



Independent Report on Ongoing Efficiency

RIIO-3 Technical Annex

REPORT

June 2025



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26th June 2025

To Ofgem

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Independent Report on Ongoing Efficiency

We have pleasure in enclosing a copy of our report in accordance with your instructions (Task Order TO-005) dated 7th April 2025. This document (the **Report**) has been prepared by Grant Thornton UK Advisory & Tax LLP (**Grant Thornton**) for Ofgem (the **Addressee**) in connection with an Independent Report on Ongoing Efficiency (the **Purpose**).

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Period of analysis

Our analysis was performed in the period between 7th April 2025 and 5th June 2025. We have not performed any analysis since, and our Report may not take into account matters that have arisen since then. If you have any concerns in this regard, please do not hesitate to let us know.

Scope of work and limitations

Our work focused on the areas set out in the Scope, which is included in section 2 of the report. There may be matters, other than those noted in the Report, which might be relevant in the context of the Purpose and which a wider scope assessment might uncover.

Forms of report

For your convenience, the Report may have been made available to you in electronic as well as hard copy format, multiple copies and versions of the Report may therefore exist in different media and in the case of any discrepancy the final signed hard copy should be regarded as definitive.

General

The Report is issued on the understanding that the management of Ofgem have drawn our attention to all matters, financial or otherwise, of which they are aware which may have an impact on our Report up to the date of signature of this Report. Events and circumstances occurring after the date of our Report will, in due course, render our Report out of date and, accordingly, we will not accept a duty of care nor assume a responsibility for decisions and actions which are based upon such an out-of-date Report. Additionally, we have no responsibility to update this Report for events and circumstances occurring after this date.

Notwithstanding the scope of this engagement, responsibility for management decisions will remain solely with the directors of Ofgem and not Grant Thornton. The directors should perform a credible review of the recommendations and options in order to determine which to implement following our advice.

Grant Thornton UK Advisory & Tax LLP

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1 Executive Summary

Background

This report sets out the independent assessment of Ongoing Efficiency (“OE”) carried out by Grant Thornton UK Advisory & Tax LLP for Ofgem at the next ‘Revenue Incentives Innovation and Outputs 3’ (“RIIO-3”)¹ Draft Determinations for gas distribution (“GD”) and transmission (“GT”) networks, and electricity transmission (“ET”) networks.

OE refers to the expected year-on-year productivity improvements over a price control period that companies could achieve, over and above the efficiencies that are captured in catch-up efficiency targets. These efficiencies should be reflected in continuous cost reductions driven by advancements in technology and process developments and wider economy productivity growth that result in less inputs being used to produce a given level of output.

OE targets incentivise companies to keep up with wider technological trends and promote ongoing innovation and adoptions of new ways of working. They allow for unforeseen technological improvements to be accounted for ex-ante. For example, Ofgem’s RIIO-2 ‘Electricity Distribution’(ED) Sector Specific Methodology Consultation notes that:

“Setting an appropriate ongoing efficiency challenge is vital to ensuring networks continually strive to identify and exploit opportunities to optimise their processes and operations. By doing so, networks are able to remain resilient in the face of change and ensure value for money for consumers²”.

This report describes the assessment of a range of evidence sources to support Ofgem in setting an OE target for the RIIO-3 price control. This assessment is based on a set of principles suggested by Ofgem in setting an OE target (Chapter 2).

The challenge in setting OE expectations and the need for regulatory judgement

Setting OE targets is a challenging exercise for a range of reasons, in particular:

- It is an inherently **forward-looking exercise**. It involves forming a view on the extent to which future technological, managerial and process improvements may lead to productivity improvements. Whilst empirical evidence on past productivity changes can provide an indication of the possibilities, there is no *a priori* reason to expect future productivity changes to follow historic ones.
- **Measuring ‘efficiency’** is fraught with challenges. Even to the extent that historical information is useful, measuring efficiency is challenging. There are different measures of efficiency (discussed below), each with their own merits and problems. And in industries like energy distribution and transmission where asset lives often extend over many years and investments can take time to yield benefits, it is often difficult to empirically measure changes in the ‘outputs’ achieved by companies for spending a given set of ‘inputs’.
- Efficiency improvements are often **highly context specific**. Improvements are regularly specific to technical processes in a given industry, and wider trends (e.g. digitisation) play out in different ways in different contexts. This means that: forming a meaningful ‘bottom-up’ view on the possibilities for OE is challenging; and sector and/or economy-wide comparisons, whilst useful, only tell part of the story.
- The **wider macroeconomic debate sheds little light**. Much of the discussion around OE – especially for RIIO-3 – has centred on broader debates, especially around: the UK’s so called ‘productivity puzzle’ and whether and how this applies to energy networks; and Artificial Intelligence (“AI”), robotics, automation, etc., and whether, how and to what extent these developments offer opportunities for energy networks to drive down costs. Although these debates are important, there is often no right or wrong answer: ideas can be put forward (arguing for more or less efficiency), but empirical evidence on what this means for future efficiency is very limited. Notwithstanding that limited empirical evidence, regulators need to consider these factors in forming their judgements.

¹ Revenue Incentives Innovation and Outputs (RIIO) is the framework used by Ofgem to develop future price controls. RIIO-3 will be the next price control which will be in place from April 2026 to March 2031.

² [RIIO-ED2 Sector Methodology Consultation: Annex 2 Keeping bills low for consumers](#)

For these reasons, forming a meaningful view on OE expectations requires examining a range of different evidence, sources and arguments. And more specifically, it also involves Ofgem applying its judgement to weigh up the different evidence and arguments presented in this report to balance the interests of consumers with the realities of running energy networks.

The approach

Ultimately, it is for Ofgem to make a judgement on the appropriate OE target for the companies it regulates. However, to support Ofgem in making this judgement, the approach taken in this report has been to:

- consider historical evidence of productivity growth and what that could imply in terms of a plausible range for future OE;
- consider wider sources of evidence – particularly stakeholders' views, wider economic projections and regulatory precedent – which may also be relevant to Ofgem in setting OE targets; and
- test whether Ofgem's initial starting point proposed for the OE target (of 1%, contained in its Sector Specific Methodology Decision ("**SSMD**")³ and consistent with RIIO-2) is consistent with the range of evidence.

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 and as noted above, various parties (and their advisors) have formed different views 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.

It is important to note that this report presents the approach based on the evidence and arguments at the time of writing. Further information may come to light in future which would merit revisiting the conclusions.

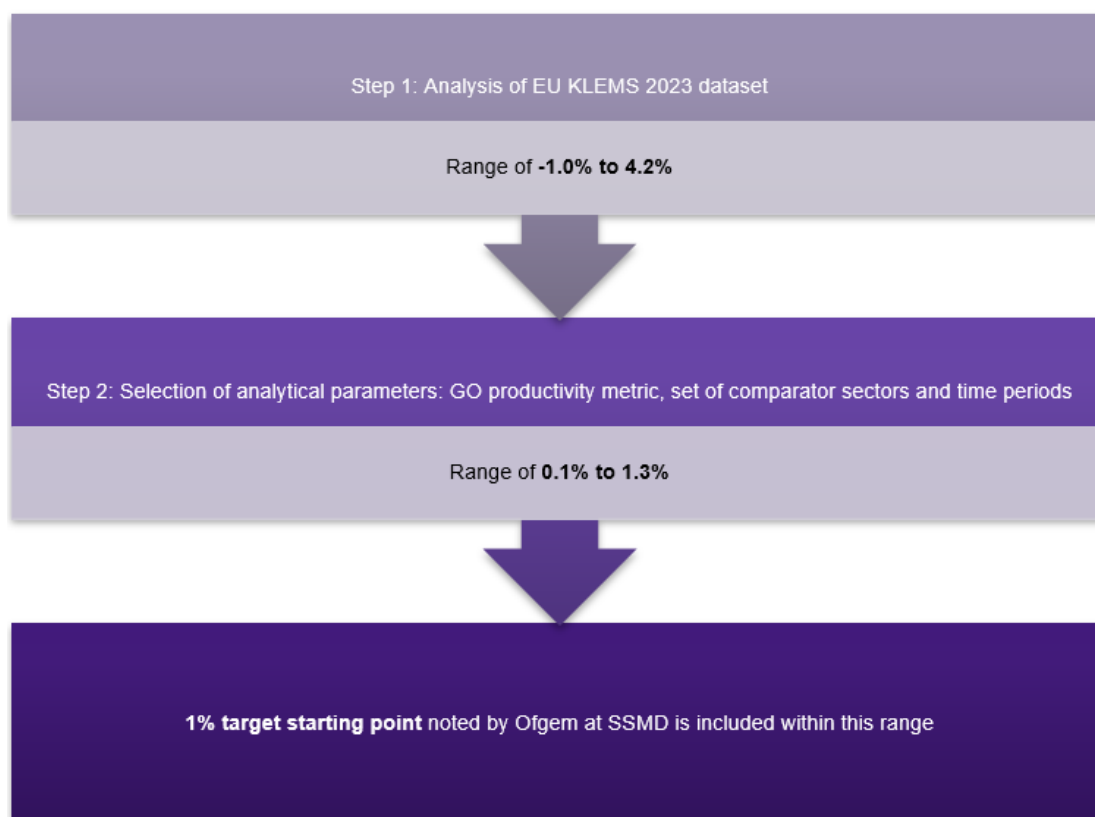
Deriving a range based on historical evidence

The starting point for exploring the range of possible OE targets was empirical evidence of historical productivity growth (based on estimates published in the 'European Union - Capital, Labour, Energy, Materials, and Services' ("**EU KLEMS**") dataset). This is in line with Ofgem's Sector Specific Methodology Decision for RIIO-3 for GD3, GT3 and ET3 and regulatory precedent from other sectors.

Figure 1, below, summarises the approach taken to deriving a plausible range based on historical evidence. It does not take account of other sources of evidence (e.g. regulatory precedent) – these sources of evidence are discussed subsequently.

³ RIIO-3 Sector Specific Methodology Decision for the Gas Distribution, Gas Transmission and Electricity Transmission Sectors, page 115, 9.31

Figure 1 Approach to determining a plausible range for OE in RIIO-3 based on historical evidence



In its raw form, this initial exercise suggests a **broad range for OE of -1.0% to 4.2% per annum** (see Step 1 in Figure 1 above). This range is wide, a result that is driven by a variety of possible choices around:

- the **productivity metric** (in particular, the choice of ‘gross output’ (“GO”) versus ‘value added’ (“VA”) – a widely debated choice considered in more detail below and discussed at length in the body of this report);
- **comparator sectors** (which sectors to use as comparators for regulated energy companies); and
- the **time period used** (whether to focus on more recent or longer time frames, and whether to exclude specific years).

Indeed, this range is so wide that it is unlikely to offer useful evidence to Ofgem to make a judgement on an appropriate OE target. Therefore, to narrow down the range, the relative merits of alternative productivity metrics, comparator sectors and time periods were considered. This assessment was informed by economic theory; the analytical choices made by ‘Cambridge Economic Policy Associates’ (“CEPA”) at RIIO-2; wider precedent for making these choices; and stakeholders’ views on the key choices (including consultancy reports).

This report favours using a simple average of productivity across a similar set of sectors to those used at RIIO-2 plus most of the other sectors also proposed by stakeholders, and drawing upon productivity growth evidence going back to 1970 (using the EU KLEMS 1 and EU KLEMS 3 dataset, excluding the years of 2008-2009 and 2020-2021⁴). Moreover, whilst recognising that there are merits to both sides of the debate on GO versus VA metric, on balance this report favours the more conservative GO metric. These choices lead to a **narrower range of 0.1% to 1.3%** (see Step 2 in Figure 1 above).

This range remains wide and it is also important to note that – whilst every care was taken in the previous step to choose sectors and time periods in an evidence-based way – there remains a degree of subjectivity in these choices.

⁴ The years 2008 and 2009 are the years of the Great Financial Crisis and the years 2020 and 2021 are the years of the Covid-19 pandemic and hence are considered outliers. Thus, they are excluded from the analysis.

