UNC 0849R:

Hydrogen Blending: Commercial framework review and amendments

Review Group Five

Wednesday 22nd November

Agenda

10:00 – 10:05 Welcome and agenda
10:05 – 10:15 Interim Report- discuss and agree plan
10:15 – 10:20 Review Assumptions
10:20 – 11:45 Review Actions and Issues Tracker
11:45 – 12:00 Break
12:00 – 12:45 Connections/ Capacity Approach
12:45 – 13:15 Lunch Break
13:15 – 13:45 Future Billing Methodology (Real Time Settlement Methodology proposal)
13:55 – 14:00 AOB, Next Steps

0849R Next Steps:

Scheduled to report to panel on 18th January 2024.

Final review group to run on 9th January 2024, to review final list of issues and outline any next phases of work such as- Capacity Allocation Mechanism / Gas Quality Data Provision.

Plan:
Complete interim report outlining the above. Pause the review groups until final conclusions on physical processes to be implemented have been completed. Arrange final review groups to review new business rules for pre-modification.

KPMG also reviewing Network Code and completing proforma's for each principle section.

Assumptions and Parameters

There are still some unknown certainties for hydrogen blending which will be answered through separate pieces of work, therefore, to ensure deliverability of this project, a number of assumptions have been defined:

- As the Government are currently set to make a decision in principle for blending into the Distribution Networks by the end of 2023, with a decision for Transmission likely to follow, we assume that changes to GS(M)R for Dx will be implemented before Tx. Having different GS(M)R specifications across networks will therefore need to be considered within this Review Group.
- Exemptions to GS(M)R may also be applied on a individual project basis prior to any increase in hydrogen content within the provisions.
- Both In-network (commingling facility owned by Gas Transporter) and pre-blend (commingling facility owned by Delivery Facility Operator) connections will be considered within this work
- Hydrogen will be available to blend
- Blending hydrogen onto gas networks may be used for the role of “reserve offtaker”; therefore variability in hydrogen volumes to be injected needs to be considered.
- This project will consider onshore networks regulatory frameworks as well as Interconnectors, however we assume that there won’t be any direct changes to EID section of UNC as its currently set out. – Megan to review this
- Other projects will be concluding on framework principles (e.g. the “Connections and Capacity Methodology project” and the “Functional Specification project”)
- Assume all existing market players and their roles will be included in blending development
- All GB Industrial, Commercial and Domestic users will be assumed to be customers of Hydrogen blend as well as Independent Gas Transporters
- This project is just considering the commercial amendments required, not physical arrangements
- We assume within the project that low levels of blending (C.5%) won’t impact physical capability of the networks (due to higher volumes vs energy)

Assumptions and Parameters

The aim of this project is to enable the first roll out of hydrogen blend injections in a timely and efficient manner whereby no amendments to Primary legislation (Gas Act 1986) and Secondary legislation (GCOTER) is required. To achieve this, the below parameters for the first phase of blend connections have been suggested:

- Within this report we assume that GS(M)R will be updated following a HSE safety review in order to accept volumes of up to 20% hydrogen into the networks.

- This project aspires to implement H2 blending by 2025 with least change to existing market framework as possible, it therefore assumes that A CV target will be calculated by the DNO based on a forecast FWACV for the Gas Day and will require to be met at the natural gas/hydrogen gas blend point. The following parameters (a) not exceeding the proposed 20% volume cap in the Transporter's pipe(s) (b) the available volume of natural gas in the pipe at the hydrogen connection point to blend hydrogen with and (c) the CV of the natural gas to be blended with, will influence the prevailing rate of injection of 100% hydrogen by the hydrogen producer across the gas day. These parameters will ensure compliance with GS(M)R (20% volume parameter) and provide data to mitigate against CV Capping (natural gas CV and natural gas flow rate).

- The Connections and Capacity Methodology project will be reviewing suitable connection roll out models that remain in-line with the Gas Act 1986. These models will then be considered within this work.

Do we agree with these assumptions and parameters?
Are there any additional considerations?

Actions and Issues List

Issues and Actions Tracker 0849R (002) (version 1).xlsx

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Connections and Capacity Allocation

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Existing Capacity Process

Distribution:

DN entry capacity is specified in the Network Entry Agreement ahead of embedded DN Entry points flowing into the distribution networks.

Capacity capability is assessed during the connection process and limitations on flow rates are agreed within the NEA for each entry point. Should an area within a distribution network become constrained, then injection is scaled back until that constraint is resolved. Therefore, the ability for blend points to inject into the DN's will remain as and when conditions allow.

Transmission

The amount of firm capacity that is available at each system entry/exit point, which is released for sale by the System Operator, is set via capacity baselines and is outlined in the Gas Transporter Licence. Non-obligated capacity which exceeds the baseline amount can also be offered if conditions on the network allows, however, this is down to the discretion of the System Operator.

Desktop capacity assessment is completed during connection process. Connectee can choose to reserve capacity via a PARCA.

Capacity is then booked via their shipper as the below products:

- Firm Capacity through long-term and short-term auctions - Interruptible capacity at day ahead auctions.

How can connections and capacity allocation be appropriately managed for the purpose of hydrogen blending?

Governments lead approach for hydrogen blending technical delivery model is free-market.
The free-market approach mimics the existing arrangements for connections to the gas network and would let the market decide where to inject hydrogen into the network. Theoretically, blending could occur wherever hydrogen producers apply to connect, which could be at any location and pressure tier across the networks.

Appropriate design of network capacity allocation within the free-market approach may help to realise any potential benefits of blending for a greater diversity of hydrogen producers.

Capacity Allocation - Optimised vs Minimal Change

Optimised – could involve the development of a market mechanism to signal optimal locations through pricing for H2 blend entry capacity across the networks, however this may require development of separate blend entry capacity product and auctions.

