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EXPECTED PERFORMANCE MODELLING FOR RIIO-GD3

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Contents

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EXECUTIVE SUMMARY

Ofgem published its RIIO-3 Draft Determinations (DD) on 1st July 2025. As part of the DD consultation, Ofgem asked whether respondents agree that there is risk symmetry within the aggregate balance of the price control.

NGN has commissioned Frontier to undertake an assessment of the risk balance of the RIIO-GD3 price control package. To do this, we use a Monte Carlo simulation analysis, enabling us to model performance outcomes of the RIIO-GD3 price control. The analysis enables us to evaluate questions such as:

- Is expected performance zero on average (i.e. companies can expect to earn the baseline allowed return on equity on average), or is there any skew of risk in the overall package (to the downside or upside)?
- How wide is the range of potential outcomes, i.e. how much scope for upside and downside is there for a notional GDN?
- Which elements of the price control package are the key drivers of the likely outcomes?

Any forward-looking analysis of this type will be driven, at least in part, by the assumptions made. Throughout this report, we explain and justify all of our assumptions. These are robustly based on historical data wherever possible. Where necessary, broadly conservative assumptions are made - by which we mean assumptions which would tend to bias the results towards the upside (i.e. better GDN performance) rather than the downside.

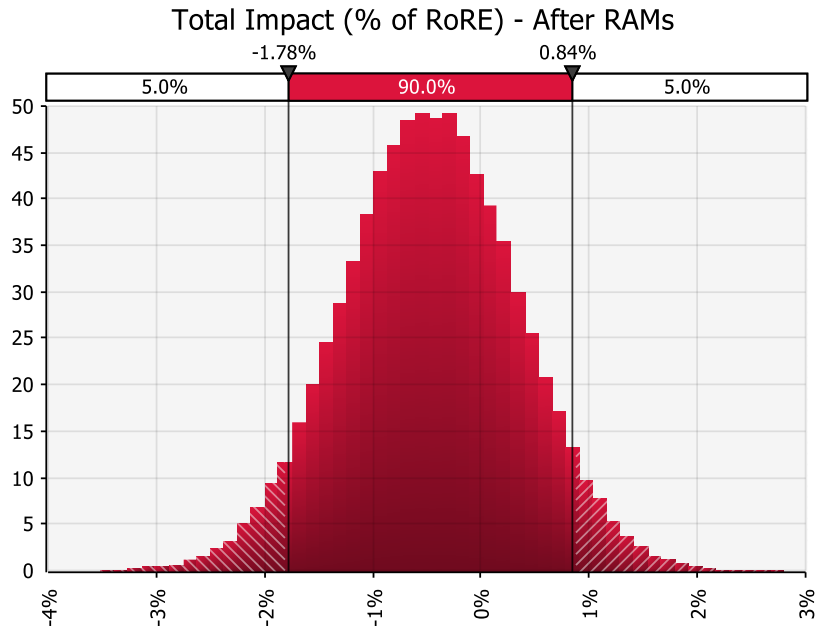
As is good practice with any analysis which incorporates a set of assumptions, we also test a number of sensitivities to check the robustness of the results to changes in those assumptions.

Key results and implications

Our baseline modelling results in an average expected underperformance of -47bps of Return on Regulated Equity (RoRE) for a notional GDN in any given year of RIIO-GD3. This equates to -£5.8m for an average GDN.

Figure 1 below shows the Monte Carlo simulation results of our baseline model. The horizontal axis shows financial outperformance in RoRE terms and the vertical axis shows the frequency of occurrences in our simulation.

Figure 1 Baseline model results – total impact (RoRE terms)



Source: *Frontier Economics analysis*

Note: *The x-axis measures RoRE out/underperformance and the y-axis measures the frequency of occurrences.*

The analysis shows the skew of plausible outcomes is clearly to the downside, with a notional GDN expected to earn lower than the baseline allowed return on equity on average. This suggests a price control that is asymmetrically calibrated.

The range of outcomes in which a notional GDN is expected to perform 90% of the time ranges from -1.78% to 0.84%, showing that there is more scope for downside than upside in the price control.

Therefore, given Ofgem's DD proposals, companies will in all likelihood underperform in RIIO-GD3. Even though there is, of course, some scope for outperformance, this is more limited than the scope for underperformance.

We do not consider that it is good regulatory practice to calibrate a price control such that companies cannot expect to earn the baseline allowed return on equity on average. We recommend that Ofgem (a) revisit its approach to setting totex allowances (e.g. the use of the 85th percentile) to ensure that it is confident companies are appropriately funded to deliver at RIIO-GD3; (b) consider whether some of the asymmetric mechanisms in the price control can be made more balanced, or scaled down; and (c) consider the impact of this inbuilt downside on investability of the finance package.

1 Introduction

Ofgem published its RIIO-3 Draft Determinations (DD) on 1st July 2025.[1] As part of its DDs, Ofgem said that, "Our working assumption is that there is risk symmetry within the aggregate balance of the whole price control"[2], and asked a consultation question (FQ17) on whether respondents agree that there is risk symmetry within the aggregate balance of the price control.

NGN has commissioned Frontier to undertake an assessment of the risk balance of the RIIO-GD3 price control package. To do this, we use a Monte Carlo simulation analysis, enabling us to model performance outcomes of the RIIO-GD3 price control. Such an analysis is inherently probabilistic – based on modelling sources of upside and downside risk and how they interact with the regulatory incentive arrangements Ofgem proposes in the DD.

1.1 Purpose of the analysis

The analysis provides a comprehensive picture of what the RIIO-GD3 price control package looks like "in the round". The analysis therefore allows Ofgem, companies, investors and stakeholders to understand the likely net effect of all the decisions on individual parameters, allowances and incentives which make up the regulatory package. This enables us to evaluate questions such as:

- Is expected performance zero on average (i.e. companies can expect to earn the baseline allowed return on equity on average), or is there any skew of risk in the overall package (to the downside or upside)?
- How wide is the range of potential outcomes, i.e. how much scope for upside and downside is there for a notional GDN?
- Which elements of the price control package are the key drivers of the likely outcomes?

1.2 Scope of the analysis

This report focuses on the RIIO-3 DD proposals for the gas distribution sector.

We are aware that there will be substantial engagement between the GDNs and Ofgem (as well as input from wider stakeholders) between the DD and the FD, which may result in changes to Ofgem's proposals. We are also aware that there may be errors and/or data issues in Ofgem's current proposals that need to be resolved. In general we have not sought to reflect any of these potential changes in our analysis. Rather, we have taken the DD proposals as set out by Ofgem on 1 July as the basis for our analysis.

[1] Ofgem (1 July 2025) RIIO-3 Draft Determinations

[2] Ofgem (1 July 2025) RIIO-3 Draft Determinations – Finance Annex, paragraph 3.135

Our analysis reflects a “notional” GDN. For example, where possible we have based our analysis on average expected performance for the sector. This means that the results reflect the risk in the price control package for the sector as a whole (rather than for NGN specifically).

Any forward-looking analysis of this type will be driven, at least in part, by the assumptions made. Throughout this report, we explain and justify all of our assumptions. These are robustly based on historical data wherever possible. Wherever necessary, broadly conservative assumptions are made - by which we mean assumptions which would tend to bias the results towards the upside rather than the downside.

As is good practice with any analysis which incorporates a set of assumptions, we also test a number of sensitivities to check the robustness of the results to changes in those assumptions.

1.3 Report Structure

The remainder of this report is structured as follows:

- Section 2 provides an overview of the methodology used for the Monte Carlo analysis;
- Section 3 sets out the assumptions used for our modelling of totex performance, and simulation results for each of the elements of totex that we have modelled;
- Section 4 sets out the assumptions used for our modelling of other incentives, and simulation results for each incentive;
- Section 5 explains how we have modelled the interactions between different incentives;
- Section 6 reports overall modelling results, bringing together the different elements of the regulatory framework to give a distribution of overall RoRE performance; and
- Section 7 reports the results of a number of sensitivity tests using alternative input assumptions.

2 Overview of Methodology

In this section we:

- Describe the structure and purpose of Monte Carlo simulation; and
- Set out at a high level the steps we have taken for the analysis.

2.1 Monte Carlo simulation

Monte Carlo simulations are used to model the probability of different outcomes in a process that cannot easily be predicted, e.g. due to the existence of random variables or shocks. They involve running a large number of simulations of possible outcomes for one or more variables, based on a specified expected mean value for each variable; and a probability distribution of potential variation around the mean.

The probability distribution for each variable can be specified to reflect the particular characteristics of the variable being assessed. For example, this might be by using alternative types of distribution, e.g. normal, Bernoulli, or triangular; by modifying the standard deviation of the probability distribution and/or by accounting for skew in the likely distribution of outcomes .

In the context of the RIIO price controls, this probabilistic simulation approach is helpful because Ofgem and the companies are interested in the balance and skewness of risk in the overall package. The range of expected performance can therefore be modelled using Monte Carlo simulation, subject to specifying the relevant assumptions for each incentive.

The output from each individual simulation is a combination of probabilistically determined out/underperformance for each incentive, which can be aggregated together to derive an overall result representing a risk assessment of the regulatory package as a whole. With a sufficiently large number of ‘draws’ from the underlying probability distributions, an overall distribution of plausible total returns can be estimated by aggregating the output from each individual incentive.

In addition, Monte Carlo analysis enables us to account for the extent to which different incentives in a price control package are correlated with one another. So, for example, if we find that outperformance on costs is typically also associated with outperformance on some Output Delivery Incentive (ODI) targets, that correlation can be built into the Monte Carlo assumptions. This means each individual iteration/simulation is internally consistent, given prior expectations about these correlations between incentives. The effect of different plausible combinations of correlations on the overall results can also be tested (including, if relevant, an assumption of no correlation).

2.2 Summary of methodology

Our methodology follows the following steps.

- **Step 1**. Identify the relevant incentives from RIIO-GD3 Draft Determinations to be modelled and establish the target levels and relevant financial incentivisation parameters Ofgem has proposed.

- **Step 2**. Establish key probability parameters for each individual incentive based on evidence e.g. of recent performance, or of reasonable expectations of RIIO-3 performance, given the DD proposals. Specifically we identify:
  - The relevant form of probability distribution (normal, Bernoulli, triangular, etc). In most cases we use a normal distribution; and
  - The relevant parameters to populate that distribution (e.g. for a normal distribution, the relevant parameters are mean expected performance and standard deviation).

- **Step 3:** Where relevant, specify any cross-correlations between incentives.

- **Step 4:** Establish the method to translate simulated performance measures for different incentives into financial outputs, measured in RoRE. This includes reflecting elements of Ofgem's proposed regulatory framework including:
  - Penalty and reward rates, and caps and collars;
  - Deadbands where no penalty or reward occurs; and
  - Sharing rates where applicable (e.g. Totex Incentive Mechanism (TIM)).

- **Step 5:** Run Monte Carlo simulations to produce probability distributions for aggregate financial performance. Our reported results are based on 100,000 iterations.

- **Step 6:** Specify and test sensitivities around the core assumptions used to produce results at Step 5.

Our approach and assumptions are set out in detail for totex in Section 3, and for non-totex incentives in Section 4. In each case we explain the relevant evidence that underpins our assumptions.

In our analysis, we consider performance from the perspective of a notional company, in RoRE terms.

3 Totex

Totex is generally expected to be the most material source of outperformance/underperformance. For the purposes of our modelling, we split totex into three buckets:

1. Costs subject to Network Asset Risk Metric (NARM);
2. Costs subject to Price Control Deliverables (PCDs); and
3. Other totex.

We model each of these buckets separately because both NARM and PCDs have the effect of modifying the incentive arrangements Ofgem imposes for totex outperformance. Both NARM and PCDs allow Ofgem to modify the totex allowances at the end of the price control, depending on delivery against these mechanisms. This means any difference between allowed and actual totex under NARM / PCDs is not treated as a simple out/underperformance and subject to TIM - instead Ofgem can (for example) scrutinise and claw back allowances that have not been spent.

We have used data from companies' Business Plan Data Tables (BPDTs) to identify the proportion of totex that falls into each of these three categories, for each licensee. We then calculate the average proportions across licensees. This gives approximately the following split of totex across the three categories: 11% NARM, 23% PCDs, and 66% other totex.

As outlined in the previous section, each of the incentives in our Monte Carlo simulation requires us to specify the form and parameters of a probability distribution, reflecting the expected range and likelihood of plausible outcomes. Table 1 below summarises the key modelling assumptions we make in relation to each of the three buckets of totex, and in the sub-sections that follow we explain our approach and the rationale for these assumptions.

Table 1 Summary of modelling assumptions for totex

Component of totex	Share of totex	Distribution	Mean	Standard deviation	Other assumptions
Other totex	11%	Normal	-3.4%	8.2%	TIM sharing factor
NARM	23%	Normal	0%	4.1%	TIM sharing factor, 5% deadband, 10% unjustified, 2.5% penalty
PCDs	66%	Normal	0%	4.1%	TIM sharing factor, 10% clawback

Source: Frontier Economics

3.1 Totex (not subject to NARM or PCDs)

We consider it is reasonable to assume a normal distribution for totex performance, and therefore we need to specify two key parameters: the mean and the standard deviation.

