Review of Ofgem's RIIO-2 Draft Determinations proposal on ongoing efficiency

Prepared for
Scottish and Southern Electricity Networks

August 2022

Final

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Executive summary

Ofgem has proposed an ongoing efficiency (OE) challenge of 1.2% per annum. The proposal was informed by a consultancy report by CEPA,[1] commissioned to provide quantitative evidence on the potential savings due to technological progress.

CEPA's quantitative evidence on OE ranges from 0.2% to 1.2%, with its estimates clearly centring around 0.6%. Only one of CEPA's estimates—value-added total factor productivity (VA TFP) for the extended comparator set over the full period—produces an OE challenge of 1.2% per annum.

This report provides clear analytical evidence to show that: CEPA's 1.2% estimate of OE is the result of errors; and Ofgem's selection of this level of OE challenge for the RIIO-ED2 Draft Determinations is similarly the result of a number clear errors.

The errors in CEPA's 1.2% estimate of OE are summarised below.

- It is well accepted that TFP must be estimated over a **complete business cycle**. However, the period selected by CEPA does *not* represent a complete business cycle—this is a clear error in the approach taken. Rather, it is simply the period over which the data is available. All estimates provided by CEPA that use data from complete business cycles yield considerably lower OE results (0.2–1% and, on average, 0.5%) and are not sensitive to the exact chosen start or end point of the business cycle.
- **VA TFP** is *not* applicable to TOTEX, as it represents an estimate of productivity change for a subset of inputs only. It either needs to be adjusted or for the focus to be placed on the gross output (GO) TFP results instead, which are significantly lower (ranging from 0.2% to 0.6% based on data from completed business cycles).
- The **expanded comparator** set places too high a weighting (one-sixth) on the Information and Communication sector, which is wrong for a number of reasons, including:
  - DNOs' spending on digital, which is intended to be represented by this sector, is significantly lower than one-sixth of TOTEX;

[1] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June.

- many the DNOs' investments in digital assets are to replace equipment that has/will become obsolete (e.g. PSTN telephones) or meet new regulatory requirements (e.g. market-wide half-hourly settlements) during the course of the next regulatory period and have therefore no or low potential for cost saving;

- the financial benefits from this spending are already embedded in the business plans; therefore the high OE target has the potential to be a double-count.

Results from a narrow comparator set or the market economy are more appropriate and yield significantly lower estimates (ranging from 0.2% to 0.8% based on data from complete business cycles).

CEPA's report provides an unhelpfully wide range (0.2–1.2% from its empirical analysis of EUKLEMS, and 0.5%, 1% and 1.2% as reference points, based on selective qualitative arguments) for Ofgem to select for its OE challenge.[2] Ofgem has adopted the most extreme figure of the proposed range and one that, as demonstrated above, is derived from erroneous analysis.

Ofgem's reasoning for its selection contains a variety of material errors, as follows.

- Its main reason for setting a 1.2% per annum challenge is that it argues that the DNO increase in spending on **data and digital** provides scope for more stretching OE improvements than those suggested by the empirical analysis.[3] However, this is a clear error by Ofgem which ignores the fact that CEPA, when constructing its expanded comparator set, explicitly considered the digital transformation in the electricity distribution network sector in its empirical analysis, which already reflects excess stretching (see above). A further stretch on any of the productivity figures using the expanded comparator set (namely, 0.5–1% using data from a completed business cycle) therefore represents a double count.

- Ofgem argues that **past innovation funding** provided in previous price controls could lead to further efficiencies beyond those in competitive sectors in RIIO-ED2.[4] In GD2, the CMA rejected an uplift from 1% to 1.2%, as Ofgem erred when it assumed that the innovation funding received by

[2] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, Table 4.1 and p. 40.
[3] Ofgem (2022), 'RIIO-ED2 Draft Determinations – Overview Document', June, para. 11.30.
[4] Ofgem (2022), 'RIIO-ED2 Draft Determinations – Core Methodology Document', June, paras 7.474–7.475.

the companies was entirely incremental to the comparator sectors in EU KLEMS, double-counted innovation cost already embedded in the business plans, and failed to consider potential distortive effects on companies' incentives to innovate.[5] By using past innovation funding as a qualitative argument to stretch the OE challenge beyond 1% p.a., Ofgem has repeated its error from GD2 without providing any incremental evidence or in any other way addressing the CMA's concerns.

- Ofgem argues that **GO-based TFP** from growth accounting may underestimate the potential for productivity improvements quality improvements in factor inputs (embodied technological change).[6] **Embodied technological change** is typically related to quality improvements of capital goods. Ofgem makes a clear error in its analysis by failing to acknowledge that such change is less relevant in the current context, as DNOs are confronted with long-lived and sunk capital assets with slow replacement rates. Moreover, if there is any quality improvement in inputs that DNOs use, this is highly likely to have been passed on to consumers in terms of quality improvements. In addition, Ofgem's OE challenge is based on **VA-TFP**, which is almost double the corresponding GO-TFP estimates (ranging from 0.2–0.6% using data from a complete business cycle). Any stretching of the OE challenge on the basis of this argument thus corresponds to a double count.

