Cadent
Your Gas Network

Appendix 10.09

Uncertainty Mechanism Case

Entry charging and access review

Cadent
Your Gas Network

Cadent's systematic approach to developing uncertainty mechanisms to manage forecast uncertainty

1. Defining our customers' needs

- What is the area?
- Why is it important to customers and stakeholders?
- What insights are shaping our thinking?
  - Customer insights
  - Stakeholder insights
  - Legislative insights
  - BAU operational information
  - Historic insights
  - Wider research

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- What do we know about future workload & costs in this area?
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  - For example using historical / independent benchmarks
- Why are levels of expenditure outside of network control?
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- What network behaviours could arise from inclusion within the base plan?
  - What would the customer impact be?

3. Qualitative assessment of the options

- What options other than inclusion in the base plan are available?
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- How would the mechanism(s) work? (Implementation, triggers, materiality thresholds etc.)
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- Why do the customer benefits outweigh the drawbacks?
- What network behaviours could the mechanism drive?
  - What would the customer impact be?

4. Quantitative assessment of the proposed options

- How do we know our 'input variables' are the best available? (i.e. ranges of workload, costs, trigger points, frequency, probability)
- How are we assuring our modelling results?
- What is the best view of materiality for the area?
- What is the modelled cost volatility for the area?
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5. Quantifying the overall customer impact

- What is the overall customer impact of all areas of forecast uncertainty – with and without mechanisms?
- What does this mean for the balance of forecast risk between customers and networks?
- What does this mean for customer bills?

6. Setting standards that customers love

- Are our proposals, and the associated impacts, easy to understand?
- Can it be demonstrated that they protect customers and investors?
- Is our suite of proposed mechanisms acceptable to customers and stakeholders?

Uncertainty area			
Demand uncertainty	Legislative uncertainty	Cost confidence	**Heat Policy**

Entry charging and access review

Cadent proposal

Initially a re-opener uncertainty mechanism triggered by a change to the charging and access arrangements, with proposals for an associated volume driver

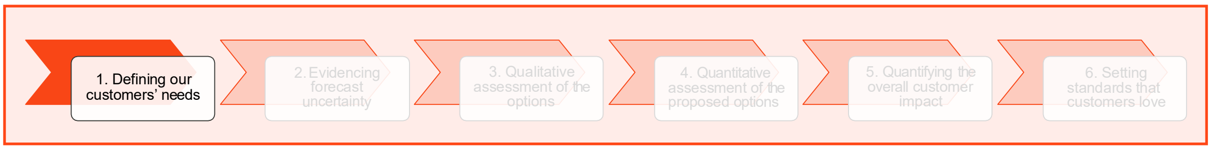
To be read in conjunction with Appendix 07.04.08 Entry Capacity enablement

The current charging arrangements for connecting new entry gas currently mean that connections are usually realistically pursued where there is existing capacity. Otherwise, the full cost of the network investment required to provide network capacity is currently recovered from a single ‘triggering party’.

We are initiating a review of existing charging and access arrangements, with a view to developing a commercial regime that encourages new distributed-gas connections. If this is established, with a mechanism to socialise investment costs, a volume of reinforcement work is likely to be required. These costs will need to be recovered from a wider base than the triggering party. There is uncertainty over the level of entry gas that may need to be connected in RIIO-2, and hence the level of reinforcement required. This will be driven by Government policy on the Renewable Heat Incentive and decarbonisation policy.

We are therefore proposing an initial re-opener to allow an adjustment to our price control following a review of and approval of revised charging arrangements. We have developed proposals for an associated volume driver for reinforcements that could be implemented upon the change in charging arrangements and once reinforcement volumes have been triggered.

1. Defining the need



1.1. What is the area?

Heat accounts for over a third of the UK’s greenhouse gas emissions[1]. Meeting the UK’s climate obligations, not least the legal commitment to bring all greenhouse gas emissions to net-zero by 2050, will require the decarbonisation of heat. One potential route to decarbonising heat is the greater use of low-and-zero-carbon alternatives to fossil natural gas to heat homes and businesses.

Sources of gas are becoming more decentralised, with increasing levels of gas injections directly into the distribution networks. Biomethane production in the UK is well established,

[1] BEIS – Clean Growth – Transforming Heating overview of current evidence, December 2018

with over 30 production facilities connected to our networks. There is potential for this to increase further given supporting Government policy, such as the Renewable Heat Incentive. There is also the potential for significant levels of shale gas, as well as other low carbon gases such as BioSNG and hydrogen.

