Incentivising truth telling, efficiency and value for consumers

Aligning outcomes with impact of frontier performance

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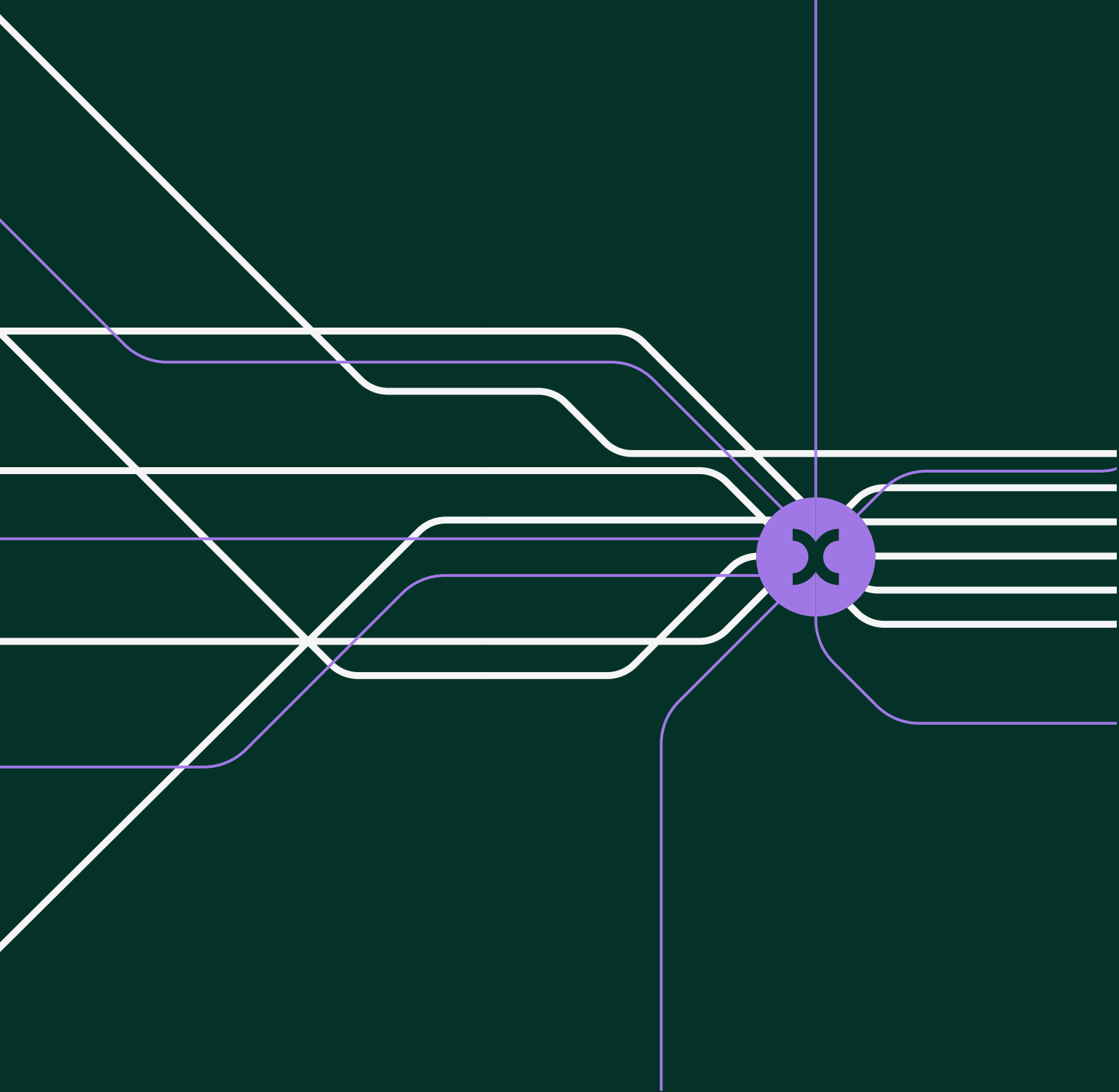
Prepared for Northern Gas Networks Limited

23 January 2024



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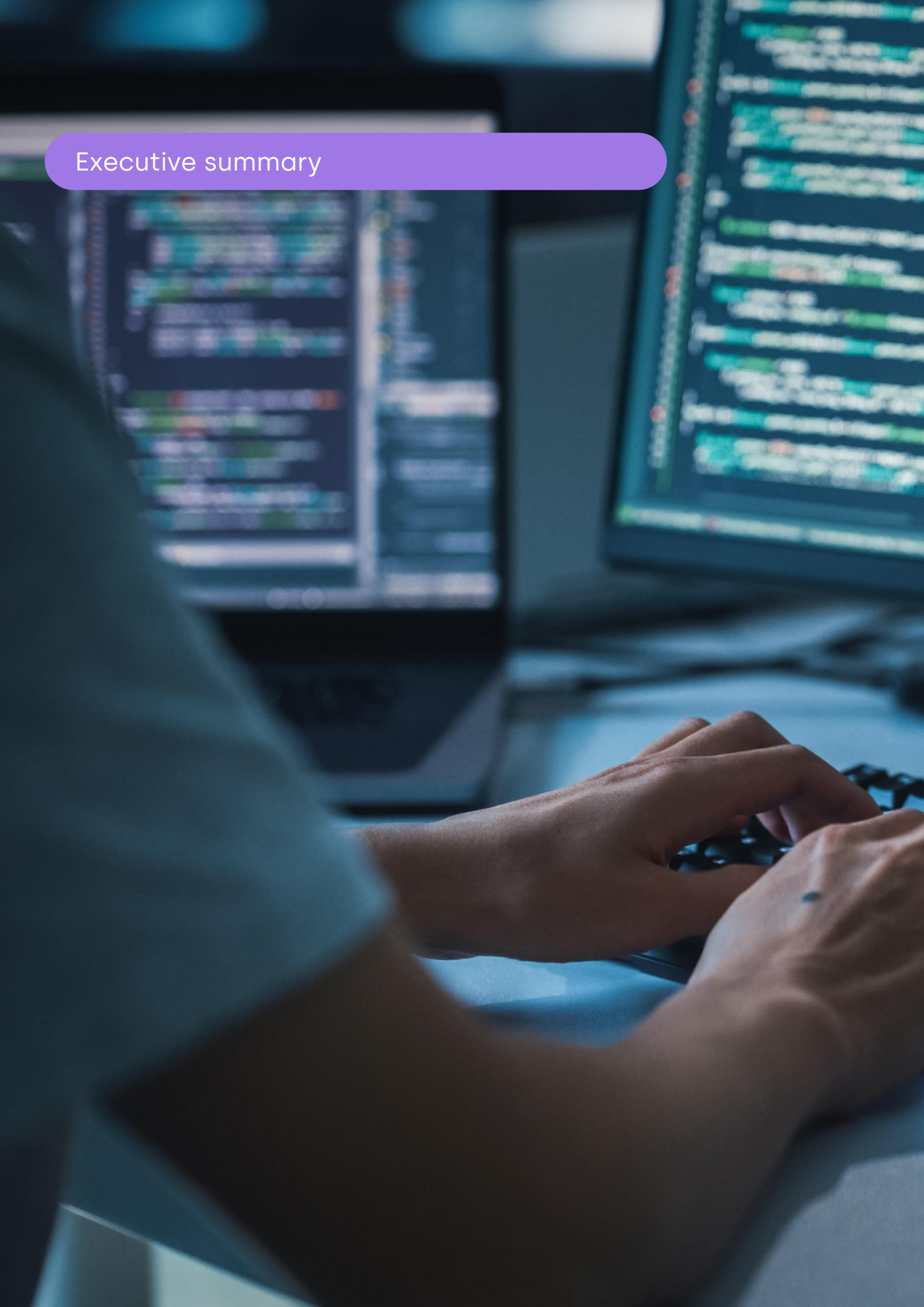


Northern Gas Networks (NGN) has commissioned Oxera to review whether the RIIO-GD2 regulatory framework appropriately incentivises companies to reveal their true potential for efficiency savings, both upfront as part of their business plan preparations, and over the course of the price control period, in order to generate value for consumers. As part of the Sector Specific Methodology Consultation (SSMC),[1] Ofgem is also consulting on, among other things, whether and how the incentives within the forthcoming RIIO-GD3 framework could be strengthened. For the purpose of this report, the relevant incentives that Ofgem is consulting on are 'truth-telling incentives' and 'efficiency incentives'.[2] The former relate to encouraging companies to submit accurate, high-quality and ambitious business plans, while the latter relate to incentivising companies to improve efficiency during a price control. This report is intended to provide evidence and, where relevant, recommendations to Ofgem in this area.

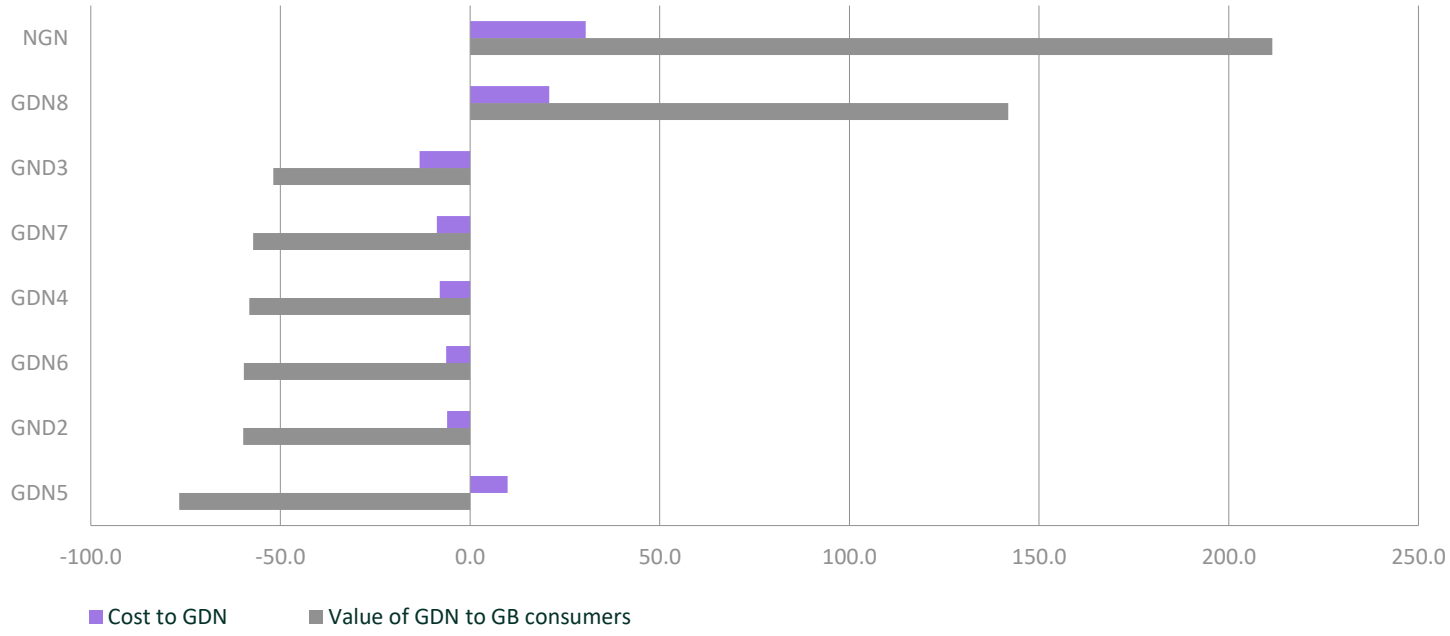
Our update of Ofgem's RIIO-GD2 cost assessment models using the latest outturn and forecast information published by the GB gas distribution networks (GDNs) confirms that NGN continues to drive the efficiency frontier, as Ofgem deemed NGN to be at the RIIO-GD1 and RIIO-GD2 Final Determinations. Industry-leading companies such as NGN have a central role in Ofgem's revenue-determination framework as they enable Ofgem to set stretching cost benchmarks for the sector, leading to reduced bills and value for money for consumers.[3] Meanwhile, revealing the full scope for efficiency improvements to drive the frontier comes with additional costs and challenges, for example in terms of significant managerial effort and the risk of lower overall allowances.[4]

We have estimated the *value of* NGN as the impact that it has on the sector's efficient cost allowance, and therefore on GB consumers' bills.[5] The analytical approach that we have used is in line with 'yardstick benchmarking'[6] that is employed by some other European regulators. It

[1] See Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, Section 7.
[2] See Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, paras 7.1. and 7.2.
[3] In the SSMC, Ofgem has stated that it will use (among other things) the performance of the frontier company to set performance targets. This will make the performance of the frontier company even more important in the price control. See Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, para. 6.93.
[4] For example, if a frontier company further improves its efficiency in the current period, it will set itself a greater cost challenge given that a frontier company may form the benchmark in Ofgem's cost models (e.g. if Ofgem were to consider a 90th percentile benchmark).
[5] Specifically, we have estimated the difference in outcomes for the sector between keeping and removing NGN from the sample.
[6] Yardstick benchmarking involves determining a company's cost allowance (or performance targets) *entirely* using external benchmarks, which can be other comparable networks or complementary alternatives.

is also consistent with the Competition and Markets Authority's (CMA) and Ofwat's approach to assessing the value of a comparator to consumers in water merger inquiries, and with the framework[7] proposed by the CMA for assessing mergers in the energy sector. In the same way, under this approach, the *cost to* NGN in driving the efficient frontier can be assessed as the impact that it has on its own efficient allowance.[8] This analysis can be used to determine the *value of* and *cost to* any GDN in driving performance, the results of which are shown below.

Cost to GDNs and associated consumer benefits (£m)



Note: The value of, and cost to, GDNs are based on the efficient modelled total expenditure (TOTEX) assuming an 85th percentile benchmark, excluding ongoing efficiency and real price effects (RPEs), over RIIO-GD2. This analysis is based on modelling using the latest outturn data from the regulatory reporting packs (RRPs).
Source: Oxera analysis.

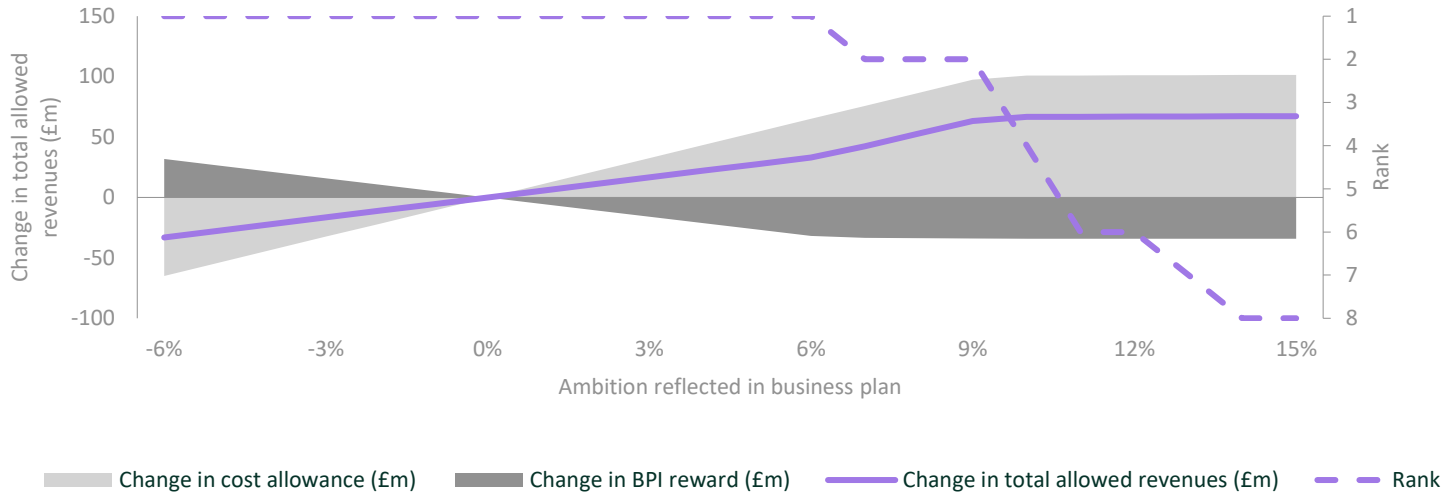
We have estimated that NGN has the highest value using Ofgem's RIIO-GD2 benchmarking models, at c. £211m over 2022–26. Moreover, the cost to NGN is also material, at c. £30m, which is greater than the cost facing any other GDN. Indeed, the cost to NGN of operating at the frontier is more than three times the c. £8.5m business plan incentive (BPI) stage 4 reward that it received for its efficient performance at

[7] See Competition and Markets Authority (2023), 'Energy network mergers: Draft guidance on the CMA's procedure and assessment', December.
[8] Specifically, the difference in outcomes for NGN between keeping and removing it from the sample.

RIIO-GD2.[9] That is, the BPI stage 4 reward that was aimed at incentivising truth-telling in RIIO-GD2 is not commensurate with either the value that NGN generates for consumers as a frontier company or the cost associated with operating at the frontier.[10]

We have further investigated the strength of the truth-telling incentive to submit ambitious and well-justified business plans by simulating how NGN's total allowed revenues (defined as the total cost allowance plus potential BPI stage 4 reward) would change if it were more or less ambitious. The outcome of this analysis is presented below.

Incentives facing NGN



Note: The change in total allowed revenues is indicated by the solid purple line, and is defined as the sum of the change in the cost allowance and the change in the BPI reward.
Source: Oxera analysis.

The simulations indicate that NGN's total allowed revenues would have been greater in RIIO-GD2 if it had submitted a less ambitious plan (i.e. if it had submitted larger TOTEX forecasts). For example, NGN can increase its TOTEX by up to 6% and still maintain its frontier position and earn (reduced) BPI payments. The reduction in BPI payments is more

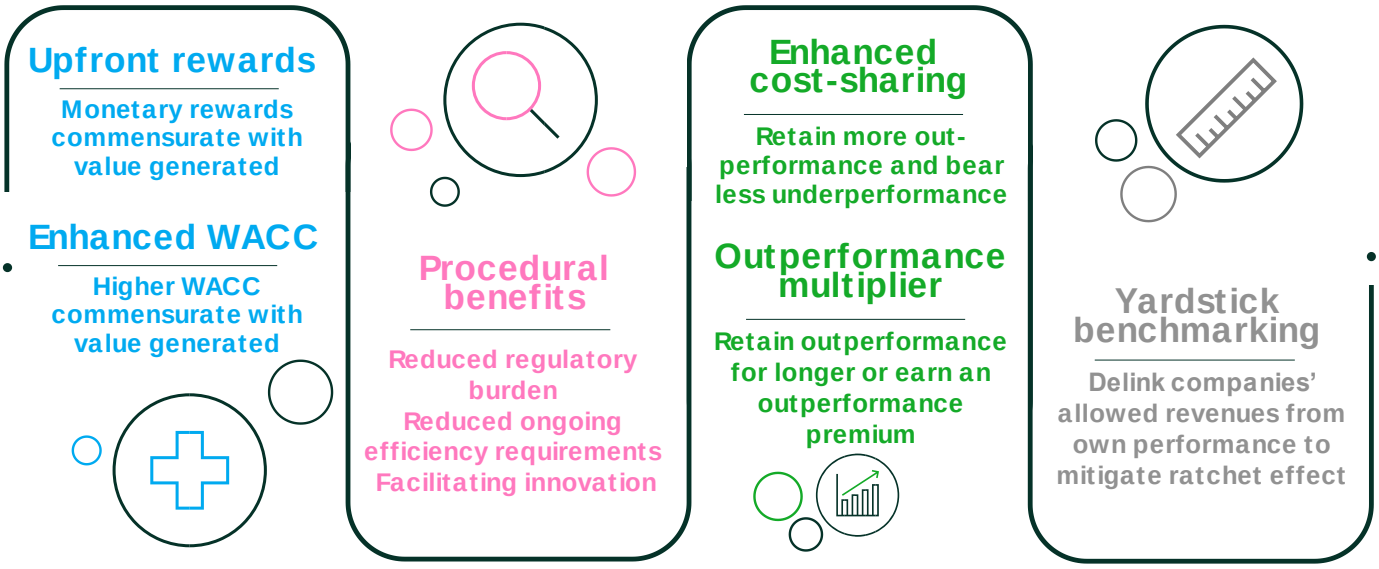
[9] See Competition and Markets Authority (2021), 'Cadent Gas Limited, National Grid Electricity Transmission plc, National Grid Gas plc, Northern Gas Networks Limited, Scottish Hydro Electric Transmission plc, Southern Gas Networks plc and Scotland Gas Networks plc, SP Transmission plc, Wales & West Utilities Limited vs the Gas and Electricity Markets Authority: Final determination Volume 3: Individual grounds', October, section 11.
[10] The focus of this analysis is on the financial cost and reward associated with the efficiency incentive. It is possible that forms of benchmarking may be adopted in other areas (such as when setting performance targets), in which case the frontier company may offer wider value through setting more stringent performance targets as well as more stringent cost targets.

than offset by the increase in NGN's cost allowance, such that the total allowed revenues are larger. NGN's total allowed revenues would increase further even where NGN is no longer estimated to be the frontier company. If NGN's submitted TOTEX increased by more than 6%, such that it was no longer a frontier company, it would have been even better off. This would begin to affect the benchmark in Ofgem's cost models[11] to the detriment of GB consumers.

The analyses presented above indicate that **the current framework would have rewarded NGN for submitting a less ambitious business plan, and penalised NGN for revealing the scope for productivity improvements**. If the overall strength of these incentives are retained for RIIO-GD3, companies may consider submitting less ambitious business plans such that they subsequently outperform and earn additional returns. While a company's own consumers may benefit from the outperformance through the cost-sharing mechanism (the efficiency incentives), this would be at the detriment of GB consumers in the form of higher bills or delayed savings due to reduced stringency of the benchmark.