Pro's-
- Could support optimisation of blend volumes into network
- Help to coordinate and manage blend cap between IGTs, DNOs, Transmission and Interconnectors.

Con's-
- Increase in resource time and cost to develop/ implement (GDN- Do not currently have an entry capacity product).
- Could act as a barrier for producers located far from optimal connection points.

Minimal change – Flows managed through gas quality provisions agreed within Network Entry Agreements (CV target and maximum flow volumes).

Pro's-

- Quicker to implement with lower costs and less complexity

Con's-

- No guarantee that producer would be able to blend hydrogen, as would depend on prevailing conditions upstream.
- Could limit blend volume potential due to sterilisation of parts of the network.

May require amendments to connections methodology/ licence to protect connections on a first come first serve basis to prevent producers from connecting upstream at a later date and sterilising the blend capacity.

Discussion- in order for the minimal change option to be sufficient, what do the provisions need to achieve?

Hydrogen Blending: Connections

Primary Legislation 	**Gas Act 1986: Section 9** "Obligation to offer connections if it is economical to do so and avoid any undue preference or discrimination"	**No change** *(to be considered if developing capacity allocation mechanism)* *(if minimal change approach implemented, it can be said that it is "uneconomical" to offer a connection where blend cap has been reached?)*
Regulations 	**Gas Safety (Management) Regulations 1996** **The Gas (Calculation of Thermal Energy) Regulations 1996**	**No change**
Licence 	**Gas Transporter Standard Condition 4B: Connection Charging Methodology** Charging the connectee the cost of supplying and laying the pipe **Gas Transporter Licence: Standard Special Condition D12** Requirement to offer terms for the provision of gas entry points	**4B Additional:** rules around pre-connection coordination and planning between NTS and DN's to manage blend cap. Provisions to apply protection for connection (first come first serve basis) **GTL SSC D12 Amend:** Non-absolute condition; inclusion of situations when terms are not offered for a gas entry point. Require commitment from Producer for the connection materialising. Greater requirement for gas networks to share information (ECPG) GT Licence exemption required for pre-blending connection?
Code (UNC) 	**Section A: System Classification** **Section V: General** Framework for new connections / modifications (application process, types of connection offer, timescales to offer / accept, application fees)	**Addition:** **Section A:** Definition of a hydrogen entry point as a subset of System Entry Point **Section V:** UNC provision for greater coordination between networks when connecting blend entry point **Amend:** Timescales around providing a connection offer may need to be amended.
Agreements 	**Network Entry Agreement** **Network Exit Agreement** **Delivery Agreement** **Transportation Agreement**	**Amend NEA:** Reference to "Natural Gas" Additional obligation for network operator to notify of expected Natural Gas flows (to enable DFO to know how much can be blended) Gas quality provisions (CV target and maximum blend volume)

Hydrogen Blending: Capacity

Primary Legislation

Gas Act 1986:
Underpins all contract and license obligations

No change

Licence

Gas Transporter License: Standard Conditions
References works to increase capacity in connection charging methodology

National Grid Gas plc Gas Transporter License Special Conditions
Entry capacity and Exit capacity constraint management incentive
Capacity requests, baseline capacity, capacity substitution
Methodology statement requirement
Methodology Statements
Entry Capacity Release; Exit Capacity Release; Entry Capacity Substitution; Exit capacity substitution and revision; Entry capacity transfer and trade

No change

Code (UNC)

Section B System Use and Capacity:
NTS Entry Capacity
NTS Exit Capacity
Supply Point and LDZ Capacity
Capacity Transfer; NTS Offtake Capacity
Section E: Daily Quantities, Imbalances and Reconciliation

Only with Capacity Allocation Mechanism:
Section B Addition: Creation of blend entry capacity product and auctions. (completely new process for GDN) (Would also require changes to Section Y Charging methodologies)

Section E Addition: Net entry concept to be expanded for 'GDN Commingling Facility'

Agreements

NEA/ NExA
PARCA/ CAM
Reservation of firm capacity
Gas connections portal
Capacity Allocation Mechanism (CAM) incremental process allows capacity to be allocated for interconnection points

NEA amend-Gas quality provisions (CV target and maximum blend volume)

PARCA no change – *producer would have choice to apply for PARCA or have zero baseline and only book non-obligated incremental day ahead/ within day.*

