UNC 0849R:

Hydrogen Blending: Commercial framework review and amendments

Review Group Three

Wednesday 2nd August

Agenda

10:00 – 10:05 Welcome and agenda
10:05 – 10:20 Review Updated Assumptions
10:20 – 11.20 Functional Specifications for Hydrogen Blending Infrastructure Overview
11.20 – 11.35 Break
11:35 – 12:30 Review Actions and Issues Tracker
12:30 – 13:30 Trading Review
13:30 – 14:00 Lunch Break
14:00 – 14:45 Charging Review
14:45 – 15:00 AOB, Next Steps

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.
- 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 IP 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 limits to maximum blend percentage volumes lower than 20% may need to be agreed within relevant NEA's and Injection sites will need to comply with a CV target submitted by the network operator. This is to minimise the risk of triggering CV capping which is outlined in the Gas Calculation of Thermal Energy Regs (GCOTER). A CV target will be calculated based on three things (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.

- 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?

Overview:
Functional Specification for Hydrogen Blending Infrastructure

2nd August 2023

DELIVERING THE PATHWAY TO NET ZERO

Agenda

Project objectives

Key Outcomes:

- Functional Specification
- Case Study Design

Next steps

Project Objectives

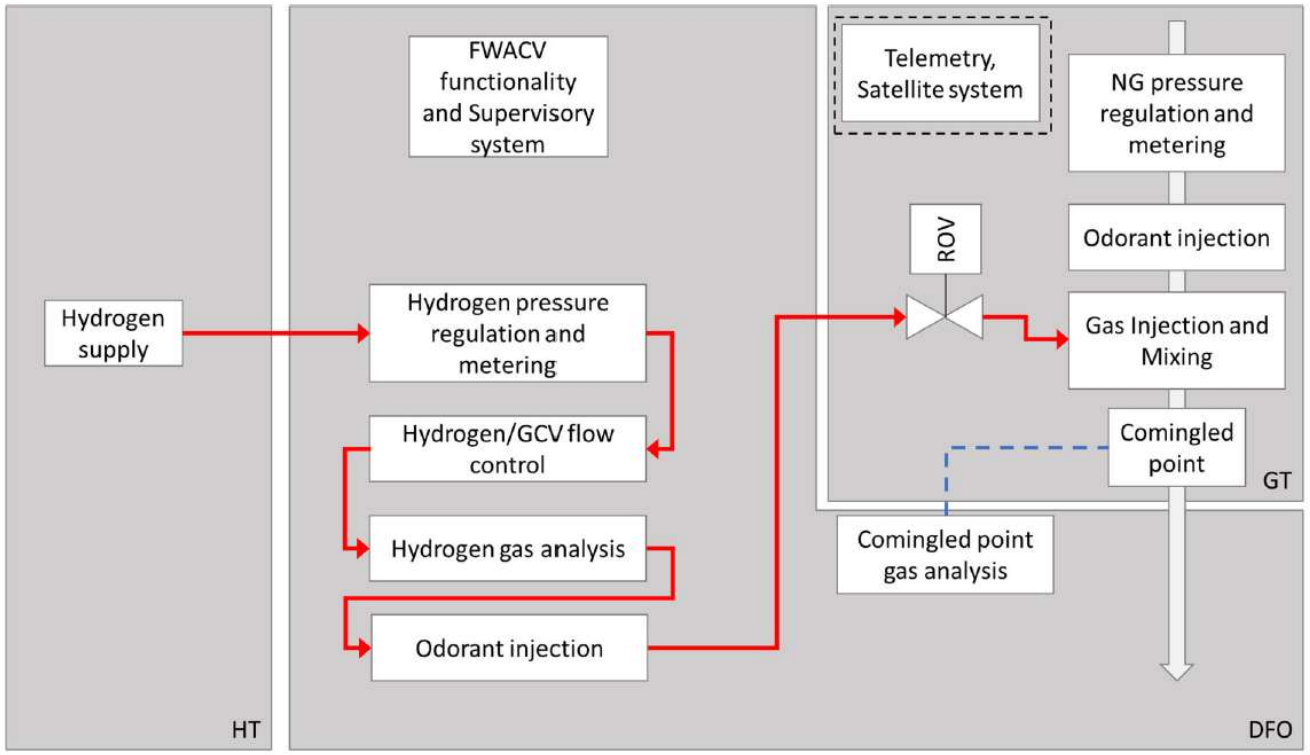
The objectives of this project were to:

- Determine the functional requirements of a blending facility
- Understand the infrastructure and equipment needed
- Assessment of technology and equipment to achieve the functional requirements
- Assessment of reflective site/s to understand space considerations
- Understanding of indicative costs to design and build a hydrogen blending facility