Incorporating other sources of evidence

The above range is based on historical productivity estimates. It is narrowed down through analytical choices in relation to productivity metric, comparator sectors and time periods. However, it remains wide. In practice, it is likely to be appropriate that Ofgem considers other factors to narrow it down further and alight on an appropriate target. In particular, the following sources of qualitative evidence are likely to be useful to Ofgem: companies' own proposed OE targets and the underlying rationale; forecasts of annual productivity growth for the UK economy, based on projections from organisations such as the 'Office for Budget Responsibility' ("**OBR**"); and regulatory precedent from previous Ofgem determinations and from other regulated sectors.

In terms of companies' own business plans, this report considers that it would be reasonable to set the OE target at, at least, the most ambitious level proposed by the companies' own assessments of OE opportunities. This means setting an OE target of at least 0.7%. This is based on the following:

- By definition, all companies should have the same opportunity of achieving OE targets (in contrast to catch-up efficiency which, by definition, should be larger for less efficient firms). Technological and/or process improvements that characterise OE are typical of the notional company, but available to all in the same way;
- Companies have a strong incentive to propose lower OE targets (so some companies may have proposed OE targets that are below what may be possible in practice); and
- Companies possess unique insights into the productivity trends in their industry (even if these are uncertain), so it would seem reasonable to infer that the proposals put forward by the most ambitious company reflect this knowledge and are achievable (although it should be noted that it may be possible to go further).

At the same time, recent regulatory precedent for OE does not go above 1.0% (for example from the RIIO-2 CMA determination and Ofwat's 'Price review 2024' ("**PR24**") proposals) and economic forecasters are not projecting sustained growth in productivity above this level across the whole economy over the next four years. Therefore, it may be prudent to set OE targets no higher than this level, unless compelling evidence to the contrary was available.

A 1% OE target?

Ofgem's RIIO-3 Sector Specific Methodology Decision for GD3, GT3 and ET3⁵ stated that:

"We will consider whether the ongoing efficiency assumption of 1% per annum at the totex level implemented in RIIO-2 is still a reasonable starting point for RIIO-3."

Given the evidence available and considered at the time this report was produced, a 1% OE target is a credible starting point for RIIO-3. It is within the narrow range described above, drawn from the analysis of historical productivity. It also aligns with regulatory precedent from previous RIIO price control decisions and other regulated sectors. In particular, at RIIO-2 the 'Competition and Markets Authority' ("**CMA**") generally defended Ofgem's regulatory discretion or "margin of appreciation"⁶. Additionally, the CMA concluded that Ofgem's decision to 'aim up' (i.e. setting the target towards the top of the range consistent with the evidence) was not an error. It is also consistent with the latest expectations from OBR on annual productivity growth for the UK economy in the next four years (which overlap with the first years of RIIO-3). However, a higher target may be appropriate if:

- 1 Ofgem chose to give most weight to historical evidence from the 1997-2007 period (noting the potential parallels between the impact of information and communication technology over that period and potential productivity impact of AI technologies);
- 2 Ofgem chose to take account of both VA and GO productivity metrics (noting the relative strengths and weaknesses of the two metrics, regulatory precedent, and expectation that regulated companies exert greater pressure over productivity growth of its supply chain); and/or
- 3 Ofgem considered that regulated companies are more akin, in terms of productivity growth potential, to the historically higher performing sectors of the economy (such as Manufacturing and Information & communication).

⁵ [RIIO-3 Sector Specific Methodology Decision for the Gas Distribution, Gas Transmission and Electricity Transmission Sectors](#), page 115, 9.31

⁶ Margin of appreciation means 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 used the best possible method.

Ultimately, it is for Ofgem to decide on the appropriate OE target. As stressed above though, OE is inherently uncertain and Ofgem must make that judgement in the context of that uncertainty and balance a range of evidence and arguments. Based on the information available at the time of writing, consistent with its SSMD, a target of 1% appears prudent and consistent with the various sources of evidence. At the same time, in reaching a final view on an appropriate OE target, Ofgem should also consider the context for the current price control, its own expert sector knowledge, and any new information that comes to light post-draft determination.

The remainder of this report considers: empirical analysis of historical productivity growth estimates (Chapter 3); regulatory precedent from both energy and other regulated sectors; independent UK productivity forecasts; and regulated companies' proposals and arguments (Chapter 4). The approach followed in this report to determine an appropriate range is outlined in Chapter 5.

2 Introduction

This independent report has been prepared by Grant Thornton UK Advisory & Tax LLP under its Economic Strategic Partner contract for RIIO-3 for gas distribution and transmission, and electricity transmission (RIIO-GD3/GT3 and RIIO-ET3). This report reflects the assessment of Grant Thornton UK Advisory & Tax LLP based on analysis of available information at the time of writing.

The analysis aims to provide a range for the OE target for the setting of the GD3, GT3 and ET3 price controls⁷. ED3 is not within the scope of this analysis.

This chapter describes the key building blocks of the RIIO framework (section 2.1) and provides a definition of OE (section 2.2). The challenges of assessing an appropriate range and setting an OE target are set out in section 2.3, and the principles that should guide this process are set out in section 2.4. The chapter concludes with an overview of the scope of the analysis (section 2.5) presented in this report and an overview of the report's structure (section 2.6).

2.1 RIIO Framework Building Blocks/ Principles

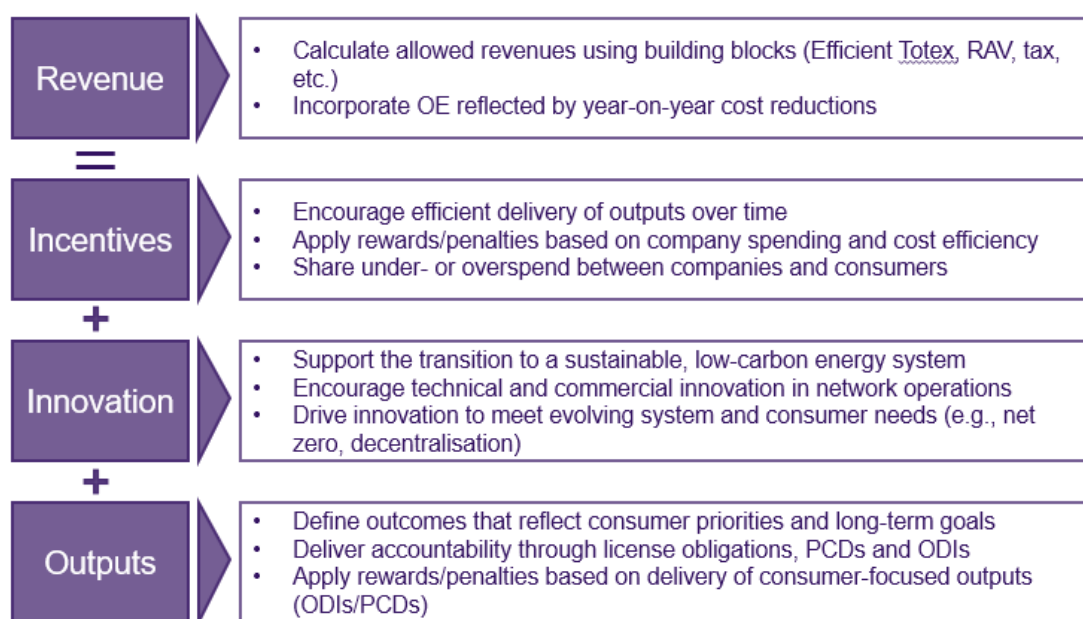
The RIIO is the framework used by Ofgem to develop future price controls for energy network companies in four sectors (gas distribution, gas transmission, electricity transmission and electricity distribution sectors). RIIO was developed to deliver long-term value for money for consumers and support the transition to a sustainable, low-carbon energy system. It reflects Ofgem's aim to deliver a transparent, output-based, and forward-looking regulatory framework which aligns companies' incentives with the evolving needs of consumers and a Net Zero energy system.

RIIO is an ex-ante and regulatory asset value ("**RAV**")⁸-based regime that determines the outputs network companies are required to deliver and the revenues they are allowed to receive for delivering services to customers efficiently. The framework is designed to incentivise companies to meet performance standards, pursue innovation, and ensure that only efficiently incurred costs are passed on to consumers. Ofgem applies a "building block" approach to determining network firms' allowed revenue in the RIIO price controls. These building blocks include:

- Total expenditure ("**totex**"): the combined capital and operational costs required to run the regulated business.
- RAV: the value of regulated assets on which companies earn a return and receive depreciation allowances.
- Allowed rate of return: the weighted average cost of capital ("**WACC**"), based on a notional capital structure, used to calculate returns on the RAV.
- Depreciation: the recovery of capital over time, reflecting the expected economic life of the asset base.
- Tax allowances: an estimate of tax liabilities to ensure businesses can meet obligations, adjusted for factors beyond company control.

⁷ On the basis of conversations with ofgem we have done a single assessment for all three sectors.

⁸ RAV is a regulatory concept which refers to the value of regulated assets on which companies earn an allowed return and receive depreciation allowances. It is used to calculate the allowed revenue.

Figure 2 RIIO Framework Building Blocks

Source: Grant Thornton's Analysis

In addition to the core building blocks, the RIIO framework incorporates mechanisms to adjust for inflation and manage uncertainty, including risk-sharing arrangements to address revenue volatility.

RIIO also includes an output framework to ensure companies are held accountable for delivering results that reflect consumer priorities and long-term sector goals. The output framework includes license obligations (“**LOs**”), price control deliverables (“**PCDs**”) and output delivery incentives (“**ODIs**”) which hold network companies accountable for delivering work funded through the price control allowances (through PCDs), and other objectives for existing and future customers (through ODIs). Network companies are rewarded or penalised for out/under performance against predefined outputs.

A key aspect of the RIIO framework is that it is designed to only allow companies to pass costs to consumers which are incurred efficiently. To uphold this, Ofgem incorporates ex-ante OE assumptions into the price control settlements. These reflect efficiency gains that companies might achieve over the price control period due to factors like technology advancements, process improvements and productivity enhancements. OE is the focus of this report and is explored further below.

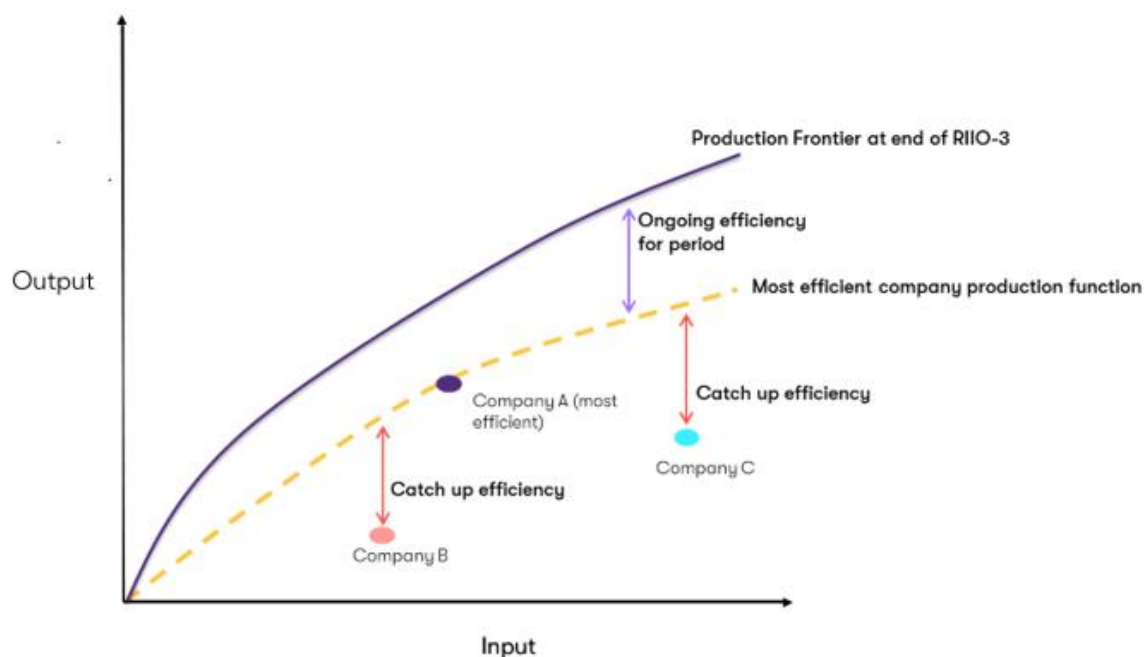
2.2 Definition of Ongoing Efficiency

As part of the RIIO process, Ofgem needs to set an annual OE target for the next price control period for the three sectors (GD3, GT3, and ET3).

