UK Government

Hydrogen economic regulatory framework

Developing an effective market framework for 100% hydrogen pipeline networks: government response

Department for Energy Security and Net Zero (2025)

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General information

In this document, '(100%) hydrogen pipeline networks' means systems of pipeline infrastructure used for transporting only hydrogen gas, with one or more entry points (where hydrogen is put into the pipeline) and multiple exit points (where hydrogen is taken out of the pipeline). These networks require appropriate regulation of relevant network owners, operators and users to provide for its safe and efficient operation. 'Hydrogen pipeline networks' is used interchangeably with 'hydrogen networks' throughout this document.

Government response structure

The consultation on the economic regulatory framework for hydrogen pipelines contained 6 chapters and 20 consultation questions.

This government response follows a similar structure. In the executive summary, we outline next steps for development and implementation of the economic regulatory framework. Each chapter summary then includes key points from the government's minded-to positions included in consultation and response. These are followed by a summary of responses received to each individual question, and a government response.

Analysis of responses received to the consultation

The consultation was open from 15 July to 9 September 2025.

We received 49 responses from stakeholders, across the following organisation types:

Number of respondents	Organisation type
11	Trade Associations
10	Hydrogen Producers
5	Gas Transporters
3	Hydrogen to Power Projects
3	Investors

3	Storage providers
2	Gas Shippers
2	Individuals
2	R&D Organisations
8	Other respondents

This document summarises responses received to each of the 20 consultation questions. In reporting the overall responses to each question, we have used tables to indicate the number of respondents who agreed or disagreed with the minded-to positions.

We have used several terms to summarise additional points raised in the responses:

- ‘strong agreement’ indicates that more than three-quarters of respondents to a question have shared this view
- ‘majority’ indicates more than half of the respondents to that question
- ‘minority’ indicates less than half of the respondents to that question
- ‘a few respondents’ indicates up to 5 respondents
- ‘some respondents’ indicates any number between 6 and 15 respondents
- ‘many respondents’ indicates any number between 16 and 40 respondents

Executive summary

This document sets out the UK Government's response to the consultation on the economic regulatory framework for hydrogen pipeline networks ('the consultation'), held from 15 July to 9 September 2025. The consultation sought views on proposals to adapt the existing regulatory framework, established under the Gas Act 1986 to support the development of dedicated hydrogen infrastructure.

Assessments and proposals set out in the consultation drew on responses to the 2022 consultation on Hydrogen Transport and Storage and subsequent review of regulatory frameworks, including views and evidence shared by the Hydrogen Delivery Council (HDC) Transport and Storage Working Group.

The consultation was open from 15 July to 9 September 2025 and received 49 responses from a broad range of respondents, including hydrogen producers, transporters, trade associations, investors and research organisations. Government has considered these responses and intends to take forward the following actions to support the development of hydrogen pipeline networks:

- **Maintain primary and residual balancing licence structures** for hydrogen pipeline networks, ensuring clear roles and responsibilities for market participants.
- **Further consider how best to license hydrogen shippers**, with the expectation that hydrogen producers are likely best placed to assume primary balancing responsibilities under a shipper licence, while allowing other network participants, such as offtakers, to apply should they meet necessary eligibility and legislative criteria.
- **Assign the role of System Operator to hydrogen transporters under licence**, recognising their familiarity with network operations.
- **Introduce secondary legislation to exempt hydrogen supply to premises from supplier licensing requirements**, keeping this under review as networks develop.
- **Refrain from introducing new licences for other activities including hydrogen production or storage** at this stage but continue to monitor the need for future regulation.
- **Develop a new, hydrogen network code, led by government in collaboration with industry and other stakeholders, using a Minimum Viable Product (MVP) approach**, to ensure timely and proportionate implementation.
- **Consider statutory powers to modify the hydrogen network code in the future**.

Evidence provided by respondents will help inform our approach to developing the hydrogen network code, alongside the subsequent design of licence and code provisions related to the issues considered within consultation.

These measures aim to provide regulatory clarity, support investment, and enable safe and efficient operation of early hydrogen pipeline networks. Government will continue to work closely with Ofgem, industry and other stakeholders to refine licence and code provisions and ensure the framework remains fit for purpose as the hydrogen economy develops.

Chapter 1: Hydrogen economic framework – Strategic Vision

Chapter summary

Chapter 1 of the consultation set out the government's strategic vision for the establishment of the hydrogen economy. Within the hydrogen value chain, hydrogen transport and storage infrastructure (T&S) is vital in enabling hydrogen production to service demand across different end use sectors, supporting delivery of the UK's decarbonisation commitments. Pipeline transport through hydrogen networks offers the most cost-effective mode of transporting the volumes of hydrogen expected to be required to support hydrogen demand in the early 2030s. The sectors where low carbon hydrogen is likely to be the most competitive decarbonisation option are traditionally located around the country's industrial bases. We therefore expect initial hydrogen T&S networks to first develop on a regional basis to support this demand. Subject to network needs and the pace of hydrogen offtake, this initial regional infrastructure could develop into more interconnected networks in future.

An effective economic regulatory framework is required to support delivery of the UK's first hydrogen pipeline networks. Hydrogen is already defined as 'gas' under the Gas Act 1986. Consultation considered the suitability of the regulatory framework set out under the Gas Act for the needs of the hydrogen economy to meet objectives for market regulation, using the following core design principles:

- Allocates clear roles and responsibilities for market participants to ensure hydrogen flows from producers to end users are safe and reliable;
- Provides commercial confidence to market participants; and
- Flexible to adjust to a future competitive market as networks grow.

The consultation focused on the regulation of early hydrogen pipeline networks, with a focus on power and industrial customers. The proposals are not intended to cover any supply of hydrogen to homes or small non-domestic premises; the potential role of hydrogen in heating these buildings will be covered in a separate consultation.

Government response

Low carbon hydrogen is essential to achieve the Government's Clean Energy Superpower and Growth Missions. It will be a crucial enabler of a low carbon and renewables-based energy system and will help to deliver new clean energy industries which can support good jobs in our industrial heartlands and coastal communities. Hydrogen presents significant growth and economic opportunities across the UK, by enhancing our energy security, providing flexible, cleaner energy for our power system and helping to decarbonise vital UK industries.

In this year's Spending Review, the Government confirmed over £500m support for hydrogen infrastructure. This will enable the development of the first regional hydrogen transport and storage network, which will connect producers with vital end users – such as power and industry – for the first time. The Industrial Strategy, through the 10 Year Clean Energy Industries Sector Plan (CEI), provided a clear deployment timeline for our Hydrogen Allocation Rounds (HARs) and announced new investment rounds and policies to drive growth in the sector. We are also working to publish a Hydrogen Strategy, which will set out our vision and objectives for low carbon hydrogen along with clear priorities for collaboration with industry.

Government considers that implementing the proposed regulatory approach would establish a clear economic framework for hydrogen, as summarised in later chapters of this document. Implementing these changes through legislation, licences, and a network code would allocate clear roles and responsibilities that meet the needs of the hydrogen economy and identified objectives of market regulation.

Chapter 2: Balancing hydrogen networks

Chapter summary

Chapter 2 of the consultation set out that a critical function of the hydrogen economic regulatory framework will be to maintain safe pipeline pressures, referred to as ‘balancing’. Government requested views on how balancing should be regulated within the hydrogen economic regulatory framework for hydrogen pipeline networks. It sought views on which industry participants are likely to be best placed to hold responsibility for regulated activities under a licence, as part of primary and residual balancing.

Government invited views on core balancing activities that will be required for hydrogen networks to deliver hydrogen gas in and out of the pipeline system, and ensure flows are kept within acceptable pressure limits. Proposed activities included sharing data on gas flows and pressure; changing gas flows on the physical system to adjust pressures to prevent an imbalance; maintaining system resilience through storage; and managing emergencies by giving or taking instruction.

Government also sought views on proposals:

- To retain existing primary and residual balancing licence structures (for hydrogen networks to meet the needs of early networks whilst supporting future growth); and
- That hydrogen producers are likely best placed to hold primary balancing responsibilities through a shipper licence.

Following consideration of responses to consultation, government intends to maintain primary and residual balancing licence structures for hydrogen pipeline networks, with the expectation that hydrogen producers are likely best placed to assume primary balancing responsibilities. Other network participants, such as offtakers, will however not be prevented from carrying out these responsibilities under licence, should they meet necessary eligibility and legislative criteria. The government is deciding how best to license hydrogen shippers to ensure there are clear regulatory roles and responsibilities for hydrogen balancing, which includes consideration of any necessary primary powers.

Question 1: Balancing activities

Question 1: Do you agree with the identified core activities that hydrogen networks will need to undertake to balance their systems? Please explain your answer and provide any supporting evidence, including any additional core activities hydrogen networks may need to undertake to balance their systems.

Summary of responses

Of the 45 responses received for this question, 39 agreed with the core balancing activities identified in the consultation, as summarised in the table below.

