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Executive summary

Ofgem reviews the expenditure and outputs included in transmission owners' (TOs) business plans to assess their efficient cost requirements and, ultimately, allowed revenues. As part of this assessment, the regulator seeks to account for forward-looking cost pressures and productivity improvements, including ongoing efficiency (OE) and real price effects (RPEs).

OE relates to the potential for efficient companies to improve their productivity in the future, via technological advancements, managerial improvements and 'learning by doing'. Meanwhile, RPEs relate to the fact that the price of several inputs that TOs face are largely determined by wider (exogenous) market forces, such that an exogenous increase or decrease in input prices results in an increase or decrease in a TO's efficient cost requirements. RPEs reflect changes in input prices (in real terms) that may not be appropriately captured by general inflation measures, such as CPIH, that revenues may be indexed to.

Oxera assisted Scottish Power Energy Networks (SPEN) on OE and RPEs during the RIIO-3 business plan submission, where we outlined a robust methodology for determining the OE target and to account for RPEs.¹ Ofgem has subsequently published its draft determination (DD) for RIIO-3, where it outlined its proposals relating to these parameters.²

Ofgem's proposals largely follow the RIIO-2 approach on both OE and RPEs. Importantly, Ofgem has not adequately engaged with the evidence that we put forward as part of SPEN's business plan, which has led to an overestimate of the feasible OE target and insufficient protections for input price pressures. These are discussed in detail below.

Ongoing efficiency

Ofgem has imposed a 1% p.a. OE challenge to SPEN's ex ante allowances, which is considerably higher than the 0.4% p.a. challenge

¹ Oxera (2024), 'Ongoing efficiency and real price effects', December, <https://www.spenergynetworks.co.uk/userfiles/file/Oxera-Ongoing-Efficiency-and-Real-Price-Effects.pdf>, accessed 7 August 2025, hereafter 'Oxera (2024), Initial submission'.

² See Ofgem (2025), 'RIIO-3 Draft Determinations for the Electricity Transmission, Gas Distribution and Gas Transmission sectors', July, <https://www.ofgem.gov.uk/consultation/riio-3-draft-determinations-electricity-transmission-gas-distribution-and-gas-transmission-sectors>, accessed 7 August 2025, hereafter 'Ofgem (2025), RIIO-3 DD'.

that SPEN embedded in its business plan, and considerably higher than the c. 0.1% p.a. achieved by comparable sectors in the wider economy—such as construction, transportation, and storage—in recent years.³ Ofgem’s proposals amount to a challenge of c. £78m over RIIO-T3 (T3). Neither Ofgem nor its consultant (Grant Thornton, GTh) adequately engaged with our evidence that supported a target of c. 0.0–0.5% p.a.

Ofgem and GTh have made several technical errors when estimating and interpreting the evidence in setting the OE target. However, our principal concern relates to Ofgem’s unsupported ‘anchor’ of a 1% p.a. OE challenge, which has been set in recent price controls in the energy and water sectors. Indeed, the scope of GTh’s report is to assess *whether the 1% p.a. target could be supported by some evidence*,⁴ rather than to independently assess what OE target the preponderance of evidence would support. GTh has provided two ranges of what an appropriate OE target could be, based on an analysis of productivity growth in the wider economy:

- a broad range of -1.0% p.a. to 4.2% p.a.;
- a ‘narrow’ range of 0.1% p.a. to 1.3% p.a.

These ranges—even the supposedly narrow range—are infeasibly wide. In particular, the top end of the ranges (which appear to support a 1% p.a. target) are driven by unreasonable and unsupported assumptions, which are explained in more detail below. **Increasing the range to include Ofgem’s anchor of 1% p.a. falls significantly short of good practice, and cannot be viewed as an independent assessment of what companies should be able to deliver.**

Ofgem also relied on qualitative arguments to justify aiming towards the top end of GTh’s narrow range. The majority of the motivated arguments that Ofgem and GTh use to justify a stretching target were already predicted and addressed in our business plan submission,⁵ yet have received no engagement.

³ See Grant Thornton (2025), ‘Independent Report on Ongoing Efficiency: RIIO-3 Technical Annex’, June (hereafter ‘GTh (2025), OE paper’) Table 2.

⁴ GTh states that part of the approach it took is to ‘test whether Ofgem’s initial starting point proposed for the OE target (of 1%, contained in its Sector Specific Methodology Decision (“SSMD”) and consistent with RIIO-2) is consistent with the range of evidence’. See GTh (2025), OE paper, p. 3.

⁵ See Oxera (2024), Initial submission.

Below, we outline the most material concerns with Ofgem's and GTh's analysis. Note that this is not an exhaustive list of concerns (further detail can be found in section 2).

Selection of comparators

GTh has not presented a sensible framework for selecting comparator sectors, nor has it engaged with the framework that we outlined in our initial submission. Instead, GTh appears to have relied exclusively on regulatory precedent and submissions from companies when selecting comparators. This approach has led to the selection of inappropriate comparators and, ultimately, an overestimate of OE.

For example, GTh has included the Information and Communication sector in the comparator set. The only rationale for this inclusion is that the sector has been used by some companies (including, allegedly, Oxera) when setting OE targets.⁶ However, Oxera explicitly argued against the use of the Information and Communication sector in our submission—i.e. GTh has misrepresented the findings of our report.⁷ For clarity, the Information and Communication sector should not be included in the comparator set for the following reasons.

- The sector contains irrelevant subsectors, such as Publishing and Motion Picture.
- The sector contains Telecommunications, part of which (wired communications) is characterised by natural monopolies and are highly regulated; the other part (wireless communications) is not relevant to TO functions.
- The impact of IT usage and increased digitisation on productivity growth is already captured in the other comparator sectors, all of which are more IT-intensive than the TO sector.
- The sector has experienced material growth over the modelled period, such that part of the estimated productivity growth is likely to be driven by economies of scale rather than purely OE.

Removing this sector alone reduces the top end of the narrow range from 1.3% p.a. to 0.6% p.a.

Moreover, GTh has included six manufacturing sectors in the comparator set without justification,⁸ despite the limited regulatory precedent. In general, the production process in a manufacturing firm is

⁶ GTh (2025), OE paper, pp. 16–17.

⁷ For example, see Oxera (2024), Initial submission, section 2.5.

⁸ GTh (2025), OE paper, p. 18.

fundamentally different from the activities undertaken by electricity transmission operators. Manufacturing typically follows a repeatable, high-volume production line, where efficiency gains can be driven by automation, lean practices, and economies of scale. In contrast, electricity transmission involves complex project-based work—such as major infrastructure installations, long-term asset management, system balancing, real-time monitoring, and ensuring grid stability across vast and often remote geographical areas. These are engineering-intensive, bespoke activities that are distinct from mass production tasks, and are therefore subject to entirely different constraints on productivity improvements.

Time period of analysis

GTh considered four time periods to estimate productivity growth: (i) 1970–1996; (ii) 1997–2007; (iii) 2010–2019; and (iv) 1970–2019, excluding 2008 and 2009.⁹ Of the four periods considered, only 1997–2007 supports Ofgem's 1% p.a. target. GTh's selected time periods suffer from at least three important limitations, as follows.

First, no time period includes data for 2008 and 2009. This is inconsistent with the CMA's decision at RIIO-2, which suggested that years of unusual productivity (high or low) should not be arbitrarily removed from the sample. Indeed, the CMA observed that 'an approach which placed insufficient weight on the lower productivity since 2008 could lead to an overestimate of the appropriate OE challenge'.¹⁰ Given that no time period considered by GTh includes data for 2008 or 2009, all of GTh's estimates place insufficient weight on the post-2008 period, which overestimates the OE challenge.

Second, only one time period (2010–2019) sufficiently accounts for the recent and sustained slowdown in productivity growth since the global financial crisis (GFC). Both Ofgem¹¹ and GTh¹² have stated that TOs are unaffected by economy-wide slowdowns in productivity growth, but neither have presented evidence to support these assertions, nor have they engaged with the evidence that we presented in the business plan

⁹ GTh (2025), OE paper, p. 18.

¹⁰ See CMA (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 2B: Joined Grounds B, C and D', October (hereafter 'CMA (2021), RIIO-2 appeal'), para. 7.80.

¹¹ Ofgem (2025), RIIO-3 DD, para. 8.33.

¹² GTh (2025), OE paper, p. 29.

that demonstrated that TOs were affected by economy-wide slowdowns.¹³

Third, the period 1997–2007 captures a period of sustained economic growth and is therefore an incomplete business cycle. This results in an overestimate of the OE target. Indeed, this is supported by GTh’s own analysis, which shows that productivity growth in this period is c. 1.2 percentage points higher than in the complete business cycle (2010–2019) and c. 0.8 percentage points higher than the historical long-run average (1970–1996).¹⁴

Use of precedent

Ofgem argues that its target of 1% p.a. is aligned with regulatory precedent.¹⁵ GTh outlines three sources of regulatory precedent to support the target,¹⁶ all of which are recent decisions made by regulators in the UK.

The use of regulatory precedent in this way is inappropriate, and has been applied inconsistently across regulatory parameters. For example, Ofgem did not seek to align with previous decisions to determine financial parameters (e.g. beta, risk-free rate). Instead, Ofgem updated the financial parameters to reflect the latest available information, even if the methodology used to determine those parameters was similar to previous decisions. As such, it is not clear why Ofgem would use specific OE targets from previous decisions to inform the OE target at RIIO-3.

Moreover, GTh’s review of regulatory precedent suffers from a clear selection bias. Based on our review of European regulators, most regulators set an OE target of c. 0.5% p.a. or below.¹⁷ Furthermore, GTh’s reliance on UK regulators may cause circular reasoning, as the decisions cited by GTh themselves rely on regulatory precedent to inform the target.

Other issues

It is not clear exactly how much weight Ofgem attached to each argument that it used to aim up within GTh’s range of OE targets.

¹³ Oxera (2024), Initial submission, section 2.7.3.

¹⁴ Note that we cannot confirm whether the latter period constitutes a full business cycle, given that GTh does not present any business cycle analysis. However, CEPA’s RIIO-2 analysis indicated that the period 1972–1997 constituted three complete business cycles, which is somewhat aligned with the period 1970–1996. As the sample is comparatively large, it is possible that the mismatch between GTh’s time period and complete business cycles will have a smaller effect on the estimated productivity growth.

¹⁵ Ofgem (2025), RIIO-3 DD, para. 8.33.

¹⁶ GTh (2025), OE paper, section 4.1.

¹⁷ These precedents are outlined in section 2.2.4.

Nonetheless, it has raised several qualitative arguments to support the 1% p.a. target, all but one of which have already been addressed in our submission alongside SPEN's business plan.¹⁸ These include the following.¹⁹

- **Embodied technical change:** Ofgem has argued that the productivity estimates do not account for the increasing quality of new capital inputs ('embodied technical change'), which justifies aiming up. Unlike other regulators that considered this argument, Ofgem has provided no evidence to support an uplift. Embodied technical change may be relevant in sectors that have a high turnover of assets where there have been significant improvements in the technology of the underlying assets. However, the TO sector has a comparatively low asset turnover, such that embodied technical change is unlikely to be relevant.
- **Innovation funding uplift:** Ofgem has argued that TOs should be able to outperform comparator sectors due to historical innovation funding. The CMA rejected similar arguments at RIIO-2, yet Ofgem has presented even less evidence to support an uplift at RIIO-3 than it did at RIIO-2. Reframing the issue as 'qualitative' (at RIIO-3) rather than 'quantitative' (at RIIO-2) does not address the CMA's concerns.
- **Business plan submissions:** Ofgem has argued that the highest target submitted by companies (0.7% p.a.) should be treated as a lower bound for what is achievable. The targets submitted by companies are 'headline' figures that may not relate exclusively to OE, which was a concern raised in the RIIO-2 appeal. The use of business plan submissions to inform a lower bound also creates perverse incentives. Moreover, where regulators have considered companies' submissions to inform the target, companies' submissions were broadly aligned with the regulator's proposals—this is not the case at RIIO-3.
- **Independent forecasts:** Ofgem and GTh have argued that productivity growth is expected to rebound during RIIO-3, based on forecasts from the Office for Budget Responsibility (OBR) and the Bank of England (BoE). However, neither source forecasts that productivity growth will average 1% p.a. over the RIIO-3 period. Moreover, the OBR in particular has systematically

¹⁸ Oxera (2024), Initial submission, section 2.7.

¹⁹ Ofgem (2025), RIIO-3 DD, para. 8.33.

overestimated future productivity growth in recent forecasts,²⁰ which suggests that these forecasts may not be reliable.

That is, all of the qualitative arguments used to support a 1% p.a. target suffer from material limitations and should be given no weight in Ofgem's assessment, unless further evidence (including robust quantitative analysis) is provided.

A feasible range

As neither Ofgem nor GTh has engaged with the substance of our previous submission, we consider that our methodology remains relevant for estimating the OE target.

Subsequent to undertaking the analysis for the business plan submission, there has been a new release of the EU KLEMS database, which captures data for more recent years as well as refinements and corrections to historical data. The table below shows the recommended range when applying the methodology outlined in our previous submission to the latest data.