We have based both of these parameters on companies' totex performance over RIIO-GD2, using four years of outturn data and one year of forecasts as reported in the 2024-25 Regulatory Reporting Packs (RRPs). In GD2 to date, companies have overspent their totex allowances on average, and are forecasting to overspend overall by the end of the period. Specifically, we find that:

- Mean totex performance is -3.4% over RIIO-GD2;
- The standard deviation of GDN performance is 8.2%.

In our view, using the average totex performance from GD2 is a conservative assumption for our GD3 modelling. Companies' GD2 allowances were based on an average reduction of about 8% to GDNs' submitted costs,[3] and as seen above companies have overspent these allowances. In comparison, Ofgem's GD3 allowances at DD represent a 23% reduction[4] to companies' submitted costs. This means that in order to for companies to repeat the totex performance of GD2 (i.e. to underperform by 3.4%), we would need to believe that companies' GD3 plans have almost three times more cost inefficiency built in, which is not credible. If company plans are similarly efficient to GD2, we would expect companies to underperform by over 10% on average, based on the size of the disallowances proposed by Ofgem at DDs. We test a sensitivity on this and report results in Section 7.

We also note that Ofgem's cost efficiency approach at RIIO-GD3 is in all material respects an exact replication of its approach at RIIO-GD2. In particular:

- Ofgem's totex benchmarking model is structurally the same as it was in GD2, using the same composite scale variable (CSV) as a cost driver;
- Ofgem also employs the same set of normalisation adjustments as it did in GD2, calculated using the same methodologies and data sources (e.g. data from the ONS ASHE survey is used to calculate regional labour adjustments, using the same methodology as at GD2); and
- Ofgem has again set the efficiency benchmark using a glidepath from the upper quartile to the 85th percentile, as it did in GD2.

In contrast, very substantial changes were made between GD1 and GD2, many of which were expressly intended to limit the scope for outperformance in GD2 relative to GD1 (and the outturn data suggests these new approaches achieved Ofgem's intended effect). These changes were detailed at length in our submissions to the CMA in the context of the appeal

[3] Ofgem (3 February 2021) RIIO-2 Final Determinations – GD Sector Annex (REVISED), Table 8

[4] Ofgem (1 July 2025) RIIO-3 Draft Determinations – Gas Distribution, Table 19

on the so-called 'outperformance wedge'. We therefore discount any performance outturns in RIIO-GD1 from informing our analysis for RIIO-GD3, since GD1 performance is clearly no longer relevant.

With regards to the standard deviation estimated from GD2 data, we note that this is very similar to the standard deviation that we used in our previous modelling at GD2.[5] This was based on a historical dataset that Ofgem had compiled, covering performance across a range of regulated sectors including gas distribution, electricity distribution, gas transmission, electricity transmission, water, water and sewerage, and aviation. It covered 27 different price controls spanning almost 25 years. We excluded some very early price controls that we considered not to be representative, and using the remaining data calculated that the range of totex performance had a standard deviation of around 8.8%. This suggests that our assumption of 8.2% is broadly representative of historical performance across different sectors.

In modelling totex, our Monte Carlo simulation draws outcomes from a normal distribution with the mean and standard deviation above. To convert this into RoRE performance, we take the following steps:

1. multiply the simulated performance score by the average annual RIIO-GD3 totex allowance (as reported in Ofgem's DD);
2. scale it by the proportion of totex that is not covered by NARM or PCDs (66%);
3. multiply by the 50% Totex Incentive Mechanism (TIM) sharing factor; and
4. divide by the sector average regulated equity (based on the RIIO-GD3 Business Plan Financial Model (BPFM)).

We note that, like RIIO-GD2, RIIO-GD3 also contains some Uncertainty Mechanisms (UMs) through which allowances can be adjusted in-period in response to developments that arise during the price control. These include both mechanistic (e.g. indexation, such as for Real Price Effects (RPEs)) and evaluative (e.g. reopeners) tools.

For simplicity, we assume here that the net impact of UMs is likely to be value-neutral, since their objective is ultimately to align changes in cost with changes in allowances. We note, however, the clear prospect that mechanisms such as RPE indexation may turn out to be inaccurate – with a particular risk to the downside given the possibility that tight supply chains (in the UK and globally) and the unstable geopolitical environment could cause significant divergence between the RPE indices and actual input prices faced by the companies. Our modelling could be developed further in a future phase by more directly considering the risk characteristics around UMs.

[5] At RIIO-GD2, we carried out a similar Monte Carlo analysis for NGN, in the context of the 'outperformance wedge'. Two Frontier Economics reports were submitted to Ofgem: (i) 'Outperformance Wedge', dated 27 September 2019, and (b) 'Outperformance Wedge, Potential performance in RIIO-GD2 - report for NGN', dated September 2020.

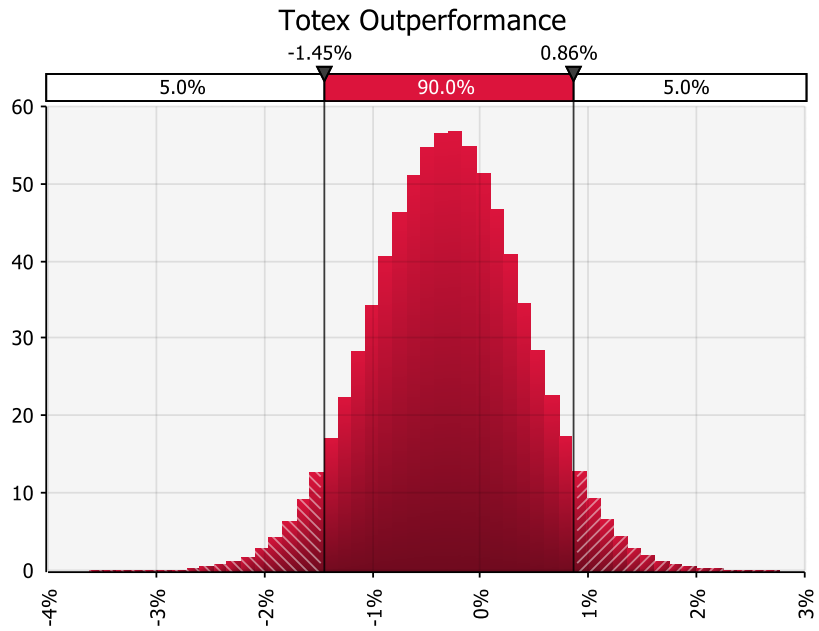
Results

Figure 2 shows the results of our Monte Carlo simulation for the portion of totex not subject to NARM or PCDs. The horizontal axis shows financial outperformance in RoRE terms and the vertical axis shows the frequency of occurrences in our simulation. Some key features of this distribution are:

- A bell-shaped distribution, which reflects that values in the middle of the distribution are most likely to occur, and the likelihood of occurrence decreases at the extremes (i.e. very low or very high RoRE outcomes are less likely).
- The distribution is broadly symmetrical, so the mean outcome (the average of all the simulated outcomes) is approximately at the mid-point of the bell curve.
- The width of the bell reflects the range of possible outcomes. However as explained above, outcomes at the extreme 'tails' are increasingly unlikely. It can therefore be helpful to consider a range that contains 90% of the outcomes, in order to specify a more meaningful range, in which we would expect performance to fall in the vast majority of instances. The 90% range is indicated at the top of the chart.

The results shown below have a mean of -0.29%, meaning that the notional GDN would expect on average to underperform on totex by 30bps of RoRE. We also find that a plausible range of outcomes for a notional GDN is between -1.45% and 0.86%, with performance falling in this range 90% of the time. This range narrows to -1.2% to 0.6% if we consider an 80% probability range.

Figure 2 Totex Monte Carlo Simulation results



Source: Frontier Economics analysis

3.2 NARM

For the RIIO-1 price controls, Ofgem introduced a mechanism to monitor the level of risk on the system across key asset classes, known as Network Output Measures (NOMs). The NOMs framework enabled Ofgem to measure network risk based on data reported by the companies on asset health and consequence of failure (among other things). This framework allowed Ofgem to introduce a target for the total amount of 'risk removed' from the system, given the expected deterioration in assets and the expected improvement in asset health based on planned interventions that were funded through totex allowances.

For RIIO-2, Ofgem replaced NOMs with a new incentive framework that is termed the Network Asset Risk Metric (NARM). The NARM methodology is similar to that for NOMs, in that it starts from a target for the monetised value of risk removed over the course of a price control. The NARM framework will continue into RIIO-3 with limited changes.

Key elements of the NARM framework include the following.[6]

- A specific portion of totex allowances are linked to investments and interventions to deliver a specified NARM risk removed output.
- Companies are set a target for the ratio of: (a) baseline allowed NARM-allocated totex to (b) NARM risk removed. This target is referred to as the Unit Cost of Risk Benefit (UCR).
- There is a 5% deadband for Over-Delivery and Under-Delivery. For any Over-Delivery or Under-Delivery within the deadband, no justification is required and it will be treated as 100% justified. For any Over-Delivery or Under-Delivery outside the Deadband, the licensee will be required to provide justification.
- Allowances can then be adjusted ex post (as part of the price control closeout process), based on Ofgem's assessment of the evidence / justification provided by GDNs.[7] These adjustments can include:
  - Ofgem can claw back any totex allowances associated with Unjustified Under-Delivery; and
  - Ofgem can increase totex allowances retrospectively to reflect any Justified Over-Delivery.
- Any Unjustified Under-Delivery will ***also*** be subject to a penalty. The penalty will be equal to 2.5% of the clawed back allowance associated with the Unjustified Under-Delivery.
- 'Clearly identifiable' Under- and Over-Delivery: Ofgem can also scrutinise and make ex-post adjustments to allowances for any projects/schemes/programmes of work that are quantifiable and separable, and which ***individually*** have a UCR outside a 5% deadband.[8]

[6] NARM Handbook v4.0

[7] Ibid., paragraph 5.12

[8] Ibid., chapter 10

Clearly, the NARM framework relies substantially on judgements made by the regulator ex post. Companies are highly exposed to decisions that Ofgem makes ex post on whether cost savings were “genuine”, and whether any departures from the risk target were “justified” or “unjustified”. Importantly, Ofgem’s underlying principle seems to be that companies must bear the burden of proof in these ex post assessments – in other words, Ofgem’s default position will be that deviations are unjustified, and it is up to companies to justify these deviations, to convince Ofgem otherwise.

We understand that Ofgem has still not finalised the RIIO-GD1 closeout process for NOMs, meaning that companies have no insight into how Ofgem is likely to make these decisions in practice (noting that the RIIO-GD1 NOM framework is also likely to have differences to NARM in terms of the tests Ofgem applies). This in itself demonstrates some of the challenge companies face in understanding and quantifying the risks they face arising from the regulatory framework, when Ofgem decisions that might materially alter the achieved returns (in this case between 2013 – 2021) are still not finalised more than four years after the end of the price control; and even up to 12 years later (for NOM delivery at the start of RIIO-1).

The NARM framework imposes a skewed balance of risk towards the downside:

- First, the penalty-only nature of the incentive makes it downside-skewed by design, with a 2.5% penalty applied to any Unjustified Under-Delivery, but no equivalent reward for Justified Over-Delivery.
- Second, companies will know that even if they pursue and deliver what they consider to be genuine efficiencies, there will still be a chance that Ofgem might not consider those efficiencies to be genuine after the fact. Ofgem has provided no guidance about what tests it will apply to determine whether or not costs are efficient. In light of the overall approach that Ofgem has adopted towards incentive regulation since RIIO-2, companies may reasonably expect that little (if any) cost reductions will be deemed “genuine efficiencies” by Ofgem. Similarly they may also expect that any overspends arising from legitimate reasons are unlikely to be given additional funding ex post.

Faced with this set of arrangements and the risk of penalties being applied ex post at the discretion of the regulator, in our view the NARM framework creates a strong incentive for the GDNs to stick as closely as possible to the allowed costs and NARM outputs specified at the start of the price control.

As a result of this, our modelling of expected outperformance in RIIO-3 starts from the expectation that outperformance on totex allocated to NARM has an expected value of zero, and a substantially reduced range of potential outcomes either side of this mean, compared to wider totex. We therefore model NARM using a normal distribution with mean zero, and standard deviation half that of other totex, i.e. 4.1%.

We assume that all over-spends and under-spends have the TIM sharing factor applied. We also model the impact of Ofgem’s ex post review process as follows:

- If there is more than 5% underperformance or more than 5% outperformance, we assume that Ofgem treats 10% of the performance as unjustified and accordingly reduces (in the case of underperformance) or increases (in the case of outperformance) allowances. This is a conservative assumption, as we are assuming that Ofgem treats underperformance and outperformance symmetrically; and would adjust only for 10% of underspend or overspend. In reality, Ofgem may have more incentive to claw back underspend, than provide additional funding for overspend. We test a sensitivity on this and report results in Section 7.
- For underperformance that is clawed back, we apply a 2.5% penalty, reflecting Ofgem's penalty-only incentive design.

