



UNC 0849R:

Hydrogen Blending: Commercial framework review and amendments

Review Group Six

Wednesday 28th February



Agenda

10:00 – 10:05 Welcome and agenda

10:05 – 11:05 Review Actions and Issues Tracker

- Including slides on Gas Energy Measurement- Impacts of Global Warming

11:05 – 11:20 Break

11:20 – 11:30 EU Blending Policy Update

11:30- 12:30 KPMG Phase 1- Commercial Framework Review Outputs

12:30 – 13:00 Lunch Break

13:00 – 13:55 Development of Interim Workgroup Report

13:55 – 14:00 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 may 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 it's currently set out.
- Other projects will also be concluding on framework principles (e.g. 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).
- A final blending delivery model will need to be agreed before all required changes to UNC and Licence can be concluded. Industry input and engagement on the development of this model will be completed through 0849R.

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. – **recommend delete**

**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](#)

Gas Energy Measurement in Consumer Billing
Follow-up action on impacts of global warming

UNC Workgroup 0693R

28th February 2024

davelanderconsulting

Gas Energy Measurement: study commissioned by Ofgem in 2014

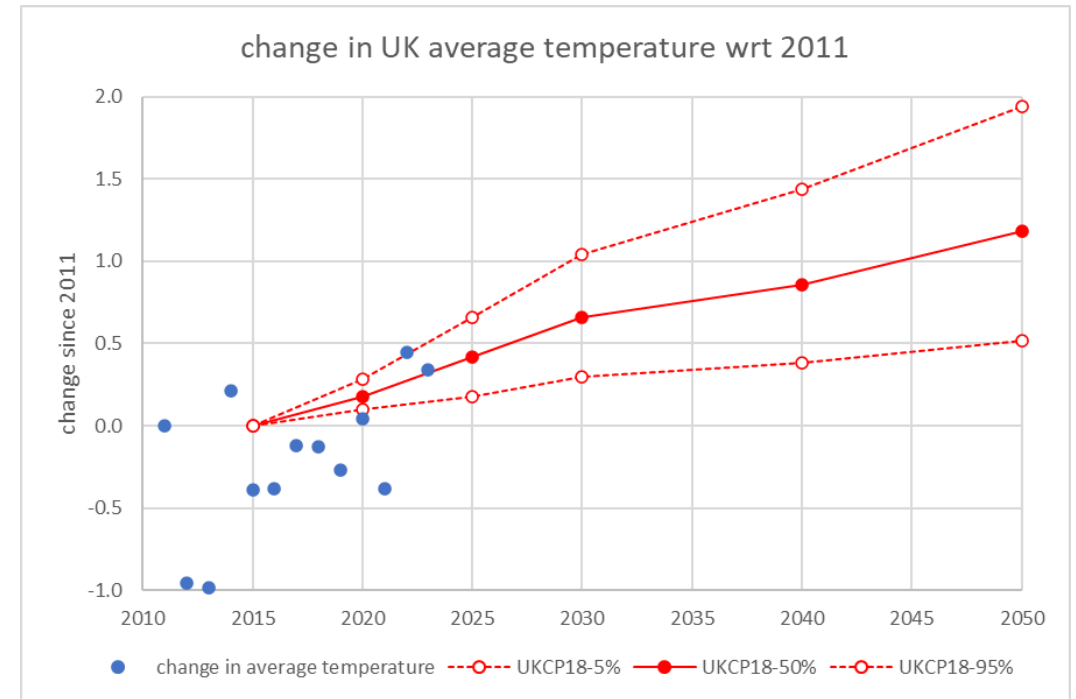
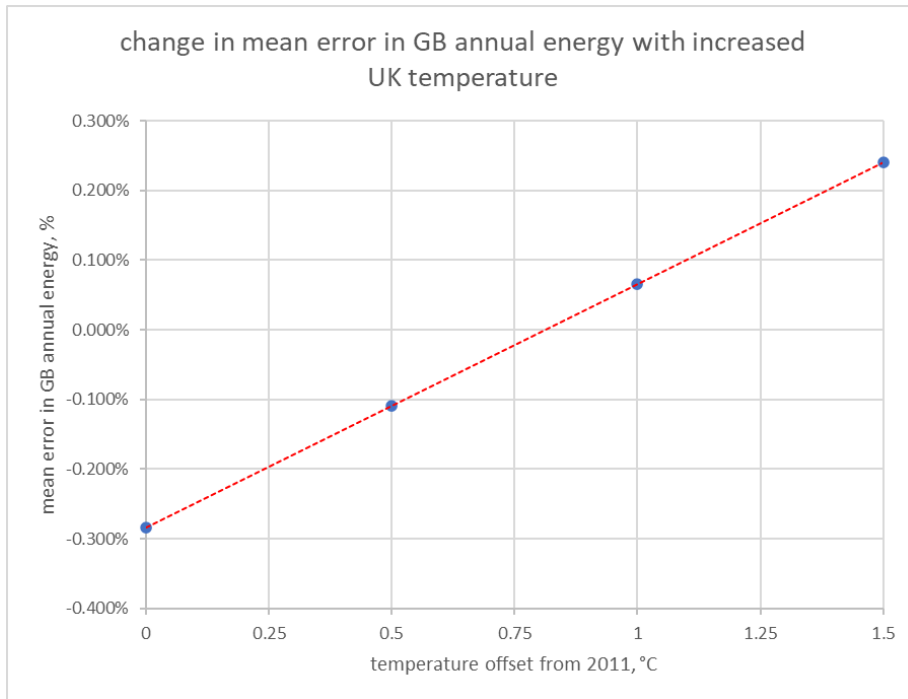
- Reported at last meeting of UNC Workgroup 0693R
 - Headline conclusion regarding accuracy of the factor in G(COTE) regulations:
 - for GB, mean error (i.e., bias) in annual energy during 2011
 $-0.238\% \pm 0.019\%$
- Follow up question:
 - What is the likely impact of global warming on accuracy of the factor