Therefore, the current framework would benefit from stronger upfront incentives to encourage GDNs to submit ambitious business plans (i.e. the truth-telling incentive), and enhanced mechanisms to deliver efficient outcomes over the course of the price control period (i.e. the efficiency incentive). To that end, we have assessed how a range of well-established incentive mechanisms used by economic regulators, including Ofgem, could be applied in RIIO-GD3,[12] as summarised below.

[11] Both the 85th percentile and the 75th percentile benchmarks considered at RIIO-GD2 are between the second-ranked and third-ranked GDNs, such that these companies have the greatest influence on the benchmark.
[12] These tools are designed to incentivise efficient performance relating to costs. Alongside these tools, regulators often adopt incentives relating to service performance to ensure that companies do not reduce expenditure at the risk of important consumer and environmental outcomes.



Source: Oxera.

We consider that a range of tools, as opposed to a single tool, would strengthen the incentives on all GDNs to reveal the full scope of efficiency improvements to the benefit of consumers. Specifically, Ofgem could explore the following.

Enhanced revenues: efficient companies should have revenues set above their current (or expected) performance, through a higher cost allowance,[13] an upfront reward,[14] or an enhanced weighted average cost of capital (WACC).[15] In principle, enhanced revenues can alleviate some of the costs associated with operating at the frontier, thereby strengthening the truth-telling incentive. Higher cost allowances and upfront rewards have extensive precedent in Great Britain and across Europe, and are therefore readily implementable at RIIO-GD3. However, the existing mechanism (the BPI stage 4 reward) requires recalibration to ensure that the costs associated with operating on the frontier are fully alleviated. In RIIO-GD2, the incentive was dampened by multiplying the reward by the cost-sharing rate, such that the full cost of operating

Calibrating the BPI stage 4 reward appropriately would strengthen the truth-telling incentive by alleviating the costs of operating on the frontier.

[13] For example, at PR19, Ofwat set Portsmouth Water's efficient TOTEX allowance at 10% above what Portsmouth Water requested, given that it was assessed to be efficient in Ofwat's cost models. See Ofwat (2019), 'PR19 final determinations: Securing cost efficiency technical appendix', December, Table A1.1.
[14] Ofgem's BPI stage 4 reward can be seen as an upfront reward for efficient performance.
[15] For example, E-control provides an enhanced WACC of up to 0.5 percentage points for efficient companies. See E-control (2018), 'Electricity Distribution System Operators 1 January 2019 - 31 December 2023 Regulatory Regime for the Fourth Regulatory Period', December, section 4.3.1.

on the frontier was not alleviated. Reducing the reward in this way conflates the intended purpose of Ofgem's incentive mechanisms, can be counter-productive to truth telling, and can result in reduced consumer benefits.

Favourable cost-sharing: cost-sharing rates[16] are adopted by regulators to protect companies and consumers from unavoidable errors in the forecast of efficient costs, and incentivise companies to improve efficiency during a regulatory period. The cost-sharing rate for efficient companies can be calibrated to allow companies to retain more of the outperformance for a longer period of time,[17] and bear less of the underperformance.[18] This has two effects on incentives. First, companies are incentivised to submit efficient business plans in order to benefit from favourable cost-sharing rates (the truth-telling incentive). This will benefit all GB consumers, as the efficient business plans provide more stringent benchmarks for the sector. Second, efficient companies have stronger incentives to improve performance during the regulatory period, given that they can retain a greater proportion of the outperformance (the efficiency incentive). A favourable cost-sharing rate, on its own, comes at no upfront cost to consumers given that a company benefits from this tool only if its expenditure deviates from the efficient cost allowance. If a company underperforms, consumers would still be partially protected through the underperformance cost-sharing rate. Meanwhile, consumers would benefit from lower bills during the regulatory period if the company outperforms.[19] Caution must be exercised in calibrating the sharing rates, such that companies are not encouraged to submit overly ambitious and ultimately unachievable business plans, setting unachievable benchmarks for the sector, and passing underperformance on to consumers. This risk could be mitigated with the adoption of other incentive tools relating to the quality of the evidence required in companies' business plans.

Enhanced and asymmetric cost-sharing rates can strengthen both the truth-telling incentive and the efficiency incentive.

Procedural benefits: the regulatory process can impose a significant burden in terms of administrative time in dealing with price reviews and reporting. A reduced regulatory burden for efficient companies can

Freeing up regulatory resources can reduce the burden and encourage innovation, strengthening both the truth-telling and efficiency incentives.

[16] Whereby companies retain (bear) only a portion of the outperformance (underperformance).
[17] At PR09, Ofwat allowed companies to retain outperformance for a fixed five-year period. See Ofwat (2007), 'PR09: The OPEX incentive allowance the outperformance multiplier for 2005–10: Letter to all Regulatory Directors of water and sewerage companies and water only companies', October.
[18] Ofwat adopted these asymmetric cost-sharing rates at PR19. See Ofwat (2019), 'PR19 final determinations: Securing cost efficiency technical appendix', December, Figure 4.
[19] Generally, companies do not retain all of the outperformance, as it may not all be due to managerial efficiency. Even if the company retains all of the outperformance within the regulatory period, the revealed efficiency improvements would set more stringent targets for other companies in the upcoming price control, such that consumers would still benefit from lower bills in the medium and long run.

alleviate some of these costs. The reduced burden can take several forms, including a lighter-touch assessment of certain investments,[20] fast-tracking, reduced commitments such as on ongoing efficiency, and strengthening support for innovative activities. If the efficient company fails to meet targets or deliver on commitments, the regulator could return to stronger scrutiny. These procedural benefits can have an additional advantage for Ofgem as it can devote more resources to reviewing and monitoring inefficient GDNs. This may generate more proportionate consumer benefits, as inefficient companies would have more room for improvement than efficient companies.

Yardstick benchmarking: a principal cost facing efficient companies is that they set themselves (as well as the rest of the sector) more stringent targets, potentially creating a rachet effect. This ratchet effect may become an increasing concern if Ofgem aims to strengthen the benchmark further, such that the frontier company's performance has a more predictable effect on its own cost allowance. This can be alleviated by delinking the efficient companies' cost allowances from their own performance through yardstick benchmarking.[21] Yardstick benchmarking can be seen as a complementary approach to upfront rewards (i.e. higher cost allowances and BPI rewards to encourage truth-telling) as the upfront reward for efficient companies can be determined through yardstick benchmarking to mitigate the risk that an efficient company will reduce its own allowance by improving performance.

Delinking allowance from own performance can alleviate costs associated with operating on the frontier and mitigate the potential ratchet effect.

Recommendations and concluding remarks

Our analyses suggest that Ofgem should carefully examine the balance of rewards and incentives for companies to reveal the true cost frontier. The current framework appears to incentivise behaviour that is inconsistent with Ofgem's objective to maintain low bills and value for money through efficiency improvements. If left unchanged, consumers may face higher bills in the medium and long run as companies respond to the perverse incentives that are currently in place.

The adjustments to the incentive mechanisms proposed in this report do not represent a material departure from the approaches that Ofgem

[20] At PR19, Ofwat set smaller challenges on efficient companies' enhancement expenditure. See Ofwat (2019), 'PR19 final determinations: Securing cost efficiency technical appendix', December, pp. 55–56.
[21] For example, several European regulators, including the Bundesnetzagentur in Germany, provide a 'super-efficiency' bonus for energy DSOs that are estimated to be more efficient than the benchmark, where the bonus is calculated as the gap in performance between the efficient DSO and the estimated cost frontier when the DSO is removed from the sample.

(and other regulators) has applied in price controls. Our main recommendation is that efficient companies receive greater upfront rewards that are decoupled from submitted costs (e.g. through yardstick benchmarking) and that are commensurate with the value and cost of operating on the frontier, and enhanced cost-sharing rates. These recommendations are well aligned with the tools that Ofgem is consulting on as part of the SSMC. The framework could be supplemented with procedural benefits and other enhanced incentives for efficient companies that are linked to service delivery during the period to further strengthen the truth-telling and efficiency incentives.

As the methodology for RIIO-GD3 becomes clearer, the analysis presented here might require refinement or expansion to ensure that the findings remain relevant for the upcoming price control. Moreover, we are examining whether other elements of Ofgem's cost assessment framework might benefit from incremental improvements to strengthen incentives for efficient performance—in particular, the ability of the current regulatory framework to appropriately differentiate between frontier and non-frontier performance.

Extended summary

Northern Gas Networks (NGN) has commissioned Oxera to review whether the RIIO-GD2 regulatory framework appropriately incentivises companies to reveal their true potential for efficiency savings, both upfront as part of their business plan preparations, and over the course of the price control period, in order to generate value for consumers. As part of the SSMC,[22] Ofgem is also consulting on, among other things, whether and how the incentives within the forthcoming RIIO-GD3 framework could be strengthened relative to RIIO-GD2.

For the purpose of this report, the relevant incentives that Ofgem is consulting on are 'truth-telling incentives' and 'efficiency incentives'.[23] The former relate to encouraging companies to submit accurate, high-quality and ambitious business plans, and the latter relate to incentivising companies to improve efficiency during a price control. This report is intended to provide evidence and, where relevant, recommendations to Ofgem in this area.

Background

As a natural monopoly, gas distribution networks (GDNs) in Great Britain are subject to economic regulation. When setting the revenues that companies are allowed to recover, Ofgem undertakes a cost-benchmarking exercise to determine the efficient cost level for each GDN for the upcoming price control. Ofgem compares the costs submitted by GDNs in their individual business plans with the costs submitted by the most efficient GDNs in the industry. For an efficient GDN that is assessed as being better than the benchmark determined by Ofgem, its allowance is capped at what the GDN submitted in RIIO-GD2.

In this context, efficient or frontier companies are of principal value, given that Ofgem uses their information to set stretching benchmarks for the sector as a whole and, by extension, to reduce bills for consumers. Meanwhile, for industry-leading companies, revealing the full scope for efficiency improvements comes with additional costs and challenges in terms of managerial efforts and the risk of lower overall revenues due to Ofgem's capping of allowances or an increase in the stringency of the benchmark.[24] In other words, there is a risk that

[22] See Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, Section 7.
[23] See Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, paras 7.1. and 7.2.
[24] This is because any reward reflecting the difference between the company's actual cost and benchmark costs becomes negligible.

companies could be motivated not to reveal the full scope for their potential efficiency improvements or to undertake costly and risky investments to operate more efficiently, limiting the effectiveness of Ofgem's regime that aims to continually drive efficiencies and encourage innovation.

Ofgem adopted additional incentive mechanisms in the RIIO price controls to strengthen the incentives on companies to operate efficiently. At RIIO-GD2, Ofgem introduced the business plan incentive (BPI) mechanism in order to reward companies for submitting high-quality and efficient business plans, or to penalise them for submitting low-quality business plans (i.e. it is a truth-telling incentive). As part of the BPI mechanism, companies were given upfront rewards if their submitted costs were more efficient than Ofgem's benchmark costs. The reward was calculated as the difference between the figure that such companies submitted and the benchmark costs, multiplied by the company's cost-sharing rate determined by Ofgem.

NGN was estimated to be the most efficient GDN in the industry in the RIIO-GD1 and RIIO-GD2 Final Determinations, and has maintained its frontier position when we updated Ofgem's cost assessment models in RIIO-GD2 with the latest outturn and forecast data.[25] That is, NGN has been, and continues to be, the most efficient GDN in the sector, according to Ofgem's cost assessment methodology.

At RIIO-GD2, as the frontier company, NGN received a BPI stage 4 reward of c. £5.2m. This reward was increased to c. £8.5m in the ensuing appeal to the Competition and Markets Authority (CMA), owing to an error in Ofgem's calculation of the reward.

Given NGN's consistent frontier performance, any assessment of the value of the frontier company, and the consequent costs and challenges that it faces, is equivalent to an assessment of the value of NGN and the incentives that it faces as the frontier company.

The value of NGN as a frontier performer

We have estimated the *value of* NGN as the impact that it has on the sector's efficient cost allowance, and therefore on GB consumers' bills.[26] The analytical approach that we have used is in line with the 'yardstick

[25] This data was taken from the 2022/23 Regulatory Reporting Packs (RRPs).
[26] Specifically, we have estimated the difference in outcomes for the sector between keeping and removing NGN from the sample.

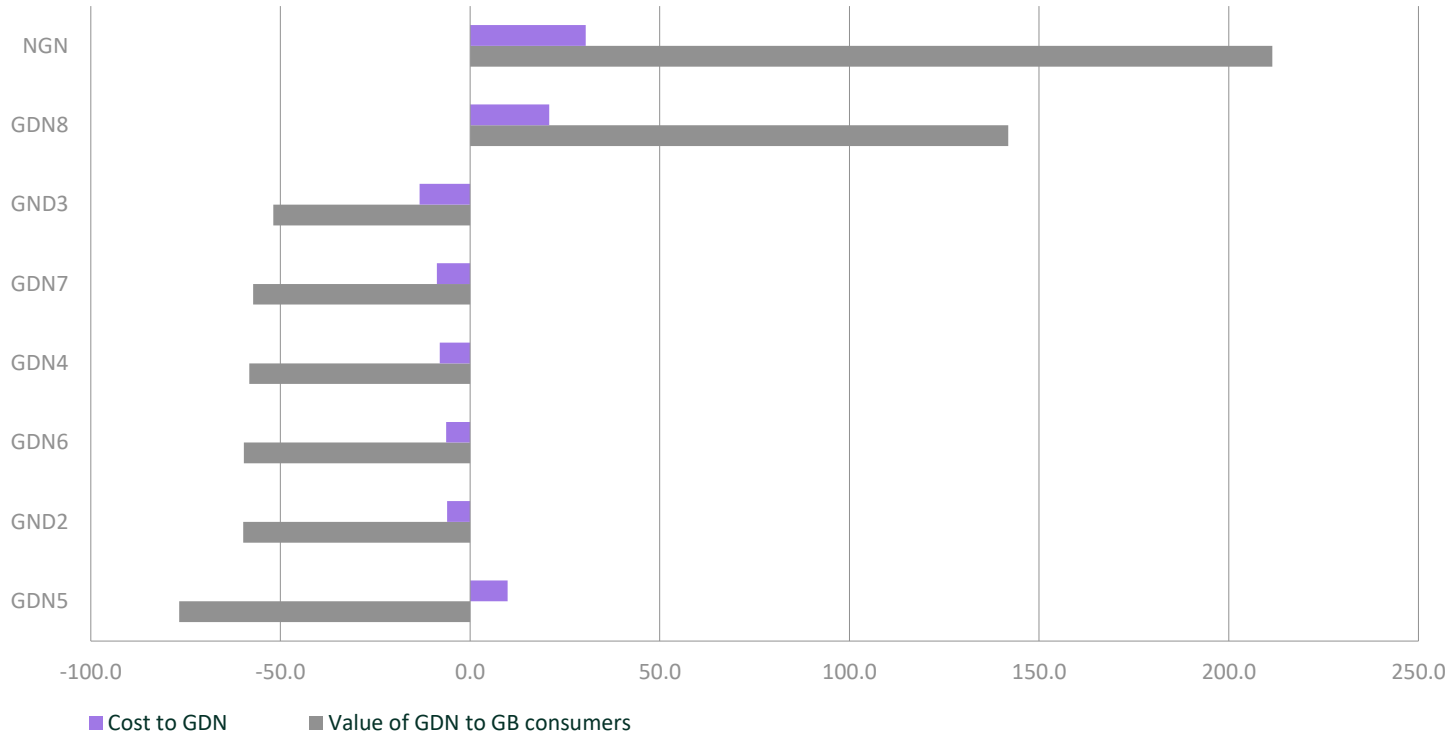
benchmarking'[27] that is employed by some other European regulators, is consistent with the CMA and Ofwat's approach to assessing the value of a comparator to consumers in water merger inquiries, and is consistent with the proposed framework[28] of the CMA for assessing mergers in the energy sector.

If NGN were to be removed from the sample, the next-highest-ranked company would set the new frontier, and the overall challenge that other GDNs face would be reduced as the benchmark becomes less stringent, resulting in higher bills for GB consumers. Moreover, NGN's industry-leading performance could result in a more challenging benchmark being set, subsequently resulting in a reduction in its own efficient cost prediction. Therefore, the *cost to* NGN of operating at the frontier can be assessed as the difference between NGN's efficient cost prediction with and without NGN in the sample.

The figure below shows the value of, and cost to, NGN of operating at the frontier, as well as the equivalent analysis for non-frontier companies.

[27] Yardstick benchmarking involves determining a company's cost allowance (or performance targets) *entirely* using external benchmarks, which can be other comparable networks or complementary alternatives.
[28] See Competition and Markets Authority (2023), 'Energy network mergers: Draft guidance on the CMA's procedure and assessment', December.

Cost to GDNs in driving performance and associated consumer benefits (£m)



Note: The value of, and cost to, NGN are based on the predicted efficient modelled total expenditure (TOTEX) assuming an 85th percentile benchmark, excluding ongoing efficiency and RPEs, over RIIO-GD2.
Source: Oxera analysis.

The value of NGN in Ofgem's cost assessment modelling is material—NGN's frontier performance leads to increased efficiency savings of c. £211m across 2022–26 for other GDNs, resulting in significantly lower bills for consumers. Meanwhile, the cost to NGN is also material, at c. £30m. NGN has the highest cost and value of any GDN in the sector, with more than half of the sector having a negative cost (i.e. their inclusion in the model increases their own allowances) and three-quarters of the sector having a negative value (i.e. their inclusion in the model reduces the estimated cost allowances for the rest of the sector).

In addition, the £8.5m BPI stage 4 reward (that NGN received for its efficient performance in RIIO-GD2) is materially lower than the cost to NGN (accounting for c. 28% of the cost), indicating that the company might have received higher overall allowances were it not operating efficiently. That is, the BPI stage 4 reward, aimed at incentivising truth-telling in RIIO-GD2, is not commensurate with either the value that NGN generates for consumers as a frontier company or the cost associated

with operating at the frontier.[29] This analysis indicates that, considered in isolation, **the BPI reward as applied at RIIO-GD2 is insufficient to appropriately incentivise companies to reveal the full scope for efficiency improvements** and operate efficiently if it were to be applied at the same level in RIIO-GD3.[30]

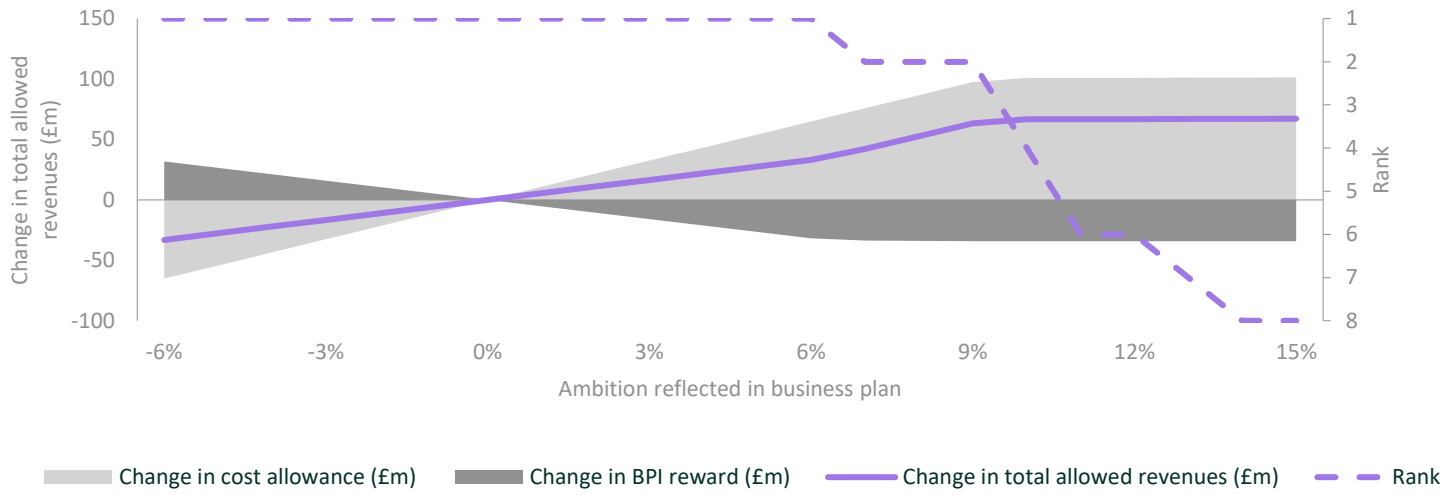
Simulating the incentives that NGN faces

Under a well-functioning, high-powered and incentive-compatible framework, a GDN should be strongly incentivised to reveal its full scope for efficiency improvements that ultimately benefit consumers through lower bills. In this respect, a GDN should be 'better off' if it operates more efficiently or submits a more ambitious business plan (and 'worse off' if it operates less efficiently or submits a less ambitious business plan). To simulate the incentives that NGN faces, we have explored how the company's total allowed revenues vary if its business plan ambition deviates from the current RIIO-GD2 submitted levels (defined as a deviation in TOTEX). Here, the 'total allowed revenues' refers to the cost allowance plus the potential BPI reward. This simulation is shown in the figure below.

[29] The focus of this analysis is on the financial cost and reward associated with the efficiency incentive. It is possible that forms of benchmarking may be adopted in other areas (such as when setting performance targets), in which case the frontier company may offer wider value through setting more stringent performance targets as well as more stringent cost targets.