- Ofgem argues that, despite the **slowdown in wider productivity growth** since the global financial crisis, there remains potential for ongoing productivity gains in RIIO-ED2, and therefore that the evidence from comparator sectors underestimates the scope for the DNOs to make productivity improvements.[7] Stretching the OE challenge to 1.2%, however, erroneously assumes that the DNOs are **fully protected** from these wider trends, and that their productivity potential could be as high as pre-crisis productivity in the chosen comparator sectors.[8] Full protection from wider trends is not supported by empirical evidence,[9] and is also not consistent

[5] Competition and Markets Authority (2021), 'Cadent Gas Limited, National Grid Electricity Transmission plc, National Grid Gas plc, Northern Gas Networks Limited, Scottish Hydro Electric Transmission plc, Southern Gas Networks plc and Scotland Gas Networks plc, SP Transmission plc, Wales & West Utilities Limited vs the Gas and Electricity Markets Authority: Final determination Volume 2B: Joined Grounds B, C and D', October.
[6] Ofgem (2022), 'RIIO-ED2 Draft Determinations – Core Methodology Document', June, para. 7.469.
[7] Ibid., para. 7.470.
[8] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, Tables 3.4 and 3.5.
[9] Ajayi, V., Anaya, K. and Pollitt, M. (2021), 'Incentive regulation, productivity growth and environmental effects: the case of electricity networks in Great Britain', University of Cambridge Energy Policy Research Group, Working Paper No. 2126, November.

with the economic reality, given that the implications of Brexit, or the impacts of the ongoing pandemic (for example, staff absences due to sickness, childcare or isolation) affect the DNOs just as they do other industries.

- Moreover, Ofgem does not consider that the DNOs are confronted with additional challenges that are likely to hamper their ability to meet unrealistic OE targets:
  - delivering net zero is a huge undertaking for the sector, and significantly different to the context of GD2; it is wrong to think that the DNOs could deliver improvements significantly above those in previous price controls and other sectors;
  - while Ofgem believes that optimising the supply chain management can achieve greater cost savings,[10] the regulator's over-reliance on uncertainty mechanisms (UMs) makes it harder for the DNOs to drive efficiencies because the volume uncertainty hampers their opportunity to form major partnerships with suppliers.

Our assessment illustrates that **Ofgem's ongoing efficiency target is an error. It is not supported by the available evidence and it is significantly above a valid range**. Our previous estimate of 0.4% p.a. using EU KLEMS data with range of 0.1–0.6% based on sensitivity analysis and other sources of evidence is consistent with the presented evidence from Ofgem's own consultants CEPA.[11] SSEN's proposed OE challenge of 0.7% p.a. (assumed to start from 2021/22) is thus already challenging. Based on the evidence it has presented, Ofgem cannot legitimately stretch a DNO OE target beyond 0.7-1% per annum. Any additional uplift beyond a 1% target is the result of Ofgem's errors.

[10] Ofgem (2022), 'RIIO-ED2 Draft Determinations – Core Methodology Document', June, para. A1.26.
[11] Oxera (2021), 'Establishing an appropriate efficiency challenge', November.

1 Introduction

1.1 Ongoing efficiency (OE) reflects the concept that even the most efficient firms may be able to reduce costs over time because resources can be saved through technological progress. Regulated firms are therefore challenged to achieve such OE improvements.

1.2 In its RIIO-ED2 Draft Determinations, Ofgem has proposed to set the ongoing efficiency target equal to 1.2%.[12] Its proposal is informed by a report by CEPA, its consultants, that was commissioned to provide quantitative evidence on the potential savings due to technological progress. CEPA's report suggests three potential reference points: 0.5% corresponding to a pessimistic outlook; 1% corresponding to a stable outlook; and 1.2% corresponding to a stretching outlook.[13]

1.3 Ofgem justifies its choice of the highest reference point of 1.2%, arguing in the main that the significant increase in spending on data and digital provides scope for OE improvements that are more stretching.[14]

1.4 Scottish and Southern Energy Networks (SSEN) has instructed Oxera Consulting LLP to undertake a detailed assessment of the approach and application that Ofgem and CEPA have used to set the OE challenge Following our assessment, we find that Ofgem's OE target is wrong and significantly above a valid range. We note that further evidence on the OE challenge is provided in reports by other consultancies commissioned by the Energy Networks Association (ENA). Our report has been completed independently of these reports but we understand the findings to be consistent.

1.5 This report is structured as follows:

- Section 2 describes the errors in CEPA's empirical estimates.
- Section 3 shows that CEPA's qualitative analysis is incomplete and selective.
- Section 4 shows that CEPA's reference points are insufficient to make an informed decision on the OE challenge.

[12] Ofgem (2022), 'RIIO-ED2 Draft Determinations – Overview Document', June.
[13] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June.
[14] Ofgem (2022), 'RIIO-ED2 Draft Determinations – Overview Document', June, para. 11.30.

- Section 5 demonstrates that Ofgem's choice of the 1.2% p.a. OE challenge is based on error.

2 Errors in CEPA's empirical estimates to inform the ongoing efficiency challenge

2A CEPA's approach to estimating productivity change

2.1 Ofgem informs its OE challenge through the growth accounting approach which focuses on total factor productivity (TFP). This approach uses aggregated data for an industry or the economy, calculating productivity growth by dividing the growth rates of output with the growth rate in input factors (measured in real terms). Productivity growth is thus the part of output growth that is not accounted for by increased production factor input.