Response	Number of responses
Agree	39
Disagree	3
Neither agree nor disagree	3

The 45 respondents to this question provided a range of views on the core balancing activities, including:

- **Majority agreement to core balancing activities** (39 respondents): highlighted that sharing data, changing gas flows, maintaining system resilience, and managing emergencies, are essential for safe and reliable network operation and for meeting user needs.
- **Information and data sharing** (13 respondents): highlighted as a critical core balancing activity, for example, sharing of real-time network status and updated gas flow forecasts between network participants. Reasons provided for this included ensuring balancing entities can take coordinated and informed balancing actions, avoid information asymmetry, and help pre-empt potential imbalances to reduce reliance on direct residual balancing interventions in times of system stress.
- **Storage** (5 respondents): identified as a critical tool for balancing activities. Responses emphasised that hydrogen networks must be storage-focussed, notably given expected limitations on the use of linepack for early networks. One respondent stated that parties should be required to store hydrogen, so hydrogen is available when needed. This could be particularly important for producers that may otherwise have no spare capacity to respond to system events.
- **Forecasting tools for renewable hydrogen production and offtake** (4 respondents): identified as a potential tool to plan and coordinate for fluctuating supply where the network might be impacted by variable demand profiles of specific offtakers or producers with renewable-based intermittent supply.

Other considerations raised by a few respondents included the technical characteristics of hydrogen networks, noting a need to understand balancing activities, timescales and requirements in more detail, as technical characteristics may differ between networks and over time.

Additionally, a few respondents highlighted interactions with Hydrogen Business Models, notably the HPBM, given its role supporting early hydrogen producers that will need to align with balancing activities. Other points raised included the importance of accurate measurements and telemetry integration (2 respondents), and the use of commercial incentives, like imbalance charges and settlement processes, to give commercial signals to the market and uphold accountability (2 respondents).

The minority of respondents who disagreed with identified balancing activities highlighted that balancing is about science rather than a range of activities and cannot be applied as ‘one size fits all’ approach.

Government response

Government welcomes the strong support for identified core activities that hydrogen networks will need to undertake to balance their systems, with responses from a wide range of organisations.

Government notes the agreement from respondents on the importance of the sharing data activity raised in the consultation; with the regular flow of real-time information helping to inform responsible parties on how best to coordinate balancing actions which could minimise the impact of a system imbalance on system users. Government also recognises that the technical characteristics of hydrogen networks will be important to guide how entities carry out balancing activities in practice, for example considering variable demand, fluctuating supply patterns, and the role storage could play for balancing.

Balancing activities proposed in consultation will be used to inform development of licences and the hydrogen network code. This will include consideration of how responsibilities could reflect the potential role of storage in balancing and how activities could be allocated to different parties. Government will continue to engage with industry to support the development of licences and code.

Question 2

Question 2: Do you agree with our assessment that primary and residual balancing licence structures should be maintained for 100% hydrogen pipeline networks? Please explain your answer and provide any supporting evidence.

Summary of responses

Of the 46 responses received for this question; 40 respondents agreed with the assessment to retain primary and residual licence structure, as summarised in the table below, citing that this would be a pragmatic, logical and strategic approach for hydrogen networks.

Response	Number of responses
Agree	40
Disagree	4
Neither agree nor disagree	2

Views provided by the 40 respondents in support of the proposed approach included:

- The **familiarity of these licensing structures**, as proven and well-established arrangements, providing consistency with natural gas (22 respondents).
- **Mitigating the risk of a single point of failure** by spreading balancing responsibilities and promoting network efficiency (7 respondents).
- **Reduced costs and increased competition**, requiring less work and cost to set up, and ensuring competitive pressure on balancing costs (3 respondents).
- Alignment to the **Hydrogen Production Business Model**, potentially requiring minimal changes in the future to accommodate market development (3 respondents).

Some responses raised wider considerations, for example highlighting the role and function of commercial incentives for balancers. Respondents raised that these should reflect the specific dynamics of the hydrogen market and the level of financial risk that primary balancers, in particular, might be exposed to.

Other considerations raised by a few respondents included the need for clarification on how primary and residual balancing would work in practice (2 respondents), and the important role Risk Taking Intermediaries (RTIs) could play in the future to provide market liquidity (1 respondent).

The minority of respondents who disagreed referenced the potential for increased complexity, particularly for smaller projects and developers, the lack of added value where pipelines will be

subject to safety regulations by the Health and Safety Executive (HSE), and that a single, central balancing entity would be more cost-effective.

Government response

Government welcomes the strong agreement from respondents across the value chain for retaining primary and residual balancing licence structures for hydrogen networks. Responses highlighted the range of benefits this licence structure could have, notably the familiarity and consistency of arrangements, which could result in efficiencies and cost savings.

Following consideration of consultation responses, we will retain primary and residual balancing licence structures for hydrogen networks. The government is deciding how best to license hydrogen shippers to ensure there are clear regulatory roles and responsibilities for hydrogen balancing, which includes consideration of any necessary primary powers. To the extent that new primary powers are required, we will seek to identify an appropriate legislative vehicle which will be dependent on parliamentary time.

Government notes the wider considerations raised by respondents. We agree that establishing the role of commercial incentives for primary balancers will be important, as detailed balancing requirements are established. Evidence provided by respondents will help inform how balancing activities can be further defined and how licences will interact with hydrogen business models, such as the HPBM. We will continue to engage with industry throughout this process to provide clarity on balancing responsibilities and understand any potential challenges in fulfilling balancing licence requirements, including for smaller projects where these may be unfamiliar.

Question 3

Question 3: Do you think there will be any costs, savings or other economic and business impacts associated with retaining these licence structures? Please explain your answer and provide any supporting evidence.

Summary of responses

The 41 respondents to this question provided a range of views on the potential costs, benefits and other impacts associated with retaining primary and residual balancing licensing structures for hydrogen networks, including:

Costs and savings

Some respondents highlighted potential costs from retaining balancing structures from increased administration and governance. This included upfront investments in tools to fulfil balancing licence requirements, costs of holding and maintaining a licence, such as compliance with monitoring, reporting and verification (MRV) obligations, and maintaining balancing infrastructure, potentially requiring additional working capital which might be challenging for small and localised networks.

Conversely, some respondents identified operational and economic efficiencies from maintaining licence structures**,** driving the efficient use of transport and storage capacity thereby reducing the need for frequent interventions from a residual balancer and avoiding economic impacts and costs associated with network imbalances. Responses also indicated that optimisation of transport and storage could translate to a lower levelised cost of hydrogen (LCOH).

Regulatory efficiencies and burdens

The familiarity of primary and residual balancing licence structures was raised by some respondents as a potential benefit for hydrogen networks, highlighting that consistency with existing licences could provide certainty to investors and could allow existing market parties to quickly adapt to hydrogen, minimising costs for market participants.

An increased regulatory burden from complex or disproportionate dual licence structures, particularly for small-scale or isolated projects was noted by some respondents. Some also emphasised that the applicability and relevance of existing licence conditions and obligations should be reviewed, in case they introduce an unnecessary burden.

However, some respondents highlighted that the alternative option of a centralised balancing structure could also add a regulatory burden and risk to hydrogen networks, requiring significant resource to develop. By not adding dual licence roles for early hydrogen networks now, this could result in additional complexity and costs at a later date.

Other considerations

Storage was highlighted by a few respondents, who raised that primary and residual balancers may be more reliant on storage for balancing compared to natural gas. This could result in network users being directly exposed to storage prices, although increased use of linepack was cited as a potential way to help storage efficiency. More broadly, the use of storage by a residual balancer to manage system pressures was also cited as a consideration for hydrogen networks.

Government response

Consultation responses to this question indicate a range of potential benefits associated with retaining primary and residual balancing licences for hydrogen networks, including in comparison to a central balancing approach. Government agrees that a dual licence structure can clearly set out responsibilities and provide consistency with existing arrangements that could offer commercial confidence to investors and users and offer operational benefits, such as facilitating the efficient utilisation of transport and storage infrastructure.

Government recognises the potential costs, complexity and regulatory impacts that the proposed approach could carry for some hydrogen networks and their users. As the hydrogen shipper and gas transporter licences and network code are developed, government will work closely with Ofgem and continue to engage with industry to ensure licence conditions are proportionate and transparent, taking into account the potential benefits and impacts of balancing requirements.

Question 4

Question 4: Do you agree that producers are likely best placed to hold primary balancing responsibilities for hydrogen networks? Please explain your answer and provide any supporting evidence.

Summary of responses

Of the 43 responses received for this question, 37 agreed that producers are likely best placed to hold primary balancing responsibilities for hydrogen networks in the consultation, as summarised in the table below.

Response	Number of responses
Agree	37
Disagree	2
Neither agree nor disagree	4

The 43 responses to this question provided a range of views, including:

Reasons provided by the majority of respondents who agreed that producers are best placed to hold primary balancing responsibilities included that they are well-placed given their direct controls on the hydrogen system and technical advantages such as their access to demand data and understanding of customer needs. This means producers can determine the best way to respond to imbalances within their own portfolios. Respondents also emphasised that many producers would understand their own operational complexities better than other market participants.

