Department for Energy Security & Net Zero

# Gas Shipper Obligation Analytical Annex

## Analytical Annex to the consultation on the Gas Shipper Obligation

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# Executive Summary

1. This annex summarises various evidence and analysis underpinning the consultation on the Gas Shipper Obligation (GSO), a proposed levy on gas shippers. It focuses on the bill impact of the GSO, and explores other impacts, such as the impact on fuel poor households, and small and micro-businesses.

2. The first section outlines the policy context, setting out the rationale for intervention, and the policy objectives. The second section outlines our potential broad options for the GSO, and the third section sets out our analytical approach. In the fourth section, the impact appraisal is set out, including consideration of key uncertainties.

3. The Government intends for the GSO to be the long-term funding mechanism for HPBM payments to initial hydrogen production projects. This analytical annex provides a snapshot of the GSO costs and impacts by setting out the estimated costs and quantitative impacts for HAR1 projects, which are in the final stages of contract signature. These costs and bill impacts would change with the funding of further hydrogen projects beyond HAR1, the extent of which will be subject to Government's future decisions on hydrogen production and the funding arrangements for it, as well as decisions on the funding arrangements for the Hydrogen Transport and Storage Business Models.

4. The GSO will initially be placed on licenced gas shippers in GB only. Government may consider the potential expansion of the GSO to Northern Ireland (NI) gas suppliers (who, in the opinion of the Secretary of State, carry on activities of gas shipping similar to those of licensed GB gas shippers) in the future, subject to further engagement with relevant stakeholders and decisions on the funding of future hydrogen projects. We propose to charge the GSO in proportion to the quantities of gas shipped to meter points, which we are calling a 'volumetric' design. We assume that costs are passed through the supply chain on a volumetric basis, by increasing the price per unit of gas. The consultation seeks initial views on potentially exempting quantities of gas used by certain non-domestic gas users from the GSO.

5. The estimated subsidy costs of HAR1 and the resulting bill impacts are presented over a 10-year appraisal period, from 2028 (the anticipated first full year of GSO operation) until 2037. These are presented as average annual impacts over Carbon Budget (CB) periods 5 (2028-2032) and 6 (2033-2037). The bill impacts presented represent 'gross' bill impacts, meaning they do not account for the cost of alternative decarbonisation technologies that would be required in the absence of hydrogen, or the wider energy system benefits that may occur as a result of low carbon hydrogen deployment.

6. With a volumetric approach, we estimate the policy impact of funding HAR1 projects on the average annual domestic gas bill to be approximately £2.60 - £4.50, over the 10-year appraisal period (2028-2037). This equates to less than 1% of the average household gas bill across this period. Further detail on these estimated impacts is set out in section 4.2, with the key assumptions underlying the analysis set out in section 3. All estimated costs and impacts are stated in real 2023 prices.

7. Our estimates show that the impacts of funding HAR1 projects across this period, for each of the options this analysis considers, have a minimal impact on fuel poverty metrics in England. Further detail is set out in section 4.3.

# Contents

# 1. Introduction and background

## 1.1 Problem under consideration, with business as usual, and rationale for intervention

8. The deployment of low carbon hydrogen (referred to throughout as 'hydrogen') can play an important role in supporting our Clean Energy Superpower and Growth Missions, and achieving net zero, as a key enabler of a low carbon and renewables-based energy system. Low carbon hydrogen can make our energy system more flexible, resilient, and independent, and could lead to billions of pounds of savings by 2050. Hydrogen-fuelled power generation coupled with long duration energy storage could provide £13bn to £24bn in savings to the power system between 2030 and 2050[1].

9. However, due to a range of barriers and market failures, this will not be realised without government intervention. The main barriers include:
   - The cost of hydrogen is higher than most high-carbon fuel alternatives. The lack of a fully developed market and imperfect investor information for hydrogen and the presence of a less than fully priced negative externality for high-carbon fuel alternatives all contribute to this lack of cost competitiveness.
   - Hydrogen technologies are risky for investors as they have not been proven at commercial scale in the UK. While some technology is already in use, many applications need to be proven at scale before they can be widely deployed. There is a first mover disadvantage, where project developers for the first at-scale hydrogen projects bear significant learning costs and risks but may not capture the full benefits of the investment, as market competitors capture their know-how.
   - The lack of a market structure also means that coordination failures might lead to suboptimal market outcomes such as undersupply where the lack of investment in one section of the market deters investment elsewhere. Uncertainty about secure future supplies of hydrogen might deter end users from switching to hydrogen, which in turn lowers the incentives for new producers to enter the market. Similarly for producers, they might still face uncertain demand for the hydrogen they produce as a result of the market's immaturity. Currently there is limited use of hydrogen in the UK and producers face some uncertainty over whether their supply will be matched by market demand.

10. To support the delivery of hydrogen, and overcome these barriers, the previous Government announced the Hydrogen Production Business Model (HPBM), consulting on its design, including how it should be funded, in August 2021[2]. The business model is designed to provide revenue support to hydrogen producers to overcome the operating cost gap between low carbon hydrogen and high carbon fuels. This is similar to the approach taken for the Contracts for Difference (CfD) scheme, which is the Government's main mechanism for supporting low-carbon electricity generation. The lessons learnt from low carbon electricity show that funding to cover the cost gap is an effective tool to reduce uncertainty for investors and developers to enable private investment, bring down costs in the long-term, and create a strong pipeline of projects.

1 DESNZ (2022) Benefits of long duration electricity storage
2 DESNZ (2021) Design of a business model for low carbon hydrogen

11. In December 2023, we announced 11 successful projects under the first Hydrogen Allocation Round (HAR1), which was aimed at providing HPBM revenue support and Net Zero Hydrogen Fund (NZHF) capital support to electrolytic projects. The precise terms of the support for each project are expected to be set out in the Low Carbon Hydrogen Agreement (LCHA) agreed between the counterparty and a project. These contracts have a duration of 15 years from start of operation, meaning funding will be required over at least this period.[3]

12. The Energy Act 2023 enables two options for funding the HPBM as well as the Hydrogen Transport and Storage Business Models: a levy on gas shippers (the Gas Shipper Obligation (GSO)) and government funding. The Government intends for the GSO to be the long-term funding mechanism for HPBM payments to initial hydrogen production projects. This analytical annex provides a snapshot of the GSO costs and impacts by setting out the estimated costs and quantitative impacts for HAR1 projects, given that these are the only projects that are in the final stages of contract signature. However, these costs and impacts would change with the funding of further hydrogen projects beyond HAR1, the extent of which will be subject to Government's future decisions on hydrogen production and the funding arrangements for it.

13. The Government is progressing the design of new business models for hydrogen transport and storage infrastructure, which will be essential to grow the hydrogen economy and help provide security of supply for producers and users of hydrogen. Government has not yet decided on how these business models will be funded; however, options include government funding and/or levy funding. If funded through the GSO, this would also increase the costs and impacts compared to those presented in this annex. The possible scale of costs associated with these business models is highly uncertain at this stage. As Government has not yet decided on the long-term funding arrangements for these business models, this analytical annex, like the consultation, focuses on the GSO as a mechanism to fund the HPBM and related costs.

14. Whilst the amount of funding raised by the GSO would increase with the funding of further hydrogen projects beyond HAR1, as set out above, in the long-term we expect subsidy costs (per unit of hydrogen) to fall over time, as a result of technological maturity, learning-by-doing and economies of scale[4]. Further deployment of hydrogen would also be expected to result in wider benefits to the energy system, which could result in future electricity bill reductions. This is explained further in section 4.2.

15. We expect to implement the GSO in 2027. It will initially be placed on licenced GB gas shippers only. Government may consider the potential expansion of the GSO to NI gas suppliers (who, in the opinion of the Secretary of State, carry on activities of gas shipping similar to those of licensed GB gas shippers), in the future, subject to further work and engagement with relevant stakeholders and decisions on the funding of future hydrogen projects. GB and NI operate separate gas networks, with different system operators, transmission and distribution network owners, regulators, and licensing arrangements. Any decision to expand the scope of the GSO to NI gas suppliers would need to consider these separate arrangements as well as whether the calculations of the GSO include gas shipped to NI via the Scotland-Northern Ireland Pipeline (SNIP) interconnector. As discussed in *General Information* of the consultation, just because the GSO is to be placed

3 HAR1 projects are expected to be operational between 2025-26 and 2026-27. Funding is expected to be required until at least 2041-42, since contracts have a duration of 15 years.
4 See DESNZ Hydrogen production costs report (2021) for further details on anticipated hydrogen production cost reductions.

on GB gas shippers, this does not preclude it from potentially having an impact on NI gas users. Further detail can be found in section 3.2.2.