2.2 Output can be measured using two metrics:

- gross output (GO) measures the total economic activity in a given industry or economy, i.e. the production of all goods and services in a given time period;
- value added (VA) corresponds to the difference between GO and intermediate inputs, and represents what the industry adds to its products and services.

Thus, GO can be considered as the 'end product'. VA represents the incremental value that a firm, industry or economy has added in the production process. With positive productivity growth, VA TFP growth will be systematically higher than GO TFP. CEPA applies both metrics, as it considers that this is consistent with precedent.[15]

2.3 It is well known that measured productivity growth is volatile and pro-cyclical with output changes.[16] That is, productivity is higher during periods of growth and lower during periods of recession. As such, the figures are highly sensitive to the time span chosen for the estimation. It is therefore best scientific practice to estimate TFP over full business cycles, to avoid distortions caused by overweighting growth or recession periods.[17]

[15] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, p. 14.
[16] The growth accounting approach measures productivity as a 'residual'—i.e. the proportion of output growth that is not explained by growth in inputs. This approach is based on economic theory, which assumes that firms are fully able to adjust their employment of input factors, such as labour or capital, as a reaction to output fluctuations. In practice, this behaviour cannot be observed. For example, firms do not take on or make redundant workers in reaction to short-term demand fluctuations, because such behaviour is associated with considerable cost. Therefore, yearly TFP changes cannot be interpreted as resources that can be saved through technological progress. Saving potentials can be assessed only by averaging TFP over a longer time span that equally incorporates growth and recession periods.
[17] OECD (2001), 'Measuring Productivity – OECD Manual: Measurement of aggregate and industry level productivity growth', p. 119.

2.4 Indeed, Ofgem's consultants, CEPA, clearly agree with this principle:[18]

> Therefore, the most robust approach to assessing historical productivity growth is to assess average productivity growth over a complete business cycle, which should help to mitigate against the risk of developing an overly optimistic or pessimistic view of productivity growth potential.

2.5 Despite this, TFP is estimated by CEPA for two time periods, one of which does not represent a complete business cycle:

- one based on the business cycle—CEPA restricted the estimation period to the business cycles period starting in 1998 (or 1999) and ending in 2015 (or 2016);
- another based on the full data period for which data is available—CEPA used the entire time series available (1995 to 2016) arguing that this would remove subjectivity around defining the start and end point of a business cycle.[19]

2.6 CEPA uses two alternative sets of comparator industries, chosen for their comparability of activities with those in the electricity distribution network sector.[20] The narrow set includes four sectors: (i) Construction (F); (ii) Wholesale and Retail Trade: Repair of Motor Vehicles and Motorcycles (G); (iii) Transportation and Storage (H); and (iv) Financial and Insurance Activities (K). The expanded set additionally includes: (v) Professional, Scientific, Technical, Administrative and Support Service Activities' (M-N); and (vi) Information and Communication (J). To capture broader productivity trends, an economy-wide sample of competitive industries is used.

2.7 CEPA's report provides the following figures.

Table 2.1 CEPA's productivity estimates (%)

Measure	Period	Narrow comparator	Expanded comparator	Market economy
VA	1995–2016	0.8	1.2	0.8
VA	Business cycle	0.3–0.4	0.9–1.0	0.5–0.6
GO	1995–2016	0.4	0.6	0.4
GO	Business cycle	0.2	0.5–0.6	0.3–0.4

Source: CEPA (2022), p. 39, Table 4.1.

[18] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, p. 11.
[19] Ibid., p. 14.
[20] Ibid., pp. 16–17.

2B Our assessment of CEPA's approach to estimating productivity change

2.8 We have identified three key errors in CEPA's approach and Ofgem's application of it (i.e. its selection of the 1.2% value). An OE target of 1.2% is empirically supported by **only** one outcome: VA TFP from the expanded comparator set, which estimates TFP over incomplete business cycles (the full period, 1995–2016). This figure is most likely to be highly overestimated as a benchmark for the OE potential of the DNOs, as outlined below.

2B.1 Selected time period

2.9 CEPA argues that the full time period (starting in 1995) is necessary to avoid subjective judgements on the start or end points of the business cycle.[21] In RIIO-T2 and RIIO-GD2, 1997–2016 was selected as the estimation period, based on analysis to identify a complete business cycle. In the subsequent appeal, the CMA accepted that defining a business cycle is difficult in practice and that the 1997–2016 time period was within GEMA's margin of appreciation.[22] In contrast, the current use of the full time period, 1995–2016, is an error, as:

- The results presented by CEPA (in Table A.1 of Appendix A) show that estimated productivity, based on the different business cycle periods identified by CEPA (starting in 1998 or 1999),[23] is in a relatively narrow range of 0.1 percentage points. Thus, estimated productivity is not very sensitive to the exact chosen start points (1998 or 1999) or end points (2015 or 2016) of the identified business cycle.[24] Thus, these business cycle periods can be used.
- The full time period, which starts in 1995, clearly does not represent a business cycle—it is simply the full period for which data is available. Evidence using clearly incomplete business cycles, i.e. the full time period, which starts several years before the start of the business cycle, is therefore not needed to robustly estimate TFP, and should be dismissed.