Revised OE estimates

| | Business plan submission | | Data update | |
|--|--------------------------|--------------|--------------|--------------|
| Time period | 2010–2019 | 1996–2019 | 2010–2019 | 1996–2019 |
| Construction | 0.5% | -0.2% | 0.2% | -0.7% |
| Transportation and Storage | -0.3% | -0.1% | -0.3% | 0.0% |
| Repair and Installation of Machinery and Equipment | 0.2% | 0.9% | -0.2% | 0.9% |
| Financial and Insurance Activities | -0.7% | -0.4% | -1.2% | -0.2% |
| Professional, Scientific, [...] Activities | 0.0% | -0.3% | -0.5% | -0.4% |
| IT and other Information Services | -0.2% | 0.0% | -0.6% | 0.3% |
| Singular comparator set | 0.5% | -0.2% | 0.2% | -0.7% |
| Broad comparator set | 0.2% | 0.2% | -0.1% | 0.1% |
| Granular comparator set (weighted) | 0.1% | 0.1% | -0.3% | 0.0% |

²⁰ Office for Budget Responsibility (2025), 'Forecast evaluation report'. July, para 2.11.

In the business plan submission, the total factor productivity (TFP) growth ranged from -0.2% p.a. (the singular comparator set, 1996–2019) to 0.5% p.a. (the singular comparator set, 2010–2019). Now, the equivalent range is -0.7% p.a. to 0.2% p.a. That is, the revised estimates suggest that our original proposed range of 0.0–0.5% p.a. overestimates the extent to which companies could make OE improvements. **Indeed, based on the latest data, SPEN's proposed target of 0.4% p.a. is above what any relevant comparator set has delivered over any appropriate time period.**

Real price effects

In Oxera's submission alongside SPEN's business plan, we highlighted two key risks in relation to the RIIO-2 approach to capturing RPEs.

- 1 **Basis risk**—the input price indices are overly broad and do not capture the price pressures that companies actually face, particularly for specialist goods and services (e.g. specialist labour, transformers, cables). This is exacerbated by Ofgem's use of stringent materiality thresholds, which prevents it from applying more targeted (and more accurate) input price indices, and also means that SPEN receives less protection from input price pressures than National Grid Electricity Transmission (NGET) and Scottish Hydro Electric Transmission (SHET).
- 2 **Composition risk**—the weights attached to each input price index are fixed ex ante, such that if a company spends more or less on a particular input, this is not reflected in the RPE adjustment.

We also provided detailed recommendations for how to adapt the RPE framework to address these concerns. Despite these risks with the RIIO-2 approach, Ofgem has not materially changed its framework for assessing RPEs. Therefore, our concerns with the RPE mechanism and our recommendations to address these concerns remain valid. Nevertheless, we also recognise that making wholesale changes to the RPE mechanism may be difficult at this stage, given the time constraints and the need for industry-wide consultation.

Given this, we consider that the following corrections should be considered.

First, to reflect the fact that the RPE mechanisms are imperfect, Ofgem should maintain the stepped TOTEX incentive mechanism (TIM). This

would offer some protection to companies and consumers from changes in input price indices that are not captured by the RPE mechanism. However, the TIM is a 'blunt instrument' for accounting for RPEs,²¹ and a more targeted approach to addressing the specific risks associated with input price pressure is required.

Second, the materiality threshold should be reduced (or removed) and a consistent set of RPEs should be applied for all companies. While it may be disproportionate to develop price indices for immaterial cost lines, Ofgem has already constructed a price index for plant and equipment for NGET and SHET. Therefore, applying the same RPE to SPEN would not increase any regulatory burden, and would ensure all TOs are equally protected.

Third, Ofgem should take steps to address the composition risk. This could include:

- adjusting the RPE mechanism such that the RPE index is weighted differently in each year, in line with companies' forecast expenditure on different cost areas;
- adjusting the RPE mechanism in line with outturn expenditure in different areas within the period;
- developing an activity-specific RPE for costs covered under volume driver uncertainty mechanisms.

More generally, Ofgem should clarify which specific risks it seeks to address through the changes it proposes to implement. Therefore, to promote transparency in its final determinations, Ofgem should:

- explicitly identify risks with the RIIO-T2 mechanism (e.g. basis risk, composition risk, etc); and,
- map proposed solutions to each of these risks.

This would provide a transparent and effective framework for evaluating the costs and benefits of different approaches for managing RPE risk in T3, and ensure that Ofgem strikes the right balance protecting

²¹ For example, SPEN may make efficiency savings over RIIO-3 that would normally entitle it to outperformance payments. However, these efficiency savings may be offset by an increase in input prices that are not captured in the RPE mechanism, such that it does not earn rewards from its outperformance. Conversely, SPEN's efficiency may worsen over RIIO-3, which would usually result in underperformance penalties, but a fall in input prices (not captured by the RPE mechanism) may offset this.

companies and customers from RPE risk, while limiting unnecessary complexity.

1 Introduction

Scottish Power Energy Networks (SPEN) has commissioned Oxera to review Ofgem's draft determination (DD) approach to determining the ongoing efficiency (OE) target and real price effects (RPEs) for electricity transmission owners (TOs) for the upcoming regulatory period (RIIO-3).²² This report follows Oxera's submission alongside SPEN's business plan, where we made several recommendations on OE and RPEs.²³

Ofgem has not adequately acknowledged, nor engaged, with the evidence presented in Oxera's submission. Therefore, all of the arguments and recommendations presented in that submission remain valid. In this report, we present new evidence and arguments to support our initial submission, and engage with the evidence and arguments that Ofgem has presented that was not considered in our initial submission. Note that we do not repeat all of the arguments raised in our initial submission in this report, although they remain valid. Therefore, this report should be read in conjunction with our previous submission. The OE analysis is covered in section 2, while the RPE analysis is covered in section 3.

²² See Ofgem (2025), RIIO-3 DD; and GTh (2025), OE paper.

²³ Oxera (2024), Initial submission.

2 Ongoing efficiency

Ahead of the business plan submission, SPEN commissioned Oxera to review the latest evidence on OE and identify a feasible range. Our analysis indicated that a target of 0.0–0.5% p.a. could be supported by the latest evidence.²⁴ Ultimately, SPEN decided to embed a 0.4% p.a. OE challenge in its business plan.²⁵ While this is towards the top end of the range that we identified, the decision was made based on the robustness of the evidence used to inform the range—the upper end was informed by the productivity growth achieved by the most relevant comparator sector (Construction) in the most recent business cycle.

At the RIIO-3 DD, Ofgem has provisionally imposed a 1% p.a. OE challenge to companies' ex ante allowances.²⁶ Ofgem commissioned a consultant (Grant Thornton, GTh) to advise it in this area. According to GTh, one part of GTh's approach is to:²⁷

test whether Ofgem's initial starting point proposed for the OE target (of 1% [...]) is consistent with the range of evidence

That is, the scope of GTh's work does not appear to provide an independent assessment of what OE target would be supported by the preponderance of evidence; rather, the scope is designed to assess whether some evidence could support a 1% p.a. target. In this way, the 1% p.a. target set at previous price controls is effectively viewed as an 'anchor' for future reviews.

GTh has provided two ranges of what an appropriate OE target could be, based on an analysis of productivity growth in the wider economy:²⁸

- a broad range of -1.0% p.a. to 4.2% p.a.;
- a 'narrow' range of 0.1% p.a. to 1.3% p.a.

Ofgem then relied on qualitative arguments to justify aiming towards the top end of GTh's narrow range to support a 1% p.a. target. Several of the arguments that Ofgem and GTh use to justify a stretching target were already predicted and addressed in our report alongside SPEN's business plan submission. In this section, we first outline our concern

²⁴ Oxera (2024), Initial submission, p. 4.

²⁵ SPEN (2024), 'SP Energy Networks RIIO-T3 Business Plan', December, p. 82.

²⁶ Ofgem (2025), RIIO-3 DD, p. 90.

²⁷ GTh (2025), OE paper, p. 3.

²⁸ GTh (2025), OE paper, Figure 1.

with GTh's application (and Ofgem's interpretation) of the growth accounting (GA) methodology (section 2.1), before addressing the qualitative arguments that Ofgem and GTh have proposed to aim up (section 2.2). Broader methodological concerns are outlined in section 2.3, and section 2.4 concludes.

2.1 Growth accounting

GA analysis is used to estimate the productivity growth achieved by 'comparable', competitive sectors of the wider economy to determine a feasible range of OE targets. As outlined in our previous submissions, GA analysis requires a careful consideration of the following factors.²⁹

- 1 The choice of productivity measure.
- 2 The selection of comparator sectors.
- 3 The time period of analysis.
- 4 The aggregation of productivity across sectors.

We assess Ofgem's and GTh's decisions in these areas below.

2.1.1 The choice of productivity measure

In Oxera's submission, we demonstrated that gross output (GO)-based measures of total factor productivity (TFP) should be used to determine the OE target.³⁰ Partial factor productivity (PFP) measures are not comprehensive measures of productivity. In particular, the productivity of any one input depends on the utilisation of other inputs, which implies that partial measures are not likely to reflect comprehensively the productivity potential of an input set. Meanwhile, value added (VA) based measures of TFP (TFP-VA) do not account for the contribution of all inputs to outputs, as they exclude intermediate inputs. The inclusion of all inputs can avoid biases in the VA measure when the mix of inputs used in the production process changes. Furthermore, the GO measure is closely related to the decisions made by companies, as it assumes that all inputs in the production process are controllable.

This finding is supported by international bodies such as the OECD as well as regulatory precedent. For example, the OECD states:³¹

Labour productivity is a partial productivity measure and reflects the joint influence of a host of factors. It is easily misinterpreted as technical change [OE]

²⁹ See Oxera (2024), Initial submission, sections 2.3–2.6.

³⁰ Oxera (2024), Initial submission, section 2.3.

³¹ OECD (2001), 'Measuring Productivity – OECD Manual: Measurement of Aggregate and Industry-level Productivity Growth', July, pp. 15–18.

[TFP-VA is] not a good measure of technology shifts at the industry or firm level.

Conceptually, KLEMS-MFP [TFP-GO] is the most appropriate tool to measure technical change by industry as the role of intermediate inputs in production is fully acknowledged

This is supported by other regulators that use GA analysis to determine the OE target. For example, the Dutch regulator (Autoriteit Consument & Markt, ACM) commissioned a report from Economic Insights to determine the OE target for gas and electricity transmission system operators (TSOs), where it argued:³²

Empirical studies of productivity use either gross output-based (GO) measures or value added based (VA) measures. [...] Under standard economic assumptions of profit maximisation, competition, and constant returns to scale, the GO-based productivity index measures technological change (Balk, 2009). For this reason, this study primarily uses the GO approach to productivity measurement.

GTh has also used TFP-GO to determine its narrow range of OE targets, which is aligned with good practice and Oxera's submissions. GTh correctly argues that TFP-VA measures ignore the contribution of intermediate inputs and therefore do not estimate productivity improvements at the TOTEX level. However, GTh argues that there may be good reasons to account for TFP-VA to inform the target and Ofgem has placed some (albeit unspecified) weight on TFP-VA when informing the target.³³ Specifically, GTh states that there is a lower measurement error with TFP-VA.³⁴

We note that VA is simply GO less intermediate inputs. If there is uncertainty in relation to the measurement of intermediate inputs, this will affect both VA-based and GO-based TFP estimates. Regardless, the impact of data uncertainty in the GO-based TFP measure does not result in a clear bias in the estimated productivity growth, whereas **focusing on VA-based TFP measures leads to a known upward bias.**³⁵

³² Economic Insights (2020), 'Frontier Shift for Dutch Energy TSOs', May, pp. 5–6.

³³ Ofgem (2025), RII0-3 DD, para. 8.33.

³⁴ GTh (2025), OE paper, p. 20.

³⁵ VA-based estimates of TFP omit the productivity effects of intermediate inputs, which overestimates the role of technological progress on delivery productivity improvements. VA-based and GO-based measures of TFP are mathematically related, with VA-based measures of TFP being equal to GO-based measures of TFP multiplied by the inverse of the share of VA in GO. As VA is equal to GO minus intermediate inputs, and intermediate inputs cannot be negative, GO is always greater than (or equal to) VA. The inverse of the share of VA in GO is therefore always greater than (or equal to) 1.

Notwithstanding the limitations with TFP-VA, we argued in our submission alongside SPEN's business plan that TFP-VA measures could be used to inform the target under certain conditions. For example, TFP-VA measures could be used to determine the OE target if the OE target was not applied to intermediate inputs (i.e. not applied at the TOTEX level). Alternatively, the target derived through TFP-VA measures could be scaled to be applicable to TOTEX. Ofgem and GTh have not presented evidence that they have performed such adjustments when using TFP-VA to inform the OE targets.

Ofgem should place no weight on TFP-VA to inform the OE target on TOTEX, unless it makes the necessary adjustments.

2.1.2 The selection of comparators

In our submission, we outlined a framework for how comparator sectors should be selected.³⁶

GTh acknowledges that 'the decision on a set of comparator sectors should be guided by information on the commonalities between comparator sectors and the activities carried out by energy network companies'.³⁷ However, GTh provides no framework for identifying suitable comparators for the energy transport sectors, nor does it engage with the framework that we outlined in our submission.