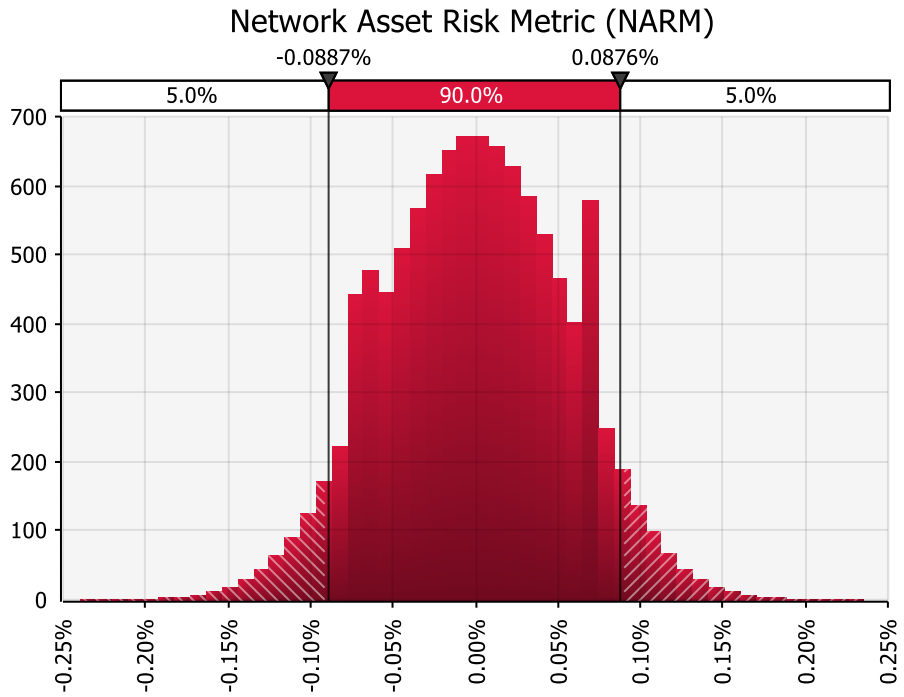
Results

Figure 3 shows the results of our Monte Carlo simulation of NARM outcomes.

A notional GDN would expect on average to underperform by 0.00014% of RoRE. The range of outcomes shows a level of asymmetry, with underperformance very slightly more likely than outperformance. In 90% of iterations of our simulation, NARM performance falls between -0.089% and 0.088%. This small asymmetry is unsurprising given the 2.5% penalty imposed on unjustified underperformance, but no corresponding reward.

We consider this result reflects a very conservative approach, as we do not have information on how Ofgem will apply its judgement in its ex post review of NARM in practice, with actual results likely being more skewed to the downside.

Figure 3 NARM Monte Carlo simulation results



Source: Frontier Economics analysis

3.3 PCDs

Price control deliverables (PCDs) are characterised by having specific deliverables attached to funding, whereby Ofgem can claw back the funding and return it to customers ex post if the specified output is not delivered. The funding for these projects is not transferrable to a different output. We understand that Ofgem's broad intention with PCDs is to restrict totex outperformance in the event of non-delivery or late delivery of specific projects, or changes in scope/specification of works compared to what was anticipated when the price control was set.

There are two main types of PCDs[9]:

- Mechanistic PCDs are set in cases where the cost and scope of a high volume activity is well understood. In such cases, the claw-back of allowances for any non-delivery of work is automatic.

[9] Ofgem (1 July 2025) RIIO-3 Draft Determinations Overview Document, paragraph 3.7

- Evaluative PCDs are typically used for large projects which have clearly defined scopes. This type of PCD allows for an assessment by Ofgem of the output delivered and an ex post adjustment to allowances, if deemed necessary.

In gas distribution, the majority of PCDs apply to replacement expenditure (repex), which relates to the iron mains replacement programme, and are mechanistic. These projects are typically assigned into categories of work, each with different unit costs, which have an allocated workload. Ofgem sets the workload for each network, with a common unit cost across categories of work.

At closeout, the PCD enables allowances to be adjusted to reflect outturn volumes of work completed, and the final delivered mix of different workload activities, based on the unit cost allowances set at the start of the price control. This means that GDNs can only outperform their PCD allowances by delivering at a lower unit cost than allowed, and cannot outperform by delivering lower volumes of work than used to set allowances.

There are also two specific evaluative PCDs proposed at GD3:

- Operational Transport Emissions Reduction PCD;
- Cyber Resilience PCD.

However due to limited information on the allowances attached to these two PCDs, and their limited expected materiality, we do not explicitly model them.

For repex PCDs, we consider it reasonable to assume a normal distribution with expected outperformance of zero. We also expect that the range of potential performance on PCDs is likely to be narrower than the range of historical performance on broader totex, due to the removal of incentives to achieve volume outperformance (because any volumes of work avoided will result in a clawback of allowances). Therefore, like for NARM, we assume that the standard deviation of PCD performance is half that of other totex, so 4.1%.

As for NARM and for other totex, we apply the TIM sharing factor to any outperformance or underperformance. In addition, for any outperformance, we assume that 10% will be clawed back, reflecting that the PCD mechanism is asymmetric by design, i.e. any undelivered workloads will result in ex post clawback of outperformance, while additional funding will not be provided (or will at least be more limited) in the case of underperformance.

Again, we consider this to be a conservative assumption. We note that there is recent precedent for Ofgem to make large ex post allowances, specifically under the Medium Sized Investment Projects (MSIP) re-opener mechanism for electricity transmission operators, where Ofgem disallowed 34% of NGET's MSIP costs ex post.[10] We test a sensitivity using a larger clawback assumption for PCDs, and report the results in Section 7.

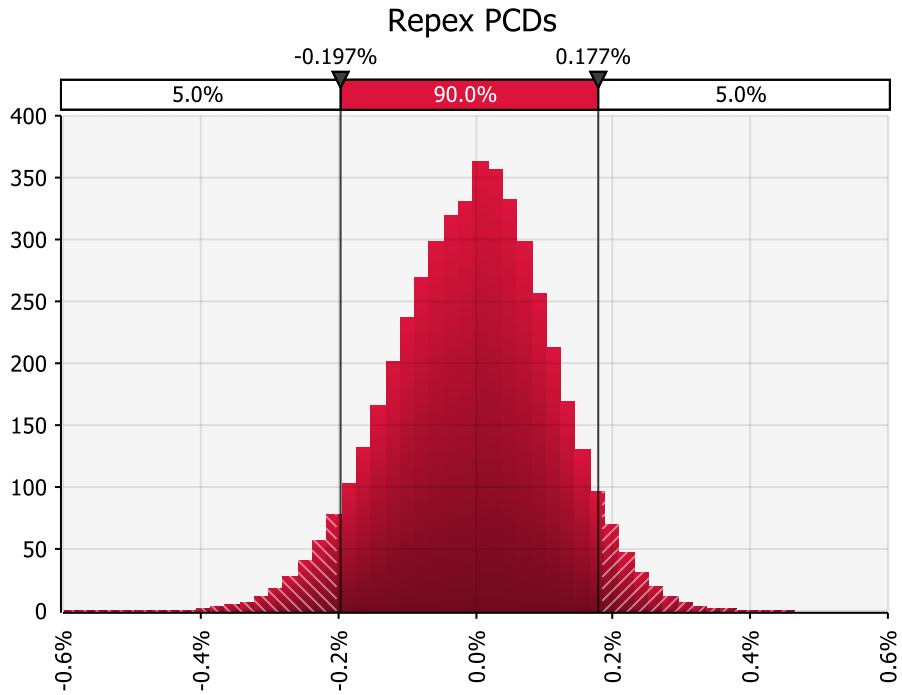
[10] Ofgem (3 September 2024) RIIO-2 Re-opener Applications 2024 Draft Determinations – ET Annex, Table ET 6. Disallowance of 34% derived as follows: (56.21 ÷ 85.24) – 1 = -34%.

Results

Figure 4 shows the Monte Carlo simulation results for the notional GDN's performance on PCDs.

The notional GDN would on average expect to underperform by 0.005% of RoRE. 90% of the time, PCDs performance falls within a range from -0.20% to 0.18%. The asymmetry that can be seen in expected PCD performance is driven by the expectation that Ofgem will claw back some proportion of outperformance, but provide no additional funding for cost overruns.

Figure 4 PCDs Monte Carlo simulation results



Source: Frontier Economics analysis

4 Other Incentives

The list of non-totex incentives and mechanisms we have modelled for the notional GDN is shown in Table 2 below. We have focused only on incentives and mechanisms that drive financial outcomes (as opposed to reputational incentives).

Table 2 Incentives and mechanisms modelled for RIIO-GD3

Incentive	Type	Description
Business Plan Incentive	BPI	Ofgem has set out provisional BPI outcomes for all GDNs in its DD
Customer Satisfaction	ODI-F	Two-sided (penalty and reward) financial ODI which continues from RIIO-GD2
Complaints Metric	ODI-F	Penalty-only financial ODI which continues from RIIO-GD2
Unplanned Interruptions	ODI-F	Penalty-only financial ODI which continues from RIIO-GD2
7 and 28 Day Repair Standards	ODI-F	Penalty-only financial ODI introduced in RIIO-GD3
Collaborative Streetworks	ODI-F	Reward-only financial ODI, continues from RIIO-GD2, but extended to all GDNs
Emergency Response Time	LO	License obligation which continues from RIIO-GD2, with scope for penalties
Guaranteed Standards of Performance	LO	License obligation which continues from RIIO-GD2, with compensation payments made to customers when guaranteed standards are not met
Return Adjustment Mechanisms (RAMs)		RAMs prevent RoRE performance from diverging too far from the baseline allowed return on equity, by scaling down returns beyond a 300bps divergence by 50%, and beyond 400bps by 90%

Source: Frontier Economics analysis
Note: ODI-F refers to financial output delivery incentives. LO refers to licence obligations.

In the RIIO-GD3 Draft Determinations, Ofgem has made the following changes to the financial incentives faced by GDNs relative to RIIO-GD2:

- Shrinkage Management ODI-F has been removed;
- A 7 and 28 Day Repair Standards ODI-F has been introduced;
- The Collaborative Streetworks ODI-F has been extended to all GDNs;
- The Unplanned Interruptions ODI-F has been split into multi occupancy buildings (MOBs) and non-MOBs, for all GDNs; and
- All ODI-Fs have updated targets, penalty and reward scores, and caps and collars.

There are also some additional incentives and mechanisms that we considered but did not include in our analysis:

- **Consumer vulnerability minimum standards.** We consider this incentive is primarily reputational and the chances of financial penalties are very low. NGN has indicated that no supplier has ever faced action against an equivalent license condition.
- **Annual environmental report.** We do not expect this to have a financial impact as we would expect a notional GDN to produce a compliant report. However, because this is a licence obligation (as well as a reputational ODI), we understand that penalties could be imposed for non-compliance. This is therefore a conservative assumption.

The rest of this section sets out the approach and parameters that we adopted for each incentive/mechanism in turn. We also show the Monte Carlo modelling results for each individual incentive. The overall modelling results are presented in Section 6.

At a high level, our approach to modelling each incentive is characterised by the following steps:

- **Step 1:** Identify any changes to the regulatory framework that Ofgem has proposed in the RIIO-GD3 Draft Determinations.

- **Step 2:** Assess recent performance data and identify any relevant trends to inform modelling assumptions.

- **Step 3:** Choose the type of distribution to simulate, and calculate parameters for the mean and standard deviation using relevant historical performance data, where available.
  - The mean is generally calculated using GD2 performance data. We generally do not use data from GD1 in our calculations because (a) data is not available for some incentives, for example those that did not exist at GD1; and (b) trends over time suggest that older data is less representative of current performance. In our view using an average of GD2 data strikes an appropriate balance between sample size and relevance of the data, and is aligned to Ofgem's methodology in setting targets for some ODI-Fs for GD3.
  - Standard deviation is generally calculated within each year of GD2, and then the average of yearly standard deviations is taken as the input parameter for the simulations. The reason we choose not to take the standard deviation of a pooled

sample of GD2 data is that time-variant factors may create variation between years that biases upwards our estimate of the likely standard deviation within a given year. For instance, if an unusual 1-in-20 weather event created a spike in unplanned interruptions and reduced customer satisfaction, the higher standard deviation that would be calculated from a pooled sample would be inflated due to variation between years. Whilst we do want to capture the risk of severe events influencing performance, this should be captured as a risk within a given year.

4.1 Business Plan Incentive

The Business Plan Incentive (BPI) is a tool used by Ofgem to incentivise companies to submit high quality and ambitious business plans.

The outcome of the BPI has already been provisionally determined in Ofgem's Draft Determinations. Therefore there is no uncertainty around the BPI outcome (other than in terms of how it may change at Final Determinations, but this is not relevant for our analysis, which is modelling the package set out at DD). We therefore apply the fixed outcome of the BPI in every iteration of the Monte Carlo analysis. Table 3 below shows the BPI outcomes for all GDNs, split into the different stages of assessment.

We understand that a number of modelling errors have been identified as part of the DD consultation process, and that Ofgem has issued an 'Issue Corrected Model' to companies. This updated model will presumably have different BPI outcomes. For now, we have used the BPI outcomes as published in the DD – these values can be updated once final BPI outcomes are known at FD.