[30] In the context of a 'one-shot game', whereby a regulator sets the allowance for one period only, the full cost of operating at the frontier and the magnitude of the associated rewards may not be well understood by companies. In this case, the ambiguity of the value of, and cost to, the frontier company may enable some companies to operate efficiently and drive the frontier, even if it transpires that it is against their interests to do so. However, in the context of a 'repeated game', whereby a regulator sets the allowance for successive price controls, the cost and reward associated with operating at the frontier becomes more well understood, and a company that faces repeated (net) penalties for operating efficiently may be unlikely to reveal the full scope of productivity improvements.

Simulating the incentives facing NGN



Note: The change in total allowed revenues is indicated by the solid purple line, and is defined as the sum of the change in the cost allowance and the change in the BPI reward.
Source: Oxera analysis.

The simulations indicate that NGN's total allowed revenues would have been greater in RIIO-GD2 if it had submitted a less ambitious plan (i.e. submitted larger TOTEX forecasts). For example, NGN can increase its TOTEX by up to 6% and still maintain its frontier position, and earn (reduced) BPI payments. The reduction in BPI payments is more than offset by the increase in NGN's cost allowance, such that the total outcome is better if it submitted a less ambitious business plan. NGN's total revenues would increase further with further increases in its submitted TOTEX, even where NGN is no longer estimated to be the frontier company. Moreover, if NGN's submitted TOTEX increases by more than 6%, such that it is no longer a frontier company, it would begin to affect the benchmark in Ofgem's cost models[31] to the detriment of GB consumers.

Both the simulation analysis and the value of a comparator analysis presented above indicate that **the current framework would have rewarded NGN for submitting a less ambitious business plan, and penalised NGN for revealing the scope for productivity improvements**. If the overall strength of these incentives are retained for RIIO-GD3, companies may consider submitting less ambitious business plans that

[31] Both the 85th percentile and the 75th percentile benchmarks are between the second-ranked and third-ranked GDN, such that the second-ranked and third-ranked companies have the greatest influence on the benchmark.

they subsequently outperform and earn additional returns. While the company's own consumers may benefit from the outperformance through the cost-sharing mechanism (the efficiency incentives), this would be at the detriment of the GB consumers in the form of higher bills or delayed savings due to reduced stringency of the benchmark.

While such analysis focuses on specific aspects of revenues (specifically the cost allowance and BPI payments), it indicates that the current framework requires realignment and stronger incentives for frontier companies to reveal the true efficient frontier.

Regulatory tools for incentivising frontier performance

Our empirical assessment indicates that the current framework would benefit from stronger upfront incentives to encourage GDNs to submit ambitious business plans (i.e. the truth-telling incentive), and enhanced mechanisms to deliver efficient outcomes over the course of the price control period (i.e. the efficiency incentive). To that end, we have assessed how a range of well-established incentive mechanisms used by economic regulators, including Ofgem, could be applied in RIIO-GD3.[32]

The approach adopted by Ofgem at RIIO-GD2 was to provide **upfront rewards** for companies whose business plans were assessed to be efficient. Ofwat also provided upfront rewards at the most recent price review in the England & Wales water sector (PR19) in the form of higher cost allowances for efficient companies—the cost allowance was based *entirely* on Ofwat's view of what constituted 'efficient', such that companies' cost allowances could be higher than the levels they proposed in their business plans. For example, Portsmouth Water was assessed to be efficient in Ofwat's framework, and its TOTEX allowance was set at 10% above what it submitted.[33]

In principle, such upfront rewards can alleviate some of the challenges associated with operating at the frontier (particularly issues regarding the capping of allowances). However, the upfront rewards (as applied by Ofwat and Ofgem) do not account for the value that frontier companies provide, and may not fully alleviate all of the challenges associated with operating efficiently. Indeed, Ofgem's calculation of the

[32] These tools are designed to incentivise efficient performance relating to costs. Alongside these tools, regulators often adopt incentives relating to service performance to ensure that companies do not reduce expenditure at the risk of important consumer and environmental outcomes.
[33] See Ofwat (2019), 'PR19 final determinations: Securing cost efficiency technical appendix', December, Table A1.1.

BPI stage 4 reward does not allow GDNs to recover the full cost of operating on the frontier, given that the reward is dampened by the cost-sharing rate. Reducing the reward in this way conflates the intended purpose of Ofgem's incentive mechanisms, can be counter-productive to truth telling and result in reduced consumer benefits.

As such, for the upfront rewards to be pursued at RIIO-GD3, the payments need to be appropriately calibrated to reflect both the full cost of operating on the frontier and commensurate with the value that efficient companies generate, or additional incentives need to be introduced to reflect this.

These upfront rewards and higher cost allowances reward an efficient company through higher revenues. A counterpart or supplementary method to enhancing the cost allowance is to provide an **enhanced WACC** for efficient companies, as done by E-Control, the Austrian regulator. E-Control provides a premium to the WACC of up to 0.5 percentage points for a company whose outturn performance is assessed to be more efficient than the median (with an equivalent reduction to the WACC for companies assessed to be less efficient than the median). Given Ofgem's focus on business plan data, if an enhanced WACC is pursued, it must be calibrated such that companies are not incentivised to submit low-cost, high-risk (i.e. undeliverable) business plans. Moreover, additional calibration may be required due to company-specific adjustments to the WACC.

Cost-sharing rates[34] are adopted by regulators to protect companies and consumers from unavoidable errors in the forecasts of efficient costs, and incentivise companies to improve efficiency during a regulatory period. At RIIO-GD1, Ofgem provided **enhanced cost-sharing rates** for companies that submitted efficient business plans. Ofwat took a similar approach, whereby the cost-sharing rates were enhanced and **asymmetric** for efficient companies. That is, efficient companies could retain a greater proportion of their outperformance and bear less of the costs of underperformance.

Enhanced and asymmetric cost-sharing rates affect incentives through two channels. First, companies are incentivised to submit efficient business plans as they would then face the prospect of greater returns (or smaller losses) in the upcoming regulatory period, thus strengthening the truth-telling incentive. This would benefit all GB

[34] Whereby companies only retain (bear) a portion of the outperformance (underperformance).

consumers, as the efficient business plans provide more stringent benchmarks for the sector. Second, efficient companies would be more strongly incentivised to outperform the cost allowances during the regulatory period, given that they can retain a greater proportion of the outperformance.[35]

A favourable cost-sharing rate, on its own, comes at no upfront cost to consumers given that a company only benefits if its expenditure deviates from the efficient cost allowance. In the case that a company underperforms, consumers would still be partially protected through the underperformance cost-sharing rate. Meanwhile, consumers would benefit from lower bills during the regulatory period if the company outperforms.[36]

Caution must be exercised in calibrating the sharing rates, such that companies are not encouraged to submit overly ambitious and ultimately unachievable business plans, setting unachievable benchmarks for the sector, and passing underperformance to consumers. This possible risk could be mitigated with the adoption of other incentive tools relating to the quality of the evidence required in companies' business plans.

The regulator can **extend** or **enhance** the outperformance payments that companies receive. For example, at PR09, Ofwat allowed companies to retain any outperformance for a fixed five-year period, rather than having allowances re-set at the next regulatory period.[37] Moreover, companies assessed to be efficient at the price review received an **outperformance multiplier**—i.e. for every £1 spent below the allowed revenues, the efficient companies would receive £1.50 in outperformance rewards. Providing additional rewards for

[35] There will need to be additional checks to ensure that companies are not outperforming by compromising on their obligations.
[36] Generally, companies do not retain all of the outperformance, as it may not be all due to managerial efficiency. Even if the company retains all of the outperformance within the regulatory period, the revealed efficiency improvements would set more stringent targets for other companies in the upcoming price control, such that consumers still benefit from lower bills in the medium and long run.
[37] One concern with the current system is that a company is not equally incentivised to improve efficiency throughout a price control—if a company makes a productivity improvement in the first year of the price control, it can earn additional outperformance payments in every subsequent year; meanwhile, if a company makes a productivity improvement in the last year of the price control, it only retains the outperformance for one year before allowances are reset at the next price control. Extending outperformance payments provides greater certainty regarding the rewards that companies receive, regardless of when the outperformance materialises. This mechanism is being considered by the Italian Regulatory Authority for Energy, Networks and Environment (ARERA) for the Italian energy networks.

outperformance in this way can strongly incentivise companies to improve their efficiency and reveal the true efficient frontier.

One limitation with amending how cost-sharing rates and outperformance payments operate is that, under certain conditions, efficient companies may be incentivised to submit higher cost plans in order to receive higher allowances, and subsequently outperform at the enhanced sharing rate.[38] This is particularly the case if companies' allowed revenues are tied to what they submit in their business plans. However, this could be alleviated through **yardstick benchmarking**.

Yardstick benchmarking involves removing the link between a company's cost allowance and its own performance. A well-understood way of doing so is to remove the company from the sample when assessing its efficient cost requirements—indeed, this is the approach adopted by the ACM in its assessment of the distribution system operators (DSOs) in the Netherlands, and the Bundesnetzagentur's determination of efficient allowance for frontier DSOs in Germany.[39]

Yardstick benchmarking can be seen as a supplement to upfront rewards if the reward is based on the difference between a company's current (or forecast) performance and a benchmark excluding the efficient company from the sample. Doing so also alleviates the risk of a rachet effect, wherein a company suffers a reduced reward if it improves its performance by setting itself a more challenging benchmark.[40]

Reducing regulatory burden for efficient companies can provide appropriate procedural benefits to submit high-quality, ambitious business plans. The reduced burden can take several forms, including a fast-tracking exercise (whereby efficient companies have their regulatory parameters determined early on in the price-review process); a lighter-touch assessment in some areas of the price control; or less regulatory scrutiny on applications for additional funding (e.g. on innovation). Specifically, in relation to innovation, the regulator could consider reducing or removing the ongoing efficiency target for frontier

[38] Indeed, multiple European energy regulators consider yardstick benchmarking to determine the 'efficiency bonus' for frontier companies.
[39] This strategy may be optimal (in terms of maximising returns) for a GDN if it is confident that it will be assessed to be efficient at the upcoming price control.
[40] Note that the ratchet effect may become an increasing concern if Ofgem aims to strengthen the benchmark further, such that the frontier company's performance has a more predictable effect on its own costs.

companies, with the monetary headroom being earmarked for innovative projects.

Reducing the burden on efficient companies has the added advantage that it could free resources for the regulator to scrutinise inefficient companies more closely. This may generate more proportionate consumer benefits, as inefficient companies would have more room for improvement than efficient companies.

Ofgem can build in safeguards to protect consumers if the efficient company's performance deteriorates. For example, if the efficient company fails to meet targets or deliver on commitments, the regulator can return to stronger scrutiny during the price control. As well as protecting consumers from deteriorating performance, the prospect of returning to stronger scrutiny acts as an efficiency incentive for the company to at least maintain its efficient position.

Recommendations and concluding remarks

The analysis presented in this report indicates that the regulatory framework adopted at RIIO-GD2 requires realignment and strengthening of incentives, with respect to both truth-telling in the business plan submissions and efficiency improvements during the price control. The BPI rewards adopted at RIIO-GD2 were not commensurate with either the challenges associated with operating at the frontier or the value of the frontier company in Ofgem's benchmarking, and our simulation analysis indicates that NGN would have been better off had it submitted a less-ambitious business plan. In the long run, these misaligned incentives will have a detrimental impact on consumers—without efficient companies continuously driving the frontier forwards, consumers will inevitably face higher bills or delayed savings.

Ofgem has a range of tools available to incentivise and reward efficient companies. We consider that it would be beneficial to adopt a combination of tools at RIIO-GD3, covering the following areas.

- **Enhanced revenues.** Efficient companies' allowed revenues should be set above their current (or expected performance) in order to alleviate the costs of operating on the frontier. While this could be achieved through a range of tools, we consider that an appropriately recalibrated version of the BPI stage 4 reward that strengthens the incentives for companies to submit ambitious business plans may be easiest to implement in RIIO-GD3. This would represent an evolution to the RIIO-GD2

Calibrating the BPI stage 4 reward appropriately would strengthen the truth-telling incentive by alleviating the costs of operating on the frontier.

framework, and is aligned with Ofgem's goals as outlined in the SSMC.[41]

- **Favourable cost-sharing**. The cost-sharing rates for efficient companies should be enhanced, such that they can retain a larger share of the outperformance (or indeed earn a premium on the outperformance), and bear less of the underperformance relative to inefficient companies. Enhanced and asymmetric cost-sharing rates have precedent in Great Britain, and are being consulted upon in the SSMC, such that they are readily implementable in RIIO-GD3.
- **Procedural benefits.** Reducing the regulatory burden on efficient companies reduces the cost (both in terms of time and resources) facing these companies, which can be used to facilitate innovation. Moreover, reduced burden on efficient companies could free regulatory resources to focus on monitoring less-efficient companies. Efficient companies can be placed under stricter scrutiny if their performance deteriorates during a price control, such that consumers are protected from underperformance.
- **Yardstick benchmarking.** Completely dissociating companies' cost allowances from their historical or expected performance can alleviate the costs associated with operating on the frontier. There is a complementarity between yardstick benchmarking and enhanced revenues. Using yardstick benchmarking to calculate the upfront reward will mitigate the risk that a frontier company's efficient performance may reduce its reward.

Enhanced and asymmetric cost-sharing rates can strengthen both the truth-telling incentive and the efficiency incentive.

Procedural benefits can encourage innovation, strengthening both the truth-telling and efficiency incentives.

Delinking allowance from own performance can alleviate costs associated with operating on the frontier, and mitigate a potential ratchet effect.

The adjustments to the incentive mechanisms proposed above do not represent a material departure from the approaches that Ofgem (and other regulators) has applied in price controls.

As a range of tools may be required to appropriately incentivise and reward frontier performance, it is important that the overarching incentive mechanism is sufficiently transparent for companies to understand the outcome for them under different scenarios, such that they can respond appropriately. A mechanism that is overly complex might have minimal impact on companies' behaviour.

The analysis presented in this report is based on the RIIO-GD2 framework. As the methodology for RIIO-GD3 becomes clearer

[41] See Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, para. 7.25.

(e.g. during and after the SSMC), the analysis may need to be refined or expanded to ensure that the findings remain relevant for the upcoming price control.

Moreover, we are examining if other elements of Ofgem's cost assessment framework could benefit from incremental improvements. In particular, we are assessing if Ofgem's framework is able to appropriately differentiate between frontier and non-frontier performance. That is, whether the outcomes of its benchmarking exercise (such as unit cost allowance on activities) are based purely on uncontrollable differences between GDNs, and not conflated with other factors (e.g. managerial inefficiency).[42]

[42] We note that Ofgem is currently consulting on its cost assessment methodology as part of the Sector Specific Methodology Consultation (SSMC). In the SSMC, Ofgem states that it is exploring alternatives to the single TOTEX model used as RIIO-GD2, such as more disaggregated modelling, the use of alternative cost drivers and the application of pre-modelling adjustments. We intend to explore these issues and others as part of this exercise.

1 Introduction

Northern Gas Networks (NGN) has commissioned Oxera to review whether the cost assessment models for the most recent price control (RIIO-GD2) and the wider regulatory framework appropriately incentivise companies to reveal the true potential for efficiency savings, both upfront as part of the business plan preparation, as well as over the course of the price control period, to generate value for consumers.

As part of the SSMC,[43] Ofgem is also consulting on, among other things, whether and how the incentives within the forthcoming RIIO-GD3 framework could be strengthened. For the purpose of this report, the relevant incentives that Ofgem is consulting on are 'truth-telling incentives' and 'efficiency incentives'.[44] The former relates to encouraging companies to submit accurate, high-quality and ambitious business plans; while the latter relates to incentivising companies to improve efficiency during a price control. This report is intended to provide evidence and, where relevant, recommendations to Ofgem in this area.

As a natural monopoly, gas distribution networks (GDNs) in Great Britain are subject to economic regulation, whereby Ofgem, as the sector regulator, sets rules and expectations regarding what the companies are allowed to charge and what services they are obligated to deliver.

At a simple level, there are two broad forms of economic regulation that are typically adopted.

- **Cost plus regulation.** Here, the company is able to recover the outturn costs of its operations, plus a rate of return that is determined by the regulator.
- **Revenue cap regulation.** Here, the regulator fixes the revenues (or prices) that the company is allowed to recover, and the revenue is typically dissociated from companies' outturn expenditure in order to incentivise efficient behaviour. The allowed revenues are typically determined based on the

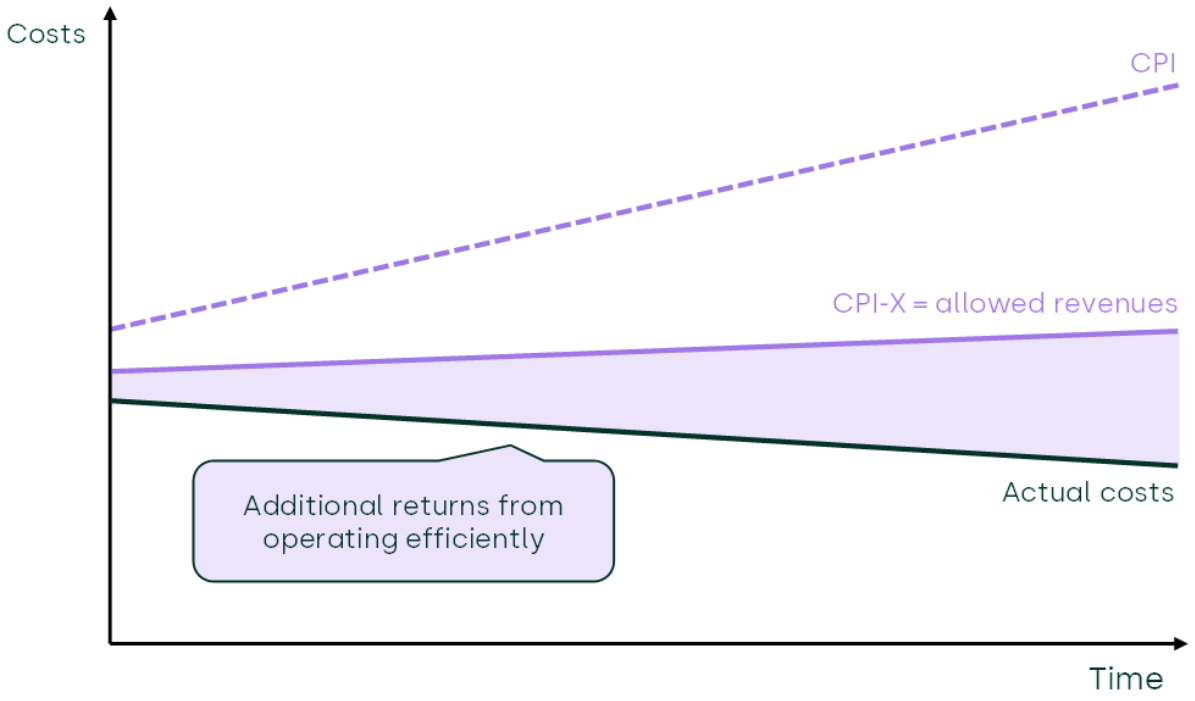
[43] See Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, Section 7.
[44] See Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, paras 7.1. and 7.2.

regulator's assessment of the company's efficient costs. CPI-X is a common form of revenue cap regulation.

A principal concern with simple applications of cost plus regulation is that there is weak intrinsic incentive[45] for companies to operate efficiently—if a company incurs costs inefficiently, it will be able to recover these inefficient costs (and earn a return on these inefficient costs) through higher prices.

Meanwhile, in principle, the CPI-X framework has good intrinsic incentives for companies to improve their efficiency. As the revenues are decoupled from companies' actual costs within a regulatory period, companies can earn greater returns by reducing their costs below what the regulator has allowed, as illustrated in the figure below.

Figure 1.1 CPI-X framework



Source: Oxera.

In this example, the regulator fixes the revenues that a company can recover at the start of the price control, shown by the **purple** line. Over

[45] Because there are limited incentives intrinsic to the cost plus regulatory framework, it is common for regulators to undertake ex post efficiency assessments when implementing this framework.

the regulatory period, the company has been able to deliver its overall obligations at a lower cost (marked by the **dark green** line), and earns additional returns as a result (known as 'outperformance', shaded in **light purple**). The reverse also holds—if a company spends more than what the regulator has determined, the company will earn lower returns ('underperformance').

Since the privatisation of the energy networks, Ofgem has adopted a regulatory system based on the CPI-X model. That is, Ofgem sets the allowed revenues that companies are able to recover, and companies can keep **a portion** of their outperformance if they spend less than what Ofgem has set. Ofgem draws a distinction between a pure CPI-X framework and the current RIIO framework (Revenue = Incentives + Innovation + Outputs).[46] Under the latter, as well as fixing the allowed revenues and incentivising efficient operations, additional mechanisms are in place, for example to incentivise companies to innovate and improve service performance.

In practice, Ofgem does not allow companies to retain all of the outperformance generated during a price control, nor do companies bear all of the underperformance if they overspend their allowances. Instead, the regulator has cost-sharing mechanisms whereby companies retain (or bear) only part of the outperformance (or underperformance). These cost-sharing mechanisms are necessary in order to account for inevitable uncertainty and errors in the regulatory system. For example, the regulator typically estimates companies' efficient cost requirements through benchmarking exercises that have an inherent level of uncertainty—it would be inappropriate for consumers to pay higher bills or companies to suffer lower returns because there are unavoidable errors in the forecasting of future costs and outputs.

As noted above, in principle, the decoupling of allowed revenues and actual costs provides strong intrinsic incentives for all companies to operate efficiently. However, the way in which the allowed revenues (and the efficient cost level) are determined can have an impact on whether the companies are incentivised to reveal the full scope for efficiency improvements.

[46] For example, Ofgem has argued that the RIIO framework built on the RPI-X framework by expanding the objectives that companies were expected to deliver. See Ofgem (2023), 'Consultation on frameworks for future systems and network regulation: enabling an energy system for the future', March, para. 2.22.