Importantly, GTh does not provide any arguments for the operational similarities between the energy transport sectors and the comparator sectors when undertaking its own analysis. Instead, GTh appears to have relied exclusively on regulatory precedent and submissions from the industry.

This has led to the selection of inappropriate comparators, which is outlined in further detail below.

GTh and Ofgem should outline a framework for selecting comparators and engage with the evidence presented in companies' submissions.

The selection of Information and Communication

GTh includes the Information and Communication sector in its comparator set. This sector has experienced the highest productivity growth across GTh's modelling period, and therefore has a material

³⁶ Oxera (2024), Initial submission, section 2.5.

³⁷ GTh (2025), OE paper, p. 20.

impact on the estimated OE target. As noted above, GTh does not provide any rationale for including this sector, beyond the observation that some companies have used such a sector to inform their own OE targets.

However, GTh has mischaracterised Oxera's submissions on this topic. Counter to GTh's statements, Oxera did not include the Information and Communication sector aggregate in its comparator set. In fact, we explicitly argued that the Information and Communication sector aggregate cannot be included in the comparator set.³⁸ Given that the gas distribution networks (GDNs) and National Gas Transmission (NGT) did not include the Information and Communication sector, only one company (National Grid Electricity Transmission, NGET) *might* have included the Information and Communication comparator set. Note that NGET's report is not in the public domain, so we cannot verify whether GTh has similarly mischaracterised NGET's submission.

Regardless of what companies have submitted, the Information and Communication sector cannot be used for the following reasons.

First, the Information and Communication sector-aggregate includes 'Publishing, motion picture, video, television programme production; sound recording, programming and broadcasting activities', which are not relevant to the TOs' activities. As more granular data at the sub-sector level is available, it is logical to omit this sector from the comparator set.³⁹

Second, the sector contains Telecommunications. Some aspects of the Telecommunications sector are relevant to the TOs' functions, such as wired communication, which requires a physical network that must be constructed and maintained, not dissimilar to a TO's network. However, the Telecommunications sector also contains the wireless communication sector, which is not likely to be relevant to the TOs' functions. Studies have shown that the wireless communications sector has achieved significantly higher rates of technological progress than

³⁸ For example, see Oxera (2024), Initial submission, p. 42. Note that we did include the 'IT and other information services' sector (a subsector within the Information and Communication sector aggregate) in one of the three comparator sets that we considered.

³⁹ Note that any sector, even those that are most comparable to TOs activities, will contain sub-sectors that are less relevant. In the absence of more granular data, it may be appropriate to include such sectors, despite their limitations. However, if more granular data is available that allows one to omit less relevant sub-sectors, there is no reason to include irrelevant comparators. For example, the 'Transportation and Storage' sector aggregate contains 'transport via pipelines', which may be operationally relevant to TO functions, but also 'air transport' (e.g. airports, aeroplane travel) which is not relevant. However, it is not possible to isolate the 'transport via pipelines' sector from the other transportation and storage sectors with the EU KLEMS dataset.

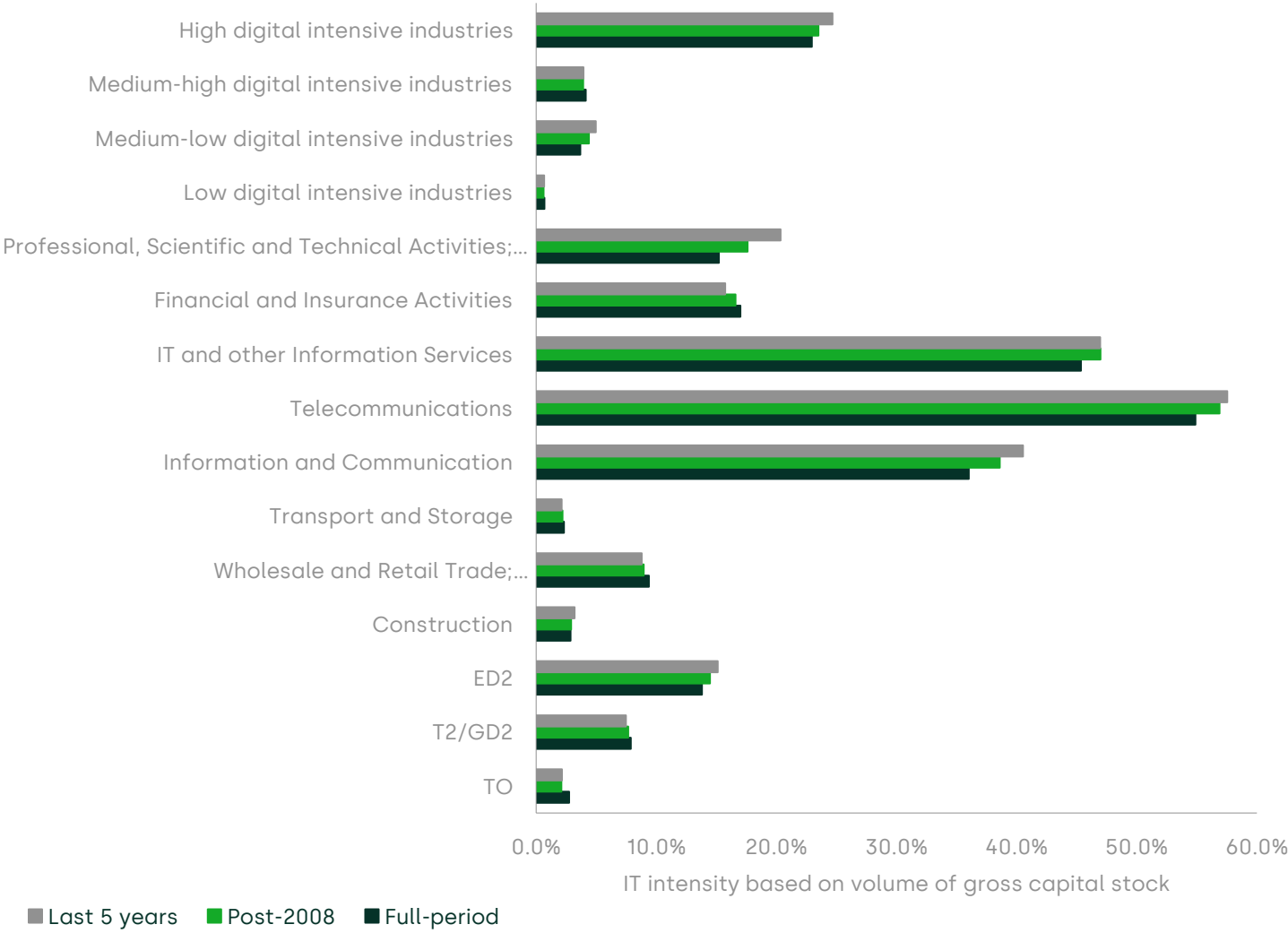
the wired communications sector,⁴⁰ such that an examination of the total Telecommunications sector will overestimate the scope for OE.

Third, aspects of the Telecommunications sector are often characterised by natural monopolies and are highly regulated. This is particularly the case in the wired communication sector, which, as noted above, is most comparable to a TO's network (e.g. BT Openreach is regulated by Ofcom as a natural monopoly). As the only comparable sector within the Telecommunications sector is not competitive, it is unlikely that the measured productivity growth exclusively relates to OE productivity improvements and could also capture catch-up efficiency and scale effects.

Fourth, the stated purpose of including the IT and other Information Services sector in previous decisions—i.e. to capture the impact of digitisation—is not relevant. The impact of digitisation on productivity will already be captured by the estimated TFP in the other comparator sectors to some extent, depending on the sectors' IT intensity. If the TO sector is more IT-intensive than the rest of the comparator sectors, it may be appropriate to consider the inclusion of the IT and other Information Services sector to capture this, provided it is given a sufficiently low weight in the analysis (notwithstanding the above issues with the sector). The figure below compares the IT intensity of GTh's comparator sectors to the TO sector.

⁴⁰ See, for example, Modica, N.F. and Chansky, B. (2019), 'Productivity trends in the wired and wireless telecommunications industries', Beyond the Numbers: Productivity (U.S. Bureau of Labor Statistics), May, **8**:8.

Figure 2.1 IT intensity of sectors based on volume of gross capital stock



Source: Oxera analysis.

The figure shows that the TO sector is far less IT-intensive than almost all comparator sectors—albeit close to the Construction sector and similar to the Transport and Storage sector.⁴¹ In particular, TOs are evidenced to be less digitally intensive than ‘medium-low digital intensive industries’. Therefore, far from requiring an uplift in the OE target to account for the impact of digitisation, a reduction in the target

⁴¹ While the TO sector is currently investing in IT and digital infrastructure, it is unlikely that TOs will be as IT-intensive as the comparator sectors by the end of RIIO-3. Currently, the TO sector is c. five times less IT-intensive than the Professional Services sector, and c. ten times less IT-intensive than the Information and Communication sector.

may be more appropriate, as TOs cannot benefit from productivity improvements in IT to the same degree as the comparator sectors can.

Fifth, the Information and Communication sector has undergone extensive growth during the modelling period. Between 1995 and 2019, the VA of the industry grew by 1,074% in real terms, compared to a growth of 27% in the TO sector and 66% in the wider economy. If there are any economies of scale in the Information and Communication sector—which we would expect, given that part of the sector is characterised by natural monopolies—the estimated TFP growth would capture a combination of OE, catch-up and scale effects.

We note that removing this sector alone reduces the implied range of feasible OE targets, as shown in the table below.

Table 2.1 OE targets excluding Information and Communication

| | 1970–1996 | 1997–2007 | 2010–2019 | 1970–2019 (excl. 2008 and 2009) |
|--|-----------|-----------|-----------|------------------------------------|
| Simple average | 0.5 | 1.3 | 0.1 | 0.7 |
| Simple average (excl. Information and Communication) | 0.4 | 0.6 | -0.3 | 0.3 |

Source: Oxera analysis of GTh (2025), OE paper, Table 2.

The implied range of feasible OE estimates reduces from 0.1–1.3% p.a. to -0.3–0.6% p.a., with the 'long-run estimate' reducing from 0.7% p.a. to 0.3% p.a. Once this correction is made, GTh's proposed range is broadly aligned with our recommended range of 0–0.5% p.a.

The Information and Communication sector should not be included in the comparator set. However, the subsector 'IT and other Information Services' could be included, provided it is assigned an appropriately low weight.

The inclusion of manufacturing sectors

GTh includes six manufacturing sectors in its comparator set. The only justification for this appears to be that some consultants (working for energy networks) proposed the inclusion of such sectors in their own

modelling. However, manufacturing sectors only have limited precedent when informing the OE target.

- In RIIO-2, CEPA explicitly excluded manufacturing sectors from its analysis, arguing that the manufacturing sectors were not comparable to energy networks.⁴²
- In RIIO-1, Ofgem set the OE target for CAPEX and REPEX based exclusively on the productivity growth achieved by the Construction sector. For OPEX, Ofgem considered comparator sets that excluded manufacturing as well as economy-wide measures of productivity (which naturally placed some weight on manufacturing sectors).⁴³
- The ACM, who also use EU KLEMS based TFP analysis, similar to Ofgem, to inform OE for its energy networks, used only one manufacturing sector to determine the OE target (the 'repair and installation of machinery and equipment' sector), which is in line with one of our proposals.⁴⁴

Given that the inclusion of manufacturing sectors in the comparator set has only limited precedent (at best), GTh should have provided a robust basis for making that decision. In this respect, we note that the manufacturing sectors are not comparable to electricity transmission networks. The production process in a manufacturing firm is fundamentally different from the activities undertaken by electricity TOs. Manufacturing typically follows a repeatable, high-volume production line, where efficiency gains can be driven by automation, lean practices, and economies of scale. In contrast, electricity transmission involves non-repetitive, project-based work—such as major infrastructure installations, long-term asset management, system balancing, real-time monitoring, and ensuring grid stability across vast and often remote geographical areas. These are engineering-intensive, bespoke activities that are distinct from mass production tasks, and are therefore subject to entirely different constraints on productivity improvements.

We note that the selection of some of the manufacturing sectors may be driven by a misunderstanding of what is meant by 'comparability'. There is a distinction between sectors that undertake similar practices

⁴² CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Advice on Frontier Shift policy for Final Determinations', November, p. 28.

⁴³ Ofgem (2012), 'RIIO-T1/GD1: Real price effects and ongoing efficiency appendix', December, para. 3.3.

⁴⁴ Economic Insights (2020), 'Frontier Shift for Dutch Energy TSOs', May, Table 4.1.

to TOs (which is the purpose of the comparability criterion) and sectors that produce outputs that are utilised by TOs. For example:

- TOs use vehicles to travel to work sites, but this does not mean that the work undertaken by the TOs is comparable to the work undertaken by a car manufacturer (as implied by GTh's comparator selection)—driving a car is not equivalent to manufacturing one;
- TOs utilise computers for business support functions and to analyse 'live' data, but they are not involved in the construction of computing hardware or related products—operating a computer is not equivalent to building one.

