

Impact Assessment

Division:	Energy Systems Management & Security Directorate
Team:	Energy Markets and Security / Gas & Hydrogen Systems Management and Operation
Associated Document:	Proposed Modifications to Cadent's Connection Charging Methodology
Coverage:	Partial coverage which means that the monetary costs and benefits are only one element of the decision.
Type of measure:	
Type of IA:	Final IA – Non-Qualified under Section 5A UA 2000
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Summary: Cadent CCM Change (B) – Financial Security

Cadent Gas Limited proposes changes to its Connection Charging Methodology (CCM) in accordance with Standard Condition 4B of its Gas Transporter Licence¹ and has furnished the Authority with its proposed modifications. The Authority has agreed that it shall consider the impact of two components, the High Cost Cap (HCC) and changes to Financial Security, separately against the Relevant Objectives in the licence. This specific impact assessment is for the Financial Security portion; but should be considered alongside the HCC Impact Assessment.

The Authority shall decide whether the proposals better achieve the Relevant Objectives of the Gas Transporter Licence. If the Authority concludes that the changes do not better

¹ [Gas Transporters Licence: Standard Conditions](#)

facilitate the Relevant Objectives or align with our principal objective and statutory duties, it may reject the proposal and deny the modification of the CCMs.

What is the problem under consideration? Why is Ofgem intervention necessary?

Cadent has proposed a High Cost Cap that reduces the amount biomethane plants connecting to a distribution network must pay for network reinforcement, with costs being socialised across users through a funding mechanism established under RIIIO 3. While this improves affordability and supports increased levels of biomethane and other distributed entry, it also introduces the potential for stranded investments should projects fail, with costs falling on gas consumers or Cadent’s shareholders. To address this, Cadent has proposed financial security requirements to de-risk the process and optimise it in favour of the most viable schemes.

Ofgem is seeking to verify that the proposal to introduce financial security requirements achieves its stated policy aims and therefore better achieve the Relevant Objectives set out in Standard Condition 4B of the licence.

What are the policy objectives and intended effects including the effect on the Relevant Objectives

The key policy objective is the introduction of a proportionate financial security requirement for parties that do not meet a defined credit threshold, ensuring that the financial risks associated with reinforcement are borne in a manner that achieves the Relevant Objectives under the licence, including cost reflectivity and the facilitation of effective competition. The intended effect is to create a more robust and orderly process for managing distributed entry connections, ensuring that projects accessing consumer-funded reinforcements demonstrate sufficient financial and commercial durability.

This supports timely delivery of low-carbon gas connections, improves the targeting of reinforcement works, and better facilitates achievement of the Relevant Objectives by protecting consumers’ interests, supporting decarbonisation at lowest cost, and ensuring the gas network is operated and developed efficiently and sustainably.

What are the policy options that have been considered, including any alternatives to regulation? Please justify the preferred option (further details in Evidence Base)

A range of options were considered² as part of Cadent’s consultation on financial security for entry reinforcement. These included setting no financial security requirement, which would have maintained the status quo but provided no protection for consumers or Cadent where reinforcement funded under the HCC becomes stranded due to project failure. This was not consistent with protecting consumers from undue risk.

Options of varying levels of security were considered – ranging from 25% up to 100%. A higher requirement would have provided stronger protection for consumers but also risk excluding small or emerging developers, potentially limiting competition.

In the preferred option, a credit threshold would be applied meaning security would only be required where a connecting party fails to meet a predetermined rating. This strikes a balance between safeguarding consumers and best enabling creditable projects.

² See, [Entry Gas Connection Charging Consultation, June 2022](#)

Preferred option – Monetised Impacts (£m)

Net Present Social Value (NPSV)³	£523m
Benefit-Cost-Ratio (BCR)⁴	1.62
Value for Money (VfM) Categorisation⁵	Medium
Average annual consumer bill impact	£1.17
Net benefit is present in Net Present Social Value (NPSV) terms relative to the counterfactual. The NPSV has been calculated using 2025 as the base year, over a 20-year appraisal period to account for the typical lifetime of a biomethane plant. Economic costs and benefits are in 2025 prices and cover the period from 2026 – 2045.	

Preferred option - Hard to Monetise Impact

Describe any hard to monetise impacts, including mid-term strategic and long-term sustainability factors following Ofgem IA guidance (maximum 10 lines).

Competition impacts: A key objective of the Financial Security proposal is to derisk eligible projects, ensuring that Cadent are protected financially from project failure, minimising the potential costs to consumers. Allowing only biomethane plants which have sufficient financial and commercial viability eligibility is likely to result in fewer biomethane plants connected to the gas grid. The competition impacts of the Financial Security proposal are expected to be lower when compared to the HCC proposal, however, there is expected to be an overall increase in competition in the biomethane industry and the supply of gas more generally, potentially resulting in lower prices for future consumers. The impact on competition is difficult to monetise and the impact on future prices, even more challenging. We have used the Herfindahl-Hirschman Index (HHI) to identify potential competition

³ As defined in the [Green Book \(2022\)](#), the Net Present Social Value (NPSV), is the sum of the value of all benefits, less all costs, in each year when discounted can be added together because they are in present value (discounted) terms, and then represent net cost benefit (benefits minus costs).