Some respondents emphasised that other parties would also be suitable primary balancers. This included offtakers (7 respondents), particularly hydrogen-to-power (H2P) offtakers, who may understand their own variable future demand and manage their own balancing requirements through the use of storage capacity or the ability to contract with multiple producers. Alternative suggestions for primary balancers provided by some respondents included third parties, such as RTIs, who could potentially play a role in managing risk and absorbing some costs related to storage (4 respondents), storage operators, or conversion carriers, like ammonia.

A few respondents raised additional considerations, including:

- **The need for clarity on how primary balancing would interact with the hydrogen business models**, including defining the role of storage, cost recovery mechanisms, and supply flexibility mechanisms, particularly for hydrogen producers (4 respondents).

- **Challenges for electrolytic producers** to carry out primary balancing, highlighting that different hydrogen pathways may be more suitable. This is due to the potential constraints on the level of control available to electrolytic producers from the availability of renewable electricity, particularly where production is linked to intermittent sources (3 respondents).
- **The need for a flexible approach to future licencing** so that the responsibility of primary balancing is sufficiently open to future entities with the required technical skills as hydrogen networks develop (3 respondents).

The minority of respondents who disagreed with this position (2 respondents) suggested that other participants like storage operators, would be better placed than producers for primary balancing.

Government response

Consultation responses to this question indicate strong agreement with government's position that producers are best placed to carry out primary balancing responsibilities for hydrogen networks. Responses particularly agreed with the rationale set out in consultation that producers will have a high degree of control over gas flows and access to important and relevant data, making them well-placed for primary balancing. Government also agrees with the potential role other network participants could play in balancing hydrogen networks, considered in Question 5 below.

Following consideration of consultation responses, government can confirm the position that for early networks, hydrogen producers are likely best placed to hold primary balancing. Evidence provided by respondents will help inform development of more detailed primary balancing responsibilities through the shipper licence and hydrogen network code.

Question 5

Question 5: Do you agree that other parties, for example hydrogen offtakers, should not be excluded from applying for a licence? Please explain your answer and provide any supporting evidence.

Summary of responses

Of the 43 responses received for this question; 37 agreed that other parties such as hydrogen offtakers should not be excluded from applying for a shipper licence, as summarised in the table below.

Response	Number of responses
Agree	37
Disagree	3
Neither agree nor disagree	3

The majority of respondents who agreed that other parties should not be excluded from primary balancing responsibilities highlighted that enabling different participants to apply for a licence could encourage competition, innovation and enhance the efficiency and resilience of the network.

Respondents notably agreed that offtakers, such as hydrogen-to-power plants, should not be excluded from seeking a licence where they could optimise their own storage and demand profiles (20 respondents). While some respondents noted that some offtakers may prefer producers to manage imbalances on the network on their behalf, those with variable demand may want to directly manage imbalances.

A few respondents raised that other participants should not be excluded from applying for a licence, such as storage operators and RTIs, considered to provide additional flexibility and competition to hydrogen networks (4 respondents). One response also supported the role that both offtakers, storage operators, and hydrogen conversion providers could play.

The minority of respondents who disagreed with this question raised that some offtakers would be too small to carry out balancing responsibilities and primary balancing should be clearly assigned to avoid any ambiguity over who has accountability (3 respondents).

Government response

Responses to this question indicate majority agreement with government's position that other participants, like offtakers, should not be excluded from applying for a licence to carry out primary balancing responsibilities within hydrogen networks.

Following consideration of consultation responses, government will ensure that the design of the shipper licence will not exclude other participants, such as offtakers, from applying to undertake primary balancing activities subject to meeting eligibility criteria. As set out in the consultation, it is government's intention that Gas Act unbundling rules will be maintained, which prohibits certain participants like gas transporters and interconnector licence holders from seeking a shipper licence and vice versa.

Government also recognises the role that other participants, like third party commercial gas shippers could have in a well-functioning market. Although the HPBM may limit the role of third parties in early networks due to restrictions on selling subsidised hydrogen volumes, as the hydrogen market matures, licence structures could be flexible to enable third parties, like RTIs, to enter the market. Third parties could also be able to undertake services on behalf of primary balancers to help them fulfil their responsibilities.

In developing the shipper licence, government, working closely with Ofgem, will review eligibility and legislative criteria. Evidence provided by respondents will help inform development of more detailed primary balancing responsibilities through the shipper licence and hydrogen network code.

Question 6

Question 6: Do you think there will be any costs, savings or other economic and business impacts from producers or offtakers holding primary balancing responsibilities? Please explain your answer and provide any supporting evidence.

Summary of responses

The 38 responses to this question provided a range of views on the potential costs, savings and other types of impacts associated with either producers or offtakers holding primary balancing licencing responsibilities for hydrogen networks.

Cost savings and operational efficiencies was highlighted as a potential benefit by some respondents, as multiple participants with balancing responsibilities could deliver lower overall costs and greater system efficiencies, compared to a single balancer or network operator, who might be driven by their own needs rather than that of other users. Respondents also stated that costs could be spread between parties avoiding a single party holding a concentrated level of risk and working capital. Reduced reliance on using third parties like RTIs was also cited as having a cost benefit, where this could lower overall transaction costs.

However, some respondents raised that primary balancing undertaken by producers and offtakers could incur additional costs. This included the investment required in balancing tools and costs to secure storage rights and access to capacity (5 respondents). A few respondents also highlighted potential costs of compliance and adherence to safety standards and insurance costs for potential intermittency risks (3 respondents); with costs varying depending on specific network design and capabilities of responsible parties.

Other considerations raised by a few responses included the need to align balancing responsibilities to business models to avoid licence requirements potentially deterring market participation (1 respondent), and to ensure the licencing regime includes safeguards for all parties and avoids disproportionate impacts on smaller projects or companies (1 respondent).

Government response

Responses to this question reflect a range of views primarily related to cost benefits and the types of costs that could be incurred by producers and/or offtakers as hydrogen primary balancers.

Government agrees that there could be a range of benefits and economic efficiencies associated with producers and offtakers acting as primary balancers. The shipper licence can ensure parties who are best able to manage primary balancing are responsible for doing so, harnessing these potential benefits.

Government also recognises the views of a minority of respondents that this could lead to some additional costs. As the shipper licence and network code for primary balancers is

developed, government will work closely with Ofgem and continue to engage with industry to ensure licence conditions are proportionate and transparent.

Chapter 3: Allocating a system operator for hydrogen pipeline systems

Chapter summary

In this chapter, government set out its position that hydrogen pipeline networks will require a System Operator to act as a central decision maker. The System Operator would take actions that meet the needs of pipeline network users, whilst ensuring that overall pipeline integrity and safety is maintained.

The chapter sought views on:

- a proposal that responsibility for the system operation of hydrogen pipeline networks should be allocated to an entity through conditions of licence;
- the key activities that a hydrogen pipeline System Operator will need to undertake; and
- an assessment that pipeline system owners are best placed to assume responsibility for system operation through conditions of their transporter licence.

The chapter set out that adopting arrangements that are in place for the analogous National Transmission System (NTS), where National Gas Transmission (NGT) is the System Operator, could support deliverability, offering clarity to investors more quickly on system responsibilities. It proposed however that arrangements should be kept under review as a case could emerge for the appointment of an overarching System Operator for all hydrogen pipeline networks.

Following consideration of responses, government will allocate system operation responsibility to an entity through licence. Government will proceed on the basis that the owners of hydrogen pipeline network will be best placed to hold this responsibility, under their transporter licence. Evidence provided by respondents, including in relation to key system operation activities, will inform the subsequent design of system operation provisions within licence conditions and the hydrogen network code.

Question 7

Question 7: Do you agree that responsibility for the system operation of hydrogen pipeline networks will need to be allocated to an entity through licence? Please explain your answer and provide any supporting evidence.

Summary of responses

Of the 42 responses that were made to Question 7, 38 agreed that responsibility for the system operation of hydrogen pipeline networks will need to be allocated to an entity through licence, as summarised in the table below.

Response	Number of responses
Agree	38
Disagree	2
Neither agree nor disagree	2

Respondents provided a range of views in support of the proposal, notably:

- **Responsibility, transparency and accountability:** More than half of respondents (24 respondents) said that the proposed approach would ensure the role of System Operator was clearly defined and transparent and could be adjusted over time. Some respondents said that a licenced approach would facilitate accountability, since enforcement action would be available and that this approach would provide confidence to the market.
- **Network integrity and market operation:** Some respondents (13 respondents) said that the proposed approach would maintain network integrity, contribute to public safety, and facilitate market functioning.
- **Pragmatism and alignment with familiar arrangements:** Some respondents (10 respondents) said that the proposed approach would be pragmatic because it mirrors arrangements that are currently in place for the natural gas system, with which prospective hydrogen market participants may already be familiar. Some suggested that adopting familiar arrangements would increase confidence amongst participants.
- **Strategic development of pipeline networks:** Some respondents (6 respondents) were of the view that the licensing approach proposed by government would facilitate the strategic development of pipeline networks from, for example, isolated networks into an interconnected, market-ready infrastructure system. Other comments included that a licence-based approach would give hydrogen networks room to develop and mature as utilisation changes over time, and that the proposed approach would make network expansion and interconnection more streamlined.