Notwithstanding the general limitations with manufacturing sectors outline above, there may be some individual manufacturing sectors that are comparable to TO functions. In particular, the 'Repair and Installation of Machinery and Equipment' sector could capture some of the maintenance, renewal and REPEX that TOs incur. However, even this classification also incorporates 'other manufacturing'—that is, manufacturing activities that cannot be directly categorised into other manufacturing sectors. As such, this comparator may suffer from a 'catch-all' classification and include sectors that are not relevant, so it should be given an appropriately low weight when compared to other comparator sectors.

There should be a strong operational rationale for including manufacturing sectors (or, indeed, any sector), which neither GTh nor Ofgem has provided. Manufacturing sectors that are not relevant to TO functions should be excluded from the comparator set.

2.1.3 The time period of analysis

In our submissions, we highlighted that productivity growth should be estimated over complete business cycles to mitigate the risk of bias. Moreover, we argued that more weight should typically be placed on more recent data, given that the recent past is often a better predictor of the near future. Given this point of principle, there is a high evidential bar for omitting or otherwise discounting recent data.⁴⁵

GTh rightly acknowledges that productivity growth should be estimated over complete business cycles. It also highlights that extending the time period over multiple decades can overlook important contextual factors

⁴⁵ Oxera (2024), Initial submission, section 2.4.

that drive productivity growth.⁴⁶ GTh ultimately considered four time periods: (i) 1970–1996; (ii) 1997–2007; (iii) 2010–2019; and (iv) 1970–2019, excluding 2008 and 2009. GTh did not present any evidence that these time periods represent complete business cycles, despite affirming the importance of estimating productivity growth over complete time periods.

GTh's selected time periods suffer from at least three important limitations, as follows.

First, no time period (not even the 1970–2019 average) includes data for 2008 and 2009. This is inconsistent with the CMA's decision at RIIO-2, which suggested that years of unusual productivity (high or low) should not be arbitrarily removed from the sample. The rationale that GTh provides is that the GFC was an atypical/unprecedented event that is unlikely to be repeated, but it also points to COVID-19 as an atypical/unprecedented event, and has highlighted that the period 1970–1996 was characterised by a range of fundamental structural changes. It cannot be the case that there are so many atypical/unprecedented events in only a few decades—these events are not atypical or unusual if they occur at such a frequency.

At the RIIO-2 appeal, the CMA argued that 'an approach which placed insufficient weight on the lower productivity since 2008 could lead to an overestimate of the appropriate OE challenge'.⁴⁷ Given that no time period considered by GTh includes data for 2008 or 2009, all of GTh's estimates place insufficient weight on the post-2008 period, which overestimates the OE challenge.

Second, the upper end of GTh's range (which ultimately informs the target)⁴⁸ is based on the productivity growth achieved by the comparator sectors in the period 1997–2007. Therefore, it does not account for the recent and sustained slowdown in productivity growth since the GFC (i.e. the 'productivity puzzle'). Both Ofgem and GTh have asserted that TOs are unaffected by economy-wide slowdowns in productivity growth, but neither have presented evidence to support these assertions, nor have they engaged with the evidence that we

⁴⁶ GTh (2025), OE paper, p. 18.

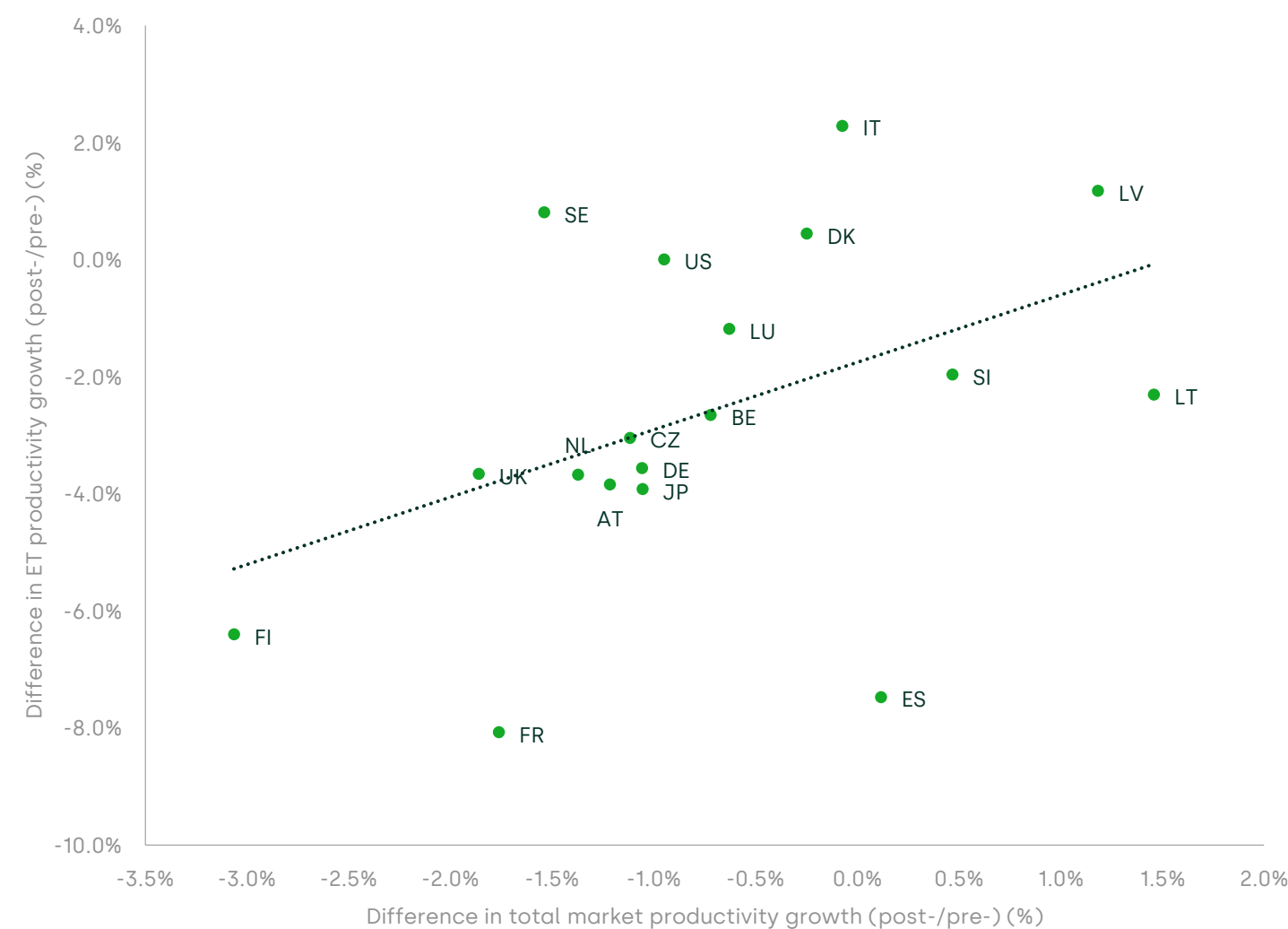
⁴⁷ See CMA (2021), RIIO-2 appeal, para. 7.80.

⁴⁸ Ofgem's target of 1% p.a. is below the 1.3% p.a. upper end of the range proposed by GTh. However, none of the TFP estimates proposed by GTh that place any weight on the recent decline in productivity support a target of 1% p.a. The highest target supported is 0.7% p.a. (based on the full modelling period from 1970 to 2019, excluding 2008 and 2009), but this still only places a small weight (c. 21%) on the recent decline in productivity.

presented in the business plan that demonstrated that TOs were affected by economy-wide slowdowns.

If Ofgem's hypothesis that network industries are less affected by economy-wide slowdowns is correct, one would expect that the productivity growth achieved in the TO sector would be uncorrelated with productivity growth achieved in the wider economy. The figure below shows the relationship between the productivity growth in the market economy and that in the TO sector for the European countries included in the EU KLEMS dataset.

Figure 2.2 Relationship between productivity growth changes post-GFC between TO sector and wider economy



Source: Oxera analysis based on EU KLEMS dataset.

The figure shows that countries that experienced larger economy-wide slowdowns in productivity following the GFC also experienced a larger slowdown in productivity in the TO sector after the GFC. The relationship is found to be statistically significant at the 1% level and positive. That is, there is strong evidence that productivity in the TO sector and the wider economy are related and follow similar directions. As such, it cannot be argued ex ante that the TO sector is independent from economy-wide slowdowns in productivity. Most European economies, including the UK, have exhibited both a decline in economy-wide productivity growth since the GFC with a similar decline in TO productivity.

Third, as demonstrated in our previous submission, the period 1997–2007 captures a time of sustained economic growth and is therefore an incomplete business cycle. Indeed, as shown below, regulators have not typically identified the period 1997–2007 as a complete business cycle.

- At the PR19 redetermination, the CMA used the period 1990–2007 as a complete business cycle, which balances periods of low economic growth in the early 1990s with periods of high growth post-1997.⁴⁹
- At RIIO-ED2, CEPA (on behalf of Ofgem) considered similar business cycles to the CMA at PR19 (1990–2007 and 1991–2007),⁵⁰ but ultimately used the period 1995–2016 for its core analysis.
- At PR24, CEPA (on behalf of Ofwat) argued that the period 1996–2019 represented a complete business cycle. While it also presented estimates for the period 1996–2008 (which is similar to GTh's time period of 1997–2007), it did so for transparency and did not argue that it represented a complete business cycle.⁵¹

Given that the period 1997–2007 constitutes a period of sustained economic growth, it is likely that this period would overestimate the scope for OE. Indeed, this is supported by GTh's own analysis, which shows that productivity growth in this period is c. 1.2 percentage points higher than in the complete business cycle (2010–2019) and c. 0.8 percentage points higher than the historical long-run average (1970–

⁴⁹ See CMA (2021), 'Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Final report', March, para. 4.533.

⁵⁰ CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, pp. 30–31.

⁵¹ See CEPA (2024), 'PR24 Draft Determinations: Frontier Shift, Real Price Effects and the energy crisis cost adjustment mechanism', June, Table 4.5.

1996).⁵² Removing the period 1997–2007 from the analysis leads to a range of OE targets of 0.1–0.5% p.a., which is largely aligned with our original submission of 0.0–0.5% p.a.

More weight should be placed on more recent data, particularly when it is more informative of the upcoming future, in line with good practice. If a longer time period is to be used (which captures multiple business cycles), Ofgem should consider aiming down within the feasible range. The OE estimate should not be informed by productivity growth that is estimated over incomplete business cycles.

2.1.4 Aggregation approach

In our submission, we explained how the optimal aggregation approach may depend on the approach to comparator selection. If only comparators that are directly relevant to large swathes of the TOs' functions are used, then a simple average of comparator sectors may be appropriate (in the absence of further information). Meanwhile, if the comparator set contains sectors that are only relevant to a subset of TOs' functions, the individual sectors should be weighted to reflect their relevance.⁵³

Following this framework, we outlined three different comparator sets with different forms of aggregation. GTh did not engage with this framework and, instead, has aggregated the results across sectors using an unweighted average.⁵⁴ This is despite the fact that GTh includes sectors that are only relevant for some TO functions. For example:

- 'Financial and insurance activities' and the 'Professional Services' sectors may undertake similar activities to some of TOs' indirect functions (e.g. HR, legal), but undertake entirely different activities to core TO functions (e.g. constructing and maintaining critical infrastructure).
- 'IT and Communication' may mirror some activities relating to handling 'big data' and analysing the smart network, but again would not capture core TO functions.

⁵² Note that we cannot confirm whether the latter period constitutes a full business cycle, given that GTh does not present any business cycle analysis. However, CEPA's RIIO-2 analysis indicated that the period 1972–1997 constituted three complete business cycles, which is somewhat aligned with the period 1970–1996. As the sample is comparatively large, it is possible that the mismatch between GTh's time period and complete business cycles will have a smaller effect on the estimated productivity growth.

⁵³ Oxera (2024), Initial submission, section 2.6.

⁵⁴ Strictly speaking, GTh assigns a lower weight to the individual manufacturing sectors, although the manufacturing sectors as a collective receive the same weight as other sectors.

Given that the 'less relevant' sectors have typically achieved higher rates of productivity growth than the core comparator sectors (such as Construction), assigning these sectors a disproportionate weight overestimates the scope for OE.

Ofgem should either: (i) only include comparator sectors that are relevant to broad swathes of TOs' functions; or (ii) assign appropriate weights to reflect each sector's relevance. This framework is outlined in Oxera's submission.

2.2 Selecting a point-estimate

Any robust application of the GA methodology is likely to result in a range of feasible OE targets, as different 'reasonable' assumptions regarding the comparability of different sectors or the appropriate time period can lead to different point estimates. However, Ofgem is required to select a point estimate for the OE target in order to set the challenge for TOs. Selecting the midpoint from the range, or an average of different estimates, may be a natural starting point in the absence of further evidence. Alternatively, it may be appropriate to deviate from the midpoint if: (i) the quality of the evidence supporting different point estimates differs; or (ii) there are alternative sources of evidence to suggest that the GA analysis may overestimate or underestimate the scope for OE.

In our submission, we found that there was no strong evidence to support deviating from the range implied by the GA analysis (0–0.5% p.a.). SPEN selected a point estimate towards the top end of the range (0.4% p.a.) as it considered that more weight should be placed on the productivity growth achieved in the Construction sector in the most recent business cycle.