⁴ As defined in the [Green Book \(2022\)](#), the Benefit Cost Ratio (BCR) as a ratio of the present value of benefits to the present value of costs. It provides a measure of the benefits relative to costs.

⁵ [DfT value for money framework](#) – This document assigns a category to the BCR derived impact assessments. They provide a succinct, overarching summary of the outcome of an often complex economic appraisal. A Medium BCR is implied by a BCR greater than or equal to 1.5 and less than 2.0

impacts, however, since consumers are not given a choice in the gas they receive, potential changes in future gas prices have not been quantified or monetised.

Security of supply impacts: Biomethane provides an additional source of energy to meet UK domestic demand. According to Cadent’s submissions as well as industry sources, biomethane presents a credible year-round production vector characterised by stable and consistent outputs, resistant to external economic shocks to gas supply. On this basis, biomethane can act as a steady source of domestic gas supply and can therefore be expected to improve the UK’s security of supply.

If the Financial Securities proposal is agreed, any project failure will result in Cadent recovering the money for reinforcement, mitigating consumer cost, but additional sites may not be connected to mitigate from the loss of biomethane flow, resulting in a loss in gas from a security of supply standpoint

A variety of different sources provides a wide range of expected figures for biomethane output. A report by Regen⁶ suggests 33TWh split between being injected into the grid, power generation, transport and industry. Notably, the Climate Change Committee’s 7th annual Carbon Budget assumes between 30 – 40TWh of biomethane will be present in the UK’s energy portfolio by 2050⁷ whereas the Green Gas Taskforce predict that more than 100TWh could be deployed by the same date.⁸ It has not been possible to quantify or monetise the overall impact of this, though we expect there to be an overall benefit to security of supply.

Key Assumptions/sensitivities/risks

The key assumptions and sensitivities used in our quantitative analysis are detailed in chapter 2. This final IA should also be read in conjunction with the accompanying decision document.

⁶ [Regen \(September 2025\) - Making the most of biomethane - An examination of biomethane's role in the energy transition](#)

⁷ [Future Policy Framework for Biomethane Production \(2024\)](#)

⁸ [Green Gas Taskforce – Unlocking the Future of Biomethane](#)

This analysis is aligned as closely as possible to the BEIS 2021 Green Gas Support Scheme (GGSS) Impact Assessment⁹. The methodology employed for biomethane plant CO₂e emissions follow Green Book¹⁰ guidance and are derived using the data tables in the Green Book Supplementary Guidance¹¹. Net ammonia emissions and fertiliser savings per GWh of biomethane produced are derived using figures from the GGSS IA. One significant divergence from the GGSS methodology has been the inclusion of propanation costs, which has been applied to 10% of biomethane, as per evidence provided by Cadent.

⁹ [Final Stage IA: Green Gas Support Scheme/Green Gas Levy - BEIS - September 2021](#)

¹⁰ [The Green Book and accompanying guidance - GOV.UK](#)

¹¹ [Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal - GOV.UK](#)

1. Introduction

Section summary

This chapter discusses purpose of the Impact Assessment, including detailing the current charging methodology, Cadent's proposed CCM amendment and our objectives for evaluating the costs and benefits of the proposal.

1.1. Cadent Gas Limited proposes changes to its Connection Charging Methodology (CCM) in accordance with Standard Condition 4B of its Gas Transporter License.

1.2. For the purposes of our review, Cadent has divided its proposal into two components:

- Entry Connections: High Cost Cap
- Entry Connections: Financial Securities.

1.3. This specific impact assessment is concerned with the second of the two modification components: Financial Securities for Entry Connections.¹² Cadent has furnished the Authority with a report setting out its proposed modification and how the proposed modification would better achieve the Relevant Objectives of the licence.

Relevant Objectives

1.4. The Relevant Objectives for CCMs are detailed in Condition 4B¹³ as follows:

- a) compliance with the connection charging methodology facilitates the discharge by the licensee of the obligations imposed on it under the Act and by this licence;

¹² A separate impact assessment has been produced for the High Cost Cap (HCC) proposal, and has been published alongside this proposal.

¹³ See, [Gas Transporters Licence: Standard Conditions \(as at 1 Dec 2025\)](#).

- b) compliance with the connection charging methodology facilitates competition in the supply of gas, and does not restrict, distort, or prevent competition in the transportation of gas conveyed through pipes;
- c) compliance with the connection charging methodology results in charges which reflect, as far as is reasonably practicable (taking account of implementation costs), the costs incurred by the licensee in its transportation business and, where the Act enables, to charge a reasonable profit;
- d) so far as is consistent with sub-paragraphs (a), (b) and (c), the connection charging methodology, as far as is reasonably practicable, properly takes account of developments in the licensee's transportation business;
- e) compliance with the connection charging methodology ensures that the licensee shall not show any undue preference towards, or undue discrimination against, any person who operates, or proposes to operate, a pipe-line system in relation to the connection of that system to the pipe-line system to which this licence relates; and
- f) the connection charging methodology is compliant with the Regulation and any relevant legally binding decisions of the European Commission and/or the Agency for the Co-operation of Energy Regulators.