[21] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, p. 13.
[22] Competition and Markets Authority (2021), Final determination, Volume 2B: Joined Grounds B, C and D, para. 7.104.
[23] Starting either in 1998 or 1999 and ending in either 2015 or 2016. These business cycles are derived from analysing the IMF World Economic Outlook Database. Our judgement on business cycles is based on EU-KLEMS data and identifies the 2007–16 period as the most recent business cycle (see Oxera (2021) 'Establishing an appropriate efficiency challenge', November).
[24] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, Appendix A, p. 60.

- Moreover, failure to establish a suitable time period based on objective grounds leaves the choice of the starting and end year to chance and makes the result a random number. To be clear, **the use of a result based on the full time period makes no attempt to construct a period based on a business cycle and runs counter to best practice.**[25]

2B.2 Expanded comparator set

2.10 CEPA argues that 'the digital evolution might allow the DNOs to realise higher rates of productivity growth somewhat closer to that achieved in more digitally enabled industries, which we reflect in our selection of industries for the expanded comparator set in the EU KLEMS analysis'.[26] CEPA estimates industry-specific TFP measures and aggregates them using simple unweighted averages. This approach is problematic as single sectors can have a high impact on the aggregate results. The comparator sectors are chosen to reflect the comparability of their activities with those in the electricity distribution network sector. These other sectors are, if anything, comparable to certain activities of the electricity distribution network sector and should not be confused with proxies for all activities of the network sector. The Information and Communication sector, for example, may be a good proxy for IT-related activities, but not for construction or maintaining a grid (which is the primary objective of an electricity distribution network).[27] However, CEPA fails to account for the relevance of each of these activities by applying equal weight to all comparator sectors. It is incorrect to use the same weight for Information and Communication (one-sixth or c. 17%) as for the construction sector, for example, given that IT-related activities represent only a small proportion of a distribution network's activities. SSEN's planned investments for IT and Digitisation corresponds to £264.1m, representing only 6% of TOTEX, considerably below 17%.[28]

2.11 Moreover, many of these investments replace equipment that will become obsolete (e.g. PSTN telephones) or meet new regulatory requirements (e.g. market-wide half-hourly settlements) during the course of the next regulatory period. Investments are needed for the transition to a net zero future

[25] OECD (2001) 'Measuring Productivity – OECD Manual: Measurement of aggregate and industry level productivity growth', p. 119.
[26] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, pp. 22 and 40.
[27] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, p. 16.
[28] SSEN (2021), 'Powering Communities to Net Zero, Our Business Plan for RIIO-ED2 2023-2028', December.

energy system or to enable new third-party business models. Digital spending should therefore be interpreted as 'product innovation'—i.e. the development of new technologies that solve new needs of grid users, and can thus be seen as improving service quality, rather than be interpreted as 'process innovation' that results in a reduction in production cost.[29]

2.12 SSEN outlines that IT and digital investments collectively will deliver £245.4m of benefits, some of which have been baked into its planned TOTEX, mainly through reduced closely associated indirect (CAI) costs. The remainder avoids new costs that SSEN would have incurred during the period.[30] Therefore, the majority of the cost-saving potential of this digital spending is already considered in SSEN's planned TOTEX before applying the OE target. Only the residual can support the delivery of ongoing efficiencies. This is different to growth-accounting TFP, which measures the total input saving potential due to technological innovation.

2B.3 The application of VA TFP

2.13 CEPA argues that VA is more 'robust',[31] which is incorrect. Robustness means that changes in the calculation method have little impact on the results. Both TFP measures are constrained by the same uncertainties, such as the choice of a suitable timeframe or the choice of comparator sectors and their weighting (see above). Hence, VA TFP is by no means more robust than GO TFP.

2.14 Moreover, **the OECD has concluded that the VA-based measure is 'not a good measure of technology shifts at the industry or firm level**'.[32]

2.15 It is highly likely that VA will overestimate the OE potential if applied to TOTEX. When choosing a measure to inform the OE challenge, the conceptual differences in the measures must be taken into account. As stated above (para. 2.2), VA TFP measures the productivity change observed in the value added (i.e. excluding intermediary goods and services), not the total product.

2.16 As such, VA TFP should not be applied to TOTEX. Ofgem acknowledged this in RIIO-T1/GD1, noting: '**the VA measure of productivity only allows us to**

[29] Competition and Markets Authority (2021), op. cit., paras 7.490–492.
[30] SSEN (2021), 'SSEN Distribution RIIO-ED2, Digitalisation Investment Plan, RIIO-ED2 Business Plan Annex 5.1', December, p. 6.
[31] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, p. 14.
[32] Tab L13: OECD (2001), 'Measuring Productivity OECD Manual Measurement of Aggregate And Industry-level Productivity Growth', p. 16.

evaluate the impact of the use of labour and capital on outputs, thus limiting the costs that this can be applied to'.[33]

2.17 Indeed, CEPA, in its most recent report for Ofgem, recognises that VA TFP provides a reliable estimate only if technical progress operates on primary inputs (labour and capital). CEPA states:[34]

> GO TFP is a better measure of productivity where technical progress affects all factors of production proportionately.
>
> VA TFP is shown to be a better measure of productivity in cases where technical progress operates on primary inputs.

2.18 However, CEPA fails to acknowledge that Ofgem applies the OE challenge on all expenditure, including in areas where less technical progress can be expected.

2.19 As such, there are three possibilities: **VA TFP must be scaled down before it can be applied to TOTEX; VA TFP should be applied to only a subset of TOTEX; or GO TFP should be used and applied to TOTEX**.