Two respondents disagreed with the proposal. One notably questioned whether the allocation of system operation responsibility for initial pipeline networks needs to be through formal licensing arrangements, or whether it could instead be handled through commercial contracts.

Eight respondents also raised that, notwithstanding their viewpoint in respect of pipeline networks, alternative arrangements might be more appropriate in certain circumstances. Examples that were cited included: pipelines conveying small volumes; early-stage, point-to-point pipelines; 1:1 private hydrogen pipelines; and networks in early stages of development. 3 respondents suggested that proposed licensing arrangements should only apply to infrastructure supported under the Hydrogen Transport Business Model (HTBM) and Hydrogen Storage Business Model (HSBM).

A few respondents raised other benefits of the proposed approach, including that a licensed entity would be best placed to independently manage and coordinate issues arising (4 respondents), and that the approach would enable cost recovery through regulated revenue streams (2 respondents).

Wider considerations were raised by a few respondents. These included references to perceived benefits of creating a distinct, licensable, system operation activity – 3 respondents said this should happen now, whilst 1 said arrangements should facilitate its future creation. Other considerations raised included that the System Operator role should be set out and allocated in an industry code, not in a licence (1 respondent), and that assumptions on the scope of the System Operator role should be set out soon (1 respondent).

Government response

Responses to this question showed strong support for government's proposal to allocate responsibility for the system operation of hydrogen pipeline networks to an entity through licence. Respondents provided a variety of views which largely supported government's proposal or were consistent with it. Government notably agrees with the views of the more than half of respondents who said that a licence-based approach would provide transparency and accountability, which could provide confidence to the market.

Following consideration of responses, government will allocate system operation responsibility to an entity through licence. Evidence provided by respondents will inform the subsequent design of licence conditions and code.

Government notes the views of those respondents who said that alternative arrangements might be more appropriate for non-networked, smaller-scale pipelines and early-stage networks. Government will reflect on these views in the context of subsequent policy development, noting that the Gas Act already makes provision for pipelines to be 'excepted' from licensing requirements under defined circumstances, which may apply in some of the instances mentioned by respondents.

Question 8

Question 8: In your view, what are the key activities that a hydrogen pipeline System Operator will need to undertake? Please explain your answer and provide any supporting evidence.

Summary of responses

In the 39 responses received to this question, respondents identified a range of activities that a hydrogen pipeline System Operator should undertake, notably:

- **Balancing responsibilities** (31 respondents): Responses identified 2 broad areas of responsibility: overall management of the balancing process (collecting and responding to entry/exit flow 'nominations' from network users); and residual balancing responsibilities (the taking of residual balancing actions as required, and the provision of demand forecasts to the market). Some respondents noted that the System Operator would likely have a greater reliance on physical balancing activities (utilising hydrogen in storage, demand-side management, etc.) compared with arrangements on the analogous NTS, where commercial balancing activities have greater prominence.
- **Managing/coordinating emergencies** (28 respondents): Some respondents said that these should include anticipatory measures, e.g. ensuring readiness to act swiftly in the event of a supply disruption, emergency response actions (including coordination with NESO), and operational command during emergency events. Some said this should involve coordination with the relevant parties across energy vectors.
- **Safe and efficient network operation** (27 respondents): Some respondents added that this would include ensuring that linepack was maintained at a safe/acceptable level, whilst acting on users' flow instructions, managing constraints, and coordinating outages.
- **Managing new connections** (19 respondents) at hydrogen entry and exit points: Some respondents mentioned the need to demonstrate transparency and fairness in how network access is granted, and to ensure that other connectees are not adversely impacted by new connections.
- **Charging, settlement and billing** (18 respondents), including charging arrangements, settling of costs incurred by users in relation to attributable residual balancing activities, and the recovery of charges through billing.
- **Network access/capacity management** (17 respondents), i.e. managing a process that fairly allocates potentially limited network capacity to prospective users, when and where they want.
- **Matters relating to asset ownership and maintenance** (16 respondents): suggesting that a hydrogen System Operator should own the pipeline and be responsible for its integrity by planning, coordinating and undertaking maintenance.

- **Co-ordinating and data sharing** (16 respondents), including co-ordinating with other bodies (e.g. Ofgem and NESO) and collecting/sharing data with relevant parties, e.g. network users to enable them to fulfil any obligations placed on them by licence or code.
- **Gas quality** (15 respondents), notably managing the quality/purity of hydrogen entering and exiting the network. One respondent noted that this would likely be more challenging in hydrogen networks, compared with natural gas networks, due in part to more limited opportunities to 'dilute' hydrogen quality excursions with compliant hydrogen within a smaller network.
- **Network planning (**10 respondents), notably to play a role in network planning and coordination.

Other activities identified by 5 respondents or fewer included:

- Metering, including calibration, validation and reconciliation to support balancing and billing;
- Facilitating the functioning of a hydrogen market; and
- Development and governance of a hydrogen code.

One respondent suggested that it would be more appropriate to define separate roles of "hydrogen System Operator" (monitoring flows, ensuring hydrogen meets quality standards, and ensuring that supply meets demand) and "network operator" (pipeline design, physical operation, and maintenance and repair, including emergency repairs).

Government response

Responses to this question identified a wide range of activities that a hydrogen System Operator would need to undertake. There was broad consensus amongst respondents on most activities, notably that System Operators should play a central role in balancing, managing/coordinating emergencies, and the safe and efficient operation of networks. Government notes that the suite of activities identified by respondents is broadly consistent with the activities undertaken by National Gas Transmission (NGT) in its role as System Operator of the analogous National Transmission System (NTS), which conveys natural gas around Great Britain.

Evidence provided by respondents to this question will inform the subsequent design of System Operation provisions within licence conditions and codes.

Question 9

Question 9: Do you agree with the assessment that hydrogen pipeline network owners are best placed to hold responsibility for system operation, under their hydrogen transporter licence? Please explain your answer and provide any supporting evidence.

Summary of responses

Of the 40 responses that were made to this question, 32 agreed with government's assessment that hydrogen pipeline network owners are best placed to hold responsibility for system operation under their transporter licence. Responses are summarised in the table below.

Response	Number of responses
Agree	32
Disagree	6
Neither agree nor disagree	2

Respondents provided views on a range of issues in support of their response. Of the respondents who agreed with the government's assessment, the primary reason given was that pipeline networks owners will be familiar with their networks and the needs of network users (13 respondents). As such, these respondents considered they will be best placed to hold responsibility for system operation. Further supportive views were raised by a few respondents. These included that the approach is proportionate and pragmatic to the likely nature of pipeline networks, offering the least complex solution (6 respondents). A few respondents also raised that Gas Safety (Management) Regulations (GSMR) obligations would be best discharged under a pipeline owner/operator model (2 respondents).

Some respondents said that a case might emerge for responsibility for system operation to be reallocated, either to an independent or single, overarching System Operator, for example if/when networks join up (14 respondents). 1 respondent said that an independent system operator would be preferrable for a mature market, drawing attention to a potential role for NESO if networks become fully integrated.

Some respondents (6 respondents), each representing a different industry sector, disagreed with the government's assessment. There was little consensus in accompanying rationale, but 2 respondents said that producers or shippers might be best placed to be responsible for system operation in initial, simplistic networks.

Some alternative proposals suggested by a few responses included that producers or shippers might be best placed to be System Operator whilst pipelines are in their infancy (4 respondents), that operators of storage facilities may be best placed to hold balancing

responsibilities in a nascent market (1 respondent), and that separation of pipeline system operation from ownership would foster innovation and avoid conflicts of interest (2 respondents).

A few of respondents raised wider considerations. These included reiterating points raised in response to question 7 on facilitating potential future reallocation of system operation responsibility (3 respondents). Other considerations raised included the ability for pipeline network owners to contract out system operation responsibilities to a third party (2 respondents), and that holders of gas transporter licences should be allowed to convey hydrogen through pipelines through an extension of their existing licence (1 respondent).

Government response

Responses to this question showed strong agreement with the assessment that hydrogen pipeline network owners are best placed to hold responsibility for system operation, under their transporter licence. Respondents raised a range of views in support of this, including that familiarity with their own networks and the needs of network users would leave them well-placed to assume the role. Whilst a small number of respondents disagreed with government's assessment, there was little consensus amongst these responses.

Following consideration of consultation responses, government will proceed on the basis that hydrogen pipeline network owners will be best placed to hold responsibility for system operation, under their transporter licence. Evidence provided by respondents will inform the subsequent design of licence conditions and code.

As set out in consultation, government also agrees that this allocation of responsibility should be kept under review, as a case may emerge for the reallocation of responsibility as hydrogen pipeline networks grow and connect.

Chapter 4: Supplier licences

Chapter Summary

Chapter 4 of consultation considered the role of licensed suppliers in hydrogen pipeline networks. It sought views on proposals to exempt persons involved in the supply of hydrogen through pipes to premises from the requirement to hold a supplier licence to remove unnecessary regulatory barriers for the first hydrogen pipelines. However, consultation noted that, as networks scale up, a case could emerge for regulatory intervention and recommended keeping arrangements under review.