However, the current framework of charging all incremental costs to the next connection does not facilitate reinforcements to provide entry capacity, which can create barriers for green gas producers. As costs are currently recovered from a single ‘triggering party’, projects are unlikely to be economically viable and will not proceed.

1.2. Why is it important?

The current arrangements mean that customers are only realistically able to pursue connections where there is existing capacity in the gas network to transport additional gas volumes. Otherwise, the cost of network investment to provide entry capacity is currently recovered from a single ‘triggering party’.

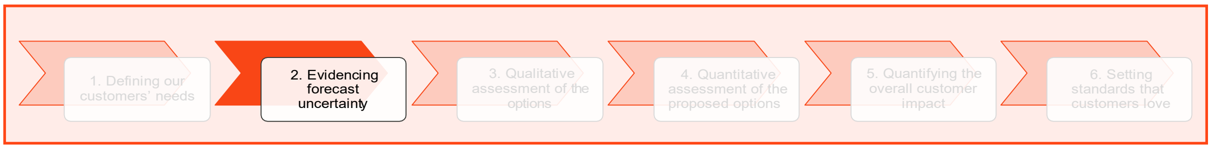
Investment cases for biomethane production can be undermined further because in some parts of the network there is very low consumer demand during the summer. This means that there is insufficient available year-round capacity to accept the flow rates that would be required to sustain the investment. This has led to some projects accepting seasonal variable capacity connections, which at times are well below their full commercial capability.

If changes to the commercial regime are made, including the development of a network pricing approach to partially socialise these costs, and to support entry gas, the need for entry-network reinforcements would be triggered. This investment currently does not take place, due primarily to the incentives and cost allocation under the existing pricing arrangements.

1.3. What insights are shaping our thinking?

The requirement to invest in entry capacity has been a strong theme voiced by entry gas and wider stakeholders at the Ofgem RIIO-2 Decarbonisation working group, Sustainability First, and from attendees at the RIIO-2 Joint Gas Network Future of Gas Stakeholder event. It has also been referenced in stakeholder’s responses to the RIIO-2 framework consultation. Full details on our insight and engagement in this area is provided in Section 1.3 of Appendix 07.04.08 Entry Capacity Enablement. In August, we launched our review of the commercial arrangements for entry gas with a range of key stakeholders. We will continue to engage with them throughout the process.

2. Evidencing the uncertainty



2.1. What we know about the future

We know from our engagement with stakeholders that if changes to the commercial regime are made to support entry gas, there could be significant increases in the demand for entry capacity. Under the Energy Network Association (ENA) common scenario, agreed by the energy networks, the following volume ranges are indicated for Cadent by 2030:

- Shale gas – 2 to 6bcm

- Biomethane/BioSNG – 0.39 to 0.89 bcm

Launching the review of the commercial regime, we held an industry workshop in August 2019 to test the preliminary conclusions we had reached and to gauge the support for different options. The feedback at this event demonstrated support for the review, with 100% supporting either a single- or multi-phase approach. Over 90% agreed that the current methodologies represented a barrier and that the methodology was designed to accommodate large-scale centralised gas entry rather than smaller-scale decentralised production. 87% indicated a preference at this stage to socialise the entry reinforcement costs to some degree.

We are currently planning the next steps following feedback from stakeholders and in consultation with the other gas networks. There was the largest support for taking forward changes that can be delivered quickly, even if they do not necessarily fully address all the issues, so subsequent changes may be needed in the medium term.

Increased volumes of green gases may also see new gas volumes of hydrogen being injected into our network if hydrogen blending is enabled during RIIO-2. As discussed in Appendix 10.04 Heat Policy, this is dependent on a future Government heat and energy policy decision which may result in the need to deliver specific hydrogen products.

Comparing uncertainty to costs included in our base plan

We have not included costs in our base plan associated with investment to support entry enablement. We have proposed a specific output as part of our RIIO-2 plan reflecting our commitments to undertake a review of distributed entry gas commercial arrangements. As confirmed in Appendix 07.04.08 Entry Capacity Enablement, these activities have been proposed without additional investment as part of our base plan.

Therefore, our proposals for an uncertainty mechanism capture all costs associated with reinforcement investment to enable entry gas. In Section 3 of this document, we provide a full evaluation of how this mechanism would work in practice.

2.2. Why we face forecasting difficulties

While we can produce an initial indicative estimate of a unit cost for reinforcing entry capacity, there is significant uncertainty over the specific location of new entry gas and the associated costs that may be incurred. Therefore, it is not possible to develop an accurate ex ante total cost forecast required to accommodate entry gas in our RIIO-2 plan. Furthermore, any future costs and costs associated with this work will be highly dependent on any changes that are successfully made to commercial arrangements.