2.20 CEPA argues that GO TFP is subjected to the 'double-counting' problem if intermediate inputs are provided from firms in the same industry.[35] However, VA TFP is not a perfect solution either, as it removes not only the problematic intermediate goods provided by the same sector but all intermediate goods (including those that are not problematic). VA TFP is therefore upward-biased.

2.21 CEPA uses aggregated data for industries, but not aggregated data for a full economy. Even the economy-wide sample of competitive industries aggregates outputs and inputs for several industries before estimating TFP (which would cause a high risk of double counting), and estimates industry-specific TFP by averaging the sector TFPs in the second step. It is highly likely that most intermediate goods used in each sector's production process are provided from outside the sector itself, and there are no or very limited inter-industry intermediary goods. Therefore, VA has a higher potential to be upward-biased than GO's potential of being downward-biased.

[33] Tab L2: Ofgem (2012), 'RIIO-T1/GD1: Initial Proposals − Real price effects and ongoing efficiency appendix', July.
[34] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, pp. 14–15 and Table 2.2.
[35] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, pp. 14–15.

3 Errors in CEPA's qualitative arguments to inform the ongoing efficiency challenge

3.1 In addition to the quantitative evidence, CEPA provides a range of qualitative arguments to be considered when setting the OE challenge. However, its analysis is incomplete and selective. Arguments that presumably justify stretching the OE challenge above the level indicated by the majority of the empirical evidence are accepted without empirical or even anecdotal evidence. In contrast, arguments that would support a lower OE challenge are rejected without evidence being provided. This inconsistent approach to evaluating evidence is flawed.

3A Embodied technical change

3.2 CEPA argues that TFP from growth accounting **may** underestimate the potential for productivity improvements that could be delivered through quality improvements that are embodied within the capital and labour inputs.[36] However, CEPA provides no evidence, either quantitative or anecdotal, on how material this problem is.

3.3 While there is no recent research that seeks to quantify the impact of embodied technical change in the EU KLEMS data, some studies have found that the benefits of input improvements are passed on to the output side, as improvements in the quality of the outputs.[37] The DNOs have improved the quality of service significantly over ED1 and are planning to do so over ED2. Thus, if there is any quality improvement in the inputs that the DNOs use, this is likely to have been passed on to consumers in terms of service quality improvements.

3.4 Moreover, starting with the 'embodiment' controversy between Jorgenson and Solow,[38] the economics literature typically expects that technological innovations are mainly introduced through the quality improvements of new capital goods. Electricity distribution is confronted with long-lived and sunk capital goods and their replacement is, compared to other industries, very slow. Embodied technological change, which may underestimate technical change in other industries, is therefore less relevant for electricity distribution.

[36] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, p. 22.
[37] Tab L31: Hulten, C.R. (1992), 'Growth Accounting When Technical Change is Embodied in Capital', *The American Economic Review*, **82**:4, pp. 964−80.
[38] Jorgenson, D.W. (1966), 'The embodiment hypothesis', *Journal of Political Economy*, **74**:1, pp. 1–17. Solow, R.M. (1960), 'Investment and technical progress', in K.J. Arrow, S. Karlin and P. Suppes (eds), *Mathematical Methods in the Social Sciences*, Stanford University Press.

Thus, any stretching of the OE challenge on the basis of this argument is not valid.

3B Regulatory precedent

3.5 CEPA highlights that the OE challenge in recent UK regulatory precedent has been generally clustered around a value of **1% per annum**.[39] However, CEPA does not discuss that, in the recent RIIO-2 appeal decision, the CMA accepted a core OE challenge of about 1%, but rejected an additional uplift of 0.2% as this was not supported by the evidence base.[40] Ofgem has not set out why it considers that the electricity distribution sector can achieve significantly higher OE improvements compared to energy transmission or gas distribution. **Estimates beyond 1% therefore require very careful analysis and need to be supported by robust scientific evidence**. CEPA's analysis fails to provide any such evidence.

3C Companies' OE proposals

3.6 CEPA argues that company proposals for OE range between 0.5% and 1.0%—i.e. **an upper end of 1% per annum**.[41] No single company proposed an OE challenge of above 1%. CEPA argues that UKPN's OE efficiency assumption of 1.0% per annum and SSEN's assumption of 0.7% per annum translate into an efficiency assumption of 1.4% for the former or 0.97% for the latter, calculated on a like-for-like compound annual growth rate (CAGR) basis for five years. This statement is a clear error and misinterpretation of these companies submissions, as these DNOs applied the OE assumption on the base year 2020/21 and rolled that base cost forward (meaning that some of OE is assumed to be delivered in ED1 not ED2 in order to derive the efficient cost base for ED2), while other DNOs applied the OE assumption on the base year 2022/23. This is equivalent to Ofgem's procedure in applying the OE-target.[42]

3.7 UKPN's and SSEN's view is that annual ongoing efficiency is 1% and 0.7% respectively. The point at which they applied the assumption does not alter their view on what rate of technological progress is possible, it simply reflects the basis on which they constructed their business plan forecasts.[43] It would have been equally misleading to stretch other DNOs' OE proposals on a like-

[39] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, p. 38.
[40] Competition and Markets Authority (2021), op. cit.
[41] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, p. 38.
[42] Ofgem (2022), 'Allowances_File_ED.xlsx', June, sheet 'Cal_frontierShift'.
[43] It is our understanding that UKPN is also disputing CEPA's representation of UKPN's 1% p.a. OE challenge assumed in its business plan.

for-like CAGR basis for seven years (which would lower WPD's, SPEN's and NPG's proposed challenge to 0.35%).