Following consideration of responses, government intends to ready secondary legislation to exempt the supply of hydrogen to premises from licencing requirements. As set out in consultation, government will ensure that existing regulatory arrangements continue to apply in respect of the H100 Fife Neighbourhood Trial.

Question 10

Question 10: Do you agree with the assessment that persons supplying hydrogen through pipes to premises should be exempted from supplier licence requirements, but that this arrangement should be kept under review as hydrogen networks develop? Please explain your answer and provide any supporting evidence, including in support of any alternative options, such as a new exemption threshold.

Summary of responses

Of the 43 responses to this question, the majority of respondents agreed that persons supplying hydrogen through pipes to premises should be exempted from supplier licence requirements, and that this arrangement should be kept under review as hydrogen networks develop, as summarised in the table below.

Response	Number of responses
Agree	35
Disagree	3
Neither agree nor disagree	5

Respondents provided a range of views in support of the proposal, notably:

- **Regulatory arrangements should be monitored as networks develop** (25 respondents): Several responses recommended review when small, non-industrial users connect to hydrogen networks, or when the market scales up to multi-user retail settings. Some noted that government may need to establish appropriate supply regulations in the future to support consumer protection needs and market confidence (9 respondents). One respondent noted that clear parameters for when a licence would be required should be established and communicated in advance.
- **Supplier licence protections are unnecessary for nascent market and anticipated types of offtakers** (22 respondents). Some responses noted that the bespoke, bilateral contractual arrangements between producers and offtakers would provide adequate commercial protections and were already sufficient. Others noted that the proposed exemption would enable more flexible commercial arrangements.
- **Reduced regulatory burden** (13 respondents), including lower or no compliance and administrative costs. Most of these raised that existing regulatory arrangements would be disproportionate and risk overregulating the earliest hydrogen pipelines (10 out of 13 responses).
- **Enable hydrogen market development** (4 respondents): noting this would support market entry for broader range of participants (3 respondents) and is necessary for maintaining project viability and pace (2 respondents).

Reasons provided by those who disagreed with the minded to position (3 respondents) also included consumer interests, suggesting that supplier licences would still be valuable to protect consumer interests in the hydrogen economy (2 respondents).

A few respondents proposed alternative arrangements to deliver an exemption, such as:

- A time-limited supplier licence exemption (3 respondents).
- A hydrogen-specific supplier licence exemption threshold (3 respondents).
- The introduction of standards of conduct or guidance for operational integrity, safety, and fair commercial practice (3 respondents).

Government response

Government notes the strong support provided by respondents for the government's minded-to position to exempt persons supplying hydrogen through pipes to premises from supplier licensing requirements, alongside broad agreement that it would reduce regulatory friction for the earliest hydrogen pipeline projects.

Having considered consultation responses, government intends to proceed with readying secondary legislation to exempt the supply of hydrogen to premises from licencing requirements. Government will, however, ensure that existing regulatory arrangements continue to apply in respect of the H100 Fife Neighbourhood Trial.

As the market develops and offtakers diversify, additional regulatory arrangements for the supply of hydrogen to premises may be needed to protect consumer interests. Whilst implementing a hydrogen supply licence would be disproportionate to the needs of the early market and may pose a barrier to the emergence of the hydrogen economy, government agrees with the majority of respondents who recommended keeping regulatory arrangements under review as networks develop and new regulatory needs emerge. Evidence provided by respondents will also be used to inform subsequent design and implementation of other licences and code.

Question 11

Question 11: Do you expect there to be any costs, savings or other economic and business impacts from the proposed exemption? Please explain your answer and provide any supporting evidence.

Summary of responses

The majority of the 31 responses to this question noted positive impacts from the proposed exemption. A minority of respondents identified potential costs and other considerations.

Savings

- The majority of respondents to this question (26 respondents) expected cost savings from the proposed exemption, notably from not having to obtain and comply with the supply licence requirements and associated administrative costs. Some respondents noted savings for government and Ofgem.
- Other savings identified included: avoided licence application fees (2 respondents), avoided financial penalties for non-compliance (2 respondents), additional savings from resourcing (1 respondent), and a reduction in potential legal ambiguity in hydrogen ownership and flow (1 respondent).

Economic and business impacts

- Some respondents identified a potential reduced regulatory burden for early market participants (12 respondents), with some adding that they expected a similar reduction in reduced administrative and compliance burden.
- Some respondents considered the proposal would enable and improve operational efficiencies and reduce complexity for early market participants (9 respondents).
- Other positive impacts raised included shortened investment timelines from time savings and reduced delays (5 respondents), improved commercial viability (4 respondents), and by enabling competitive pricing of hydrogen to industrial users (1 respondent).

Costs, risks, and impacts

Very few costs associated with the proposed exemption were identified by respondents (2 respondents). Costs, risks and impacts identified included:

- Familiarisation costs, noting that these are likely to be outweighed by the reduction in administration costs (1 respondent);
- Regulatory uncertainty for investors on future licensing arrangements being priced into financing models (1 respondent); and
- A lack of consumer protections due to an absence of licence obligations (1 respondent).

Other considerations

- Other considerations raised by a few respondents included a need to prioritise safety and system integrity (1 respondent) and to consider a tailored licence ‘lite’ in the future (1 respondent).

Government response

Government recognises the beneficial impacts and cost savings identified by the majority of respondents, which support government’s recommendation to exempt persons supplying hydrogen through pipes to premises from supplier licence requirements.

Government also acknowledges the potential risks and other considerations identified by a few of respondents, though considers that these would be outweighed by the benefits and cost savings that an exemption would provide. Nonetheless, evidence provided by respondents will inform subsequent policy design and implementation. Impacts will be kept under review as part of ongoing monitoring.

Chapter 5: Other hydrogen licences

Chapter summary

In chapter 5 of the consultation, government sought views on any further licensed responsibilities that could be required for hydrogen networks beyond the Hydrogen Gas Transporter licence, shipper licence, and the arrangements for supply considered separately within the consultation.

Following consideration of responses to consultation, government has not identified a need for further regulation of other activities, like hydrogen production and storage, through new licences in initial hydrogen networks. Government will however keep this position under review as the hydrogen economy develops, should regulatory needs arise.

Question 12

Question 12: Do you consider that any other activities in 100% hydrogen pipeline networks should be regulated under licence, for example the activities of production and/or storage? Please explain your answer and provide any supporting evidence.

Summary of responses

Of the 41 responses received for this question; 27 thought no licences for other activities required; 7 thought some licencing could be required across both production and storage or just storage; 7 neither agreed nor disagreed.

Response	Number of responses
Yes – license hydrogen production and storage	4
Yes – license hydrogen storage Only	3
Yes – license production only	0
No to licensing additional activities	27
Neither agree nor disagree	7

The majority of respondents did not support additional licensing of other activities including hydrogen production or storage. Reasons provided for this included that existing regulation, such as the Gas Act, safety regulations, hydrogen business models, and a hydrogen network code, would provide sufficient regulatory oversight to maintain safe and reliable production and storage of hydrogen, without the need for additional licences. Respondents highlighted that new regulation may slow sector investment and growth, whilst minimising regulation could instead foster a healthy and competitive market.

Some respondents supported licensing of hydrogen production and/or storage, highlighting that regulation can help ensure transparency, safety, and reliability for hydrogen offtakers. Without clear regulation, respondents warned that there could be risk of inconsistent treatment of parties. Specifically, a few respondents considered that licensing hydrogen storage could mitigate monopolistic characteristics, ensuring storage operators cannot abuse their market position and that access to storage capacity is provided on fair and transparent terms.

A few respondents suggested alternatives to full licensing, such as a connection agreement to ensure producers and storage need to sign up to the hydrogen code to connect to the hydrogen network. Other options included types of obligation on storage, outside of a full licence framework.

Some respondents also highlighted the need to maintain a flexible approach to future licencing as hydrogen networks develop, suggesting government keep this position under review to assess if and when additional intervention is necessary. Respondents emphasised a future licencing regime could help ensure transparent access, prevent anti-competitive behaviour, and maintain market confidence.

Government response

Responses to this question reflect a range of diverse views on licencing other activities within hydrogen networks, notably hydrogen storage and production. Whilst the majority of responses did not consider licencing other activities for hydrogen networks to be necessary, others raised both merits and demerits of licencing.

Government agrees with the majority of respondents who did not agree to licensing other activities for hydrogen networks, and that economic regulation is an important tool to ensure hydrogen networks operate safety, efficiently, and fairly. Regulation provides clear responsibilities and relationships for critical activities and offers clarity to prospective network participants as to how networks will operate together.

Government also agrees, however, that the regulatory framework that will be in place through the Gas Act, the range of applicable hydrogen safety regulations and hydrogen business models will provide sufficient oversight of activities like production and storage, without the need for new licences at this time.

Government can confirm the intention that other activities, like hydrogen production and storage will not be regulated through a new licence in initial hydrogen networks. Instead,

government will consider how regulatory objectives can be met through the wider framework, for example through interactions with the Hydrogen Storage Business Model (HSBM), to ensure fairness, transparency, and reliability for network users.

