Critique of RIIO-2 ongoing efficiency analysis

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Executive summary

Scottish & Southern Electricity Networks Transmission (SHE-T) has asked Oxera to review Ofgem's approach to cost assessment as part of its RIIO-2 Draft Determinations. This report focuses on the ongoing efficiency analysis, while we review Ofgem's total expenditure (TOTEX) assessment in a separate report.[1]

Ofgem sets the ongoing efficiency challenge at 1.2% for capital expenditure (CAPEX) and replacement expenditure (REPEX), and 1.4% for operating expenditure (OPEX) for all network companies. These targets were estimated based on several inappropriate and/or unsubstantiated choices made by CEPA in its analysis, as well as Ofgem's decision not to take CEPA's advice (in certain respects) and to be selective with regard to the outcomes of CEPA's analysis. As a result, Ofgem's ongoing efficiency assumption is upwardly biased and not reflective of the likely scope of productivity gains achievable in RIIO-2. Indeed, the flaws in Ofgem's approach leads to a much higher ongoing efficiency challenge than the evidence can support.

In particular, in this report we identify the following issues and estimate their impact on the ongoing efficiency target.

I. Ofgem's sole focus on the value added (VA) measure of productivity growth leads to an upward bias in the ongoing efficiency target.

Productivity growth is defined as the difference between output growth and (weighted average) input growth.[2] In measuring output growth, practitioners typically consider gross output (GO) as well as value added (VA) measures. GO represents the total output of a firm, industry or economy and can be considered as the 'end-product'. VA, on the other hand, represents the incremental value that a firm, industry or economy has added in the production process. CEPA recommends using both measures to inform the ongoing efficiency target.[3]

Ofgem does not take CEPA's advice about using the GO productivity measure and, instead, *solely* uses the VA measure to set the ongoing efficiency target.[4] **Ofgem's decision to use VA based TFP measures alone is unreasonable/inappropriate**. Not only is this counter to the advice of its consultant, but is also inconsistent with regulatory precedent in the UK and Europe. Regulators have tended to focus more on the GO measures, at the firm level and in a TOTEX context, as they can better reflect an industry's technical change, and can explicitly account for the role of all inputs in the production process. Indeed, several regulators do *not* use the VA measure at all, and CEPA itself has recommended focusing on the GO measure in previous reports.[5]

In CEPA's analysis, the VA measure of productivity growth is approximately double that of the GO measure, indicating that **Ofgem's decision to only**

[1] Oxera (2020), 'Ofgem's TOTEX assessment approach at the RIIO-ET2 draft determinations: a review', August.
[2] The weights are derived using each input's contribution to the total output.
[3] CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, p. 12.
[4] Ofgem (2020), 'RIIO-2 Draft Determinations - Core Document', July, pp. 48–49.
[5] CEPA (2012), 'Ongoing efficiency in new method decisions for Dutch electricity and gas network operators', November, pp. 43–44.

use the VA based TFP outcomes results in a material bias in the estimated ongoing efficiency target.

II. The use of labour productivity to set ongoing efficiency targets for operating expenditure (OPEX) is inappropriate.

Ofgem uses labour productivity growth to set the ongoing efficiency target for OPEX. Labour productivity is a partial factor productivity (PFP) measure and, unlike total factor productivity (TFP) measures, is not a comprehensive measure of productivity. In particular, the productivity of any one input depends on the utilisation of other inputs, which implies that **partial measures such as labour productivity are not reliable measures of productivity**.

Labour costs account for approximately 80% of TSOs' OPEX,[6] so the related activities still require a certain level of capital and intermediate inputs. Therefore, it is *incorrect* to suggest that ongoing efficiency of the transmission companies can be correctly captured by assessing labour productivity alone. Moreover, many of the sectors in CEPA's comparator set (including the market economy as a whole) exhibit a similar level of labour intensity as TSOs' OPEX. Therefore, the TFP growth of the identified comparator set can be used to set an OPEX target.