This uncertainty is also increased by the potential for new gas sources other than methane to begin injecting into our network in RIIO-2, alongside any changes in demand for entry capacity that may arise from our proposed consultation on network charging.

Given the early stages of consultation on the future commercial regime, **we currently are not able to control the volume of reinforcement work we will undertake in RIIO-2 to support entry gas.** However, we have made commitments as part of our associated output case in Appendix 07.04.08 to move forward with the required charging review. Figure 1 below summarises the initial version of this timeline that was consulted on with stakeholders.

Figure 1: Indicative timeline for consultation on commercial arrangements

Once a new regime is in place, we will work closely with the supply chain to ensure we can deliver entry capacity in a timely fashion. This will build on our existing work and experience working with the supply chain through the Optinet innovation project which includes the installation of in-grid compression to boost the output from existing biomethane plant.

We already hold regular meetings with entry stakeholders and, working with our colleagues in the other gas networks, we will aim to formalise this to form our entry stakeholder forum, and establish an initial connections standard, ahead of the start of RIIO-2. We will aim to ensure coverage from biomethane developers, biomethane operators, trade bodies and shippers.

These activities will provide us with a **better view** of potential future volumes of reinforcement work we may be required to undertake to support entry gas in RIIO-2.

2.3. Network impacts and behaviours from including in the base plan

The risk with including potential volumes and hence total costs for entry enabling reinforcement in our base plan is that we would be including highly indicative cost estimates in our proposals, under the assumption that a successful change was made to existing commercial arrangements. This creates a risk that inaccurate costs are included in our allowances, which may not align with the outcome of our ongoing consultation activity.

Firstly, it would be inappropriate to initially include costs in our base plan until a review of the existing charging and access regime is undertaken. A change is required here, including the ability to socialise the investment costs of reinforcement to support entry capacity, in order to enable future volumes[2].

If a decision is made that enables the introduction of a commercial regime, uncertainty will remain over the volume of reinforcement work required. **If we were to include costs in our base plan**, we would be required to generate a forecast of future volumes, which are difficult to predict given the unknown impact of a change to our charging approach.

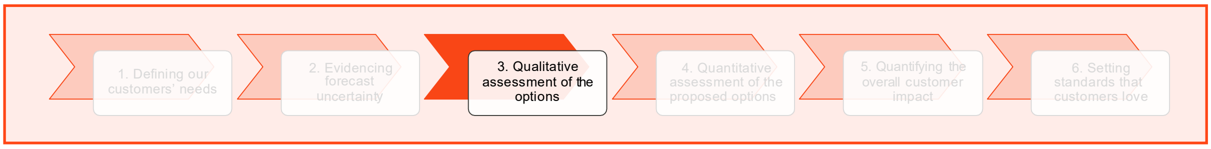
There is a **credible risk** that our estimate could underpredict future volumes of required reinforcement work. This creates an incentive for us to price risk into our ex ante estimates, by considering volumes towards the higher end of known future scenarios. This would ensure we had adequate funding if significant reinforcement work is triggered.

[2] Some customers have opted to compress gas so that it can be injected into the higher-pressure tiers of the network where demand is more sustained through the summer. In some cases, it would be more efficient if we installed compression at strategic points in the network that would support a number of different current and future production sites, rather than each site having to build its own compression.

However, this **creates a risk to customers**: future volumes of work may fail to materialise, creating an opportunity for windfall gains.

Excluding costs from our baseline expenditure ensures that customers will only pay for the reinforcement volumes that are triggered in RIIO-2. This will also support our broader objective, as through the charging and access review, to develop a regime to support the connection of entry gas to our network.

3. Qualitative assessment



3.1. Options for addressing uncertainty

Given the uncertainty on future workload volumes in RIIO-2 for reinforcements to support entry gas, we have identified several mechanisms that could be used to address this risk:

Table 1: Evaluating options for uncertainty mechanisms

Mechanism Option	Description
Volume driver	This mechanism relies on the use of a relevant unit cost estimate to forecast costs when volumes of workload are uncertain. This would effectively address the uncertainty around the demand from stakeholders to inject new gas into the network and makes use of cost information gathered from our existing experience with biomethane producers in RIIO-1.
Re-opener mechanism	A re-opener would account for the current uncertainty in understanding costs when both the design and requirement for projects in RIIO-2 is currently unknown. However, as costs for entry enablement will be driven by volumes this is not applicable in this setting for cost recovery. There is also a risk with a re-opener that critical investment may be slower due to additional checks and balances required to ensure we can recover revenues, which may not allow the timely implementation of reinforcement works for entry. However, it is appropriate to initially include such a mechanism before arrangements for cost recovery are agreed. This accounts for the charging and access review that need to take place to enable future investment. One could also consider a mechanism whereby an estimate is included in our base-plan, with a re-opener mechanism used to make any required adjustments in period. However, this creates a risk to customers that costs are provided for work that does not materialise. Furthermore, given the work is dependent on the charging review, these costs can be more appropriately evaluated after its conclusion.