Approach taken

- Existing model used for Ofgem study:
 - inputs of air temperature, atmospheric pressure
 - granularity of GB, LDZ and UK outcode
- To every temperature: simply add:
 - 0.5°C, 1.0°C, 1.5°C

Note: this ignores local variation (i.e., all outcodes are affected equally)
- Impact on mean error in GB annual energy

Results



- 0 °C to 1.5°C with respect to 2011
 - Mean error changes from -0.3% to +0.24%
 - Net under-recovery becomes net over-recovery at ca. 0.8 °C
 - Around 2030-2040?
- UK Met Office UKCP18 average annual temperature predictions (referenced to 2011 – not 1981-2000)

Conclusions

- Increase in UK temperatures are likely to lead to a small net under-billing to a similar net over-billing over the next 30-40 years
- GB level of granularity – more work required for localised impacts
 - UKCP18 predictions could in principle be employed to assess winners and losers
- Will future consumer billing arrangements (such as Future Billing Methodology) obviate the need for consumer billing based on a single, fixed, volume conversion factor?
 - If yes, then no need to consider amendment of fixed factor
 - If no, then may need to consider amendment

EU Policy

Topic	Articles	Summary	New?	Notes
Gas Quality	Reg - Recital	<ul style="list-style-type: none"> Adjacent TSOs should remain free to agree on higher or lower hydrogen blending levels at IPs 	New	<ul style="list-style-type: none"> Interpreted as higher or lower than 2%
Gas Quality	Reg - Article 19 - Cross-border coordination of gas quality in the natural gas system	<ul style="list-style-type: none"> Procedure for solving CB issues related to GQ differences. <u>For blends, the article applies only if H2 <2%.</u> <ul style="list-style-type: none"> TSOs shall accept blends after the completion of the procedure in Art19. NRAs may jointly decide to maintain the restriction. This decision shall be reviewed every 4 years. 	New in the Regulation	<ul style="list-style-type: none"> Art 19 does not apply to third countries. Before, this obligation was in the INT NC (Art 15). Art 15 can be amended during the INT NC revision to include details from Art. 19 No procedure for H2 > 2%
Gas Quality	Reg - Article 23 - Tasks of the ENTSO for Gas	<ul style="list-style-type: none"> Gas quality monitoring report by 1st January 2025 on: <ul style="list-style-type: none"> - new developments on GQ and their forecasts - examples of cases related to GQ differences 	New	<ul style="list-style-type: none"> GQ info from third country may be needed
Gas Quality	Reg - Annex I - GUIDELINES ON TRANSPARENCY	<ul style="list-style-type: none"> Publication of specification of GQ parameters. At least: GCV, WI and O2 content, and the liability or costs of conversion for network users in case gas is outside these specifications <u>Publish measured values of GCV, WI, H2 blended, methane content and O2 at all relevant points, on a daily basis</u> 	Not new, but parameters were added	

Flexibility for EU-UK interco ?