Table 3 DD BPI Outcomes (measured in basis points of RoRE)

Company	Stage A	Stage B Comparative	Stage B Bespoke	Stage C	Total
Cadent EOE	0	-7.14	0.718	4.85	0.68
Cadent Lon		-8.67	1.304		
Cadent WM		-4.29	0.336		
Cadent NW		3.98	0.442		
NGN	0	37.33	0.28	4.78	42.39
SGN Sc	0	-5.23	0.153	-4.43	-12.40
SGN So		-9.33	0.071		
WWU	0	-6.22	-0.33	-3.78	-10.33

Company	Stage A	Stage B Comparative	Stage B Bespoke	Stage C	Total
Median	**0**	**-5.73**	**0.31**	**-0.50**	**-4.92**

Source: Ofgem (1 July 2025) RIIO-3 Draft Determinations Overview Document, Table 4

In order to model the BPI impact for the notional GDN, we take the median outcome from each stage of the BPI assessment and sum them together to calculate the total BPI impact for a notional GDN.

We use the median of GDN outcomes, instead of the mean, to better capture the design of the BPI. The design of Stage B (comparative) in particular means that only two GDNs (those more efficient than the 85th percentile benchmark) can receive a reward, and of those, only the frontier company can receive a material reward. All other GDNs will receive a penalty by design. This means that regardless of how efficient the sector is on average, six out of eight GDNs will receive a penalty at this stage. The BPI assessment is therefore punitive to the majority of GDNs by design. Using the median as opposed to the mean captures this more effectively.

As shown in Table 3, the median BPI outcome is -4.92 bps of RoRE. This applies to every year in RIIO-GD3, so to calculate the expected BPI impact, we multiply the median BPI outcome by the average GDN regulated equity. In every iteration of our simulation, we therefore model BPI as having a -4.92 bps of RoRE impact.

4.2 Customer Satisfaction Survey

Ofgem has retained the incentive design for the customer satisfaction (CSAT) ODI-F in RIIO-GD3, as well as retaining the three survey areas of:

1. Planned Work;
2. Unplanned Work; and
3. Connections.

Ofgem has outlined in the DD its intention to "raise the penalty bands significantly with the aim of consolidating performance and discouraging deterioration" and "to ensure that only CSAT performance which is exceptional relative to RIIO-GD2 performance is rewarded".[11] As such, Ofgem is proposing to set the target scores for each survey area equal to the average performance score from GD2.[12] Table 4 shows the incentive design we expect Ofgem will set

[11] Ofgem (1 July 2025) RIIO-3 Draft Determinations – Gas Distribution, paragraph 3.145

[12] Ofgem calculated the target scores at the time of Draft Determinations using the first three years of GD2, but noted its intention to update the targets once the 2024/25 RRPs are available. For our analysis, we have calculated target scores, deadbands, penalty and reward scores using the 2024/25 RRPs as we expect Ofgem will do at Final Determinations.

at the FD based on the 2024/25 RRPs (i.e. including one additional year of performance data that has become available since the DD was published, and which we expect Ofgem to reflect in the FD).

Table 4 Customer Satisfaction Incentive Design

	Max Penalty score	Penalty score	Target	Reward score	Max Reward score
Planned Work	8.68	8.80	8.96	9.12	9.20
Unplanned Work	9.00	9.00	9.58	9.66	9.70
Connections	8.83	8.94	9.09	9.23	9.31

Source: Frontier Economics analysis of GDN Regulatory Reporting Packs (RRPs) with targets taken from Ofgem's RIIO-3 Draft Determinations

Note

For each of the three survey elements, we assume performance is normally distributed with a mean and standard deviation based on the first four years of outturn GD2 performance data. Table 5 below summarises the resulting parameters.

Table 5 Customer Satisfaction Incentive Design

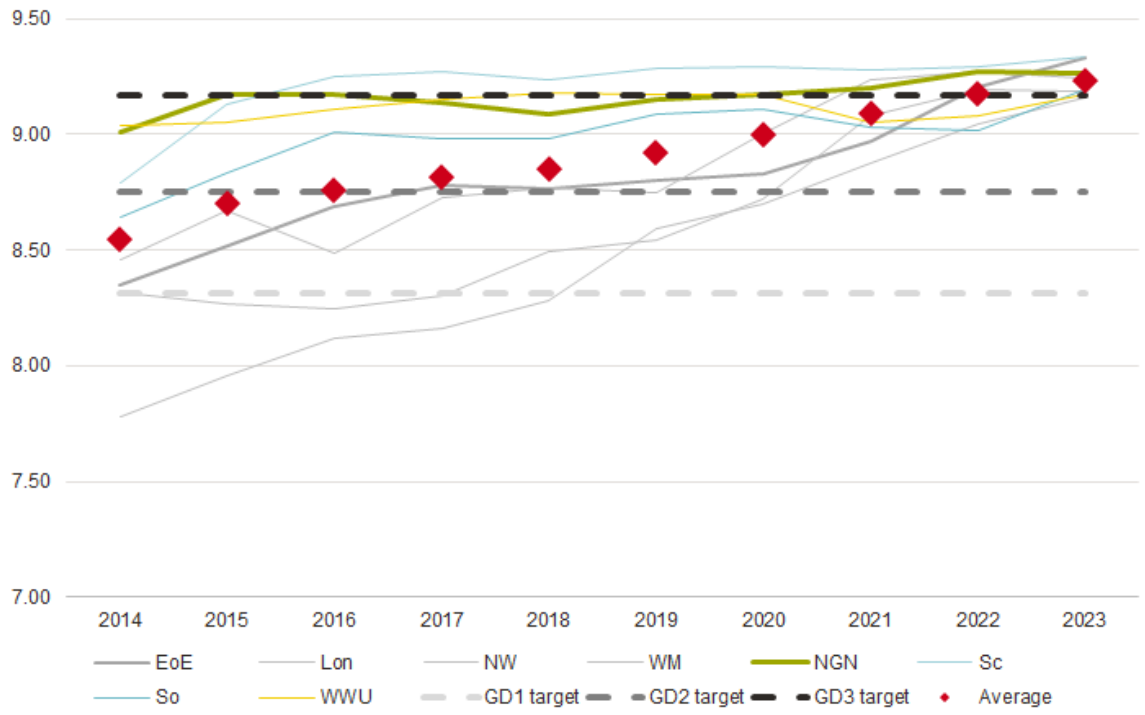
	Mean	Standard Deviation
Planned Work	8.96	8.80
Unplanned Work	9.58	9.00
Connections	9.09	8.94

Source: Frontier Economics analysis

Note

We note that over the course of GD1 and GD2, customer satisfaction performance has improved materially, notably with poorer performing GDNs catching up to the best performers (see Figure 5 below). This means that the spread of performance in recent years is far narrower than in the past. As we discuss below, this narrowing spread of performance, combined with relatively wide deadbands around targets, is likely to result in very few cases of rewards and penalties being achieved for these incentives in GD3.

Figure 5 Average customer satisfaction (across all three surveys) over time



Source: Frontier Economics analysis of GDN Regulatory Reporting Packs (RRPs) with targets taken from Ofgem's RIIO-2 Final Determinations and RIIO-3 Draft Determinations

Results

Figure 6 below shows the results of the Monte Carlo simulations for each of the Customer Satisfaction incentives, after applying the relevant deadbands, caps and collars. The results show that:

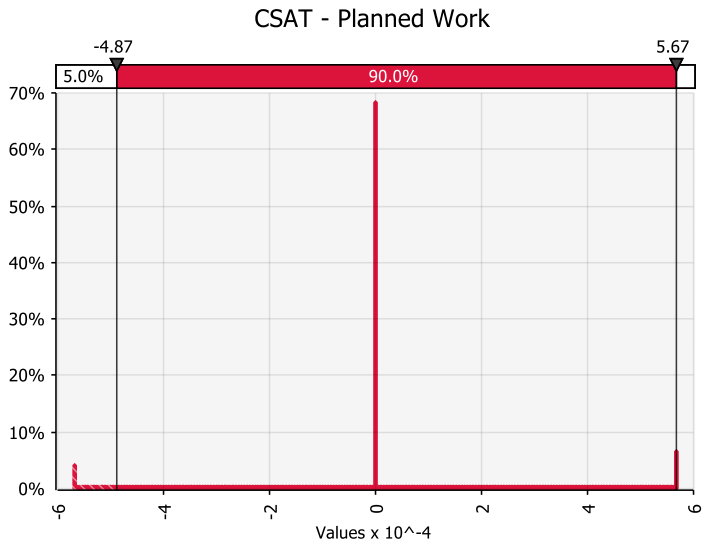
- **Planned Work and Connections:** Almost 70% of the time, the notional GDN would not receive either a reward or a penalty. This is a result of a deadband set by Ofgem which is very wide relative to the spread of GDN performance, meaning that GDNs are unlikely to perform outside the deadband and therefore unlikely to receive a reward or penalty.

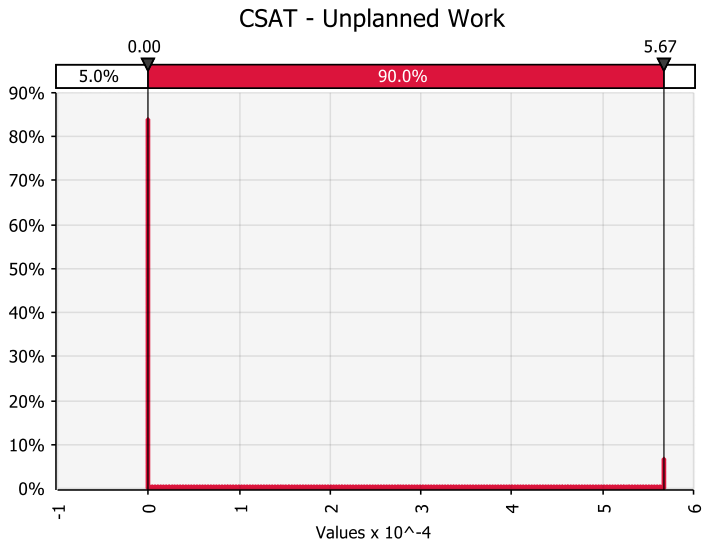
  There are also clusters of performance concentrated at the penalty caps and collars. This is to be expected as the 'long tails' of instances of performance beyond the caps and collars will all receive the maximum penalty or reward scores.

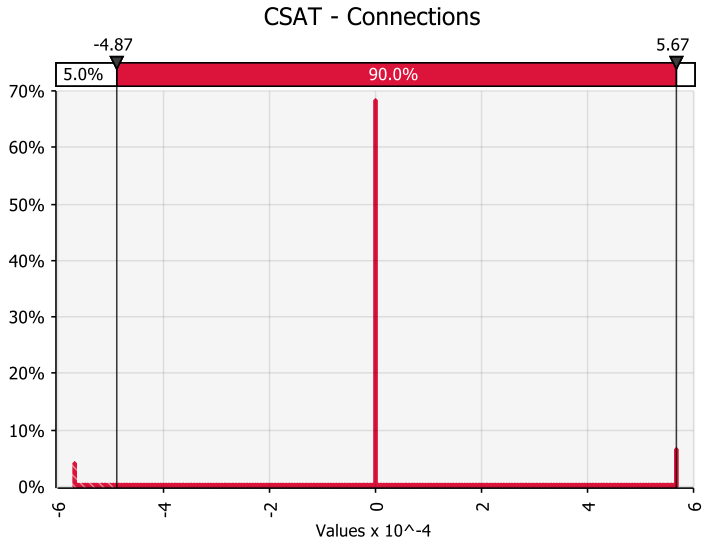
  We note that the results are slightly skewed to the upside. This finding is driven by the maximum penalty score being set by Ofgem at 1.75 standard deviations away from the mean; whereas the maximum reward score is set at 1.5 standard deviations above the mean. However, the modelling might be overly generous in this respect. With performance scores having improved over GD2, in reality the probability of further incremental improvement is likely to be lower than the probability of an incremental decline in performance, and this is especially true for large changes in performance.

- **Unplanned Work:** Ofgem has decided at DD that it would be inappropriate to impose a penalty for performance scores above 9. With the mean set at the average GD2 performance level, and GD2 performance having improved considerably for the worst performing GDNs such that the variation between GDNs is now relatively small, there is no iteration of our simulation which results in performance low enough to produce a penalty. However the reward score is stretching enough that over 80% of the time, a GDN would receive neither a reward nor a penalty.

Figure 6 Customer Satisfaction ODI-F simulation results







Source: *Frontier Economics analysis*

Note: *The y-axis in the CSAT charts shows the relative frequency (in percentage terms) of each result occurring, as opposed to the absolute frequency. For example, in the CSAT – Planned work results, we observe that almost 70% of the time there is a 0% impact on RoRE.*

4.3 Complaints Metric

Ofgem has decided to retain the penalty-only Complaints Metric ODI-F in GD3 to "maintain and consolidate effective performance"[13] in GDNs' handling of complaints.

The incentive structure has been updated in GD3, with a reduction in the minimum required performance level from 5 to 3.5 (where a lower score indicates better performance), and the maximum penalty now occurring at a score of 5. This means that GDNs receive penalties for scores above 3.5, with penalties increasing linearly up to the maximum penalty of 0.17% of RoRE, which occurs for scores of 5 and above.

As with the design of the Customer Satisfaction incentives, Ofgem has made it incrementally more difficult for GDNs to outperform, or in this case, to avoid underperforming.