Noting the evidence and views provided by respondents, government will also keep this position under review as the hydrogen economy develops, should regulatory needs emerge.

Chapter 6: Network code

Chapter summary

In chapter 6, government considered the role of a network code in supporting the operation and growth of hydrogen pipeline networks. Government set out that network codes can help ensure fair, transparent and standardised rules for all network users, thereby helping to create a level playing field and facilitate network development by encouraging investment and participation in the network. Government sought views on the proposal that a new hydrogen network code should be developed for early hydrogen pipeline networks, to ensure the code is optimised to the needs of early hydrogen networks.

Government also sought views on:

- A proposal that the hydrogen network code should be developed by government and industry working in partnership, but that government is best placed to take on a coordination function.
- A proposal that the first issue of the hydrogen network code should be developed based on a ‘Minimum Viable Product’ (MVP) approach.
- The types of stakeholders who should be involved in code development, as well as who should be a party to the code.
- The level of code development progress that is needed to support investment decisions, as well as views on which issues should be prioritised for initial code development.

Following consideration of responses, government intends to lead the development of a new hydrogen network code, in collaboration with industry and other stakeholders, using an MVP approach. As part of development of the code, we will establish processes to modify the code after its first issue, where we anticipate government having a reduced but ongoing role. Evidence provided by respondents will inform our approach to developing the network code.

Question 13

Question 13: Do you agree that a network code will be required for early 100% hydrogen pipeline networks, including those that are funded through the Hydrogen Transport Business Model (HTBM?) Please explain your answer and provide any supporting evidence.

Summary of responses

Government received 44 responses to question 13, with strong agreement that a network code for early hydrogen pipeline networks would be required. Responses are summarised in the table below:

Response	Number of responses
Agree	37
Disagree	4
Neither agree nor disagree	3

Respondents provided a range of reasons to support their responses, notably:

Clarity

Some (14 respondents) stated that a network code offers clarity of process, role, and responsibility, which is necessary for networks to operate smoothly and effectively. Amongst these, respondents contrasted this with the alternative arrangement of bilateral agreements, stating that these would be overly complex and opaque. Other respondents warned that deferring the development of a network code to a later stage could create uncertainty for project developers, which could deter investment.

Consistency and Fairness

Many (17 respondents) highlighted that network codes are much fairer and more consistent than ad hoc bilateral agreements. A key reason given was the concern that in the absence of the regulatory oversight afforded by a network code, bilateral agreements could create an uneven playing field, which could undermine competition and could disadvantage new network users.

Network Growth

Some (15 respondents) stated that a network code facilitates the growth of networks, including the ability for discreet networks to connect in future, by ensuring standardisation across networks. Respondents highlighted the potential efficiency and cost benefits of standardisation,

such as the ability to share resources. However, a minority of respondents did note that there may need to be aspects of the network code that will need to be network specific, alongside others cautioning against a ‘one size fits all’ approach.

Nascent industry

Of the respondents who disagreed with the consultation position, the most common reason given (3 respondents) was that the low carbon hydrogen industry is currently too nascent to warrant a network code, and therefore bilateral agreements are more appropriate where there are a small number of participants. However, those respondents generally also believe that a network code may be needed once the industry becomes more mature.

Government response

Responses indicate strong agreement for early hydrogen pipeline networks being subject to a network code, including those funded through the HTBM. Government agrees with the many respondents who discussed the benefits of a network code, such as clarity, consistency, fairness and the ability to enable network growth.

Government notes the concerns of one respondent that a ‘one size fits all’ approach may not be optimal. As part of code development government will work with industry to consider the optimum way to manage issues that are network specific but will reserve the right to determine which issues are genuinely network specific as opposed to individual commercial preference.

The government also recognises the view that particularly while the hydrogen economy is nascent, there may be networks where a network code is not necessary.

Based on the responses, we confirm it is government’s position for early hydrogen pipeline networks, including those funded through the HTBM to be subject to a network code. Government anticipates that, as is the case for natural gas, hydrogen pipelines that are exempted or have an exception from the requirement to hold a transporter licence under the defined circumstances in the Gas Act will not be required to be subject to a network code.

Question 14

Question 14: Do you agree that a new hydrogen network code should be developed? Please explain your answer and provide any supporting evidence.

Summary of responses

Government received 43 responses to question 14 which show strong agreement for a new hydrogen specific code being developed. Responses are summarised in the table below:

Response	Number of responses
Agree	36
Disagree	2
Neither agree nor disagree	5

Most respondents reiterated themes from question 13 as part of their response to this question. In addition, respondents provided a range of additional reasons to support their responses, notably:

Separating out from the Uniform Network Code

Some (8 respondents) highlighted the need to separate hydrogen and natural gas code provisions. Respondents stated that separating these provisions by creating a new hydrogen network code avoids the complexity of assessing any new hydrogen provision against the existing UNC provisions. Others said that a new hydrogen network code allows for hydrogen changes to be assessed only by stakeholders who have an interest in hydrogen.

Proportionate for early hydrogen networks

Some (9 respondents) stated that developing a new hydrogen network code is the best way to ensure the code is proportionate to early hydrogen networks as the alternative approach of modifying the existing Uniform Network Code (UNC) to also cover hydrogen would likely result in unnecessary complexity and excessive regulatory burden. It was further noted that many elements of the UNC will not be applicable to hydrogen.

Flexibility & pace

Some (6 respondents) highlighted that hydrogen pipeline networks will require greater adaptability from a network code relative to natural gas networks, to accommodate the anticipated market scale up. This is best achieved through developing a new network code with governance arrangements that are designed specifically for hydrogen pipeline networks. Of those who provided further detail, respondents cited the need for the code modification

process to be simpler, relative to the UNC, and to involve the stakeholders who are best placed to have a role in the development of the hydrogen network code. In addition, others noted that it is necessary for code provisions to be in place quickly so that hydrogen projects can reach final investment decisions, and that developing a hydrogen specific code is more likely to result in a faster outcome.

Learning from existing codes

Although there was strong agreement for the development of a new hydrogen network code, a few (3 respondents) stated that relevant content from either the UNC or CCS Network Code should be used to inform the development of the hydrogen network code, where appropriate. In addition, respondents indicated that those involved in developing the hydrogen network code can learn from the successful process of implementing the CCS Network Code.

Government response

Responses indicate strong support for a new hydrogen network code being developed for early hydrogen pipeline networks. Government agrees with respondents who believe this represents the most proportionate solution for early hydrogen pipeline networks, and that it offers benefits in terms of greater pace of implementation and flexibility to adapt going forwards, relative to the alternative of incorporating hydrogen into the existing UNC. Government also agrees with the respondents who identified the benefits of separating natural gas and hydrogen network code provisions.

Based on the agreement of the majority of responses, we confirm it is government's position that a new hydrogen network code will be developed for early hydrogen pipeline networks.

Evidence provided by respondents will help inform our approach to developing the hydrogen network code. This includes the need, as highlighted by some respondents, for the process to be informed by the existing UNC and CCS Network Code as far as is applicable. We are learning from the successful development of the CCS Network Code to inform our approach in developing a hydrogen network code.

Question 15

Question 15: Do you agree with the description of the role of UK Government during code development and subsequent modification? Please explain your answer and provide any supporting evidence.

Summary of responses

Government received 42 responses to question 15, with strong agreement for the role of the UK Government in code development and subsequent modification, as described in the consultation. Responses are summarised in the table below:

Response	Number of responses
Agree	33
Disagree	4
Neither agree nor disagree	5

Respondents provided a range of reasons to support their responses, notably:

Benefits of government involvement

Most (31 respondents) who agreed with the question set out the benefits of government having a role in the development of the hydrogen network code. Respondents generally agreed that Government is best placed to take on a coordination role due to the current nascency of the hydrogen market. Others said that government involvement is needed to ensure strategic alignment to policy objectives, as well as ensure the network code is aligned to funding mechanisms and the regulatory framework. In addition, others said that government is best placed to represent all parts of the industry and may at times need to help balance the needs of different industry stakeholders.

At the same time, a few respondents highlighted the essential need for government to engage with industry and benefit from industry expertise throughout code development. In addition, respondents also felt there may be a need to balance government objectives against industry requirements in some cases.

Extent of government's role

Of those who agreed with the question, most (17 respondents) referred to government having a "leading" role in code development. In addition, one respondent who disagreed with the consultation's description of the role of government did so on the basis that it is too narrowly defined. This respondent felt that the coordination role could be taken on by a third party, with government focusing on decision making (including decisions on code format and structure,

and contentious elements of the code), project management, convening stakeholders and legal drafting. Respondents said that a “leading” role for government is needed to drive delivery of the network code at pace. Others referred to the CCS Network Code development process, stating that the successful outcome was dependent on government going beyond a “coordinating” role. However, among those who disagreed with the question, the most common view was that organisations who are independent of government, such as Ofgem or NESO, are best placed to lead development of the network code.

Evolution of government’s role

Some (11 respondents) who agreed with the question referred specifically to their agreement that the role of government should reduce over time, but that government should continue to have a role in code modification. Some said that government will continue to need to modify the code in line with policy developments in future, but that the network code should evolve to being industry led as the market develops, alongside the regulator Ofgem. A few respondents said that a Code Manager should have a future role in the hydrogen network code.