Future Billing Methodology

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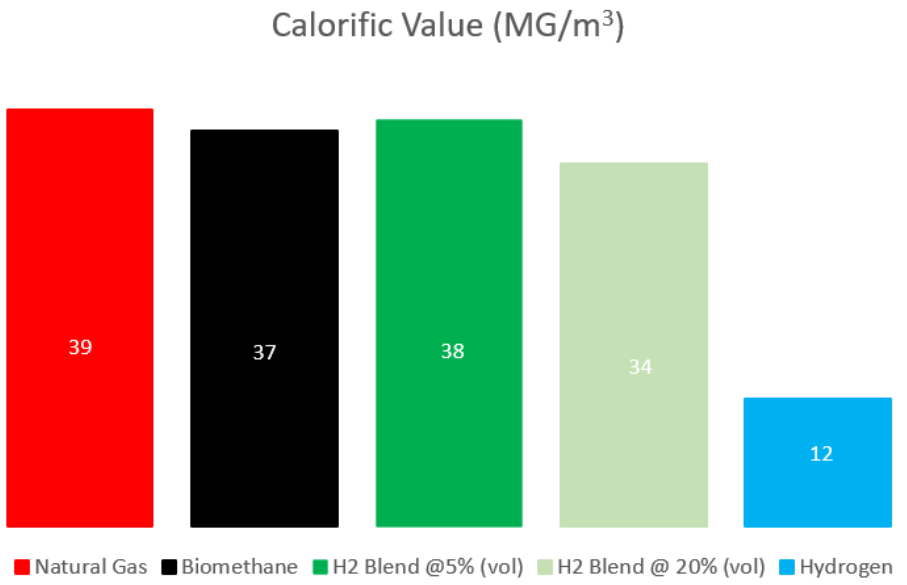
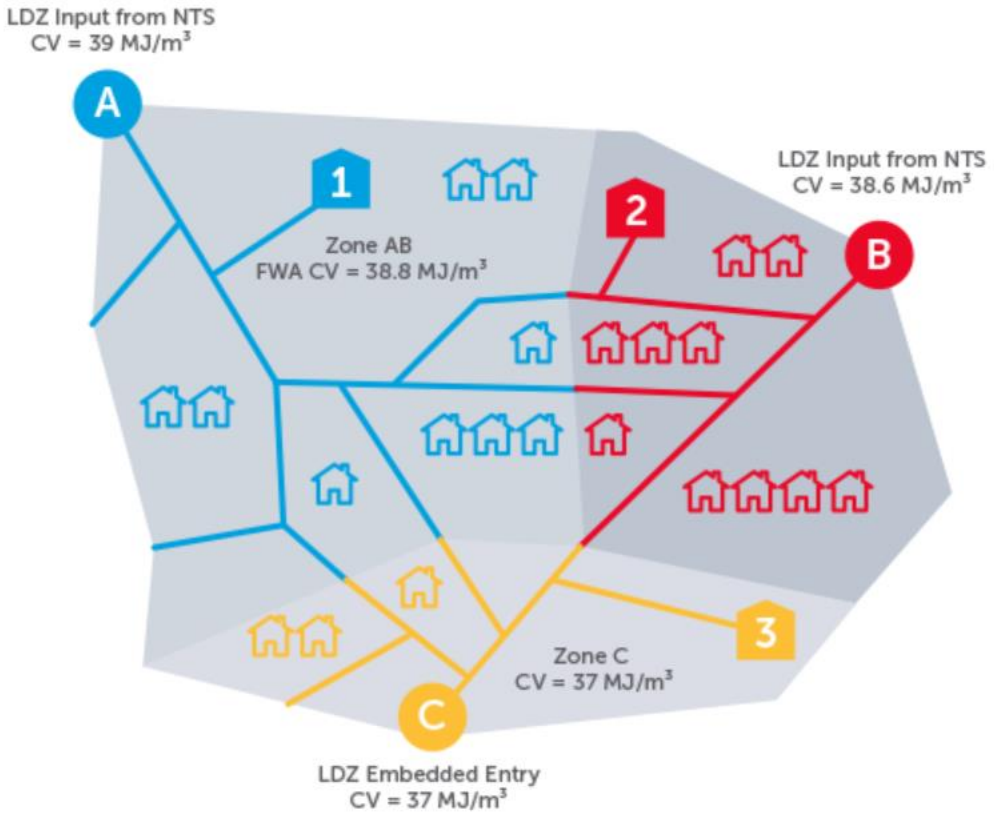
The Calorific Value Challenge

- The key issue for hydrogen blending is CV and its impact on settlement and billing where it results in CV capping to 1MJ above the lowest input CV. The figure shows ball-park CVs for the gas network
- The CV of biomethane can be increased to avoid CV capping of this magnitude through the addition of propane or a blending agreement. In both cases biomethane sites have to meet a target CV to prevent CV capping.
- A new biomethane injection site entering into the same network but higher up the system will be allowed if there is enough physical capacity but they have to meet the target CV to avoid CV Capping and subsequently CV shrinkage. There could be an impact on the blending efficiency for the downstream site but propanation would still be an option
- Hydrogen CV is much lower than biomethane and we assume blending with propane to meet target CVs would be uneconomical for hydrogen sites
- To avoid CV Capping and CV shrinkage this means that there is an effective cap on the amount of hydrogen that can be injected into a natural gas network under current thermal energy regulations and UNC Shrinkage rules, in the region of 5% hydrogen content of the gas in the pipe at the entry point.



Future Billing Methodology

Existing Billing Arrangements – In order to increase blend volume injections up to 20% there would need to be a consistent lowering of the CV across the networks so that the gas flowing into each LDZ entry point did not have a wide range in CV, as this would cause CV capping.



Within the diagram you can see three entry points into the LDZ A,B and C. The FWACV for this particular LDZ would work out to be 38.2 MJ/m³ taking in to account the CV for LDZ input at A,B and C, however the lowest CV entering the LDZ is 37MJ/m³, therefore billing within this LDZ would be capped at 38MJ/m³ causing under recovery of energy.

Theoretically, as more Hydrogen producers connect to the network across a geographical region and inject volumes of hydrogen to blend, the CV within that region should lower and become more homogeneous, however ensuring that the lowering of CV is consistent across all entry points into a specific LDZ could heavily rely on the proximity of the injection location to the LDZ entry point.