The impact of using TFP to set ongoing efficiency challenge for OPEX would depend on the comparator set and aggregation approach used. Based on CEPA's TFP analysis, **the OPEX target should be 0.2% p.a. lower than that applied by Ofgem**.[7] In our analysis for SHE-T, which considers a different set of comparators and aggregation approach, we estimate an ongoing efficiency assumption for OPEX that is about 0.1% higher than for CAPEX.[8]

III. CEPA's comparator selection and aggregation approach does not create an appropriate comparator to benchmark TSOs.

Ofgem has focused *exclusively* on the **weighted average** TFP growth of the **all-industries** set, where the weights are based on the contribution of each sector to the wider UK economy. This all-industries sample is a very broad benchmark that does not account for the specific activities undertaken by TSOs. As such, it is not specifically focused at the potential productivity improvement of TSOs—the outcome would be the same for whichever sector was being regulated (water, transport, telecommunications, digital or energy), which clearly do have different potentials for productivity improvements.

Moreover, while such an comparator set can provide an useful estimate of *economy-wide* productivity growth, such productivity would anyway be captured in the CPIH to which revenues are indexed.[9] In contrast, ongoing efficiency and RPEs should capture what is *incremental* to CPIH and should

[6] Oxera analysis of SHE-T data.
[7] In CEPA's analysis, the comparator set and weighting approach does not differ across different types of expenditure. As such, using TFP to set the OPEX target is equivalent to using the CAPEX target, which is 0.2% lower than the OPEX target applied by Ofgem. See Ofgem (2020), 'RIIO-2 Draft Determinations - Core Document', July, pp. 48.
[8] Oxera (2019), 'Scottish Hydro Electric Transmission's cost assessment', 4 December.
[9] Note that CPIH, as a consumer price index, captures the net effect of economy-wide productivity growth and economy-wide changes in input prices. As revenues of the companies are indexed to it, there is a need to ensure that there is no double counting of productivity gains by using the all-industry set to determine ongoing efficiency. In this regard, the inconsistency with the treatment of real price effects by indexing costs to input-specific price indices also requires examination.

reflect specifically the activities and potential productivity improvement of TSOs.

The all-industries sample contains sectors, such as 'agriculture, forestry and fishing' and 'accommodation and food service activities', that are unrelated to the specific activities undertaken by TSOs. These sectors are likely to use a different mix of inputs to TSOs (and certainly produce very different outputs). Therefore, technological advances in these sectors are less relevant to inform the scope for productivity improvements in the electricity transmission sector. This means that the Ofgem's chosen benchmark is in itself inappropriate.

Moreover, as they are designed to produce an economy-wide based benchmark, the weighting approach is inconsistent with the choice of comparator sectors in the first place. For example, the 'professional, scientific, technical, administrative and support service activities' sector is given the largest weight in CEPA's weighted average analysis (18.2%),[10] yet CEPA does not include this sector in the network-specific comparator set. Meanwhile, 'transportation and storage', a sector that CEPA deems to be relevant to energy networks, is given only a 6.4% weight.

A benchmark specifically focused at the potential productivity improvement of TSOs can instead be achieved by constructing weights and selecting comparator sectors based on the activities undertaken by TSOs. The use of weights based on the relevance of the comparator sector to the activities that TSOs undertake ('activity weights') is used in regulatory applications in the UK and Europe, including by CEPA itself in past reports.[11] The comparator sectors and weights identified in our previous work for SHE-T[12] are thus consistent with the established practice. Using these comparators and weights over the time period that Ofgem/CEPA has focussed on (see discussed below on this) and for the VA measures (see earlier discussion) reduces the ongoing efficiency target from 1% p.a. to 0.8% p.a.

IV. CEPA's choice of time period to estimate productivity growth is inappropriate and likely to lead to an upward bias in ongoing efficiency.