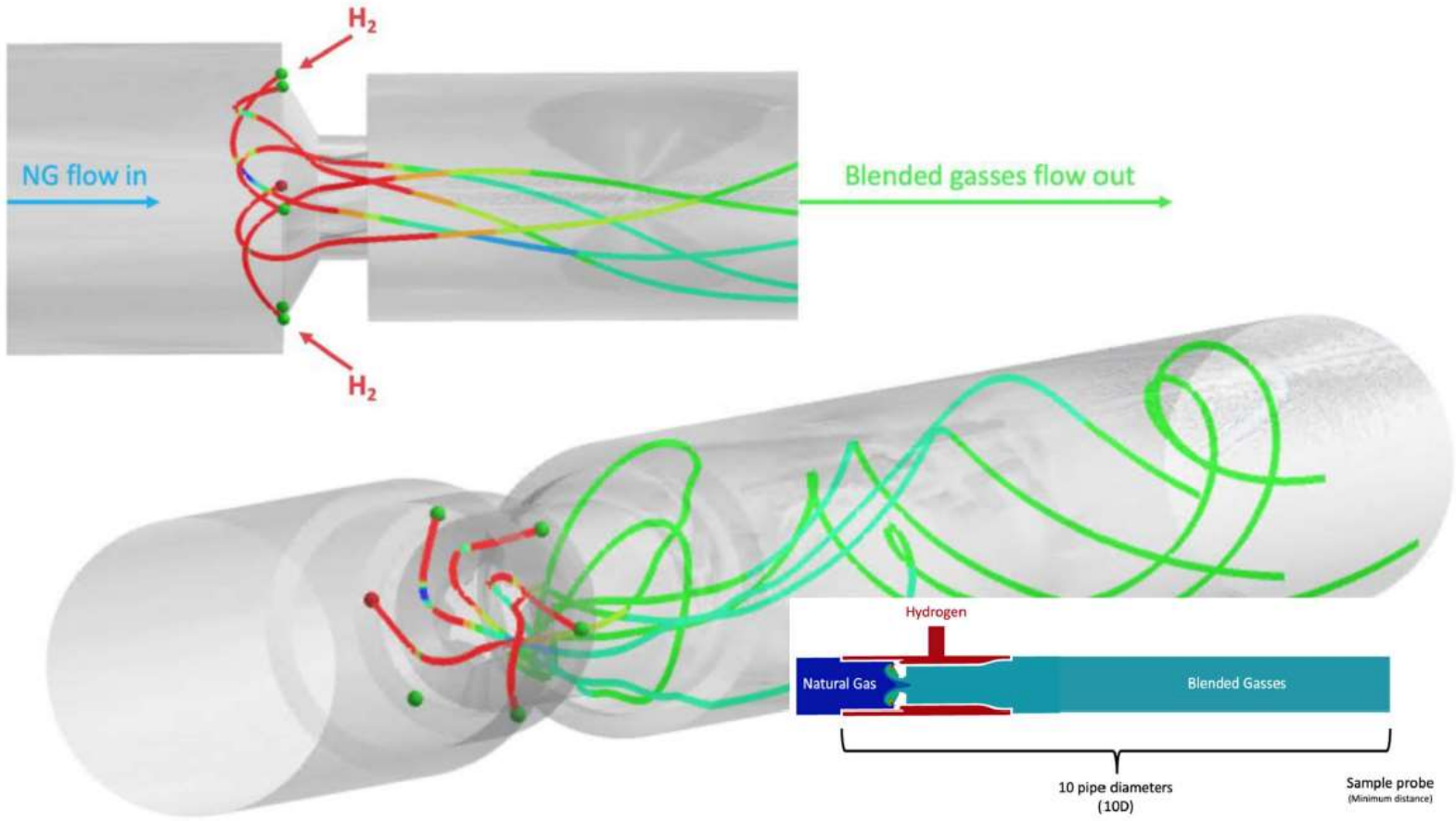
Key Outcomes – Functional Specification

- **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")