Below, we summarise Ofgem's approach to setting the efficient cost level (section 1.1), the additional mechanisms that it has adopted to incentivise companies to reveal the full scope for productivity improvements (section 1.2) and the recent developments from the SSMC (section 1.3).

1.1 Ofgem's cost models

When setting the first RIIO price control (RIIO-GD1), Ofgem used a range of cost assessment models to assess the efficiency of GDNs' business plans, which included a suite of disaggregated models (examining individual cost items at a granular level) and total expenditure (TOTEX) models.[47] At the most recent price control (RIIO-GD2), Ofgem used a single TOTEX model to set GDNs' efficient costs. Specifically, it estimated the following regression using a combination of outturn data (covering 2014–19) and forecast data (covering 2020–26):

$$\ln(TOTEX_{it}) = \beta_0 + \beta_1 \ln(CSV_{it}) + \gamma_1 t_1 + \gamma_2 t_2 + \varepsilon_{it}$$

where:

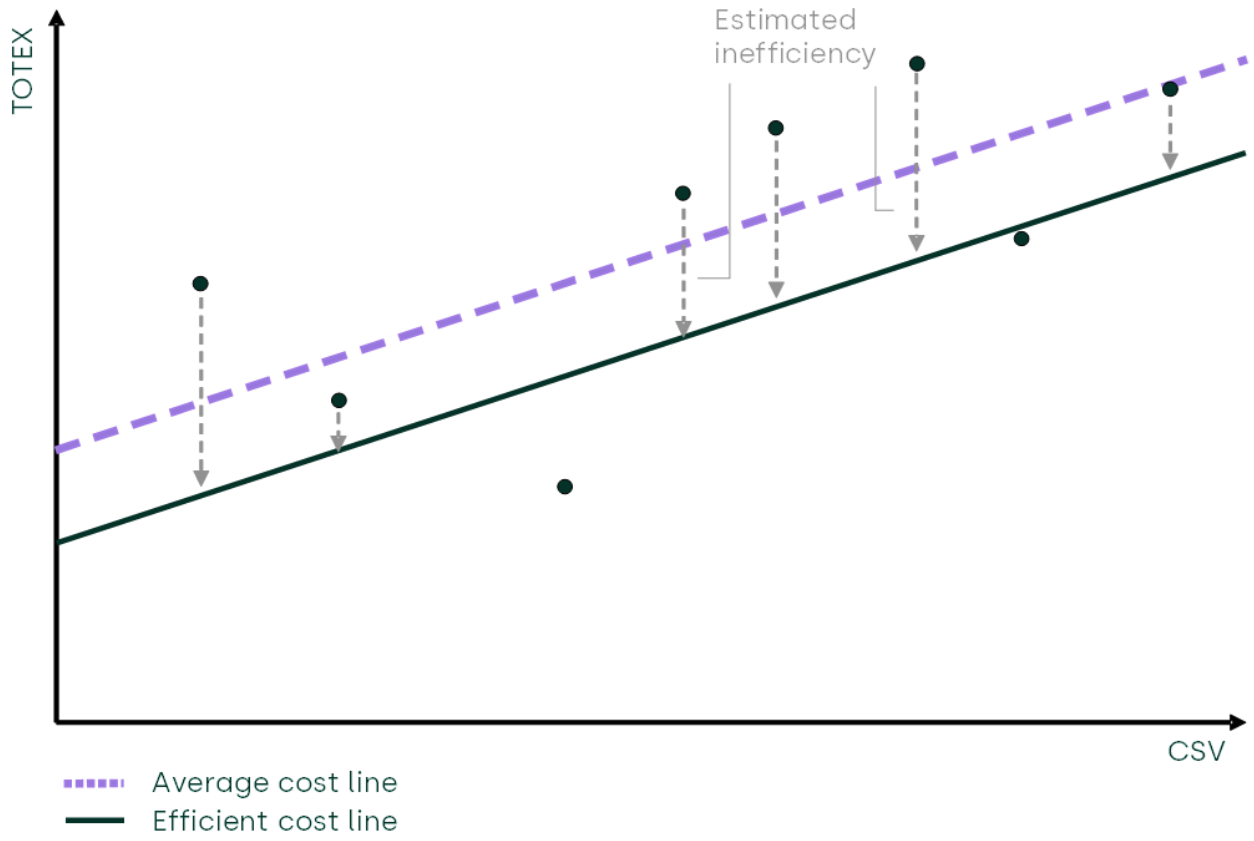
- $\ln(TOTEX_{it})$ is the natural logarithm of TOTEX[48] incurred by GDN 'i' at time t;
- $\ln(CSV_{it})$ is the natural logarithm of the composite scale variable (CSV) for GDN 'i' at time t; [49]
- t_1 is the time trend for outturn data;
- t_2 is the time trend for forecast data;
- β_0 is the intercept in the cost equation;
- β_1 is the relationship (specifically, the cost elasticity) between the CSV and TOTEX;
- ε_{it} is a random error term for GDN 'i' at time t, and is assumed to incorporate statistical noise (e.g. data and modelling errors) and inefficiency.

Regression analysis predicts GDNs' TOTEX at an average level of efficiency (i.e. the 'average cost line'). In order for the estimated cost

[47] The TOTEX models differed in their employment of forecast data.
[48] Before assessing expenditure, Ofgem undertakes pre-modelling adjustments to account for costs or characteristics that it deemed: (i) could be difficult to assess directly in the cost models; and (ii) were not adequately accounted for in the composite scale variable (CSV).
At RIIO-GD2, these pre-modelling adjustments related primarily to the exclusion of certain cost items and adjustments for regional wages differences and other contextual factors (e.g. population density and sparsity). Further analysis might be required to ensure that these regional (and other) factors are appropriately captured within in the cost assessment framework.
[49] A CSV combines multiple cost drivers into a single variable. At RIIO-GD2, the CSV was constructed as the weighted average of: (i) Modern Equivalent Asset Value (MEAV); (ii) customer numbers; (iii) external condition reports; (iv) maintenance MEAV.

line to reflect an efficient level of expenditure, Ofgem corrects the average cost line to reflect the upper-quartile (UQ) performance or 85th-percentile performance,[50] a stylised example of which is shown in the figure below.

Figure 1.2 Stylised example of Ofgem's cost assessment framework



Source: Oxera.

The **purple** line represents the relationship between TOTEX and the CSV, as estimated by the regression model (the average cost line). The GDNs (represented by the **dark green** dots) above this average cost line have higher costs than predicted by the model, and therefore according to Ofgem's framework are deemed to be less efficient. Meanwhile, GDNs below the regression line have lower costs than predicted by the

[50] At the RIIO-GD2 determination, Ofgem set allowances on the basis of companies that had been performing at the UQ in the first year of RIIO-GD2 and were able to achieve the 85th percentile by the third year of RIIO-GD2. In the determination Ofgem referred to this as a 'glidepath'. See Ofgem (2021), 'RIIO-2 Final Determinations – GD Sector Annex (REVISED), February, para. 1.11.

average cost line and are deemed to be more efficient. In the case of Ofgem, the average cost line is shifted downwards to reflect either a UQ performance or an 85th percentile performance (i.e. the average cost line is shifted downwards such that only 25% or 15% of the industry are more efficient than the benchmark, respectively). The 'corrected' line represents the efficient cost line and is marked in **dark green**. The gap between a GDN's current position and the 'corrected' regression line (the **grey** arrow) represents the GDN's estimated inefficiency under Ofgem's framework.

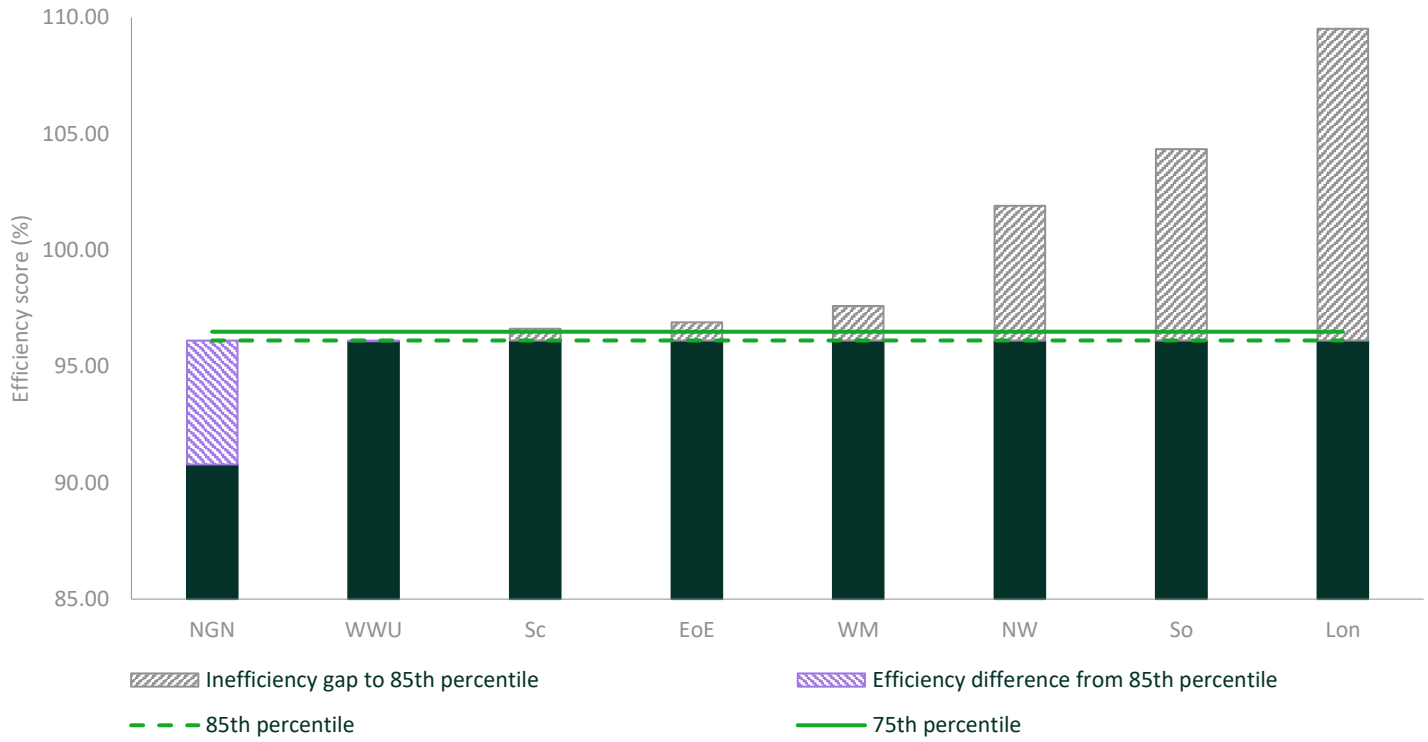
All GDNs are expected to affect the slope of the regression line—changing one data point (e.g. increasing the measured CSV) will affect the slope of the regression line, as the average cost line shifts and pivots such that it can pass through the new average.[51] However, only the performance of the efficient GDNs[52] will determine the magnitude of the cost challenge for inefficient GDNs. That is, if efficient GDNs were to improve their efficiency, the benchmark could become more stringent and the regression line would be shifted further from the average, thereby leading to a greater challenge for the sector as a whole and lower bills for consumers. This makes efficient GDNs particularly valuable in Ofgem's cost assessment modelling.

Note that Ofgem evaluated GDNs' efficiency over the RIIO-GD2 period (2022–26), although data from RIIO-GD1 was also used to estimate the regression line. Therefore, the efficiency challenge was based on companies' expected performance in RIIO-GD2, rather than companies' outturn performance in RIIO-GD1.

The figure below shows the distribution of efficiency scores at RIIO-GD2.

[51] In rare cases, the data may change without affecting the slope of the average cost line (e.g. if the effect of a change in one data point is perfectly offset by the effect of a change in another data point). However, in nearly all practical cases, every observation will affect the slop of the average cost line to some degree.
[52] In a sample of eight companies, the 75th and 85th percentile lie between the second- and third-ranked company. Hence, only the first- and second-ranked companies will be better than the benchmark. The third-ranked company would be considered inefficient, yet its performance would affect the stringency of the benchmark.

Figure 1.3 Distribution of estimated efficiency scores at RIIO-GD2



Note: Ofgem defines efficiency as the ratio between companies' actual costs and the costs predicted by the model. A lower number indicates that a GDN is more efficient.
Source: Ofgem (2020), 'RIIO-GD2 Final Determinations: Step-by-Step Guide to Cost Assessment', December, Table 6.

At RIIO-GD2 Ofgem assessed NGN to be the most efficient (i.e. frontier) company in the industry—NGN was 5.3 percentage points more efficient than the 85th percentile of c. 96% and 6 percentage points more efficient than the UQ of c. 97%. For GDNs that were assessed to be more efficient than the benchmark (such as NGN), Ofgem set the cost allowance at what the GDN submitted in its business plans (i.e. the cost allowance for each GDN was the minimum of the efficient cost prediction and what the GDNs had submitted).

Several companies appealed aspects of Ofgem's approach to cost modelling to the Competition and Markets Authority (CMA). However, the CMA deemed that companies' disagreements were within Ofgem's margin of regulatory discretion[53] (see Appendix A1 for further

[53] See Competition and Markets Authority (2021), 'Cadent Gas Limited, National Grid Electricity Transmission plc, National Grid Gas plc, Northern Gas Networks Limited, Scottish Hydro Electric Transmission plc, Southern Gas Networks plc and Scotland Gas Networks plc, SP Transmission plc, Wales & West Utilities Limited vs the Gas and Electricity Markets Authority: Final determination

information). Ofgem also noted in its recent decision on the consultation on Future Systems and Network Regulation (FSNR), that its approach to cost modelling at RIIO-3 will represent an evolution of the RIIO-2 approach, rather than undertaking a wholly different form of cost assessment.[54] While it would be appropriate to undertake a proper model development exercise at the upcoming price control in order to reflect future cost pressures, for example, the RIIO-GD2 TOTEX model provides a useful starting point when determining the incentives that efficient companies face.

As noted above, Ofgem uses forecast data to estimate its cost models and the efficiency benchmarks, such that the efficiency baked into GDNs' plans sets the efficiency challenge for the sector. Moreover, the cap on GDNs' allowed TOTEX for efficient companies might (in isolation) penalise or challenge companies for submitting efficient costs. As such, Ofgem has adopted additional tools to incentivise companies to reveal their full scope for efficiency savings.

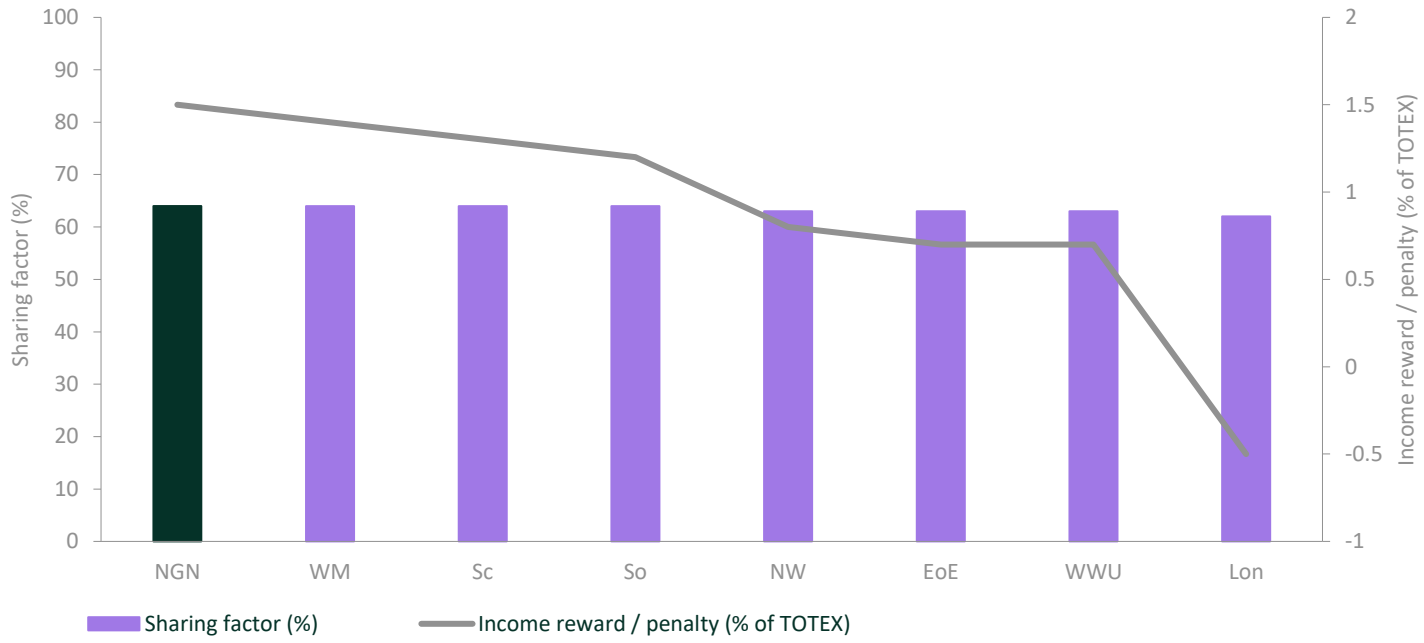
1.2 Incentive framework for efficient companies

At RIIO-GD1, Ofgem applied the Information Quality Incentive (IQI) to incentivise companies to be truthful in revealing information in their business plans, by maximising rewards for companies whose outturn expenditure was close to their forecasts. Under this mechanism, companies assessed as efficient also had favourable cost-sharing rates, such that they could earn additional returns if they outperformed on costs, thereby increasing the strength of the efficiency incentive. Moreover, companies could earn an upfront reward for submitting efficient business plans. The figure below shows how the cost-sharing rates and the upfront rewards varied across the industry.

Volume 3: Individual grounds', October (hereafter, Competition and Markets Authority (2021), 'Individual grounds', October).

[54] Specifically in relation to modelling, Ofgem argued that an advantage of an evolution to the existing framework is that Ofgem could use existing assessment models and methods. This indicates that the RIIO-GD2 model might be used as a starting point. See Ofgem (2023), 'Future Systems and Network Regulation Core Document', October, Table 2 and para. 5.44.

Figure 1.4 Reward and penalty rates at RIIO-GD1



Source: Ofgem (2012), 'RIIO-GD1: Final Proposals – Overview', December, p. 29.

The figure shows that NGN, as the most efficient company, received the largest income reward and had the largest cost-sharing rate at RIIO-GD1. However, the variation in the cost-sharing rate across the industry was small (between 62% and 64%). By comparison, in Ofwat's most recent price control (PR19), the cost-sharing rates ranged from 32% to 60%, depending on the efficiency of water companies' business plans.[55] That is, Ofwat's methodology had greater differentiation for efficient versus inefficient companies.

As part of the IQI, companies' allowed revenues were determined on the basis of a weighted average of Ofgem's view of efficient costs (given a 75% weight) and the GDN's view of its efficient costs (given a 25% weight).

At RIIO-GD2 Ofgem removed the IQI, arguing that the mechanism had not provided sufficient incentives for companies to reveal accurate information about their efficient cost requirements, given that companies had generally outperformed during the RIIO-GD1 period. Ofgem further argued that placing weight on companies' own

[55] See Ofwat (2020), 'PR19 final determinations: Securing cost efficiency technical appendix', December, section 10.

submissions could lead to perverse incentives and that the IQI mechanism was overly complex and misunderstood.[56]

As an alternative to the IQI, for RIIO-GD2 Ofgem introduced a business plan incentive (BPI) mechanism. The BPI rewards and penalties were split into four stages.

- **Stage 1:** related to whether the companies submitted information in their business plans that met the minimum requirements. This stage was a pass/fail, with financial penalties imposed on networks that failed the stage.
- **Stage 2:** related to whether the customer value propositions (CVPs) were of sufficient quality. Only networks that had passed stage 1 could receive a reward at stage 2.
- **Stage 3:** at this stage, Ofgem applied a penalty of 10% to all poorly justified lower-confidence costs that were removed by Ofgem.
- **Stage 4:** at this stage, Ofgem rewarded networks that had submitted costs that were more efficient than its own assessment. The value of the BPI reward was based on the difference between the company's proposals and Ofgem's assessment, multiplied by the company's cost-sharing rate.

Note that only the stage 4 reward explicitly rewarded companies for putting forward efficient business plans, while the preceding three stages rewarded or penalised companies based on the quality of the evidence presented in their plans.

At the RIIO-GD2 determination, NGN received a BPI stage 4 reward of c. £5.4m. This was revised to c. £8.5m at the ensuing CMA appeal, due to an error in Ofgem's calculation of the BPI reward (which Ofgem also acknowledged).

Meanwhile, the cost-sharing rate was determined based on the degree of high-confidence costs (i.e. costs that could be included in the TOTEX model) in companies' submissions. In Ofgem's decision on the frameworks for FSNR, it argued that the cost-sharing rate would build on the approach at RIIO-2 (i.e. distinguishing between high- and low-confidence costs), but noted that it is continuing to assess the best way in which the factor should be set.[57]

[56] See Ofgem (2019), 'RIIO-2 Sector Specific Methodology – Core document', May, paras 11.29–11.32.
[57] Ofgem (2023), 'Future Systems and Network Regulation Core Document', October, para. 2.173.

1.3 Developments in the SSMC

Ofgem is consulting on whether and how the incentives within the forthcoming RIIO-GD3 framework should be strengthened as part of the SSMC.[58] The relevant incentives for the purposes of this report that Ofgem is consulting on are 'truth-telling incentives' and 'efficiency incentives'.[59] The former relates to the tools in place to encourage companies to submit accurate, high-quality and ambitious business plans; while the latter relates to tools in place to encourage companies to improve efficiency during a price control. Ofgem's commentary and proposals on each of these incentives that are relevant for this report are summarised below.