1.5. On the basis of the two impact assessments, the Authority shall decide whether the proposals better achieve the Relevant Objectives of the Gas Transporter Licence and whether modifications align with Ofgem's principal objective and statutory duties. If the Authority concludes that the changes do not better facilitate the Relevant Objectives, or do not align with Ofgem's principal objective and statutory duties, it may reject the proposal and deny the implementation of the new CCMs.

Problem under consideration

1.6. Under the current charging arrangements, the reinforcement required to facilitate distributed gas entry is recovered on a deep connection basis, with the full cost falling on the connecting party. Cadent's associated High-Cost Cap (HCC) proposal would address this by socialising reinforcement costs up to an agreed cap. While this improves affordability and supports increased levels of biomethane and other distributed entry, it also introduces

the potential for stranded investments should projects fail to commission or operate at the contracted capacity.

1.7. Without an accompanying requirement for proportionate financial security, any unrecoverable stranding costs could ultimately fall on other gas consumers or Cadent's shareholders. This would not be cost-reflective and could result in reinforcement being progressed for projects that are not sufficiently robust, undermining the efficiency of the process and potentially delaying more viable schemes.

1.8. Standard Condition 4B places a duty on the Gas Transporter to keep its Connection Charging Methodology under review and to bring forward modifications where these better meet the Relevant Objectives, including reflecting changes in the transportation business and facilitating competition. Ofgem's intervention is therefore necessary to consider whether the combined package of the HCC proposals and the introduction of financial security requirements better achieves these objectives and provides appropriate protection for gas consumers.

Policy objective

1.9. In reviewing these proposals we consider the extent to which proposed changes better achieve the Relevant Objectives of the licence. The Relevant Objectives are set out above in par. 1.4 and considered in line with Ofgem's principal objective, to protect the interest of existing and future consumers in relation to gas conveyed through pipes, as well as our statutory duties to promote economic growth and to support the UK Government's Net Zero target.

1.10. According to Cadent the Financial Security requirement should ensure that, where reinforcement is required to facilitate system entry under the High-Cost Cap (HCC) proposals, appropriate arrangements are in place to protect gas consumers from the risk of stranded investment. Introducing a proportionate financial security requirement for parties that do not meet the defined credit threshold ensures that the costs and risks associated with reinforcement are borne in a manner that is more closely aligned with the Relevant Licence Objectives, including cost reflectivity and the facilitation of effective competition.

1.11. The intended effect is to create a more robust and orderly process for managing distributed entry connections, ensuring that projects accessing consumer-funded reinforcements demonstrate sufficient financial and commercial durability. This supports timely delivery of low-carbon gas connections, reduces the likelihood of reinforcement

being committed for projects unable to reach commissioning, and better facilitates the Relevant Objectives by protecting consumers' interests, supporting decarbonisation at lowest cost, and ensuring the gas network is operated and developed efficiently and sustainably.

Description of alternative options considered

1.12. Alternative options were considered as part of Cadent's consultation on financial security for entry reinforcement¹⁴. These included:

- i. **No financial security requirement** Maintains the current arrangements but provides no protection for gas consumers where reinforcement funded under the HCC is subsequently stranded. This option is not consistent with cost-reflectivity or with protecting consumers from undue risk.
- ii. **Low or high levels of financial security:** Options ranged from low levels (25%–50%) to full protection (100%). While a higher requirement provides stronger protection, it risks creating a barrier to entry (in direct opposition to the HCC's key objective of reducing barriers to entry), by imposing high upfront costs, thus excluding smaller or emerging developers which could restrict competition. Conversely, lower levels reduce the protection available to consumers.
- iii. **Targeted financial security:** Applied only where the connected party does not meet the required credit threshold (preferred option)

1.13. Under the preferred approach, security is set at 50% of the lower of:

- the High Cost Cap amount applicable to the requested capacity; or
- the allocated reinforcement cost.

1.14. Security must be provided on acceptance of the Connection and Reinforcement Offer and is released once the connecting party has demonstrated full and sustained output at

¹⁴ Ofgem is legally obligated to assess only the proposal brought forward, therefore these options considered by Cadent are out of scope of this Impact Assessment.

the contracted capacity. This approach provides proportionate protection while supporting competitive neutrality and ensuring that projects participating in consumer-funded reinforcements have demonstrated an appropriate degree of financial robustness.

1.15. Cadent's preferred option claims to strike the best balance between safeguarding consumers, maintaining support for credible projects, and ensuring the proposals better meet the Relevant Objectives.

2. Approach to the Impact Assessment

Section summary

This chapter provides a summary of the chosen option and the counterfactual that we have assessed them against. We also describe our approach to assessing the impact of the option on industry and consumers.

Scope of impact Assessment

2.1. The scope of this impact assessment (IA) is to consider the costs and benefits of the Financial Securities proposal, and to assess whether the proposal is aligned with the Ofgem Strategic Objectives.

2.2. We have sought to undertake quantitative analysis wherever possible to inform this IA. However, data availability, time constraints and the need for proportionate analysis, security of supply impacts have been discussed qualitatively rather than quantitatively. We have also aligned as closely as possible with the methodology employed within this IA with the GGSS approved methodology.