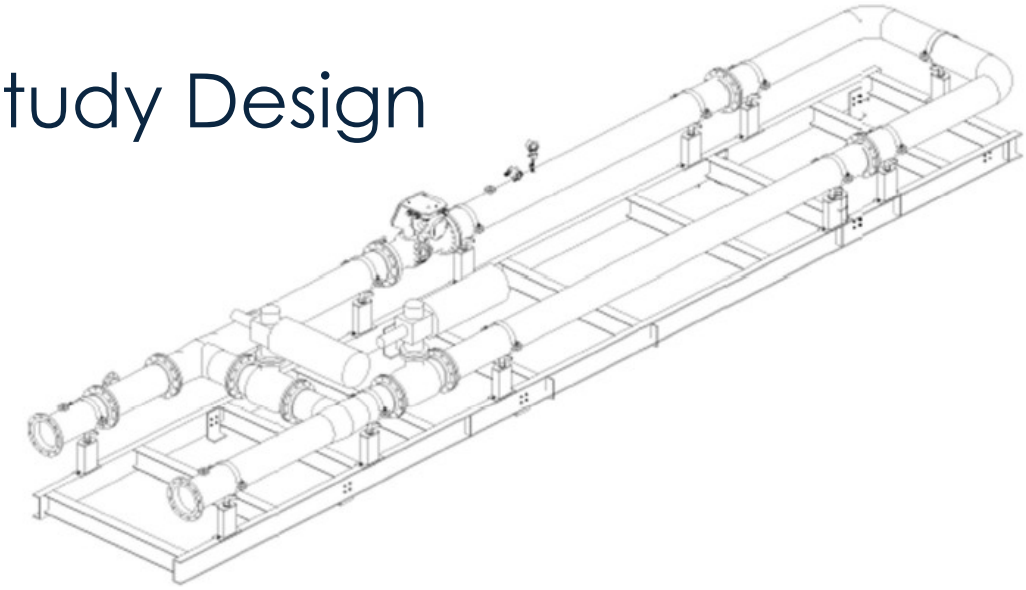


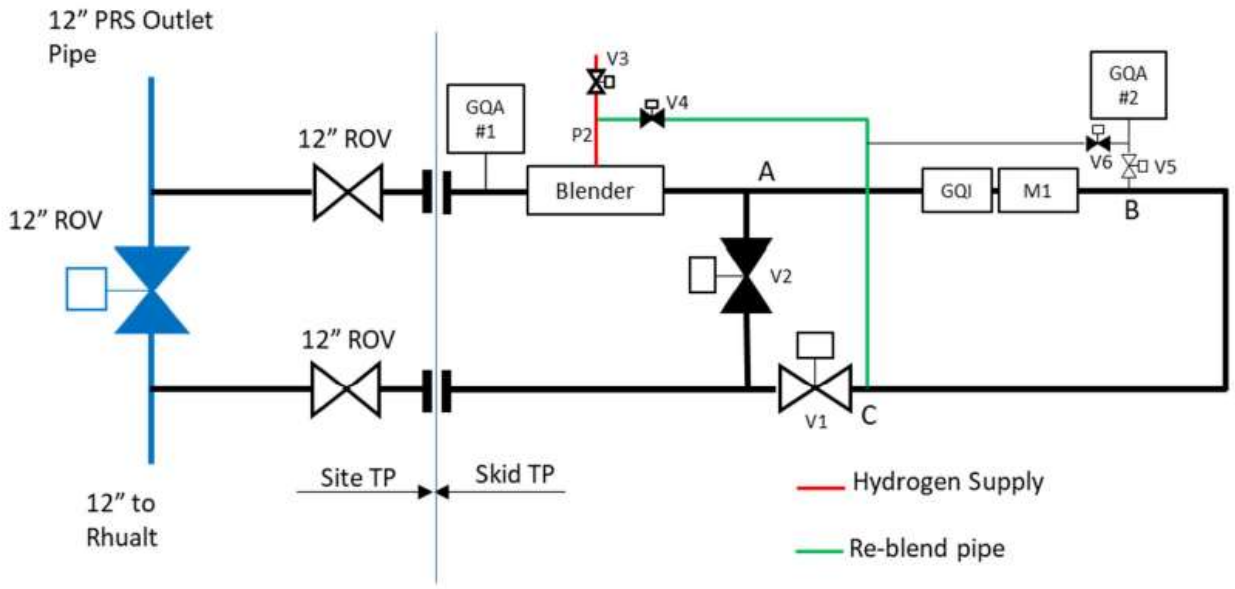
Key Outcomes – Technology Assessment



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





Next Steps

- Full reports will be published on the ENA portal
- Report to be submitted with HyDeploy evidence for HSE review
- Ambiguity within GSMR over the definition of gas to be considered by HSE when assessing any changes to GSMR
- Standardise e.g. IGEM standard for roll out

Actions and Issues List

Copy of Issues and Actions Tracker 0849R (002) (version 1)

Trading

Legislative Hierarchy Review

Assumptions and Parameters

- 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
- 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)

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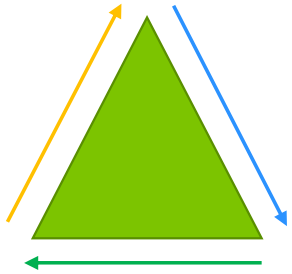
Trading Review: Existing Trading Regime

Shippers, Traders and the System Operator take gas trading actions. Shippers/ Traders can trade between themselves on various gas markets or over the counter via the NBP in order to balance their portfolios. This can cover long, medium- or short-term trades. Most of the markets that Shippers/Traders can trade on are used ahead of the Gas Day, with the majority of trades being anonymous.