Real-Time Settlement Methodology

November 2023

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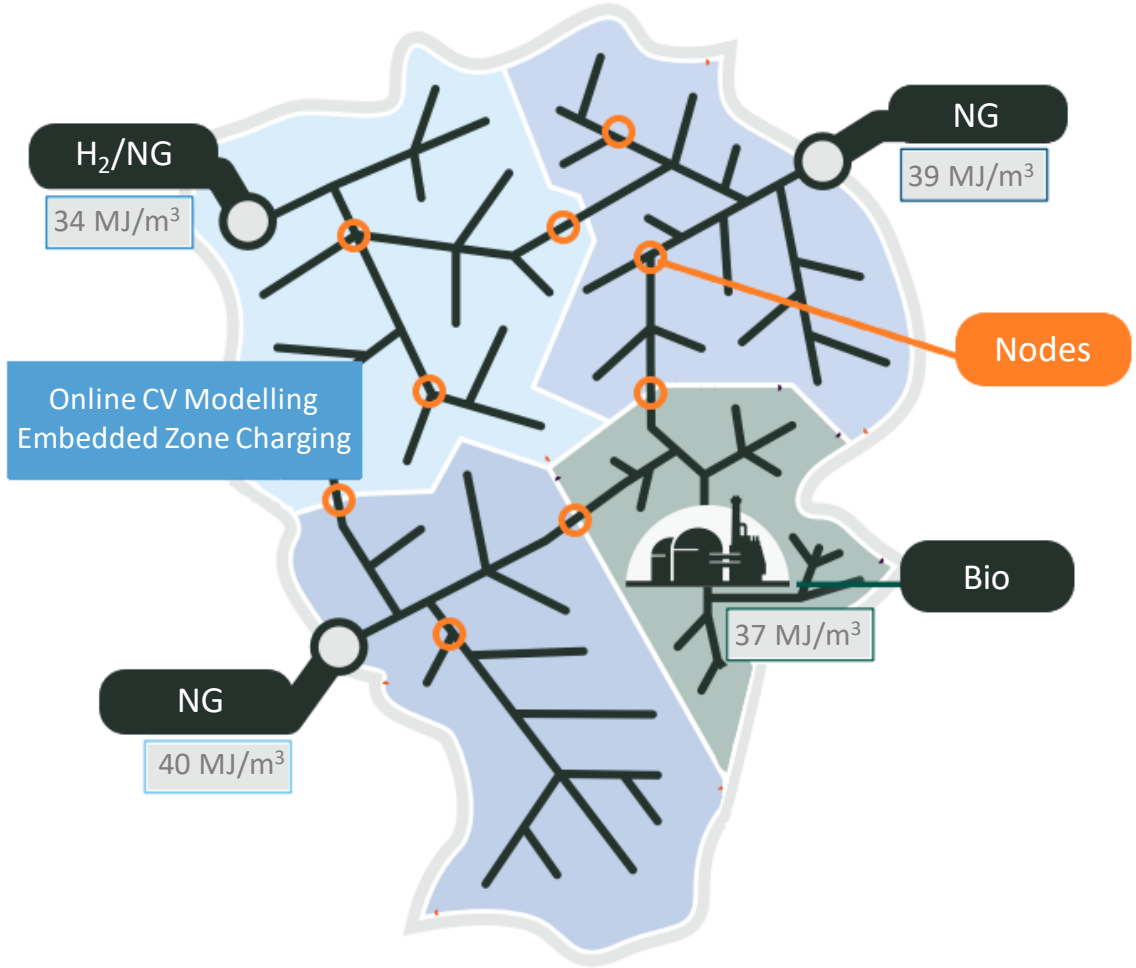
FBM &
Recommended solutions

FBM & Recommended solutions



Government consultation

Lead option to work within existing gas billing arrangements

Future Billing Methodology

Option C: Online CV Modelling

Inputs: Measured CV and volumes at LDZ offtakes and embedded hydrogen injection points

Outputs: CV values at exit points across the LTS and attribution to each system node (charging area).

Option B: Embedded Zone Charging

Suitable for green gas supplies only

Reduce propanation

Network and CV modelling to define charging area

REAL-TIME NETWORKS

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Real-Time Settlement Methodology

What is the proposal?

Real-Time Settlement Methodology

Develop and demonstrate an **integrated and flexible solution** that enables the characterisation, settlement and billing process of **multivariable calorific values** across the LDZ and the whole network

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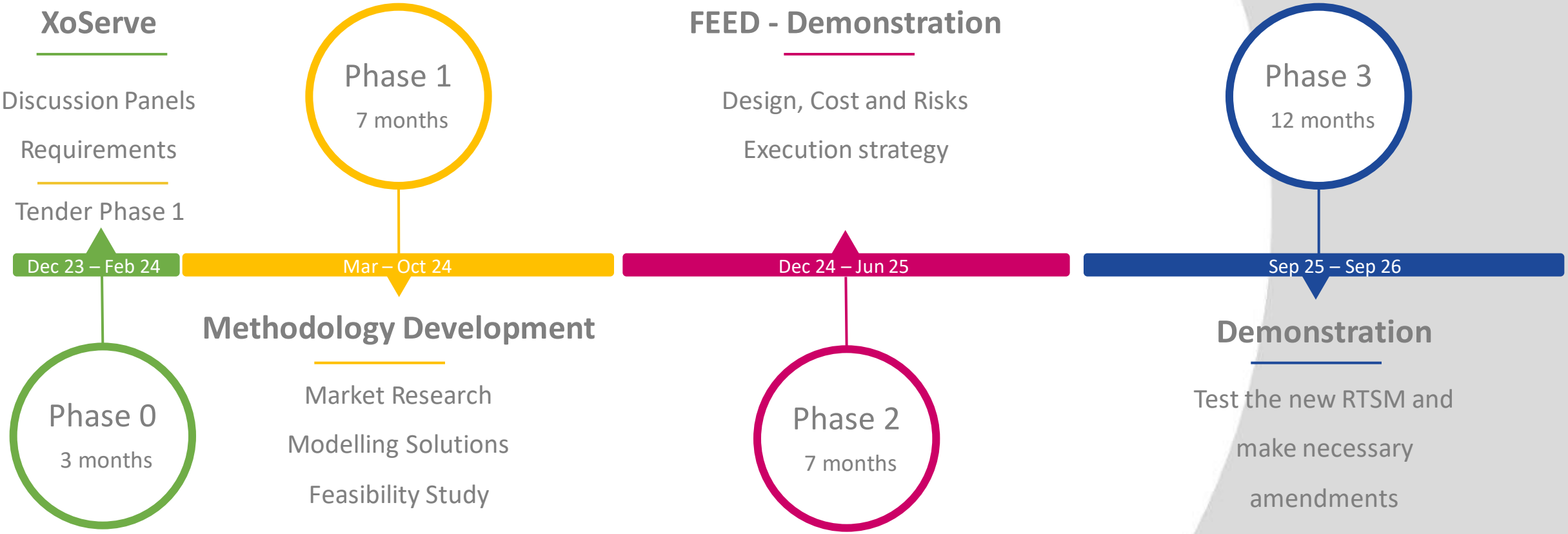
Execution plan