Methodology

2.3. This impact assessment follows the same methodology as the High Cost Cap (HCC) IA, published at the same time as this IA, however in this IA, scenarios have been developed based on an assumed number of biomethane plants failing to complete, therefore a proportion of reinforcement costs are not socialised and benefits not realised.

2.4. As with the HCC IA, this IA includes the following quantified and monetised impacts:

2.4.1. Carbon emissions reductions from biomethane replacing demand for natural gas¹⁵. These emissions have been monetised using Green Book guidance and

¹⁵ The [Regen \(September 2025\) - Making the most of biomethane - An examination of biomethane's](#)

applying appropriate carbon prices in the Supplementary Guidance and Data Tables.

2.4.2. An increase in carbon emissions due to the need for roughly 10% of biomethane requiring propanation¹⁶ to be injected into the gas grid.

2.4.3. Air quality impacts/damage costs¹⁷ due to increased ammonia emissions, released as a by-product of biomethane production.

2.4.4. Reduced air quality impacts and damage costs due to the counterfactual use of feedstock used for biomethane production.

2.4.5. Fertiliser cost savings: Decreased synthetic fertiliser usage due to increased digestate production.

Baseline

2.5. The baseline for costs, carbon emissions and air quality/damage costs used is based on the annual gas consumption for 2024. Cadent have provided data for 30 biomethane plants which are currently unable to enter the market due to high reinforcement costs.

Counterfactual

2.6. The counterfactual use of feedstock is assumed to be the same as those used in the GGSS IA, for example where some of the feedstock is assumed to go to landfill, releasing high concentrations of ammonia as a result. These ammonia emissions are included in the net ammonia emissions figures, which have been calculated overall as 0.62 tonnes of ammonia per GWh of biomethane produced.

Scenarios

[role in the energy transition](#) and GGSS IA have been used to identify emissions reductions.

¹⁶ Propanation refers to the enrichment of biomethane with propane, to increase the calorific value of biomethane.

¹⁷ Damage costs refer to the impacts on human health caused by high concentrations of ammonia.

2.7. Financial Security provision is based upon the sites failing to produce biomethane post Final Investment Decision (FID) as part of the RIIO-3 mechanism.

2.8. Based on the Central Scenario in the High Cost Cap (HCC) Charging IA methodology, where 30 biomethane plants are to be built¹⁸, three further scenarios have been modelled. These are a low scenario of 10% failure (or 3 plants reaching FID and not producing biomethane), a central scenario of 20% failure (or 6 plants reaching FID and not producing biomethane) and a high scenario 30% failure (9 plants reaching FID and not producing biomethane.)

2.9. As per the HCC charging methodology IA, the RIIO-3 Final Determinations, published¹⁹ on 4 December 2025 allows for a maximum of £20m reinforcement costs per network being socialised. In the case of Cadent, this means they will be allowed a total of £60m to be socialised across the RIIO-3 period (London has been excluded due to the fact that no biomethane plants are planned to be built in London).

Consumer Bill Impact

2.10. The consumer bill impact in the low scenario, where 3 plants fail to be complete, £6m of reinforcement costs will not be socialised. In the central scenario, the full £20m allowed UIIOLI costs will be socialised. This is because there are 30 plants that could potentially be built, so if 6 plants fail, there are still 24 plants remaining which could be built. In the high scenario where 9 plants fail to complete, £18m of reinforcement costs will not be socialised. In both the high and low scenarios, the consumer bill impact will therefore be lower than in the HCC Cadent Charging Methodology IA.

2.11. To calculate the consumer bill impact, the socialised reinforcement costs have been divided by the total number of consumers on each of Cadent's networks. The NESO Future Energy Scenarios (FES) 2025: Pathways to Net Zero²⁰ have been used to determine the number of consumers remaining on the gas networks each year. The 'Falling Behind'

¹⁸ Since this IA is only concerned with stranded investments, existing operational biomethane plants fall out of the scope of this IA.

¹⁹ [RIIO-3 Final Determinations – Gas Distribution](#)

²⁰ [Future Energy Scenarios: NESO Pathways to Net Zero 2025 Data Workbook](#) – The Heat pump stock graph on tab F.44 has been used as the best analogy for the remaining customers on the gas network until 2050. All 4 pathways are included in the graph.

pathway is expected to be the most likely and therefore our central scenario mirrors this trend in the decline of consumers. London does not have any existing or proposed biomethane plants and therefore has been excluded from the analysis. Since the cost per consumer does not exceed £10 per year, it has not been possible to measure downstream fuel poverty impacts using DESNZ's Low Income and Low Energy Efficiency model.

Emissions impact

2.12. The output of each biomethane plant has been modelled based on the flow rate and expected hours of operation (provided by Cadent). This output will replace existing gas demand and therefore, the reduction in carbon emissions, increase in ammonia emissions and change in air quality/damage costs have been quantified and monetised using Green Book methodology, Defra's Air Quality/Damage Costs toolkit²¹ and evidence from DESNZ's Green Gas Support Scheme Impact Assessment.