However Ofgem did note concern from GDNs that a small number of complaints could disproportionately impact the overall Complaints Metric scores for GDNs with a very low baseline number of complains. Ofgem has therefore set the minimum performance level above the mean and median scores observed in GD2.

We model Complaints Metric scores as a normal distribution with mean and standard deviation parameters based on the first four years of GD2 outturn data. This leads to a mean performance of 1.91 and a standard deviation of 0.91.

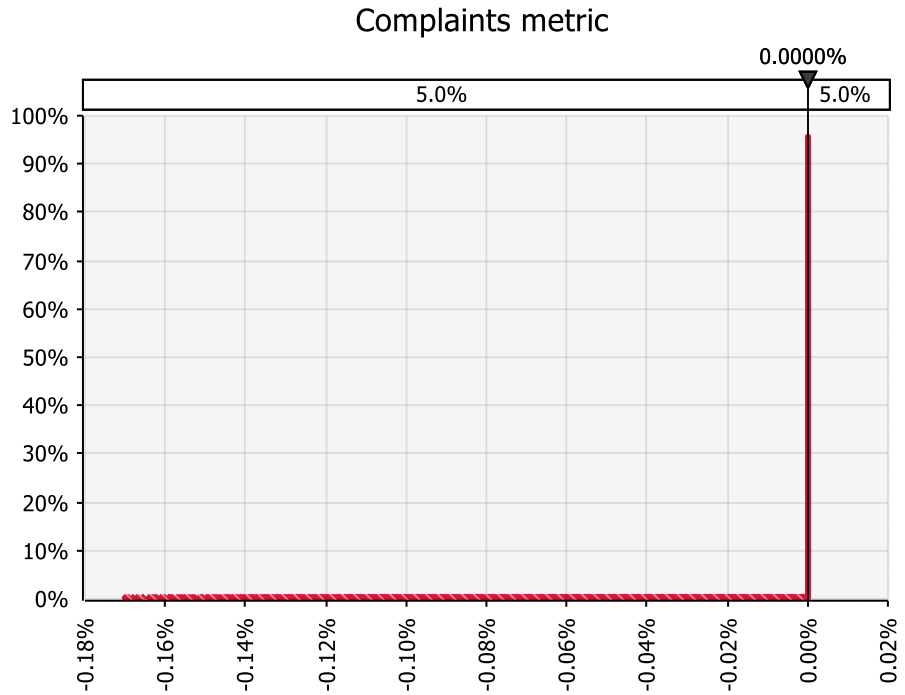
[13] Ofgem (1 July 2025) RIIO-3 Draft Determinations – Gas Distribution, page 55

Results

Figure 7 below shows the results of our Monte Carlo simulation for the Complaints Metric.

With substantial improvements in performance across GD2 for all GDNs, and specifically the improvement of the worst performing GDNs, the distribution of performance we model is fairly narrow. This leads to a result where in over 95% of iterations, the notional GDN receives neither a reward nor a penalty. The risk of a penalty occurring (given this is a penalty-only incentive) does nevertheless add downside asymmetry to the regulatory framework.

Figure 7 Complaints Metric Simulation



Source: Frontier Economics analysis

4.4 Guaranteed Standards of Performance (GSOP)

Guaranteed Standards of Performance provide financial incentives for GDNs to achieve common minimum performance standards with respect to interruptions, connections and customer service. In GD3, Ofgem is proposing to retain the GSOPs framework.

There are 14 GSOPs in total, but for simplicity we model GSOP payments in the aggregate.

All else equal, the total GSOPs payments made by a GDN is likely to be higher for GDNs with more customers. Controlling for this provides a more appropriate estimate of what a notional

GDN might expect to pay in any year of RIIO-GD3. Using outturn data on GSOPs payments from GD2 and the latest customer numbers, we calculate the average GSOPs per customer for each GDN across GD2.

We use a normal distribution to simulate GSOPs per customer with the specified parameters calculated from the average GSOPs per customer in GD2 for each GDN:

- **Mean:** 0.41
- **Standard Deviation:** 0.32

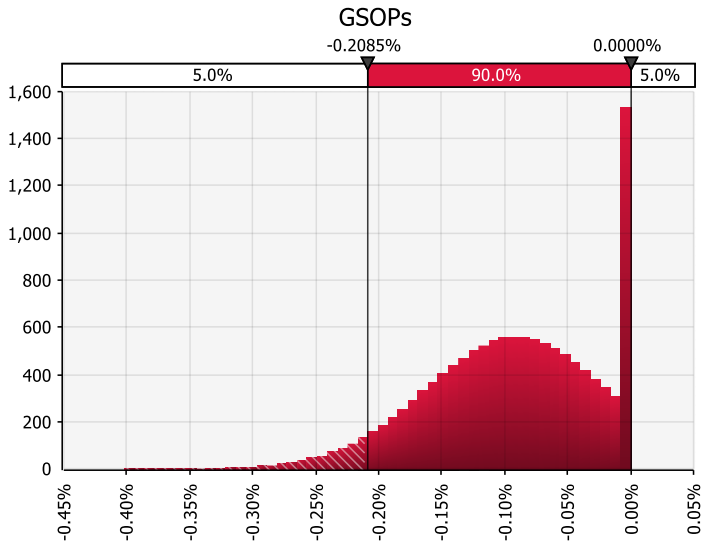
To transform the simulated GSOPs per customer into a RoRE outcome, we first multiply by the GDN average number of customers to calculate an expected outcome in financial (£m) terms. This is then divided by the sector average regulated equity, with the range of outcomes bounded so that the outcome cannot be positive (to reflect that a GDN cannot receive a payment from a customer).

Results

The results of our analysis imply an average expected underperformance of nearly 0.1% RoRE. This estimate is arguably highly conservative as our modelling approach creates a concentration of iterations where there are zero GSOPs payments made by a notional GDN (as shown by the large bar on the right in the chart below). This is because we use a normal distribution, which is symmetrical around the mean, but actual payments must be bounded at zero. In reality, there were no instances in GD2 of a GDN making zero GSOPs payments. The smallest GSOPs payment observed in GD2 was £0.10 per customer by SGN Scotland in 2021/22, which would equate to -0.07% in RoRE terms.

Our approach is therefore conservative and yet still leads to a downside risk for the notional GDN.

Figure 8 GSOPs Monte Carlo Simulation results



Source: Frontier Economics analysis

4.5 Emergency Response Time LO

All GDNs have a license obligation (LO) to respond to 97% of uncontrolled gas escapes within one hour, and 97% of controlled escapes within two hours.

In GD2, four GDNs (SGN Scotland, SGN Southern, Cadent London and Cadent North West) failed to meet these targets, and paid a total of £8m[14] into Ofgem's Energy Redress Fund as a result. This means there is both a material risk of GDNs breaching the 97% minimum performance level, and a risk of significant payments in the event of a breach.

In our previous Monte Carlo analysis in GD2, we modelled a breach of the Emergency Response time LO as a 1-in-20 event based on a notional gas network being secured against a 1-in-20 winter standard. In the event of a breach, we assumed a £5m penalty would occur.

We now have four years of outturn GD2 data available on emergency response times for all GDNs[15]. We have therefore improved our approach to modelling emergency response times, using a normal distribution with a mean and standard deviation based on observed performance data for GD2. We have also used the information on the payments made by SGN

[14] Ofgem (30 May 2025) Press release: Three gas distribution operators to pay £8, for missing callout targets

[15] GDN Regulatory Reporting Packs 2024/25, Tab 1.06 Summary_PerfSnapshot

and Cadent[16] in response to missing their targets, to calculate the average payment made for each percentage point breach of the 97% threshold.

Our modelling therefore simulates performance using a normal distribution and the following assumptions:

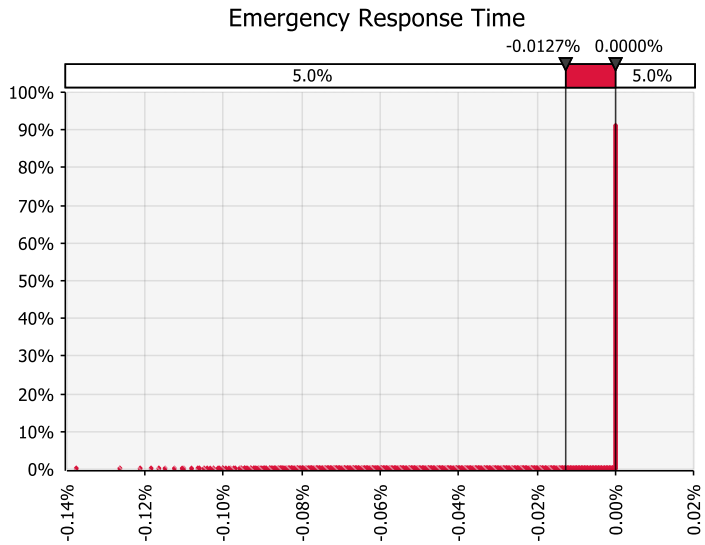
- **Mean:** 98.4%;
- **Standard deviation:** 1.1%; and
- For all iterations where simulated performance falls below the 97% minimum performance level, we assume an expected penalty of c.£535,000 for each percentage point below the minimum performance level, based on the observed payments made in GD2.

Results

Figure 9 below illustrates the Monte Carlo simulation results for the Emergency Response Time LO.

The results imply an expected average impact on RoRE of -0.002% for the notional GDN. As expected, over 90% of the time no penalty is incurred. However, breaching the minimum performance level by a significant margin can lead to fines approaching 0.1% of RoRE.

Figure 9 Emergency Response Time LO Monte Carlo simulation results



Source: Frontier Economics analysis

[16] Ibid.

4.6 Unplanned Interruptions

In RIIO-GD2, Ofgem introduced the penalty-only Unplanned Interruptions ODI-F to incentivise GDNs to prevent deterioration in the length of unplanned interruptions. Ofgem set minimum performance levels (MPLs) for each GDN, with Cadent London and Cadent EoE receiving separate minimum performance levels for multi-occupancy buildings (MOBs) and non-MOBs.

In RIIO-GD3, Ofgem has proposed to separate MPLs for MOBs and non-MOBs for all GDNs. In addition, whilst GDNs are set to be subject to MPLs that are GDN-specific for MOBs, Ofgem has proposed a common MPL for non-MOBs. Table 6 below shows the incentive framework proposed in the DD.

Table 6 Unplanned Interruptions GD3 Incentive Design

	Minimum Performance Level	Excess Deterioration Level
Non-MOBs	13	18
MOBs		
Cadent – EoE	410	601
Cadent – Lon	593	793
Cadent – NW	342	542
Cadent – WM	388	588
NGN	212	412
SGN Sc	549	749
SGN So	212	412
WWU	212	412

Source: Ofgem (1 July 2025) RIIO-3 Draft Determinations – Gas Distribution
Note: Ofgem has proposed setting NGN and WWU's MOBs target levels at equivalent to SGN Southern.

Non-MOBs

We model non-MOB performance for the notional GDN using a normal distribution with the mean and standard deviation based on outturn data for the first four years of GD2:

- **Mean:** 9.51; and

- **Standard Deviation:** 4.43.

We model penalties in line with Ofgem's Draft Determinations proposal:

- The Minimum Performance Level is set at 13 so any performance less than 13 does not incur a penalty.
- The Excess Deterioration Level is set at 18, so any performance equal to or above this level incurs the maximum penalty.
- Ofgem has proposed that the maximum penalty is equivalent to 0.17% of RoRE, split equally between MOBs and non-MOBs. Therefore there is a linear increase in the penalty, from 0 at a score of 13, to 0.085% of RoRE at scores of 18 and above.

MOBs

Modelling MOBs unplanned interruptions performance for a notional GDN is more complex, with Ofgem setting GDN-specific Minimum Performance Levels.

GD2 performance data indicates the average number of hours for each MOB unplanned interruption. Given the different Minimum Performance Levels, the data for each GDN is not directly comparable. We therefore calculate, for each GDN in each year of outturn data, the distance of observed performance from their expected GD3 target. Converting this into percentages provides a more comparable metric from which we estimate parameters for a normal distribution. Our simulation therefore predicts the percentage distance from the Minimum Performance Level for a notional GDN. The parameters used for our normal distribution are as follows:

- **Mean:** 58% below the minimum performance level; and
- **Standard Deviation:** 33%.

To calculate the penalty in each iteration of the simulation, we calculate the percentage increase in average hours required for each GDN, from the Minimum Performance Level, to reach Ofgem's proposed Excess Deterioration Level. In each iteration, if modelled performance is insufficient to meet the Minimum Performance Level, a penalty is incurred in line with Ofgem's proposed linear incentive between the Minimum Performance Level and the Excess Deterioration Level, with a cap of 0.085% of RoRE.