- **Article 52 Regulation** indicates that NC and guidelines apply to entry points from and exit points to third countries from 24 months from the date of entry into force of this Regulation.
- **Article 79 Directive** states that EU TSO and third countries TSO are free to conclude technical agreement on issues concerning the operation of interconnectors pipelines, insofar as those agreements are compatible with Union law and relevant decisions of the regulatory authorities of the Member States concerned.
- Article 82 Directive outlines the procedure to follow in order to amend, extend, adapt, renew or conclude an agreement on the operation of a transmission line with a third country

Hydrogen Blending Implementation Programme Presentation to 0849R working group

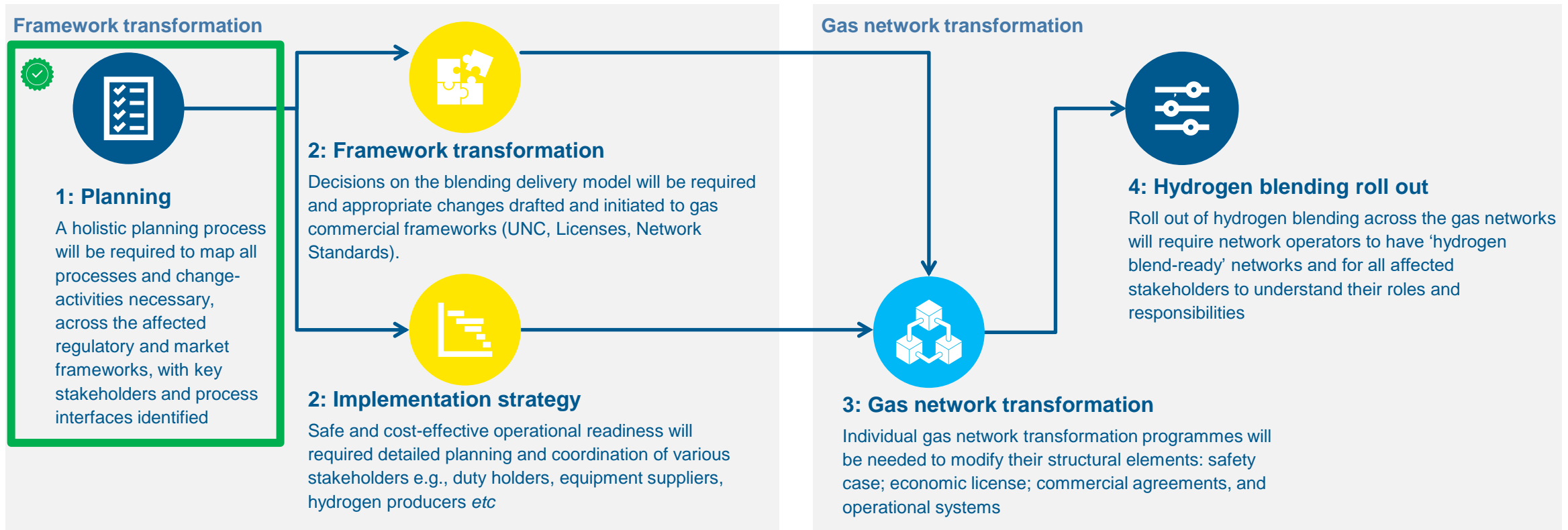
28th February 2024

Agenda

Item	
1	Overview of Blending Implementation Programme Process
2	Phase 1: Summary of our approach
3	Phase 1: Key Findings and next steps
4	Phase 2: indicative process and timeline

Overview of Blending Implementation Programme process

Between September and December 2023, we completed the planning phase for the blending implementation programme, which included conducting a thorough review of the gas market frameworks, and developing a process for making decisions on the outstanding questions relating to the blending delivery model, and translating these into code and licenses changes, and operational readiness plans. This process will be the focus of Phase 2.



Phase 1: Summary of our approach

Five pillars of activity were identified that collectively will allow Britain’s network to become hydrogen blend-ready. In Phase 1, we conducted a review of activities required across each pillar, and mapped the timelines, roles and responsibilities, and sequencing of these activities, to produce a detailed transformation plan.