Thank you

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Thank you

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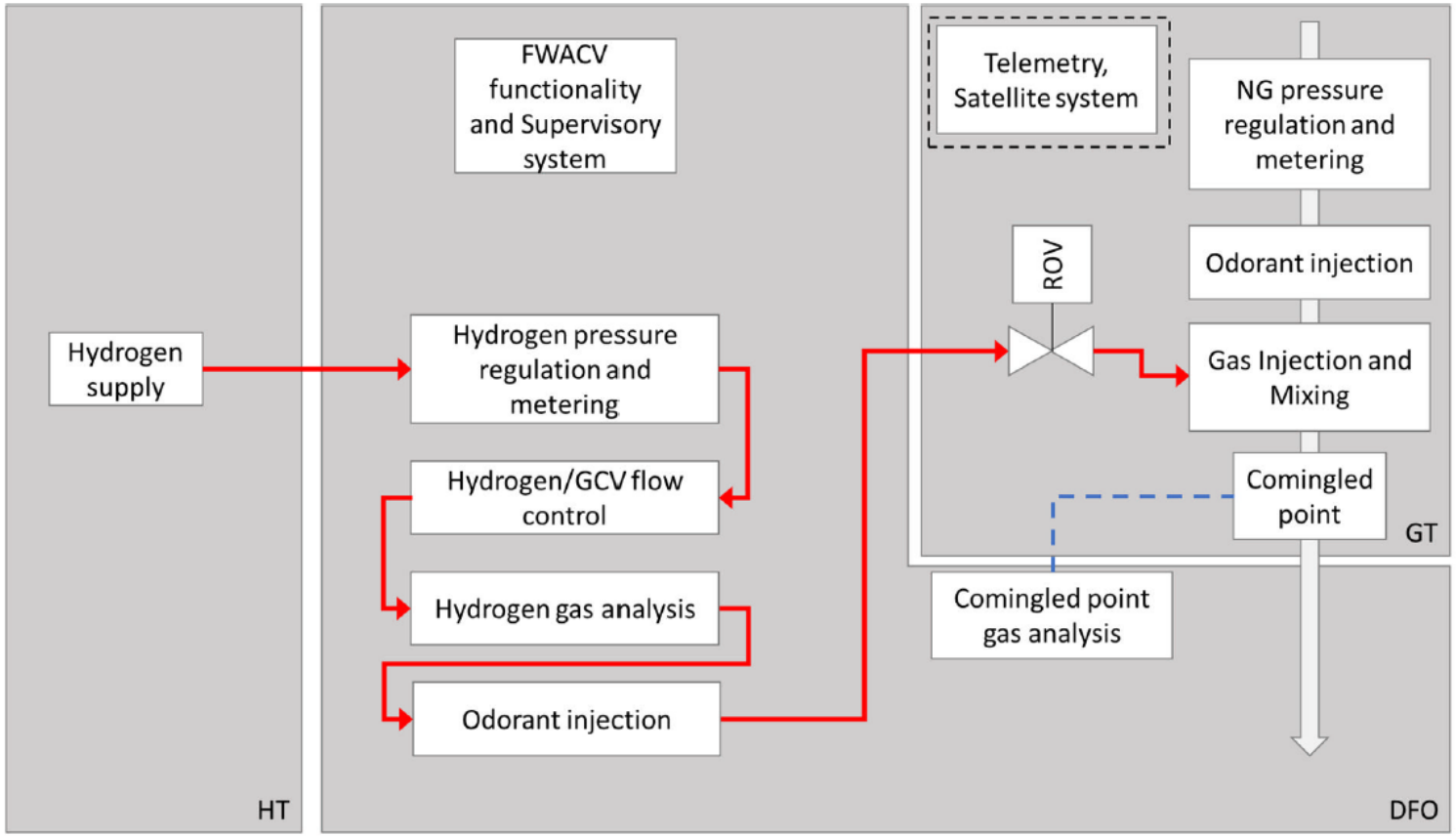
Appendices