Truth-telling incentives

Ofgem argued that the BPI mechanism as applied at RIIO-GD2 'provided positive value to consumers and incentivised companies to provide higher quality and more ambitious business plans than they otherwise would have'.[60] However, Ofgem noted that the industry raised several concerns with the BPI mechanism, including the following.[61]

- The assessment of CVPs in the stage 2 reward was 'difficult', and this was reflected in the low number of CVPs rewarded—if stage 2 is to be retained, Ofgem's assessment methodology requires refinement.
- The incentives of the BPI mechanism require sharpening to become more effective.
- There may be high cost volatility in RIIO-3, which would impact the cost assessment process and the incentives facing network companies.

Ofgem is consulting on its proposals to amend the BPI framework to address some of these concerns. Ofgem notes that the truth-telling incentive at RIIO-3 should support: (i) business plan information that enables it to set price controls effectively; (ii) ambitious cost forecasts; (iii) ambitious output proposals that go beyond baseline expectations.[62]

[58] See Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, Section 7.
[59] See Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, paras 7.1. and 7.2.
[60] Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, para. 7.11.
[61] Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, paras 7.8–7.10.
[62] Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, para. 7.15.

In relation to incentivising ambitious cost forecasts, Ofgem is considering the following approaches.

- Providing further guidance as to what is required from companies for costs to be considered high-confidence or well-justified.
- Sharpening the incentives for companies to submit efficient business plans.
- Whether the size of the reward should reflect Ofgem's value judgement regarding the ambition in companies' business plans, or be calculated as a formula (as per the RIIO-2 approach).

Efficiency incentive

Ofgem argued that the cost-sharing rates (i.e. the efficiency incentive) as applied at RIIO-GD2 were an 'effective incentive to provide cost efficiencies and innovative solutions'.[63] However, Ofgem also noted differing views among stakeholders regarding how the efficiency incentive could be adapted: one network company stated that the incentives could be sharpened through higher rewards and penalties (i.e. higher cost-sharing rates); while a consumer body argued that the cost-sharing rate could be lowered and still provide strong incentives.

Ofgem argues that the efficiency incentive adopted at RIIO-3 should: (i) incentivise efficient delivery of outputs within a period; (ii) incentivise sharing the benefits (and risks) of outperformance (and underperformance) in a way that contributes to addressing information asymmetry.[64] Ofgem is consulting on three approaches that may meet these objectives.[65]

- Retain the RIIO-2 approach (with the cost-sharing rate determined by the ratio of high-confidence costs to low-confidence costs) but with enhanced guidance. Ofgem argues that the distinction between high-confidence costs and low-confidence costs is important, as companies may be incentivised to inflate high-confidence costs (where Ofgem is unable to provide a robust independent assessment) and subsequently outperform. However, Ofgem notes that the

[63] Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, para. 7.15.
[64] Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, para. 7.15.
[65] Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, paras 7.41–7.43.

determination of high-confidence and low-confidence costs introduced complexity in the framework and can impose a burden on companies.

- Utilise a mechanism like the RIIO-1 approach and PR24, whereby the cost-sharing rate differs across companies depending on how efficient they are. Ofgem argues that this incentivises companies to submit ambitious cost forecasts; however, it does not (in isolation) address the information asymmetry associated with low-confidence costs.
- Fixing the cost-sharing factors in line with current rates, or on a sectoral basis. Ofgem argues that this would be the simplest approach.

While Ofgem's considerations in the SSMC have focused on an evolution of the BPI mechanism and cost-sharing rates, it is consulting on whether there are alternative approaches that could be adopted at RIIO-3 that could incentivise the key objectives pertaining to the truth-telling and efficiency incentives.[66]

1.4 Summary

The cost assessment framework needs to provide appropriate incentives for companies to reveal the full scope for efficiency savings. In this regard, the framework must incentivise companies to submit high-quality, ambitious business plans, and incentivise companies to make further productivity improvements throughout the price control. As outlined above, the overarching regulatory model, the approach to assessing efficient cost allowances, the BPI rewards and cost-sharing rates all influenced the incentives on GDNs to reveal the efficient frontier at RIIO-GD2.

In the remainder of this report, we examine whether this framework provides sufficient incentives for GDNs to reveal the full scope for efficiency savings, and we provide recommendations for how the incentives could be strengthened in this regard.

The report is structured as follows.

- Section 2 replicates the RIIO-GD2 model with the latest available data.
- Section 3 estimates the value of and cost to NGN as a frontier company.

[66] Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, paras 7.35–7.37.

- Section 4 quantitatively assesses the incentives facing NGN to reveal the efficient frontier under the RIIO-GD2 framework.
- Section 5 reviews the tools available to regulators for incentivising and rewarding companies to reveal the full scope for efficiency savings.

2 RIIO-GD2 model replication

2.1 The dataset

NGN has shared with Oxera (under legal privilege) the cost modelling files used by Ofgem for the RIIO-GD2 review, as well as the latest Regulatory Reporting Packs (RRPs) for the industry. The overall dataset contains 12 years of outturn data (2014–23) and three years of forecast data (2024–26). All modelling undertaken by Oxera in this report is based on the full dataset (2014–26) unless otherwise stated.

With respect to the forecast data, two data sources are available for consideration: (i) the business plan information submitted by companies and collated by Ofgem for the RIIO-GD2 review; (ii) the updated forecasts of costs and cost drivers submitted by companies in their latest RRPs.

While the data from the latest RRPs is more likely to reflect the expected costs in the remaining years of the RIIO-GD2 period (2024–26), the data is not provided at a sufficient level of granularity to precisely merge the data into Ofgem's analysis files. Moreover, some of the data pertaining to the cost driver forecasts is not included in the RRPs. Therefore, throughout this report, we consider the use of both datasets to provide separate estimates relating to the strength of the incentive framework.

For the current assessment, we have ensured a consistent and complete dataset when using the (incomplete) forecasts from the RRPs, in the following ways. To forecast GDNs' TOTEX, we assume that the TOTEX that feeds into Ofgem's modelling (e.g. after exclusions of certain cost items and other pre-modelling adjustments) follows the same growth rates as the high-level TOTEX forecasted in the RRPs. For the CSV, we extrapolate the trend based on the outturn information (i.e. over 2014–23).

2.2 Replicating the RIIO-GD2 cost model

The table below shows the modelling results and key statistical diagnostics of the replication of the models from the two datasets, alongside Ofgem's RIIO-GD2 model at the Final Determination (FD). The first dataset ('Replication (outturn only)') updates the data used at the FD with the latest outturn data from the RRPs. The second dataset ('Replication (outturn + RRP forecasts)') also incorporates forecasts for 2024–26 using growth rates derived from the RRP.

Table 2.1 RIIO-GD2 model replication results

	GD2 FD	Replication (outturn only)	Replication (outturn + RRP forecasts)
TOTEX CSV (log)	0.786***	0.816***	0.858***
Time trend (GD1)	-0.003	-0.0101**	-0.0095**
Time trend (GD2)	0.004	0.0164***	0.0158
Constant	-0.059	-0.257	-0.558**
Adj. R-squared	0.918	0.916	0.874
Normality	0.2617	0.954	0.458
Heteroscedasticity	0.5061	0.785	0.287
Pooling	1.0000	0.993	0.986
RESET	0.0000	0.0002	0.158

Note: ***,**, and * represent the statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Oxera analysis.

The coefficient on the TOTEX CSV increases in magnitude when the latest outturn data is included. This implies that the same increase in TOTEX CSV results in greater predicted costs than in the FD model, i.e. the estimated economies of scale are lower. Additionally incorporating forecasts increases the estimated coefficient, lowering the estimated economies of scale further.

The model fit, measured by the adjusted R-squared, falls as outturn data is included, although it remains high relative to some applications (e.g. the model fit in the RIIO-ED2 TOTEX models was c. 0.86–0.88).[67] The model fit worsens further when the forecasts are also incorporated into the dataset. The model diagnostics remain largely unchanged relative to the RIIO-GD2 FD results.[68]

It is likely that Ofgem will amend some aspects of its cost modelling at RIIO-GD3 (for example, to reflect future cost pressures at the next price control). Indeed, Ofgem has stated in the SSMC that it will explore alternatives to the single TOTEX model, including modelling at different

[67] See Ofgem (2022), 'RIIO-ED2 Final Determinations Core Methodology Document', November, Table 68.
[68] The main exception to this is that the RIIO-GD2 model 'passes' the RESET test once the TOTEX forecasts are incorporated into the dataset. In isolation, this indicates an improvement in the quality of the model. However, given the deterioration in model fit, it is unclear whether the overall statistical quality has improved with the latest data update.

levels of aggregation, and selecting different cost drivers. Moreover, it is possible and might indeed be necessary that Ofgem and the companies explore the use of RIIO-GD3 business plan data at the next price control review, in line with the approach used for the RIIO-GD1 and RIIO-GD2 determinations.

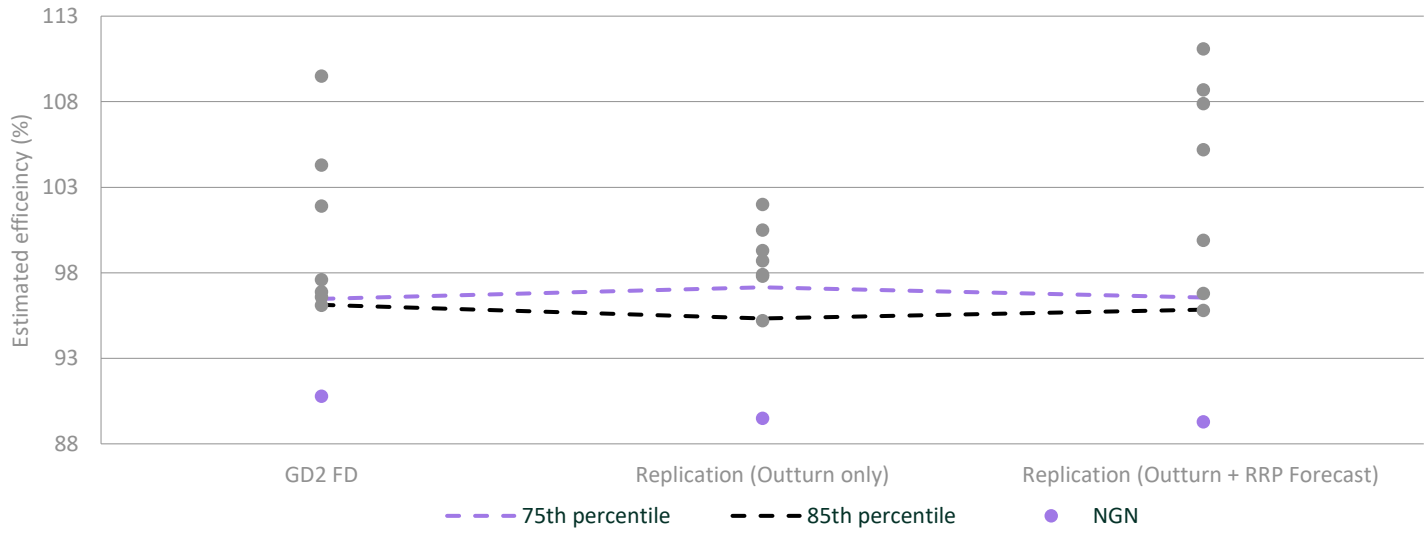
However, we consider that the RIIO-GD2 model as presented above provides a useful starting point for the assessment of incentives, because:

- the deterioration in the statistical quality of the model is comparatively minor and remains comparable to some cost models in other sectors;
- the coefficients remain (directionally) intuitive as they were at RIIO-GD2;
- the CMA did not ask Ofgem to correct the aspects of the cost assessment models that were appealed;
- Ofgem has stated that RIIO-GD3 will represent an evolution of the RIIO-GD2 framework rather than a significant departure.

2.3 GDNs' performance in the RIIO-GD2 cost model

The figure below shows the performance of the GDNs in these models.

Figure 2.1 GDNs' performance, 2022–26



Note: A lower efficiency score indicates that the GDN is more efficient. Several GDNs' relative performances change materially between the three different data sources, but have been anonymised due to data confidentiality.
Source: Oxera analysis.

The figure shows that, relative to the RIIO-GD2 outcome, the 75th percentile benchmark has become less stringent with the incorporation of the latest outturn data by c. 1 percentage point, largely driven by the improved performance of the third-ranked GDN. Meanwhile, the performance of the rest of the sector is dependent on the inclusion of updated forecast data—there is some convergence in performance among the inefficient GDNs when the latest outturn data is included (the least efficient GDNs catch up to the industry average), whereas the convergence disappears when forecast data is also included.

Importantly, the figure indicates that NGN's frontier position is maintained (with an efficiency score of 89–90%) when the latest data (both outturn and forecast) are incorporated into the assessment. Indeed, NGN's efficiency score improves by c. 1–2 percentage points, relative to the RIIO-GD2 Final Determination outcome.

Box 2.1 How NGN maintains its operational efficiency

NGN has been able to deliver continuous efficiency improvements throughout the RIIO controls, resulting in benefits to both NGN's consumers and GB consumers more widely. The following examples provide some insight as to how this was achieved.

First, NGN implemented modern labour terms and conditions (T&Cs) for the majority of its operational workforce. This reduced the costs of legacy staff by c. 25%, with NGN expecting c. 500 new operational staff to work under the new T&Cs. This amounted to a cost saving of over c. £9m p.a. in RIIO-GD1.

Second, NGN implemented a Direct Service Provider (DSP) model, where NGN now uses small local engineering firms to deliver its replacement programme rather than the 'tier 1' companies that have been the industry default. This has delivered c. £15m p.a. in efficiency savings over RIIO-GD1.

Third, given that NGN has made strong productivity improvements over time, it has re-invested its outperformance payments in areas that (among other things) improve its productivity further. For example, NGN has used outperformance to invest heavily in its IT systems through the SAP4 Hana investment and 'Future Ways of Working' programme. These projects are expected to significantly improve the customer experience and enable NGN to become a data-focused business.

Source: Based on information provided by NGN.

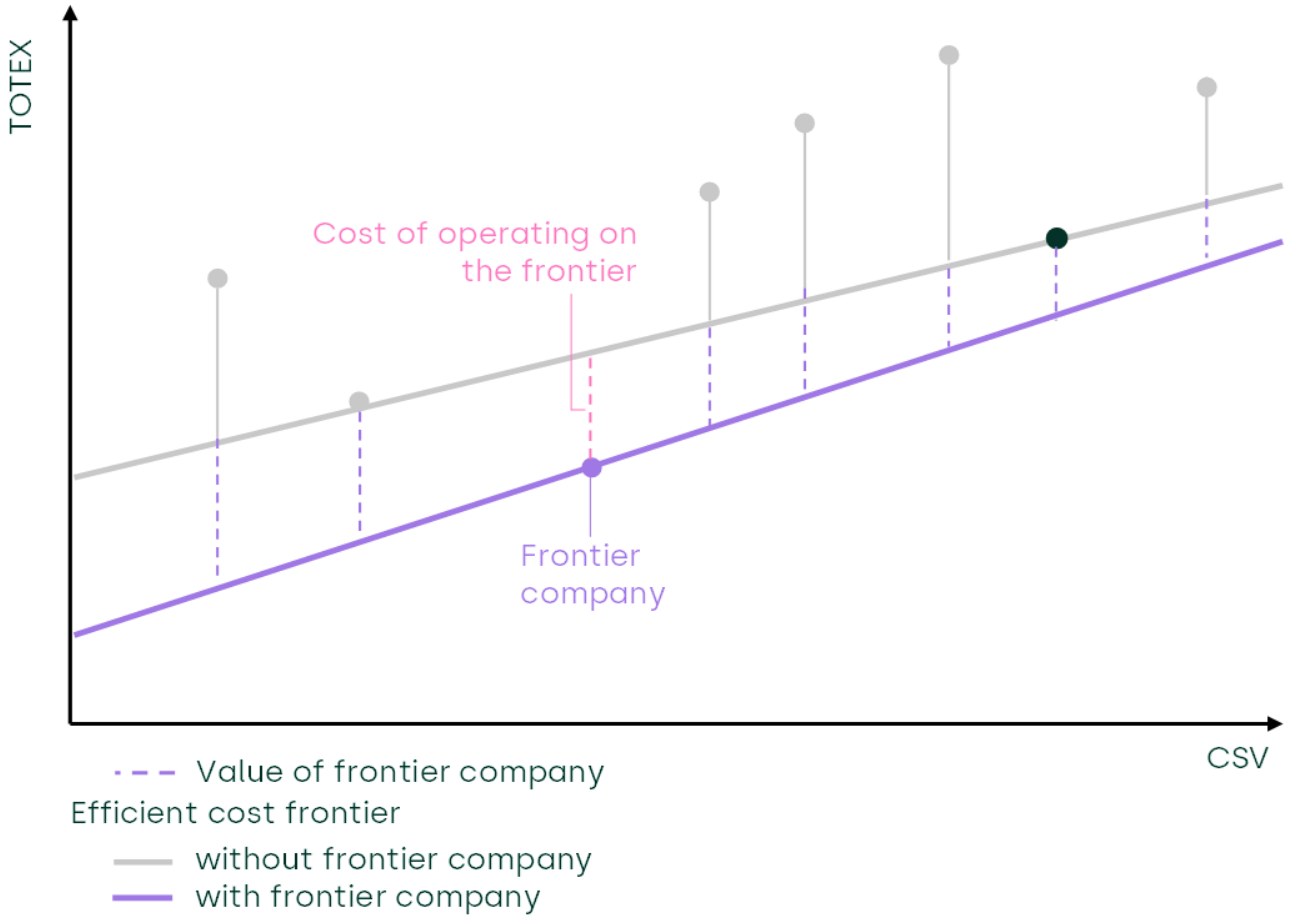
Given that NGN maintains its frontier position, assessing the incentives that NGN is facing is equivalent to assessing the incentives that the frontier company faces.

3 What is the value of NGN to GB consumers and what costs does it face?

Frontier companies are particularly useful in Ofgem's cost assessment methodology, given that they set more stringent benchmarks for the sector, by extension leading to lower bills for consumers. Meanwhile, revealing the full scope for cost savings (including any efforts needed to realise and achieve superior performance) runs the risk of lower overall allowances as a result of Ofgem capping allowances or tightening the benchmark whereby the excess allowance between the company's actual cost and benchmark costs (and therefore, any BPI reward) becomes less material. In other words, there is a risk that frontier companies are not sufficiently motivated and rewarded to reveal the full scope for efficiency improvements, thus limiting Ofgem's ability to set efficient cost allowances for the sector as a whole.

The figure below presents a stylised example of the valuable role played by a frontier company in a benchmarking model, in which the frontier GDN sets the benchmark.

Figure 3.1 Stylised example of the value of and cost facing a frontier company



Note: The vertical axis represents TOTEX and the horizontal axis represents Ofgem's sole cost driver in the RIIO-GD2 TOTEX model (the CSV). The purple line represents the efficient cost model with NGN in the sample, and the grey line represents the efficient cost model without NGN in the sample.
Source: Oxera.

The figure shows that the frontier company (the **purple** dot) sets the benchmark for other companies. If this frontier company were removed from the sample, the second-ranked company (the **dark green** dot) would become the frontier and the overall challenge for the other companies would be reduced (as shown by the **light purple** dashed lines). The overall value of the frontier company can be estimated as the difference in companies' efficient cost predictions with and without the

frontier company in the sample (when estimating both the cost model and the efficiency benchmarks).[69]

In a similar way, the frontier company's performance might lead to a reduction in its own predicted efficient costs. In the stylised example above, the frontier company's predicted efficient costs would be higher if it did not operate at the frontier (the difference is marked by the **pink** dotted line). That is, the frontier company's performance sets a more challenging benchmark for itself, as well as for other companies. As with the overall value of the frontier company, the overall *cost* or *challenge* that NGN faces from operating at the frontier can be gleaned through the difference between NGN's cost allowances with and without NGN in the sample (i.e. using yardstick benchmarking,[70] see section 5.6).

This methodology is broadly aligned with how Ofwat and the CMA estimate the value of a comparator when assessing the detriment of a merger.[71] It provides a static view of how valuable NGN is and the challenges it faces based on its current performance.

Moreover, in its proposed framework for assessing mergers in the energy sector, the CMA reinforces the importance of a high-performing comparator.