OE refers to the expected year-on-year productivity improvements over a price control period that even the most efficient company can achieve, over and above the efficiencies captured in catch-up efficiency targets. This efficiency should be reflected in continuous cost reductions driven by advancements in technology and process developments that result in less inputs being used to produce a given level of output.

OE productivity improvements imply an outward shift in the production frontier. In contrast, catch-up and embedded efficiencies are intended to bring a company operating inside the existing production frontier closer to the frontier. This process is illustrated in Figure 3 below.

Figure 3 Graphical representation of Ongoing Efficiency and Catch-up Efficiency



Source: Grant Thornton's Analysis

Similarly, OE is not intended to capture benefits derived from economies of scale, where they exist. In industries where economies of scale are present, an increase in input levels leads to a more than proportionate increase in output levels, which could result in total factor productivity growth that does not result from OE.

By embedding OE targets into the price control framework, Ofgem incentivises network companies to continually improve efficiency, ensuring that cost reductions are shared with consumers to their benefit.

Efficiency improvements can materialise during the price control period and may result from investments embedded in companies' business plans or from process improvements and productivity growth in the wider economy.

2.3 Challenges in setting OE targets

There are challenges in setting OE targets in the beginning of the price control. In particular:

- It is a **forward-looking exercise**, which involves forming a view on the extent to which future technological, managerial and process improvements may lead to productivity improvements. Whilst empirical evidence on past productivity changes can provide an indication, there is no *a priori* reason to expect future productivity changes to follow historic ones.
- Even measuring **historic productivity and efficiency** in the energy sector can be challenging. Efficiency could be measured in multiple ways (discussed below), each with its own merits and problems. It can also be challenging to measure the inputs and outputs of the energy networks, which are characterised by long asset lives and where investments can take time to yield benefits.
- Efficiency improvements are often **highly context specific**. Improvements are often specific to technical processes in the sector, and adoption of wider trends (e.g. digitalisation) varies. Therefore, forming a meaningful 'bottom-up' view on an OE target is challenging; and sector and/or economy-wide comparisons could be useful but are certainly not perfect. Wider macroeconomic trends may not translate directly into the energy sector due to the regulatory regime.

The **wider macroeconomic debate sheds little light**. Much of the discussion around OE – especially for RIIO-3 – has centred on broader debates, especially around: the UK's so called 'productivity puzzle' and whether and how this applies to energy networks; and AI, robotics, automation, etc., and whether, how and to what extent these developments offer opportunities for energy networks to drive down costs. Although these debates are important, there is often no right or wrong answer: ideas can be put forward (arguing for more or less efficiency), but empirical evidence on these trends is very limited.

For these reasons, forming a meaningful view on OE expectations should involve examining a range of different evidence, sources and arguments. It also means applying judgement to weigh up the different evidence and arguments and to balance the interests of consumers and the realities of running energy networks.

2.4 Key Principles

Within the context of these challenges in setting OE targets, it is useful to establish principles that can help guide the setting of targets. Ofgem has set out such principles, and these have informed the work set out in this report.

According to Ofgem, the setting of OE targets should:

- **Align with regulatory best practice and previously established regulatory principles and definitions.** The methodology for setting the OE target should be consistent with best practices and decisions made in comparable regulated sectors. The proposed approach should follow the rationale from previous RIIO determinations, whilst drawing on lessons from other sectors and being consistent with principles upheld in recent CMA decisions.
- **Reflect current and historical trends across the wider economy, as well as expectations over its direction of travel.** The selected OE target should consider the current and historical economic circumstances ensuring the framework reflects key macroeconomic factors such as inflation, wage growth, and supply chain pressures that may influence companies' capacity to deliver cost efficiencies during the price control period.
- **Provide an appropriate degree of challenge for regulated companies.** The OE target should reflect the need to create strong and sustained incentives for companies to improve performance and push the economic frontier. The target should be stretching but achievable, encouraging firms to pursue operational improvements, embrace innovation, and adopt best practices.
- **Reflect the context and characteristics of the energy sector, including expectations over its future development.** The methodology for setting the OE target should capture the distinct characteristics of the energy sector, namely the capital-intensive nature of the sector, long asset lifecycles, and regulatory obligations as well as emerging challenges and opportunities associated with the energy transition and Net Zero.
- **Be consistent with wider price control determinations.** The methodology for setting the OE target should be consistent with the wider RIIO-3 determinations and specific elements, in particular with cost assessment.

In light of these principles, the scope of this report is outlined below.

2.5 Scope

Ofgem commissioned Grant Thornton UK Advisory & Tax LLP to provide independent advice on an appropriate range for OE at RIIO-3. As per the Ofgem RIIO-3 SSMD for the GD, GT and ET sectors⁹, the approach to assessing an appropriate OE target is based on the review of a wide range of evidence. Key sources of evidence include historical productivity growth trends from the EU KLEMS dataset; regulatory precedent from the energy sector and other regulated sectors; network companies' business plan submissions; and forward-looking productivity growth estimates from independent sources, such as Bank of England and the OBR.

The aim of this report is to provide an independent view on the appropriate range for the OE target at RIIO for GD3, GT3 and ET3, informed by a review of the analytical sources listed above, economic theory, and regulatory best practice.

The assessment discussed in this report provides Ofgem evidence to make a decision on an appropriate OE target that is:

- supported by available **empirical evidence and qualitative considerations**, and based on **regulatory judgement looking at evidence "in the round"**,
- **stretching but achievable**, designed to protect consumers and challenge regulated companies whilst being proportionate and realistic; and
- **informed and cognisant of the trade-offs** involved in selecting different OE targets within the plausible range.

⁹ [Ofgem RIIO-3 Sector Specific Methodology Decision for the Gas Distribution, Gas Transmission and Electricity Transmission Sectors](#)

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 and definitive answer. For example, various parties (and their advisors) have formed different views about which sectors and time periods provide the most appropriate comparators based on analysis of historical productivity trends. 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 conclusions, and attached less weight to matters which are open to debate.

Ultimately, it is Ofgem's decision what the appropriate OE target should be. This report reflects Grant Thornton UK Advisory & Tax LLP's view of the range at the time of writing. Ofgem should be mindful of possible changes to the underlying evidence-base in making its decisions and be open to adjusting its judgement if information changes.

2.6 Structure of this report

This report is structured as follows:

- Chapter 2 provides an introduction and sets the context for OE within the RIIO framework. It also describes the principles that should guide the process of setting an OE target at RIIO-3.
- Chapter 3 describes the empirical evidence from historic productivity estimates from EU KLEMS dataset, including a replication of CEPA's analysis at RIIO-2, and updated analysis with the latest version of the EU KLEMS.
- Chapter 4 discusses other sources of evidence, including: regulatory precedent relevant to Ofgem's OE decision with a particular focus on the most recent price control decisions by Ofwat and UREGNI; the latest forecasts from independent bodies on UK productivity growth; historical performance of energy network companies in previous price controls; and companies' proposals for OE as well as the main arguments presented to support those proposals.
- Chapter 5 summarises the issues raised in earlier chapters and explains the implications for setting the OE range.
- Appendices include more detailed information on the EU KLEMS dataset results used in this report (Appendix A).

3 Analysis of historical productivity estimates

The purpose of this chapter is to present the results of analysis of the EU KLEMS dataset to derive a range for the possible OE target for network companies. Section 3.1 provides a brief summary of the chapter. Section 3.2 briefly describes the source data used in this analysis. Sections 3.3 and 3.4 set out the analytical choices made, respectively, at RIIO-2 and by regulated companies in their RIIO-3 submissions. Section 3.5 sets out the analytical choices proposed in this report and the resulting OE ranges that follow, based on the latest EU KLEMS data. Finally, section 3.6 sets out the limitations of this type of analysis and provides simple illustrative sensitivity analysis.

3.1 Summary of chapter

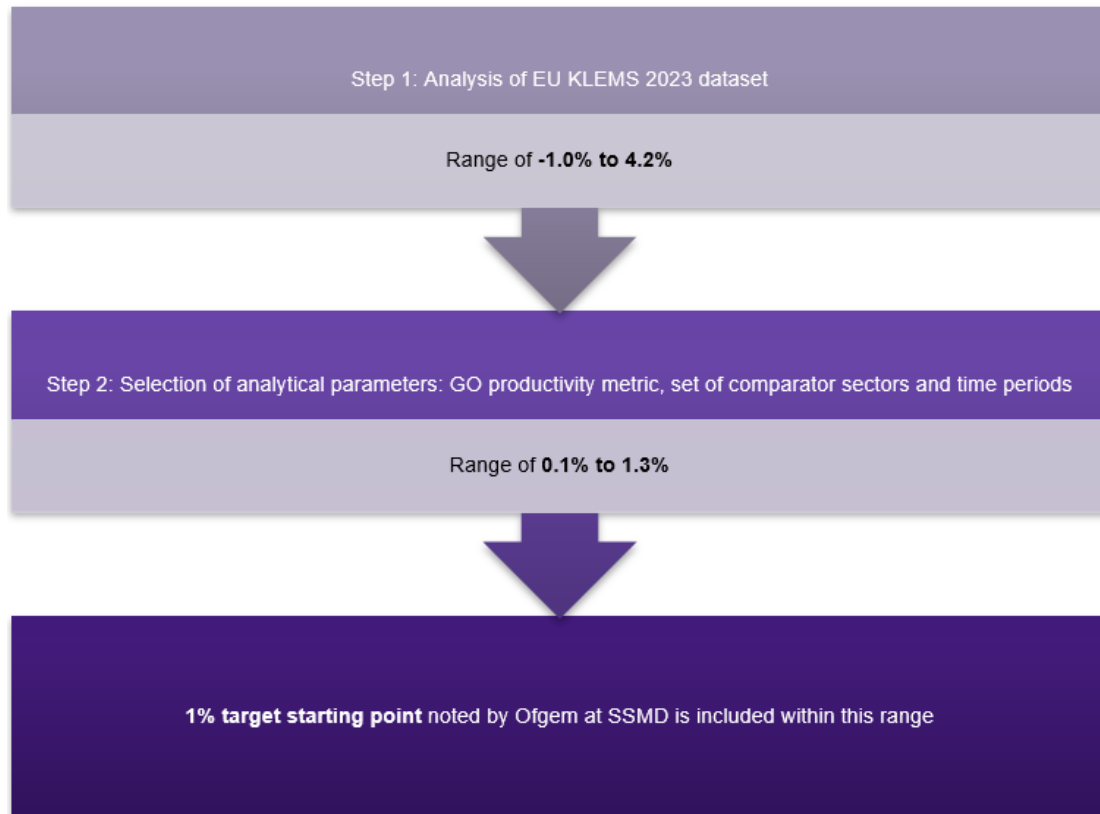
The starting point for exploring the range of possible OE targets was empirical evidence of historical productivity growth, based on estimates published in the EU KLEMS dataset. This is in line with Ofgem's SSMD for RIIO-3 for GD3, GT3 and ET3 and wider regulatory precedent (e.g. Ofwat).

Estimates of historical productivity growth vary widely by sector, time period, and productivity metric used (see below). Therefore, analytical choices need to be made to derive a range that is usable by Ofgem. In making those analytical choices, this work first considered the approach taken at RIIO-2 and the evidence submitted by regulated companies and their advisors (to the extent that they commented on the analysis of historic EU KLEMS data as the basis of OE targets) as part of their RIIO-3 business plan submissions. This initial exercise suggests a broad OE range of -1.0% to 4.2%.

To narrow down the range, the relative merits of alternative productivity metrics, comparator sectors and time periods were then considered. In addition to the choices and arguments made by CEPA at RIIO-2 and the evidence submitted by regulated companies at RIIO-3, this assessment was also informed by economic theory and wider precedent for making those choices. This leads to a narrower range of 0.1% to 1.3%.