Mechanism Option	Description
Use it or lose it allowance **(PCD)**	This would involve including a price control deliverable (PCD) as part of our RIIO-2 plan. However, this fails to address the risk we currently face in forecasting a potential allowance and could also create barriers if there are insufficient funds to deliver the required activities. Customers would be protected in the case of under-delivery.

We have also undertaken a qualitative assessment of uncertainty in this area to understand the challenges an uncertainty mechanism must aim to address.

Table 2: Qualitative assessment of risks posed by reinforcement for entry enablement

Volume risk	Unit cost risk	Impact on outputs	Material cost / bill impact
High	**Medium**	**Low**	**High**

Further detail on our assessment is provided below:

- **Volume risk**: Our work is driven by the requirements of green gas producers, resulting in an uncertain future workload that is out of our control. This is further influenced by the potential impact of any changes to network pricing, or Government policy decisions around green gas and hydrogen blending.
- **Unit cost risk:** We have confidence in our proposed approach for unit costs associated with installing compression, as outlined in Section 3.2. However, total cost uncertainty remains due to the unknown volumes of work that may be required.
- **Impact on outputs**: This area of uncertainty is largely confined to our outputs supporting new connections, the level of service we provide in this process and entry enablement.
- **Material cost / bill impact:** Dependent on the volume of new connections required by green gas producers, there is potential for significant costs to be incurred. However, bill impact effects will be largely determined by the conclusion of charging reviews.

3.2. Our proposed uncertainty mechanism

We are proposing for a re-opener trigger mechanism to allow for an adjustment to our price control following the successful completing of an entry charging and access review. This process is a precursor to enable future entry capacity, therefore it would not be appropriate to initially include a specific mechanism for cost recovery.

Upon the successful completion of this charging review, our proposal is that the re-opener is used to introduce a **volume driver** in RIIO-2 for entry reinforcement, using a unit cost approach for installing new compression. This would allow us to react to customer demand in RIIO-2, and to meet the expectations of our green gas stakeholders. Further details on the operation of this mechanism in practice are provided below:

Operation of the proposed re-opener/volume driver in practice

Our initial proposal of a re-opener recognises that a change to the existing commercial regime is required before a mechanism for revenue recovery can be considered. In reality, the best method for customers of accounting for any relevant costs during RIIO-2 is through a volume driver. We propose that the re-opener mechanism could be used in period following the conditions outlined for the trigger below, to introduce a flexible volume driver to support investment for entry gas.

- **Form of the trigger:** We propose that the re-opener mechanism is triggered through Ofgem approval of a commercial arrangement that would arise through a change to the Uniform Network Code and the Connection Charging methodology licence condition. Subsequently, a trigger would need to be identified for individual volumes of work that would be reclaimed through the volume driver. We propose to consult on the exact form of this through our framework consultation – in other sectors the signing of a connection agreement would be used to demonstrate customer commitment. We would seek to agree the relevant commercial terms that should apply with entry developers with Ofgem through this process.
- **Mitigating the likelihood of the trigger:** Mitigating the likelihood of this trigger would go against our ambitions to provide greater support to entry gas producers.
- **Claiming costs through the volume driver:** As part of the RRP process, we would on an annual basis submit data on the actual volumes of entry enabling reinforcement that we have undertaken. Revenues would be recovered with a year lag, in line with agreed unit rates, allowing time to verify our submitted volumes.

Form of the volume driver:

We recognise the potential drawback of using a volume driver approach in an area where we do not have prior experience. A pragmatic approach is required to ensure the driver is not a barrier to investment and recognises the realities of the activity.