The System Operator trades for a discreet number of reasons, including to purchase shrinkage gas or in the role of residual balancer to encourage the market to balance gas input and offtakes from the network. The System Operator can only trade on the On-the-Day Commodity Market (OCM).

System Operator – SO monitors, throughout the day, the System Balance: Opening Linepack + (Supplies – Demands).
As the Residual Balancer, SO takes trade actions on the OCM to ensure NTS is operationally secure and to balance efficiently, & influences cashout incentive for Shippers. GNNC can undertake NBP title trades, NBP physical trades and Physical Locational trades on the OCM.

SO also trades for Shrinkage reasons (shrinkage is energy used to operate the NTS or unaccounted for gas due to measurement reasons), can trade on the OCM, OTC and other platforms.



Traders- buy and sell gas before it reaches the end consumer
Trader Users only have ability to trade NBP Title gas (i.e. commercial not physical transactions)

Shippers- Gas shippers buy gas from producers, trade gas and sell it onto gas suppliers or deliver to large end users.

Shipper Users can undertake NBP title trades, NBP physical trades and Physical Locational trades.

Hydrogen Blending: Trading

Primary Legislation 	**Gas Act 1986:** Trader User does not need a license, therefore trading rules are within Network Code	**No change**
Regulations 	**Gas Safety (Management) Regulations 1996** **The Gas (Calculation of Thermal Energy) Regulations 1996**	**No impact**
Licence 	**Gas Transporter License: Standard Conditions: Condition 39** Definition of trading business: activities connected with the acquisition and disposal of gas in Great Britain/ activities connected with storage The licensee shall use its best endeavours to secure that no information relating to, or derived from, its transportation business is disclosed for the benefit of any trading business	**No change**
Code (UNC) 	**Section D: Operational Balancing and Trading Arrangements:** [Residual balancing NTS trading arrangements] Arrangements to maintain the balance between the quantities of gas delivered to and offtaken from the Total System. Trading arrangements are also covered, inc. market transactions, contract renominations, contingencies, and multi-day balancing actions **Section N: Shrinkage** National Grid NTS will estimate each Day, the quantity of NTS own use gas, NTS unaccounted for gas and CV Shrinkage on the following Day A Shrinkage Provider (NTS) may purchase gas in respect of shrinkage by making Trade Nominations	**No change-** *blended gas will trade at NBP (if no subsidy offered for blending, producer may lose revenue on volumes blended, however this is better than flaring)* **Section D: No change-** *Trading arrangements will remain the same for all balancing actions.* **Section N: No change-** *(shrinkage volumes will increase with H2 blend)*

Charging

Legislative Hierarchy Review

Assumptions and Parameters

- 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
- 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

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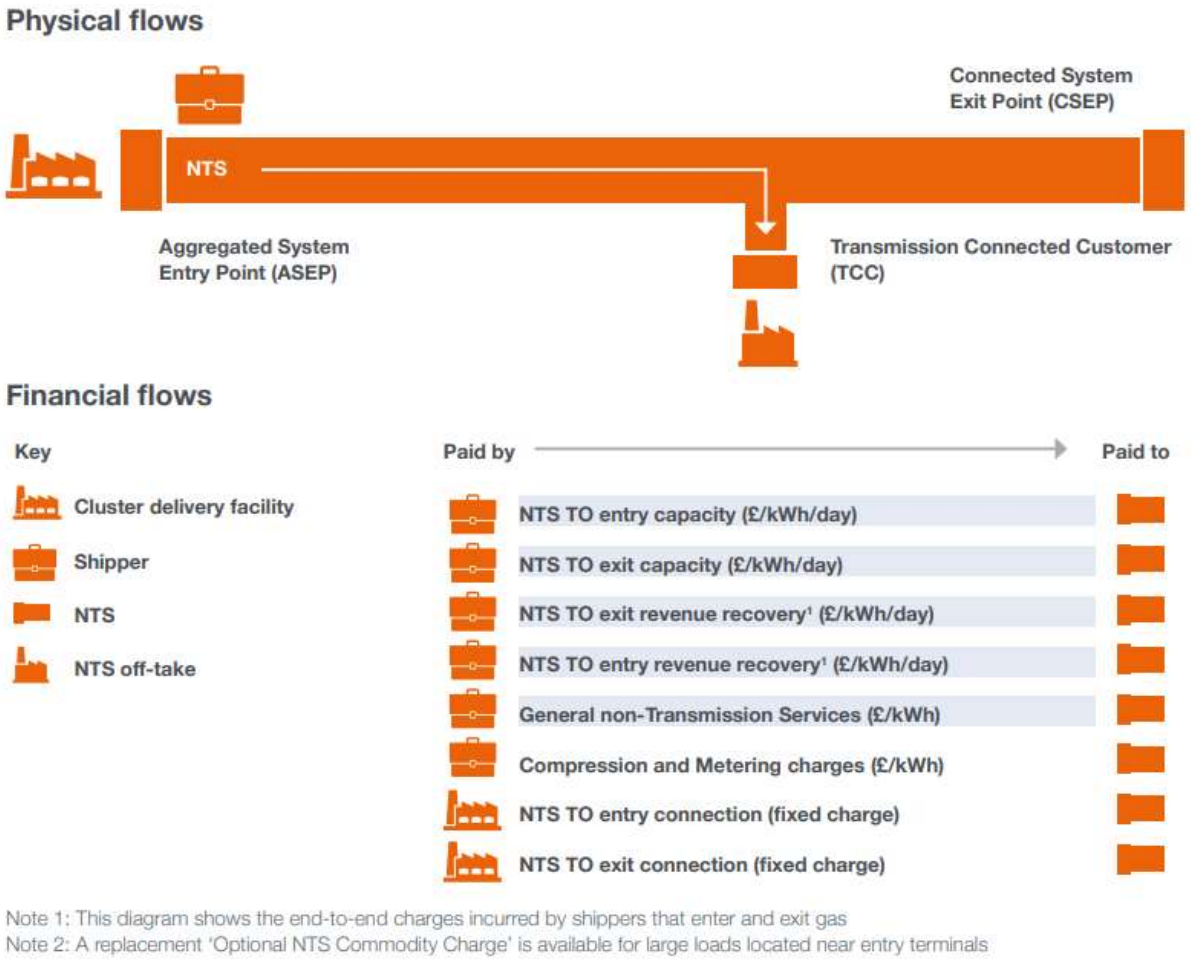
Existing NTS Charging Framework