Key Outcomes – Functional Specification

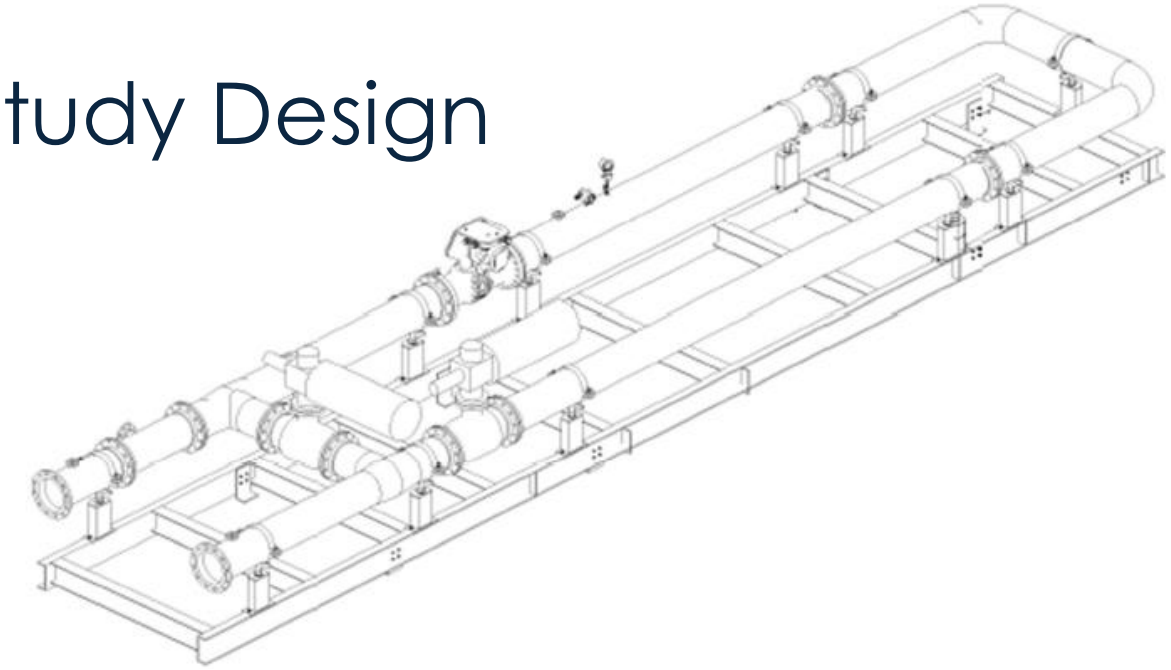
- **GSMR** - A maximum hydrogen content (assume 20%vol.)
- **GCoTER** - Control on a target CV (same as biomethane
- Co-mingling point for GSMR and FWACV compliance
- Direct or Indirect Odorisation

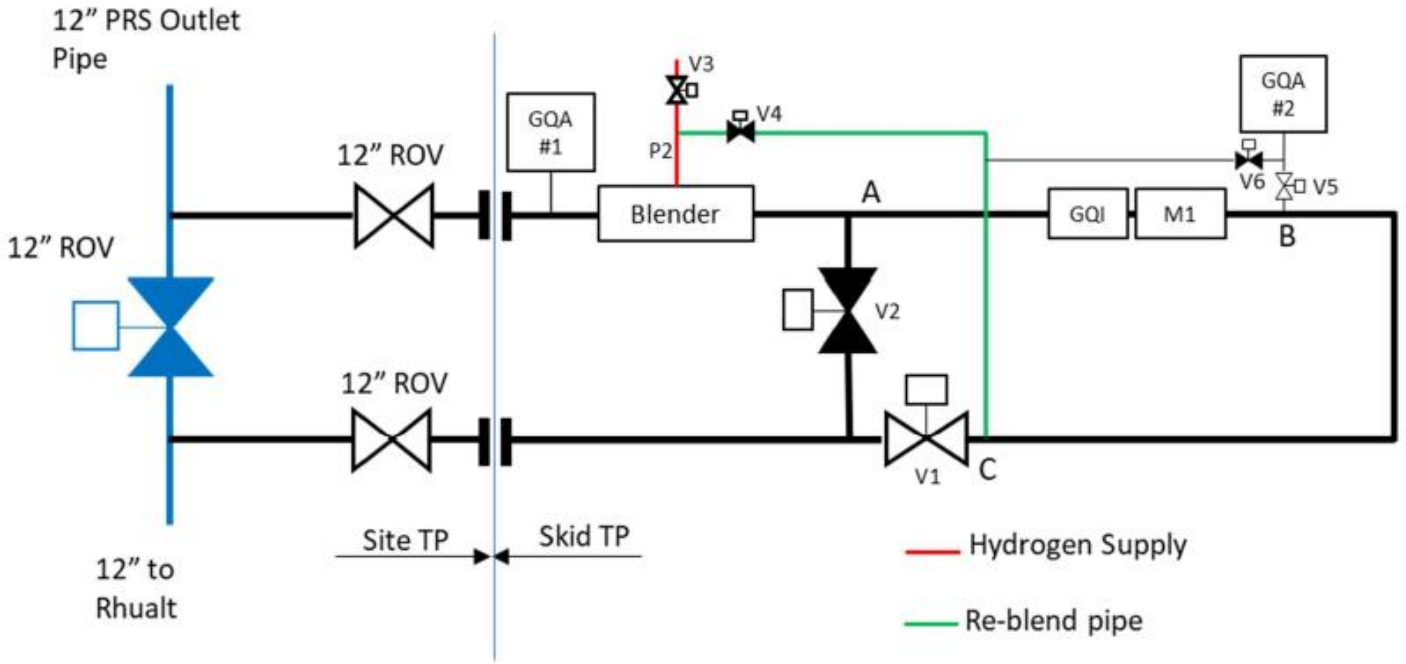
Figure 1: Asset ownership under Model 1 ("Minimum Connection")