Productivity growth is typically 'pro-cyclical'. That is, productivity growth is larger in times of macroeconomic growth and smaller (sometimes negative) in times of macroeconomic decline. For this reason, productivity growth should be estimated over complete business cycles that include both above-average and below-average trends. In its analysis for Ofgem, CEPA does not perform any primary analysis to estimate business cycles, but references two publications from the OBR.[13] CEPA states that the period 1997–2016 includes two complete business cycles based on these publications.

The publications that CEPA cites use outdated data that might have been subject to material revisions which have an impact on the position of the business cycle. Importantly, CEPA has not validated whether the business

[10] CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, Table A5, p. 58.
[11] CEPA (2012), 'Scope For Improvement In The Efficiency Of Network Rail's Expenditure On Support And Operations: Supplementary Analysis Of Productivity And Unit Cost Change', March, section 3.2.5.
[12] Oxera (2019), 'Scottish Hydro Electric Transmission's cost assessment', December, section 3.2.
[13] Office for Budget Responsibility (2011), 'Estimating the UK's historical output gap', Working paper 1; Office for Budget Responsibility (2014), 'Output gap measurement: judgement and uncertainty', Working paper 5.

cycles identified by the OBR are supported by analysis of the EU KLEMS dataset that it uses to estimate productivity growth. Indeed, our analysis of EU KLEMS data indicates that the 1997–2016 period is characterised by *incomplete* business cycles. Specifically, it includes one complete business cycle in the period 2007–16 and one incomplete business cycle in the period 1997–2007. As the period 1997–2007 is characterised by sustained, above average economic growth, CEPA's estimate of productivity growth is likely to be biased upwards and is therefore inappropriate.

Using CEPA's own analysis, **shortening the time period to 2006–16** (which is close to one complete business cycle in 2007–16) **leads to a reduction in the ongoing efficiency target of 0.3–0.6% p.a. in the VA-based measure for CEPA's comparator sectors.**[14]

V. Ofgem has not adequately considered the uncertainties affecting the UK economy when setting the ongoing efficiency target.

CEPA recommends that Ofgem to place some weight on the OBR and Bank of England (BoE) forecasts of productivity growth to adjust the ongoing efficiency target. Ofgem has ignored this advice.

By doing so, Ofgem does not properly consider forward-looking uncertainty around the UK's exit from the European Union and the COVID-19 pandemic, which exacerbates the upward bias of Ofgem's ongoing efficiency target. This is particularly important in light of the productivity slowdown experienced in the UK in recent years and expected to persist in the medium term,[15] which is in contrast to Ofgem's view of 'rising long-term productivity forecasts'.

These macroeconomic uncertainties suggest that it would be prudent to reduce the ongoing efficiency benchmark. In addition, Ofgem may need to further reflect the forward-looking uncertainties by choosing to true up these targets, alongside RPEs, over the course of RIIO-2 depending on how the economy and sector perform.

VI. The uplift for the impact of innovation funding is inappropriate as it amounts to double counting; CEPA's calculations of the uplift are also based on simplistic and unjustified analysis.

The innovation fund provided by Ofgem during RIIO-1 is around £330m, for which CEPA arrives at a 0.2% annual improvement in ongoing efficiency during RIIO-2. CEPA made several overly simplistic and unjustified assumptions in its analysis, including (i) the only benefit arising from the innovation fund is cost reduction; (ii) none of the impact of the innovation fund has already been accounted for in Ofgem's cost assessment framework; and (iii) the benefits of innovation funding last for 20 years.

We have identified the following issues relating to double counting and assumptions with this assessment, which together mean that Ofgem's uplift for the innovation funding is inappropriate.

- Ofgem uses a combination of historical (RIIO-1) and forecast (RIIO-2) data to set cost allowances for TSOs. To the extent that there have already been some benefits from the innovation fund in RIIO-1, and companies have accounted for the impact of innovation funding in their

[14] Note that CEPA's most-recent business cycle is the period 2006–16. See CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, Table 3.2.
[15] Bank of England (2020), 'Monetary Policy Report', January.

business plans, the impact of innovation funding on costs is (at least partially) **already accounted for in Ofgem's cost assessment framework**.