16. This analytical annex has been produced alongside a consultation on the 'Gas Shipper Obligation', providing detail on the potential impacts of the GSO on energy users under the broad Options considered in the consultation.

## 1.2 Policy design principles

17. We have developed a set of overarching principles to guide the design of the Gas Shipper Obligation. The design of the GSO should, wherever possible, align with these principles:
    - Solvency: The funds raised by the GSO should provide a robust funding stream to the relevant hydrogen business models, allowing for long-term certainty on revenue support.
    - Simplicity: Operational simplicity will help ensure additional costs on energy users are minimised over the long term, and that the administrative burden of the GSO is minimised. The GSO also needs to be simple to deliver, to ensure that it can be operational and able to collect funding from 2027.
    - Affordability and fairness: The GSO should minimise the cost to energy users.
    - Policy coherence: The GSO should align with wider HMG decarbonisation and energy affordability objectives.
    - Market stability: The GSO should not create perverse incentives or destabilise the energy market.
    - Flexibility: The GSO should be flexible to future changes in the energy market.
    - Compliance: The GSO should minimise the likelihood of non-compliance

# 2. Description of options considered

18. Primary powers in the Energy Act 2023 enable the Secretary of State to introduce a levy on licensed GB gas shippers for the purpose of funding revenue support contracts for the Hydrogen Production Business Model and related costs. The powers that provide for the levy in the Energy Act 2023 also enable it to be placed on gas suppliers in Northern Ireland (NI) who, in the opinion of the Secretary of State, carry on activities of gas shipping similar to those of licensed GB gas shippers. As mentioned above, the Government's position is that the Gas Shipper Obligation (GSO) will be initially placed on licenced GB gas shippers only and may consider the potential expansion to NI gas suppliers in the future, subject to further work and engagement with relevant stakeholders and decisions on the funding of future hydrogen projects. However, just because the GSO is to be placed on GB gas shippers, this does not preclude it from potentially having an impact on NI gas users, which is dependent on the decision to be taken on interconnectors, as discussed in section 3.2.2. This analysis therefore assesses the broad options for the design of a levy on GB gas shippers, with impacts across all UK gas users.

19. The consultation sets out several design options and aims to collect evidence and stakeholder views to inform these, alongside evidence to enable further positions to be developed. We have therefore considered broad policy options for implementing the GSO in this analysis. These options are:
    - Option 0 (counterfactual) – do not introduce the Gas Shipper Obligation.
    - Option 1 – implementing a levy on GB gas shippers on a per meter basis, whereby shippers are charged in proportion to the number of meter points they ship gas to.
    - Option 2 – implementing a levy on GB gas shippers on a volumetric basis, whereby shippers are charged in proportion to the quantities of gas shipped to meter points.

20. The levy in both Options 1 and 2 would be implemented through secondary legislation, using the powers provided by the Energy Act 2023.

21. The Gas Shipper Obligation Consultation sets out options for the design of the GSO. The sections below assess some of these options against the design principles (set out in section 1.2) and describe the options in more detail.

**Performance against design principles**

22. Table 1 below compares a meter-point design option against a volumetric design option, assessing them against the design principles set out in section 1.2. Each principle is rated on a red-amber-green (RAG) scale, based on how well it meets the principle (with green indicating good alignment, and red indicating poor alignment). The rationale for each rating is presented below.

**Table 1: Options and key principles of the GSO**

| Design Principle | Option 1 | Option 2 |
|---|---|---|
| Solvency | Green | Green |
| Simplicity | Green | Amber |
| Affordability & Fairness | Red | Green |
| Policy Coherence | Amber | Green |
| Market Stability | Green | Green |
| Flexibility | Amber | Amber |
| Compliance | Green | Green |

Solvency:

23. Assessing against our design principles, both options considered will ensure solvency by providing a robust funding stream to the HPBM, allowing for long-term certainty on revenue support. This assessment would continue to hold even with increased costs and impacts compared with those for funding HAR1 projects.

Simplicity:

24. Option 1 would be the simplest to design and operate. Historical data shows that the number of meters being served is less volatile than the quantity of gas consumed[5], making it easier for the Gas Shipper Obligation administrator (the Administrator) to calculate collection amounts (and account for reconciliation) and for shippers to forecast the costs they will be facing. Both the number of gas meter points and the quantities of gas shipped are expected to decrease over time, meaning historical data is not a good predictor of future variation. However, it is expected that quantities of gas shipped will continue to be more volatile, given its exposure to external factors such as weather conditions. We expect Option 2 is more complex to deliver and administer, as consideration of gas consumption would be necessary when administering the GSO, and for shippers when forecasting it. Therefore, the Administrator and shippers may face a lower administrative burden under Option 1 than a volumetric approach under Option 2. We consider that both options are still deliverable in 2027, though Option 1 has a lower risk to delivery than Option 2 due to its relative simplicity. This assessment would continue to hold even with increased costs and impacts compared with those for funding HAR1 projects.

Affordability and fairness:

25. For this analysis, we assume that 100% of the costs of the GSO will be passed on to shippers' customers and eventually to the end users of gas. This assumption is in line with experience of the Green Gas Levy (GGL). Interviews with gas suppliers, conducted as part of the evaluation of the GGL, suggested that suppliers passed on the full cost of the levy to their customers (where this was possible)[6]. The GSO is the first levy proposed on GB gas shippers, and it will ultimately be a commercial decision for shippers whether they choose to pass on some or all of the costs of the GSO. As such, we are testing pass through cost

5 Using annual data from Xoserve from 2017-2023, we calculate yearly variations in the quantities of gas consumed ranged from -13% to 6%. Yearly variation in the number of active meter points ranged from 0% to 1% over the same period.

6 DESNZ (2024) Green Gas Support Scheme (GGSS) and Green Gas Levy (GGL): evaluation (p43). A small number of suppliers reported not being able to pass on levy costs to customers (e.g. because the supplier reaches the price cap before costs are fully accounted), suggesting that in some cases suppliers were unable to pass on full levy costs.

assumptions through the consultation. We also intend to evaluate pass through of GSO costs through our monitoring and evaluation plan.

26. In addition to the above cost pass through assumption, we have also assumed that for a per meter approach (Option 1), these costs would be passed through on a per meter basis, and for a volumetric approach (Option 2), these costs would be passed through on a volumetric basis, by increasing the price per unit of gas. For Option 1, this would result in all end users of gas being charged the same amount, disproportionately affecting small domestic and non-domestic gas users compared to large industrial users. The share of domestic meter points is forecast to remain constant at approximately 98% of all meter points, however by 2030 we project only 32% - 43%[7] of gas consumption will be by domestic users. This means that under Option 1, the household gas sector accounts for greater cost recovery, making it a less fair and affordable option for domestic gas users. Option 2 looks to address the issue of fairness by charging the GSO on a volumetric basis, which better reflects the extent to which a shipper is responsible for shipping gas to meter points, since it would be charged on the quantities of gas they ship to these meter points and should result in reduced costs for the domestic market. For example, over the period 2028-2037, we estimate the average annual gross bill impacts of funding HAR1 projects to the average dual fuel household to be approximately £6.80 - £9.40 under Option 1, compared to £2.60 - £4.50 under Option 2. Further information on estimated bill impacts is provided in section 4.2. Our RAG assessments of Options 1 and 2 against this design principle (red and green respectively) are reflective of the costs presented in this annex, relating to HAR1 projects.

27. As set out above, the GSO costs and impacts would increase with the funding of further hydrogen projects beyond HAR1. It is expected that this would widen the difference in affordability between Options 1 and 2 for domestic consumers, who would continue to account for approximately 98% of cost recovery under Option 1, and therefore be required to absorb the majority of these cost increases. Therefore, even with increased costs and impacts, Option 2 would be expected to continue to perform better against this design principle, with the worsening performance of Option 1 against this policy design principle meaning that our red RAG assessment would still be expected to hold for Option 1.