The process described above is summarised in the figure below. The remainder of this chapter describes the below process in more detail.

Figure 4 Approach to determining a plausible range for OE in RIIO-3 based on historical evidence



3.2 Source data

The EU KLEMS database is a harmonised, industry-level dataset covering growth and productivity. It includes measures of value added to the economy, investment, labour and capital stocks, across the EU and other advanced economies, including the UK. Historical estimates of productivity growth are also provided based on growth accounting analysis, a quantitative tool used to calculate the change in aggregate productivity by sector, and decompose it into contributions attributable to different inputs (capital, labour, etc.) and Total Factor Productivity (“TFP”).

The EU KLEMS database reports the VA measure of TFP, and the other key measure – GO – is derived from the VA TFP measure. The GO metric reflects the combined productivity of activities delivered in-house by a given sector and activities delivered by a sector’s supply chain, fully acknowledging the role of all inputs (including those purchased from the supply chain). VA, on the other hand, reflects only productivity of activities delivered in-house within a given sector, as the value of the intermediate inputs (i.e. inputs supplied by the supply chain) necessary for production is not considered.

There are three different versions of the EU KLEMS database used for the analysis undertaken in this report. These versions differ based on their date of publication. These are EU KLEMS 2009 (“**EU KLEMS 1**”), EU KLEMS 2019 (“**EU KLEMS 2**”) and EU KLEMS 2023 (“**EU KLEMS 3**”). EU KLEMS 1 used the NACE¹⁰ 1 methodology to define sectors in the economy whereas EU KLEMS 2 and 3 used NACE 2 methodology. EU KLEMS 1 covers the time period from 1970 to 2007, EU KLEMS 2 covers the time period from 1995 to 2016, and EU KLEMS 3 covers the time period from 1995 to 2021. Each of these datasets provides productivity growth estimates for about 21 sectors and around 25 sub-sectors, depending on the version of the dataset.

¹⁰ NACE is the acronym (from the French 'Nomenclature statistique des Activités économiques dans la Communauté Européenne'-Statistical classification of economic activities in the European Community) used to designate various statistical classifications of economic activities developed since 1970 by the European Union

3.3 RIIO-2 methodology

RIIO GD & T2

Consultants CEPA, commissioned by Ofgem, used the 2019 release that is EU KLEMS 2 dataset to propose an OE range for RIIO GD2 and T2 in 2020.

CEPA calculated productivity growth for two different comparator sets of sectors:

1. a 'targeted' (or narrow) comparator set including
 - Construction
 - Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
 - Transportation & Storage
 - Financial and Insurance Activities and
2. an 'economy-wide' comparator set (a simple weighted average of all sectors, excluding real estate, public admin, education, health and social services).

Average annual productivity growth rates were calculated for three different time periods: 1995-2016, 1997-2016, and 2006-2016. CEPA's final advice to Ofgem was based on data from the period 1997-2016 for the targeted comparator set of sectors.

In terms of productivity metric:

- For opex, CEPA used Partial Factor Productivity¹¹ ("**PF**P") estimates (both based on VA and GO) as well as the TFP estimate (based on the GO metric).
- For repex and capex, CEPA used TFP estimates, using both the VA and GO metrics.

CEPA used these different data points (in terms of productivity metrics and comparator sectors) to form a proposed OE range at draft determinations.

RIIO ED2

Consultants CEPA, commissioned by Ofgem, used the EU KLEMS 2 dataset to propose an OE range for RIIO ED2 in 2020.

In addition to the comparator sectors used at RIIO GD2 and ET2, CEPA also considered an additional comparator set, composed of the following sectors:

- Construction
- Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
- Transportation & Storage
- Financial and Insurance Activities
- Professional, Scientific, Technical, Administrative and Support Service Activities; and
- Information and Communication

Average annual productivity growth rates were calculated both for the entire period covered by the EU KLEMS 2 dataset and for four sub-sets,¹² taking account of the business cycles defined by the World Economic Outlook ("**WEO**").

CEPA recommended the OE challenge to be applied at totex-level and calculated based on TFP productivity measures. CEPA's proposed OE target ranges took account of both VA and GO productivity metrics.

¹¹ Partial productivity metrics focus on the relationship between a single input and the resulting output, allowing for a focused analysis of efficiency within a specific aspect of production.

¹² These time periods were 1998-2015, 1998-2016, 1999-2015 and 1999-2016.

3.4 Productivity analysis in network companies' submissions for RIIO-3

Gas Distribution Networks (GDNs) and National Gas Transmission (NGT)

As part of their RIIO-3 submissions, all four GDNs and NGT jointly commissioned a report from the consultancy Economic Insight ("EI") which suggested an OE range of 0.2% to 0.8%, proposing a target at the 0.5% mid-point. EI favoured applying a single OE target to totex, rather than having separate capex/repex and opex targets. EI also argued in favour of using the TFP GO estimate over alternative productivity metrics¹³.

EI proposed using the following set of comparator sectors (each given equal weight in its quantitative analysis). These include three of the sectors from CEPA's targeted set¹⁴ along with additional ones around manufacturing, chemicals and computers and other such equipment¹⁵:

- Construction,
- Wholesale and Retail trade; Repair of motor vehicles and motorcycles;
- Transportation & Storage;
- Manufacturing (both as a standalone sector and based on a selection of the specific sub-sectors below, treated as standalone sectors for the purpose of calculating average productivity growth)
 - Manufacture of machinery and equipment ('not elsewhere classified');
 - Manufacture of rubber and plastic products and other non-metallic mineral products;
 - Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment;
 - Manufacture of motor vehicles, trailers, semi-trailers and other transport equipment;
 - Chemicals and basic pharmaceutical products;
 - Computer, electronic, optical products; electrical equipment; and
- Total Industries (A-S) (used as an additional standalone sector).

The lower bound of EI's range is based on data from the period 2010-2019 and the upper bound is based on the average of the periods 1995-2019 and 1970-2007, weighed by the number of years in each period.

Scottish Power Energy Networks (SPEN)

Scottish Power Energy Networks ("SPEN") commissioned a report from consultancy Oxera, which suggested a feasible OE range of 0.0% to 0.5%. Oxera argued for the use of TFP GO measure over alternative productivity metrics. It also argued for a single OE target to be applied to totex rather than separate targets for capex/repex and opex but highlight that scope of OE may be less applicable to 'new' activities and may differ across expenditure types.

Oxera used two time periods, 1996 to 2019 and 2010 to 2019 to derive their proposed OE range. It considered three sets of comparator sectors, including all the sectors from CEPA's targeted set:

1. Singular sector
 - Construction
2. Broad set
 - Construction
 - Transportation and Storage and

¹³ EI derived estimates of GO from the VA data included in EU KLEMS using the following formula: $GO\ TFP = VA\ TFP \times (VA\ in\ current\ prices / GO\ in\ current\ prices)$. This formula was also used by CEPA at RIIO-2.

¹⁴ EI excluded 'Financial and insurance activities'.

¹⁵ EI put forward the following principles as the basis on which it selected comparator sectors: similarity to the energy sector; competitiveness; and extent of scale effects.

- Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment;
3. Granular Set (a weighted¹⁶ average of 7 sectors) namely
- Construction
 - Transportation and Storage
 - Financial and insurance activities;
 - Professional, scientific and technical activities; administrative and support service activities and
 - Information and communication;
 - Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment (sub-sector of Manufacturing).

National Grid Electricity Transmission (NGET)

National Grid Electricity Transmission (“**NGET**”) commissioned a report from consultancy Frontier Economics (“**FE**”) which suggested a plausible OE range of 0.1% to 0.7%. FE argued for the use of TFP measures and based its estimates on an average of the GO TFP and VA TFP metrics.

The lower bound of FE’s range is based on data from the period 2009-2019 and the upper bound is based on the period 1996-2019. FE use both a targeted comparator sector set and an economy-wide measure of productivity. The targeted comparator set includes the four sectors chosen by CEPA as well as the following sectors/sub-sectors:

- Manufacturing: machinery and equipment (‘not elsewhere classified’) (sub-sector of Manufacturing);
- Manufacturing: Electrical equipment (sub-sector of Manufacturing);
- Professional, scientific, technical, administrative and support service activities, and
- Information and communication.

Scottish and Southern Electricity Networks Transmission (SSEN)

Scottish and Southern Electricity Networks Transmission (“**SSEN**”) commissioned a report from consultancy Oxera, which suggested a plausible OE range of 0.1% to 0.5%. The consultant proposed a point estimate of 0.2% p.a., to be applied only to business-as-usual cost areas or 0.1% if applied to the totex baseline.

Oxera argued for the use of the TFP GO productivity metric. They conducted their analysis by looking at productivity growth estimates only for the time period of the latest business cycle, 2010 to 2019. The consultant undertook a mapping exercise where each comparator sector was mapped to an expense category in the opex, capex and totex. The share of the totex related to the activity to which a comparator sector is mapped was considered to be the weight for the sector. The comparator set included the following sectors/sub-sectors

- Construction;
- Transportation and storage;
- Financial and insurance activities;
- Agriculture, forestry and fishing;
- Water supply; sewerage; waste management and remediation activities;
- Information and communication;
- Professional, scientific, technical, administrative and support service activities;
- Real estate activities;
- Education; and

¹⁶ The weight assigned to each sector is the share of totex related to the regulated company’s activity to which the sector is mapped by the consultant.

- Manufacturing of Electrical equipment (sub-sector of Manufacturing).

3.5 Deriving an ongoing efficiency range for RIIO-3

As set out in the introduction to this chapter, the present work first derived an initial, broader, OE range, which takes into account most of the different analytical choices made or proposed by CEPA (at RIIO-2), and by EI, Oxera and FE (at RIIO-3) (sub-section 3.5.1.). This was then narrowed by making more restrictive analytical choices (sub-sections 3.5.2.), drawing on economic theory, precedent and arguments put forward by companies and their advisors.

3.5.1 Broad range

The initial, broader, OE range was derived based on the following set of parameters:

- Consideration of both GO and VA productivity **metrics**, as per CEPA's RIIO-2 analysis, whilst excluding PFP metrics;
- Consideration of three possible combinations of **sectors**, one being the same as that proposed by CEPA at RIIO-2, and the other two include those proposed by EI, Oxera (in its work for SPEN)¹⁷ and FE;
- Consideration of three different **time periods**: 1970-1996, 1997-2007 and 2010-2019.

The rationale underlying these choices is set out below¹⁸.

Choice of productivity metric

At RIIO-2, CEPA considered using PFP metrics for setting an OE target for opex, with the rationale that opex inputs are dominated by labour, hence it is the trend in labour productivity growth that matters most for determining the growth in opex productivity.

However, it is understood that, in RIIO-3, Ofgem will likely set OE targets for totex, which makes TFP metrics more appropriate. Moreover, PFP metrics, such as labour productivity, whilst well suited to assess efficiencies in labour-intensive sectors, could potentially lead to an incomplete or misleading picture of productivity if applied to sectors or areas of expenditure with a more mixed set of inputs. In principle, energy networks have full control over their mix of inputs under the RIIO framework and it is appropriate to assume that energy companies are likely optimising their input mix to achieve maximum productivity, and that these involve a range of different factors of production. Therefore, PFP metrics have been excluded from the initial range.

In principle, both the GO and VA metrics have merit and the choice between them is discussed in section 3.5.2.

Choice of sectors

All sectors previously considered by CEPA or proposed by regulated companies (through external consultant reports) were considered at this stage of analysis, with two exceptions.

First, some consultants have included economy-wide productivity growth averages alongside selected comparator sectors. It was considered that 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. In addition, Oxera, in its analysis for SSEN, considered the sectors Real estate activities; Education; Agriculture, forestry & fishing and Water supply, sewerage, waste management & remediation activities. In Oxera's analysis, these sectors combined carried a weight of only 8% and the rationale for their inclusion is not entirely clear. Moreover, none of the other pieces of analysis reviewed included these sectors – these sectors have therefore been excluded from the present analysis.