Calorific Value and Propanation

2.13. The average calorific value ("CV") for biomethane is 36MJ/m³²², compared to the average calorific value of natural gas at 39.4MJ/m³²³, with an allowable range of 36.9MJ/m³ and 42.3MJ/m³.²⁴ Under the Gas (Calculation of Thermal Energy) Regulations 1996²⁵, as amended ("the Regulations"), Ofgem is responsible for ensuring that customers are protected from the financial impact of receiving gas that is of a significantly lower calorific value ("CV") than they are charged for. This means that biomethane may need to be propanated to bring the calorific value up to 39.4MJ/m³(though this is dependent on the calorific value of the gas at the time). Evidence provided by Cadent suggests 10% of all biomethane requires propanation, yielding additional carbon and ammonia emissions. This

²¹ [Air quality appraisal: damage cost guidance](#) – This guidance details the process for assessing the air quality impact of a policy or project and was used for the ammonia values within this Impact Assessment.

²² [IEA – An Introduction to Biogas and Biomethane](#) –Section - What are biogas and biomethane?

²³ [Digest of UK Energy Statistics \(DUKES\): calorific values and density of fuels](#) – 2025 value for Natural Gas consumed. This is the weighted average of calorific values will approximate the average for the year of entering the National Transmission System and what readers will see quoted on their gas bills.

²⁴ [Network Entry Gas Quality Specification](#) - The Gross Calorific Value (real gross dry) shall be in the range 36.9 to 42.3MJ/m³, in compliance with the Wobbe Number, ICF and SI limits

²⁵ Regulations 6 & 9, Gas (Calculation of Thermal Energy) Regulations 1996

has been accounted for in the calculation of carbon emissions and damage costs/air quality impacts. Since propanation will occur before being injected into the gas grid, the financial costs borne by the biomethane plants falls outside of the scope of this impact assessment.

Fertiliser Saving

2.14. Digestate is a by-product of anaerobic digestion. If the source mix has higher nitrogen content, a higher quality digestate is created, displaying larger quantities of synthetic fertiliser for use in the agricultural sector. This is a presumed saving from the greater volume of biomethane being produced. The value of avoided synthetic fertiliser costs is the average of monthly spot prices from 2017-2020 published by Agriculture and Horticulture Development Board.²⁶

Competition Impacts

2.15. These have been assessed using the Herfindahl–Hirschman Index (HHI) which measures the concentration of a market. Results between 0 and 1,000 indicate that markets are highly competitive (where 0 is perfectly competitive), between 1,000 and 1,800 indicating markets are moderately competitive and results above 1,800 indicating higher, though acceptable levels of market concentration (the higher the figure, the closer to natural monopoly a market is).

Security of Supply

2.16. These impacts have been considered qualitatively. Increasing biomethane output to be used as a source of energy means GB has additional sources of flexible gas, resulting in a greater ability to meet potential peak demand scenarios such as '1 in 20' (the level of daily demand which would only be exceeded once in every twenty winters – a capacity obligation Gas Distribution Networks must ensure is met).

2.17. The Climate Change Committee's 7th annual Carbon Budget assumes at least 20TWh of biomethane will be present in the UK's energy portfolio by 2050, with Industry

²⁶ [Agriculture and Horticulture Development Board](#) (AHDB) - [Great Britain fertiliser prices](#). Information used within BEIS 2021 GGSS Impact Assessment

suggesting that biomethane could rise as high as X TWh. The increase in biomethane will reduce reliance on third-party nations for gas supply, with less exposure to geopolitical events.

2.18. Unlike other major sources of gas, biomethane is largely insulated from external economic shocks due to its production method. Biomethane produces on a constant basis year round, thereby reducing volatility and contributing to stable domestic supplies.

2.19. No decision has been made as yet on Hydrogen Blending at distribution level, however, it is worth noting that should government move to enable hydrogen blending at distribution level, the presence of biomethane plants on distribution networks would assist networks to balancing calorific value levels caused by entry of hydrogen²⁷ onto networks, thereby increasing security of supply.

Key Assumptions

2.20. Without the socialisation of reinforcement costs, it is assumed these biomethane plants will not be built, as detailed in Cadent's original proposal. Whilst the GGSS provides subsidies to build biomethane plants, this funding does not cover reinforcement costs, which according to Cadent, is a big enough barrier to entry that the plant is not built. The reinforcement cost is a transfer of costs²⁸ and therefore, is not included in the Net Present Social Value (NPSV) calculation

2.21. Biomethane plants have an average lifetime of 20 years, therefore, it is assumed benefits will be achieved over a 20-year appraisal period. No assumption has been made of a biomethane plant shutting down before the natural end of its lifetime.

2.22. All biomethane plants considered in this IA are expected to have connections reinforced during the RIIO-3 period (2026 – 2031) and costs will be socialised in the year they incur. For the purpose of this analysis, it is assumed reinforcement and socialisation of costs occur evenly over the last four years of the RIIO-3 period (allowing for applications to

²⁷ Pure Hydrogen has a calorific value of 12.1MJ/m³ ([Energy Network Association](#)) – Legislative framework for hydrogen blending)

²⁸ Economic transfers are detailed in Section 6.3 of the Green Book and state that transfers benefit the recipient and are a cost to the donor and therefore do not make society as a whole better off.

be approved and feasibility studies to occur in the first year, meaning plants will be built and pipes reinforced from 2027 onwards).