- Productivity improvements associated with innovation funding in energy and research and development (R&D) activities in comparable sectors are likely to be **already embedded within the TFP estimates derived from the EU KLEMS analysis** (which CEPA acknowledges). In fact, the 'electricity, gas, steam and air conditioning supply' sector spends less on R&D (at 0.06% of its output) than most industries that are included in CEPA's comparator set.
- The assumptions that feed into CEPA's analysis of the 0.2% uplift are **inappropriate**, and have a material impact on the estimated uplift. For example, the duration of benefit from innovation is 20 years and assuming that the only benefits arising from innovation funding relate to cost reduction is inappropriate.

Considering the incorrect rationale and unjustified assumptions used in this analysis, **no further innovation overlay is appropriate**.

VII. Ofgem might not have fully accounted for companies' proposed ongoing efficiency improvements when setting cost allowances, thereby potentially double-counting the impact of ongoing efficiency.

Ofgem applies its ongoing efficiency assumptions to the cost allowances derived from its cost assessment approach. In its assessment of the TSOs' business plan costs, Ofgem sets the benchmarks using a mixture of historical and forward-looking data. Ofgem states that it has removed companies' business plans before the cost assessment. However, we could not validate this statement with the analysis files provided and thus there is **potential for double counting of ongoing efficiency** that requires further examination.

Conclusion

The percentage impacts of the issues presented above is summarised in the table below. As each impact figure focuses on a single issue at a time and keeps other unsubstantiated assumptions used by CEPA and Ofgem constant, the cumulative impact is not the total of the individual impacts. The combined effect of these unsubstantiated choices made by CEPA and Ofgem leads to a much higher ongoing efficiency challenge than the evidence can support, for example, compared with our recommendation for SHE-T of 0.3–0.8% for TOTEX and CAPEX, and 0.5–0.9% for OPEX.[16][17]

[16] Oxera (2019), 'Scottish Hydro Electric Transmission's cost assessment', 4 December.
[17] Note that Oxera's ongoing efficiency recommendation is not intended to be additional to any ongoing efficiency embedded in SHE-T's plan. Ofgem should strip out the ongoing efficiency assumptions made by the TSOs before setting cost allowances or apply only the incremental part of its ongoing efficiency challenge relative to the TSOs' assumptions.

Indicative impact of issues identified in Ofgem's ongoing efficiency assessment

Suggested approach	Indicative impact on Ofgem's ongoing efficiency target (percentage points lower than CEPA's reference range)
Attaching some weight to GO-based TFP measures	0.3–0.5%
Using TFP measures to determine the OPEX target (instead of PFP)	0.1–0.2% (OPEX only)
Using appropriate comparator sets and activity-based weighting approaches[1]	0.2%
Estimating TFP over complete business cycles	0.3–0.6%
Removing the uplift for innovation funding	0.2%

Note: [1]This is based on the difference between the estimate obtained by CEPA's economy-wide weighting approach (1% p.a.) and the weighting approach proposed in our report for SHE-T (0.8% p.a.). Both figures are based on VA-based TFP measures.

Source: Oxera analysis

In addition, significant uncertainty about the next five years of RIIO-2 will affect both ongoing efficiency and real price effect (RPE) estimates. The uncertainty relating to RPEs could be addressed through Ofgem's true-up process. However, the uncertainty relating to ongoing efficiency is currently not addressed in Ofgem's framework. Given the link between RPEs and ongoing efficiency, this inconsistent application of true-up mechanisms places unnecessary risk on companies.

Therefore, it is important that Ofgem carefully evaluates the approaches and assumptions taken in its own decisions and CEPA's analysis. To arrive at a relevant ongoing efficiency challenge for network companies during RIIO-2, Ofgem needs to rely on approaches and assumptions that are based on valid economic theory and substantiated with robust evidence.

1 Introduction

Scottish & Southern Electricity Networks Transmission (SHE-T) has asked Oxera to review Ofgem's approach to cost assessment as part of its RIIO-2 Draft Determinations. In this report, we focus on the ongoing efficiency analysis undertaken by CEPA for Ofgem,[18] and examine the link between ongoing efficiency and RPEs that Ofgem has overlooked in its Draft Determinations decision.