¹⁷ Oxera, in its work for SSEN, also considered the following additional sectors Real estate activities; Education; Agriculture, forestry and fishing and Water supply, sewerage, waste management and remediation activities. However, these sectors carry a combined weight of only 8% and have not been considered by other consultants. The rationale for their inclusion is also not entirely clear. They have therefore been excluded from the present analysis.

¹⁸ There was a replication exercise undertaken to help develop the rationale for the choices made in this analysis. This replication exercise involved applying the methodologies adopted by CEPA at RIIO-2 and proposed by regulated companies' consultants for RIIO-3 using the latest EU KLEMS data (2023). The replicated estimates for CEPA were much different from CEPA's own estimates whereas the replicated estimates for EI were very close to EI's own estimates.

Second, the present analysis takes a slightly different approach to the treatment of the Manufacturing sector than most previous work. Two scenarios were considered, both of which take into account the evidence from the six sub-sectors of manufacturing considered by other consultants. In one scenario, mean productivity growth was calculated across these six sub-sectors and these sub-sectors were entered into the analysis as a single sector. In the other scenario, each of these sub-sectors was treated as if it represented a standalone sector. The effect of the latter scenario is to give much greater weight to manufacturing, which results in somewhat higher lower and upper bounds for the resulting OE range. This approach would be justified if it was considered that these sub-sectors represent more suitable comparators to regulated energy companies than other sectors of the economy.

In summary, the present analysis considered the following three sector groupings:

- (1) Construction; (2) Wholesale and Retail trade; Repair of motor vehicles and motorcycles; (3) Transportation & Storage and (4) Financial and Insurance Activities, based on CEPA's RIIO-2 analysis;
- Sectors 1-4 plus (5) Manufacturing (average of 6 selected sub-sectors¹⁹), (6) Professional, scientific, technical, administrative and support service activities, and (7) Information and communication²⁰;
- Sectors 1-4 plus (5a-f) Six sub-sectors of Manufacturing, (6) Professional, scientific, technical, administrative and support service activities, and (7) Information and communication.

Choice of time periods

At RIIO-2, CEPA based its proposed GD2 and T2 OE ranges on the period 1997-2016 while for ED2, CEPA used 1995-2016. Oxera and FE used 1996-2019 for the upper bound of their proposed OE range and 2009-2019 for the lower bound. Meanwhile, EI considered evidence dating as far back as 1970 and used evidence from three separate time periods to inform its OE range: 1970-2007, 1995-2019 and 2010-2019.

Economic growth, which is largely driven by productivity growth, can fluctuate significantly year to year and be affected by unique events. For example, the Great Financial Crisis of 2008-2009 was a generational event that had a large negative impact on economic growth, both immediately and during its aftermath. Economic growth is also known to follow 'business cycles': periods of expansion followed by periods of contraction or lower growth (although the length and size (or amplitude) of these cycles is not constant). It is therefore common practice to look at average productivity growth over at least a business cycle, to smooth these cyclical fluctuations. Business cycles typically last between two and ten years.

Looking at productivity growth for individual years can lead to very wide ranges. Conversely, looking at average productivity growth over multiple decades can overlook the contextual factors that have driven productivity growth in different decades, and that may be more or less relevant at different points in the future.

The present analysis considered three, non-overlapping, time periods for the purpose of producing a plausible OE range: 1970-1996, 1997-2007 and 2010-2019. The years of the Great Financial Crisis (2008 and 2009) and of the Covid-19 pandemic (2020 and 2021) were excluded given that these were (1) outliers in terms of productivity growth; (2) unprecedented events in recent history that have a low likelihood of being repeated in the near future. The choice of time periods seeks to strike a balance in terms of granularity and breadth of evidence considered. Whilst individual business cycles have not been identified, the time span covered by each of these three time periods is large enough to contain multiple full business cycles. Using individual years would have yielded a very wide productivity growth range. On the other hand, aggregating multiple business cycles together into a single average number would have ignored the fact that average productivity growth has been higher in some periods than in others, driven by circumstantial factors that should be borne in mind when choosing future OE targets. The inclusion of the period 1970-1996 felt appropriate as it broadens the evidence base and provides an additional reference point.

¹⁹ The six sub-sectors being a combination of those considered by, EI (Chemicals; basic pharmaceutical products; Computer, electronic, optical products; electrical equipment; Manufacture of rubber and plastic products and other non-metallic mineral products; Manufacture of machinery and equipment n.e.c; Manufacture of motor vehicles, trailers, semi-trailers and of other transport equipment; Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment), Oxera (Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment) and Frontier Economics (Manufacture of machinery and equipment n.e.c).

²⁰ Sectors (6) and (7) having been proposed by CEPA at ED-2, Frontier Economics and Oxera

Weighting

Each sector and year is given equal weight to produce an average annual productivity growth by time period. This is in line with CEPA's approach at RIIO-2 and most other consultants' analysis²¹ underpinning regulated company proposals. The exception is the scenario where the six sub-sectors of manufacturing were treated as standalone sectors. Whilst it may be more appropriate to fine-tune the weight given to each individual sector to reflect their comparability with regulated companies, setting these weights would be potentially arbitrary in the absence of more detailed evidence than is currently available.

Results

Table 1 shows the average annual productivity growth based on the analytical choices and for the time periods and combination of sectors set out above. This gives a possible OE range of **-1.0% to 4.2%**. The lower end of the range reflects the VA productivity growth post-financial crisis for a narrow set of sectors that were especially negatively affected by that event. The upper end of the range reflects the productivity growth across all sectors considered in the decade prior to the financial crisis, measured by the VA metric.

Table 1 TFP VA and TFP GO Estimates for three time periods and nine sectors as proposed by CEPA, EI, Oxera and FE

Comparator sectors	Productivity Metric	1970-1996	1997-2007	2010-2019	1970-2019 (excluding 2008 and 2009)
Sectors used at RIIO-2: 1. Construction 2. Wholesale and retail trade; repair of motor vehicles and motorcycles 3. Transportation and storage 4. Financial and insurance activities	Value Added	1.0%	0.5%	-1.0%	0.6%
	Gross Output	0.5%	0.3%	-0.5%	0.3%
Sectors 1-4 above, plus: 5. Average of 6 selected Manufacturing subsectors 6. Information and communication 7. Professional, scientific and technical activities; administrative and support service activities	Value Added	1.0%	2.6%	0.2%	1.4%
	Gross Output	0.5%	1.3%	0.1%	0.7%
Sectors 1-4 above, plus: 6 Selected Manufacturing subsectors with each given equal weight relative to other sectors (5a, 5b, 5c, 5d, 5e, 5f) ¹ 6. Information and communication 7. Professional, scientific and technical activities; administrative and support service activities	Value Added	1.4%	4.2%	0.3%	2.0%
	Gross Output	0.6%	1.8%	0.2%	1.1%

3.5.2 Narrow range

The above range is very wide and unlikely to be useful to Ofgem in setting an OE target in practice. Therefore, a narrow OE range was derived based on the following set of analytical choices:

²¹ With the exception of Oxera, which uses weighted average in some calculations.

- Use of the GO productivity metric (whilst noting that there is precedent and arguments for also considering the VA metric);
- Use of CEPA's targeted comparator set from RIIO-2, together with Manufacturing (average of six selected sub-sectors), Information & communication, and Professional & admin activities;
- Use of data from all the years available, with the exception of the years of the Great Financial Crisis and the Covid-19 pandemic.

The rationale underlying these choices is set out below.

Choice of productivity metric (GO vs VA)

The OE range is highly sensitive to the choice of productivity metric. There are arguments for and against each metric. VA estimates are provided directly in the EU KLEMS dataset whilst GO needs to be derived from the VA metric based on intra-sector flows of intermediate inputs, themselves estimated, consequently increasing the risk of measurement error. Meanwhile, VA is typically more volatile and a narrower measure of sectoral productivity (as, by definition, it excludes intermediate inputs). Linked to the previous point, GO is also more consistent with the wider regulatory regime (noting that the OE target is intended to be applied to totex) and more consistent with regulatory precedent (whilst noting that Ofwat's PR24 decision had regard to both GO and VA).

The GO metric results in a more conservative range and is also more consistent with how the OE metric is applied in practice as part of the regulatory framework (GO relates to the *total* value of production rather than just the VA component, and is therefore consistent with the application of the OE target to *total* expenditure). The narrow range proposed in this report in this report is therefore based on GO.

However, Ofgem may wish to recognise the potentially lower measurement error in VA estimates and note that regulators (including Ofgem itself, Ofwat and UREGNI, as set out in chapter 4) have typically considered both the GO and VA metrics in setting OE targets and that there are arguments in favour of either metric. It is therefore potentially defensible for Ofgem to consider VA-based estimates in setting OE targets, and Ofgem may wish to consider doing so.

Choice of sectors

The choice of comparator sectors is a subjective exercise, and, in principle, arguments could be made for the inclusion or exclusion of each of the sectors that were considered at the earlier stage. Ultimately, 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 as well as consistency with precedent. Based on the evidence available, it was considered that there is no compelling reason for the exclusion of specific sectors/sub-sectors that were considered as part of the broad OE range. All those sectors share some features with regulated energy companies, but it is not possible to determine, with greater precision, how much each sector has in common with those companies. It was therefore decided to keep all the sectors/sub-sectors that make up the broad range.

Another key question was how much weight to give to the six selected sub-sectors of Manufacturing. It was decided to treat the combination of these sub-sectors as a single over-arching sector (hence, giving the combination of the sub-sectors the same weight as other main sectors). This approach is based on the fact that it leads to a more conservative OE range and the fact there is no clear evidence, beyond arguments based on sector definitions, to show that some of these sub-sectors are more representative of the productivity growth potential of regulated energy companies than other sectors. However, if Ofgem considered, based on additional evidence or its expert regulatory judgement, that the selected manufacturing sub-sectors have more in common, from a productivity growth perspective, with regulated energy companies than other sectors, then it may be justified to select an OE target above the upper bound of the proposed narrow range.

Choice of time period

As shown in the table below, the upper end of the range is driven by the 1997-2007 period and the lower end of the range is driven by the 2010-2019 period. Between 1970 and 1996, average productivity growth for the sectors in question sits closer to the lower bound of the range.

These results reflect the most salient economic changes that characterise each period. Economic and productivity growth during the 2010-2019 period was influenced by the aftermath of the Great Financial Crisis, an unusually long and deep recession by recent historical standards that had repercussions across multiple sectors of the

economy. On the other hand, the 1997-2007 period benefitted from the development and spread (albeit fitful) of information and communication technologies, which may have some parallels with the current trends around AI and associated technologies. Meanwhile, the 1970-1996 period combines a range of fundamentally different and contrasting events and structural changes, including the 1970s energy crisis, de-industrialisation and shift towards a service sector economy, and privatisation and deregulation of several economic sectors.

Many of the changes that happened during the 1970-1996 period are unlikely to be repeated in the near future, at least in the same form. Equally, the Great Financial Crisis (and its aftermath) was a once in a generation event – though some observers have argued it represents a ‘new normal’ of persistent low productivity growth. By contrast, the 1997-2007 period may have parallels with the current wave of investment in AI, and trend towards greater digitisation of the economy²².

However, it is important to recognise that there are risks and limitations in using historical productivity evidence to guide views of future productivity (as set out in section 3.6). This report therefore uses average productivity estimates from the three different time periods to arrive at a plausible range but does not make a recommendation on how much weight should be given to each of the different time periods – this is something that will need to be considered by Ofgem, with reference to a wider evidence base (including the evidence set out in chapter 4) and by reference to its own expert knowledge of the energy sector and its wider price control determinations.

Results

Table 2 below presents TFP estimates based on the GO Metric for the selected comparator sectors, and for the three time periods under consideration. Using this evidence results in an OE range between **0.1% and 1.3%**.