28. The impacts on non-domestic gas users from HAR1, explained further in section 4.2, indicate minimal impact to non-domestic gas users, under both options considered. However, these costs and impacts would increase with the funding of further hydrogen projects beyond HAR1, as set out above. We recognise that a volumetric approach based on gas consumption (Option 2) could therefore have an increased impact on certain non-domestic gas users, especially users of large amounts of gas. However, when balanced against the impacts discussed above on domestic gas users, we still expect Option 2 would continue to perform better against this design principle than Option 1, even with the funding of further hydrogen projects beyond HAR1. The consultation seeks initial views on potential exemptions for non-domestic gas users. This analytical annex does not consider the increase in impacts that could result to non-exempt gas users as a result of any such potential exemptions. We expect to engage further with stakeholders on any potential exemptions proposals. Further detail on this is set out in section 5 in the consultation accompanying this document.

7 Estimates based on DESNZ forecasts of future gas demand and active gas meter points. The share of meter points which are domestic is forecast to remain constant, with the range in share of gas demand which is domestic is based on a range of plausible gas demand reductions in line with current government policies.

Policy Coherence:

29. In terms of policy coherence, given our assumptions on how costs of the GSO will be passed through, Option 2 aligns better with wider HMG energy affordability objectives, reducing the additional burden on domestic gas users compared to Option 1. This assessment would continue to hold even with increased costs and impacts compared with those for funding HAR1 projects. The introduction of a levy on gas shippers, under either of the options, may incentivise reductions in gas consumption by acting as a signal of the Government's commitment to low carbon alternatives. This aligns with wider decarbonisation objectives and the Clean Energy Superpower Mission. Given the larger impact on domestic gas users, a per meter approach (Option 1) could further incentivise reduced consumption, however this would only be the case if users are able to switch away from gas completely.

Market Stability:

30. Neither of the options considered are expected at this stage to impact energy market stability, meaning both options perform equally well against this principle. This assessment would continue to hold even with increased costs and impacts compared with those for funding HAR1 projects.

Flexibility:

31. Both options are considered equally to align with this design principle. This assessment would continue to hold even with increased costs and impacts compared with those for funding HAR1 projects. The design of the GSO will be kept under review in light of future energy market changes.

Compliance:

32. Both options would be backed by a robust enforcement and compliance regime to ensure non-compliance was minimised, meaning both options perform equally well against this principle. This assessment would continue to hold even with increased costs and impacts compared with those for funding HAR1 projects.

33. Given its favourable performance against the affordability and fairness, and policy coherence design principles, particularly regarding the impact on domestic gas users, Option 2 in the analysis is our preferred option.

**Option 0 (counterfactual): do not introduce the Gas Shipper Obligation**

34. In this analysis, we have quantified the 'gross' impacts of implementing the GSO in respect of HAR1 projects, meaning the costs and impacts are estimated against a zero-cost counterfactual. These impacts therefore do not account for the wider system benefits that could occur as a result of hydrogen deployment, or for the cost of funding alternative decarbonisation technologies that would need to be deployed in its place to meet our legally binding Carbon Budgets, in the absence of the projects funded through the GSO.

**Option 1: Distribute the Gas Shipper Obligation between shippers according to the number of gas meter points that they serve.**

35. Under Option 1, we assume that the total costs of the GSO are allocated to shippers based on the number of meters that they ship gas to. For this analysis, we assume that 100% of the costs of the GSO will be passed on to shippers' customers and eventually to the end users of gas. We have also assumed that these costs would be passed through on a per meter basis, resulting in all end users of gas being charged the same amount.

**Option 2: Distribute the Gas Shipper Obligation according to the quantities of gas shipped to their customers (preferred option).**

36. Under Option 2, we assume that the total costs of the GSO are allocated to shippers in proportion to the quantities of gas shipped to meter points (a 'volumetric' design). For this analysis, we assume that 100% of the costs of the GSO will be passed on to shippers' customers and eventually to the end users of gas. We have also assumed that these costs would be passed through on a volumetric basis, by increasing the price per unit of gas for the end users. As set out in section 3.2 - Determining the quantities of gas shipped of the consultation, we consider that the underlying dataset of the General Non-Transmission Services (GNTS) charge on Exit could be used to determine the quantities of gas shipped to customers by shippers. This charge is payable by shippers via the Commodity invoice administered by Xoserve. Our positions, set out in detail in the consultation, are that the GSO under this option would be calculated based on market share approach, with a monthly collection frequency.

37. See the Gas Shipper Obligation consultation document for further information on the volumetric approach, including proposals for timings of payments and calculation of the obligation rate.

# 3. Analytical approach

38. This section outlines the evidence base on which impacts of the policy proposals have been modelled. As explained above, the analysis considers the costs and quantitative impacts of funding HAR1 projects only through the Gas Shipper Obligation (GSO). These figures would change with the funding of further hydrogen projects beyond HAR1, the extent of which will be subject to Government's future decisions on hydrogen production and the funding arrangements for it. We intend to publish strike price and cost information following the announcement of future successful hydrogen production projects, and to the extent those projects are to be funded by the GSO, further analysis of costs and impacts, when available.

39. As explained in paragraphs 25 and 26, we assume that gas shippers will pass on 100% of the cost of the GSO to their customers in the same way as the charges are set. For the purposes of calculating impacts on end users under Option 1, it is assumed that each end user has one meter. We are aware that some larger users will have more than one meter per premises, and so the cost of a levy under Option 1 may be more than the estimated impacts presented in this annex for such users, who would face costs against multiple meter points. However, we still expect the impact of a levy under Option 1 to be negligible on their bills, owing to the large quantities of gas these users will consume.

40. Estimated subsidy costs of HAR1 and the resulting gross bill impacts are presented over a 10-year appraisal period, from 2028 (the anticipated first full year of the GSO operation) until 2037. These are presented as average annual impacts over Carbon Budget (CB) periods 5 (2028-2032) and 6 (2033-2037). We have chosen to present subsidy costs and bill impacts in this way due to uncertainty in exact year-on-year variations. Total subsidy cost in a given year is uncertain due to variation in exact production volumes and the achieved sales price of the hydrogen produced. In addition to this uncertainty, the resulting bill impacts are also influenced by the number of meter points or total quantities of gas shipped in that year (which we assume form the levy base under Options 1 and 2 respectively). Both are expected to fall, as the transition towards net zero progresses. However, exact yearly decreases are highly uncertain. By providing average impacts over 5-year periods, we are able to present the estimated scale of impacts to domestic and non-domestic gas users, without presenting figures at a level which would convey spurious accuracy in our analysis. For each of these periods, we estimate gross bill impacts on the average dual fuel domestic consumer energy bill. We also assess the impacts on non-domestic gas users, estimating gas price rather than average bill changes, given the large variation in gas consumption between different types of non-domestic gas users.

41. As explained in the preceding paragraph, a key uncertainty that influences the impacts of the GSO are future changes to the levy base from which we expect shippers to recover costs (the number of gas meter points or the quantities of gas shipped under Options 1 and 2 respectively). We have therefore presented impacts to domestic and non-domestic gas users as a range. This range, based on DESNZ modelling, reflects a variety of plausible reductions in the number of gas meter points and the quantity of gas shipped under current Government policies.

42. We have not estimated subsidy costs or bill impacts for CB period 7 (2038-2042), which would cover the final years of HAR1 contracts. This is due to the increasing uncertainty in

the underlying assumptions required to estimate the resulting bill impacts, such as long-term forecasts of gas prices and gas consumption. There is significant uncertainty in the robustness of our forecasts for both factors when forecasting so far into the future. HAR1 annual subsidy costs have not been estimated beyond 2037, however the costs presented up until 2037 should represent 'peak' HAR1 costs (noting that year-on-year variations in subsidy cost will persist due to changes in exact volumes sold and the achieved sales price). If there were further increases in HAR1 impacts beyond those we have estimated, these would primarily be driven by decreases in the levy base. We expect both gas consumption and the number of gas meter points, which form the levy base under our two options, will continue to decline beyond our appraisal period, meaning impacts would continue to rise for those who continue to consume gas. However, the rate at which this happens is highly uncertain and is dependent on future policy decisions. As such, the design of the GSO will be kept under review to help ensure its sustainability and continued alignment to the design principles.