3D Industry evidence

3.8 Even though CEPA tries to assess productivity improvement for the electricity distribution network sector, no sector-specific data was used. CEPA argues that:[44]

> The objective of the growth accounting analysis of historic productivity growth is to provide an external benchmark from competitive sectors for the productivity improvements that could be achieved in the energy network sector.

Two independent studies, by Ajayi et al. and NERA,[45] presented empirical evidence demonstrating that the benchmark from competitive industries was not achieved in the energy network sector. CEPA dismisses this evidence, arguing that there is no definitive evidence to support detailed calibration of the OE challenge.[46] This again demonstrates CEPA's unbalanced approach, in that it accepts arguments favouring higher OE targets without evidence, but dismisses arguments for lower OE targets due to a purported lack of definite evidence.

3E RIIO-ED2 context

3.9 CEPA argues that the RIIO-ED2 context supports the view that the electricity distribution network sector is closer to more dynamic competitive sectors in the expanded comparator set:[47]

> In particular, **we believe** that the net zero, digital and institutional transformation of the electricity distribution system does present scope for new opportunities to innovate and to adopt more productive technologies in ways that will allow the network companies to deliver an increase in outputs, commensurate with the anticipated increase in allowed expenditure [emphasis added]

Empirical evidence, or at the very least anecdotal evidence, to support this argument is not provided anywhere in Ofgem's Draft Determinations reasoning or CEPA's analysis. This argument has to be considered as an unsupported

[44] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, p. 39.
[45] Ajayi, V., Anaya, K. and Pollitt, M. (2021), 'Incentive regulation, productivity growth and environmental effects: the case of electricity networks in Great Britain', University of Cambridge Energy Policy Research Group, Working Paper No. 2126, November. NERA (2021), 'Ongoing Efficiency Improvement at RIIO-ED2', prepared for the Energy Networks Association.
[46] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, p. 40, Table 4.2.
[47] Ibid., June, p. 25.

subjective belief rather than an informed judgement based on scientific evidence and no reliance should be placed on it.

3.10 Moreover, technological process imposed by the digital transformation is already reflected in CEPA's empirical estimates, resulting in an overestimated TFP figure (see paras 2.10 to 2.12).

3F Ongoing trends

3.11 Since the global financial crisis, economy-wide productivity growth in the UK has been below its long-term trend. A recent report by the Office for Budget Responsibility (OBR) concludes that: [48]

> the unusually weak productivity growth that followed the financial crisis, the implications of Brexit for trade intensity and productivity, and the degree of scarring imparted by the pandemic have not gone away.

3.12 CEPA argues that it would not be appropriate to apply an explicit adjustment to the OE challenge to reflect the productivity slowdown, as: (i) growth accounting analysis incorporates the effects of the slowdown by including post-global financial crisis data; and (ii) there is a lack of compelling evidence on whether and how the slowdown has materially affected the electricity distribution sector 'which is protected by regulated revenue streams from a monopoly service'.[49]

3.13 On the first point, CEPA's timespan over which a productivity target of 1.2% is estimated is from 1995 to 2016. The post-global financial crisis period therefore has an impact on roughly one-third of the full estimation period. The productivity slowdown following the crisis is therefore not captured in full.

3.14 On the second point, empirical evidence demonstrates the contrary: the declining productivity growth of electricity transmission and distribution networks is in line with the decline in aggregate UK productivity affected by the global financial crisis.[50] Hence, the possibility of low productivity over ED2 needs to be considered carefully and cannot be dismissed.

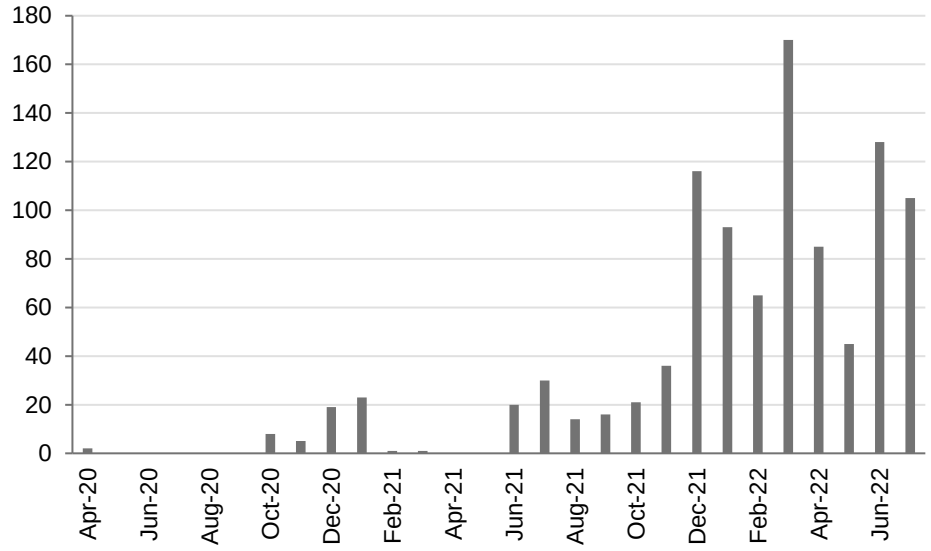
3.15 CEPA explored forward-looking estimates of productivity improvements and recent macroeconomic factors (such as BREXIT and the COVID-19 epidemic) as part of the context for the OE improvements that might be achievable by the

[48] Office for Budget Responsibility (2022), 'Economic and fiscal outlook', March, p. 176.
[49] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, p. 30.
[50] Ajayi, Anaya and Pollitt (2021), op. cit.