At the DD, Ofgem and GTh used the following justifications to aim up within the range of 0.1–1.3% p.a.

- The hypothesis that TFP may not account for embodied technical change and therefore underestimate the true scope of OE.
- The effect of innovation funding on productivity growth.
- Using the targets proposed by companies being used as a 'lower bound' regarding what the OE target should be.
- Regulatory precedent supports a target of 1% p.a.
- Independent forecasts of economy-wide productivity growth.
- The observation that VA measures lead to higher estimates of productivity growth than GO measures.

- The impact of IT and digitisation expenditure activities on productivity growth.
- The impact of the material slowdown in productivity growth after the GFC.

Our concerns with these arguments are addressed below.

2.2.1 Embodied technical change

Embodied technical change relates to the fact that the quality of inputs might improve over time, contributing to productivity improvements, yet this is not captured in the TFP estimates.⁵⁵ Usually this is framed in terms of the quality of capital inputs improving over time—for instance, a computer bought in 2020 is likely to be more productive (e.g. have faster processing power and greater storage) than a computer bought in 2000.

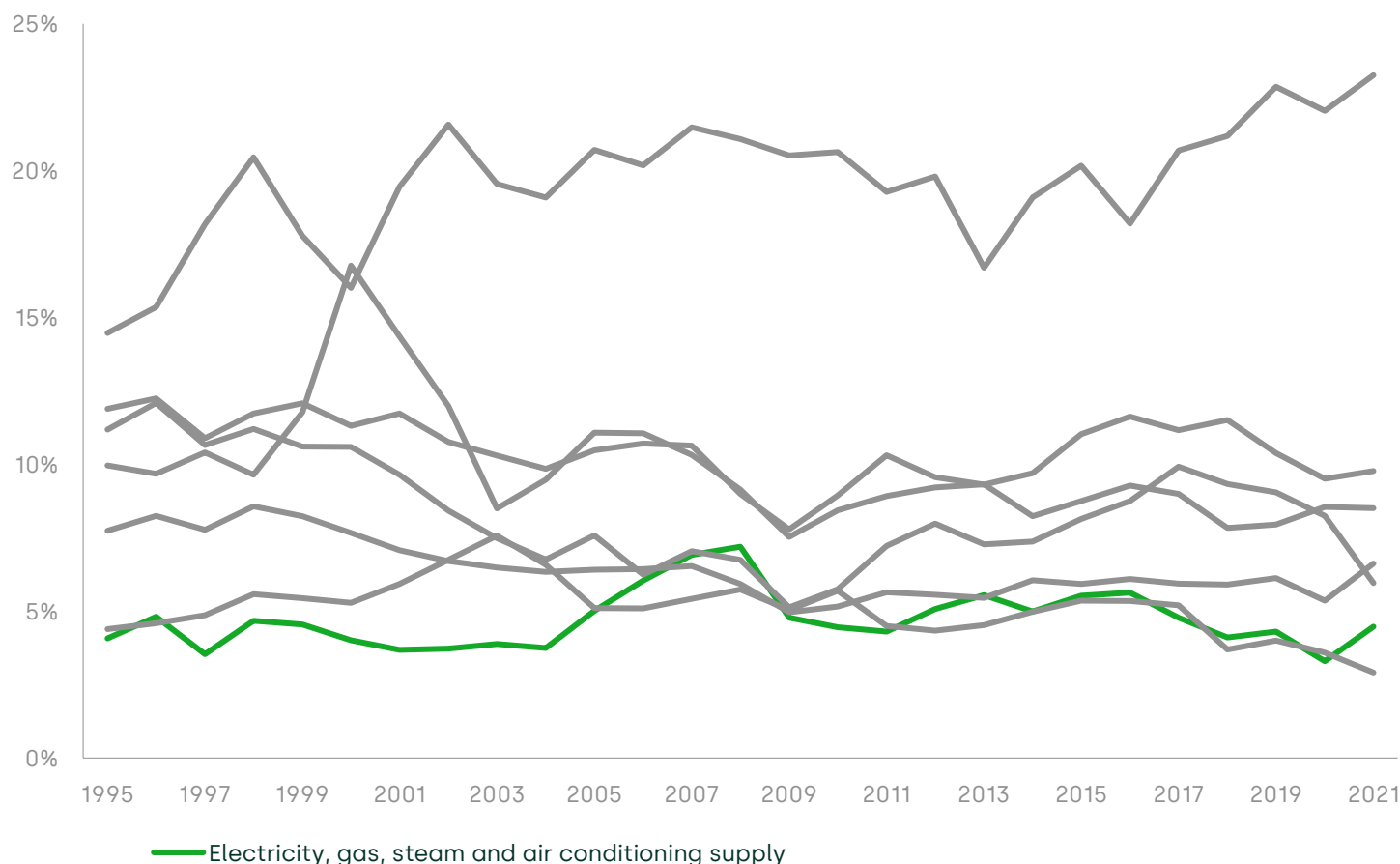
Ofgem has not presented any evidence regarding the presence of embodied technical change in the comparator sectors or the energy transportation sectors. It is good practice, and indeed essential, to provide some evidence to support regulatory decisions. Indeed, the ACM examined embodied technical change when setting its frontier shift target for Dutch TSOs, and found that an uplift was not required.⁵⁶

Moreover, to the extent that embodied technical change may exist, it is unlikely to be material in the TO sector. For embodied technical change to be relevant, there must be a relatively high turnover of assets (i.e. a greater proportion of the capital stock is 'new'). This may be applicable to certain types of assets that are replaced or upgraded regularly, such as IT, but is unlikely to be relevant for vast swathes of the TOs' asset base that are only replaced every 20–50 years. The figure below shows the asset turnover rates in the TO sector compared to the comparator sectors.

⁵⁵ The extent to which TFP captures embodied technical change is disputed among experts.

⁵⁶ For example, see Economic Insights (2020), 'Frontier Shift for Dutch Gas and Electricity TSOs', May, section 7.

Figure 2.3 Trends in asset turnover across the electricity transmission and comparable sectors, 1995–2021



Note: The asset turnover rate is defined as the gross fixed capital formation over the total gross capital stocks of the sector.

Source: Oxera analysis of EU KLEMS data.

The figure shows that the asset turnover rate in the TO sector is low, and significantly lower than the comparator sectors.

Furthermore, not only is the rate of replacement/installation a relevant driver of embodied technical change, but the actual advancements in technology for those assets is also relevant. For example, it is clear that there has been rapid progress in the computing power of IT assets over time such that embodied technical change may be relevant for the assets; but it is less clear that technological progress in other relevant assets (e.g. vehicles, transformers, cables) has been similarly rapid. That is, as the materiality of embodied technical change will be sector specific, it is important to assess whether (rather than assert that) embodied technical change is relevant for the sector in question.

For these reasons, we do not consider that the hypothesised presence of embodied technical change can be used as an argument to aim up on the OE target.

2.2.2 Innovation funding uplift

Ofgem has argued that energy networks should be able to benefit from efficiency gains resulting from the historical customer-funded innovation projects (the 'innovation uplift'). At the RIIO-2 appeal, the CMA rejected Ofgem's innovation uplift, giving the following justifications for doing so.⁵⁷

- Ofgem had assumed that all of the projects relating to the innovation fund improved efficiency via cost reductions, whereas the CMA argued that a significant proportion of the innovation funding was used to improve quality. The CMA noted that 'the impact of this error, by itself, is sufficient for us to conclude that GEMA erred'.⁵⁸
- Ofgem had incorrectly assumed that the impact of the innovation funding was entirely incremental to the TFP estimate, whereas the CMA noted that the comparator sectors also undertake research and development (R&D) activities such that the impact of innovation funding is already captured within the TFP estimates to some extent.
- The impact of innovation funding was already captured within companies' business plans, to some extent.
- There is a realistic expectation that the introduction of an uplift for innovation funding would distort companies' incentives with respect to R&D activities, specifically in relation to whether companies invest in cost-reducing or output-enhancing activities.

Unlike at RIIO-2, Ofgem has not proposed a specific uplift for innovation funding, but has instead used the argument more qualitatively to aim up. That is, Ofgem has provided even less evidence for an innovation uplift than it did at RIIO-2, where the CMA had rejected the uplift. Using the argument qualitatively (as opposed to quantitatively) does not address the limitations highlighted by the CMA in the RIIO-2 appeals, and therefore cannot be used as a justification for aiming up.

⁵⁷ CMA (2021), RIIO-2 appeal, paras 7.802–7.866.

⁵⁸ CMA (2021), RIIO-2 appeal, para. 7.512.

If an uplift for innovation funding is to be considered, Ofgem should address the limitations highlighted by the CMA. A framework for performing such an adjustment could be as follows.

- 1 Assess the extent to which the comparator sectors invest in R&D, and compare this to the innovation funding that TOs have received. If the comparator sectors have spent more on R&D than TOs, no upward adjustment is required and a downward adjustment should be considered.
- 2 Determine how much of the innovation funding received by TOs relates to cost reduction versus quality enhancement. Only innovation funding relating to cost reduction should be considered when setting the OE target, given that the OE target is applied to expenditure.
- 3 Estimate the expected impact of the innovation funding on cost trends, either through a bottom-up assessment (e.g. how much have individual projects reduced TOTEX) or through top-down comparisons (e.g. what is the typical return on R&D in related sectors).

In the absence of a detailed assessment of the kind outlined above, the presence of innovation funding should not be used to aim up.

2.2.3 Business plan submissions

Ofgem has argued that NGET is the most ambitious company, having proposed an OE target of 0.7% p.a., which Ofgem treats as a 'lower bound' for what is deliverable.⁵⁹ Such use of business plan data to validate Ofgem's OE target is subject to several limitations.

First, using the OE targets proposed by companies as a 'minimum' value for the OE target will create perverse incentives. If companies know they will be penalised (through tougher efficiency challenges) by submitting more stretching targets, they may be less likely to propose ambitious and challenging business plans.⁶⁰

Second, the OE targets proposed by companies are 'headline figures' that may not accurately capture the level of OE embedded in their business plans. In this respect, a 0.7% p.a. OE target submitted by one company may not be comparable to a 0.7% p.a. OE target submitted by another. This was evident at RIIO-2 and the subsequent appeals, where

⁵⁹ GTh (2025), OE paper, p.5.

⁶⁰ As explained below, companies may also be incentivised to submit overly stretching OE assumptions.

the 'true' OE target submitted by companies was a contentious issue. In this context, the observation that a subset of companies has proposed a 'stretching' OE target may have little bearing on the level of OE that companies are actually planning to achieve.

Relatedly, companies have sometimes gone against the advice of their advisers when setting their own OE targets. In particular, NGET selected a target at the top end of the range estimated by its advisers, without providing any additional evidence to support such a target. Caution should be exercised when interpreting these figures—given that companies are incentivised to submit 'ambitious' business plans, it is feasible that at least some of them submit over-stretching OE targets in an effort to gain additional rewards or avoid penalties. This is particularly the case in the context of OE, which (as outlined above) is a headline figure that may not accurately capture the frontier shift productivity improvements that companies are proposing.

Third, the evidence submitted by companies to support their OE targets is often very similar to the evidence explored by regulators—the companies often rely on industry-wide studies or reports from economic experts to determine the OE target. That is, the OE targets submitted by the companies often do not represent 'new' evidence regarding the potential scope for OE; rather, it is often a different interpretation of the same (or at least similar) evidence as that presented by the regulator.

Fourth, where companies' business plan forecasts have been considered as qualitative evidence, the OE target proposed by the regulator was already aligned with what companies had submitted. For example:

- At the PR19 redetermination, the CMA stated that its target (of 1% p.a.) was aligned with what the majority of the disputing companies had requested (three of the four disputing companies proposed 1% p.a. or more).⁶¹
- At the RIIO-2 appeal, the CMA noted that Ofgem is entitled to use business plan information, but the CMA's proposed target (c. 1% p.a.) was aligned with what companies had requested

⁶¹ CMA (2021), 'Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Final report', March, para. 4.617 and Table 4.17.

(note that there was a dispute regarding whether these were calculated correctly).⁶²

In the current context, Ofgem's 1% p.a. target is significantly higher than the highest OE target submitted by companies. One company submitted a target of 0.7% p.a., while the rest of the industry proposed targets of 0.5% p.a. or below.

Ofgem should not place any weight on companies' proposed targets when determining the OE target. Instead, Ofgem should engage with the evidence presented in companies' business plans to assess what target would be appropriate. Ofgem (or its consultant) should explain why it considers that the methodological choices made by companies are incorrect, such that companies can have an opportunity to respond.

2.2.4 Regulatory precedent

Ofgem argues that its target of 1% p.a. is aligned with regulatory precedent.⁶³ GTh outlines three sources of regulatory precedent to support the target:⁶⁴

- the RII0-2 decisions and associated appeals, where a c. 1% p.a. target was ultimately set;
- the PR24 decision, where Ofwat set a 1% p.a. target;
- UREGNI's decision in Northern Ireland, where the regulator set a 1% p.a. target.

The use of regulatory precedent in this way is inappropriate for the following reasons.