43. As outlined above, the GSO will be initially placed on GB gas shippers only. Government may consider the potential expansion of the GSO to include NI gas suppliers in the future, as set out in the consultation. The precise impact on GB and NI gas users also depends on whether gas shipped to some, or all of the interconnectors will be in scope of the GSO, as discussed in section 3.2.2 of the consultation. The HAR1 impacts we have estimated are based on UK gas demand and meter point forecasts and so should be considered for all UK gas users, including NI gas users. Due to data limitations, we do not have gas demand forecasts covering our appraisal period (2028-2037) that disaggregate between NI and GB gas consumption and do not have data on gas shipped specifically to NI from GB (via the SNIP interconnector). Depending on the decisions taken on interconnectors, this could result in an underestimation of HAR1 GSO impacts to GB gas users. However, given that NI accounts for roughly 3% of the UK population, under both options assessed, this variation in the size of the levy base, and corresponding impact, is thought to be minimal. The estimated impacts of the GSO to fund HAR1 projects under Option 2 also do not account for future quantities of gas shipped to interconnectors (except those which are transported to NI, as described above). This is because potential future gas quantities shipped to interconnectors are highly uncertain, with historical data not thought to be a good predictor. If in scope of the GSO, we would expect this to increase the size of the levy base that shippers recover costs from under this option, reducing the impacts to gas users compared to the estimates set out in this analysis. We are seeking further information on this area of policy design, including forecasts of this data, as set out in section 3.2. Therefore, the impacts assessed here should be considered for all UK gas users, though the precise impacts across GB and NI gas users will be subject to the decisions and uncertainties outlined here.

44. From 2028, which is anticipated to be the first full year of GSO operation, to 2032 (covering the CB5 period), we estimate that the GSO could need to raise approximately £150m per annum to cover HPBM spend relating to HAR1 projects[8]. Over the CB6 period (2033-2037) we estimate the average annual total subsidy cost for HAR1 projects could rise to approximately £155m. This increase is the result of some projects being expected to ramp up to full production capacity over several years. We do not anticipate a material change in total annual HPBM spend relating to HAR1 projects beyond this period. These estimates do not include estimates of additional contingency, which we propose will be collected to mitigate the risk of under-collection, due to uncertainty in HPBM cost forecasts.

8 For further detail on the uncertainties that inform these estimates see section 4.8.

Contingency is expected to be a small cost in relation to the costs set out here so would not significantly alter the estimated impacts. Further details on options to mitigate for under-collection are set out in section 4.5 of the consultation document. Further detail of the uncertainties that could result in under collection are set out in section 4.8 of this annex.

45. The analysis presented in this annex therefore only sets out the costs and impacts based on the broad design options of either a meter point or volumetric approach. In addition to contingency, other design variables, such as decisions regarding credit cover, mutualisation, and interconnectors, could be expected to have an effect on the exact costs and impacts. However, we do not expect them to be significant in comparison to the effect of a choice between a meter point and volumetric design. The analysis also does not account for the impacts of a potential exemptions scheme, which the consultation seeks initial views on, and which could also influence the impacts presented in this annex.

46. In addition to the funds needed to be raised to cover HPBM payments to projects, there will be costs to the Administrator and the HPBM counterparty. These costs are also expected to be met by the GSO and therefore are assumed to be passed on to end users of gas. There will also be an administrative burden to shippers (which we assume they will also pass on to end users of gas). These costs are discussed further in section 4.1 however, they are thought to be small in comparison to the costs of the GSO we have estimated, meaning it is not expected that they would influence the impacts we have estimated in section 4.2.

47. There may be further costs, for example to other industry bodies such as Xoserve, and the cost of a potential future allocation body (which could also be funded by the GSO). These are expected to be small in comparison to the costs of the GSO we have estimated, meaning it is not expected that they would influence the impacts we have estimated.

48. The data sources used to assess the impacts of the GSO are:

- Projected HPBM costs relating to HAR1 projects– the GSO profile is based on DESNZ's latest view of the sums needed to fund HAR1 projects through the HPBM. These estimates carry some uncertainty, as they depend on when hydrogen production becomes operational, the exact volumes of hydrogen produced, and the achieved hydrogen sale price. More detail on uncertainty is set out in section 4.8.
- Projected gas consumption – DESNZ projections for UK gas consumption. Given the high level of uncertainty in future gas consumption, we utilise a range of projections which reflect plausible demand reductions consistent with current Government policies. These are then used to calculate the size of the levy base in future years for Option 2. As explained above, due to data limitations, these projections exclude any quantities of gas exported through interconnectors and do not disaggregate between NI and GB gas consumption.
- Projected gas meter numbers – DESNZ projections for future gas meter point numbers. Given the high level of uncertainty, we utilise a range of projections which reflect plausible meter point reductions consistent with current Government policies. This is then used to calculate the size of the levy base in future years for Option 1. As explained above, these projections do not disaggregate between NI and GB gas meter points.
- Projected gas and electricity prices – forecasts of retail gas price changes, consistent with Green Book supplementary guidance, are used to estimate the price impacts of the

GSO. The Dynamic Dispatch Model (DDM)[9] is used to assess the impact of gas price changes on electricity prices.

- Number of gas shippers – datasets provided by Xoserve (the Central Data Services Provider for GB's gas market) are used in the analysis to estimate the number of active gas shippers on the NTS. This is used to estimate total familiarisation and administrative costs to shippers.

49. All prices in this analysis have been converted to 2023 prices using the GDP deflator[10] to enable a like-for-like comparison of costs and impacts across different time periods.

9 DECC (2012) The Dynamic Dispatch Model: a fully integrated power market model
10 HMT (2014) GDP deflators at market prices, and money GDP

# 4. Impacts appraisal

## 4.1 Policy costs and administrative burden

50. The primary component of the Gas Shipper Obligation (GSO) funding profile[11] is the cost of providing subsidy support to the HPBM. Exact subsidy support calculations will be determined by the terms of the LCHA[12]. Due to analytical limitations, we have not estimated all components of subsidy support as set out in the draft LCHA, but instead have estimated these costs using projections for how Achieved Sales Prices may evolve.[13]

51. There are expected to be further policy and administrative costs as a result of the GSO, which we have estimated where possible. These include costs to the Administrator and counterparty. There is also expected to be an administrative burden on shippers. These costs are thought to make up a very small proportion of the overall costs passed on to end users of gas. There may be further costs to other industry bodies such as Xoserve, and the cost of a potential future allocation body (which could also be funded by the GSO). These are expected to be small in comparison to the costs of the GSO we have estimated, meaning it is not expected that they would influence the impacts we have estimated. We expect that the Low Carbon Contracts Company (LCCC) will fulfil the function of the Administrator, subject to successful completion of administrative and legislative arrangements.

52. For the Administrator, the cost of operating and enforcing the GSO has been estimated to be in the range of £2.5m to £4m annually. These estimates cover each of the broad options considered and carry significant uncertainty, reflecting the fact that policy design decisions (that will impact operating costs) are still to be made and that enforcement costs will vary depending on the scheme compliance regime. There could also be higher costs during the initial implementation period. The estimates are based on existing capabilities LCCC have in place today with the assumption that the GSO will be a monthly process. Costs to the administrator may vary if a more or less frequent collection process is agreed. These estimates only relate to LCCC's anticipated role as the Administrator of the GSO. They will incur further costs as the counterparty to the HPBM, the estimates of which are still being finalised but are expected to be of a similar magnitude to the Administrator cost estimates. These costs will include staffing, system maintenance and any costs associated with legal disputes or audit requirements under the HPBM. As mentioned above, this analytical annex provides a snapshot of the costs and impacts of the GSO by setting out the estimated costs and quantitative impacts for HAR1 projects only. Costs and impacts would change with the funding of further hydrogen projects beyond HAR1, the extent of which will be subject to Government's future decisions on hydrogen production and the funding arrangements for it. However, these administrative costs estimates are not expected to materially change with the funding of further hydrogen production projects, as LCCC's role as the Administrator and counterparty would continue to remain the same.