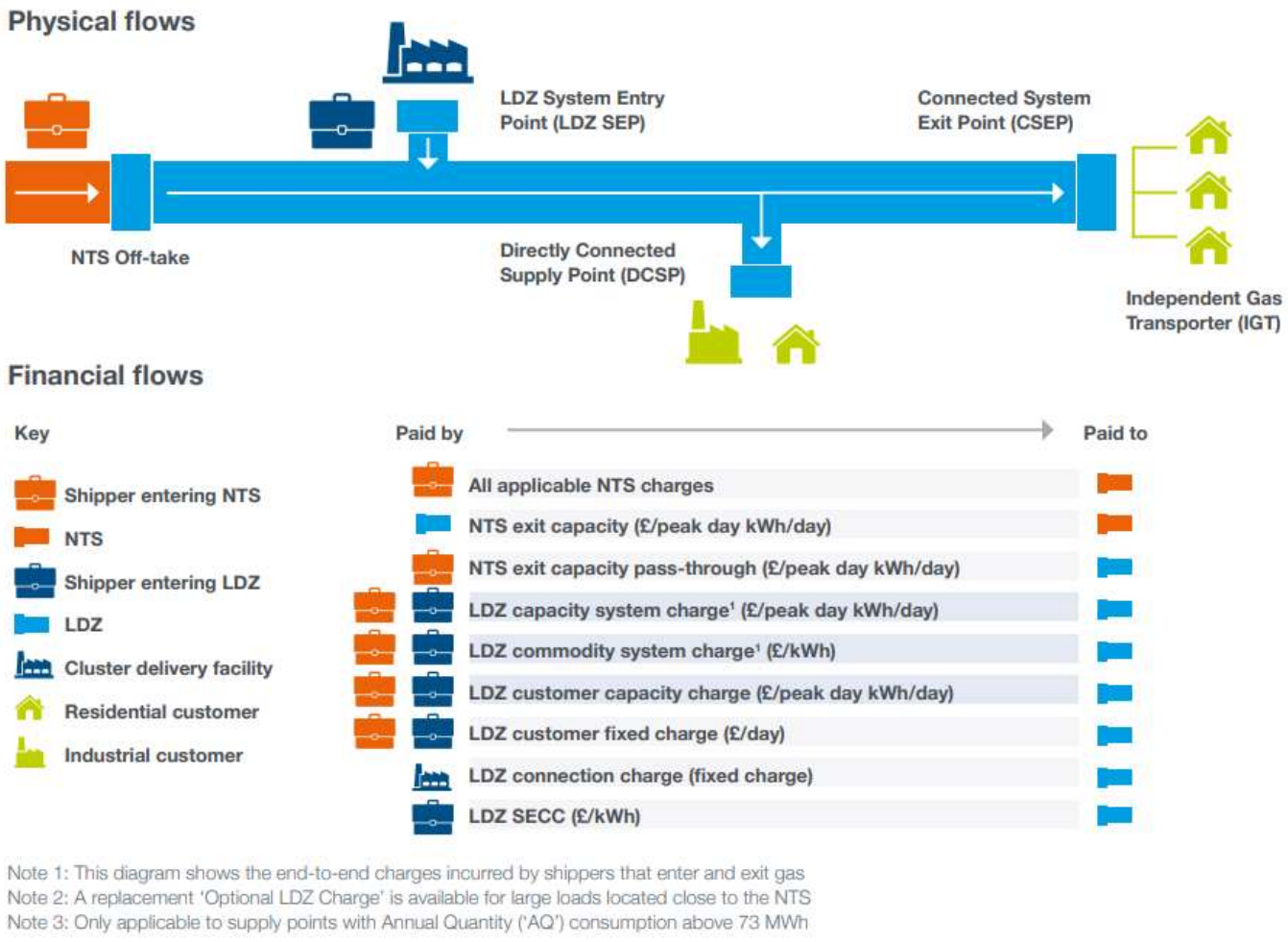


(Enabling hydrogen blending from industrial clusters.pdf) (energynetworks.org)

A 'net-entry' principle for charging arrangements has already been reflected through MOD 0363V under TPD Section E 1.10 'NTS Commingling Facilities.'

TPD Section E 1.10 'NTS Commingling Facility' already defines the net entry scenario for NTS CSEP's, however the definition of gas (GT C3.1) states – 'In the Code, unless the context otherwise requires, "gas" means any hydrocarbons or mixture of hydrocarbons and other gases consisting primarily of methane which at a temperature of 15 ° C and an absolute pressure of 1.01325 bar are or is predominantly in the gaseous state'. Therefore, additional text may need to be added to the definition for a 'NTS Commingling Facility' (GT C1) to allow for Hydrogen to be covered under the gas definition.

Existing LDZ Charging Framework



Note 1: This diagram shows the end-to-end charges incurred by shippers that enter and exit gas
Note 2: A replacement 'Optional LDZ Charge' is available for large loads located close to the NTS
Note 3: Only applicable to supply points with Annual Quantity ('AQ') consumption above 73 MWh

(Enabling hydrogen blending from industrial clusters.pdf) (energynetworks.org)

Diagram gives an overview of the LDZ charging framework, showing the set of network charges paid by shippers and/or delivery facility operators to enable gas to be conveyed via an NTS offtake (illustrated in red) or from a direct entry connection at the LDZ (illustrated in teal) to a Directly Connected Supply Point (DCSP).

For Distribution networks a similar concept to MOD 0808 'Reverse Compression' may be built upon in order to provide a solution for a connection scenario where gas will be leaving the network to be blended at the DFO owned commingling facility before a blend is injected. This MOD is still being developed, so this will need to be reviewed for Hydrogen blending purposes once the legal text has been finalised.