Pillars	What we did
<p>1 Policy The Government’s high-level strategic decision and supporting detail on how blending should be implemented.</p>	<p>Review of DESNZ minded-to positions (Aug-23) to inform high-level scope of our assessment</p> <p>Review of Strategic Decision in Dec-23, and integration of updated timelines and process into delivery plan</p>
<p>2 Safety Evidence The completion of the safety trials by (HyDeploy / FutureGrid) and subsequent assessment of the evidence and decision by the Health and Safety Executive (HSE).</p>	<p>Workshops held to understand safety trials progress and review process</p> <p>Review of previous comparable GS(M)R change processes to inform mapping of process and timelines</p>
<p>3 Market Frameworks The design of the blending ‘delivery model’ plan to support commercial-scale blending, and the changes require to network licenses, codes (UNC), and supporting agreements to achieve this.</p>	<p>Detailed review of all network codes (UNC) and licenses to identify where changes required to deliver blending</p> <p>Literature review of blending delivery models (incl. 0849R working group outputs) to map potential delivery options</p> <p>Design of timetable for achieving final blending delivery model, with input from DESNZ and Ofgem</p>
<p>4 Operational Readiness The operational changes required to safely deliver a blend-ready network, including procedures updates, staff training, and system upgrades.</p>	<p>Workshops with all Gas Networks to map operational functions and review those impacted by blending</p> <p>Review of resource requirements for operational readiness activities and est. timelines for implementation</p>
<p>5 Project Pipeline The pipeline (location & size) of early-stage hydrogen projects with ambitions to blend, informing the geographic focus of operational implementation and the delivery model design.</p>	<p>Mapped all existing HAR1 applications and other known pipeline projects</p> <p>Review of government funding round timelines against blending timeline and integrate into delivery plan</p>

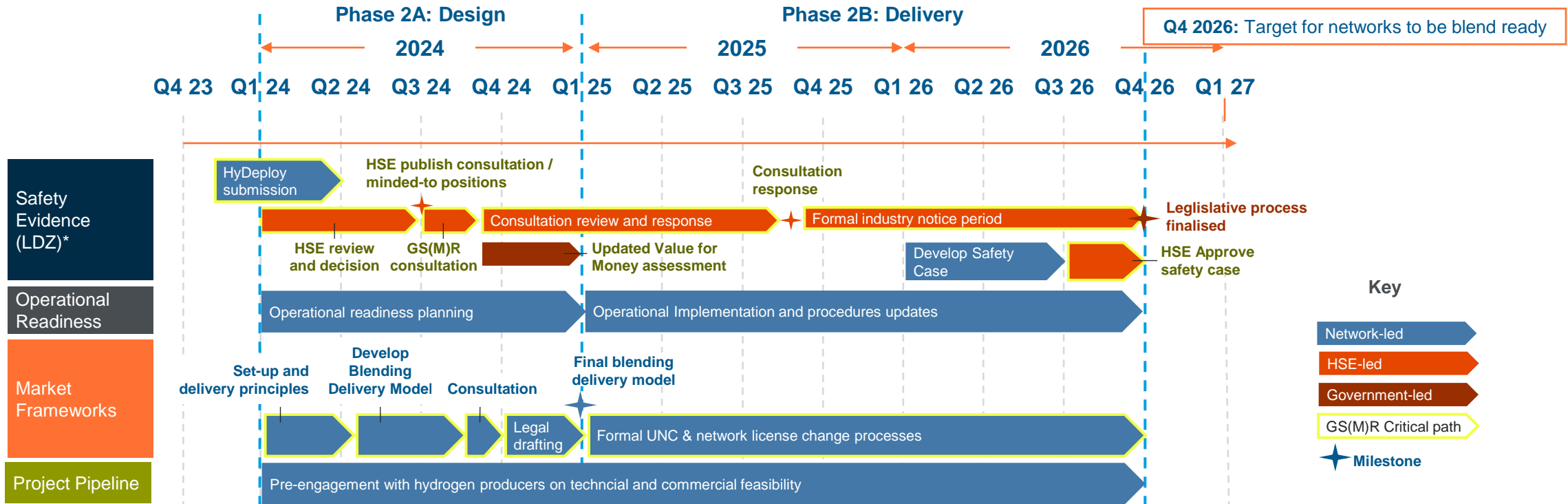
Phase 1: Key findings and Phase 2 activity

The key findings from Phase 1, and plan for delivery in Phase 2 are summarised below. ‘Policy’ is excluded from the table below as whilst an important driver of the overall process, this is Government-led with limited further input required by the networks following the strategic decision in December 2023.