- **Unit of volume:** Our initial proposal of a volume driver is to measure the units of installed compression that will be required to support an entry gas connection. As outlined in Appendix 7.04.08, we are proposing to undertake investment on a reactive basis, and that this measure relates to new capacity constructed. Further evaluation of the incentives associated with this are provided in Section 3.3.
- **Establishing unit costs:** Compression is a new activity for the gas distribution networks, and we therefore recognise that any unit costs estimates would initially need to contain a large risk margin. Therefore, we are proposing additional protections as part of this uncertainty mechanism. It may be appropriate for a one-off unit cost review mechanism to be triggered after a minimum number of installations, and if average costs are outside a percentage deadband. Further details on this proposal are provided below.

In this document, we have conducted analysis using an initial estimated unit cost for compression installation. We propose in practice that an initial transition period operates to cover the first ten reinforcements undertaken, after which we must submit a new entry costing methodology to Ofgem for approval. Once approved, the volume driver would **apply on the new values**, calculated in accordance with the agreed methodology and published in an entry-capacity costing statement. This methodology would include a framework and outline of triggers for any future changes, which could be reviewed for the start of future price-control periods.

3.3. Evaluating our proposed uncertainty mechanism

The additional protection of initially proposing a re-opener ensures that our proposal to recover costs in the future through a volume driver only applies following the enabling decision to implement a revised charging regime for entry capacity.

Nevertheless, it is important to fully evaluate the behaviours that our proposed uncertainty mechanism will encourage, to ensure they do not create perverse incentives. Below, we consider positive behaviours that a mechanism should promote. Our analysis below focuses on the proposed volume driver, which would ultimately apply for cost recovery.

Table 3: Evaluating incentives created by our proposed uncertainty mechanism

Behaviours and incentives	Evaluation
To minimise costs	A financial incentive remains under the volume driver to identify efficiencies and to deliver reinforcement work to support entry gas below agreed unit costs where possible. This benefits customers, through the achievement of a lower unit cost in the future and sharing through the totex incentive mechanism. There is a risk that initial connections under a new regime could be in low-capacity areas. This may be the case as viable projects that have not proceeded due to the lack of existing entry capacity could be the first movers to pursue additional capacity. This risk could be mitigated by profiling the average unit cost or front-loading it and reviewing this at the same time as the one-off actual cost review.
To deliver required work	Entry reinforcements will be triggered by external demand from entry gas producers. We will have an ability to create incentives to encourage such connections through the charging review. A volume driver would not create an incentive to avoid undertaking this work. This would have negative reputational and operational impacts on our business, especially given our ambition to promote clean gas and environmental outputs. We have proposed a reputational ODI. Given the need for an entry producer to agree to the commercial terms of a new connection, it would not be possible under this volume driver to overdeliver volumes above an efficient level.
To take a whole-systems approach	There may be a concern that a volume driver for reinforcements for entry gas limits our incentive to consider wider strategic solutions, or to take a whole-systems approach to new changes in demand. Financial incentives remain under this mechanism to identify efficiencies against the agreed unit cost rates. This includes any alternative solutions which are more cost-effective than proceeding with our proposals for installed compression. Capacity is likely to be provided in a modular form, providing some strategic spare capacity as new connections are made. This could be signposted to gas producers and could also be incentivised through the charging arrangements. As outlined in Appendix 7.04.08, we have proposed to undertake future investment on a reactive basis, given the risk of asset stranding under a more strategic approach.

Interactions with other uncertainty mechanisms in our proposed package

Heat policy

Our proposals for an entry reinforcements volume driver will interact with Ofgem's prescribed re-opener for heat policy in practice. As described in Section 2.1, a key driver of the uncertainty in future volumes is the direction of future Government policy towards the future role of hydrogen on the gas networks.

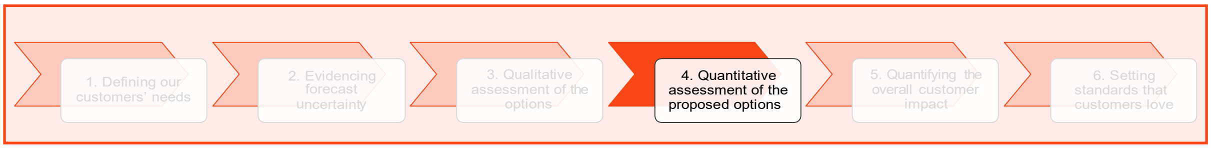
Any significant policy decisions taken during the RIIO-2 may have significant implications for the volumes of work that we are required to undertake. Recognising this dependency, our proposed approach ensures we can adapt and respond accordingly. For example, if a decision was taken that significantly supported the role of entry gas on our network, this could be adequately responded to through the volume driver.