DNOs.[51] CEPA concludes that there is not sufficient evidence to support making even a qualitative adjustment.

3.16 The COVID-19 pandemic had the potential (and still does) to affect productivity in the sector: workers become ill, isolate at home, or develop long COVID. DNOs are affected by these same issues, and have now had experience of the impact for c. 2.5 years. Data from SSEN's COVID absence reporting shows high absences in 2022, demonstrating that the pandemic is far from over (see Figure 3.1).

Figure 3.1 SSEN's absence levels



Source: Information provided to Oxera by SSEN.

3.17 Moreover, CEPA ignores that the sector is confronted with two additional challenges that are likely to hamper the DNOs' ability to meet high OE-targets:

- delivering net zero is a huge undertaking for the sector, and significantly different to the context of GD2; it is wrong to think that DNOs could deliver improvements significantly above those in previous price controls and other sectors;
- while Ofgem believes that optimising the supply chain management can achieve greater cost savings,[52] it is our understanding that Ofgem's over-reliance on uncertainty mechanisms (UMs) actually makes it harder for

[51] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, p. 25.
[52] Ofgem (2022), 'RIIO-ED2 Draft Determinations – Core Methodology Document', June, para. A1.26.

DNOs to drive efficiencies as the volume uncertainty hampers their opportunity to form major partnerships with suppliers.[53]

3.18 As such, CEPA's rejection of the productivity slowdown and other factors as a qualitative factor that justifies selecting the OE target from the centre of the estimated range is itself an error.

[53] Based on information from SSEN.

4 Errors in CEPA's reference points to inform the ongoing efficiency challenge

4.1 Based on the evidence described in the previous sections, CEPA proposes three reference points for the OE challenge:

1. **0.5%**, corresponding to a pessimistic outlook that is consistent with the OE challenge proposed by the least ambitious companies, and with the view whereby the wider slowdown in productivity since the global financial crisis acts as a brake on productivity improvements;
2. **1%**, corresponding to a stable outlook, which is proposed by the most ambitious companies and is in line with recent regulatory decisions for the OE challenge in other regulated sectors;
3. **1.2%**, corresponding to a stretching outlook that takes into consideration that the EU KLEMS values resulting from the 2019 dataset significantly underestimate the frontier efficiency improvements due to embodied technical change, and which is consistent with a belief that, in RIIO-ED2, the network companies will be able to achieve efficiencies closer to those of more dynamic competitive sectors.

4.2 A range of 0.5–1.2% is not helpful to select the OE challenge given that CEPA does not indicate which scenario is the most plausible based on scientific evidence. Moreover, CEPA's EUKLEMS analysis provides an even wider range, of 0.2–1.2%.[54]

4.3 The reference point of **0.5%** does *not* correspond to a particular pessimistic outlook, but is supported by empirical evidence. The average of all the productivity estimates provided by CEPA is around 0.6%. Taking into consideration only estimates from completed business cycle, the average declines to 0.5%.

4.4 The **1% reference point** corresponds to the assumption proposed by the most ambitious companies; is in line with some recent regulatory decisions (although above others); is considerably higher than *any* GO-based productivity measures; and is above all VA-based productivity measures (bar one) over a complete business cycle.

[54] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, Table 4.1.

4.5 The **1.2%** reference point is not supported by the vast majority of the empirical evidence provided by CEPA; only one figure—value-added TFP for the full period and the extended comparator set 2—is consistent with this challenge. This figures is based on errors and represents an overestimate for the reasons outlined above. Moreover, the scenario does not reflect any qualitative arguments justifying lower OE targets.

4.6 **Given this and discussions in the previous sections of the three scenarios provided by CEPA, the one chosen by Ofgem (1.2%) is clearly** not justified by the evidence and therefore is a clear error in the exercise of regulatory discretion.

5 Errors in Ofgem's assessment of the ongoing efficiency challenge

5.1 Given that Ofgem's own consultants provide a very wide range to set the OE challenge, the regulator must exercise judgement as to which scenario provided by CEPA to choose. By setting the OE challenge to 1.2% per year, Ofgem has chosen the highest figure and one which, as demonstrated above, is erroneous.

5.2 The Core Methodology Document provides the range of factors considered in coming to the proposed OE challenge for RIIO-ED2.[55] These are:

- the ambition to deliver transformational change in the electricity distribution sector;
- the potential for OE improvement through quality improvements that are embodied within inputs, which is not reflected in evidence provided by the growth accounting approach;
- the lack of evidence suggesting that the slowdown in wider productivity growth since the global financial crisis has had an impact on the potential for ongoing productivity gains in RIIO-ED2;
- the limited relevance of short-term macroeconomic factors (such COVID-19, Brexit and the Russian invasion of Ukraine), as DNOs should be insulated from these;
- the DNOs' business plan submissions on OE up to 1% per annum for the most ambitious network companies;
- UK regulatory precedent generally clustering around 1% per annum;
- the inability to quantify the extent to which cost efficiencies from previous innovation funding are already captured in the DNOs' business plans.