Key findings		Next Steps
Safety Evidence	<ul style="list-style-type: none"> HyDeploy evidence review and GS(M)R legislative timeline is driving critical path to networks being ‘blend ready’ Based on previous comparable legislative processes (e.g. Wobbe index changes), initial outlined plan has changes coming into force from Q4-26 (following a 1-yr industry notice period) Potential for NTS timeline to catch up with LDZ if safety assessment process can be streamlined having been completed once already for LDZ 	<ul style="list-style-type: none"> Focus at start of Phase 2A will be collective buy-in on timeline from DESNZ, Ofgem and HSE HSE to conduct safety assessment and issue initial minded-to position prior to consultation
Market Frameworks	<ul style="list-style-type: none"> A set of decisions are required on the final ‘blending delivery model’, which should be consulted on with industry, prior to the translation of these into formal UNC and license changes These changes were categorised into the following categories, which will guide the Phase 2 working groups structure: <ul style="list-style-type: none"> Capacity Allocation, Connections, Trading and Balancing, and Network Charging Gas quality Measurement, Monitoring and System Operations Network Communications and Coordination The process for deciding on the final delivery model needs to be collaborative and involve input from wider industry (and Government / Ofgem), whilst also moving at pace. 	<ul style="list-style-type: none"> Agreement of up-front ‘blending delivery principles’ with DESNZ / Ofgem to guide decision-making process Establishment of Phase 2 working groups to conduct options assessments and recommend solutions Establish stakeholder engagement structures for input into emerging delivery model
Operational Readiness	<ul style="list-style-type: none"> Detailed action plans need developing and delivering in phase 2 in parallel to market frameworks changes (some of this may need to be at risk). Plans will need to be responsive to any changes to assumptions arising from HSE Safety Assessment, and emerging final ‘Blending Delivery Model’ to guide scope of actions required 	<ul style="list-style-type: none"> Develop operational implementation requirements to inform decisions on delivery model Begin developing detailed operational action plans for delivery phase
Project Pipeline	<ul style="list-style-type: none"> More detailed understanding of potential blending pipeline required to target resources of initial operational readiness activities Lack of certainty on blending policy and commercial frameworks limiting producers’ ability to commit to blending projects 	<ul style="list-style-type: none"> Engage with pipeline to identify priority projects / areas for implementation and collaborate on technical studies / design

Phase 2: Indicative process and timeline

Based on our findings from Phase 1, the indicative process and timeline for implementing blending into the LDZ is outlined below. **This is subject to agreement with Government and HSE on the legislative timeline, but has been based on previous, comparable processes.** The critical path is being driven by the legislative process for changes to GS(M)R, including the HSE Safety Review, with the timeline awarded to the market frameworks workstreams having been designed to align with this.



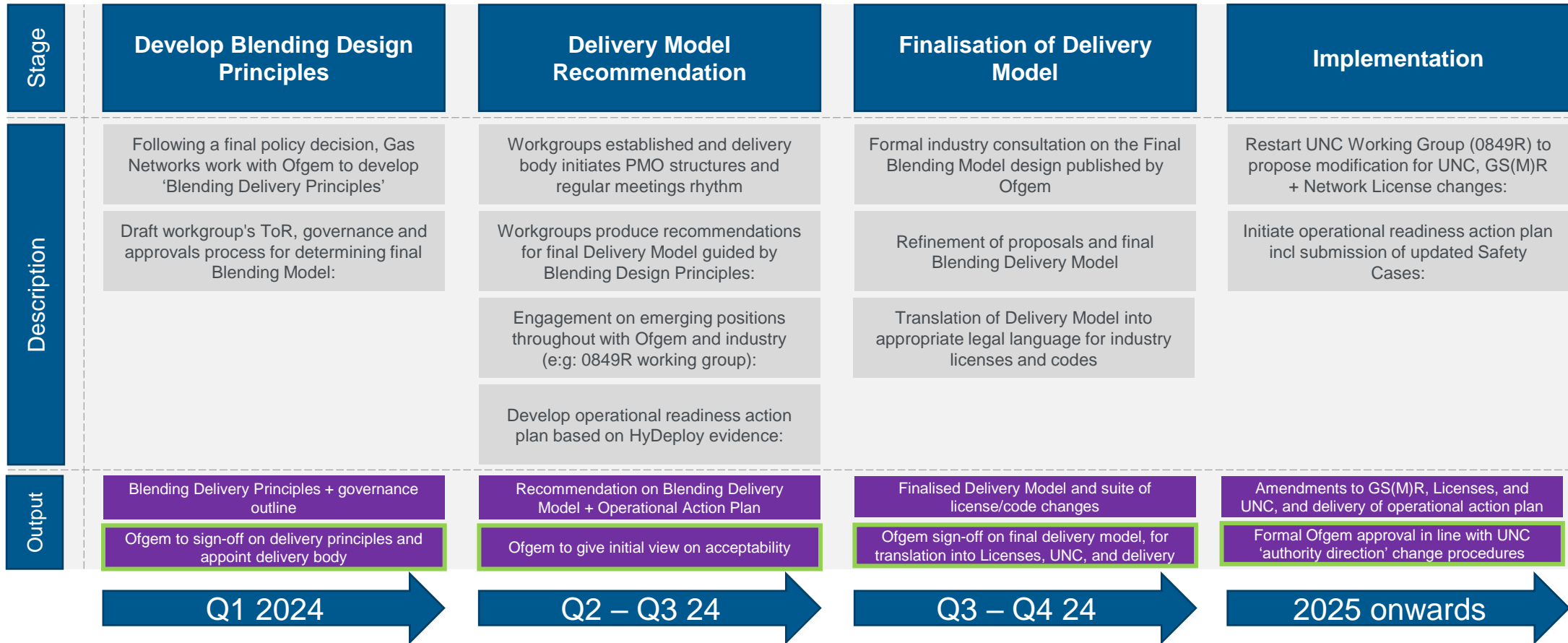
*There is an ambition to accelerate the trials for NTS-level blending in order to eventually align with the LDZ legislative process, with potential for a joint consultation response in Q3 2025 if this can be achieved. As such, the market frameworks review will also consider the delivery model for NTS-level blending.