2.23. A biomethane plant is assumed to be producing output 7,884 hours annually (90% usage), in line with evidence provided by Cadent.

2.24. All biomethane plants will be funded by the GGSS, meaning they are legally required to adhere to and report on their use of best practises (such as digestate spreading, which lowers the concentration of ammonia in any single area) to reduce the air quality/damage costs. Therefore, the damage costs calculated in this IA could in reality be lower.

2.25. The NESO Future Energy Scenarios (FES) 2025: Pathways to Net Zero - 'Falling Behind' Pathway²⁹ has been used to estimate the remaining number of consumers left on the network.

2.26. A social discount rate of 3.5% for non-health impacts and 1.5% for specific health related impacts, as set out in Defra's Air Quality and Damage Costs toolkit.

2.27. 10% of all biomethane will require propanation to increase its calorific value so that it can be injected into the gas grid. This is explained in more detail in the methodology section.

2.28. Additionally, it is presumed that project failure will happen evenly over the RIIO-3 period.

Results

2.29. The results from the analysis are detailed below. Other than table 1, which is determined over the RIIO-3 time period, the costs and benefits for the options are assessed over the policy appraisal time period (20 years), as detailed in section 2.21

²⁹ [Future Energy Scenarios: NESO Pathways to Net Zero 2025 Data Workbook](#) – The Heat pump stock graph on tab F.44 has been used as the best analogy for the remaining customers on the gas network until 2050. All 4 pathways are included in the graph.

2.30. Throughout the results documented in Tables 1 to 5, the central price of carbon has been used. Table 6 and Table 7 give the difference between the Green Book’s predicted low and high carbon prices for each of the three scenarios.

2.31. Table 1 demonstrates the quantified emissions benefits for each of the scenarios. The total CO₂e benefit accounts for the CO₂e cost of producing biomethane, the CO₂e cost for using propane to propanate and the CO₂e benefit from abating natural gas. This benefit ranges from 1.94MtCO₂e to 2.53MtCO₂e. The total ammonia cost is due to the increased biomethane production as detailed in section 2.6 The cost ranges from -15.79kt to -20.51kt. Total gas abated in TWh is the gas replaced by biomethane, accounting for the differences in calorific value. This ranges from 25.46TWh to 33.08TWh.

Table 1: Quantified emissions benefits for each scenario

Scenarios	Low Scenario	Central Scenario	High Scenario
Natural Gas CO ₂ abatement benefit (MTCO ₂ e)	5.53	4.95	4.26
Biomethane CO ₂ emissions cost (MTCO ₂ e)	-2.28	-2.04	-1.76
Propane CO ₂ emissions cost (MTCO ₂ e)	-0.72	-0.65	-0.56
Overall CO₂ Benefit (MTCO₂e)	2.53	2.26	1.94
Ammonia emissions cost (kt)	20.51	18.35	15.79
Total Gas Air Quality/ Damage Cost Benefits (TWh)	33.08	29.60	25.46

2.32. Table 2 demonstrates the equivalent monetised impact for the quantified emissions benefits in Table 1. The total carbon reduction benefit ranges from £678m to £882m reducing contributions to climate change as a result. This is a societal benefit, rather than an individual consumer benefit. The total ammonia cost ranges from £-146m to -£191m.

There is a gas health benefit that is associated with displacing natural gas with other sources of gas and is detailed in section 2.5. This benefit ranges from £38m to £49m. Increased biomethane usage causes decreased synthetic fertiliser usage and therefore a saving, as detailed in section 2.14 This ranges from £74m to £97m.

Table 2: Monetised impacts

Scenarios	Low Scenario	Central Scenario	High Scenario
Natural Gas CO2 abatement benefit	£1382m	£1238m	£1062m
Biomethane usage CO2 cost	-£570m	-£510m	-£438m
Total Propane CO2 cost	-£180m	-£161m	-£138m
Total CO2 benefit	£631m	£726m	£624m
Total Fertiliser benefit	£97m	£87m	£74m
Total Gas Air Quality/Damage Cost benefit	£46m	£41m	£36m
Total Ammonia Air Quality/Damage Cost	-£191m	-£171m	-£146m

2.33. Table 3 details the overall benefits/costs to the end consumer, accounting for the previously discussed impacts. The methodology for monetising these impacts is stated in **Error! Reference source not found.** These are then aggregated to calculate the final Net Present Social Value (NPSV).

2.33.1. The Net Present Social Value (NPSV) ranges from £448m to £583m, with a central estimate of £523m. This means the overall benefits exceed the costs by £523m over the 20-year period, in the central scenario.

2.33.2. The Benefit Cost Ratio (BCR) in the central scenario is 1.62, meaning for every £1 spent, £1.62 is received in benefits.

Table 3: Overall Net Present Value, BCR and yearly consumer saving

Scenarios	Low Scenario	Central Scenario	High Scenario
Total Benefits	£1525m	£1366m	£1172m
Total Costs	£941m	£843m	£724m
Net Present Social Value (NPSV)	£583m	£523m	£448m
BCR	1.62	1.62	1.62

2.34. Table 4 below details the annual direct impact to the consumer bill across the three different scenarios throughout the RIIO-3 period (the period which costs can be socialised) This is despite the cost being a transfer of costs, as defined in section 2.20. The total consumer bill impact ranges between £5.61 to £6.31 for the time period.