> there is a risk that a high performing comparator might be lost as a result of the merger, which would have an adverse impact on cross-industry benchmarks, reducing the scale of challenge for other companies in the sector
>
> **CMA (2023), 'Energy network mergers: Draft guidance on the CMA's procedure and assessment', December, para. 4.14.**

In a regulatory context, in order to determine the strength of the incentive regime, it is important to assess how the total reward offered

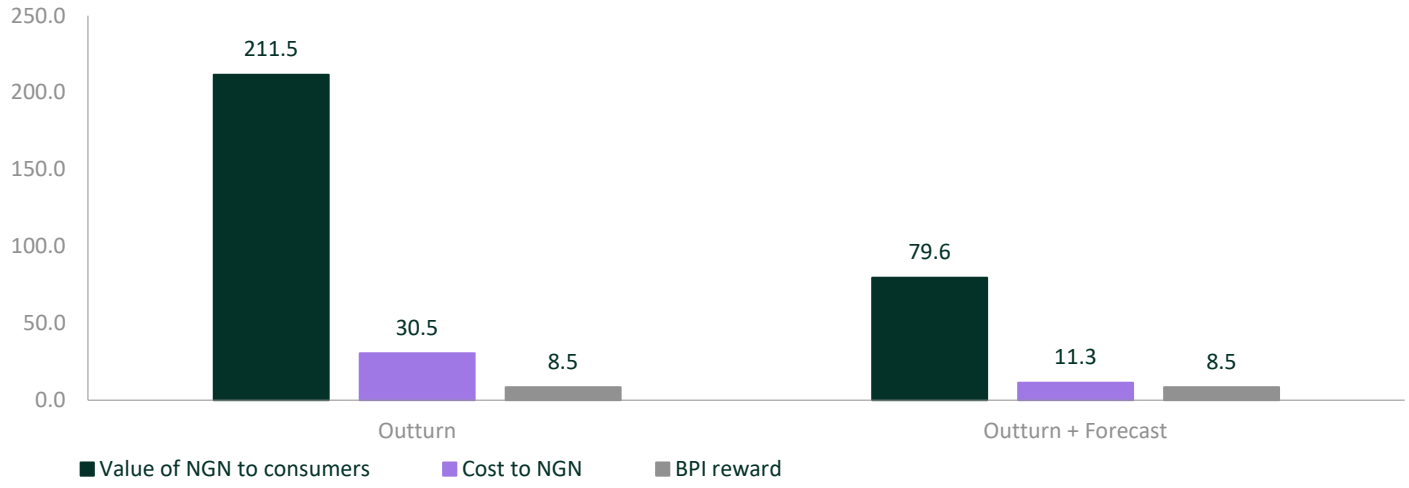
[69] The overall value of the frontier GDN manifests itself in two ways. First, the removal of the frontier GDN is expected to change the slope of the regression line, which might affect other GDNs' relative performance. Second, the removal of the frontier GDN affects the extent to which the regression line is shifted downwards.
[70] Yardstick regulation involves determining a company's allowed revenues without reference to their actual (outturn or forecast) performance.
[71] For example, Ofwat assesses whether the benchmark becomes more or less stringent when a merging entity is removed from the sample as a comparator. See Europe Economics (2015), 'Valuing the Impact of Mergers in the Water and Sewerage Sectors and Identifying Undertakings in Lieu', October, section 3.2.

to efficient companies compares with the total value that such companies provide to the sector, and consumers, as a whole. The total net benefit to consumers can be seen as the value of the frontier company revealing the full scope of efficiency improvements minus the reward given to said company. Meanwhile, the value is driven by the cost savings generated by the efficient companies, which are in turn driven by the strength of the incentive.

3.1 Estimating the value of and cost to NGN of being a frontier company

The figure below shows the estimated value of NGN to GB consumers, and the cost that it faces, with latest outturn data included, under an 85th percentile efficiency benchmark.

Figure 3.2 The estimated value of NGN to GB consumers as a frontier company and the cost that NGN faces (£m)



Note: The value of and cost to NGN are based on the predicted efficient modelled TOTEX assuming an 85th percentile benchmark, excluding ongoing efficiency and RPEs, over RIIO-GD2.
Source: Oxera analysis.

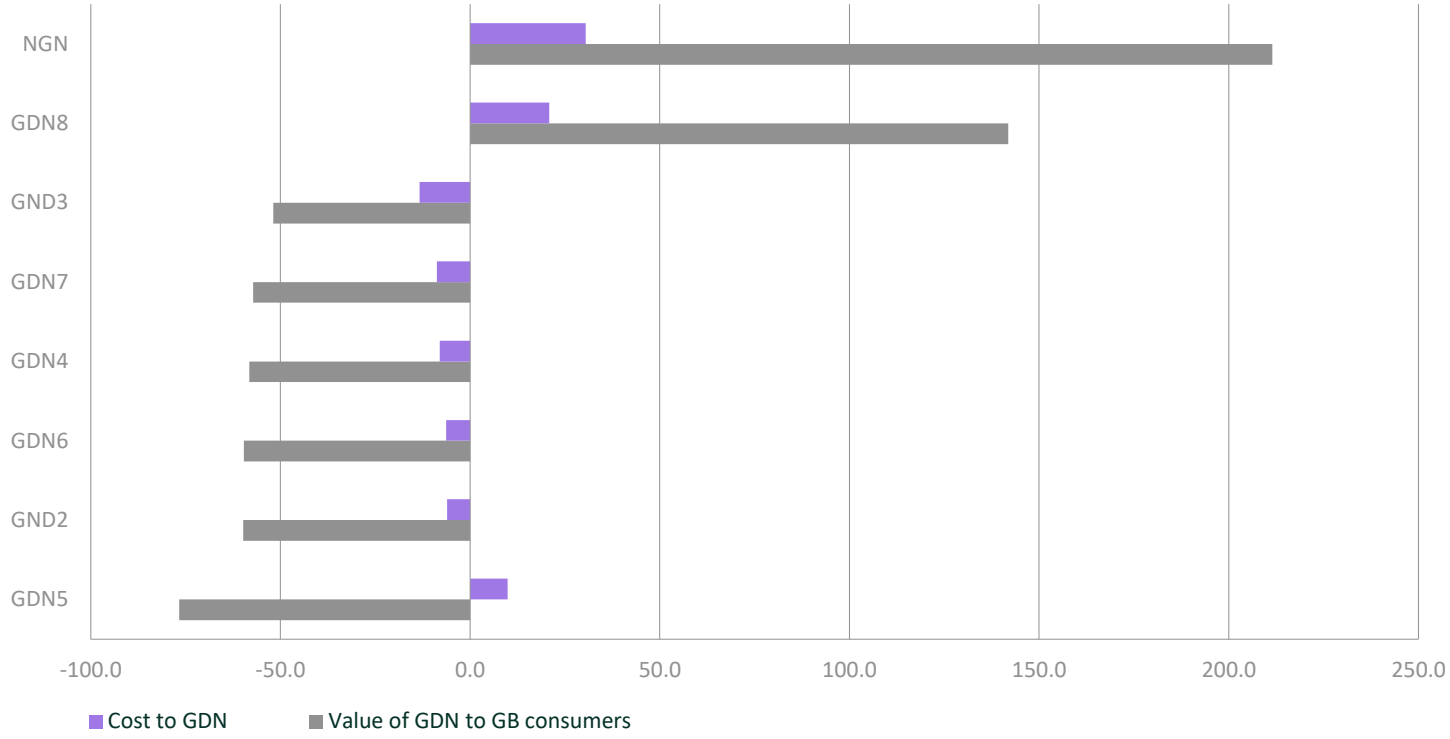
The figure shows that the value of NGN as a comparator is c. £80m–£210m at the 85th percentile, while the associated cost that NGN faces is c. £11m–£30m.[72] This compares to a BPI reward of c. £8.5m at RIIO-

[72] The value of and cost to NGN are smaller as RRP forecasts are also included. This is because the gap between the second- and third-ranked GDNs is smaller, hence the change in the efficiency benchmark as NGN is removed from the sample relaxes by a smaller amount.

GD2, which covers neither the value that NGN provides to consumers, nor the cost that it faces for operating on the frontier.

The figure below shows the equivalent analysis based for all GDNs in the sample using outturn data only.

Figure 3.3 The estimated value of and cost to GDNs in driving performance (£m)



Note: The value of and cost to NGN are calculated using outturn data here.
Source: Oxera analysis.

Both the value of NGN and the cost that it faces are significantly larger than for other GDNs. Indeed, in this model, only one other GDN has a positive value, but this company is expecting to underperform its TOTEX allowance over GD2, while NGN is expecting to outperform. Similarly, the magnitude of the cost that NGN faces is significantly larger than that faced by the other GDNs—in fact, more than half the sample have a negative cost (i.e. their cost allowances are higher when their data is included in the model). The inclusion of these GDNs in the sample not

only increases their own cost allowances,[73] but also reduces the benefit to other consumers through more relaxed benchmarks.

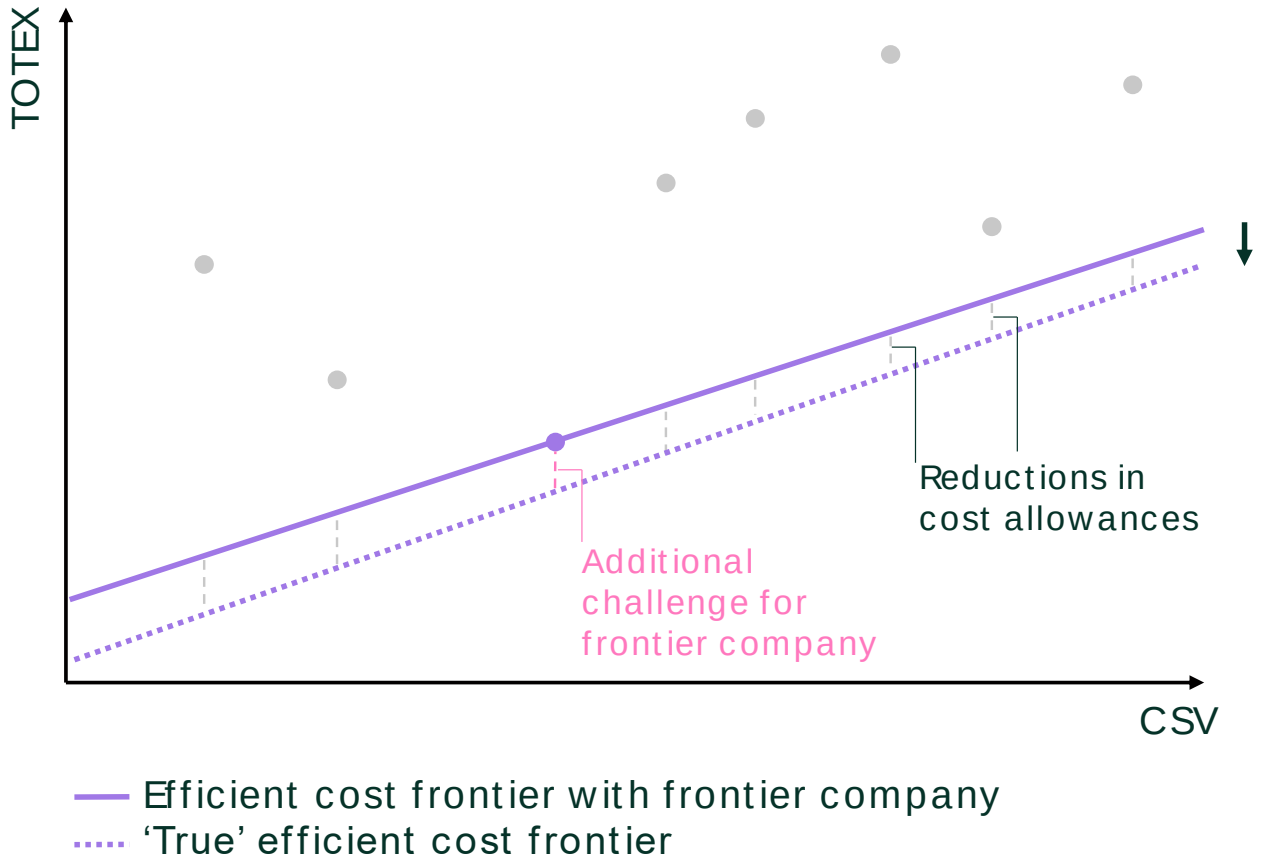
This analysis indicates that NGN is a particularly useful comparator in Ofgem's cost assessment framework, yet it faces disproportionate costs for its high performance. That is, the BPI stage 4 reward at RIIO-GD2, which is aimed at incentivising the truth-telling incentive at RIIO-GD2, is not commensurate with either the value that NGN generates for consumers as a frontier company, or the cost associated with operating at the frontier. This indicates that the BPI reward does not incentivise companies to reveal the full scope of productivity improvements in their business plans (i.e. to 'truth-tell').

[73] GDN 5, as an inefficient GDN, has a negative value in the benchmarking exercise given that its inclusion relaxes the stringency of the benchmark. However, unlike the other inefficient GDNs, it has a positive cost, indicating that its inclusion in the sample sets itself a more stringent challenge. This is due to GDN 5's influence on the estimated coefficients in the RIIO-GD2 model.

4 Evaluating the incentives on NGN to improve performance

A well-functioning regulatory framework should incentivise **all** companies, including those at the frontier, to improve performance. In particular, the incentives should be sufficiently strong for all companies to reveal the full scope for efficiency improvements—otherwise, the cost frontier may not reflect best practice, which makes determining the true efficient cost level challenging. The figure below shows a stylised example of how this could manifest.

Figure 4.1 Stylised example of revealing the efficient frontier



Source: Oxera.

In this example, the frontier company sets the benchmark for the rest of the industry, and is therefore a valuable comparator (as demonstrated in section 3). However, the frontier company has not revealed the full scope of productivity improvements—while doing so would be valuable

for Ofgem and consumers through lower cost allowances (marked by the purple dotted lines), it may result in additional challenges for the frontier company, including a lower cost allowance for itself (marked by the pink dotted line).

Therefore, reward mechanisms need to ensure that frontier companies do not receive disproportionately greater rewards for revealing less scope and operating less efficiently; otherwise, there may be no incentive for efficient companies to continue to operate more efficiently.

If the rewards (or challenges) associated with revealing the full scope for efficiency savings are equal to the rewards (or challenges) associated with operating less efficiently, the framework becomes in principle[74] 'incentive-neutral'—i.e. the framework neither discourages nor encourages companies to operate at the frontier. Meanwhile, if the reward associated with operating at the frontier is greater, companies are incentivised to push towards (or beyond) industry-leading performance. The degree to which the rewards for revealing the efficient cost frontier are greater than the rewards associated with operating less efficiently would represent the strength of the incentive.

The benchmarking exercise is also repeated regularly as part of the framework when assessing the next regulatory period. As such, there is a requirement to incentivise long-term performance instead of focusing on short-term savings over one regulatory period. This long-term incentivisation can be achieved by ensuring that companies have scope to outperform (e.g. by identifying an appropriate benchmark) and guaranteeing that companies can retain (a portion of) their outperformance. A long-term view of the incentive structure is essential if frontier companies are to continue setting challenging benchmarks for others, resulting in lower bills for consumers.

Having a framework that incentivises frontier companies to make further productivity improvements may become increasingly important, given that the simpler, low-risk innovations have already been adopted. As innovative projects become increasingly risky and complex, the costs facing a frontier company (including both financial and in terms of managerial effort and risk appetite) become larger.

[74] Our analysis focuses on the monetary costs and rewards for operating at the frontier, but other 'costs' (such as managerial time spent on operating efficiently) also need to be taken into account when measuring the overall costs and rewards to the company.

To assess whether Ofgem's regulatory framework indeed incentivises NGN to improve performance, we evaluate the net benefit to NGN if its TOTEX deviates from its existing level by +15%[75] to -6%,[76] as a proxy for the level of ambition in its business plan. Here, the net benefit refers to the combined effect of two factors:

- the change in NGN's **efficient cost allowance**. Given that NGN is estimated to be efficient and therefore has its allowance capped to its current performance, one would expect the efficient cost allowance to decrease (increase) as NGN's TOTEX decreases (increases). Once NGN's TOTEX increases such that it is no longer assessed to be efficient, the relationship between NGN's TOTEX and its cost allowance should become more marginal;
- the change in NGN's **BPI stage 4 reward**.[77] One would expect the BPI reward to increase (decrease) as NGN's TOTEX decreases (increases), the value of which would depend on the choice of benchmark. Once NGN's TOTEX increases such that it is no longer assessed to be efficient, the BPI reward would become zero.

Under a well-functioning framework, if NGN submits a more ambitious business plan, the increase in its BPI reward would be expected to at least offset the reduced efficient cost allowance. In other words, the net benefit to NGN for improving performance would be expected to always be positive.

This analysis assesses the financial outcome for NGN under varying levels of TOTEX only; in reality, other factors may contribute to the overall incentives that NGN faces. There can be procedural and reputational benefits associated with operating efficiently, such that the rewards arising from reducing TOTEX are greater than simply the increased BPI payments. Similarly, the analysis assumes that NGN can freely reduce TOTEX by up to 6%—in reality, such a cost reduction might require significant managerial effort (if it is feasible at all), such that the

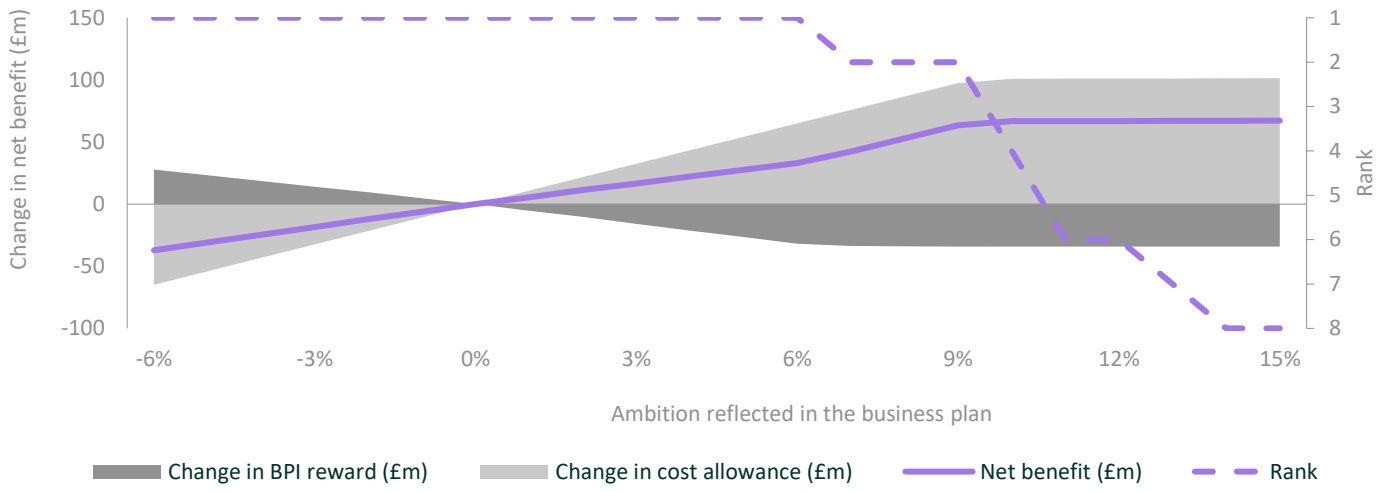
[75] At the RIIO-GD2 determination, NGN was estimated to be c. 13 percentage points more efficient than the average GDN. Therefore, an uplift of 15% to NGN's TOTEX might simulate the net benefit to NGN of operating slightly less efficiently than average.
[76] At the RIIO-GD2 determination, NGN was estimated to be c. 6 percentage points more efficient than the second-ranked company. Here, the simulation of a reduction in TOTEX of 6% assumes that the distance between the second-ranked company and NGN is the same as the distance between NGN and the full scope for efficiency improvements that is possible for it to deliver.
[77] In this simulation, we calculate the BPI reward as the difference between the outturn and modelled TOTEX (before ongoing efficiency and RPEs), multiplied by the cost-sharing rate set by Ofgem at the RIIO-GD2 determination.

challenges associated with operating more efficiently are greater than simply the reduced cost allowance.

4.1 Quantitatively assessing the incentives facing NGN

The figure below shows how the net benefit, BPI reward and cost allowance change as NGN's submitted TOTEX (i.e. the level of ambition) deviates relative to the existing value, under a benchmark at the 85th percentile. The simulation results at the 75th percentile is presented in Appendix A2.

Figure 4.2 Simulating the incentives—85th percentile



Note: The net benefit is indicated by the solid purple line, and is defined as the sum of the change in the cost allowance and the change in the BPI reward.
Source: Oxera analysis.

Since Ofgem currently defines the cost allowance as the minimum of the submitted TOTEX and the efficient predicted cost, NGN's cost allowance tracks its submitted TOTEX until the TOTEX overtakes the efficient predicted cost. This occurs as NGN falls beneath the 85th percentile rank (from second to third) at an 8% increase in TOTEX. However, since a GDN below the third rank has only a marginal effect on its efficient predicted costs, NGN's cost allowance stabilises as its TOTEX increases above c. 9% of the current level (i.e. the line flattens).

As expected, the BPI reward acts in reverse, falling monotonically as TOTEX increases, reaching £0 (a -£21m change from the existing level) as the submitted TOTEX overtakes the efficient cost prediction after an 8% increase in TOTEX.

Despite the BPI reward and cost allowances acting in opposite directions, the magnitude of the increase in cost allowance outweighs the decrease in BPI reward as NGN increases its TOTEX. As shown in Figure 4.2, NGN's net benefit is effectively maximised at a TOTEX increase of 9%. This analysis indicates that the current framework does not provide sufficient incentives for companies to reveal the efficient frontier—the rewards offered to NGN for improving performance are not commensurate with the associated challenges or value generated for consumers. Indeed, the evidence suggests that the current strength of incentives, if applied at RIIO-GD3, could incentivise the opposite behaviour to what is intended.

5 Regulatory tools to incentivise frontier performance

In a competitive market, a company operating more efficiently than its competitors benefits from a range of rewards, including a higher return. As the price of a good or service is typically determined by wider market forces (i.e. the price is determined by forces external to the company), companies can earn 'excess' returns by reducing their costs while charging the same market price. The prospect of higher returns for operating efficiently creates strong incentives for companies to maintain or improve their efficiency over time. Moreover, the additional returns generated through efficiency improvements can be used to invest in (potentially high-risk) innovative endeavours, which could lead to further cost reductions or other benefits such as improvements to service quality.

In regulated sectors, a common approach to mimic this competitive pressure is for the regulator to fix prices for a period of time, and if the company can deliver outputs at a lower cost than the regulator anticipates, the company can earn additional returns in this period. However, when setting the prices that companies are allowed to charge, it is common for the regulator to use (to varying degrees) companies' own costs (outturn or expected). In this way, companies may be penalised (e.g. through lower cost allowances) by operating more efficiently, and may be incentivised not to reveal the true scope for their potential productivity improvements.

In other words, the fact that the regulatory process involves a periodic assessment of costs means that companies' performances in the current period might directly influence their outcome in future periods.