Table 2 Average TFP GO estimates for selected comparator sectors and time periods

Sectors	1970-1996	1997-2007	2010-2019	1970-2019 average (excluding 2008 and 2009)
1. Construction	0.4%	-0.9%	-0.1%	0.1%
2. Wholesale and retail trade; repair of motor vehicles and motorcycles	1.0%	0.0%	-0.3%	0.5%
3. Transportation and storage	1.3%	0.7%	-0.6%	0.8%
4. Financial and Insurance Services	-0.7%	1.2%	-1.0%	-0.3%
5. Manufacturing (simple average of the six selected sub-sectors)	0.7%	2.6%	0.3%	1.1%
6. Information and communication	1.3%	5.2%	2.9%	2.7%
7. Professional, scientific and technical activities; administrative and support service activities	-0.4%	0.0%	-0.3%	-0.2%
Simple Average	0.5%	1.3%	0.1%	0.7%

²² Based on discussions with Ofgem and a high-level review of company business plans, these wider societal trends also appear to be present in the energy sector.

3.6 Limitations of using historical productivity estimates only to assess OE and sensitivity analysis

Estimating an appropriate OE target is a challenging and inherently uncertain exercise. Benchmarking using the EU KLEMS dataset is intrinsically subjective as there are many analytical choices available (e.g. which measure of productivity, which comparator industries, which time periods, etc.).

There are also broader limitations to consider when using historical productivity estimates in the process of estimating OE, which should be noted:

Past productivity is not necessarily a good guide for future productivity. Estimating OE is inherently a forward-looking exercise. The approach relies on historical productivity growth trends to inform plausible future productivity growth trends. It involves forming a view on the extent to which future technological, managerial and process improvements may lead to productivity improvements. Whilst empirical evidence on past productivity can provide an indication of the possibilities, there is no *a priori* reason to expect future productivity changes to follow historic ones.

Macroeconomic data is, by nature, uncertain, and productivity growth data tends to be highly cyclical and volatile. Therefore, using past productivity growth trends to derive expectations on productivity growth could result in very uncertain outcomes.

Productivity is estimated, making it susceptible to measurement and modelling errors. Productivity growth is not observable. Estimates are derived from a theoretical construct about how the economy works (or should work) which is prone to error. Even to the extent that historical information is useful, measuring past efficiency is challenging. Thus, historic productivity estimates are subject to modelling and measurement errors, impacting the accuracy of any conclusion derived from them.

Productivity data is not sufficiently granular. Productivity estimates from the EU KLEMS dataset are high-level, based on very large groups of different companies, and lack sufficient granularity to draw robust conclusions about productivity growth at the company-level.

No sector is a perfect comparator to energy network companies. The sectors included in EU KLEMS are different from the sectors Ofgem is trying to regulate. There is no perfect comparator to the energy network companies covered by RIIO. This means any analysis using the dataset will only allow for generalised, high-level conclusions that do not consider more nuanced features of the sector.

The above uncertainties mean that the results of the exercise are highly sensitive to analytical choices (which are inherently subjective). This is clear from the discussion above, where, for example:

- Changing the time period can result in drastic swings in implied OE, depending on which parts of the economic cycle are included or excluded; and
- Similarly, adding or removing certain sectors can have material impacts on the implied OE values.

Given the uncertainties and limitations above, it may therefore be prudent to avoid choosing figures at the extremes of the empirical range set out in the previous section, as they reflect less frequent occurrences and therefore have a lower probability of taking place (if one assumes that the past is indicative of the future). It is not possible to be precise about the extent to which the extremes should be avoided – there are no ‘tests’ for this, and ultimately it is a matter of judgement.

Given the uncertainties associated with setting an OE target on the basis of historical productivity performance, it is likely to be appropriate for Ofgem to also appeal to other sources of information. The next chapter discusses the key alternative sources of evidence that may inform the appropriate OE target.

4 Other sources of evidence

Based on the analytical choices and sensitivity analysis described in the previous chapter, a range of **0.1% to 1.3%** was derived from the EU KLEMS data. In practice, it is likely to be appropriate that Ofgem considers other factors to narrow this range further and alight on an appropriate target. In particular, the following sources of evidence are likely to be of relevance:

- **regulatory precedent**, which provides important points of reference in terms of targets adopted, methodology and robustness to scrutiny;
- **forecasts of annual productivity growth for the UK economy**, based on projections from organisations such as the OBR; and
- **companies' own proposed OE targets** and their underlying rationale.

This section outlines the evidence from regulatory precedent from RIIO-2 (section 4.1.1) as well as recent decisions by regulators in other sectors in the UK (section 4.1.2). The section further provides information on independent productivity estimates for the UK economy (section 4.2) followed by company proposals (section 4.3). This analysis did not look at companies' historical performance.

This chapter is mostly descriptive in nature – setting out key 'facts' that may be of use to Ofgem in setting its OE targets. However, with respect to companies' proposals, a view is provided on their relevance and validity. The next chapter discusses the implications of this information for setting OE targets.

4.1 Regulatory Precedent

4.1.1 Precedent from RIIO-2

Ofgem published two OE targets at Final Determinations at RIIO-2, one for GD, GT and ET in 2020, and another one for ED in 2022. Consultancy CEPA was commissioned to undertake independent analysis and propose a methodologically robust OE range in both instances.

Gas Transmission and Distribution, and Electricity Transmission

At the RIIO- GD/GT/ET2 Final Determinations Ofgem proposed an OE target of 1.15% for capex and repex and 1.25% for opex for all network companies²³. These estimates were the upper bound of the OE range proposed by CEPA, which is lower than the estimates originally suggested by Ofgem at Draft Determinations (1.2% for capex and repex and 1.4% for opex). The choice of these estimates was based on several analytical and qualitative considerations that built on Ofgem's RIIO-1 and Ofwat's PR19's methodologies.

CMA Appeals

Gas companies and one electricity company appealed Ofgem decision. FE and NERA were commissioned by, respectively, Distribution Network Operators ("**DNOs**"), the appellants, and the Electricity Network Association ("**ENA**") to scrutinise CEPA's analysis and Ofgem's determination.

The appellants stated that the proposed OE target was too high when compared to the regulatory precedent set in other sectors and was unlikely to be achieved due to the productivity slowdown in the UK economy following the Great Financial crisis. Additionally, they also highlighted the high degree of uncertainty around transformational change leading to higher TFP for the companies.

Ofgem claimed that past innovation funding (under RIIO-1) would deliver further TFP growth in RIIO-ED2. DNOS argued that most of these benefits were already factored into benchmarking models and should not be double-counted as additional OE.

²³ Ofgem (2020), 'RIIO-2 Final Determinations – Core Document', December

The CMA²⁴ upheld Ofgem's core OE assumptions²⁵ but noted that there were some inconsistencies in the evidence base and overturned certain aspects of Ofgem's decision on the OE target. It noted that Ofgem's OE target assumed network companies should outperform the broader economy and ignored post-2008 productivity slowdowns, relying solely on long-term historical data.

On the principle of Innovation Uplift²⁶, CMA maintained that by imposing an additional uplift, Ofgem departed from regulatory practice under which regulatory activities should be transparent, accountable and consistent. It stated that Ofgem's assessment of the Innovation Uplift was also skewed by a double-counting error (both within the core OE target and the with productivity improvements already captured in the company Business Plans). In its Final Determination on the RIIO-2 appeals for transmission and gas distribution networks, the CMA directed Ofgem to reduce its OE figure by 0.2% - equivalent to the Innovation Uplift²⁷.

It should be noted, however, that the CMA defended Ofgem and CEPA's expanded set of comparator sectors arguing that additional sectors better reflect digitalisation and evolving network operations. The CMA also generally defended Ofgem's regulatory discretion, or 'margin of appreciation', meaning that CMA would only rule in favour of the companies if they could prove that Ofgem had made an error, rather than simply not using the best possible method). Additionally, the CMA concluded that Ofgem's decision to set the OE target was not an error²⁸.

Post-CMA redetermination, Ongoing Efficiency estimates were finalised at 0.95% for capex and repex, and 1.05% for opex for RIIO GD and T2, while the OE estimate for RIIO ED2 was finalised at 1% of totex.

Electricity Distribution

Under the RIIO-2 framework for electricity distribution (RIIO-ED2), Ofgem proposed an OE target of 1%, following consideration of available evidence and responses received after Draft Determinations. This is lower than the estimate of 1.2% originally proposed at Draft Determinations.

The evolution from GD/GT2 to ED2 marked a shift from a focus on broader economy-wide trends to a greater focus on sector-specific evidence, recognising that energy networks are more alike in some sectors of the economy than others. ED2 also acknowledged the significant transformation within electricity networks, driven by increased automation and digital infrastructure as well as the energy transition.

4.1.2 Regulatory precedent in other sectors

Similarly to Ofgem, regulators oversee and regulate companies across other sectors in the economy to ensure efficient services for customers, including assessing the most appropriate OE target for networks. Regulatory decisions in other sectors set the context for any OE targets Ofgem may consider setting for energy network companies.

Amongst recent price control decisions, Ofwat's PR24 Final Determinations for the water sector, published in December 2024, are of particular interest to Ofgem in the context of RIIO-3. Ofwat's frontier shift target sets an important precedent for RIIO-3, given the comparable nature of the sector and challenges faced by companies, in particular the scale of investment needed in the sector over the next price control, similar to that of electricity transmission. The nature of the regulatory regime is also sufficiently similar to allow for meaningful comparison.

Similarly, the Utility Regulator for Northern Ireland ("UREGNI") assesses productivity to set a challenge for companies in the electricity, gas and water sectors in Northern Ireland, related to economy-wide productivity improvements. UREGNI published the Final Determination for the RP7 Price Control on 30th October 2024, which pertains to Northern Ireland Electricity ("NIE") Networks. This price control is set to run from April 2025 to March 2031.

Both Ofwat and UREGNI use the same evidence base and assessment approach as Ofgem when setting Ongoing Efficiency targets. This section of the report provides an overview of recent regulatory decisions made by Ofwat and UREGNI during previous price controls.

²⁴ [CMA Appeals \(Final Determinations Volume 2B\)](#)

²⁵ CMA Appeals Volume 2B, 7.801

²⁶ Innovation Uplift refers to an explicit adjustment to the ongoing efficiency target made by Ofgem. This uplift was justified by Ofgem on the basis that these companies, due to past innovation funding, should potentially be able to achieve greater productivity improvements than the relevant comparator sectors of the wider economy.

²⁷ CMA Appeals, Volume 2B, 7.807

²⁸ CMA Appeals Volume 2B, 7.444

Ofwat's PR24 Frontier Shift

At PR24, Ofwat put forward a frontier shift challenge of 1% p.a. applied to base and enhancement expenditure²⁹. This is the midpoint of the range originally suggested by consultancy CEPA at Draft Determinations (0.8% - 1.2%). This advice was based on the replication of Ofwat's principles and approach at PR19 and on consideration of alternative calculation methods. This range was also in line with other OE targets adopted by UK regulators in recent decisions.

The choice of 1% p.a. was based on a number of analytical considerations that built on PR19's methodology. These included:

- Qualitatively considering VA, TFP alongside the GO based range which justifies aiming towards the upper bound of the range.
- Considering the potential for embodied technical change, which is not fully accounted for by EU KLEMS estimates, and justifies aiming towards the upper bound of the GO-based range. Embodied technical change relates to cost savings that can be realised by companies due to quality improvements in factors of production.

More generally, Ofwat did not solely consider the assessment of the EU KLEMS database. Instead, it reached a decision about the potential for productivity growth "in the round". In doing this, Ofwat considered the ambition to deliver a substantial increase in investment in the water sector over PR24 as well as expected productivity improvements resulting from the introduction of AI, big data and robotics. Additionally, Ofwat considered companies' business plan submissions and regulatory precedent.

Six companies have appealed Ofwat's Final Determinations to the CMA. The frontier shift challenge is one of the points of dispute in all statements of case. Two of the appealing companies are arguing for a 0.8% p.a. frontier shift target (the upper end of EI's proposed range), two companies argue for 0.5% p.a., and one argues for 0.45% p.a.