53. As per the consultation, we intend for the Administrator to monitor gas shippers' compliance with their obligations and have the ability to take action in response to cases of

11 Which for HAR1 projects we estimate to be approximately £150-155m per annum from 2028 to 2037.
12 DESNZ (2022) The "Payments Calculations" section of the draft LCHA sets out how subsidy amounts are expected be calculated
13 As per the draft LCHA, these factors are expected to be the main determinants of the level of subsidy support.

non-compliance. We also intend to make provisions in the GSO regulations to enable Ofgem (the Regulator) to use their enforcement powers under the Gas Act 1986 for breaches of levy obligations and so there may also be costs to the Regulator, as the regulator. If there are breaches by shippers in the delivery of their obligations, the Regulator would be able to trigger their own investigations and enforcement process, which would incur costs. In line with other levies, such as the Supplier Obligation, any costs are expected to be covered by the Regulator's general funding and therefore are not included in our estimated GSO funding profile.

54. Shippers will also incur administrative costs through familiarising themselves with the policy, updating systems and engagement to notify customers of the GSO. These activities will result in some costs in the run-up to and immediately after the policy is anticipated to come into effect in 2027. Once the policy is in place, shippers will also face recurring costs from delivering obligations, including the costs of providing information to the Administrator, making payments and potentially lodging credit cover, so that they are able to cover their obligations for each month. These costs are expected to be small in comparison to the GSO funding profile, and as with other costs to shippers, we assume these costs are passed on to end users of the gas they ship. There may also be additional administrative costs to gas suppliers. However, due to the integrated nature of many gas shippers and suppliers, we have assumed there is no additional administrative costs to suppliers for the purpose of this analysis. We are seeking more information on this through the consultation.

55. We have made an initial estimation of the administrative burden to shippers, based on estimates for administrative burden of the Green Gas Levy (GGL)[14]. It should be noted that the GGL was levied on suppliers of gas, not shippers. However, it is thought the administrative burden would not change significantly as a result of this. One reason for this is that the GSO will be the first levy on gas shippers, and the GGL was the first levy on gas suppliers, meaning we expect a similar level of administrative burden resulting from shippers familiarising with the GSO. The GGL estimates are based on quarterly payments, so we scale recurring costs to account for the monthly frequency proposed in the GSO, as we assume that administrative burden is likely to increase with more frequent collections (and conversely may decrease with less frequent collections). The GGL estimates also assume that some of the administrative costs incurred are in relation to the lodging of credit cover by suppliers. As set out in section 5.2.1 of the consultation document, we are considering credit cover as a risk mitigation tool to manage defaulted payments. The administrative burden of the GSO could therefore differ from these estimates, depending on decisions regarding the inclusion (and exact design) of any credit cover requirements. For example, where shippers choose to lodge credit cover in cash, rather than via a letter of credit, this could further increase the costs of the GSO (to fund HAR1 projects) set out above, however, we would not expect it to materially alter the estimated impacts.

56. The administrative burden incurred by shippers may vary between Options 1 and 2. Under Option 1, we estimate that each shipper will require the equivalent of 3 to 6 months of one full-time staff member's time to undertake familiarisation activities and the initiation processes for the first payment, and the equivalent of three months' time per year for a member of staff to manage payments.

57. Under the volumetric approach, Option 2, we estimate that each shipper would require between 6 and 12 months of one member of full-time staff's time for familiarisation, and between 6 and 12 months of one member of full-time staff's time per year for recurring

14 BEIS (2020) Green Gas Levy Consultation stage – Impact Assessment, page 16-17.

administrative activities. This reflects the greater complexity in the changes required to change billing systems. We aim to minimise any additional complexity where possible, such as proposing the use of existing datasets, like using the underlying dataset for the GNTS charge on Exit to determine the quantities of gas shipped.

58. Using ONS average wage data[15], we can estimate the administrative burden per shipper, and by combining with data provided by Xoserve on the number of shippers, we can estimate the total administrative burden. These estimates are summarised in Table 2 below.

**Table 2: Estimated administrative burden on shippers (£m, 2023 prices)**

*Figures are rounded to the nearest £0.1m*

| | Option 1 | | Option 2 | |
|---|---|---|---|---|
| | Initiation Costs | Recurring Annual Costs | Initiation Costs | Recurring Annual Costs |
| **Low** | 0.7 | 0.6 | 1.5 | 1.5 |
| **Central** | 1.1 | 0.7 | 2.2 | 2.2 |
| **High** | 1.5 | 0.8 | 2.9 | 2.9 |

59. Our estimates are highly uncertain, as the details of the GSO are subject to consultation and further policy development. However, they show that in the context of the total cost of the GSO, the administrative burden on shippers is small. We aim to refine these estimates using information collected as part of the consultation.

60. The administrative costs that we have estimated are minimal in comparison to the subsidy cost estimates. This is consistent with the findings of the interim evaluation of the GGL, which found that the administrative burden was minimal, regardless of the size of the supplier[16]. The estimates of administrative burden to shippers are not expected to materially change with the funding of further hydrogen production projects, given the requirements to shippers would remain the same.

## 4.2 Policy impact on gas bills for households and businesses

61. In this analysis, we assume that shippers pass on all policy costs and any administrative burden imposed on them to end users of gas (either directly to end users or via suppliers) and in a manner that is reflective of the way the charges are set. We are testing pass through cost assumptions through the consultation. As outlined above, it is anticipated that the costs of the HPBM to fund HAR1 projects will be approximately £150m per annum over the CB5 period (2028-2032), increasing to approximately £155m per annum over the CB6 period (2033-2037). We do not expect HAR1 subsidy costs to materially change beyond 2037. However, as explained in section 3, due to increasing levels of uncertainty in the assumptions required to estimate the resulting impacts, we do not attempt to do so beyond

15 Median full-time salary of a business and management consultant, from Annual Survey of Earnings and Hours (ASHE) 2023, Table 16, for SIC code 7022 (Business and other management consultancy activities).
16 DESNZ (2024) Green Gas Support Scheme (GGSS) and Green Gas Levy (GGL): evaluation (p43) .

this point. We do not expect there to be a material difference between Option 1 or 2 in terms of the overall cost and spend profile of the Gas Shipper Obligation (GSO). Table 3 below summarises the gross bill impacts of funding HAR1 projects to the average domestic dual fuel household under the two options we have modelled.

62. This section provides a snapshot of the estimated bill impacts of the GSO based on subsidising HAR1 projects only via the GSO. The costs and impacts would increase with the funding of further hydrogen projects beyond HAR1, the extent of which will be subject to Government's future decisions on hydrogen production and the funding arrangements for it. However, we expect subsidy costs (per unit of hydrogen) to fall over time, as a result of technological maturity, learning-by-doing and economies of scale.

63. For Option 1, we divide the estimated average annual subsidy cost (outlined above) by the gas meter point forecasts in the relevant periods. As explained in section 3, we do this against several meter point forecasts, which determine the ranges presented, given the high level of uncertainty in precise meter point reductions, with each of these forecasts representing plausible reductions under current Government policies. For this option, we assume that the GSO places a fixed cost on all gas users regardless of consumption. As this would not impact the variable cost of electricity production from gas-fired power stations, any potential knock-on impact on electricity prices is considered negligible and assumed to be £0. Please see section 3 for detail on our analytical approach and data sources used to reach these estimates.

64. For Option 2, we divide the estimated average annual subsidy cost by the gas demand forecasts in the relevant periods, to estimate the increase in price per unit of gas consumed. We then combine this with DESNZ assumptions for gas consumption for dual fuel households, to estimate bill impacts on domestic gas users. We do this against several demand forecasts, which determine the ranges presented, given the high level of uncertainty in precise demand reductions, with each of these forecasts representing plausible reductions under current Government policies. For this option, we also estimate the impact on electricity prices, due to gas price changes. The modelling shows a minimal (<0.1%) electricity price increase, because the impact of gas prices on electricity prices (determined through the projected use of gas for power generation) is projected to be increasingly limited over time. Therefore, alongside average impact on dual fuel bills, in the tables below we only present the £ per MWh impact on gas prices.

As seen in Table 3, we find that Option 1 results in a larger cost to domestic gas users compared to the volumetric Option 2. This is because, households are expected to represent a greater share of total gas meters, than total quantities of gas shipped. The share of domestic meter points is forecast to remain constant at approximately 98% of all meter points, however by 2030 we project only 32% - 43% of gas consumption is by domestic gas users. As such, under Option 1, the household gas sector is required to cover a far greater proportion of the costs of the GSO than under a volumetric approach (Option 2). It therefore follows that any costs will be greater for domestic gas users under Option 1.