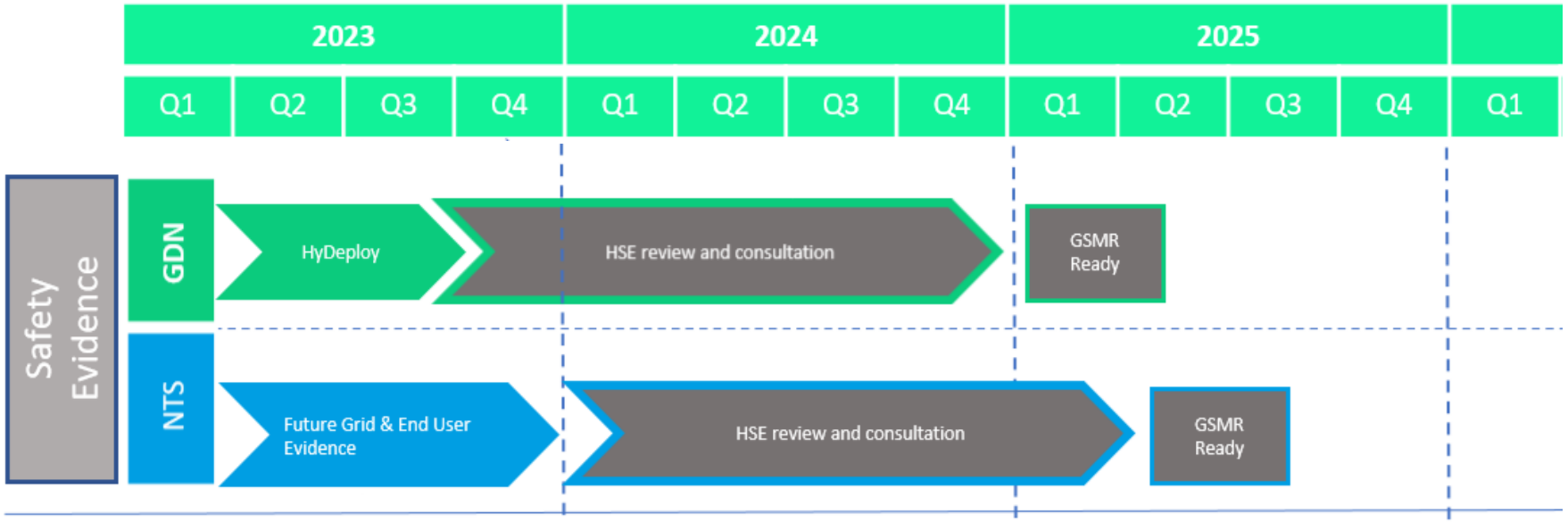
Key Outcomes – Case Study Design

- A compact purpose-built blending facility loop could be built for mixing off the current network
- Ownership of the loop needs consideration
- Software upgrades required (at exiting sites)
- Ofgem Approval of H2 inclusive Calorific Value Determination Device
- Indicative cost of injection skid £1-4m





Expected Policy Timelines



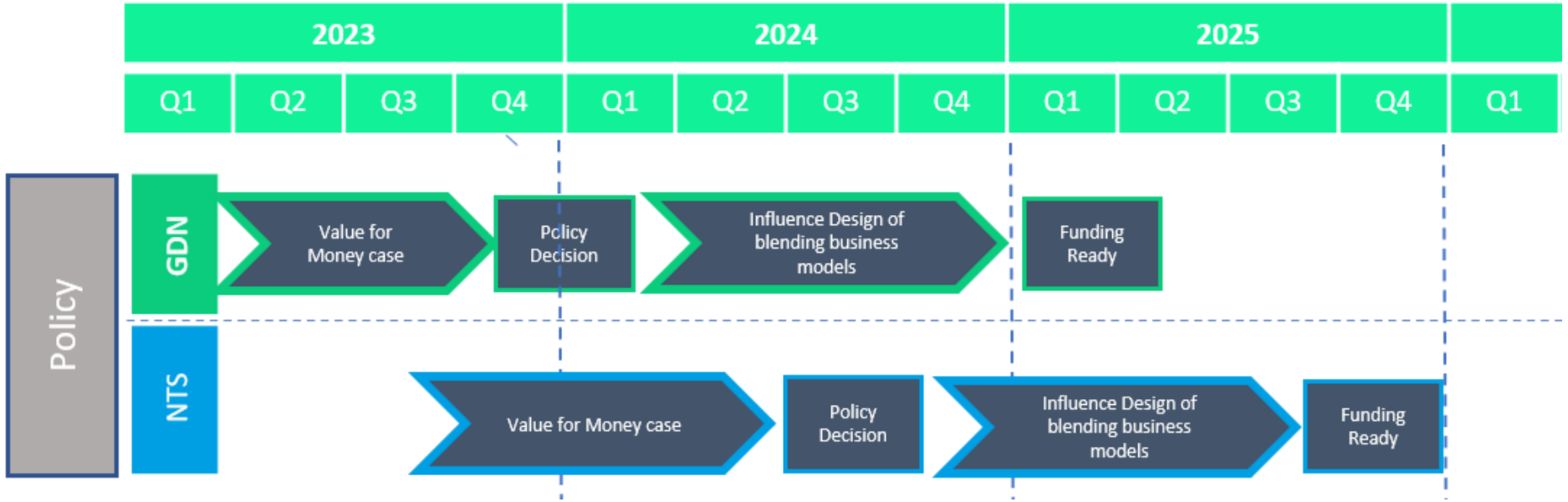
HyDeploy

Keele University (100 homes & 30 Uni buildings. 18 month trial)
Winlaton (668 homes, 1 school. 10 months)
Tested- network infrastructure/ pipes and home appliances.
Safety data evidence due to be submitted in 2023.

FutureGrid

Decommissioned asset test facility located in Cumbria.
Tests for 2%, 10% & 20% blends begin in 2023. Safety data due to be submitted by the end of the year.

Expected Policy Timelines



For the Distribution Networks, the Government have confirmed that a policy decision in principle will be made at the end of 2023. Development into the design of blending business models will then begin whilst the HSE conduct their safety evidence review. The Distribution Networks are therefore aiming to be GS(M)R ready by 2025, with first initial blend injections connecting throughout the year.

Timelines for the NTS is still unclear as this is dependant on the on-going work at Future Grid and the work reviewing impacts to Industrial end users, however current assumption is that this will follow shortly after Distribution.