Reinforcements

We have also made bespoke proposals for a volume driver relating to network reinforcement, covering general, specific and capacity upgrades. While both relate to reinforcement activity, the underling drivers of demand differ.

Our proposals tailored towards network reinforcement are driven by a need to maintain network resilience, and to respond to changing customer demands. In practice, the assessments outlined in Appendix 10.08 Reinforcements to trigger the need for reinforcement would include analysis of any impacts to the local network for work undertaken under the entry reinforcement volume driver. We recognise the need to ensure that volumes of work are recorded separately in both cases, to remove any potential for double counting.

4. Quantitative assessment



As outlined in earlier sections, we propose that a volume driver is introduced through a re-opener mechanism during RIIO-2. Our subsequent analysis focuses on associated costs that would arise under this scenario. Therefore, the analysis below assumes that the commercial charging review successfully triggers future entry gas volumes.

4.1. Inputs for uncertainty modelling

The requirement to provide network capacity is triggered when an entry agreement is executed for a new gas injection plant. The reinforcement would involve installing compression to move gas up through pressure tiers. We have calculated the average compression requirement by modelling the reinforcement needs to accommodate:

- 'Firm' year-round capacity for all biomethane connections that are currently 'variable'.
- Providing entry capacity to convert all known biogas plants that could be converted from electricity generation to be injected into the gas grid.

We have developed a range of high-, likely- and low-cost scenarios associated with entry enablement to qualitatively assess this area of uncertainty. To produce these estimates, the following inputs have been used in our calculations:

Common View

We have used the ENA Common View range of 0.39 to 0.89bcm for Biomethane and BioSNG to develop our range of potential volumes of new gas that may be injected into our network in RIIO-2. This is summarised below.

Table 4: Input assumptions – volumes from Common View by scenario

Cadent total	Low	Likely	High
Volumes from Common View (bcm)	0	0.39	0.89

Unit costing

Based on our existing experience, we have used standard compression capacities that can be scaled up and identified cost estimates for this compression which indicates a total cost **of £1.3m per 500scm/h installation.**

At this stage, we propose an initial indicative connection to new capacity ratio of 100% for each network (that is each additional unit of connection capacity requires reinforcement). However, this assumption could be self-reconciled across the RIIO-2 period by only allowing revenue recovery for required reinforcements.

Total volumes

Based on the volumes of new gas indicated by the common view, we have compared these to the existing levels already injected into our network to consider the incremental change in RIIO-2, as summarised below. This is calculated by considering the additional volumes, above existing RIIO-1 levels, that are implied by the ENA common view estimates.

Table 5: Input assumptions – incremental volumes by scenario

Cadent total	Low	Likely	High
Incremental entry gas volumes (scm/h)	0	21,328	64,137

We have also considered the scale of converting existing variable biomethane connections to firm in RIIO-2. At present, there are 15 sites that could be converted. We have assumed different rates of conversion in our scenarios as summarised below.

Table 6: Input assumptions – converting variable biomethane connections to firm

Cadent total	Low	Likely	High
Existing connections converted to firm	0%	50%	100%

Final input - total costs

Using the input information described above, we have calculated a total cost for each scenario to include in our uncertainty analysis. These costs are calculated by phasing incremental volumes equally throughout RIIO-2, while converting ‘variable’ connections to ‘firm’ is assumed to take place towards the beginning of the next control period. For the latter, these costs are phased throughout RIIO-2 under the following assumptions: 50% in year 1, 30% in year 2 and 20% in year 3.