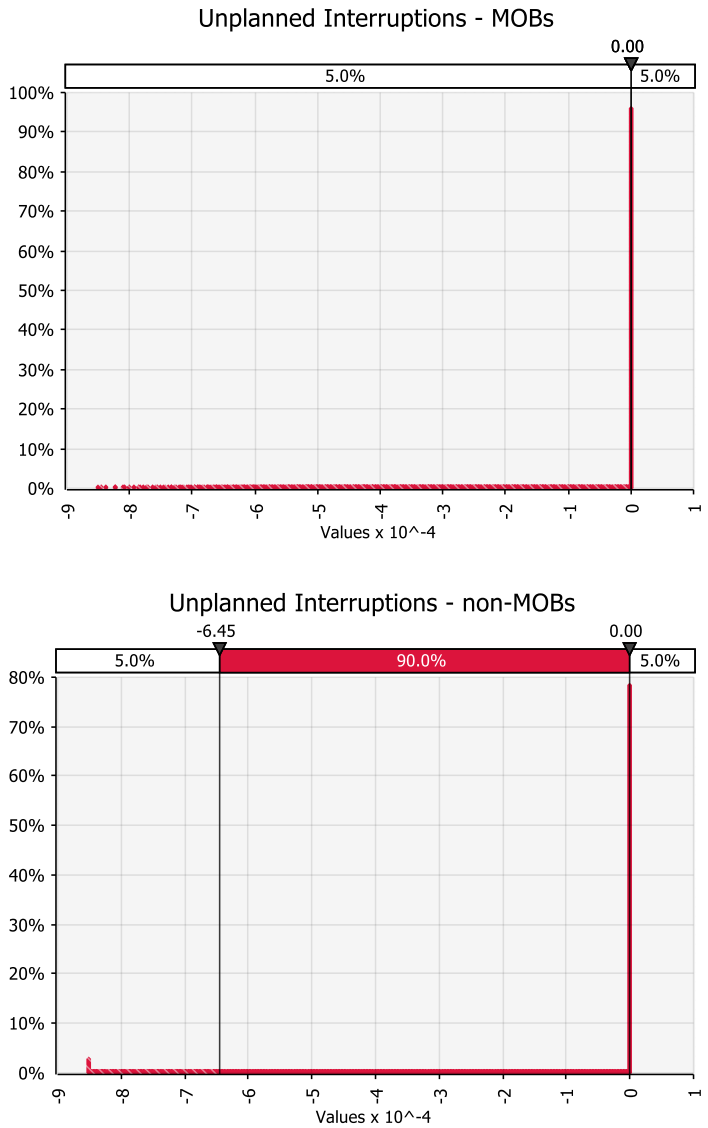
Results

Figure 10 below shows the results of our simulation.

The expected average outcome is a -0.001% and -0.008% impact on RoRE for MOBs and non-MOBs respectively. In nearly 80% of iterations for non-MOBs and over 90% of iterations for MOBs, the outcome is no penalty. However, as with the other penalty-only ODI-Fs, there remains a risk of a penalty being incurred.

We consider that for MOBs, the financial risk is likely to be underestimated by our analysis. For certain GDNs, there are relatively few MOBs so a small number, or even an isolated incident which, potentially for uncontrollable reasons, causes a significant unplanned interruption, can be highly detrimental to performance. This means that there is potentially more downside risk than captured in our analysis for GDNs with a small number of MOBs.

Figure 10 Unplanned Interruptions Monte Carlo simulation



Source: Frontier Economics analysis

4.7 Collaborative Streetworks

In RIIO-GD3, Ofgem has proposed to extend the Collaborative Streetworks ODI-F so that the reward is available to all GDNs. Previously, the incentive was only available in Greater London, to the relevant licensees of Cadent and SGN, but now all GDNs will have the opportunity to achieve a reward.

Ofgem has also set out criteria that must be met for a GDN to receive a reward. These criteria are not entirely within GDN control, with local authorities needing to meet eligibility criteria to become a central coordinator for the area, and other utilities needing to be willing and able to collaborate with GDNs. At SSMD, Ofgem stated that it had not "seen evidence that other local authorities were willing, able and suitable to deliver the central coordinator role outside of Greater London"[17]. In the DD, Ofgem indicated that the Greater Manchester Combined Authority was "supportive of extending the ODI-F into Greater Manchester"[18], however it remains to be seen whether any other local authorities would meet the criteria to be appointed as a central coordinator.

Furthermore, Ofgem has set a minimum threshold of five projects that must be completed to receive a reward. Outturn data from GD2 shows that Cadent London and SGN Southern consistently met this threshold, however Cadent EoE has not met the five project threshold in any year to date.

We assume that whilst Cadent London and SGN Southern will continue to meet the criteria, other GDNs will not be able to complete the requisite number of projects. Cadent London and SGN Southern averaged 7 and 8 projects respectively in GD2, and we therefore assume that they will continue to average that number of projects per year in GD3. This assumption may be conservative as the strength of the incentive has been reduced in GD3. Ofgem has indicated the financial reward for completing a project is set to cover the costs of collaboration and include a small financial reward, with an acknowledgement that the reward and incentive rate is lower in GD3 than in GD2.[19]

To model the Collaborative Streetworks ODI-F, we do not simulate any specific outcome but rather assume that the notional GDN has a 1-in-8 chance of being SGN Southern, and a 1-in-8 chance of being Cadent London, and therefore receiving a reward. The expected reward for the notional GDN is therefore calculated as follows:

- Assuming Cadent London and SGN Southern complete 7 and 8 projects respectively, the average number of projects completed for the notional GDN is (7+8)/8 = 1.88.
- Ofgem has set different reward rates for standard projects and projects of strategic importance, with a £75,000 and £125,000 reward respectively. We assume that 50% of

[17] Ofgem (1 July 2025) RIIO-3 Draft Determinations – Gas Distribution, paragraph 3.205

[18] Ibid., paragraph 3.206

[19] Ibid., paragraph 3.216

projects completed meet the criteria to be considered of strategic importance. The average reward per completed project is therefore £100,000.

- We therefore calculate a £187,500 reward from the Collaborative Streetworks ODI-F.
- In line with Special Condition 4.6 of Cadent's Gas Transporter License, we apply the TIM sharing factor of 50% to this reward such that in every iteration, the notional GDN receives a £93,750 reward. This equates to an expected +0.0076% RoRE outcome.

4.8 7 and 28 Day Repair Standards

In the DD, Ofgem has proposed introducing a penalty-only financial ODI-F to incentivise "GDNs to meet common performance targets for completing outstanding gas escape repairs within 7 and 28 days"[20].

Minimum performance targets have been set based on average GD2 performance. At DD, this equated to completing 75% of outstanding repairs within 7 days and 90% of outstanding repairs within 28 days.

Ofgem has suggested that the proposed targets may be adjusted once 2025 RRP data is available (which it now is). For the purposes of our analysis, we have conservatively assumed that Ofgem will increase the penalty threshold to 76% completion within 7 days and 92% completion within 28 days to reflect the full set of available data, with a corresponding increase in the penalty cap threshold to 66% and 87%.

We model each element of the Repair Standards ODI-F assuming a normal distribution with a mean and standard deviation calculated based on outturn GD2 data. In line with Ofgem's DD, the penalty threshold has been set at the observed GD2 mean with the penalty cap set at one standard deviation away from the mean. The resulting parameters are:

- **7 Day Repair Standards:**
  - **Mean** = Minimum Performance Level = 76%
  - **Standard Deviation**: 10%
  - Maximum penalty incurred at 66%
- **28 Day Repair Standards:**
  - **Mean** = Minimum Performance Level = 92%
  - **Standard Deviation**: 5%
  - Maximum penalty incurred at 87%

[20] Ofgem (1 July 2025) RIIO-3 Draft Determinations – Gas Distribution, page 22

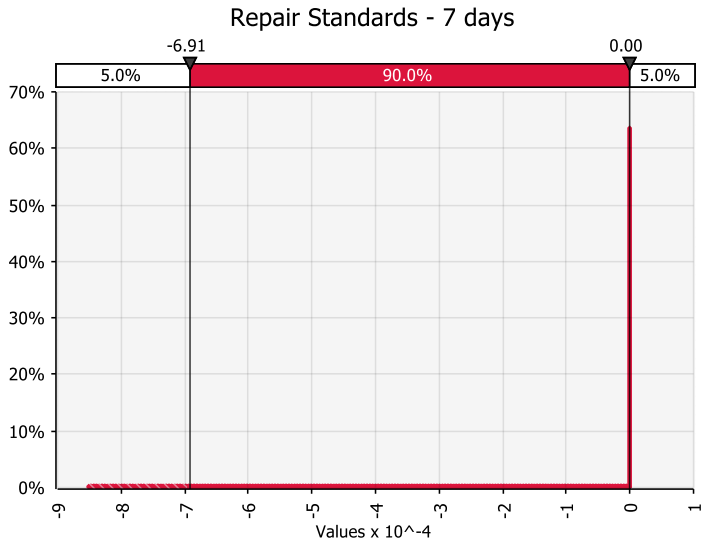
Results

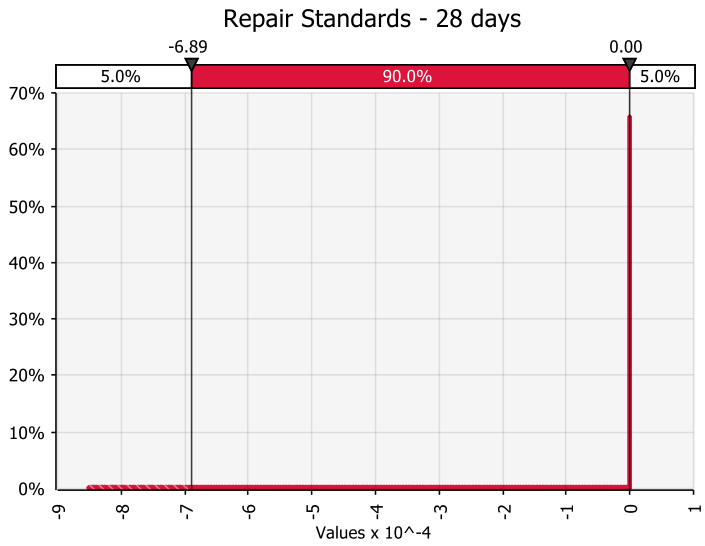
Figure 11 shows the results of our analysis. Similar to other penalty-only incentives, we observe a large concentration of iterations with no penalty incurred. However, the concentration is markedly less for this ODI-F with only 65% of iterations leading to no penalty being incurred.

The average expected penalty for a notional GDN is 0.014% of RoRE for 7 day repairs and 0.013% of RoRE for 28 day repairs. Ofgem has set the minimum performance level at the average of GD2 observed data so it is unsurprising that this ODI-F leads to material downside risk for the notional GDN.

We acknowledge that with the introduction of this ODI-F, GDNs will be incentivised to improve performance more than they were in GD2. However, the standard deviation in performance is significant enough that even if average performance improves in GD3, the risks of incurring a penalty are still relatively high.

Figure 11 7 and 28 Day Repair Standards Monte Carlo simulation





Source: Frontier Economics analysis

5 Interactions between incentives

The preceding two sections have set out how we model each aspect of the price control individually. In reality, performance of different incentives is likely to be correlated with one another. For example, one might expect a negative correlation between customer satisfaction and emergency response time (i.e. fewer incidents attended to beyond the target response time is likely to lead to more satisfied customers) to be reflected in outturn performance data.

Part of the Monte Carlo simulation therefore involves specifying correlation coefficients between all incentives in a 'correlation matrix'. Figure 12 below summarises the correlations used in our baseline modelling. Every populated cell shows the correlation coefficient between the two incentives/mechanisms shown in the relevant row and column. A correlation coefficient of 1 means that the two incentives/mechanisms are perfectly positively correlated (i.e. when one has a high outcome, the other also has a high outcome). A coefficient of -1 means the two are perfectly negatively correlated (when one has a high outcome, the other has a low outcome), and a coefficient of 0 means there is no correlation (the outcomes are unrelated).

We have calculated correlations between incentives using historical data, where available. Where historical performance data is not available (e.g. for NARM and PCD because no relevant closeout process has been completed yet), we have assumed zero correlation with other incentives.

To aid interpretation of the matrix below, some of the correlation coefficients have been switched from negative to positive (relative to the coefficients used in the modelling), or vice versa, in cases where one of the pair of incentives has an inverse relationship between scores and financial performance. Specifically, metrics such as the Complaints Metric and Unplanned Interruptions ODI-Fs, as well as GSOPs (where a reduction indicates better performance) are scaled such that higher scores are equivalent to better outcomes. The interpretation of the matrix is therefore that a positive correlation between, for instance totex and Unplanned Interruptions, means better totex performance (lower totex) is correlated with better unplanned interruptions performance (lower average duration of unplanned interruptions).

Figure 12 Correlation matrix

	Totex	NARM	PCDs	Planned Work	Unplanned Work	Connections	Complaints	MOBs	Non-MOBs	7 Day Repairs	28 Day Repairs	ERT LO	GSOPs
Totex	1.0												
NARM	0.0	1.0											
PCDs	0.0	0.0	1.0										
Planned Work	0.4	0.0	0.0	1.0									
Unplanned Work	0.6	0.0	0.0	0.8	1.0								
Connections	0.2	0.0	0.0	0.3	0.3	1.0							
Complaints	0.2	0.0	0.0	0.0	0.0	0.9	1.0						
MOBs	0.8	0.0	0.0	0.6	0.9	0.2	0.1	1.0					
Non-MOBs	0.5	0.0	0.0	0.1	0.5	0.3	0.4	0.7	1.0				
7 Day Repairs	0.6	0.0	0.0	0.6	0.6	-0.2	-0.4	0.6	0.2	1.0			
28 Day Repairs	0.6	0.0	0.0	0.7	0.7	-0.2	-0.4	0.6	0.3	1.0	1.0		
ERT LO	0.8	0.0	0.0	0.4	0.7	0.1	0.1	0.9	0.8	0.7	0.7	1.0	
GSOPs	0.6	0.0	0.0	0.8	0.9	-0.1	-0.4	0.8	0.2	0.8	0.9	0.6	1.0

Source: Frontier Economics analysis

Importantly, these correlations should not be interpreted as causal relationships (although some could be causal). For instance, the first column of the matrix shows that strong totex performance tends to be linked to strong ODI performance. Clearly, there is cost involved in delivering better ODI performance (e.g. increasing employee numbers so that emergencies can be attended to more quickly), so all else equal, companies with better ODI performance are likely to have ***higher*** (rather than lower) costs. We would expect that companies who perform well on ODIs could choose to place less cost and effort into ODI performance and thereby reduce costs further – which would entail outperforming allowances even further.