Back-up

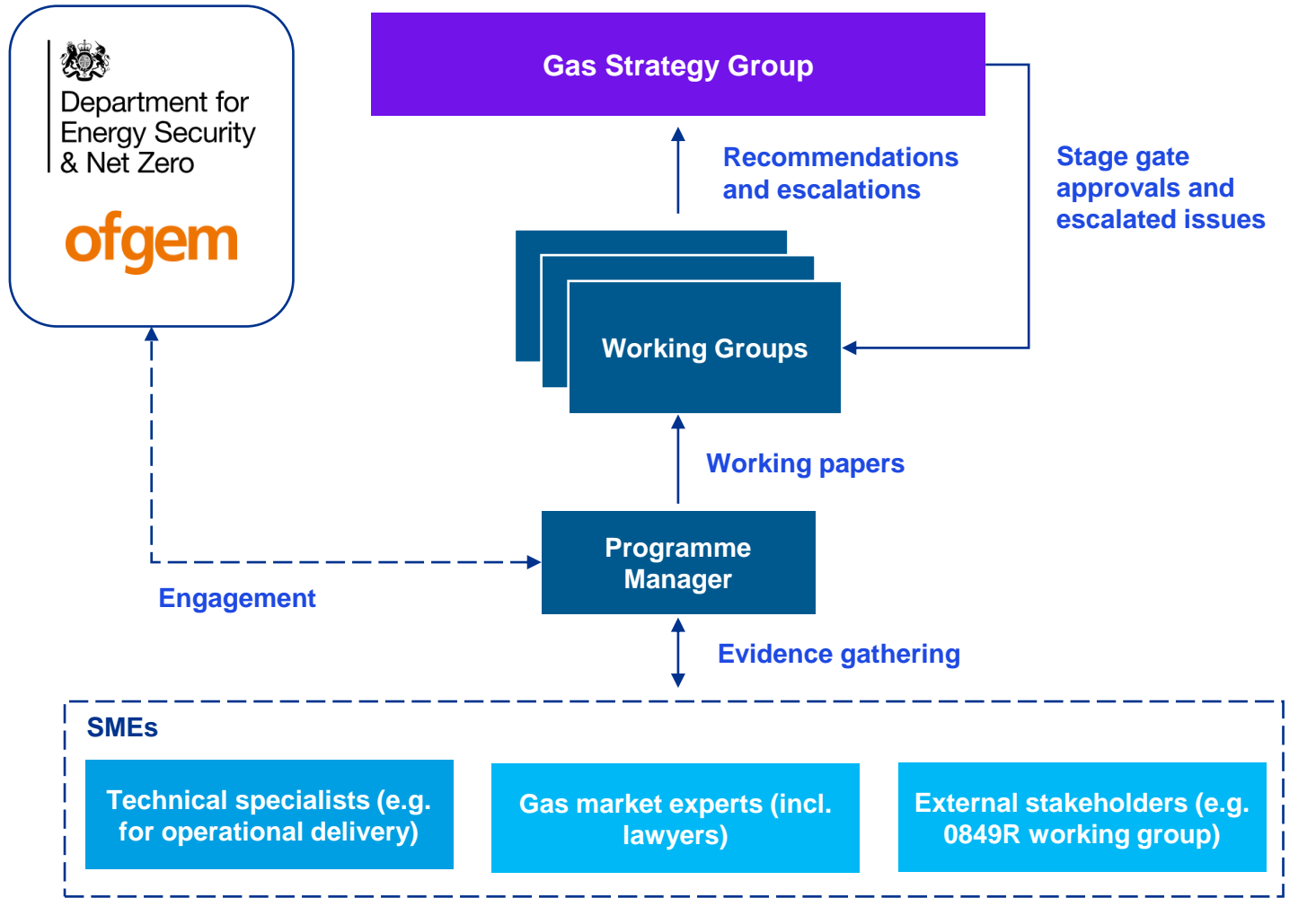
Phase-2 working groups structure

Working Group	Scope	Example range of options	
		Least Change	Optimisation
Capacity, Connection and Charging	<ul style="list-style-type: none"> • Connection offers – a ‘free market’ approach whilst optimising system flows • Capacity Allocation process – shippers obtaining capacity to inject hydrogen-blends • Network charging – new charge required for transportation of hydrogen-blended gas? 	<ul style="list-style-type: none"> • Mirror biomethane model for connections and capacity allocation • Minimal changes required with Entry Points and connection offers made on first-come, first-served basis • Additional ‘blending transportation charge’ may be required 	<ul style="list-style-type: none"> • Bespoke connections and capacity allocation processes for hydrogen injection points • Optimise blending flows to reduce curtailment risk and prioritise larger hydrogen plants • Additional ‘blending transportation charge’ • Charges related to new hydrogen connections and capacity
Trading and Balancing	<ul style="list-style-type: none"> • Nominations process - how hydrogen-blended gas reaches the system • Curtailment of hydrogen-blended nominated gas due to gas quality (a ‘no fault’ curtailment) 	<ul style="list-style-type: none"> • Minimal changes to ‘Input Nominations’ with NGT responsible for accepting or rejecting • No special protection for hydrogen gas shippers from curtailment risk 	<ul style="list-style-type: none"> • Bespoke nominations process for H₂-blended gas with accommodations for gas quality and hydrogen capacity • Potential new charging arrangement in the event of a ‘no fault curtailment’
Measurement, Monitoring and System Operations	<ul style="list-style-type: none"> • System entry conditions – changes to account for gas properties • Measurement – hydrogen injection facilities’ measurement procedures • Curtailment rights – physical movement of hydrogen-blended gas 	<ul style="list-style-type: none"> • No changes to system boundary definitions and additional monitoring only at new hydrogen entry points • Exemptions-based approach 	<ul style="list-style-type: none"> • No change to system boundary definitions • Expanded definition of ‘Commingling facilities’ to enable these at LDZ • Additional monitoring infrastructure to improve gas quality forecasts