**Table 3: Estimated annual gross impact of funding HAR1 projects to average dual fuel household bills (2023 prices):**

| Option | Description | Estimated Impact 2028 - 2032 | Estimated Impact 2033 - 2037 |
|---|---|---|---|
| Option 1 | Gross bill increase for an average dual fuel household (£) | £6.80 - £7.10 | £7.50 - £9.40 |
| Option 2 | Gas price increase per MWh (£) | £0.20 -£0.30 | £0.20 - £0.40 |
| | Gross bill increase for an average dual fuel household (£) | £2.60 - £3.50 | £2.70 - £4.50 |

65. Table 4 shows a more detailed breakdown of the gross bill impacts under Option 1. The range of impacts presented are determined by differing forecasts for reductions in gas meter points.

66. Under this option, we estimate the annual gross bill impact of funding HAR1 projects per meter point may be £6.80 - £7.10 over the CB5 period, rising to £7.50 - £9.40 over the CB6 period. For the average dual fuel household, this equates to approximately a 1% increase in gas bills across both periods. For non-domestic users of gas, we estimate that this option results in negligible impacts, as the fixed meter point charges are estimated to be very small (<0.1%) relative to their existing energy bills. For micro-businesses, consuming quantities of gas below the small business threshold (defined as non-domestic sites consuming less than 500MWh p.a. electricity and 2,778MWh p.a. gas), the impacts as a proportion of existing bills could be larger and potentially more in line with estimated domestic consumer impacts (1%).

67. While this option may be the simplest way to impose a levy on gas shippers, it raises issues of fairness for domestic gas users, who we assume would face the same flat charge as large non-domestic users of gas. This results in domestic users facing a much larger proportion of the costs.

**Table 4: Estimated annual gross impact of funding HAR1 projects to gas bills, Option 1 (2023 prices)[17][18]**

| | | Estimated Impact 2028 - 2032 | Estimated Impact 2033 - 2037 |
|---|---|---|---|
| Annual gross bill increase per meter (£) | | £6.80 - £7.10 | £7.50 - £9.40 |
| Gas bill increase (%) | Average dual fuel households | 1% | 1% |
| | Small businesses | <0.1% | <0.1% |
| | Medium businesses | <0.1% | <0.1% |
| | Large energy users | <0.1% | <0.1% |

68. Table 5 shows a more detailed breakdown of the bill impacts under Option 2. In this case, the GSO is distributed between shippers according to quantities of gas shipped. The range of impacts presented are determined by differing forecasts for reductions in gas demand.

69. Under Option 2, we estimate the annual gross bill impact of funding HAR1 projects on the average domestic dual fuel bill may be £2.60 - £3.50 over the CB5 period, rising to £2.70 - £4.50 over the CB6 period. This equates to a less than 1% increase in gas bills across both periods.

70. The average gas prices for non-domestic users of gas are estimated to increase by up to 2% over both the CB5 and CB6 periods, dependent on the business size. This is because larger businesses pay a lower base price for their energy.

**Table 5: Estimated annual gross impact of funding HAR1 projects to gas bills by affected group, Option 2 (2023 prices)**

| | | Estimated Impact 2028 - 2032 | Estimated Impact 2033 - 2037 |
|---|---|---|---|
| Gas price increase per MWh (£) | | £0.20 -£0.30 | £0.20 - £0.40 |
| Gross bill increase for an average dual fuel household (£) | | £2.60 - £3.50 | £2.70 - £4.50 |
| Gas bill increase (%) | Average Dual Fuel Household | <1% | <1% |
| | Small business | <1% | <1% |
| | Medium business | <1% | 1% |
| | Large energy users | 1% | 2% |

17 The definition of a small/medium/large size business is determined by criteria on the consumption of gas & electricity per annum.
Small business: A non-domestic site consuming less than 500MWh p.a. electricity and 2,778MWh p.a. gas, which generally covers most non-industrial, non-domestic sites.
Medium business: A non-domestic site consuming 500-20,000MWh p.a. electricity and 2,778-27,777MWh p.a. gas, e.g., a large supermarket.
Large energy user: A non-domestic site consuming over 20,000MWh p.a. electricity and 27,777MWh p.a. gas, e.g., a factory.
Given this analysis focuses on gas bill impacts, we have not separately estimated the impact on EIIs (very large energy-intensive industrial consumers typically covered by Climate Change Agreement, which are in receipt of existing BAU electricity support).
18 Point estimates provided where the size of impacts prevents a meaningful range of impacts being presented.

71. Given the small impact on gas prices that we have estimated under our preferred option (less than £0.50/MWh per annum across our appraisal period of 2028-2037), the impacts of subsidising HAR1 through the GSO are not expected to materially influence long-term projections for gas prices[19] (noting that future gas prices are influenced by various external factors, meaning forecasts are highly uncertain). Dependent on the extent of increases to GSO costs and impacts beyond those presented here, there could be a material impact on long-term trends in end user gas prices.

72. However, this analysis only quantifies the 'gross' impacts of implementing the GSO, meaning the costs and impacts are estimated against a zero-cost counterfactual. These impacts therefore do not account for the wider system benefits that could occur as a result of hydrogen deployment, or for the cost of funding alternative decarbonisation technologies that would need to be deployed in its place to meet our legally binding Carbon Budgets, in the absence of the projects funded through the GSO.

73. The hydrogen programme, and electrolytic hydrogen production in particular, could offer wider system benefits, such as from hydrogen providing long duration energy storage and reducing the cost of running the electricity network (by reducing network constraint costs associated with electricity supply). Hydrogen fuelled power plants can provide a flexible source of low carbon electricity during periods of low renewable output, which can help to minimise the whole system costs in a decarbonised power sector. Hydrogen can further enhance the power system's resilience, as electrolytic hydrogen can be produced using renewable electricity that would otherwise need to be curtailed, easing network constraints. We expect these benefits could significantly lower the cost of a future decarbonised power system in the mid-2030s.

74. Additionally, the hydrogen production funded through the GSO will help contribute towards our legally binding Carbon Budget targets. Therefore, in the absence of hydrogen deployment funded through the GSO, alternative decarbonisation technologies would need to be deployed in its place, to help contribute towards these targets. DESNZ whole energy system modelling and external analysis (such as the National Grid Electricity System Operator's Future Energy Scenarios[20]) indicate that hydrogen is expected to play an important role in our path to Net Zero. We expect that the deployment of alternative decarbonisation technologies in place of hydrogen would be more expensive. This means that the 'net' bill impacts of the GSO are likely to be positive, if the increased cost of funding the alternative technologies in place of hydrogen, were also passed on to end users in a similar way to the GSO. This would mean that to meet net zero, bill impacts would be expected to be higher in the absence of funding this hydrogen deployment.

## 4.3 Fuel poverty impact

75. Fuel poverty is a devolved issue and each country in the UK has its own fuel poverty indicator for measuring the issue. At this stage we have only been able to assess the impact using data from England.

76. The Low Income Low Energy Efficiency (LILEE) indicator considers a household to be in fuel poverty if it is living in a property with a Fuel Poverty Energy Efficiency Rating[21] of

19 FFPA 2024 presents a range of wholesale gas price projections
20 National Energy Systems Operator (2024) Future Energy Scenarios
21 DECC (2014) Fuel Poverty Energy Efficiency Methoodology

Band D, E, F, or G, and its disposable income (income after housing costs and energy costs) would be below the poverty line[22].

77. The impact of the GSO on fuel poverty is dependent on the size of the increase in gas prices. Households that do not use mains gas to heat their homes will not be affected.

78. In England, where the LILEE indicator is used, we estimate that the impact of the Gas Shipper Obligation (funding HAR1 projects) on the number of households in fuel poverty is minimal compared to the baseline scenario where the GSO is not imposed, under either of Options 1 or 2. As future rates of fuel poverty depend on a range of other policies, we have assessed the impact of the GSO for 2028-32 and 2033-37 against the most recent estimates (2023) of existing levels of fuel poverty. Given that we forecast the unit price of gas to fall from 2023 levels, we would expect to see fuel poverty fall from 2023 levels, and our analysis finds that this continues to be the case under both options considered across both time periods assessed.

79. When assessing the impacts of the GSO (funding HAR1 projects), under both options and time periods assessed, we estimate a 3% decrease in fuel poverty, from 2023 levels. This indicates that neither option considered has a noticeable impact on fuel poverty levels, due to the small impact on gas prices.