Government response

Responses indicate strong support for government having a role in the initial development of the code, as well as for government having a reduced but continuing role in future code modification.

Government agrees with the view of the many respondents who said that government involvement is needed to ensure strategic alignment with policy objectives, and continued alignment with the developing funding mechanisms and regulatory framework. We also agree that government has a role to help ensure the code balances the needs of different industry stakeholders, including future users of hydrogen pipeline networks.

We also recognise that many respondents expressed a desire for government to have a more active role to “lead” code development, relative to the description of government’s role in the consultation, and in a way that is consistent with the approach taken for the CCS Network Code. We also acknowledge the positive role government can play in driving forward code development.

Based on the agreement of the majority of responses, we confirm it is government’s position to lead the process of developing a hydrogen network code, particularly in the early phase of development when the industry is most nascent. At the same time, government recognises the critical role that industry, Ofgem and other stakeholders will need to play in code development. So whilst government intends to lead the process, we still intend to develop the code in partnership with industry and collaborating with Ofgem and other relevant stakeholders. The specific details of the roles and responsibilities of different stakeholders will continue to be refined during the process of code development and kept under review.

As part of development of the code, we will establish processes to modify the code after its first issue, where we anticipate government having a reduced but ongoing role.

In addition, government also intends to consider a statutory ability to be able to modify the code in the future. As government will be providing financial support to early networks through Business Models to deliver long term policy objectives, we consider this to be a reasonable and proportionate step. A statutory ability to modify the code will ensure government has the flexibility to act if needed, including to ensure value for money for subsidy provided by government, support delivery of government objectives, and in the interest of future network users. We strongly anticipate that most modifications to the code will be made through business-as-usual processes which will be determined through the code development process. Any statutory ability to modify the code would be used by exception, only where considered to be proportionate and necessary and would involve consultation with relevant parties before use. We are considering the primary powers necessary to deliver this policy. To the extent that new primary powers are required, we will seek to identify an appropriate legislative vehicle to deliver this policy, which will be dependent on parliamentary time.

Question 16

Question 16: Which types of stakeholders do you think should be involved in the development of the code? Please explain your answer and provide any supporting evidence.

Summary of responses

Government received 38 responses to question 16. The majority stated that various hydrogen businesses should be involved in the development of the code (35 respondents). The most common responses were that hydrogen producers (19 respondents), hydrogen transporters (17 respondents) hydrogen offtakers (17 respondents), hydrogen storage operators (14 respondents) and the hydrogen industry in general (14 respondents) should be involved in code development. In addition, respondents commonly cited Ofgem (11 respondents) and NESO (9 respondents) as key stakeholders.

A few (5 respondents) also mentioned environmental regulators, HSE, standards bodies, hydrogen trading bodies, and local authorities. Others highlighted the importance of having sufficient legal, commercial, financial and technical expertise involved in the process. In addition, a few respondents recommended involving stakeholders who have experience of operating and developing a network code.

Inclusive yet delivery focused

Most (22 respondents) stated the need for a collaborative, inclusive and transparent approach involving a wide range of stakeholders, as this is most likely to result in a code which satisfies a broad range of stakeholders.

Some (8 respondents) suggested that the level of engagement from different stakeholder groups should vary, depending on their level of interest in the code. For example, some stakeholders could be consulted only at key milestone points, with others more involved in the detailed development of code content. Respondents stated that this approach would improve the speed at which the network code can be developed. In addition, a few respondents said that government should have a role in determining how different stakeholders engage in the process.

Phased approach

Some (11 respondents) advocated for a phased approach which evolves over time. Specifically, respondents suggested starting with wide engagement to gather ideas, but then narrowing engagement to those stakeholders likely most impacted by the first issue of the network code, particularly for detailed discussions of complex technical and operational issues. Some (6 respondents) noted that lessons such as this were successfully used to develop the CCS Network Code.

Government response

Responses to this question are well aligned to the government's own views. This includes the importance of having a broad representation from industry, including prospective network users. We also agree that the approach to code development needs to be collaborative, inclusive and transparent, whilst ensuring that the code is delivered at pace.

We agree with the principle that it is appropriate for stakeholders to be engaged to different degrees, depending on their level of interest in the hydrogen network code. In addition, we will give further consideration to the suggestion of a phased approach that evolves over time, noting this is broadly in line with the CCS Network Code approach. We are learning from the successful development of the CCS Network Code to inform our approach in developing a hydrogen network code.

These insights will inform our view as to which stakeholders should be involved in the development of the hydrogen network code. We anticipate engaging further on this question with relevant stakeholders as part of the code development process.

Question 17

Question 17: Who should be a party to the code? Please explain your answer and provide any supporting evidence.

Summary of responses

Government received 34 responses to question 17, with mixed responses regarding the types of entities who should be party to the code.

While not all respondents named specific parts of the value chain, the most common responses were that hydrogen transporters (24 respondents), producers (18 respondents), storage operators (17 respondents) and shippers (16 respondents) should be a party to the code. Some (13 respondents) stated that hydrogen 'offtakers' or 'end users' should be party to the code. Among those who specified a type of offtaker, responses were mixed between power and industrial offtakers.

Some (6 respondents) made the point that, regardless of who is a party to the code, it is important that stakeholders who are not a party to the code are given the opportunity to participate in its development, as they may still be affected by provisions in the code. For example, anyone connected to the network could be impacted by obligations regarding the need to provide forecasted demand for hydrogen.

No consensus on the role of 'non-shippers'

Some (13 respondents) advocated explicitly for the hydrogen network code arrangements to mirror those of the UNC, with only entities who hold a transporter or shipper licence being parties to the hydrogen network code. Of those, it was acknowledged that licensed shippers could encompass different parts of the value chain, including producers, offtakers and storage providers. It was also argued that only transporters and shippers should be parties to the code because they will bear the majority of the costs and risk associated with hydrogen pipeline network operation and use. A few respondents suggested that other entities can better protect their interests via bilateral agreements with their shipper, rather than as a code party.

However, some (15 respondents) advocated that all parties who are connected to the network should be a party to the code. A few respondents supported this view by arguing that all entities with a network connection will need to have a role in the effective operation of the network, including with respect to balancing. Specifically, a few respondents cited the important role that storage providers will play in network balancing as a reason for needing storage providers to be parties to the code.

Government response

Responses to this question reflect a diversity of opinions with respect to which entities should be a party to the hydrogen network code. In particular, respondents disagreed over whether

those connected to hydrogen pipeline networks who do not hold a shipper licence should be a party to the code.

We recognise the view that the level of costs and risks that different entities will experience as a result of using hydrogen pipeline networks is a relevant factor in considering who should be party to the code. The nature of these costs and risks is expected to become clearer through the process of developing the hydrogen network code.

These insights will inform our view as to who should be a party to the code. We will engage further on this question with relevant stakeholders as part of the code development process.

Question 18

Question 18: Do you agree that the hydrogen network code should be developed using a minimum viable product approach? Please explain your answer and provide any supporting evidence.

Summary of responses

Government received 42 responses to question 18, with strong support for a minimum viable product (MVP) approach being used to develop the hydrogen network code. Responses are summarised in the table below:

Response	Number of responses
Agree	36
Disagree	2
Neither agree nor disagree	4

Respondents provided a range of reasons to support their views, notably:

Speed of implementation

Some (12 respondents) supported the MVP approach on the basis that it will enable the first issue of the code to be implemented more quickly, emphasising that the code needs to be developed at pace to align with the timelines of early hydrogen pipeline networks. Respondents stated that creating a relatively simple code in the first instance will not only be quicker, but also more proportionate to the needs of early networks.

Flexibility to develop with the market

Some (14 respondents) agreed with the MVP approach because it allows the code to be developed iteratively as the market develops. A few said that a detailed code cannot be developed until the optimal operation of hydrogen pipeline networks is better understood, and that industry needs to be given more time to develop best practice, before codifying. Others made the similar point that attempting to anticipate the needs of future hydrogen pipeline networks is likely to be inefficient. It could lead to over-engineering the code to accommodate future needs which might not materialise. In addition, it was highlighted that for the MVP approach to work, the network code needs to be designed in a way that is agile and flexible from the outset.

Precedence for an MVP approach

Some (9 respondents) cited the successful experience of using an MVP approach to develop the CCS Network Code as a reason for agreeing with this approach for hydrogen. However, it was also noted that there are important differences between a carbon dioxide network and a hydrogen network that need to be considered.

Clarity for the MVP approach

Some (8 respondents), including some of those who agreed with the consultation question, felt that more clarity is needed as to what an MVP approach would mean in practice for the hydrogen network code. Further, a few expressed concerns that an MVP approach might result in important considerations and aspects of a code being missed.

Government response

Responses indicate strong support for using an MVP approach to develop the hydrogen network code. Government agrees with respondents who identified speed of implementation and the flexibility to develop the code alongside market development as key advantages of an MVP approach. Government also recognises the successful experience of adopting this approach to develop the CCS Network Code.