Table 4: Yearly bill impact for the consumer across the RIIO-3 period

Scenarios	Low Scenario	Central Scenario	High Scenario
2026	£1.38	£1.38	£1.38
2027	£0.69	£0.69	£0
2028	£1.40	£1.40	£0.70
2029	£1.41	£1.41	£1.41
2030	£1.43	£1.43	£1.43
2031	£0.00	£0.00	£0.00

2.35. Table 5 details the HHI change, as described in section 2.15 If the policy was not to be implemented the HHI remains at 294.4, whereas, if the policy was implemented, the HHI would range from 168.6 for the low scenario to 186.9 for the high scenario. This suggests that post the application of the Financial Security policy, increased biomethane output from new and existing sites in all scenarios creates a market that will be less concentrated and highly competitive compared to the 2025 baseline.

Table 5: Herfindahl-Hirschman Index (HHI)

Monetised Impacts	Baseline	Low Scenario	Central Scenario	High Scenario
HHI	294.4	168.6	177.3	186.9

Sensitivity Analysis

2.36. We have undertaken some sensitivity analysis using lower and higher carbon prices, according to the Green Book Methodology, to understand impacts if carbon prices were to fluctuate. These are documented in Table 6 & Table 7.

2.37. Table 6 details the overall benefits/costs using the 'low' carbon price, as set out in the Green Book supplementary guidance Data Table.

2.37.1. The Net Present Social Value (NPSV) ranges from £231m to £300m, with a central estimate of £269m. This means the overall benefits exceed the costs by £269m over the 20-year period, in the central scenario.

2.37.2. The Benefit Cost Ratio (BCR) in the central scenario is 1.53, meaning for every £1 spent, £1.53 is received in benefits.

Table 6: Overall Net Present Value and BCR using sensitivity analysis for low carbon price scenario

Scenarios	Low Scenario	Central Scenario	High Scenario
Total Benefits	£871m	£780m	£670m
Total Costs	£571m	£511m	£439m
Net Present Social Value (NPSV)	£300m	£269m	£231m
BCR	1.53	1.53	1.53

2.38. Table 7 details the overall benefits/costs using the 'high' carbon price, as set out in the Green Book supplementary guidance Data Table.

2.38.1. The Net Present Social Value (NPSV) ranges from £762m to £992m, with a central estimate of £889m. This means the overall benefits exceed the costs by £889m over the 20-year period, in the central scenario.

2.38.2. The Benefit Cost Ratio (BCR) in the central scenario is 1.75, meaning for every £1 spent, £1.75 is received in benefits.

Table 7: Overall Net Present Value and BCR using sensitivity analysis for low high carbon price scenario

Scenarios	Low Scenario	Central Scenario	High Scenario
Total Benefit	£2323m	£2081m	£1785m
Total Cost	£1331m	£1192m	£1023m
Net Present Social Value	£992m	£889m	£762m
BCR	1.75	1.75	1.75

2.39. As stated in section 2.13, the CV for natural gas is variable and we have undertaken some sensitivity analysis using CV of the low range and high ranges of allowable values in the Gas Distribution Network

2.40. Table 8 details the overall benefits/costs using the following natural gas CVs, 36.9MJ/m³, 39.4MJ/m³ and 42.3MJ/m³ for the central scenario.

2.40.1. The Net Present Social Value (NPSV) ranges from £446m to £599m, with a central estimate of £523m. This means the overall benefits exceed the costs by £523m over the 20-year period, in the central scenario.

2.40.2. The Benefit Cost Ratio (BCR) in the central scenario is 1.62, meaning for every £1 spent, £1.62 is received in benefits.

Table 8: Overall Net Present Value and BCR using sensitivity analysis for high carbon price scenario

Scenarios	Scenario 1	Scenario 2	Scenario 3
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Calorific Value (MJ/m ³)	36.9	39.4	42.3
Total Benefit	£1453m	£1366m	£1279m
Total Cost	£854m	£843m	£832m
Net Present Social Value	£599m	£523m	£446m
BCR	1.70	1.62	1.54

3. Conclusions

Section summary

This chapter brings together the findings of our quantitative and qualitative analysis to determine whether the Financial Security proposal delivers a satisfactory outcome for customers.

- 3.1 We have considered both the monetised and non-monetised benefits of the Financial Security proposal, and considered how closely the proposal aligns with the policy objectives and Relevant Objectives of the licence.
- 3.2 We acknowledge the uncertainty regarding a number of the assumptions that have informed this analysis, particularly the quantitative analysis. However, we are confident that, even with our least optimistic assumptions, the Financial Security proposal will yield overall benefits compared to costs, and therefore accept Cadent's proposal and approve the Financial Security proposal.
- 3.3 We estimate that the chosen option would generate a Net Social Present Value of £523m, with a corresponding BCR of 1.62.
- 3.4 Based on the analysis set out in this impact assessment (IA), as well as that of the related impact assessment on the High Cost Cap, we have concluded that the updated CCMs better achieve the Relevant Objectives of the license and, therefore, should not be vetoed. This is set out in our decision letter.