80. Similarly, assessing the impacts of both options against the number of households in England facing energy costs greater than 10% of income (after housing costs)[23], we again find that the estimated impacts of the GSO (funding HAR1 projects) do not prevent the number of households facing energy costs greater than 10% of income falling across both periods assessed, under both options. For Option 1, we estimate a 16% and 21% decrease in the number of households facing energy costs greater than 10% of income, across the periods 2028-2032 and 2033-2037 respectively. For Option 2, we estimate a 17% and 22% decrease respectively across the periods. This indicates that while neither option prevents the number of households facing energy costs greater than 10% of income from falling, households are marginally better off under our preferred option (Option 2).

81. These estimates rely on forecasts of how gas prices will change in future, compared to 2023 levels, meaning they are highly uncertain. They also do not account for the impact of other government policies that may further affect the level of fuel poor households, or the potential impact of funding alternative decarbonisation technologies in place of hydrogen production.

82. The figures above provide a snapshot of the estimated impact of the GSO on fuel poverty levels based on the estimated costs and quantitative impacts for HAR1 projects. These costs and impacts would change with the funding of further hydrogen projects beyond HAR1, the extent of which will be subject to Government's future decisions on hydrogen production and the funding arrangements for it. This in turn could increase the impact of the GSO on fuel poverty levels. However, further deployment of hydrogen would also be expected to result in wider benefits to the energy system, which could result in future electricity bill reductions, which would reduce levels of fuel poverty.

22 The poverty line (income poverty) is defined as an equivalised disposable income of less than 60% of the national median (Section 2 of the ONS website):
23 In Scotland, Wales and Northern Ireland, a 10% threshold forms part of the fuel poverty measurement

83. We will continue to monitor the impacts of the GSO, and we intend to develop a monitoring and evaluation plan, including monitoring costs on end users and impacts on fuel poverty.

## 4.4 Distributional impacts

84. This section describes the distributional impacts of the Gas Shipper Obligation funding HAR1 projects on domestic gas users. The GSO impacts on businesses are presented in section 4.2.

85. This analysis expands on the earlier assessment of the expected bill impacts on the 'average' household. It aims to provide greater insights into the distributional impacts of Options 1 and 2 on domestic gas users.

86. To analyse these impacts, we have utilised gas expenditure data by income decile, from the ONS family spending workbook[24] and assumptions for future energy costs[25]. To illustrate potential distributional impacts, given we do not anticipate the relative impacts of Option 1 compared to Option 2 to vary significantly over time, we have done so for 2030, by taking the midpoint of our annual estimated GSO impacts (for HAR1 projects) across the CB5 period (2028-2032).

87. Under Option 1, the cost to households consuming gas is estimated to be the same, regardless of income since the charge is on a per meter basis, as set out in Table 7. For Option 2, the cost is estimated to vary by the amount of gas consumed, which varies by income decile, with higher income households tending to consume more gas. There will be variation in gas consumption within each income decile, resulting in varying impacts under Option 2, which are not captured by this analysis.

24 Family spending workbook 1: detailed expenditure & trends table A6, category 4.4
25 Consistent with Green Book supplementary guidance

**Table 7: Impact of funding HAR1 projects through the GSO, on gas bills of dual fuel households, per decile (real 2023 prices).**

| | Bill Impact from the GSO in 2030 | | Estimated Average Annual Total Household Expenditure in 2030 |
|---|---|---|---|
| **Income Decile** | **Option 1** | **Option 2** | |
| Lowest Decile | £7.00 | £2.60 | £17,600 |
| 2nd Decile | £7.00 | £2.80 | £20,000 |
| 3rd Decile | £7.00 | £2.80 | £21,400 |
| 4th Decile | £7.00 | £2.80 | £24,800 |
| 5th Decile | £7.00 | £3.00 | £26,700 |
| 6th Decile | £7.00 | £3.00 | £30,800 |
| 7th Decile | £7.00 | £3.10 | £32,800 |
| 8th Decile | £7.00 | £3.20 | £36,000 |
| 9th Decile | £7.00 | £3.30 | £40,400 |
| Highest Decile | £7.00 | £3.90 | £52,300 |

88. As energy is an essential good, it tends to represent a higher share of total household expenditure for lower income households. Under Option 1, the estimated impacts of the GSO, to fund HAR1 projects, are therefore estimated to account for an increasingly higher proportion of total household expenditure, which is also presented in Table 7. Therefore, the GSO under Option 1 is estimated to have a greater impact on lower income groups than Option 2, when comparing impacts as a proportion total household expenditure. However, when assessing the impacts of the GSO to fund HAR1 projects, the increase in expenditure as a result of the GSO is estimated to be minimal across all income groups.

89. Under Option 2, as higher income households tend to consume more gas, under this approach the costs of the GSO to fund HAR1 projects are estimated to account for a similar proportion of total household expenditure across all income deciles. The impacts are estimated to be lower, compared to Option 1, for all income deciles.

90. As mentioned above, this section provides a snapshot of the distributional impacts of the GSO on domestic customers based on the estimated costs and quantitative impacts for HAR1 projects only, given that these are the only projects that are in the final stages of contract signature. The costs and impacts of the GSO would increase with the funding of further hydrogen projects beyond HAR1, the extent of which will be subject to Government's future decisions on hydrogen production and the funding arrangements for it. Even with increased costs and impacts compared with those for funding HAR1 projects, the trends identified in this distributional analysis would be expected to remain, with the impacts across all income deciles increasing.

## 4.5 Equalities impact assessment

91. A Public Sector Equality Duty (PSED) was completed for the primary legislation[26], which identified that there may be some impacts on Protected Characteristic Groups (PCGs) as a result of the introduction of the Gas Shipper Obligation.

92. While the expected impacts on PCGs are likely to be small, three characteristics might potentially be affected: race/ethnicity, disability (long-term illness), and age (measured as the age of the oldest household member), as these groups could be particularly impacted by an increase in gas prices.

93. The remaining characteristics are either less relevant at a household level and/or there is limited energy consumption data available at this level of granularity; these characteristics are sex, gender reassignment, sexual orientation, marriage and civil partnership, religion or belief, and pregnancy and maternity.

94. For age, initial PSED analysis suggested that 16-24 year-olds and over 75s could be most impacted by the GSO, which is driven primarily by lower median annual income of those two groups.

95. The initial PSED analysis found that groups with a disability/long-term illness could be more impacted by the GSO than those without, despite similar levels of gas consumption. This is because groups with a disability/long-term illness have a lower median annual income than those without.

96. For race/ethnicity, initial PSED analysis found that there could be a small difference in relative bill impacts between white ethnic groups and all other ethnic minorities[27]. Once again, this was driven by differences in incomes.

97. In summary, the department believes that the GSO may have a greater impact on certain groups with protected characteristics. We expect to see small variations in direct bill impacts across households with and without protected characteristics, but income differences will exacerbate these further. Although analysis of protected characteristics can provide an indication of likely distribution, and impact on various groups, ultimately the GSO bill impact will depend on individual household consumption, which is heterogenous and may be influenced by a variety of factors, and also how the costs of the GSO are passed through. This assessment is not expected to change with an increase in GSO costs and impacts beyond those presented in respect of HAR1 projects in this annex.

98. This assessment will be kept under review. An updated PSED assessment will be conducted at the government response stage.

26 BEIS (2022) Energy Bill Impact Assessments, p 69
27 Source data is available for 2 ethnic groups only: White – White ethnic groups (including White British and White ethnic minorities); Other (all other ethnic minorities). This is because the number of people surveyed was too small to make any reliable conclusions about any of the 18 ethnic groups or 5 aggregated groups. Source: DESNZ (2023) Fuel Poverty Statistics 2021

## 4.6 Impact on small and micro businesses

99. In this Small and Micro Business Assessment (SaMBA) we have considered the impacts of the Gas Shipper Obligation on both gas shippers and non-domestic gas users. For gas shippers, the make-up of the gas shipper market is variable. There is a very uneven distribution regarding the quantities of gas handled by each shipper, with the top 10 shippers by volume covering 56% of the quantities of gas shipped in 2023[28]. We do not collect data on the sizes of their businesses, but it is possible that a number of gas shippers could be small or micro-businesses given the quantity of gas handled.