Hydrogen Blending: Charging

Primary Legislation	**Gas Act 1986**	**No impact**
Regulations	**Gas Safety (Management) Regulations 1996** **The Gas (Calculation of Thermal Energy) Regulations 1996**	**No impact**
Licence	**National Grid Gas plc Gas Transporter Licence Special Conditions** Details on NGG recovery of allowed revenue, the amount NGG should aim to recover through transportation charges Directly remunerated services not included in allowed revenue (i.e., connection charges) **Part C 9.13.15** Types of points defined **NTS Transportation Charging Methodology Statements** Details charges that users of the gas National Transmission System (NTS) have to pay and how they are calculated	**GT Licence Standard Conditions Amend:** **No change:** *(blending transportation charges will go towards allowed revenue)* **No change:** connection charges remain the same **Part C 9.13.15 Appendix 1:** include "blend point" classification **NTS Transportation Charging Methodology Statements Amend:** For discount option, include "Applicable Commodity Rate" for "Blend Point"
Code (UNC)	**Section B System Use and Capacity:** NTS Entry Capacity and NTS Exit Capacity **Section E Daily quantities, imbalances and reconciliation:** [provides overview of the capacity reconciliation charges to Shippers for overruns, scheduling – balancing costs **UNC Section Y Charging methodologies:** [Provides methodology on how to apply the specific values within allowed revenue (taken from the license) to get rates, i.e., for capacity]	**Section E Amend:** outlines net entry concept for 'NTS commingling facility' definition of gas may need amending
Agreements	**NEA/ NExA**	**NEA/ NExA Amend-** MOD 8080 'reverse compression' concept for net entry charge