Based on the agreement of the majority of responses, we confirm it is government's intention for the hydrogen network code to be developed using an MVP approach. Evidence provided by respondents will help inform the exact nature of this approach.

Government also recognises the desire from some respondents for more clarity as to what an MVP approach means in practice, and the concern from some respondents that there is a risk that important aspects could be missed from the first issue of the code. We intend to mitigate that risk by considering collaboratively with industry, Ofgem and other stakeholders which issues should be prioritised for the first issue of the hydrogen network code as part of the code development process.

Question 19

Question 19: What is the minimum level of progress in code development that is required at the different stages of project development to enable investment decisions? Please explain your answer and provide any supporting evidence.

Summary of responses

Government received 35 responses to question 19, with respondents clearly emphasising the need for progress in network code development to enable investment decisions.

Requirement for project FID

The majority (18 respondents) stated explicitly that they require a complete or 'near complete' network code before taking a final investment decision (FID). This is because the detailed roles and responsibilities that will be set out in the code will partly determine the costs and risks that are allocated to projects, which will impact investment decisions. However, a few (5 respondents) stated that FID could be taken as long as 'basic principles' are agreed, without necessarily needing a complete code. Views on which elements of the code are most important to enable projects to make investment decisions are set out in the summary response to question 20.

Aligning to project milestones

Some (13 respondents) advocated for a staged approach to code development which is aligned to major project milestones, with developers needing a gradually improving understanding of their roles and responsibilities as they get closer to FID. The need for investors to see progress being made against a clear timeline was also highlighted.

There were different views regarding the exact level of progress that is needed over time. For example, a few respondents said confirmation that a hydrogen network code will be developed is a useful step to reduce investor uncertainty. Given the need for developers to make a reasonable assessment of likely financial returns at an early stage, others specifically stated the need for a 'Heads of Terms' (HoT) to be published as an interim milestone. Views varied as to when a HoT is required, including during the feasibility stage, while business model allocation windows are open, or during the shortlisting and eligibility phase of the business model process. A few (3 respondents) said that early progress in code development is particularly important to enable projects to commit to development expenditure (Devex), which is needed at an earlier stage.

Alignment to wider regulatory and policy

Some (12 respondents) made the point that the hydrogen network code needs to be developed in a way that is aligned to hydrogen business model developments, as well as any changes to licences for hydrogen networks. Given the view that detailed roles and responsibilities set out in the code will affect the allocation of cost and risk, respondents specifically noted that

progress in code development will be needed before developers can sign business model contracts.

Government response

Responses to this question provide valuable insights as to the level of progress that is needed in code development over time, and the important role the code will play in enabling investment decisions.

Government acknowledges the majority view of respondents that a complete or near complete hydrogen network code will be needed to enable project developers associated with hydrogen pipeline networks to take FID. While there are a range of views regarding the pace of code development that is needed prior to FID, we recognise the potential benefits in publishing early iterations of the code, such as in the form of a HoTs.

In addition, we also recognise the benefits of a staged approach to developing the code which is aligned to major project milestones. We also recognise the need for a clear timeline for code development, and for those involved in code development to be able to show regular progress against the plan.

These insights will inform our approach to development the hydrogen network code. We will engage further with stakeholders as part of the code development process, ensuring that code development timelines support industry partners in project development.

Question 20

Question 20: Which issues should be prioritised during initial code development? Please explain your answer and provide any supporting evidence.

Summary of responses

Government received 37 responses to question 20, with respondents providing a degree of consensus as to which issues need to be prioritised during initial code development.

According to respondents, the highest priority issues for code development should be balancing (18 respondents), roles and responsibilities (14 respondents), data sharing and transparency (14 respondents), as well as quality and technical standards (12 respondents). Respondents also prioritised charging and invoicing (11 respondents), capacity management (9 respondents) emergencies (8 respondents), and code governance (8 respondents).

Other priorities mentioned by a small number of respondents included safety (6 respondents), entrance and exit from agreements (4 respondents), nominations (4 respondents), maintenance (3 respondents), and metering (2 respondents).

Respondents often reiterated the point made in response to question 19 that detailed roles and responsibilities that will be set out in the code will partly determine the costs and risks that are allocated to projects, which will impact investment decisions. Respondents generally prioritised issues based on the extent to which they will impact costs and risks.

Additional priorities

Many (14 respondents) highlighted the importance of gaining more clarity on the high-level allocation of market framework roles and responsibilities. Similarly, respondents stated that more clarity is needed with respect to the timeline and development process for code development (including roles and responsibilities), as well as with respect to interactions between the code, licences, business models and other commercial agreements that may be needed. It was stated that progress is needed in these areas before work can begin on priority areas of the code. Others emphasised the importance of assessing the interactions between the hydrogen network code and business models, so that cost and risk allocation is better understood.

Learning from precedence

Some (6 respondents) recommended that prioritisation of code issues should be informed by the experience of developing the CCS Network Code, given that many of the challenges will be similar. One respondent suggested using the UNC as a starting point and eliminating content that is not applicable to hydrogen.

Government response

Responses to this question provide valuable insights regarding the issues that should be prioritised during initial development of the code, and the importance of prioritising issues based on the extent of their impact on project costs and risks.

In addition to considering which areas of the code to prioritise, we agree that it is also important to prioritise the process of code development. As set out in our response to question 15, we confirm it is government's position to lead the process of developing a hydrogen network code, particularly in the early phase of development when the industry is most nascent.

We agree with the need to maintain alignment between the hydrogen network code, licences and hydrogen business models. As set out in our response to question 19, we recognise the important role the code will play in enabling project developers to take investment decisions.

We agree with respondents who advised that the UNC and CCS Network Code should help inform which issues should be prioritised during initial development of the code. We are learning from both the UNC and CCS Network to inform our understanding of hydrogen network code content.

These insights will inform our approach to development the hydrogen network code. We will engage further with stakeholders as part of code development, to ensure that we are prioritising the right issues.

Acronyms

Acronyms	Definition
CCS	Carbon Capture and Storage
FID	Final Investment Decision
HoTs	Heads of Terms
HPBM	Hydrogen Production Business Model
HTBM	Hydrogen Transport Business Model
MVP	Minimum Viable Product
NESO	National Energy System Operator
T&S	Transport and Storage
UNC	Uniform Network Code

Glossary

Term	Definition
Balancing	'Balancing' is the process of ensuring the amount of gas entering network pipelines is the same as the amount of gas taken out of network pipelines. It is important to balance networks, so the system is operated within safe pressures and provides a reliable service for users.
Minimum Viable Product	This approach means prioritising issues that are most relevant to early hydrogen networks and their users for the first issue of the network code, whilst ensuring the network code is flexible enough to adapt as hydrogen networks develop over time.

Network Code	A ‘network code’ is a legal document that forms the basis of the arrangements between network owners and network users. It sets out the detailed responsibilities of network participants, including responsibilities related to balancing and system operation. A network code can be considered as the rulebook which defines how network participants should act, to ensure the effective and efficient operation of the network. Codes are given legal force through the requirement of licensed entities to be parties to the code, through conditions in their licences. As the regulator, Ofgem is responsible for ensuring that licensed entities meet their licence conditions. Natural gas networks are covered by the Uniform Network Code (UNC). This is an agreement between licensed gas transporters (pipeline owners) and the licensed shippers whose gas they transport.
Primary balancing	Primary balancing is when a primary balancer carries out their balancing responsibilities. Primary balancers are responsible for most day-to-day balancing activities under a ‘shipper’ licence. A shipper is defined in the Gas Act as an entity that arranges for gas to be introduced to, and conveyed by means of, or taken out of, a pipeline system operated by a licensed gas transporter. They arrange for gas to be transported in and out of the network, share data with network operators, and take instruction in emergencies. In natural gas, primary balancers are usually commercial shipping entities, with numerous licensed shippers operating in the market.

Residual balancing	Residual balancers act as a 'backstop' for primary balancers when additional physical actions are needed to resolve an imbalance. They continually monitor gas supply and demand on the system. The physical design and scale of the natural gas network allows the residual balancer to take physical actions to the network when required, if primary balancers fail to resolve an imbalance, like utilising linepack to adjust the pressures and gas flows in the pipelines. They are also responsible for giving instructions to the market to prevent an emergency such as a National Gas Supply Emergency (NGSE), but these emergencies are very rare and have never been declared for natural gas. Residual balancing is carried out by the National Transmission System (NTS) System Operator (currently National Gas Transmission (NGT)) under their Gas Transporter licence. Residual balancing is one of many different functions of the NTS System Operator. There can be several actions taken by the residual balancer in a normal natural gas day.
System Operation	System operation refers to activities that enable a pipeline system to function safely and reliably, complying with regulatory and licence conditions, and meeting the needs of its users. In the natural gas system, National Gas Transmission (NGT) is both the pipeline system owner and System Operator for the National Transmission System (NTS). It is given its designation of "NTS System Operator" through conditions of its transporter licence.
Therms	A unit of heat, especially as the former statutory unit of gas supplied in the UK

This publication is available from: www.gov.uk/government/consultations/hydrogen-economic-regulatory-framework-developing-an-effective-framework-for-pipeline-networks

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