EU Blending Strategy

Harmonised Rules

The Commission introduced a 5% blending mandate at interconnection points (article 20).
Parliament and the Council proposed to delete this article but agreed on common rules for gas quality for blended volumes comprises between 0 and 3 %, while leaving Member States the decision to apply H2 blending or not.
In the revised article 19, the Council proposes to apply harmonised rules at IPs for hydrogen blends up to **2%.**

Article 52 of the Regulation
The European Commission's initial proposal wanted the Network Codes and guidelines for gas and hydrogen in the EU to "*apply to all interconnection points within the Union and entry points from and exit points to third countries*".
The Parliament is supporting the Commission's proposal.
The Council has proposed to delete this reference to third countries.
The initial proposal of the Commission would means that we would need to comply with EU Network Code and guidelines, should we want to send gas/hydrogen to the EU.

Interconnectors

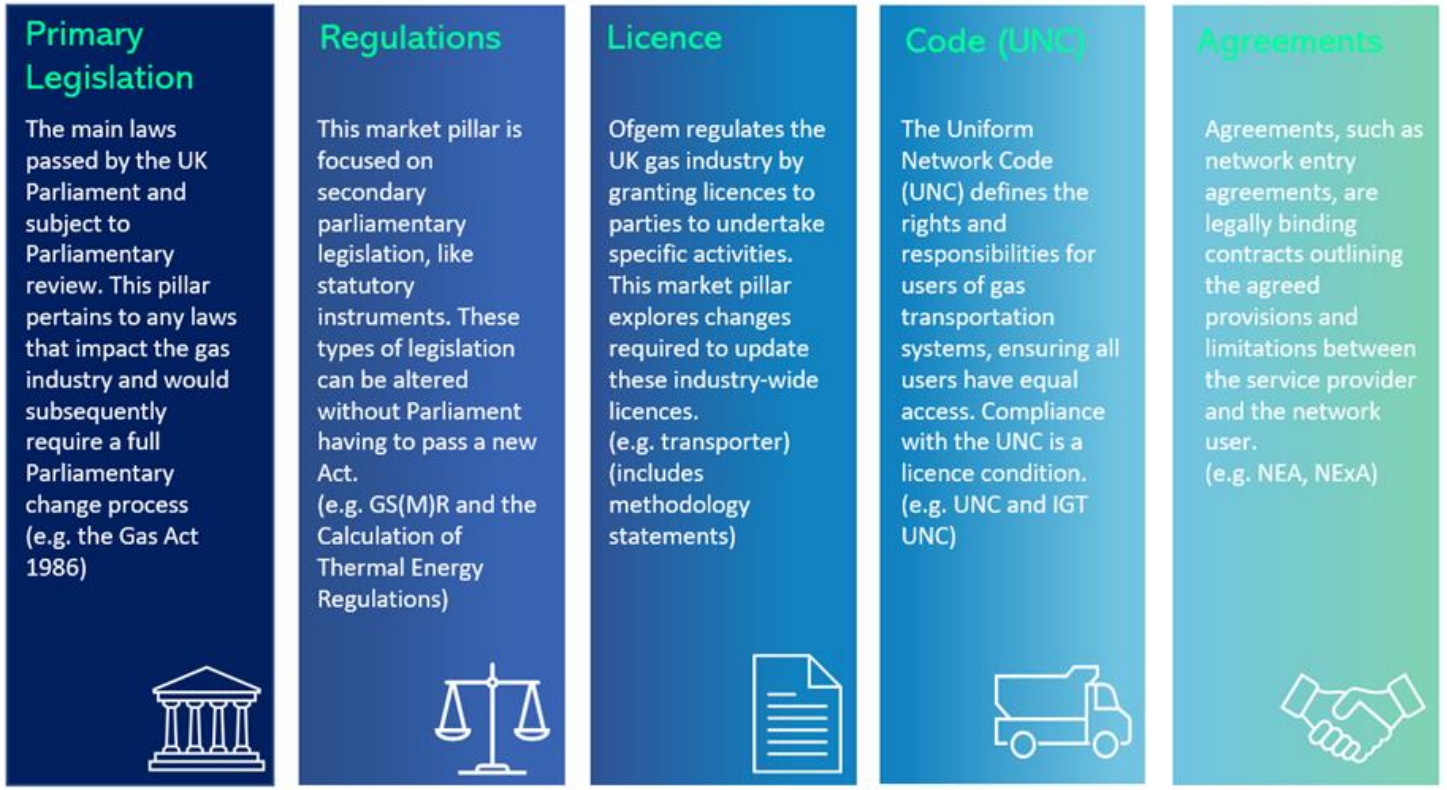
Belgian has amended its Gas Law to allow a 2% hydrogen blend as of July 2023. However, the first concrete injection project will start later, in 2024. Initial Blends will only impact the regional network and won't reach interconnection points. Fluxys has plans to reach a blending level up to 10%. Going beyond this threshold would require changes in the way the network is operated.

The Netherlands Government Strategy on Hydrogen also includes the option of a H2 blending obligation, outlining that "*Physical blending up to 2% is already achievable with minor adjustments, and with further adjustments, the percentage could gradually be increased to approximately 10-20%.*"

Gas Goes Green Proposal

The ENA Gas Goes Green working group have been involved in a number of workshops to develop an initial thought piece on existing commercial framework compatibility and the required amendments necessary.

This Review Group has been proposed for a period of 6 months to review these high-level amendments and further develop solution options with the objective to agree commercial framework changes required with wider industry and raise suitable enabling modifications.



0849R Work Group Objectives:

Work Group 1	Work Group 2	Work Group 3	Work Group 4	Work Group 5	Work Group 6
-Introduction and overview of H2 blending progress so far. -Agree Assumptions and Parameters -Gas Quality Review -System Operation Review	-System Operation Review continued.. -Balancing Review	-Trading Review -Charging Review (overview of functional specification project outputs)	-GGG Connections Methodology Solution Options -Capacity Review -Connections Review	-TBC (Progress to be reviewed throughout sessions)	-Final Considerations -Pre-mod Review