Communications and Coordination	<ul style="list-style-type: none"> • Information flows from NTS to LDZ in relation to hydrogen-blended gas 	<ul style="list-style-type: none"> • Data on hydrogen content of gas to be recorded and shared at NTS-LDZ offtakes 	<ul style="list-style-type: none"> • Enhanced communication between control centres to allow optimisation of connections and capacity offers

Blending Delivery Model process and governance



Blending Delivery Model Design / Governance Overview



Key stakeholder roles and responsibilities

Group	Role
Gas Strategy Group	<ul style="list-style-type: none"> Sign-off recommendations from working groups at stage gates Resolve any issues escalated by working groups
Working Groups	<ul style="list-style-type: none"> Review and approve framework for deciding between options Review options and assess / score against decision making framework Provide recommendations to GSG on shortlist / final delivery model based on options assessment
Programme Manager	<ul style="list-style-type: none"> Prepare workpapers and decision papers for network working groups, and summary versions for GSG Coordinate process for determining delivery principles, and design framework for assessing options Secretariat / PMO support for overall programme
Government & Ofgem	<ul style="list-style-type: none"> Provide overall policy direction, including views on acceptability of decision making principles, framework, and emerging positions
Industry / SMEs	<ul style="list-style-type: none"> Provide evidence / input into workpapers for options analysis Consult on viability / acceptability of emerging positions

Next Steps:

Submit interim report to panel on 21st March 2024.

(Including all areas of change identified by work group and areas of uncertainty that require further clarification)

Networks to appoint supplier to manage the next phase of work (phase 2- blending delivery model)
Currently progressing with final sign off for phase 2 plan.