Appendix A

Section summary

This appendix summarises the figures within the High Cost Cap (HCC) Impact Assessment for completeness.

1.1. The following tables are from the High Cost Cap (HCC) proposal that has been published alongside this proposal. For the full impact assessment, please refer to that document.

Results for the High Cost Cap

1.2. The results from the analysis are detailed below. Other than table 1, which is determined over the RIIO-3 time period, the costs and benefits for the options are assessed over the policy appraisal time period (20 years), as detailed in section 2.21

1.3. Table 1 demonstrates the quantified emissions benefits for each of the scenarios. The total CO₂e benefit accounts for the CO₂e cost of producing biomethane, the CO₂e cost for using propane to propanate and the CO₂e benefit from abating natural gas. This benefit ranges from 2.00MtCO₂e to 4.35MtCO₂e. The total ammonia cost is due to the increased biomethane production as detailed in section 2.6. The cost ranges from -16.73kt to -36.30kt. Total gas abated in TWh is the gas replaced by biomethane, accounting for the differences in calorific value. This ranges from 25.91TWh to 56.20TWh.

Table 9: Quantified emissions benefits for each scenario

Scenarios	Low Scenario	Central Scenario	High Scenario
Natural Gas CO ₂ abatement benefit (MTCO ₂ e)	4.51	6.18	9.78
Biomethane CO ₂ emissions cost (MTCO ₂ e)	-1.86	-2.56	-4.04

Propane CO2 emissions cost (MTCO2e)	-0.65	-0.88	-1.40
Overall CO2 Benefit (MTCO2e)	2.00	2.75	4.35
Ammonia emissions cost (kt)	-16.73	-22.94	-36.30
Total Gas Air Quality/ Damage Cost Benefits (TWh)	25.91	35.52	56.20

1.4. Table 7 demonstrates the equivalent monetised impact for the quantified emissions benefits in Table 1. The total carbon reduction benefit ranges from £505m to £1086m, reducing contributions to climate change as a result. This is a societal benefit, rather than an individual consumer benefit. The total ammonia cost ranges from £-156m to -£337m. There is a gas health benefit that is associated with displacing natural gas with other sources of gas, as detailed in section 2.4. This benefit ranges from £38m to £82m. Increased biomethane usage causes decreased synthetic fertiliser usage and therefore results in a cost saving, as detailed in section 2.11. This ranges from £80m to £171m.

Table 10: Monetary impacts for the different model inputs

Scenarios	Low Scenario	Central Scenario	High Scenario
Natural Gas CO2 abatement benefit	£1136m	£1547m	£2444m
Biomethane usage CO2 cost	-£469m	-£638m	-£1008m
Total Propane CO2 cost	-£162m	-£221m	-£349m
Total CO2 benefit	£505m	£687m	£1086m
Total Fertiliser benefit	£80m	£108m	£171m
Total Gas Air Quality/Damage Cost benefit	£38m	£52m	£82m

Total Ammonia Air Quality/Damage Cost	-£156m	-£214m	-£337m
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1.5. Table 11 details the overall benefits/costs to the end consumer, accounting for the previously discussed impacts. The methodology for monetising these impacts is stated in **Error! Reference source not found.** These are then aggregated to calculate the final Net Present Social Value (NPSV).

1.5.1. . The Net Present Social Value (NPSV) ranges from £459m to £1090m, with a central estimate of £676m. This means the overall benefits exceed the costs by £676m over the 20-year period, in the central scenario.

1.5.2. The Benefit Cost Ratio (BCR) in the central scenario is 1.66, meaning for every £1 spent, £1.66 is received in benefits.

Table 11: Overall Net Present Value and BCR

Scenarios	Low Scenario	Central Scenario	High Scenario
Total Benefits	£1254m	£1707m	£2697m
Total Costs	£795m	£1031m	£1607m
Net Present Social Value (NPSV)	£459m	£676m	£1090m
BCR	1.58	1.66	1.68

1.6. Table 12 below details the annual direct impact to consumer bills across the three different scenarios throughout the RIIO-3 period (the period which costs can be socialised). This is despite the cost being a transfer of costs, as defined previously. The total consumer bill impact ranges between £4.87 to £11.23 for the 5-year period.

Table 12: Yearly bill impact for the consumer across the RIIO-3 period

Scenarios	Low Scenario	Central Scenario	High Scenario
2026	£1.38	£1.38	£2.07
2027	£1.39	£1.39	£2.08
2028	£1.40	£1.40	£2.10
2029	£0.71	£1.41	£2.12
2030	£0.00	£1.43	£2.14
2031	£0.00	£0.00	£0.72

1.7. Table 13 details the HHI change, as described in section 2.15. If the policy was not to be implemented the HHI remains at 294.4, whereas, if the policy was implemented, the HHI would range from 186.9 for the low scenario to 125 for the high scenario. This suggests that post the application of the HCC, increased biomethane output from new and existing sites in all scenarios creates a market that will be less concentrated and more competitive compared to the 2025 baseline.

Table 13: Herfindahl-Hirschman Index (HHI)

Monetised Impacts	Baseline	Low Scenario	Central Scenario	High Scenario
HHI	294.4	186.9	160.6	125