5.3 However, when reaching its proposed ongoing efficiency challenge, Ofgem has either misinterpreted or inappropriately accounted for the evidence. We examine each of the factors in turn below, cross-referring to earlier sections where appropriate.

[55] Ofgem (2022), 'RIIO-ED2 Draft Determinations – Core Methodology Document', June, para. 7.464.

5A Transformational change

5.4 Ofgem's main argument for a stretching OE target is that it considers that the significant increase in spending on Data and Digital provides scope for more stretching OE improvements. However, CEPA has already considered the impact of this digital transformation in the electricity distribution network sector through its selection of industries for the expanded comparator set (see section 2, paras 2.10–2.12, p. 22).[56] A further stretch on any of the productivity figures using the expanded comparator set (namely, 0.5–1% using data from completed business cycles) therefore represents a double count.

5B Embodied technical change

5.5 Ofgem argues that GO-based TFP from growth accounting may underestimate the potential for productivity improvements as a result of quality improvements in factor inputs. Ofgem does not provide any evidence demonstrating that OE improvement through quality improvements that are embodied within inputs cause a material impact on OE for the DNOs. Moreover, if there is any quality improvement in inputs that DNOs use, this is highly likely to be passed on to consumers in terms of quality improvements. In addition, the OE challenge is based on VA-TFP, which is almost double the corresponding GO-TFP estimates. Any stretching of the OE challenge on the basis of this argument thus corresponds to a double count (see section 3, paras 3.2–3.4).

5C Productivity slowdown and macroeconomic factors

5.6 Ofgem is incorrect in arguing that DNOs are isolated from recent macroeconomic trends (see section 3, paras 3.10–3.16). Stretching the OE challenge to 1.2% assumes that DNOs are *fully* protected from these wider trends and that their productivity potential could be as high as pre-crisis productivity in the chosen comparator sectors (estimates over completed business range between 0.4% and 2.3%, and are on average 1.3%[57]). Full protection from wider trend is not supported by empirical evidence[58] and is not consistent with the economic reality given that the implications of Brexit, or the impacts of the ongoing pandemic (for example, staff absences due to sickness, childcare or isolation) affect the DNOs just as they do other industries.

[56] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June,.
[57] CEPA (2022), 'RIIO-ED2: Cost Assessment – Frontier Shift methodology paper', June, Tables 3.4 and 3.5.
[58] Ajayi, Anaya and Pollitt (2021), op. cit.

5.7 Moreover, Ofgem ignores that the DNOs are confronted with additional challenges that are likely to hamper their cost-saving potential:

- delivering net zero is a huge undertaking for the sector that ties up resources;
- Ofgem's approach to rely on UMs makes it difficult for DNOs to drive efficiencies as the volume uncertainty hampers their opportunity to form major partnerships with suppliers.

5D DNOs' OE assumptions

5.8 No firm proposed an OE target above 1%. The fact that UKPN and SSEN applied the OE assumption on the base year 2020/21 does not make the proposed OE target per annum any higher (see section 3, para. 3.6).

5E Regulatory precedent and innovation funding

5.9 When considering regulatory precedent, Ofgem does not discuss that, while a core OE challenge of about 1% for energy transmission and gas distribution was accepted by the CMA, an additional uplift of 0.2%, intended to capture cost efficiencies from previous innovation funding, was rejected as it was not supported by the evidence base. The CMA concluded that Ofgem erred when it assumed that the innovation funding received by the companies was entirely incremental to the comparator sectors in EU KLEMS double-counted innovation cost already embedded in the business plans, and failed to consider potential distortive effects on companies' incentives to innovate.[59] The same OE challenge in absolute terms will not become correct simply by not providing quantitative evidence, while arguing that potential savings from past innovation funding justify a stretching target (see section 3, para. 3.5).

5.10 The same arguments that caused the CMA to reject the uplift for innovation funding in GD2 and T2 are also relevant in the current context.

- The fact that R&D spending is not incremental to the comparator sectors in EU KLEMS is even more relevant in ED2, as the expanded comparator sample contains sectors with the highest R&D intensity (i.e. Information and Communication, and Professional, Scientific and Technical).[60]

[59] Competition and Markets Authority (2021), op. cit.
[60] HM Revenue & Customs (2022), 'Research and Development Tax Credits Statistics: September 2021', updated 26 April 2022, Table 7.

- Ongoing efficiency benefits from innovation funding were either already realised in ED1 or baked into DNOs' business plans for ED2.
- Innovation delivers more than just cost savings (i.e. process innovation), but also serves wider goals, such as carbon reduction (i.e. product innovation).

5.11 Moreover, there is no reason to consider that the electricity distribution sector can achieve significantly higher OE improvements compared to energy transmission and gas distribution, especially given their respective contexts.[61] While net zero implies that there is uncertainty around the direction of travel for the gas sector, it also implies significant uptake of electric vehicles and heat pumps, and thus significant pressure on the DNOs to deliver this growth. In such a context, it is inappropriate to set a more challenging OE target in the electricity distribution sector.

[61] We addressed the arguments on transformation change (paras 2.10–2.12) and innovation funding (paras 3.5 and 5.9).

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