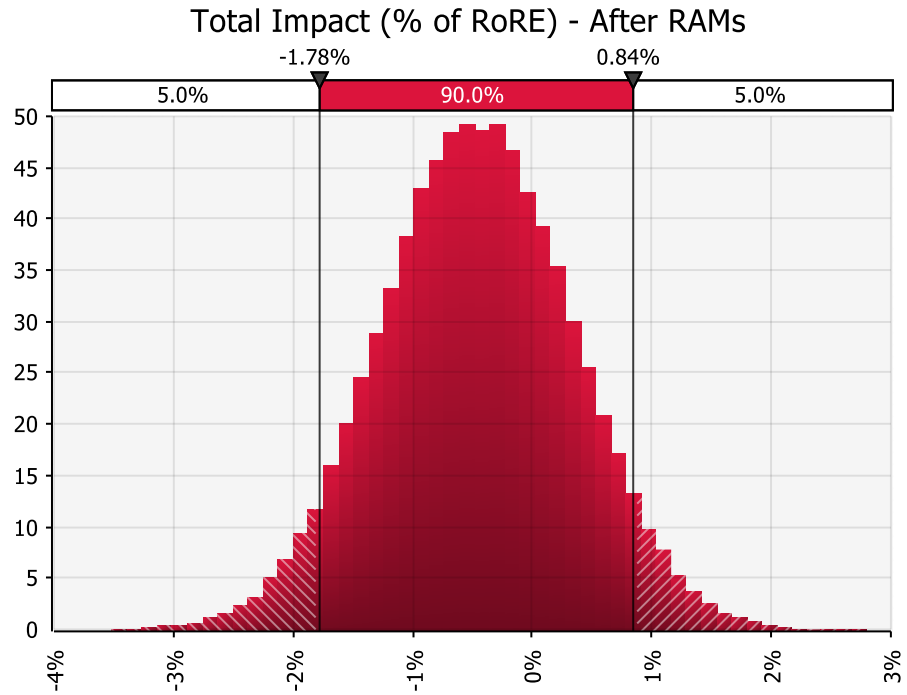
We have also tested the robustness of our results by running the Monte Carlo simulation with all correlations set to zero. The results of this sensitivity are reported in Section 7.

6 Results

Our baseline approach, described in the sections above, results in an average expected underperformance of -47bps of RoRE for a notional GDN in any given year of RIIO-GD3. This equates to -£5.8m for an average GDN.

Figure 13 below shows the Monte Carlo simulation results of our baseline model. The horizontal axis shows financial outperformance in RoRE terms and the vertical axis shows the frequency of occurrences in our simulation.

Figure 13 Baseline model results – total impact (RoRE terms)



Source: Frontier Economics analysis
Note: The x-axis measures RoRE out/underperformance and the y-axis measures the frequency of occurrences.

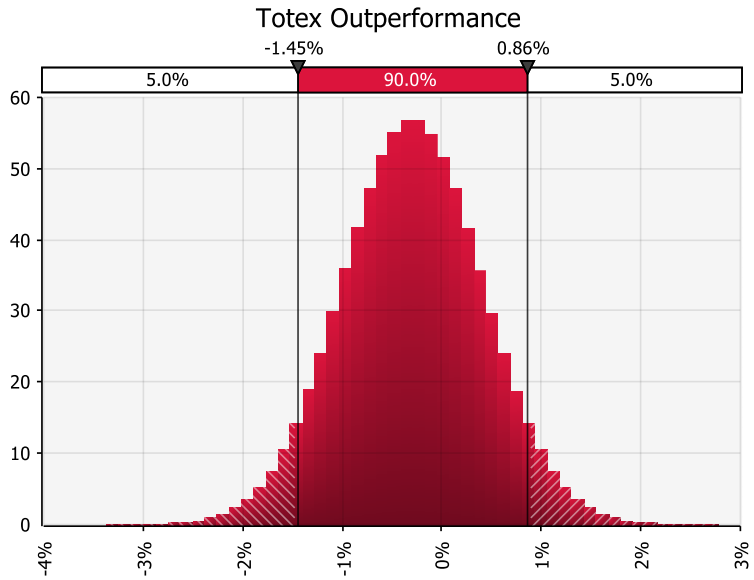
The results show that the skew of plausible outcomes is clearly to the downside, with a notional GDN expected to earn lower than the baseline allowed return on equity on average. This suggests a price control that is asymmetrically calibrated. The 90% probability range (the range of outcomes in which a notional GDN is expected to perform 90% of the time) ranges from -1.78% to 0.84%, showing that there is more scope for downside than upside in the price control.

Another way to interpret the results is by considering the 'P10' and 'P90' outcomes, i.e. the best and worst outcomes that one would expect to see with 10% probability. The results

suggest that the P10 scenario is RoRE outperformance of -1.49%, while the P90 scenario is RoRE performance of 0.56%. Again, this clearly demonstrates an asymmetric calibration of the price control.

One of the main drivers of the expected underperformance is totex, for which our simulation results are shown in Figure 14 below.

Figure 14 Baseline model results –Totex performance



Source: Frontier Economics analysis

Our simulation shows an expected underperformance on totex of -0.29% in RoRE terms. Achieving an equivalent upside outperformance occurs at the 80th percentile of our simulation. As explained in Section 3, our modelling assumptions for totex (which are calculated using RIIO-GD2 data) are conservative given the extent of disallowances that Ofgem has proposed to make to companies' submitted costs, which are almost three times larger than those made at RIIO-GD2.

The asymmetry in the results is driven further by the design of key regulatory incentives and mechanisms including:

- GSOPs underperformance with an expected -0.094% RoRE impact;
- BPI is by design likely to result in most GDNs receiving a penalty;
- PCDs performance is skewed to the downside, given that there is a non-zero probability that Ofgem claws back any outperformance;
- NARM is skewed to the downside given the 2.5% penalty for unjustified underperformance and no corresponding reward; and

- Several ODI-Fs, including the newly proposed 7 and 28 Day Repair Standards ODI-F, are penalty only and therefore pose further downside risk to a notional GDN.

Table 7 shows a full breakdown of the impact of each incentive on the results.

Table 7 Baseline Model – Breakdown of results by incentive

Incentive	Mean RoRE Impact (bps)	90% probability range (RoRE bps)
Totex (excl. NARM and PCDs)	-29.4	-145 to 86
NARM	-0.01	-8.9 to 8.8
Repex PCDs	-0.48	-20 to 18
BPI	-4.9	-4.9
CSAT – Planned Work	0.1	-4.9 to 5.7
CSAT – Unplanned Work	0.6	0 to 5.7
CSAT – Connections	0.1	-4.9 to 5.7
Complaints Metric	-0.2	0 to 0*
Unplanned Interruptions – Non-MOBs	-0.8	-6.5 to 0
Unplanned Interruptions – MOBs	-0.1	0 to 0*
Repair Standards – 7 day	-1.4	-6.9 to 0
Repair Standards – 28 day	-1.3	-6.9 to 0
Collaborative Streetworks	0.76	0.76
Emergency Response Time	-0.2	-1.3 to 0
GSOPs	-9.4	-20.8 to 0
Aggregate impact	-46.7	-178 to 84

Source: *Frontier Economics analysis*

Note: **Some ranges show 0 to 0 – this is because in 90% of iterations, the outcome was 0. There may still be a low probability of non-zero outcomes.*

In conclusion, given the DD proposals, companies will in all likelihood underperform in RIIO-GD3. Even though there is, of course, some scope for outperformance, this is more limited than the scope for underperformance.

We do not consider that it is good regulatory practice to calibrate a price control such that companies cannot expect to earn the baseline allowed return on equity on average. We recommend that Ofgem (a) revisit its approach to setting totex allowances (e.g. the use of the 85th percentile) to ensure that it is confident companies are appropriately funded to deliver at RIIO-GD3; (b) consider whether some of the asymmetric mechanisms in the price control can be made more balanced, or scaled down; and (c) consider the impact of this inbuilt downside on investability of the finance package.

7 Sensitivities

As explained above, the results of any forward-looking analysis of this type will be driven, at least in part, by the underlying assumptions. In this report, we have either used historical data to determine our assumptions, or taken a conservative approach to ensure our results are not distorted to the downside by discretionary assumptions.

In this section, we explore the impact of adjusting certain key assumptions, in order to stress-test our findings. We model the following sensitivities.

- **Totex performance:** In our baseline model, we model totex performance using a normal distribution with mean performance of -3.44%, based on GD2 outturn data. However, as noted in Section 3, the scale of proposed disallowances for GD3 relative to GD2 means underperformance arising from the RIIO-3 DD is even more likely. We model two sensitivities on totex:
  - A sensitivity where we assume **mean performance of -10%**, based on the fact that Ofgem's DD disallowances are almost three times larger than at RIIO-2 (as set out in Section 3). If company plans are similarly efficient to GD2, we would expect companies to underperform by over 10% on average.
  - Since totex underperformance is a key driver of our results, we also test an extremely conservative scenario that assumes Ofgem's proposed allowances are set at precisely the correct level to cover the costs of a notional GDN, i.e. **mean totex performance of zero**.

- **NARM and PCD:** As set out in Section 3, the NARM and PCD mechanisms enable Ofgem to make ex post adjustments to funding. The extent of adjustments is to some extent within Ofgem's discretion. For our baseline modelling we have made conservative assumptions around the extent of clawback. However we test a sensitivity where Ofgem's judgements are more downside skewed. Specifically, we assume that:
  - PCD clawbacks are 30% (compared to 10% in the baseline model);
  - GDNs keep 50% of NARM outperformance if exceeding the deadband (compared to 90% in the baseline model); and
  - GDNs keep 100% of NARM underperformance if exceeding the deadband (compared to 90% in the baseline model).

- **Cross-Correlations:** In our baseline model, we specify correlations between incentives by, where possible, calculating historical correlation in GD2. Where outturn data is unavailable (for instance on NARM and PCD performance), we have assumed there is zero correlation with other incentives. At RIIO-2, Ofgem argued that there is no evidence of correlation between totex performance and non-totex performance.[21] Whilst evidence

[21] Ofgem (9 July 2020) RIIO-2 Draft Determinations – Finance Annex, paragraph 3.121

from GD2 suggests otherwise, we run our modelling with zero correlations between incentives to test the impact on our results.

We summarise the results of each of these sensitivities below.

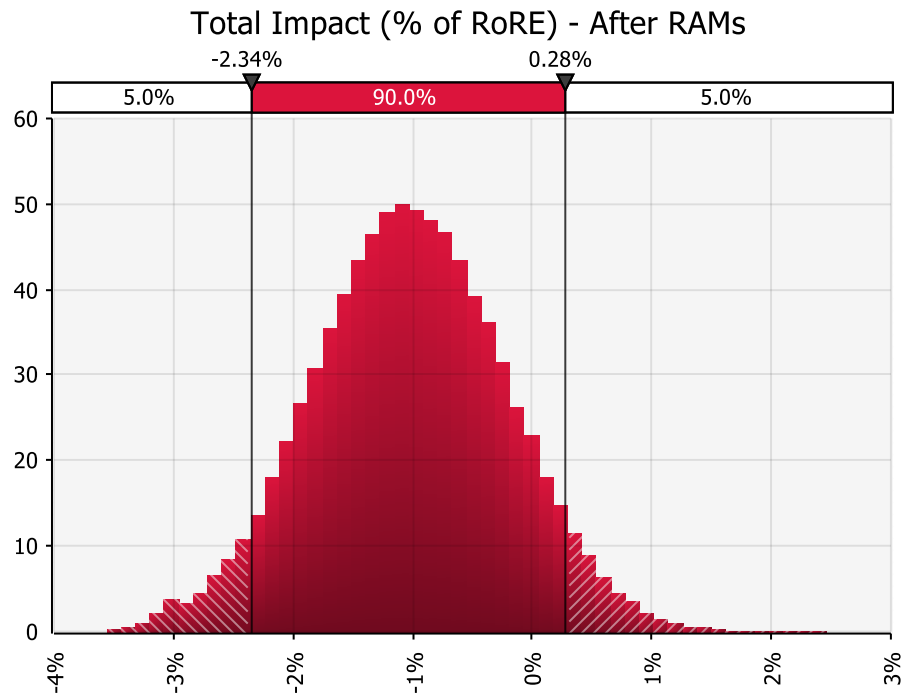
Results: Totex mean performance of -10%

Figure 15 below shows the results of the sensitivity where we assume mean totex performance of -10%. In comparison to the baseline model, this sensitivity results in:

- Average overall performance of -1.03% of RoRE (compared to -0.47%); and
- A 90% probability range of -2.34% to 0.28% (compared to -1.78% to 0.84%).