Megan to share update and plan moving forward with 0849R once final sign off for phase 2 is complete.

Future Considerations for group:

Plan for formal licence / code change process

Who will be leading the MOD submission?

Should this be two separate MOD's (Transmission and Distribution split)?

Depending on agreed changes, decide whether direct change to code is necessary or an addendum.

Following safety evidence submission

If decision to implement exemption based approach is required instead of system wide GS(M)R change, how will this impact the market framework transition?

Thank you



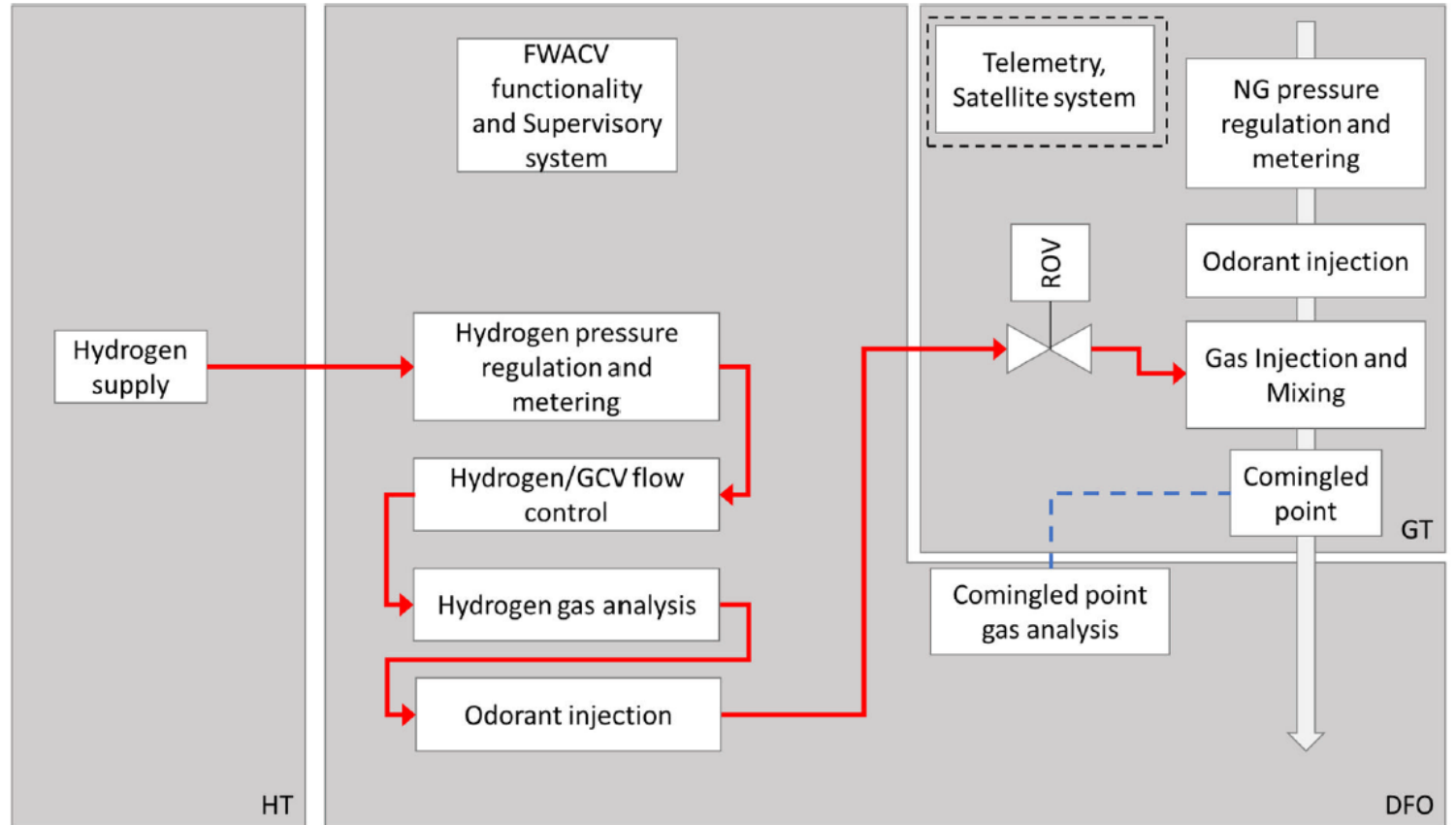
Appendices



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