First, regulatory precedent can be used to inform *methodology* but should not be used to select a *specific target*. For example, using the productivity growth observed in comparable sectors of the UK economy to set the OE target has extensive precedent, both in the UK and in Europe. As such, any departure from this methodology should be robustly justified (e.g. new data/methods are available that lead to a more accurate assessment of OE). However, the specific OE target

⁶² CMA (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 2B: Joined Grounds B, C and D', October, para. 7.293.

⁶³ Ofgem (2025), 'RIIO-3 Draft Determinations Overview Document', July, para. 8.33.

⁶⁴ GTh (2025), OE paper, section 4.1.

implied by this methodology is expected to vary over time, given that the actual evidence supporting the target will change.

We note that Ofgem has not referred to precedent in such a way to set other regulatory parameters. For example, Ofgem did not refer back to previous decisions to determine financial parameters (e.g. beta, risk-free rate). Instead, Ofgem updated the financial parameters to reflect the latest available information, even if the methodology used to determine those parameters was similar to previous decisions. As such, it is not clear why Ofgem would lift specific OE targets from previous decisions to inform the OE target at RIIO-3—a change in evidence requires a change in target.

Second, GTh's review of regulatory precedent is narrow and has a clear selection bias (i.e. only regulators that support a 1% p.a. OE target have been included in the sample). There are several regulators that have proposed significantly lower OE targets that neither GTh nor Ofgem appear to have considered. For example:

- Oxera, in its work for the Flemish energy regulator (Vlaamse Regulator van de Elektriciteits- en Gasmarkt, **VREG**) recommended a target of c. 0.1–0.4% p.a.⁶⁵
- The **ACM** set a target of 0.4–0.5% p.a. for the Dutch TSOs.⁶⁶
- The Walloon energy regulator (Commission wallonne pour l'Energie, **CWaPE**) did not set an incremental frontier shift target for Walloon distribution system operators (DSOs).⁶⁷
- The Brussels energy regulator (**BRUGEL**) set an overall efficiency target (potentially capturing frontier shift as well as other

⁶⁵ See Oxera (2020), 'The necessity and magnitude of frontier shift for the Flemish electricity and gas distribution operators over 2021–24', February, p. 6.

⁶⁶ Economic Insights (2020), 'Frontier Shift for Dutch Gas and Electricity TSOs', May.

⁶⁷ CWaPE (2023), 'Tariff methodology 2025-2029', pp. 8 and 39–41 and the accompanying annex, Schwartz & Co (2023), 'Calcul des coûts additionnels prévisionnels des GRD wallons sur la période 2025-2029 relatifs à l'extension du réseau électrique et gaz et à l'évolution de la pointe sur le réseau électrique', 31 March.

sources of efficiency)⁶⁸ of 0.75% p.a.,⁶⁹ which was limited to a subset of OPEX and not applied to CAPEX.⁷⁰

- The **ACM** originally set a target for DSOs of 0.1% p.a. based on the trend in unit costs over 2004–2020. However, in a subsequent appeal, the Dutch Tribunal Court (the CBb) argued that this would not account for the increased costs associated with the energy transition. The CBb instructed the ACM to use recent data only, which showed that unit costs were increasing by 2.1% p.a. (i.e. a negative frontier shift target).⁷¹
- The Austrian energy regulator (**E-Control**) considered a variety of information sources to estimate the frontier shift target at 0.95% p.a. However, E-Control noted that there would be increased costs associated with the energy transition and challenging macroeconomic conditions,⁷² and moderated the target to 0.4% p.a.⁷³
- The Finnish energy regulator (**Energiavirasto**) estimated the 'general productivity' target (loosely equivalent to the OE target) to be 2% p.a. for the fourth and fifth regulatory periods. However, the Finnish DSOs were experiencing a step-change in the operating environment at the time (c. 2015) that was unaccounted for in the regulator's determination. As such, Energiavirasto set a target of 0% p.a. as a balanced approach.⁷⁴

That is, a more comprehensive review of regulatory precedent suggests that a frontier shift target of 1% p.a. is the highest that has been considered, with most regulators setting a target below 1% p.a.

⁶⁸ BRUGEL does not explicitly state whether the '*efficiëntiefactor*' is intended as a catch-up or OE (i.e. frontier shift) challenge. However, it does cite catch-up efficiency challenges in the Walloon region (from CWaPE), on average 0.74%, in its motivation for retaining the efficiency factor at 0.75% for the upcoming regulatory period—suggesting that it is (at least not wholly) intended as a frontier shift. See BRUGEL (2023), 'Motivatief- en positioneringsrapport betreffende de invoering van nieuwe tariefmethodologieën voor de Brusselse distributienetbeheerder voor elektriciteit en gas voor de periode 2025-2029', 28 November, section 9.1.

⁶⁹ BRUGEL (2023), 'Tariefmethodologie die van toepassing is op de beheerder van het distributienet elektriciteit en gas die actief is in het Brussel Gewest 2025-2029. Deel 1', 28 November, section 10.3, https://brugel.brussels/nl_BE/themes/distributietarieven-12/tariefmethodologie-2025-2029-609, accessed 9 December 2024 (hereafter, 'BRUGEL (2023), Methodology').

⁷⁰ BRUGEL (2023), 'Motivation report', 28 November, section 9.2, p. 107.

⁷¹ College van Beroep voor het bedrijfsleven (2023), 'ECLI:NL:CBB:2023:321', para. 18.3.

⁷² E-Control (2023), 'Regulierungssystematik für die fünfte Regulierungsperiode der Stromverteilernetzbetreiber 1. Jänner 2024 – 31. Dezember 2028', October, section 4.

⁷³ E-Control (2023), 'Regulierungssystematik für die fünfte Regulierungsperiode der Stromverteilernetzbetreiber 1. Jänner 2024 – 31. Dezember 2028', October, section 7.

⁷⁴ Energiavirasto (2015), 'Regulation methods in the fourth regulatory period of 1 January 2016 – 31 December 2019 and the fifth regulatory period of 1 January 2020 – 31 December 2023', November, pp. 79–80.

Relatedly, the specific precedent (beyond Ofgem) to which GTh refers is flawed. As GTh itself notes:

- the PR24 decision is currently being appealed by six companies where the frontier shift target is an area of focus, so the decision is not 'settled';
- UREGNI's decision was itself formed (at least in part) by regulatory precedent, creating a 'circular reasoning'.

For these reasons, regulatory precedent should not be used to directly inform the OE target.

2.2.5 Independent forecasts

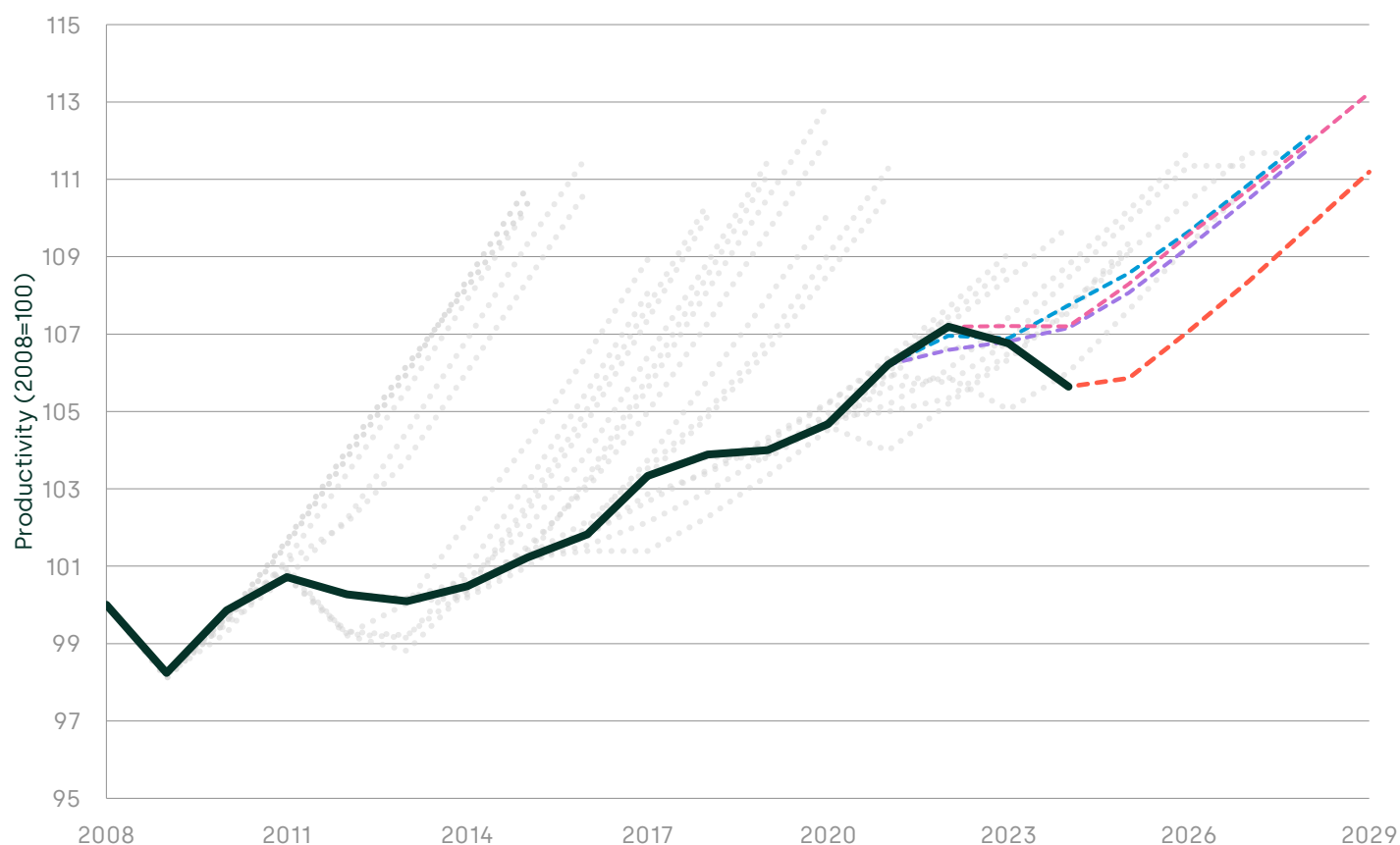
Ofgem suggests that independent forecasts of economy-wide productivity growth support a target of 1% p.a.⁷⁵ As Ofgem correctly notes, these forecasts are not specific to the energy sector. This alone should imply that little weight is given to these arguments when forming the OE target. In addition, there are at least two concerns with Ofgem's interpretation of economy-wide productivity growth forecasts.

First, as highlighted by GTh, neither the Office for Budget Responsibility (OBR) nor the Bank of England (BoE) forecast that productivity growth will average 1% p.a. over the RIIO-3 period. The OBR is closest at c. 0.9% p.a., while the BoE forecasts productivity growth of 0.5% p.a. and 0.3% p.a. in 2026 and 2027, respectively (note that the BoE forecasts do not extend to the full RIIO-3 period). Therefore, if any weight is placed on these forecasts, it would suggest a lower target than 1% p.a. Moreover, the large difference in forecast between the BoE and the OBR suggests that the future scope of productivity improvements is highly uncertain, although no central forecast would support a target of 1% p.a., which should further reduce the weight placed on these forecasts.

Second, independent forecasts have persistently been overly optimistic regarding the potential for productivity improvements. The figure below shows how the OBR's forecasts have compared to outturn data. The dotted lines represent the OBR's forecasts at different points in time, while the solid line represents the outturn productivity growth rate. Note that only recent forecasts are coloured.

⁷⁵ Ofgem (2025), RIIO-3 DD, section 8.33.

Figure 2.4 OBR productivity growth forecasts



Source: Oxera analysis of data provided by the Institute for Fiscal Studies (IFS). See IFS (2025), 'OBR successive forecasts for productivity growth and out-turn', March, <https://ifs.org.uk/data-items/obr-successive-forecasts-productivity-growth-and-out-turn-index-2008-100>, accessed 5 August 2025.

The figure shows that the OBR's forecasts of productivity growth have been consistently higher than the outturn, particularly in the medium term. In the most recent forecasts (the coloured lines), the OBR had forecasted accelerating productivity growth, while the outturn productivity has declined (i.e. negative productivity growth). That is, as well as being uncertain, these forecasts have been shown to have a systemic bias.

The optimism and uncertainty associated with the OBR's productivity growth forecasts is widely acknowledged, including by the OBR itself.⁷⁶ For example, when providing oral evidence to the Treasury Committee in

⁷⁶ For example, see OBR (2025), 'Forecast evaluation report', July, para. 2.11.

2024, Professor David Miles (then head of economic analysis at the OBR) stated:⁷⁷

Productivity is really difficult to forecast [...] it is no more than an educated guess, and maybe not even terribly educated

For these reasons, we do not consider that any weight should be placed on these forecasts when determining the OE target.

2.3 Other methodological concerns

The methodological choices that GTh made when estimating the range (outlined in section 2.1) and the qualitative arguments that it raises for aiming up (outlined in section 2.2) imply a lack of understanding of the issues. Moreover, GTh has made several statements that—while they may not directly inform the OE target—imply a lack of understanding of the concept of OE, how it is achieved, how it should be estimated and how it feeds into the regulatory framework.

A sample of such statements are outlined below.