This result shows that if we adjust our assumptions to reflect the extent of disallowances in GD3, the expected underperformance for the notional GDN would be significantly larger, and RAMs would be triggered in a material number of iterations.

Figure 15 Sensitivity – Mean totex performance set to -10%



Source: Frontier Economics analysis

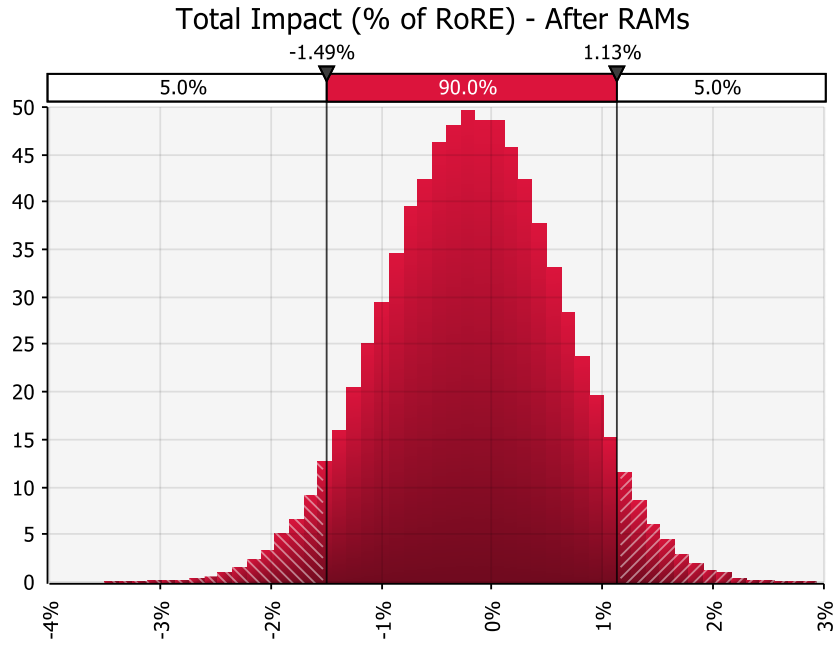
Results: Totex mean performance of 0

Figure 16 below shows the results of the sensitivity where we assume mean totex performance of zero. In comparison to the baseline model, this sensitivity results in:

- Average overall performance of -0.17% of RoRE (compared to -0.47%); and
- A 90% probability range of -1.49% to 1.13% (compared to -1.78% to 0.84%).

Importantly, these results show that although the scale of downside is reduced, the notional GDN would still expect to underperform in RoRE terms on average – even under the highly optimistic assumption that Ofgem's DD allowances are set at the correct level.

Figure 16 Sensitivity – Mean totex performance of zero



Source: Frontier Economics analysis

Results: NARM and PCD sensitivity

Figure 17 below shows the results of a sensitivity where we make stronger assumptions on Ofgem's decisions to claw back outperformance. Specifically, we adjust the following assumptions in our modelling:

- Clawbacks for PCDs outperformance are increased from 10% to 30%;
- For NARM, GDNs keep 50% of outperformance beyond the deadband (compared to 90%), but keep 100% of underperformance beyond the deadband (compared to 90%).

In comparison to the baseline model, the results of this sensitivity shows:

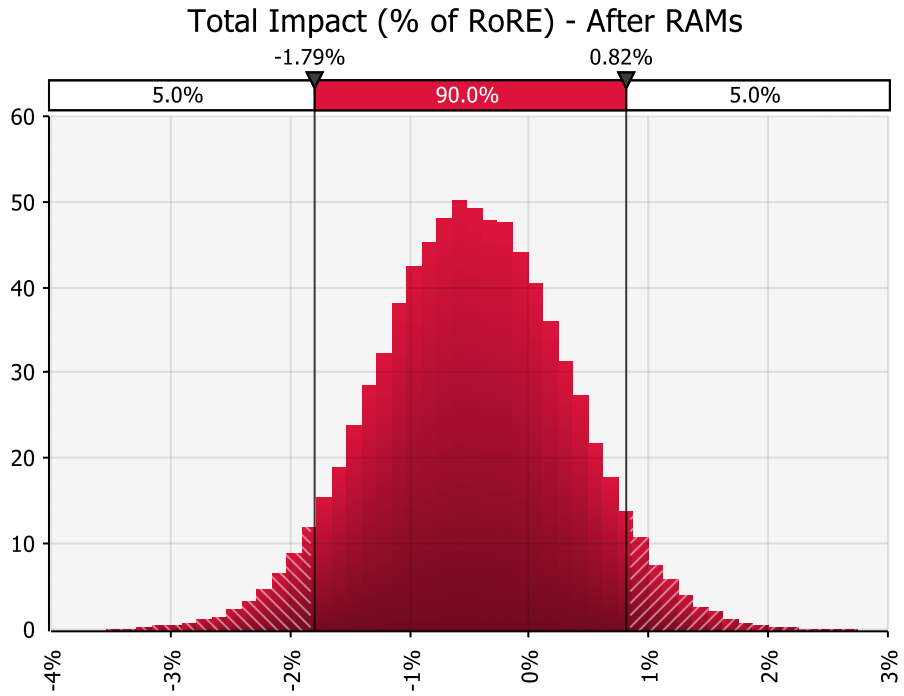
- Mean performance is -0.48% of RoRE (compared to -0.47%); and
- A 90% probability range of -1.79% to 0.82% (compared to -1.78% to 0.84%).

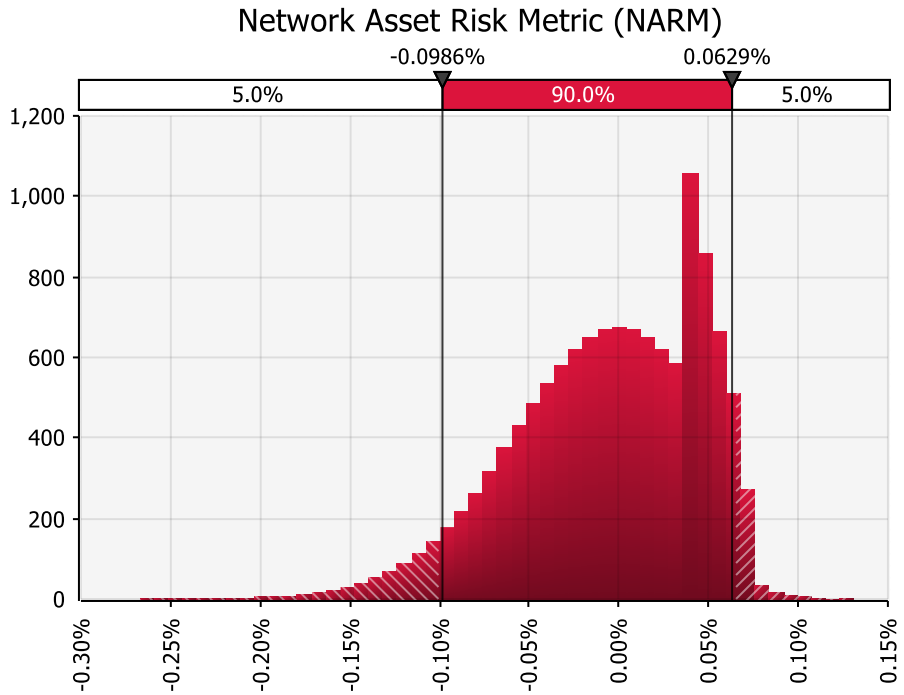
In terms of the underlying outcomes for NARM and PCDs individually:

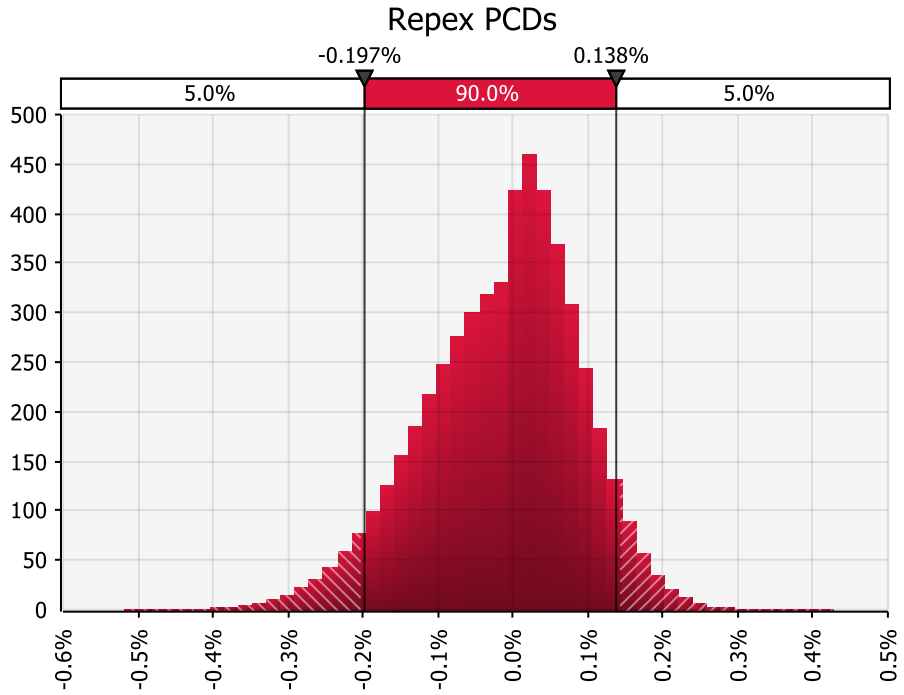
- The 90% range of NARM outcomes is -0.099% to 0.063% (compared to -0.089% to 0.088%); and
- The 90% range of PCD outcomes is -0.20% to 0.14% (compared to -0.20 to 0.18%).

This result shows that if Ofgem were to make larger clawbacks on outperformance on NARMs and PCDs, the asymmetry in the regulatory framework would increase slightly. This can be seen more clearly in the individual NARM and PCDs results also shown in Figure 17.

Figure 17 Sensitivity – Larger downside for NARM and PCD







Source: Frontier Economics analysis

Results: Cross-correlations sensitivity

Figure 18 below shows the results of a sensitivity where we set the correlations between all incentives, including totex performance, to zero. Ofgem previously argued at RIIO-2 (in the context of Monte Carlo analysis relating to the 'outperformance wedge') that there is limited

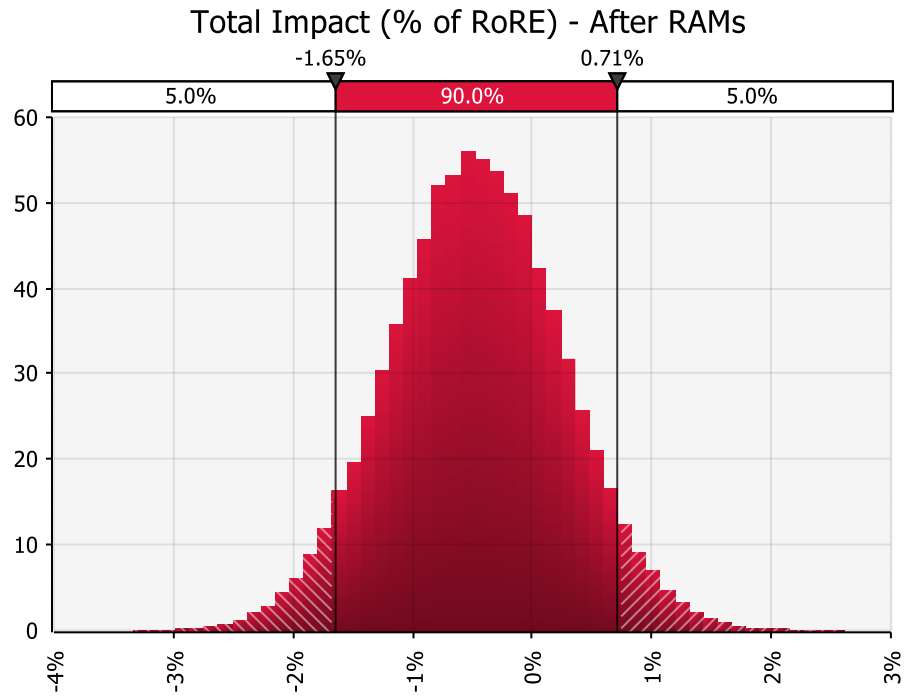
evidence of correlations between totex and financial incentives. Whilst this contradicts our analysis of GD2 data, to test the robustness of our results to changing our correlation assumptions, we run the simulation with all correlations set to zero.

In comparison to the baseline model, this sensitivity shows:

- Mean performance is -0.47% of RoRE (compared to -0.47%); and
- A 90% probability range of -1.65% to 0.71% (compared to -1.78% to 0.84%).

This results show that in the absence of cross-correlations between incentives, the range of outcomes narrows slightly with both higher outperformance and lower underperformance less likely.

Figure 18 Sensitivity – All correlations set to zero



Source: Frontier Economics analysis