<ol style="list-style-type: none"> Helping the transition to a low-carbon energy system Connecting low-carbon energy sources (Sustainable network) Reducing/de-carbonising demand (Whole system outcomes) 	<ul style="list-style-type: none"> Low carbon transition Company commitment to company specific carbon reduction targets Broader sustainability (procurement practices, waste management, etc...)

Flexible reward incentive for companies to make an exceptional contribution towards the low carbon transition





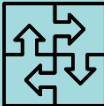
How will it work?




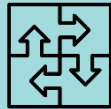
- Stakeholder led
- Two opportunities to present ODI proposals (business plan and End of year 2)
- 1st opportunity: GDN to make a case as part of BP for an exceptional contribution they are going to deliver (2nd opportunity to operate the same), detailing:
 - Output (proposal) commitment / forward planning
 - Metrics that performance will be assessed against
 - GDN and consumer benefits of proposal (to inform amount of reward)
 - Timeframe for delivery
 - Ofgem will then assess delivery as per milestones
- Reward upon successful delivery

This is intended to:

- Strengthen strategic focus on LCT
- Revolutionise operational practices, partnership collaboration, implementation
- Cover new outputs for activities that are not captured by the framework ie an exceptional contribution to LCT.

It is **not** intended for R&D innovation or large capital projects.

	Low carbon incentive	Sustainability + low carbon
LCT and enviro management 	<ul style="list-style-type: none"> Potentially more ability to deal with future uncertainty 	<ul style="list-style-type: none"> Networks funded upfront to deliver a more sustainable network. Consumers only pay efficient costs of improvement.
Within control 	<ul style="list-style-type: none"> Could allow companies increased flexibility in how they deliver outcomes Qualitative aspects could focus on behavioural changes 	<ul style="list-style-type: none"> Emphasises aspects that are in company control Increased certainty and assurance that actions will be delivered
Transparency 	<ul style="list-style-type: none"> Would address the disparate nature of incentives by having a single incentive with a clear focus 	<ul style="list-style-type: none"> Pre-commitment on outputs that will be delivered for consumers, and transparency of the associated costs More accountability for delivery/sets delivery targets for assessment Forward looking - clearly defines actions upfront that each company will deliver
Consistent across sector 	<ul style="list-style-type: none"> Increases the focus on competition Potential to be considered at a cross sector level 	<ul style="list-style-type: none"> Aspects could be implemented cross sector
Integrated plan 		<ul style="list-style-type: none"> Allows more integrated business planning (eg interactions with refurbishment/replacement) Integrates environmental awareness further into business practices and gives GDNs more discretion to plan/programme project works

Low carbon incentive	Sustainability + low carbon
 <p>Risk that if scope is narrowed to only focus on low carbon it may detract from other wider environmental issues that companies currently have to consider</p>	 <p>Potential decrease in flexibility to deal with uncertainty since large parts will be written in to Pricing Control Deliverables</p>
 <p>Potentially more difficult to compare company performance on specific metrics.</p>	
 <p>Backwards looking and post business plan process</p>	

- Do you have any other thoughts on the approaches discussed?
- Under the outlined sustainability and low carbon framework:
 - a) Is there anything you think wouldn't be covered in the PCD that could be included as an ODI?
 - b) Can you think of anything that could be an exceptional contribution to LCT?
- Anything else to add?

AOB

Next Decarbonisation workshop: 29th November, Glasgow

Our core purpose is to ensure that all consumers can get good value and service from the energy market. In support of this we favour market solutions where practical, incentive regulation for monopolies and an approach that seeks to enable innovation and beneficial change whilst protecting consumers.

We will ensure that Ofgem will operate as an efficient organisation, driven by skilled and empowered staff, that will act quickly, predictably and effectively in the consumer interest, based on independent and transparent insight into consumers' experiences and the operation of energy systems and markets.