100. Since we assume costs will be passed on to shippers' customers, we do not expect small shippers to be disproportionately impacted by the GSO. The volumetric approach of our preferred option may increase the administrative burden on shippers, due to changes in gas demand being more volatile than changes in the number of meter points. This is reflected in our estimates of administrative burden presented in section 4.1. However, the total administrative burden to shippers is still considered to be low (less than £5m per year[29]) in comparison to the total GSO costs. We are seeking to test pass through cost assumptions and impacts on small shippers through the consultation.

101. Given our assumption on how GSO costs will be passed through, comparing the design options considered, our preferred Option 2 reduces the impact on SaMBs, by aligning cost recovery with gas consumption. Under Option 1, SaMBs would face the same costs as large industrial users of gas.

102. The costs and impacts associated with the GSO would increase with the funding of hydrogen production projects beyond HAR1. Based on our assumption about pass-through of GSO costs, even with increased costs and impacts, our preferred Option 2 would continue to reduce the impact of GSO costs on SaMBs (compared to Option 1). We also would not expect administrative costs to shippers to materially change, meaning the administrative burden to shippers in comparison to GSO costs would be lower even with increased costs and impacts.

## 4.7 Monitoring and evaluation

103. Monitoring and evaluation (M&E) evidence from existing schemes, in addition to wider evidence, has been used to inform development of the Gas Shipper Obligation.

104. To gather and assess evidence on the GSO effectively, we will be developing an M&E plan, which will set out our detailed approach to M&E for the GSO and focus on proportionate and timely M&E activity, thereby supporting the GSO's effective delivery. The M&E plan will consider a Theory of Change (ToC), details of monitoring indicators, evaluation questions, activities and timelines. The plan will also consider evaluation approaches and methods, monitoring time period, frequency, data sources and activities, suggested budget and resources to be allocated. We anticipate that our work on the M&E plan will highlight the need for a process and impact evaluation to assess the performance of the GSO against the key principles described in section 1.2. The M&E plan sits within a

28 Data from Xoserve, covering annual quantity of gas shipped from 2017-2023. 89 shippers in total were shipping any gas at all in 2023.
29 We have estimated total recurring annual administrative burden to shippers to be £1.5m - £2.9m, as per Table 2.

wider M&E framework for the hydrogen policy space. We will ensure that activities set out in the GSO M&E plan fit within the wider M&E context.

105. We will work closely with the Administrator to ensure information collected from gas shippers enables effective monitoring of the GSO. Monitoring will be used to support robust budget management and assess scheme compliance and enforcement. Monitoring will also review potential impacts of this policy on affected groups.

## 4.8 Risks and uncertainties

106. The two major factors that establish the impacts estimated in this analysis are the projected HPBM spend and the levy base that the cost is spread over. The levy base is assumed to be either the total number of meter points served by shippers (Option 1), or the total quantities of gas shipped (Option 2). Both projected HPBM spend, and the levy base are subject to uncertainty, meaning the impacts presented in section 4.2 are inherently uncertain. In particular, the levy base is increasingly uncertain in later years, which means we are unable to accurately estimate the impacts of the Gas Shipper Obligation beyond 2037. Further details on the key drivers of uncertainty in the two factors is set out below.

**Uncertainty in the levy base**

107. There is uncertainty in both the total number of meter points and the total quantity of gas consumed in future years, which given our assumptions regarding cost pass through, will determine the size of the levy base in Options 1 and 2 respectively. Historical data shows greater volatility in gas consumption than gas meter points given seasonal and annual variations in weather and other factors[30]. However, both future gas consumption and the number of gas meter points will depend on wider decarbonisation policies, which will likely incentivise reduced gas consumption (and as a result fewer meter points). This makes historical data a poor predictor of the future size of the levy base under either charging approach. Our analysis therefore uses gas consumption and meter point projections, accounting for known policies and decarbonisation goals. Given the uncertainty, we have estimated impacts against a range of plausible future reductions in both active gas meter points and quantities of gas shipped. These projections result in a declining levy base (under both Options 1 and 2) in future years. Holding all else constant, a declining levy base reduces the divisor the costs are spread over, increasing the costs of the GSO to the remaining levy base. However, the success of known decarbonisation policies and the implementation of additional policies will determine actual decreases in the levy base. As this becomes increasingly uncertain in later years, so do projections of how the levy base will change over time, meaning we do not estimate the size of the levy base beyond 2037 (the end of our 10-year appraisal period). We have chosen to present average annual impacts across two 5-year periods, due to uncertainty in exact year-on-year variations. By providing average impacts over 5-year periods, we are able to present the estimated scale of impacts to domestic and non-domestic gas users, without presenting figures at a level which would convey spurious accuracy in our analysis.

30 Using annual data from Xoserve from 2017-2023, we calculate that yearly variations in the quantities of gas consumed ranged from -13% to 6%. Yearly variation in the number of active meter points ranged from 0% to 1% over the same period. Older historical data is not available due to system changes.

### Uncertainty in HPBM spend

108. The uncertainty surrounding the HPBM spend is also complex. The GSO cost profile is based on DESNZ's latest view of the costs needed to fund the HPBM. The exact quantum of these costs is uncertain, particularly in the longer term, as they depend on several variables which are increasingly unknown in later years. The key variables are:
    - Exact hydrogen production (and sales) volumes. Hydrogen production projects are subsidised based on the volumes of hydrogen they sell, meaning uncertainty in production (and sales) volumes creates uncertainty in HPBM spend. In the nearer term, production volumes may vary from forecasts due to delays in projects coming online and variations in load factors (for example resulting from either unexpected outages, or conversely planned maintenance not occurring).
    - Achieved sale prices. The variation in sale prices will depend on the type of contracts agreed with offtakers and can be influenced by wholesale gas prices and alternative fuel prices such as diesel. Carbon prices and any green premium may also influence sales prices. We expect the sale price could increase over time, meaning holding all else constant, GSO costs could decline. The extent to which this happens will depend on contracts agreed and changes in gas, alternative fuel, and carbon prices, which all become increasingly uncertain over time.
    - As mentioned above, in this analytical annex, we include projected HPBM spend for HAR1 (electrolytic) projects only, given that these are the only projects that are in the final stages of contract signature. However, the projected HPBM spend, and therefore associated impacts, would change with the funding of further hydrogen projects beyond HAR1, the extent of which will be subject to Government's future decisions on hydrogen production and the funding arrangements for it.

### Contingency

109. Given the uncertainties in the variables discussed in this section, and the fact that collection amounts are proposed to be calculated on the basis of estimated HPBM costs and using some estimated meter readings to determine the levy base, we are proposing that the Administrator may be required to collect contingency to mitigate the risk of under-collection.

110. As set out in the consultation, we propose that the GSO should operate on a monthly payment cycle. This is to minimise forecasting uncertainty (compared to alternatives such as quarterly frequency) therefore reducing the overall levels of contingency needed. Over time, we anticipate that the uncertainty in these factors will decrease as hydrogen production becomes more established, increasing forecasting accuracy and therefore potentially affecting the level of contingency required in proportion to this uncertainty. More details can be found in the consultation document, and we are seeking views through the consultation on the options being considered for contingency and to manage overcollections.

**Uncertainty in electricity price impacts**

111. In our modelling, the Dynamic Dispatch Model (DDM)[31] is used to assess the impact of gas price changes on electricity prices. We carried out this modelling to assess whether changes in gas prices would feed through into electricity prices, given the role gas plays in power generation. This was done for Option 2. For Option 1, the GSO is assumed to place a fixed cost on all gas users regardless of consumption. As this would not impact the variable cost of electricity production from gas-fired power stations, any potential knock-on impact on electricity prices is considered negligible and assumed to be £0.

112. In Option 2 we found the resulting increase in electricity prices to be <0.1%, suggesting that gas prices play very little role in setting electricity prices across our appraisal period. If gas were to play a greater role in electricity generation at the margin in future years than our modelling assumes, then the impact on electricity prices (as a result of change on gas prices) could be greater than we have estimated.

31 DECC (2012) The Dynamic Dispatch Model: a fully integrated power market model

This consultation is available from: www.gov.uk/government/consultations/funding-mechanism-for-the-hydrogen-production-business-model-proposed-design-of-the-gas-shipper-obligation

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