2.3.1 Economy-wide productivity

GTh does not include the overall economy as a comparator 'sector' in its TFP analysis. As GTh correctly notes, 'this would result in double-counting of some sectors, whilst adding in less relevant sectors (albeit with lower weight), in a way that reduces transparency, does not seem to have a clear justification and may be considered arbitrary'.⁷⁸

However, GTh goes on to contradict this statement:⁷⁹

OE improvements are generally driven by *economy-wide* advancements in technology, capital investment, human resources and/or operational processes. The focus of OE is, by definition, on how companies can leverage wider economic productivity advancements [emphasis included in original text]

If OE improvements were driven by economy-wide advancements, it would be wholly appropriate to include the overall economy as a comparator set. In fact, one would not need to identify comparator

⁷⁷ House of Commons (2024), 'Treasury Committee Oral evidence: Budget 2024, HC 625', March, Q50, <https://committees.parliament.uk/oralevidence/14450/pdf/>, accessed 5 August 2025.

⁷⁸ GTh (2025), OE paper, p. 17.

⁷⁹ GTh (2025), OE paper, p. 30.

sectors at all, as it would be appropriate to focus exclusively on economy-wide productivity growth.

It is clear from GTh's own analysis that OE is not driven primarily by economy-wide advancements in technology. As the comparator sectors selected by GTh are broadly competitive (with some exceptions, as outlined in section 2.1.2), the TFP growth achieved by any individual comparator sector is equivalent to the OE achieved by that comparator sector. If OE was driven by economy-wide advancements, all comparator sectors would achieve broadly similar productivity growth. However, GTh's analysis shows that productivity growth is materially different across sectors. For example, the Information and Communication sector achieved a 5.2% p.a. productivity growth in the period 1997–2007, while the Construction sector achieved negative productivity growth of -0.9% p.a.

OE is not driven by economy-wide advancements in technology. Rather, OE is sector-specific and depends on the activities that each sector undertakes and the type of technology that they utilise.

2.3.2 Catch-up efficiency versus OE

GTh correctly identifies that OE refers to the expected productivity improvements available to companies over and above the catch-up efficiency challenge. In other words, the OE target should reflect the productivity improvements available to the 'frontier' or 'most efficient' company. However, GTh does not appear to understand how OE productivity improvements are made in practice. For example, when responding to companies' arguments that the scope for OE is lower for large, 'one-off' projects, GTh states:⁸⁰

The focus of OE is, by definition, on how companies can leverage wider economic productivity advancements rather than solely relying on internal process enhancements through trial and error, **which are more typically reflected in embedded efficiencies and the challenge of catch-up efficiency** [emphasis added]

That is, GTh argues that OE is **not** driven by trial and error or improving internal processes, and that these typically relate to 'embedded efficiencies' and the catch-up efficiency challenge. This is incorrect. Assuming a reasonable level of transparency and access to information, firms can achieve catch-up efficiency not through trial and error, but by

⁸⁰ GTh (2025), OE paper, p. 30.

replicating the established practices of frontier firms. While some adaptation may be necessary, the process is largely one of imitation rather than exploration. In contrast, it is frontier companies—or inefficient companies seeking to leapfrog the frontier—that must rely on trial and error, as they are experimenting with unproven methods to improve performance.

Moreover, the suggestion that firms can simply leverage economy-wide productivity gains to deliver OE misunderstands the source of those gains. Economy-wide productivity growth is, in fact, the aggregate outcome of OE improvements across individual firms and sectors. It is not an exogenous resource to be tapped into, but rather a reflection of firm-level innovation and performance.

In fact, the observation that trial and error and 'learning by doing' are key drivers of OE is widely supported in the academic literature and has been for decades.⁸¹ Innovation is a key aspect of technical change (or OE), and is largely driven by trial and error and learning by doing, as well as explicit R&D activities.

2.3.3 Remit from the SSMC

GTh has referred to the SSMC as a justification for finding evidence to support a 1% p.a. target, rather than independently assessing what a reasonable OE target would be. This is a selective use of the SSMC, given that the SSMC also outlined other sources of evidence that Ofgem would explore, including forward-looking productivity forecasts for the UK economy (which GTh has considered, albeit incorrectly as highlighted in section 2.2.5) and network companies' historical performance (which GTh has not considered).

At RIIO-2, Ofgem used the productivity growth achieved by the frontier GDN (Northern Gas Networks, NGN) as a cross-check to its proposed OE target (of c. 1.2% p.a.). It argued that NGN had delivered productivity improvements in excess of 1.2% p.a., which suggests that the OE target was reasonable. This specific decision was challenged at the CMA, given that (among other things) there were disputes over the degree to which NGN had achieved 1.2% p.a. productivity growth, and Ofgem's analysis focused on only one company over a short time horizon.

We note that the degree to which companies have made productivity improvements over time can be modelled directly. Indeed, this is how

⁸¹ For example, see Arrow, K.J. (1962), 'The Economic Implications of Learning by Doing', *Review of Economic Studies*, 29:3, pp. 155–173.

several European regulators set the OE target. In the current context, the productivity growth achieved by the gas distribution sector could be inferred by the coefficient on the time trend in Ofgem's TOTEX regression. At RIIO-2, the coefficient implied that outturn costs were decreasing (i.e. productivity improving) at a rate of c. 0.4% p.a. At RIIO-3, the same analysis suggests that outturn costs have been increasing (i.e. productivity worsening) at a rate of 0.2% p.a. Note that this is within the range of the productivity growth achieved by comparator sectors (see section 2.4).

We do not consider that significant weight should be placed on this analysis at RIIO-3, given that it is subject to several limitations. For example, the coefficient on the time trend could capture RPEs and modelling errors and does not distinguish between OE and catch up.⁸² More detailed analysis using more sophisticated modelling would be required for this to form a key source of evidence.

Regardless, the fact that GTh does not appear to have explored this at all is a material omission, given that it could be used as a justification for aiming down. Indeed, even though the evidence is weak, there is at least some evidence for aiming down as a result of this issue. This is in contrast to several of GTh's justifications for aiming up—including the innovation uplift, embodied technical change, and the slowdown in productivity growth after 2008—where GTh has presented no evidence at all.

2.3.4 The margin of appreciation

GTh has pointed towards the 'margin of appreciation' that the CMA afforded Ofgem at the RIIO-2 appeals to support a 1% p.a. target.⁸³

at RIIO-2 the CMA generally defended Ofgem's regulatory discretion or "margin of appreciation" (meaning that the CMA would only rule in favour of the companies if they could prove that Ofgem had made an error, as opposed to not having used the best possible method)

Deferring to the supposed margin of appreciation to justify a 1% p.a. target casts doubt on the robustness of the evidence supporting said target. Indeed, it raises the question of why detailed analysis was undertaken in the first place, if Ofgem is free to disregard robust evidence supporting a lower target providing that there is at least some

⁸² Assuming that the regulatory framework is working well, one would expect that companies have been catching up to good practice. In this context, the time trend would overestimate the scope for OE (i.e. it would be even more negative).

⁸³ GTh (2025), OE paper, p. 32.

evidence to support a higher target, no matter the relative strength of the different sources of evidence.

2.3.5 The impact of incorrect targets

GTh has argued that a higher OE target is beneficial for consumers, while a lower target is harmful. Specifically, it states:⁸⁴

A target above 1%, especially materially so, whilst benefiting customers in terms of lower prices in the next control period could risk under-compensating companies. [...] On the other hand, any target below 1%, especially materially so, could result in bills being higher than necessary

There are several concerns with these statements.

First, GTh's statements assume that the 1% p.a. target is an unbiased estimate of the degree to which companies can make OE improvements. If the true scope for OE improvements was 0% (as supported by some reasonable assumptions), even a target below 1% p.a. (but above 0% p.a.) would underfund companies.

More importantly, GTh has misunderstood how setting an incorrect target will affect companies and consumers. Setting an overly stringent OE target does not benefit consumers and does not just under-compensate companies. For example, an overly stretching OE target could result in some combination of the following.

- Cancelled or postponed investments that are necessary to facilitate the energy transition.
- Reduced maintenance on the network, resulting in asset deterioration, reduced reliability and poorer quality for consumers.
- Lower returns for investors, ultimately reducing the incentive to invest in a period of unprecedented investment and capital to be raised by transmission companies⁸⁵ and exacerbating the issues outlined above.
- Higher bills in the long run, due to the increasing need for investment (to compensate for underdelivered historical investment) and the higher returns required to incentivise that investment.

⁸⁴ GTh (2025), OE paper, p. 32.

⁸⁵ Indeed, Ofgem states that 'it will be vital for networks to attract investment to help them meet CP2030 and net zero targets' in RIIO-3. See Ofgem (2025), 'RIIO-3 Draft Determinations - Finance Annex', July, para. 1.4.

That is, an overly stringent OE challenge only reduces consumer bills in the short run, but has a detrimental impact on consumers in the long run (through higher bills and lower quality).

Meanwhile, setting an OE challenge that is too relaxed may result in unnecessarily high bills in the short run. However, the RII framework has incentives for TOs to improve efficiency during a regulatory period, regardless of the strength of the OE challenge. Therefore, any 'excess returns' achieved by a TO during the regulatory period would ultimately be passed on to consumers at the next regulatory period once these cost reductions are 'baked in'. Indeed, at least 75% of the excess returns achieved during the regulatory period would be passed on to consumers directly through the TOTEX incentive mechanism (TIM).

GTh's comments reflect a degree of short-termism that is inappropriate when setting allowances for critical infrastructure providers.

2.3.6 What counts as evidence

GTh has commented on the fact that companies and regulators have used different arguments to justify higher or lower targets. It states:⁸⁶

It should be noted that the debate around OE – which has spanned multiple price controls in multiple sectors – has often been characterised by different parties (often supported by advisors) making arguments around matters that do not have a clear, definitive answer. For example [...] about which sectors and time periods provide the most appropriate comparators when looking at historic evidence. And there has been extensive discussion around the extent to which macroeconomic factors (especially the UK's 'productivity puzzle') and technological advances (e.g. AI and robotics) should have a bearing on OE targets. Whilst these arguments provide important context, **this report has sought – as far as possible – to appeal to hard evidence and facts (e.g. regulatory precedent and the positions put forward by companies) to draw its ultimate conclusions**, and attached less weight to matters which are open to debate. [emphasis added]

GTh's characterisation of the analysis is incorrect for several reasons.

First, the only examples that GTh gives as 'hard evidence and facts' relate to regulatory precedent and companies' submissions. These are facts insofar as no one disputes *what* regulators and companies have

⁸⁶ GTh (2025), OE paper, p. 3.

proposed. However, they should not be considered as 'hard evidence' of the extent to which TOs can make OE improvements in RIIO-3. Both regulators and companies take sides on issues that GTh characterises as value judgements (such as the appropriate time period) when proposing their targets. That is, the 'hard evidence' that GTh cites are also value judgements, according to GTh's position. Moreover, the targets themselves are not evidence of what companies can achieve at RIIO-3, nor what companies have achieved in the past; rather, they are assumptions that regulators and companies made regarding what companies could deliver in the relevant price control. It is the job of the regulator and its adviser to assess whether these assumptions are valid using robust evidence.

Second, while there are some aspects of the GA methodology that require value judgements (i.e. 'no definitive answer'), there are definitively incorrect answers. For example, there could be a reasonable discussion as to exactly when a business cycle starts and ends, but there is no debate that productivity growth must be estimated over complete business cycles (which GTh has not done). Similarly, there could be a reasonable discussion as to whether the Transportation and Storage sector is equally comparable to TO functions as the Construction sector, but there is no debate that the Construction sector is indeed a relevant sector. Characterising all of these important modelling decisions as value judgements abdicates responsibility for making reasonable modelling decisions, and enables any practitioner to make modelling decisions that suit their interests (i.e. 'goal-seeking').

Relatedly, characterising certain 'qualitative factors' (such as the impact that the recent slowdown in productivity should have on the OE target) as value judgements essentially removes the need for a practitioner to investigate the issues empirically. For example, the extent to which productivity growth in the TO sector is related to productivity growth in the wider economy does not need to be a purely qualitative assessment—it can be verified empirically (as we have done, and GTh has not engaged with).

2.4 Concluding remarks

As neither Ofgem nor GTh has engaged with the substance of our previous submission, we consider that our methodology remains relevant for estimating the OE target. Subsequent to undertaking the analysis for the business plan submission, there has been a new release of the EU KLEMS database, which captures data for more recent years as well as refinements and corrections to historical data. The table below shows the recommended range when applying the methodology outlined in our previous submission to the latest data.

Table 2.2 Revised OE estimates

| | Business plan submission | | Data update | |
|--|--------------------------|--------------|--------------|--------------|
| Time period | 2010–2019 | 1996–2019 | 2010–2019 | 1996–2019 |
| Construction | 0.5% | -0.2% | 0.2% | -0.7% |
| Transportation and Storage | -0.3% | -0.1% | -0.3% | 0.0% |
| Repair and Installation of Machinery and Equipment | 0.2% | 0.9% | -0.2% | 0.9% |
| Financial and Insurance Activities | -0.7% | -0.4% | -1.2% | -0.2% |
| Professional, Scientific, [...] Activities | 0.0% | -0.3% | -0.5% | -0.4% |
| IT and other Information Services | -0.2% | 0.0% | -0.6% | 0.3% |
| Singular comparator set | 0.5% | -0.2% | 0.2% | -0.7% |
| Broad comparator set | 0.2% | 0.2% | -0.1% | 0.1% |
| Granular comparator set (weighted) | 0.1% | 0.1% | -0.3% | 0.0% |

Source: Oxera analysis of EU KLEMS data.