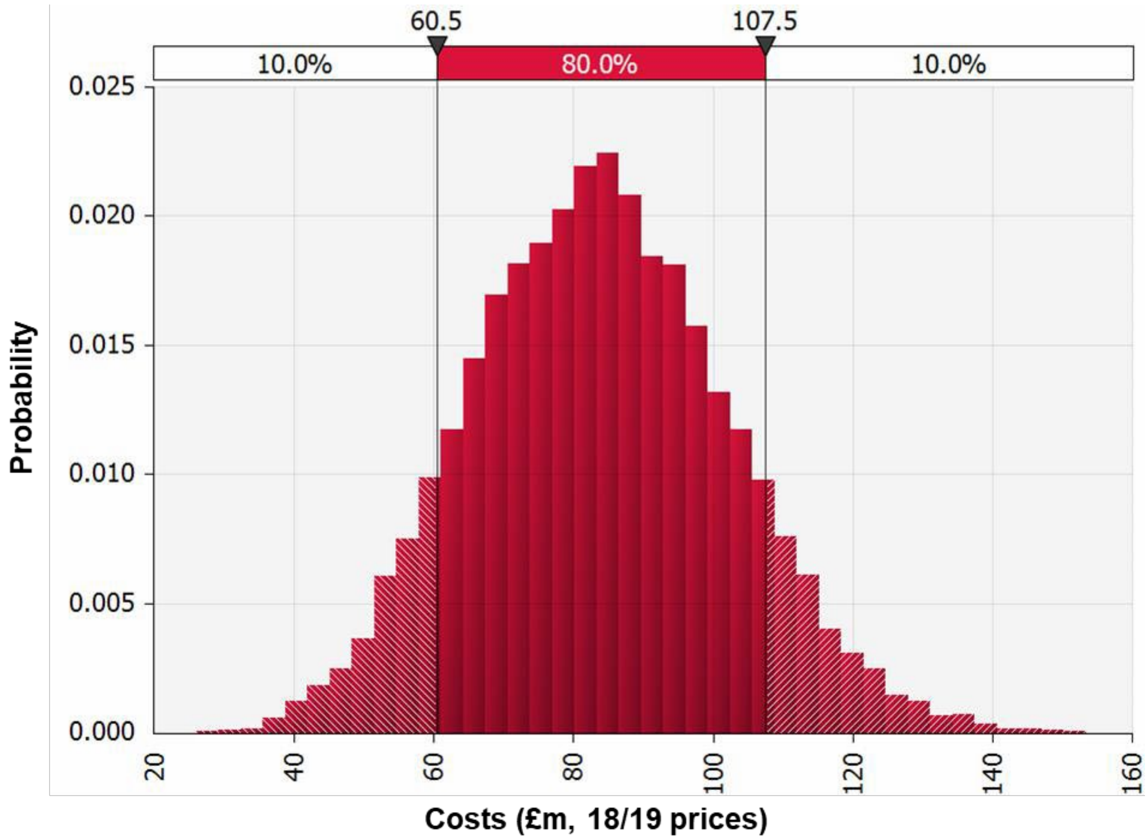
Table 7: Input assumptions – converting variable biomethane connections to firm

Cadent total	Low	Likely	High
Total costs for entry enablement (£m)	0.0	65.2	186.3

4.2. Assessing uncertainty

Using our input data described above, we have undertaken Monte Carlo analysis to understand the range of cost impacts for this area of uncertainty in RIIO-2. This provides a distribution of the potential cost outcomes for entry enablement, based on 10,000 iterations. This approach illustrates the high and low scenarios of uncertain costs, alongside the meant cost outcome and associated volatility. Figure 2 below summarises this distribution, while Table 8 summarises this cost risk by network.

Figure 2: Monte Carlo: Total RIIO-2 cost risk for reinforcement for entry capacity, no mechanism. Costs, £m 18/19 prices



Minimum	Maximum	Mean	Standard Dev	Iterations
£25.99m	£153.38m	£83.82m	£18.23m	10,000

This analysis illustrates the uncertainty in future reinforcement volumes to enable entry capacity, and the associated cost risk. Without the introduction of an uncertainty mechanism, there is a risk that actual costs incurred in RIIO-2 may deviate from an initial estimate proposed as a base-line allowance.

Table 8: Monte Carlo: Total RIIO-2 cost risk by network for reinforcement for entry capacity, no mechanism. Costs, £m 18/19 prices.

Network	Minimum	Maximum	Mean	Standard Dev
East of England	£2.70m	£67.08m	£30.25m	£12.15m
North London	£0.19m	£37.00m	£17.39m	£7.64m
North West	£0.89m	£48.63m	£23.67m	£9.63m
West Midlands	£0.56m	£28.53m	£12.52m	£5.86m

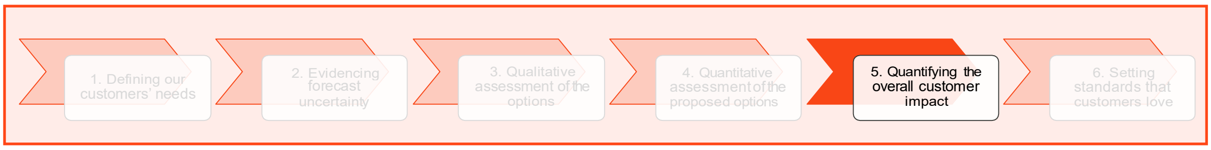
4.3. Impact of our proposed uncertainty mechanism

As we have assumed that income from volume drivers is not subject to a sharing factor, and given that a materiality threshold is not applicable, our modelling implies from a theoretical perspective that the cost risk outlined above is fully mitigated using our mechanism.