Slide 19

MB0 TPD Section E 1.10 NTS Commingling Facility 1.10.1 In relation to a NTS Commingling Facility, the Connected System Agreement shall provide for the Connected System Operator to notify the Transporter in relation to each Day in respect of which gas flows out of the NTS to a NTS Commingling Facility and from the NTS Commingling Facility into the NTS of: (a) a quantity (the "gross commingling exit quantity") which represents the quantity of gas offtaken from the NTS at the Connected System Exit Point on the Day; and (b) a quantity (the "gross commingling entry quantity") which represents the quantity of gas delivered to the NTS at the System Entry Point on the Day. 1.10.2 In relation to a NTS Commingling Facility in respect of a Day in relation to which the Connected System Operator notifies the Transporter of: (a) a gross commingling exit quantity which is greater than the gross commingling entry quantity, the Entry Point Daily Quantity Delivered shall be zero and the CSEP Daily Quantity Offtaken shall be the quantity equal to the gross commingling exit quantity less the gross commingling entry quantity; (b) a gross commingling entry quantity which is the greater than the gross commingling exit quantity the CSEP Daily Quantity Offtaken shall be zero and the Entry Point Daily Quantity Delivered shall be the quantity equal to the gross commingling entry quantity less the gross commingling exit quantity.
Megan Bray, 2023-03-01T16:48:19.212

RJ1 Not sure this is the right section as it sets out the baselines for each point...what is blend point doesn't have a baseline
Randall, Jennifer, 2023-03-06T07:53:47.319

Thank you

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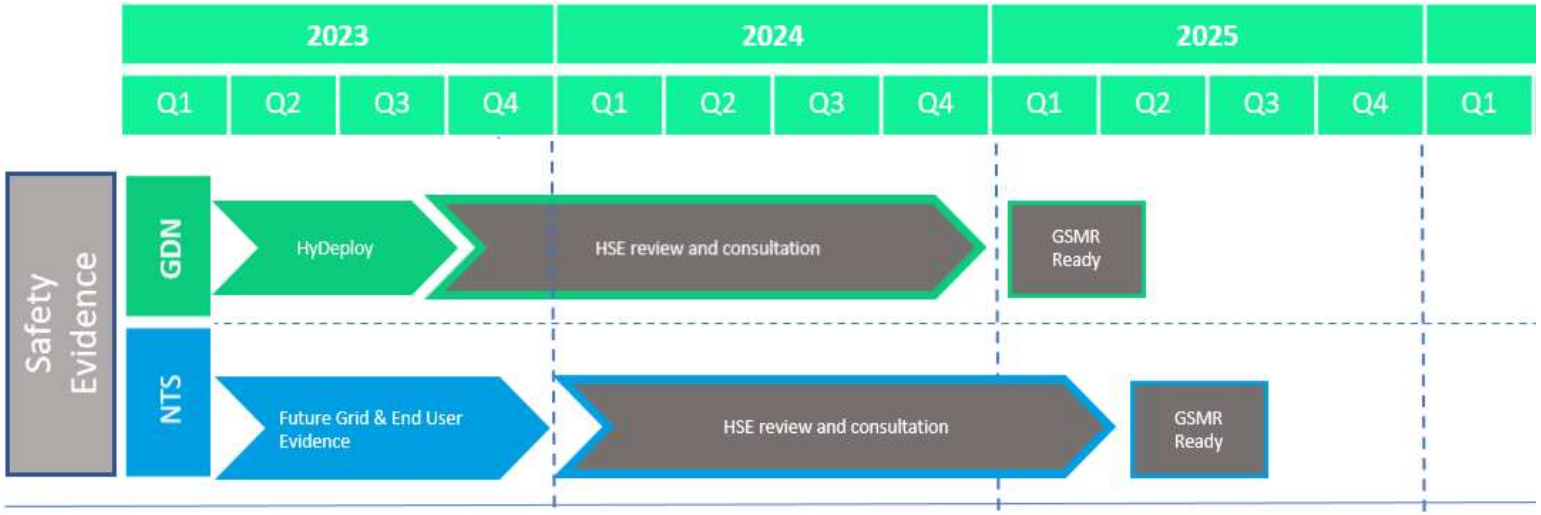
Appendices