The table shows that the TFP growth in the comparator sectors has generally decreased following the data update, although the impact varies by sector. In the business plan submission, the TFP growth ranged from -0.2% p.a. (the singular comparator set, 1996–2019) to 0.5% p.a. (the singular comparator set, 2010–2019). Now, the equivalent range is -0.7% p.a. to 0.2% p.a.

That is, the revised estimates suggest that our original proposed range of 0.0–0.5% p.a. overestimates the extent to which companies could make OE improvements. **Indeed, based on the latest data, SPEN's proposed target of 0.4% p.a. is above what any comparator set has delivered over any time period.**

3 Real price effects

Energy networks in general—and electricity networks in particular—will likely face increased input price pressures in RIIO-3. In addition to economy-wide input price pressures (e.g. general real wage growth), electricity networks across the UK and Europe are increasing their activity in order to meet the needs of the energy transition, which places significant capacity constraints on their suppliers and leads to higher input prices. As these capacity constraints relate to highly specialised goods and services, they are unlikely to be captured by the 'broad' input price indices that were used at RIIO-2.

In Oxera's submission alongside SPEN's business plan, we highlighted two key risks in relation to the RIIO-2 approach to capturing RPEs.

- 1 Basis risk—the input price indices are overly broad and do not capture the price pressures that we actually face, particularly for specialist goods and services (e.g. specialist labour, transformers, cables).
- 2 Composition risk—the weights attached to each input price index are fixed ex ante, such that if a company requires more or less spending on a particular input, this is not reflected in the RPE adjustment.

Ofgem's approach to assessing RPEs at the DD largely follows the RIIO-2 approach. Ofgem has not adequately engaged with the issues associated with our proposed corrections to this mechanism. In the sections below, we highlight why Ofgem's approach does not correct for the basis and composition risks, as well as provide recommendations for how to proceed ahead of the final determination.

3.1 Basis risk

Basis risk relates to the observation that the input price indices that Ofgem uses for the RPE mechanism do not track the input prices that TOs ultimately face.

This is driven by the following factors.

- TOs use different inputs to those that are captured in the input price index, in part due to the highly specialised nature of the assets that TOs utilise.
- Ofgem has applied a materiality threshold, which prevents it from applying more targeted (and more accurate) input price

indices, and also means that SPEN receives less protection from input price pressures than NGET and SHET.

These are discussed in more detail below.

3.1.1 Selection of indices

Ofgem uses high-level indices to capture the input price pressures that TOs face for often highly specialised inputs. For example, the 'FOCOS Resource Cost Index of Infrastructure: Materials FOCOS' index captures prices for all infrastructure projects. It is likely that certain materials used to construct many infrastructure projects—for instance, roads, railways and bridges—are different from those that are relevant for activities undertaken by TOs—such as the materials used to construct cables and transformers. TOs may therefore be subject to different input price pressures. Specifically, Bituminous products and Aggregates (e.g. gravel and sand) constitute a major proportion of the FOCOS index, yet these materials are generally irrelevant for the activities undertaken by TOs.⁸⁷ As such, input price pressures relevant to TOs may be understated due to the inclusion of irrelevant materials in the index applied, leaving TOs underfunded to deal with such exogenous price pressures. The same issue may be present in the '4/CE/EL/02 Electrical Engineering Materials' index, which includes elements such as 'Lighting equipment' and 'Measuring, testing and navigation equipment: watches and clocks'.⁸⁸

Relatedly, TOs do not typically 'construct' network assets such as cables and transformers. Rather, TOs purchase these assets from third parties. The price trends of 'raw' inputs (e.g. steel) may differ significantly from the price trends of intermediate inputs (e.g. transformers) if supplier margins are changing. In RII0-3, both the UK networks and several European networks will be increasing activity in order to enable the energy transition. This could place significant capacity constraints on TOs' suppliers, and may result in increased input

⁸⁷ FOCOS consists of a number of 21 different elements, but three elements constitute over 50% of the index. These are 'Labour and Supervision', 'Plant and Road Vehicles' and 'Coated Macadam and Bituminous Products'. These are all elements that are either supposed to be captured in other elements of the RPE mechanism (labour and plant and equipment) or are unlikely to make up a large proportion of SPT's materials costs ('Coated Macadam and Bituminous Products'). For more information on the construction of FOCOS, please see: Department for Business & Trade (2025), ['Building materials and components statistics: material price indices methodology'](#), 24 January, section 3.2.

⁸⁸ BCIS (2021), ['Developing inflation indices for civil engineering'](#), pp. 7–8.

price pressures (e.g. increased supplier margins) that will not be captured in the input price indices.⁸⁹

This increase in supplier margins is a significant issue. FOCOS, which makes up half of Ofgem's selected indices for materials costs, does not include supplier margins, despite much of TOs expenditure being on finished goods which can be significantly affected by such margins. For example, these margins alone can account for c. 18% of a standard transformer's price.⁹⁰ If there are large swings in margins for these suppliers, which could be expected given the ongoing capacity constraints with suppliers, or in other costs not captured within the RPE mechanism, this may expose companies to price increases that are not captured in the RPE mechanism. TOs may subsequently have to absorb such exogenous cost increases, potentially resulting in funding issues across their activities in T3.

3.1.2 Materiality thresholds

Ofgem has maintained the same materiality thresholds that is applied at RIIO-2 when considering whether to apply an RPE. Specifically, Ofgem applies the following two thresholds.

- Primary threshold: an RPE is applied if a cost category constitutes at least 10% of TOTEX.
- Secondary threshold: an RPE is applied if a cost category constitutes at least 5% of TOTEX and the expected input price movement affects TOTEX by at least 0.5%.

TOs utilise several different inputs, and collating granular data on these inputs (and mapping them to relevant input price indices) could lead to a disproportionate burden on both companies and the regulator. However, the stringent materiality threshold set by Ofgem can lead to an inaccurate assessment of input price pressures for the following reasons.

First, a stringent materiality threshold means that individual inputs need to be aggregated into 'input categories' in order to be considered for an RPE. For example, any individual material used by SPEN may represent less than 10% of TOTEX, even though the materials category as a whole accounts for 16%. Given that the granular information regarding exactly what material (e.g. steel, copper, plastics) is not used to determine the

⁸⁹ Dempsey, H. (2024), '[World's largest transformer maker warns of supply crunch](#)', *Financial Times*, 2 November.

⁹⁰ Wood Mackenzie (2024), '[Power Transformers: Supply shortage and High Lead Times](#)', April, p. 8.

RPE index, Ofgem relies on overly broad indices (e.g. 'electrical engineering materials') to construct the materials RPE, which contributes to the issues outlined in the section above.

Second, there may be cost categories that appear immaterial when the price control is set (e.g. because they represent less than 10% of TOTEX) but become material over the control period. Ofgem's secondary threshold is intended to account for this issue, but it relies on Ofgem's forecasts of the input price indices. If Ofgem's forecasts are inaccurate,⁹¹ it could mistakenly identify an input as immaterial.

Third, Ofgem's use of materiality thresholds means that some networks (and their consumers) receive a greater degree of protection than others. Specifically, NGET's and SHET's 'Plant & Equipment' costs are indexed to 'relevant' price indices,⁹² while SPEN's are not due to perceived immateriality. It does not create an additional burden on Ofgem or companies for SPEN's costs to be indexed to the same price indices as the other TOs. As Ofgem stated, the regulatory burden comes from needing to investigate and select new indices for different cost areas.⁹³ However, if Ofgem were to apply the same indices to SPEN's plant and equipment costs, this would not involve the selection of any new indices. Furthermore, it may increase the regulatory complexity to have different indices for different companies. This goes against the intended purpose of a materiality threshold.

Using the weights proposed for RIIO-3, this would have led to a difference in the overall RPE index of 0.2% over the 2021–2025 period. This also ensures that companies experience the same level of protection, without introducing a difference between companies based on an arbitrary threshold.

3.2 Composition risk

The RPE mechanism uses weights for each input price index, based on either a notional cost structure (as exhibited for GDNs) or the bespoke cost structure submitted in companies' business plans (as exhibited for TOs). These weights are fixed throughout RIIO-3. Therefore, even if individual input prices tracked the input price pressures that companies face (i.e. there is no basis risk), companies are still exposed to

⁹¹ Note that the underlying rationale behind indexing expenditure allowances to RPEs is that Ofgem's forecasts of input prices (or, indeed, any forecast of input prices) is likely to be inaccurate.

⁹² Note that the price indices identified by Ofgem as relevant may also suffer from the basis risk issues identified above.

⁹³ Ofgem (2025), 'RIIO-3 Draft Determinations Overview Document', June, para. 6.52.

composition risk if the outturn input mix differs from what Ofgem has assumed.

In a predictable, steady-state environment, such an approach is unlikely to materially increase the risk facing companies and consumers, as the outturn input mix is unlikely to differ from what was assumed in companies' business plans. However, the TO sector in particular is not in a predictable, steady-state environment. TOs are required to scale up (or down) investments over RIIO-3 in order to cope with changing priorities, in particular—and as acknowledged by Ofgem—Scottish TOs are expecting a step-increase in their scale of growth to meet their anticipated CAPEX programmes and to meet the demand of the government's Clean Power 2030 Action Plan.⁹⁴ Moreover, the absence of a predictable, steady-state environment for the TO sector is evident given the significant amount of expenditure that Ofgem has allocated to uncertainty mechanisms. If these costs were easily predictable, they would be captured in ex ante allowances.

Furthermore, the cost structures are for the price control period as a whole. Companies may have determined that it is most efficient to undertake more activity in certain years of the period, rather than purchasing the same number of materials in every individual year of the period. As such, the proportion of a company's costs spent on materials and labour may differ year on year, but the RPE mechanism implicitly assumes that this is not the case. This assumption may bias companies away from undertaking an efficient profile of activity across the price control period, towards undertaking the same amount of activity in each year.

These issues cannot be solved through the identification of more accurate indices.

3.3 Recommendations

In the business plan submission, we provided detailed recommendations for how the RPE mechanism could be improved, addressing both basis risk and composition risk.⁹⁵ We consider these recommendations remain relevant, and should be implemented in the RIIO-3 final determination. Nevertheless, we also recognise that making wholesale changes to the

⁹⁴ Ofgem (2025), 'RIIO-3 Draft Determinations – Electricity Transmission', July, pp. 144–145.

⁹⁵ Oxera (2024), Initial submission, section 3.3.

RPE mechanism may be difficult at this stage, given the time constraints and the need for industry-wide consultation.

Given this, we consider that—at a minimum—the following corrections could be made.

First, to reflect the fact that the RPE mechanisms are imperfect, Ofgem should maintain the stepped TIM. This would offer some protection to companies and consumers from changes in input price indices that are not captured by the RPE mechanism. However, the TIM is a 'blunt instrument' for accounting for RPEs, and a more targeted approach to addressing the specific risks associated with input price pressure is required.

For example, SPEN may make efficiency savings over RIIO-3 that would normally entitle it to outperformance payments. However, these efficiency savings may be offset by increasing input prices that are not captured in the RPE mechanism, such that it does not earn rewards from its outperformance. Conversely, SPEN's efficiency may worsen over RIIO-3, which would usually result in underperformance penalties, but a fall in input prices (not captured by the RPE mechanism) may offset this.

Second, the materiality threshold should be reduced (or removed) and a consistent set of RPEs should be applied for all companies. While it may be disproportionate to develop price indices for immaterial cost lines, Ofgem has already constructed a price index for plant and equipment for NGET and SHET. Therefore, applying the same RPE to SPEN would not increase any regulatory burden, and would ensure all TOs are equally protected.

Third, Ofgem should take steps to address the composition risk. This could include the following.

- Adjusting the RPE mechanism such that the RPE index is weighted differently in each year, in line with companies' forecast expenditure on different cost areas.
- Adjusting the RPE mechanism in line with outturn expenditure on different areas within the period.
- Developing an activity-specific RPE for costs covered under volume driver uncertainty mechanisms.

More generally, Ofgem should clarify which specific risks it seeks to address through the changes it proposes to implement. Therefore—to promote transparency in its final determinations—Ofgem should:

- explicitly identify risks with the RIIO-T2 mechanism (e.g. basis risk, composition risk, etc); and,
- map proposed solutions to each of these risks.

This would provide a transparent and effective framework for evaluating the costs and benefits of different approaches for managing RPE risk in T3, and ensure that Ofgem strikes the right balance between its competing regulatory objectives (namely—protecting companies and customers from RPE risk, while also minimising unnecessary complexity).



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A photograph of an office interior seen through a glass wall. Three modern, white, bowl-shaped pendant lights hang from the ceiling. In the background, the word "oxera" is displayed in large, white, three-dimensional letters. A desk with papers and a chair is visible in the lower right. The background shows lush green foliage outside the window.

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