This **does not imply** that the costs associated with the uncertain volumes are fully mitigated and removed. Instead, the volume driver effectively allows us to collect associated revenues for reinforcement for entry capacity at an agreed rate.

We and customers will remain exposed to residual risk based on how outturn unit costs compare to the rate agreed as part of the mechanism. These differences would be shared under the totex incentive mechanism. This places an incentive on us to maintain a focus on cost efficiency when delivering reinforcement work. Customers are also protected as costs are only recoverable for the actual volumes of work we undertake. Given the driver of reinforcements is from a triggering party, we are unable to systematically control volumes of future work. We have also made additional proposals to address uncertainty in future unit costs, while maintaining flexibility to ultimately support future new connections of entry gas.

5. Quantifying the customer impact



As outlined in earlier sections, we are undertaking a review of entry charging and access arrangements that will have implications for how costs are recovered for reinforcement works. The values presented below are for illustrative purposes only and demonstrate the impact of different cost scenarios flowing directly to domestic customer bills.

In Section 5 of Appendix 10.00 Our approach to managing risk and uncertainty, we have analysed the overall customer impact of uncertain costs with and without our proposed package of mechanisms. We have also evaluated how our proposed package recognises the trade-off between sharing exposure of cost risk with our customers. In Chapters 10 and 11 of our business plan, we also quantify the impact of our proposed package of uncertainty mechanisms on customer bills in RIIO-2.

We have also quantified the bill impact associated with the entry charging and access review volume driver individually. **Error! Reference source not found.** below summarises the potential bill impact per annum by the end of RIIO-2 for the mean, P10 and P90 costs estimated in our Monte Carlo analysis. As the costs associated with this uncertainty mechanism are categorised as capex, the bill impact is spread over a significantly longer period. For the mean cost impact below, this is equivalent to £0.21 per annum at the Cadent level.

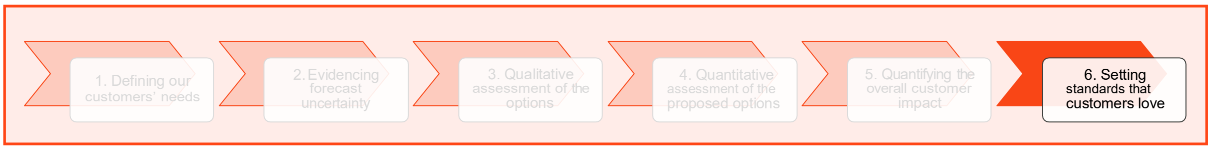
Table 9: RIIO-2 end bill impacts for P10 mean and P90 costs from uncertainty analysis

RIIO-2 end bill impact (£, 18/19 prices)	P10	Mean	P90
East of England	£0.24	£0.33	£0.43
London	£0.23	£0.32	£0.41
North West	£0.27	£0.37	£0.48
West Midlands	£0.19	£0.26	£0.34

For the purpose of constructing bill impact estimates, we have focused on the central costs from our Monte Carlo analysis and have not considered the potential timing effects on revenue recovery from the use of a volume driver. In practice, bill impacts would materialise with a two-year lag from spend, following a successful claim through the mechanism.

As outlined in Chapter 10 (Managing risk and uncertainty), Ofgem's business plan guidance suggests that "uncertainty mechanisms that highlight risks to consumers of which Ofgem would not otherwise have been aware" is an example that could constitute part of a Consumer Value Proposition (CVP). We discuss our CVP in Section 7.1 of Chapter 7. In this instance, we have excluded CVP for our proposed uncertainty mechanism for entry charging and access review, to avoid double counting with the associated value included in our supporting output case.

6. Setting the standards



Our proposals for a volume driver are clear and simple for our customers to understand. We will only be able to recover revenue for reinforcement volumes that materialise in RIIO-2. We have also proposed additional protections around the appropriate unit rate to use in a volume driver, ensuring customers are protected and only pay for an efficient level of investment. These proposals have incorporated challenges we have received from our CEG.

Our evaluation of the implications of including costs for entry reinforcements in our base plan, as outlined in Section 2.3, and of the incentives associated with our proposed volume driver mechanism, demonstrate the benefits of this approach for customers and stakeholders.

Our overall approach to managing risk and uncertainty using uncertainty mechanisms has been tested with customers through our acceptability testing. A full discussion of this engagement is provided in Chapter 10 – it is noted here that customers found this approach to be acceptable, and that we had been thorough in our work to manage cost risk in RIIO-2.