Expected Policy Timelines



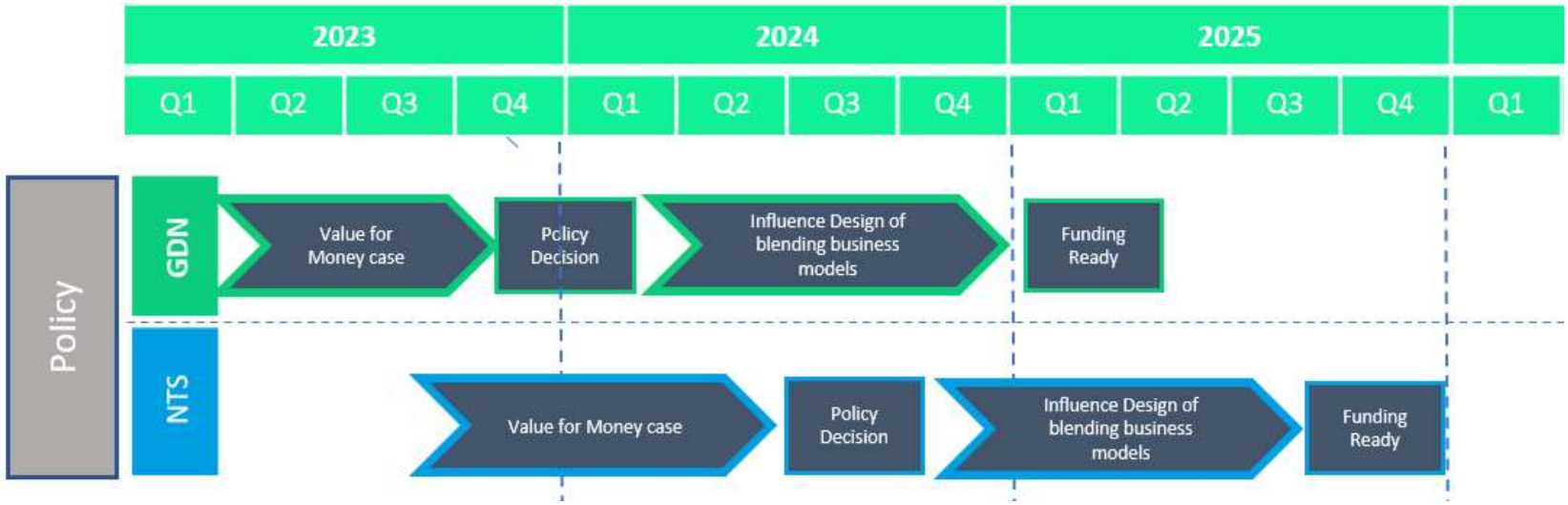
HyDeploy

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

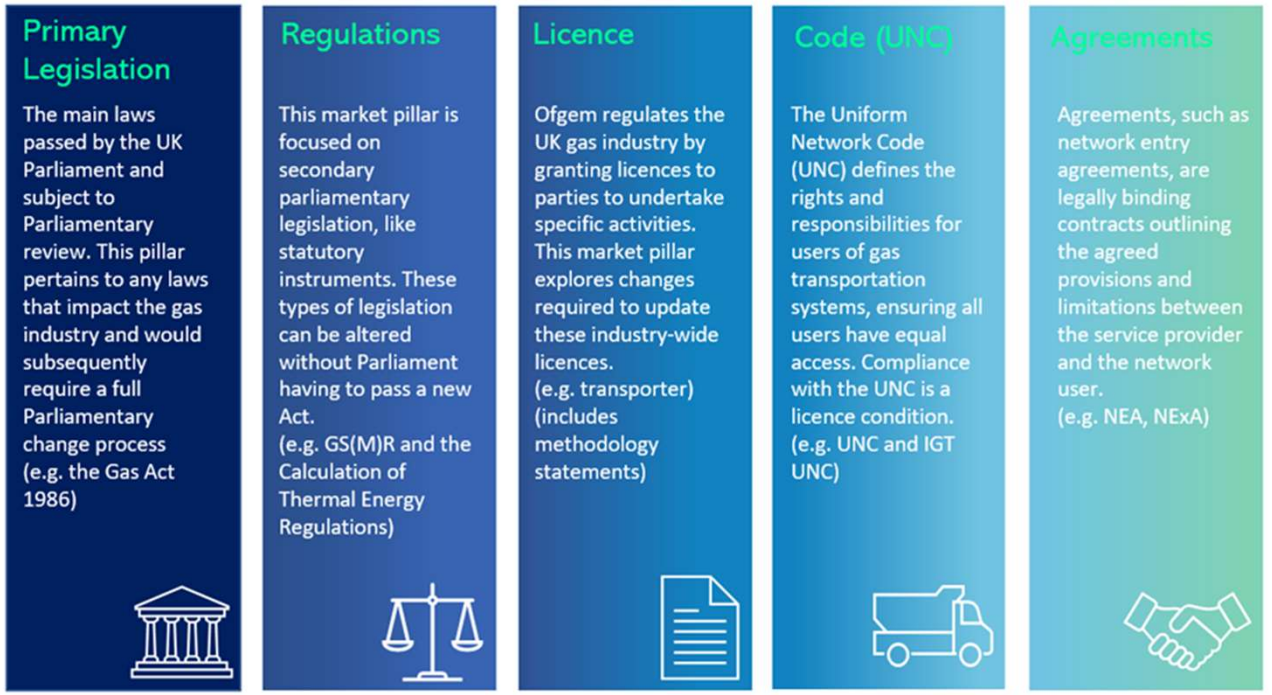
Belgian has amended its Gas Law to allow a 2% hydrogen blend as of July 2023. However, the first concrete injection project will start later, in 2024. Initial Blends will only impact the regional network and won't reach interconnection points. Fluxys has plans to reach a blending level up to 10%. Going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