For this reason, regulators have often adopted additional mechanisms in order to incentivise companies to reveal the full scope of efficiency improvements. In the SSMC, Ofgem has distinguished between two types of tools, as follows.[78]

- **Truth-telling incentives**—whereby the tool is designed to encourage companies to submit accurate, ambitious and efficient business plans (e.g. the BPI rewards).

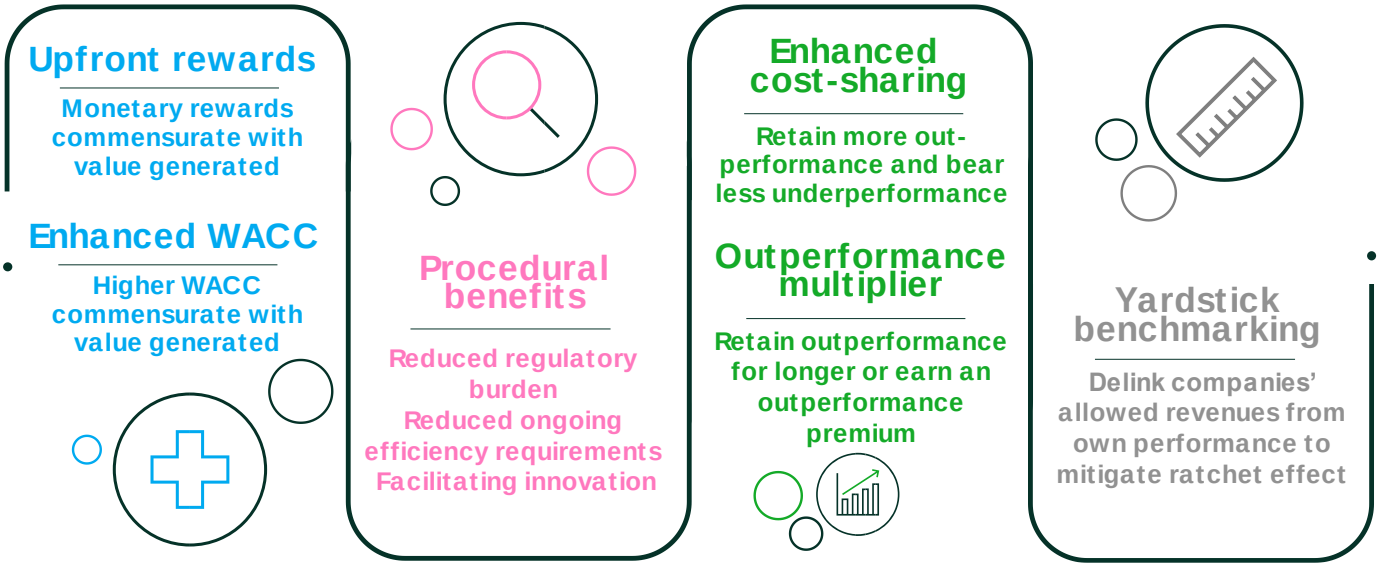
[78] See Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, paras 7.1–7.2.

- **Efficiency incentives**—whereby the tool is designed to encourage companies to deliver their outputs efficiently and discourage overspending during a price control (e.g. the cost-sharing mechanism).

In reality, any individual tool may have a 'truth-telling component' and an 'efficiency' component, such that a combination of tools can reinforce or complement the incentives in each area.

Based on a selection of regulatory precedent from multiple sectors and jurisdictions, we have categorised the available tools, as outlined in the figure below.

Figure 5.1 Overview of tools available to incentivise performance



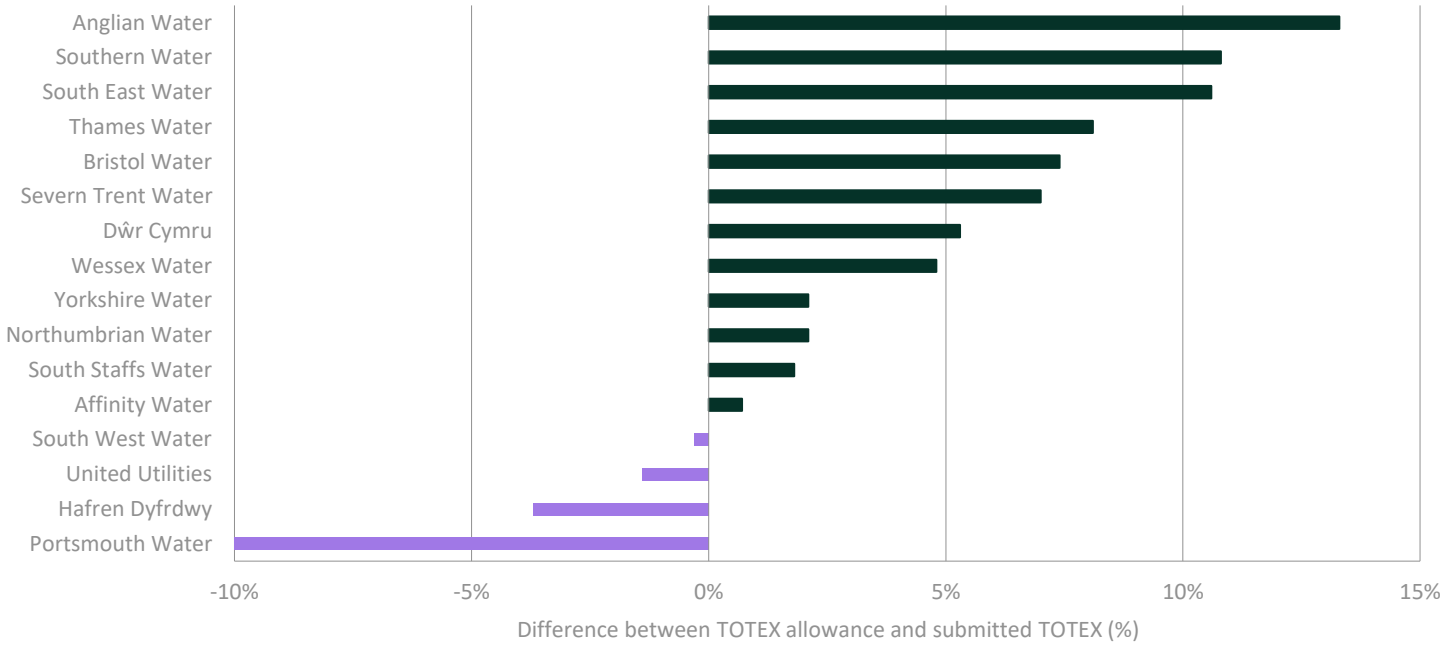
Source: Oxera.

In this section, we review the efficacy of these tools and assess how they could be implemented in the upcoming regulatory period.

5.1 Upfront rewards

A common tool adopted by UK regulators to incentivise companies to operate efficiently and submit efficient business plans is to provide some form of upfront monetary reward. For example, at PR19, in cases where companies were assessed to be efficient, Ofwat set cost allowances above the levels they submitted in their business plans. The table below shows how the wholesale water TOTEX allowance compared to what companies submitted in their business plans at PR19.

Figure 5.2 Wholesale water efficiency challenge (PR19)



Note: A negative number indicates that the company's submitted TOTEX was below its cost allowance (i.e. Ofwat assessed that they were efficient and uplifted the allowance accordingly).
Source: Ofwat (2019), 'PR19 final determinations: Securing cost efficiency technical appendix', December, Table A1.1.

Figure 5.2 shows that four companies—Portsmouth Water, Hafren Dyfrdwy, United Utilities and South West Water—received a higher wholesale water TOTEX allowance than they requested at PR19. As shown in the figure, the rewards offered to these efficient companies (highlighted in **purple**) were more than offset by the value they generated for inefficient companies (highlighted in **dark green**).

In this way, the cost allowance was partially[79] dissociated from companies' own data, so a company was not necessarily penalised for submitting an efficient business plan. Indeed, Ofwat noted that this was an important part of its incentive regulation regime.

[79] The efficient companies were still included in the cost assessment models. As such, their data still informed the degree of the overall challenge, albeit to a lesser degree than if the regulator set allowances based on the minimum of what companies submitted and Ofwat's own view.

> Our independent view of efficient costs is an important part of our incentive-based regulatory regime, taking account of the information asymmetry between Ofwat and the companies. As companies know that we do not start with their own view of costs but rather with an independent view, **this approach reduces the incentive for companies to inflate their requested expenditure to influence our view of efficient costs**. Our overall approach rewards efficient business plans, which means that **some efficient companies may receive more in allowances than requested** in their business plans. These companies help set the efficiency challenge for the sector as a whole. [emphasis added]
>
> **Ofwat (2019), 'PR19 final determinations: Securing cost efficiency technical appendix', December, p. 13.**

At PR19, Ofwat capped the allowance that a company could receive to 10% above what it submitted in its business plan. Therefore, while Ofwat assessed Portsmouth Water to be over 10% more efficient than Ofwat's benchmark, it capped Portsmouth Water's cost allowance to be 10% above its submitted costs. In its final methodology for the upcoming price control (PR24), Ofwat acknowledged that the use of a cap weakened the incentives on companies to submit efficient business plans. Ofwat does not intend to cap allowances at PR24, but does not rule out the use of a cap in exceptional circumstances.

> We do not intend to 'cap' allowances if company forecasts are significantly below our efficient cost allowances at PR24. Such an approach could disincentivise companies to submit stretching business plan forecasts at future price reviews. But we do not rule out the use of capping completely as it may be needed to protect the interest of customers in exceptional cases. We will consider this issue further at draft and final determinations.
>
> **Ofwat (2022), 'Creating tomorrow, together: Our final methodology for PR24 Appendix 9 – Setting expenditure allowances', December, p. 39.**

Ofgem used a similar approach at RIIO-1, whereby the overall cost allowance was based on a weighted average of Ofgem's assessment of efficient costs and companies' business plan submissions. While the incentives to submit efficient business plans may be weaker under this approach, as some weight is placed on companies' submissions,[80] the fact that sole weight is not given to companies' own submissions removes some of the incentive to submit inefficient business plans. Moreover, placing some weight on companies' TOTEX forecasts may be appropriate to mitigate the intrinsic uncertainty in the regulator's predictions of efficient costs. Indeed, some European regulators (e.g. the Norwegian Water Resources and Energy Directorate, NVE) continue to use an interpolation of their view and the companies' view to determine efficient cost allowance.[81]

In these examples, the gap between what companies submitted and the cost allowance set by the regulator can be seen as an 'upfront reward' for efficient companies, as the tariffs are based on a higher cost base than that submitted by the companies. The prospect of an upfront reward may be categorised as a 'truth-telling incentive' under Ofgem's methodology, on the assumption that ambitious, low-cost business plans are closer to the true efficient cost level.

At RIIO-GD2, Ofgem changed its approach to providing upfront rewards for efficient companies through the introduction of the BPI framework. Here, the reward for submitting an ambitious business plan (stage 4) was determined by the difference between Ofgem's view of efficient costs and companies' submissions, multiplied by the company-specific cost-sharing rate. Reducing the reward in this way conflates the intended purpose of Ofgem's incentive mechanisms, can be counter-productive to truth telling and result in reduced consumer benefits.

The main limitation of these approaches is that they are based on alleviating the costs associated with operating at the frontier, rather than being based on the value that the frontier observations provide to the consumers of all the companies. Moreover, as the efficient companies' data is still used to set their own cost allowances through the cost modelling, the full cost of operating at the frontier is not alleviated.

[80] Ofgem used additional tools, such as enhanced cost-sharing rates, which might in principle have offset some of the disincentive associated with placing weight on companies' own submissions.
[81] See NVE (2022), 'Economic Regulation', October, found here: https://www.nve.no/norwegian-energy-regulatory-authority/economic-regulation, last accessed 4 December 2023.

As noted in section 4, alleviating the costs associated with operating at the frontier only creates an incentive-neutral framework (i.e. companies are neither incentivised nor disincentivised from operating efficiently). Further benefits are required to actively incentivise companies to reveal the full scope of efficiency improvements, and the magnitude of these benefits will determine the strength of the incentive. For example, this may be achieved by Ofgem placing reduced commitments on ongoing efficiency for frontier companies, compared to the inefficient ones, which can be used to support innovative initiatives.

Conversely, if the upfront reward is set too high, it may incentivise companies to submit low-cost, high-risk and unachievable business plans. As efficient companies set the benchmark for the rest of the industry, this could result in unachievable efficiency targets for other GDNs. However, this possible risk could be mitigated with the adoption of other incentive tools relating to the quality of the evidence required in companies' business plans.

Box 5.1 Summary and recommendations

Upfront rewards can incentivise companies to reveal the true scope for their productivity improvements by alleviating some of the challenges associated with operating efficiently. However, the magnitude of the reward must be calibrated appropriately to ensure that it is commensurate with the challenges that the frontier company faces. As demonstrated in sections 3 and 4, the rewards at RIIO-GD2 were insufficient in this respect.

Source: Oxera.

5.2 Enhanced WACC

In a competitive market, companies that operate more efficiently than their competitors can earn a greater return. A natural starting point when incentivising companies to operate efficiently is to provide a

higher return (weighted average cost of capital, WACC) for companies that are estimated to be efficient.[82]

This is the approach adopted by the Austrian energy regulator, E-Control. Specifically, E-Control undertakes a cost-benchmarking exercise based on outturn performance, and companies estimated to be more efficient than the average can receive an uplift to the WACC of up to 0.5 percentage points, while those assessed to be less efficient than average can have a reduced WACC of up to 0.5 percentage points.[83] The mechanism is designed such that the average company earns a reasonable return.

While the prospect of an increased WACC might incentivise companies to submit efficient business plans (i.e. a truth-telling incentive), there might be additional challenges in adopting this tool in the GB GD sector, given Ofgem's focus on business plan data. That is, if an enhanced WACC is pursued, it needs to be sufficiently calibrated such that companies are not incentivised to submit low-cost, high-risk (i.e. undeliverable) business plans. Moreover, further calibration could be necessary to make company-specific adjustments to the WACC.

An enhanced WACC can be seen as a counterpart to a higher upfront allowance or an upfront reward—both tools provide companies with greater revenues for operating efficiently, albeit through different channels. Given that Ofgem has already adopted upfront rewards in the RIIO price controls, increasing revenues through a better-calibrated upfront reward may be more readily implementable at RIIO-GD3 than an enhanced WACC.

[82] For example, at PR19 Ofwat provided 'fast-track' companies (see section 5.5 below) with higher allowed returns. See Ofwat (2017), 'Delivering Water 2020: Our final methodology for the 2019 price review', December, p. 19.
[83] See E-control (2018), 'Electricity Distribution System Operators 1 January 2019 - 31 December 2023 Regulatory Regime for the Fourth Regulatory Period', December, section 4.3.1.

Box 5.2 Summary and recommendations

The prospect of an enhanced WACC provides clear incentive for companies to submit efficient business plans and reveal the full scope for efficiency improvements. If such a tool is implemented, it needs to be appropriately calibrated to ensure that companies are not incentivised to submit high-risk and undeliverable business plans with the primary objective of receiving a higher WACC.

Additional complexities that could be associated with adjustments to the WACC (e.g. financeability) require careful consideration.

Source: Oxera.

5.3 Enhanced cost-sharing rates

Determining regulatory parameters involves significant risks and uncertainties, particularly in the assessment of efficient cost allowances. To protect companies and consumers from errors or omissions in the regulator's assessment of efficient costs, some regulators have cost-sharing mechanisms whereby companies keep some of the additional returns if they outperform their allowance, and bear some of the loss if they underperform their allowance. For example, a symmetrical cost-sharing rate of 50% would imply that a company would make £5m of additional returns if it underspent its allowance by £10m, and would bear £5m of lower returns if it overspent its allowance by £10m.

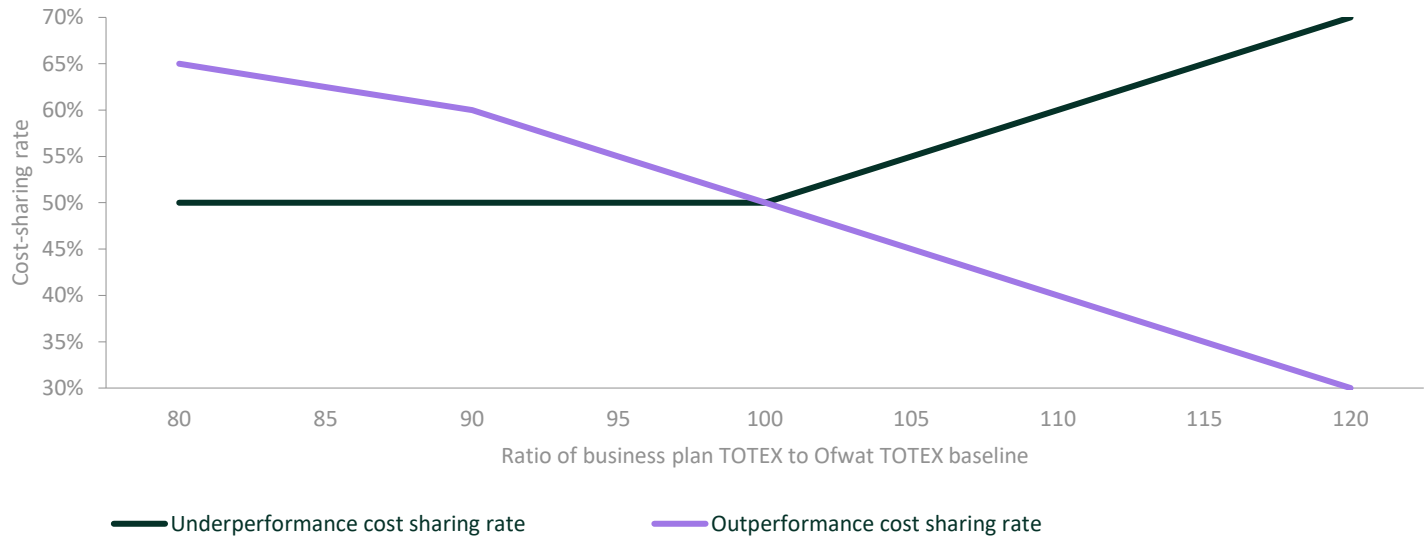
While some form of cost-sharing may be appropriate to protect companies and consumers, limiting the amount of outperformance retained (or underperformance borne) by the company will likely affect the incentives on companies to operate efficiently (i.e. an 'efficiency incentive' under Ofgem's terminology). Indeed, several regulators do not have a cost-sharing mechanism at all; rather, the regulated companies

have full exposure to out- and underperformance.[84] This approach might be expected to strengthen the incentive to operate efficiently; however, it adds significant risk to the company (if the regulator has underestimated efficient expenditure requirements) and to consumers (if the regulator has overestimated efficient expenditure requirements). As noted by Ofgem in the SSMC, some of these risks could be mitigated through the use of targeted, robust uncertainty mechanisms,[85] but some risk will inevitably remain.

Given that some form of cost-sharing mechanism is likely to be in place at RIIO-GD3,[86] it would be appropriate to assess how the cost-sharing rates could be used as a tool to incentivise both efficiency within a regulatory period and truth-telling in the business plan submissions. For example, the regulator can set favourable, asymmetrical cost-sharing rates for companies that submit high-quality and efficient business plans. At PR19, Ofwat adopted asymmetrical cost-sharing rates based on the ratio of companies' submitted TOTEX and Ofwat's view of companies' efficient TOTEX, as shown in the figure below.

[84] See, for example, BRUGEL (2023), 'DECISION (BRUGEL-DECISION-20230627-232) Projets de méthodologies tarifaires applicables au gestionnaire de réseau de distribution d'électricité et de gaz actif en région bruxelloise pour la période 2025-2029 PARTIE 1 MODÈLE DE RÉGULATION ET CADRE RÉGULATOIRE', October, section 13.1.1.
[85] Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, para. 7.47.
[86] See Ofgem (2023), 'Future Systems and Network Regulation Core Document', October, para. 2.173.

Figure 5.3 Asymmetric cost-sharing rates set by Ofwat at PR19



Source: Ofwat (2019), 'PR19 final determinations: Securing cost efficiency technical appendix', December, Figure 4.

The figure shows that efficient companies (those with an efficiency ratio of less than 100) have a greater cost-sharing rate for outperformance. At the far left-hand side of the figure, efficient companies can have an outperformance sharing rate of 65% (i.e. they can keep 65% of the outperformance), while they have an underperformance sharing rate of 50% (i.e. they bear only 50% of the underperformance). At the far right-hand side of the figure, companies can have an outperformance sharing rate of 30% (i.e. they can keep 30% of the outperformance) and an underperformance sharing rate of 70% (i.e. they bear 70% of the underperformance. There is a sliding scale in between these two ranges.

In principle, the asymmetric nature of the cost-sharing rates can incentivise companies to submit efficient business plans (i.e. truth-telling), given that they face the prospect of greater returns if their plans are assessed to be efficient (and lower returns if their plans are assessed to be inefficient). However, given the lower cost-sharing rate for underperformance, there is a risk that companies may be incentivised to submit low-cost, high-risk and unachievable business plans that are subsequently not delivered. Such business plans may set infeasible benchmarks for the rest of the industry. Therefore, the underperformance cost-sharing rate needs to be appropriately calibrated and used alongside other truth-telling incentives.

At RIIO-GD2, Ofgem did not base its cost-sharing rates on its assessment of efficient costs, but rather on the proportion of a

company's costs that was deemed to be 'high confidence' and the proportion that was deemed to be 'low confidence'. Specifically, the cost-sharing rate for each company was determined by the following equation:

$$Cost\text{-}sharing\ rate = 50\% * (confidence\ metric) + 15\% * (1 - confidence\ metric)$$

where the confidence metric is the ratio of high- to low-confidence costs.