Companies argue that the frontier shift challenge is not an appropriate stretch on costs. During the CMA appeals, the arguments presented by companies were that Ofwat's proposed OE target:

- Is not consistent with the significant decline in the UK productivity rates since the global financial crisis in 2008. They argue that UK productivity has been close to zero in most industries for almost two decades.
- It is not realistic to expect that the water sector could significantly outperform the wider UK economy in terms of productivity. Over PR14 and PR19 the water sector has consistently delivered low productivity growth, in line with overall performance in the UK, and below Ofwat's frontier shift assumptions.
- Water is not a "high-tech" sector, and there is great uncertainty around significant innovation projects and Research & Development, such as implementing AI, big data and robotics, in the sector.

The outcomes of the ongoing appeals from water companies to the CMA might change the decision at Final Determination and will provide further framing for Ofgem's decision on OE. These outcomes will finalise the target that will be in place from April 2025 to March 2030.

UREGNI's Ongoing Efficiency

In line with regulatory precedent, in October 2024, UREGNI decided on a 1% p.a. OE target as appropriately stretching for NIE Networks. The 1% p.a. applies to both opex and capex.

NIE Networks (the regulated entity) provided estimates of productivity improvement supported by analysis by consultants EY. They argued that a challenge beyond 1% p.a. would not be appropriate due to:

- The CMA found that Ofgem's decision to add an innovation uplift was not sufficiently well evidenced, as noted in the CMA's final decision³⁰.
- Innovation funding embedded in the Northern Ireland regulatory framework is not directly comparable to Great Britain.
- Northern Ireland's labour productivity is 18% lower than the UK average. Therefore, any OE target for NIE Networks is likely to be within a range that is well below any range supported by UK wide data.

²⁹ Ofwat (2024), 'PR24 final determinations: Aligning risk and return', December

³⁰ Final determination and order in the Energy Licence Modification Appeals 2021 (issued on 28 October 2021) – Volume 2B part 7, page 177

When setting the OE target (referred to as the Productivity Challenge by UREGNI) for NIE Networks, UREGNI considered the following evidence used as evidence:

- The annual OE proposed by the companies. NIE network companies had proposed an OE range of 0.5% - 1% at Draft Determinations, with an OE target of 0.8%.
- UREGNI's own assessment of TFP growth, using the EU KLEMS dataset (based on Ofgem's ED-2 methodology). This analysis proposed a range of 0.12% - 1.2%, with a proposed target of 1% at Draft Determination.

UREGNI used both the 2019 and 2023 EU KLEMS datasets, and their range is informed by both TFP GO and TFP VA figures and uses an unweighted average of selected industries. They placed less reliance on the 2023 dataset as it includes a Covid year (2020). UREGNI were influenced by Ofgem's ED-2 approach when deciding which comparator sectors to include.

UREGNI cited several factors that make the ongoing efficiency target achievable, including increased digitalisation, optimistic labour productivity forecasts, innovation spending, and the Department for the Economy's commitment to closing the productivity gap between Northern Ireland and GB.

UREGNI's view is that this target is supported by both quantitative evidence and regulatory precedent, including Ofwat's recent draft determination for PR24. It is also within the range suggested by NIE Networks. UREGNI ultimately decided to keep the target of 1.0% at Final Determination.

4.2 Independent productivity forecasts

This section of the report presents the latest productivity forecasts from the Bank of England and from the Office of Budget Responsibility, two official bodies that forecast UK productivity growth³¹.

4.2.3 Bank of England

The Bank of England's ("BoE") February 2025 Monetary Policy Report noted that the average TFP from 2020 to 2023 was about 0.2% and shrunk by 0.4% in 2024. The BoE forecast no TFP growth in 2025 with productivity improving slightly in 2026 (0.5%) and 2027 (0.3%)³².

The Bank of England also suggests that climate change will put downward pressure on productivity, both through its direct effects and the need to divert investment toward green infrastructure rather than productivity-enhancing capital. On the upside, the BoE states that technological advancements, especially in AI, have the potential to boost global trend productivity. However, projections of AI's productivity impact vary widely, with potential global gains to global trend growth ranging from a 0 – 1.5 percentage point³³ increase annually over the coming decade, according to the Monetary Policy Report.

4.2.4 Office for Budget Responsibility

The latest Economic and Fiscal Outlook report from the Office for Budget Responsibility calculated that growth in TFP was 0.1% in 2024. TFP is then forecast to grow to 0.2% in 2025, 0.7% in 2026 and then continue to rise to 1.1% by 2029. According to this forecast, average TFP growth over the first four years of the next control period will be 0.925%.

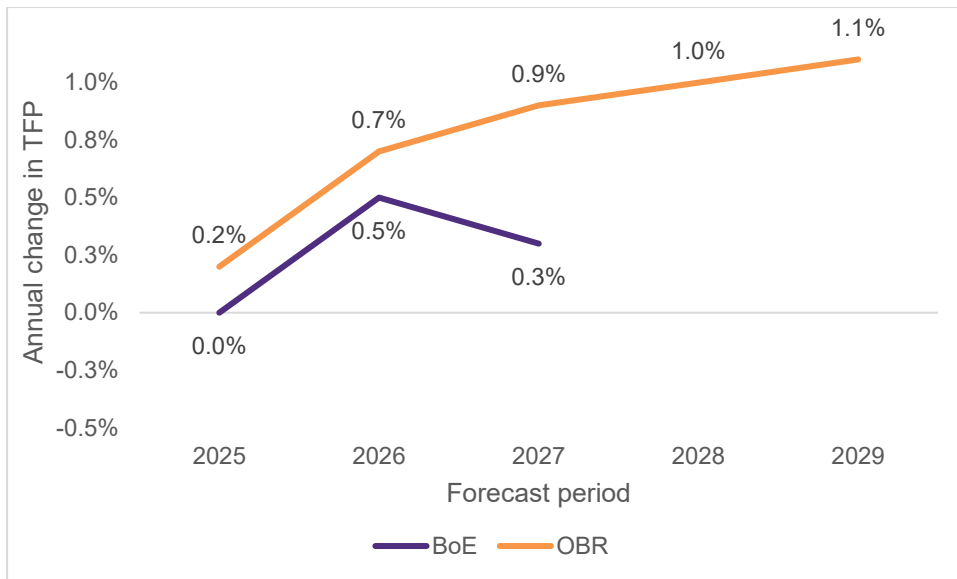
If productivity growth continues the same trend beyond 2029, then this would imply annual average productivity growth over the 5 years of the control period above 1.0%. Clearly, productivity growth is expected to be greater than this in the higher-performing sectors of the economy.

Figure 5 Forecasts for annual change in Total Factor Productivity (TFP) in UK

³¹ In its appeal decision for RIIO-2, the CMA took into account BoE and OBR forecasts but placed less weight on this evidence, relative to EU KLEMS data, in part because of the discrepancy between the two forecasts.

³² <https://www.bankofengland.co.uk/monetary-policy-report/2025/february-2025>

³³ Where 1 percentage-point is equivalent to 0.01%



Source: Monetary Policy Report (February 2025) and Economic and Fiscal Outlook (March 2025)

4.3 Network companies' proposals for RIIO-3

This section summarises regulated companies' proposed OE targets for RIIO-3 and their supporting arguments.

4.3.1 Proposed OE targets and supporting empirical evidence

Transmission and gas distribution companies have proposed OE targets for RIIO-GD/GT/ET-3 in their business plan submissions. In reaching a view on OE targets, companies have referred to the following evidence sources:

- Analysis of the EU KLEMS database
- Historical trends in UK productivity growth
- Business plan submissions.

Proposed OE targets range from 0.2% to 0.7%, as set out in the table below.

Table 3 Gas Distribution, Transmission and Electricity Transmission Companies' proposed OE targets for RIIO-3

Companies	Proposed RIIO-3 OE Target
Gas Distribution	
SGN	0.5% for totex
Cadent	0.5% for totex
WWU	0.5% for totex
NGN	0.5% for totex
Gas Transmission	
NGT	0.5% for totex
Electricity Transmission	
NGET	0.7% for opex 0.7% for capex
SPT/SPEN	0.4% for totex
SHET/SSEN	1) 0.2% to be applied to areas of the cost base that incorporate repetitive BAU activities (NOC ³⁴ s, specific CAI ³⁵ categories) 2) Alternatively, a target of 0.1% could be applied to totex

Source: Grant Thornton's review of Electricity and Gas company Business Plans

Gas Networks RIIO-3 Business Plan proposals

The four gas distribution companies and National Gas Transmission jointly commissioned a report from consultancy EI, which concluded that a plausible OE range of 0.2% to 0.8% p.a., suggesting a target at the 0.5% mid-point.

Electricity Transmission RIIO-3 Business Plan proposals

Electricity Transmission Owners ("TOs") have proposed more differentiated OE targets.

NGET argued for a 0.7% p.a. target, which is at the upper end of the benchmarking range (0.1–0.7%) proposed by consultants Frontier Economics. FE's proposed range is based on analysis of EU KLEMS 3 data for the period 1996-2019, using the GO metric and the sectors set out in chapter 3. The upper bound of the range reflects the average productivity growth over the whole period. The difference between Frontier's and EI's ranges appear to be due to the choices of comparator sectors and time periods.

SPT/SPEN proposed a 0.4% target for totex, towards the upper end of the 0.2%-0.5% range proposed by consultants Oxera. However, SPT specified that the OE target should be only applied to regular and repeatable activities and not one-off large projects. Oxera's proposed range is based on analysis of EU KLEMS 3 data for the period 1997-2019, using the GO metric and the sectors set out in chapter 3. The upper bound of the range reflects the average productivity growth over the whole period. The difference between Oxera's and FE's/EI's ranges appear to be due to the choice of comparator sectors.

SHET/SSEN suggested a lower OE range (0.1%-0.5%), with a preferred point estimate of 0.2% p.a., to be applied only to business-as-usual cost areas or 0.1% if applied to the totex baseline. Their proposed OE target was based on analysis of EU KLEMS data by Oxera, which considered only the period 2010-2019, using the GO metric from EU KLEMS 3. In contrast with other previous work (including its own work for SPT), Oxera adopted a weighted

³⁴ Network Operating Costs

³⁵ Closely Associated Indirect costs

average approach and included four additional sectors: Agriculture, forestry and fishing; Education; Real estate activities and Water supply, sewerage, waste management and remediation activities³⁶.

4.3.2 Qualitative arguments made by network companies

In setting out their proposed OE targets, regulated companies and their consultants made two types of qualitative arguments, which are briefly discussed below. These arguments were considered when selecting the time periods and sectors used in the empirical analysis presented in chapter 3.

Macroeconomic context

Several companies argued that recent productivity stagnation due to macroeconomic factors should be considered when assessing an OE target. NGT noted that CEPA's expectations about future UK productivity growth at RIIO-2 proved to be optimistic and also pointed to the BoE's productivity forecast (as set out in section 4.2). This argument would suggest placing greater weight on more recent productivity evidence and/or choosing an OE target towards the lower end of possible ranges.

Grant Thornton perspective

Whilst UK productivity growth over the past 15 years has been below historical norms, this may partly be attributed to a series of protracted significant macroeconomic shocks with few historically comparable events including the Great Financial Crisis, Brexit and the Covid-19 pandemic. It is difficult to foresee when a significant adverse macroeconomic shock could arise again in the future. Macro-economic performance is also known to be cyclical, with periods of low growth followed by periods of high growth, and vice-versa. This means that the more recent past may not always be the best indicator for what lies ahead.

Indeed, OBR's independent forecast (as set out in section 4.2) suggests an acceleration of *average* UK productivity growth from recent levels, with an annual average above 0.9% over the first four years of the next control period. The approach taken in this report (as set out in chapter 3) has been to derive OE ranges from periods with different observed levels of productivity growth.

It is also useful to view the recent slowdown in productivity growth alongside arguments (used, for example, by CEPA as part of the PR24 process) that innovations in AI, robotics, automation and so forth could support productivity growth going forward. It is especially worth noting that several regulated energy companies mentioned potential productivity upsides³⁷ (above and beyond embedded efficiencies) as part of the justification for their proposed investments in IT & telecoms within RIIO-3 draft business plans.³⁸ This may suggest that the present moment is more analogous to the mid-1990s (when there was a step change in the capabilities and adoption of information and communication technologies, that translated into productivity growth) than to the 2010s.

Whilst such arguments are highly uncertain, so too is the suggestion that the recent slowdown in productivity growth is likely to be prolonged into the future. Balancing these arguments is ultimately a matter of judgement.