In other words, high-confidence costs were assigned a cost-sharing rate of 50%, while low-confidence rates were assigned a cost-sharing rate of 15%. Ofgem has argued that the use of confidence metrics is necessary to address the information asymmetry that can arise in Ofgem's assessment of low-confidence costs.[87] However, by basing the cost-sharing rate entirely on the degree of high- and low-confidence costs, Ofgem removed an important truth-telling incentive. Moreover, the cost-sharing rate is effectively capped at 50% (if all TOTEX is assessed to be high-confidence), which weakens the incentive to outperform relative to RIIO-GD1 (where the cost-sharing rates were c. 62–64%) and what some companies were allowed at PR19 (where the outperformance cost-sharing rate could be set at 65% for the most efficient companies).

Ofgem's RIIO-GD2 framework can be readily adapted to re-incorporate an element of truth-telling incentive while maintaining the distinction between high- and low-confidence costs. For example, the cost-sharing rate could be determined by the following equation:

$$Cost\text{-}sharing\ rate = \alpha * (confidence\ metric) + 15\% * (1 - confidence\ metric)$$

where α is a company-specific, high-confidence cost-sharing rate based on the efficiency of companies' TOTEX submissions. Using the example from PR19 outlined above, for example, α could range from 65% to 30% for outperformance, and from 50% to 70% for underperformance. Such an approach would combine the advantages of two of the approaches considered by Ofgem in the SSMC (see section 1.3) while mitigating some of the disadvantages.[88]

[87] See Ofgem (2023), 'RIIO-3 Sector Specific Methodology Consultation - Overview Document', December, chapter 7.42.
[88] The prospect of enhanced cost-sharing rates incentivises companies to submit ambitious business plans, which was part of the truth-telling incentive applied at RIIO-GD1. Meanwhile, the distinction between high-confidence and low-confidence costs reduces the impact of information asymmetry, as companies cannot earn excessive outperformance on costs that are assessed to be low confidence (which was the intention behind the RIIO-GD2 approach).

A general advantage of enhanced cost-sharing rates as opposed to other tools for incentivising efficient behaviour is that, on its own, it comes at no upfront cost to consumers, given that a company only benefits from this tool if its expenditure deviates from the efficient cost allowance. In the case that a company underperforms, consumers would still be partially protected through the underperformance cost-sharing rate. Meanwhile, consumers would benefit from lower bills during the regulatory period if the company outperforms.[89]

However, under certain conditions, there is a risk that companies could be incentivised to submit higher cost plans to receive higher allowances and subsequently outperform at the enhanced cost-sharing rate. This is particularly the case if a company's submitted TOTEX has a material impact on its own allowed TOTEX.

[89] Generally, companies do not retain all of the outperformance as it may not be all due to managerial efficiency. Even if the company retains all of the outperformance within the regulatory period, the revealed efficiency improvements would set more stringent targets for other companies in the upcoming price control, such that consumers still benefit from lower bills in the medium and long run.

Box 5.3 Summary and recommendations

Enhanced and asymmetric cost-sharing rates for efficient companies can strengthen the incentive for all companies to submit efficient business plans, given that efficient companies would face the prospect of higher returns (or be protected from lower returns) in the upcoming period.

Moreover, the enhanced cost-sharing rate incentivises companies to make further productivity improvements throughout the regulatory period, as they are able to retain a greater proportion of the outperformance.

The primary risk associated with such an approach is that, in isolation, an efficient company might be incentivised to submit a higher cost plan if its proposed costs have a material influence on its cost allowance. Therefore, enhanced and asymmetric cost-sharing rates may be more effective in incentivising efficient performance if companies' cost allowances are dissociated from their submitted costs and if additional checks are in place.

Source: Oxera.

5.4 Extending and enhancing outperformance

One limitation with the CPI-X framework is that companies can only retain outperformance within a regulatory period before the revenues are re-set at the next regulatory period. For example, if a company were to improve its efficiency in the last year of the regulatory period, it would be able to retain the outperformance for only a single year before the revenues would be re-set. This feature of the CPI-X framework limits the incentives on companies to make efficiency improvements for the full duration of the regulatory period, and incentivises them to withhold efficiency improvements until the initial years of the next regulatory period.

To address this limitation, regulators could allow companies to retain outperformance for a longer, predetermined period (sometimes referred to as rolling incentive mechanism). Ofwat, for example, took this

approach at PR09.[90] The table below shows how such a system could operate in the context of a three-year price control with companies able to retain the outperformance for a three-year period.

Table 5.1 Extending outperformance—stylised example (£m)

	Regulatory period 1			Regulatory period 2		
	Year 1	**Year 2**	**Year 3**	**Year 1**	**Year 2**	**Year 3**
Allowed expenditure	100	110	105	-	-	-
Actual expenditure	95	105	90	-	-	-
Outperformance (in year)	**5**	**5**	**15**	-	-	-
Incremental outperformance (relative to prior years)	5	0	10	-	-	-
Outperformance payment (year 1 rewards)	5	5	5	-	-	-
Outperformance payment (year 2 rewards)	-	0	0	0	-	-
Outperformance payment (year 3 rewards)	-	-	10	10	10	-
Total financial reward for outperformance	**5**	**5**	**15**	**10**	**10**	**-**

Source: Oxera.

In this example, the company outperforms its cost allowance by £5m in the first two years of the price control, and by £15m in the last year. Under the simple CPI-X framework, the company earns outperformance payments in these years (the row 'Outperformance (in year)'). While the company could retain the £5m outperformance in year 1 for the full regulatory period, it could retain the £15m outperformance in year 3 only for one year before the revenues are re-set at the second regulatory period. In this way, the company might be incentivised to delay the efficiency improvements until year 1 of the second regulatory period, where it could retain the outperformance for longer.

If, instead, the outperformance is retained for a fixed period, the company can retain any outperformance in year 3 into the next regulatory period. Such an approach provides consistent incentives for all companies to outperform for the duration of the regulatory period,

[90] See Ofwat (2007), 'PR09: The OPEX incentive allowance the outperformance multiplier for 2005–10: Letter to all Regulatory Directors of water and sewerage companies and water only companies', October. The Italian Regulatory Authority for Energy, Networks and Environment (ARERA) is also considering this incentive mechanism for the Italian energy networks.

thereby encouraging them to reveal the full scope for efficiency improvements.

As well as extending the period in which companies can retain outperformance, Ofwat provided an uplift to the outperformance payments for companies deemed efficient at PR09. Specifically, companies could retain 1.5 times their outperformance during the regulatory period. Using the example outlined above, the company would earn an outperformance of £7.5m in year 1 under such an approach.[91]

An 'outperformance multiplier' recognises that: (i) it may be more challenging for efficient companies to outperform their allowances (e.g. due to exhausted efficiency savings); and (ii) the value of productivity improvements among the efficient companies is greater, given that the efficient companies set the benchmark for the other companies in the industry. Such an approach can be seen as setting the cost-sharing rate for outperformance to above 100% for efficient companies.

As with the enhanced cost-sharing rates, both extending the period in which companies can retain outperformance and providing an outperformance multiplier can come at zero initial cost to consumers, given that the efficient company must outperform in order to receive benefits. However, the outperformance multiplier will involve additional costs to consumers if the efficient company outperforms, and these additional costs must be appropriately balanced with the value that the frontier company generates for its own consumers and that of others.

[91] The company outperformed its allowance by £5m. With an outperformance multiplier of 1.5, the company would earn 1.5*£5m in outperformance payments (i.e. £7.5m).

Box 5.4 Summary and recommendations

Extending the period in which companies can retain outperformance can mitigate the perverse incentives regarding the timing of efficiency improvements under the CPI-X framework. The length of this period has typically been the length of a regulatory period (i.e. five years in the Ofwat price controls), but the optimal period might be longer or shorter and requires careful consideration.

Providing efficient companies with an outperformance multiplier has two important effects on incentives. First, it incentivises them to submit efficient business plans such that they are eligible for the outperformance multiplier. Second, it strongly incentivises efficient companies to make further efficiency improvements during a regulatory period. However, as with the enhanced cost-sharing rates, an efficient company might be incentivised to submit a high-cost plan against which it can outperform and earn additional payments. Therefore, the incentive would be further strengthened if companies' cost allowances were dissociated from their submitted costs and through additional checks.

Source: Oxera.

5.5 Reduced regulatory burden

The reporting requirements on companies during a price review and price control period can impose significant costs, in terms of monetary costs and managerial effort. Therefore, alleviating some of these requirements for efficient companies can strengthen their incentives to reveal the full scope for efficiency improvements.

Reduced regulatory burden for efficient companies can take several forms. For example, both Ofgem at RIIO-1 and Ofwat at PR19 had a procedure to fast-track companies that submitted high-quality (and efficient) business plans. While the exact details regarding the benefits afforded to efficient companies differed between the two regulators, the principle was that key elements of the price determination were determined early in the process for fast-tracked companies, such that fast-tracked companies could devote fewer resources to engaging in

the price determination and more resources to delivering their plans. Fast-tracking has the additional benefit that regulators can devote more resources to scrutinising inefficient (or otherwise low-quality) business plans.

However, at the RIIO-2 review, Ofgem removed the fast-track process and Ofwat has proposed removing it for PR24. One limitation of the process is that it relies on the regulator's initial assessment of companies' business plans being robust and accurate. However, regulatory parameters (including the cost models used by regulators to assess companies' efficiency) can change (even materially) throughout the price review process. In this way, companies deemed to be efficient in the initial assessment could be deemed inefficient under the final determination models. Similarly, companies deemed inefficient in the initial assessment could be deemed efficient under the final determination models, and thus lose out on rewards they would otherwise have been entitled to.

An alternative way in which regulators could reduce regulatory burden is through a lighter-touch assessment in some areas of the price review, or through reduced reporting requirements during a regulatory period. For example, at PR19, Ofwat applied smaller efficiency challenges on enhancement schemes[92] for companies assessed to be efficient in the base cost models.[93] Ofgem could adopt a similar light-touch assessment of low-confidence costs for efficient companies.

Another area where efficient companies could benefit from a light-touch assessment is with respect to additional funding for innovation. As noted previously, one way to facilitate this could be to impose lower ongoing efficiency requirements for frontier companies so that the efforts associated with it could be used on innovative activities. Companies that have been assessed by Ofgem to be consistently industry-leading—such as NGN—have made concerted efforts to drive efficiency (see Box 2.1), generating benefits for all GB consumers. Reduced ongoing efficiency requirements could further motivate than deter productivity developments. Moreover, if companies have a proven track record of delivering outputs for consumers efficiently, Ofgem might be justified in being more lenient regarding the requirements on innovative projects. The increased freedom could take several forms,

[92] Enhancement expenditure relates to costs incurred to increase the size or quality of the existing asset base (for example, to cope with additional population growth or meet new service standards).
[93] See Ofwat (2019), 'PR19 final determinations: Securing cost efficiency technical appendix', December, pp. 55–56.

such as removing/lowering the threshold for innovation funding (currently £5m) and removing/lowering the cap on company contributions.

The prospect of reduced regulatory burden for efficient companies can act as a truth-telling incentive, as companies would only benefit from the reduced burden if they submit efficient companies. Moreover, reduced regulatory burden can also act as an efficiency incentive if there are built-in safeguards to protect consumers. For example, if the frontier company fails important cost or service targets, the regulator has the option to the return to standard scrutiny. In this way, the company can only benefit from reduced regulatory scrutiny if it continues to operate efficiently, thereby providing an ongoing incentive to maintain performance.

These procedural benefits can have an additional advantage for Ofgem, as it can devote more resources to reviewing and monitoring inefficient GDNs. This may generate more proportionate consumer benefits, as inefficient companies would have more room for improvement than efficient companies.

Box 5.5 Summary and recommendations

Reduced regulatory burden can take several forms, and some of these tools might be appropriate in incentivising companies to operate efficiently and bolster efforts on innovation.

While the fast-track process might expose consumers to additional risk (e.g. if changes to regulated parameters occur between the fast- and slow-track determinations), such a risk might be minimal if the regulator does not envisage a material change in its modelling approach. (Ofgem has noted that RIIO-GD3 will not be a material departure from RIIO-GD2.)

Reduced regulatory burden not only lowers the costs that the efficient company faces, but also the costs to the regulator of ongoing monitoring and assessment of performance. This frees resources for the regulator to monitor in greater detail the performance of inefficient companies.

The benefits of reduced regulatory burden can be difficult to quantify (except where certain commitments are reduced), such that it might be difficult to determine whether a company is better or worse off by operating efficiently. Therefore, reduced regulatory burden could be used as one procedural incentive among other financial incentives, but in isolation is unlikely to provide clear and sufficient incentives.

Source: Oxera.

5.6 Yardstick benchmarking

As noted in section 3, a primary cost that a frontier company faces is that it sets the benchmark for itself—if a frontier company makes further efficiency improvements, it will set a more stringent benchmark for itself. Therefore, removing the link between the frontier company's cost allowance and its own performance ('yardstick benchmarking') can mitigate this disincentive. One well-understood way of doing so is to remove the frontier company from the sample when estimating the cost models and/or remove it from the sample when estimating the benchmark for the frontier company.

Such an approach is broadly aligned with how prices are set in a competitive market. Specifically, the price that a company can charge in a competitive market is driven by wider market forces as opposed to its own costs. Therefore, a shift towards yardstick benchmarking might mimic the role of competition more closely than Ofgem's current framework.

Some form of yardstick benchmarking has been applied in several European jurisdictions. For example, the Bundesnetzagentur in Germany provides a 'super-efficiency' bonus for energy distribution system operators (DSOs) that are estimated to be more efficient than the benchmark. This bonus is calculated as the gap in performance between the efficient DSO and the estimated cost frontier when the DSO is removed from the sample.[94] Similarly, the Netherlands Authority for Consumers and Markets (ACM) uses yardstick regulation in the case of the Dutch DSOs.

Yardstick benchmarking can be seen as a complementary approach to upfront rewards (i.e. higher cost allowances and BPI rewards to encourage truth telling). That is, the upfront reward for efficient companies can be determined through yardstick benchmarking to mitigate the risk that an efficient company reduces its own allowance by improving performance.

[94] This super-efficiency bonus is capped at 5% of outturn TOTEX. See ARegV, section 12a.

Box 5.6 Summary and recommendations

By decoupling companies' allowed revenues from their submitted TOTEX, companies are strongly incentivised to reveal the full scope for efficiency improvements—if a company submits a low-cost plan, it will not set its own benchmark and suffer from lower cost allowances than if it had submitted a high-cost plan. This alleviates a significant challenge to operating at the frontier. Moreover, yardstick benchmarking can also discourage submitting unrealistic business plans.

While the challenge to a company operating at the frontier might be alleviated through yardstick regulation, the incentives could be further strengthened by providing additional rewards that are commensurate with the extent of the company's efficiency and the value that the efficient company provides.

Source: Oxera.

5.7 Concluding remarks

Our analyses suggest that Ofgem should carefully examine the balance of rewards and incentives for companies to reveal the true cost frontier at RIIO-GD3. The current framework appears to incentivise behaviour that is inconsistent with Ofgem's objective to maintain low bills and value for money through efficiency improvements. If left unchanged, consumers may face higher bills in the medium and long run, as companies respond to the incentives currently in place.

The adjustments to the incentive mechanisms proposed in this report do not represent a material departure from the approaches that Ofgem (and other regulators) has applied in price controls. Our main recommendation is that efficient companies receive greater upfront rewards decoupled from submitted costs (e.g. through yardstick benchmarking) that is commensurate with the value and cost of operating on the frontier, and enhanced cost-sharing rates. These recommendations are well-aligned with the tools that Ofgem is consulting on as part of the SSMC. The framework could be supplemented with procedural benefits and other enhanced incentives

for efficient companies, linked to service delivery during the period, to further strengthen the truth-telling and efficiency incentives.

As the methodology for RIIO-GD3 becomes clearer, the analysis presented here could require refinement or expansion to ensure that the findings remain relevant for the upcoming price control. Moreover, we are examining if other elements of Ofgem's cost assessment framework could benefit from incremental improvements to strengthen incentives for efficient performance—in particular, the ability of the current regulatory framework to appropriately differentiate between frontier and non-frontier performance.

A1 Outcomes at the Competition and Markets Authority

Several companies appealed Ofgem's approach to cost modelling to the CMA.

- Cadent argued that the **pre-modelling adjustment** for London-specific regional factors was insufficient, and that alternative approaches led to higher allowances for GDNs operating in London.[95] However, the CMA ruled that the evidence provided by Cadent was insufficient to find that Ofgem erred in its approach, specifically arguing that Ofgem had already applied 'substantial pre-modelling adjustments'.[96]
- As part of Cadent's appeal, it argued that regulatory best practice involves the use of **multiple models** (as opposed to the single TOTEX model used at RIIO-GD2), in order to 'compensate for the inevitable limitations of any single model'.[97] However, Ofgem countered that the use of a single TOTEX model could better capture the trade-offs between different activities and costs, and it could reduce information asymmetry issues associated with a more detailed, bottom-up assessment.
- Scottish Gas Networks (SGN) argued that Ofgem was incorrect to set the **benchmark** as a glidepath between the UQ and the 85th percentile.[98] Specifically, SGN argued that the single TOTEX model was not sufficiently robust to apply a benchmark more stringent than the UQ due to the presence of data errors and statistical uncertainty, for example. However, the CMA argued that SGN had provided insufficient evidence that Ofgem had erred when setting the benchmark.

In summary, the CMA did not find sufficient errors in Ofgem's RIIO-GD2 cost model to justify amending the RIIO-GD2 outcome for any of the GDNs.

[95] Competition and Markets Authority (2021), 'Individual grounds', October, section 10.
[96] Ibid., para. 10.277.
[97] Ibid., para. 10.213.
[98] Ibid., section 12.

A2 Additional estimates of the value of NGN and the challenge that it faces

This appendix presents the value of NGN (shown in section 3) under different modelling assumptions with respect to the data and choice of benchmark. It is structured as follows.

- Section A2.1 shows the value of NGN and the cost that it faces under different modelling assumptions.
- Section A2.2 shows the incentives that NGN faces under different modelling assumptions.

A2.1 The value of NGN and the cost that it faces

The table below presents estimates of the value of NGN and the cost that it faces under the 75th and 85th percentiles under the various approaches to handling forecast data.

Table A2.1 The estimated value of NGN and the cost that it faces (£m)

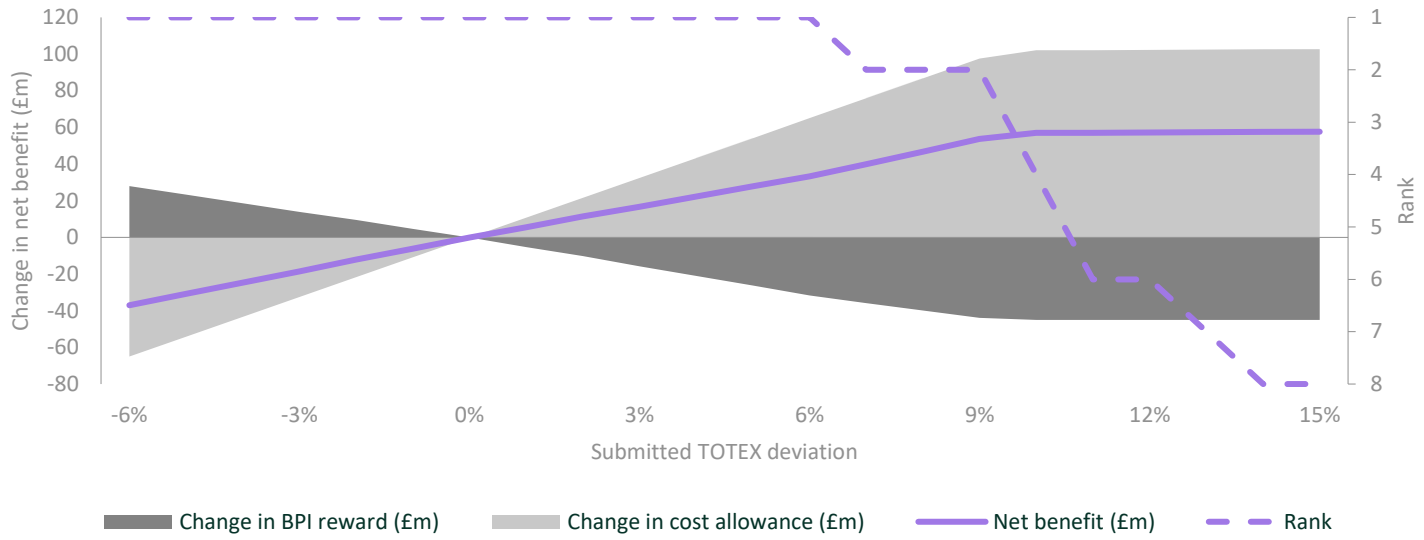
		Replication + Outturn	Replication + Outturn + Forecast
Value of NGN	75th percentile	93.7	170.1
	85th percentile	211.5	79.6
Cost to NGN	75th percentile	13.4	24.4
	85th percentile	30.5	11.3

Note: The value of and cost to NGN are based on the predicted efficient modelled TOTEX, excluding ongoing efficiency and RPEs, over RIIO-GD2.
Source: Oxera analysis.

A2.2 The incentive structure that NGN faces

The figure below replicates the simulation analysis using the UQ benchmark.

Figure A2.1 UQ benchmark



Note: The net benefit is defined as the sum of the change in the cost allowance and the change in the BPI reward. This analysis relies on the latest outturn data without updating forecasts.
Source: Oxera analysis.

The insights here are broadly similar to those presented in section 4.1—while the BPI reward does increase with a reduction in TOTEX, this does not compensate for the lost revenues resulting from the cap on allowances.

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