Sector-specific productivity growth potential

TOs argued that due to their large, one-off strategic projects, there is limited scope for incremental efficiencies typically gained through repetition and "learning-by-doing". Some companies stated that, despite proposed high levels of investment, there are constraints on the ability of these investments to generate additional productivity gains (beyond those recognised in business plans).

NGT noted that the future of the gas industry is uncertain due to increased electrification of the grid. NGT also argued that the gas sector is less likely to benefit from productivity-enhancing technological change and innovation compared to high-tech industries.

³⁶ The weighting assigned to these additional four sectors combined in the aggregated weighted average for the TFP GO estimation, is less than 8%.

³⁷ These would arise, primarily, through disembodied technical change as processes are improved through new systems and information. However, it can be difficult to anticipate exactly how these changes will unfold or what the scale of their impact will be.

³⁸ The detailed review of company's business plans was beyond the scope of the present work. This statement is based on statements made by Ofgem colleagues.

These arguments could potentially suggest selecting an OE target towards the lower end of plausible ranges.

Grant Thornton perspective

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 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. More generally, it is not clear from company submissions why capital-intensive sectors, such as electricity transmission, should not benefit from wider transformative technological advancements.

With respect to NGT's arguments, it is not clear why uncertainty over the future of the gas industry would prevent it from benefitting from economy-wide improvements in productivity. And whilst there may be some uncertainty over the long-term future of the gas sector, it is expected to remain a vital component of GB's energy mix throughout the RII0-3 period.

5 Plausible Ongoing Efficiency ranges

5.1 Approach

This chapter discusses the approach taken in this report to support Ofgem in setting an OE target for RIIO-3.

The nature of productivity growth related to OE means that *a priori* expectations of productivity growth are inherently uncertain. As a result, forming a meaningful view on OE expectations means examining a range of different evidence, sources and arguments. It also means applying judgement to balance – in the context of this significant uncertainty – the interests of consumers and the realities of running energy networks.

To support Ofgem in making this judgement, the approach taken in this report has been to:

- consider historical evidence of productivity growth and what that could imply in terms of a plausible range for future OE (Chapter 3);
- consider wider sources of evidence – particularly stakeholders' views, wider economic projections and regulatory precedent – which may also be relevant to Ofgem in setting OE targets (Chapter 4); and
- test whether Ofgem's initial starting point proposed for the OE target (of 1%, contained in its SSMD³⁹ and consistent with RIIO-2) is consistent with the range of evidence (present Chapter).

The remainder of this chapter summarises and combines the evidence presented in earlier chapters to test the validity of Ofgem's initial OE target.

5.2 Deriving a range based on historical evidence

Based on historical estimates of productivity, and by making the analytical choices set out in chapter 3, the analysis presented in this report results in a 'narrow' OE range of **0.1% to 1.3%**. This range is based on a broad cross-section of sectors, as proposed by consultants previously commissioned by Ofgem and by energy companies, and the more conservative Gross Output productivity metric. The lower end of the range is representative of the period 2010-19, which was impacted by the aftermath of the Great Financial Crisis. The upper end of the range is representative of the period 1997-2007, which saw significant productivity growth, driven by the improvement in information and communication technologies and their widespread adoption.

This range remains wide, and it is also important to note that – whilst every care was taken in the previous step to choose sectors and time periods in an evidence-based way – there remain a degree of subjectivity in these choices and limitations in the use of historical productivity data. Therefore, it may be prudent to avoid choosing figures at the extremes of this range, and also to consider other sources of evidence, as discussed in the next section.

5.3 Incorporating other sources of evidence

The above range is based on historical productivity estimates and narrowed down through analytical choices in relation to productivity metric, comparator sectors, and time periods. However, it remains wide. In practice, it is likely to be appropriate that Ofgem considers other factors to narrow it down further and alight on an appropriate target. In particular, the following sources of qualitative evidence are likely to be useful to Ofgem: companies' own proposed OE targets and the underlying rationale; forecasts of annual productivity growth for the UK economy, based on projections from organisations such as the OBR; and regulatory precedent from previous Ofgem determinations and from other regulated sectors. These are discussed in detail in Chapter 4.

³⁹ RIIO-3 Sector Specific Methodology Decision for the Gas Distribution, Gas Transmission and Electricity Transmission Sectors, page 115, 9.31

In terms of companies' own business plans, this report considers that it would be reasonable to set the OE target at, at least, the most ambitious level proposed by the companies' own assessments of OE opportunities. This means setting an OE target of at least 0.7%. This is based on the following:

- By definition, all companies should have the same opportunity of achieving OE targets (in contrast to catch-up efficiency which, by definition, should be larger for less efficient firms). Technological and/or process improvements that characterise OE are typical of the notional company, but available to all in the same way;
- Companies have a strong incentive to propose lower OE targets (so some companies may have proposed OE targets that are below what may be possible in practice); and
- Companies possess unique insights into productivity trends in their industry (even if these are uncertain), so it would seem reasonable to infer that the proposals put forward by the most ambitious company reflect this knowledge and are feasible (although it should be noted that it may be possible to go further).

At the same time, recent regulatory precedent for OE does not go above 1.0% (for example from the RIIO-2 CMA redetermination and Ofwat's PR24 proposals) and economic forecasters are not projecting sustained growth in productivity above this level across the whole economy over the next four years. Therefore, it may be prudent to set OE targets no higher than this level, unless compelling evidence to the contrary was available.

5.4 A 1% OE target

Ofgem's RIIO-3 Sector Specific Methodology for RIIO-3 for GD, GT and ET⁴⁰ stated:

"We will consider whether the ongoing efficiency assumption of 1% per annum at the totex level implemented in RIIO-2 is still a reasonable starting point for RIIO-3."

Given the evidence available and considered at the time this report was written, a circa 1% p.a. OE target is a credible starting point for RIIO-3. A 1% p.a. target is consistent with historical evidence and with regulatory precedent from previous RIIO price control decisions and other regulated sectors, including Ofwat's recent PR24 decision. It also aligns with the latest expectations from OBR on annual productivity growth for the UK economy over the next four years (which overlap with the initial years of RIIO-3).

Importantly, the 1% figure would appear consistent with the CMA decisions at the time of RIIO-2. In particular, 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). Additionally, the CMA concluded that Ofgem's decision to 'aim up' (i.e. setting the target towards the top of the range consistent with the evidence) the OE target was not an error⁴¹.

Any substantial deviations from this number towards the upper or lower end of the range would imply trade-offs. 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. Doing so could deviate from regulatory and CMA precedent and potentially be out of kilter with what independent forecasters predict for the wider UK economy over the next control period. However, a higher target may be appropriate if:

- 1 Ofgem chose to give most weight to historical evidence from the 1997-2007 (noting the parallels between the impact of information and communication technology over that period and potential productivity impact of AI technologies);
- 2 Ofgem chose to take account of both VA and GO productivity metrics (noting the relative strengths and weaknesses of the two metrics, regulatory precedent, and expectation that regulated companies exert greater pressure over productivity growth of its supply chain); and/or
- 3 Ofgem considered that regulated companies are more akin, in terms of productivity growth potential, to the historically higher performing sectors of the economy (such as Manufacturing and Information & communication).

On the other hand, any target below 1%, especially materially so, could result in bills being higher than necessary and could deviate from objective evidence sources – like regulatory precedent and independent forecasts.

Ultimately, it is for Ofgem to decide on the appropriate OE target. As stressed above, OE is inherently uncertain, and Ofgem must make that judgement in the context of that uncertainty and balance a range of evidence and arguments. Based on the information available at the time of writing, consistent with its SSMD, a target in the

⁴⁰ [RIIO-3 Sector Specific Methodology Decision for the Gas Distribution, Gas Transmission and Electricity Transmission Sectors](#), page 115, 9.31

⁴¹ CMA Appeals Volume 2B, 7.444

vicinity of 1% appears prudent and consistent with the various sources of evidence. Moreover, productivity trends are inherently long-term in nature (spanning multiple price control periods) and an argument could therefore be made for retaining the same target over time to avoid internal inconsistencies. At the same time, in reaching a final view on an appropriate OE target, Ofgem should also consider the context for the current price control, its own expert sector knowledge, and any new information that comes to light post-draft determination.

A Appendix – Detailed EU KLEMS results

1. Disaggregate productivity growth estimates

Table 4 TFP VA growth estimates for all sectors and sub-sectors preferred by CEPA, EI, FE and Oxera from 1970-2019 (excluding 2008-09)

Consultancy	Sectors/ sub-sectors (NACE 2)	1970-1996	1997-2007	2010-2019	1997-2019 (excl. 2008-09)	1970-2019 (excl. 2008-09)
CEPA, EI, FE, Oxera	Construction	1.2%	-2.1%	-0.4%	-0.7%	0.2%
CEPA, EI, FE, Oxera	Wholesale and retail trade; repair of motor vehicles and motorcycles	1.8%	0.0%	-0.5%	0.2%	1.0%
CEPA, EI, FE, Oxera	Transportation and storage	2.4%	1.6%	-1.3%	0.6%	1.5%
CEPA, FE, Oxera	Financial and insurance activities	-1.4%	2.4%	-2.0%	0.3%	-0.5%
EI	Chemicals; basic pharmaceutical products	4.4%	4.9%	1.6%	3.3%	3.9%
EI	Computer, electronic, optical products; electrical equipment	3.6%	15.3%	2.5%	8.8%	6.2%
EI	Manufacture of rubber and plastic products and other non-metallic mineral products	2.7%	2.5%	2.2%	2.4%	2.6%
EI, FE	Manufacture of machinery and equipment n.e.c.	0.6%	6.6%	-1.0%	3.7%	2.1%
EI	Manufacture of motor vehicles, trailers, semi-trailers and of other transport equipment	2.4%	5.2%	-0.2%	2.6%	2.5%
EI	Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	-1.9%	4.5%	-1.3%	2.3%	0.2%
FE, Oxera, CEPA-ED2	Information and communication	2.0%	9.7%	5.1%	7.5%	4.7%

FE, Oxera, CEPA-ED2	Professional, scientific and technical activities; administrative and support service activities	-0.7%	0.0%	-0.5%	-0.2%	-0.4%
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Table 5 TFP GO growth estimates for all sectors and sub-sectors preferred by CEPA, EI, FE and Oxera from 1970-2019 (excluding 2008-09)

Consultancy	Sectors/ sub-sectors (NACE 2)	1970-1996	1997-2007	2010-2019	1997-2019 (excl. 2008-09)	1970-2019 (excl. 2008-09)
CEPA, EI, FE, Oxera	Construction	0.4%	-0.9%	-0.1%	-0.3%	0.1%
CEPA, EI, FE, Oxera	Wholesale and retail trade; repair of motor vehicles and motorcycles	1.0%	0.0%	-0.3%	0.1%	0.5%
CEPA, EI, FE, Oxera	Transportation and storage	1.3%	0.7%	-0.6%	0.3%	0.8%
CEPA, FE, Oxera	Financial and insurance activities	-0.7%	1.2%	-1.0%	0.2%	-0.3%
EI	Chemicals; basic pharmaceutical products	1.5%	2.1%	0.7%	1.4%	1.4%
EI	Computer, electronic, optical products; electrical equipment	1.5%	5.7%	1.2%	3.4%	2.4%
EI	Manufacture of rubber and plastic products and other non-metallic mineral products	1.0%	1.1%	0.8%	1.0%	1.0%
EI, FE	Manufacture of machinery and equipment n.e.c.	0.2%	3.0%	-0.4%	1.7%	0.9%
EI	Manufacture of motor vehicles, trailers, semi-trailers and of other transport equipment	0.8%	1.6%	-0.1%	0.8%	0.8%
EI	Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment	-0.7%	2.1%	-0.6%	1.1%	0.2%
FE, Oxera, CEPA-ED2	Information and communication	1.3%	5.2%	2.9%	4.1%	2.7%
FE, Oxera, CEPA-ED2	Professional, scientific and technical activities; administrative and support service activities	-0.4%	0.0%	-0.3%	-0.1%	-0.2%