1.1 Assessing CEPA's ongoing efficiency analysis

CEPA's approach in establishing the ongoing efficiency assumptions starts with the growth accounting analysis which aims at estimating future efficiency gains, based on historical productivity improvements of sectors in the UK economy available from the EU KLEMS dataset.[19] Based on its analysis, CEPA derives a range of ongoing efficiency challenges of 0.6–1.0% p.a. for CAPEX and REPEX, and ongoing efficiency challenges of 1.0–1.2% p.a. for OPEX.[20]

CEPA proposes several adjustments to its estimate to account for other factors that it stated Ofgem should consider when setting the ongoing efficiency target. These include:

- a downside of 0.3% from the reference value of 0.8% (i.e. a mid-point of the 0.6–1.0% range) for CAPEX and REPEX, as well as an upside of 0.05% from the reference value of 1.1% (i.e. a mid-point of the 1.0–1.2% range) for OPEX to reflect productivity forecasts for the UK economy;
- an upside of 0.2% from the top of the TFP ranges (i.e. 1.0% for CAPEX and REPEX, and 1.2% for OPEX) to reflect further possible productivity improvements as a result of innovation funding received by the network companies during RIIO-1.[21]

By combining the TFP estimates and the adjustments set out above, CEPA's analysis arrives at the following ranges for ongoing efficiency:[22]

- 0.5–1.2% p.a. for the ongoing efficiency challenge for CAPEX and REPEX;
- 0.5–1.4% p.a. for the OPEX ongoing efficiency challenge.

While CEPA generally follows the well-established growth accounting methodology in its analysis,[23] in developing a reference range it makes several inappropriate and unsubstantiated choices that, coupled with Ofgem's focus on the upper end of the range, results in an upward bias to the ongoing efficiency estimates.

[18] CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May.
[19] EU KLEMS is a publicly available data source that provides information on inputs, outputs, prices and productivity in sectors of the economy in several countries. Data is available at https://euklems.eu/
[20] CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, p. 2.
[21] CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, p. 1.
[22] CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, p. 2.
[23] EU KLEMS sets out its approach in Timmer, M., O'Mahony, M. and Van Ark, B. (2007), 'EU KLEMS Growth and Productivity Accounts: Overview', November, section 3, http://www.euklems.net/data/overview_07ii.pdf

1.2 Assessing Ofgem's decisions regarding CEPA's analysis

In our review, we also assess a number of Ofgem's decisions not to take CEPA's advice and to be selective with regard to the outcomes of CEPA's analysis. This results in Ofgem inappropriately selecting the upper bounds from CEPA's range (1.2% p.a. for CAPEX and REPEX, and 1.4% p.a. for OPEX), exacerbating the upward bias.[24] These decisions lead to a much higher ongoing efficiency challenge than the evidence can support. For comparison, our recommendation for SHE-T for its business plan submission (which was based on analysis of the same dataset used by CEPA) was 0.3–0.8% p.a. for TOTEX and CAPEX, and 0.5–0.9% p.a. for OPEX.[25]

1.3 Report structure

Our report is structured as follows.

- Section 2 examines Ofgem's decision not to take CEPA's advice by relying on only the VA productivity measure and overlooking the GO productivity measure.
- Section 3 discusses CEPA's use of labour productivity for OPEX, instead of TFP.
- Section 4 assesses Ofgem's reliance on only the all-industries comparator set aggregated using an inappropriate weighting approach.
- Sections 5 and 6 review CEPA's choice of time period and consideration of forward-looking uncertainty.
- Section 7 reviews the application of further uplift for innovation funding.
- Section 8 illustrates the double count of ongoing efficiency assumption as Ofgem has not fully removed companies' assumptions in the cost assessment before overlaying its challenge.
- Section 9 discusses the link with RPEs.

[24] Ofgem (2020), 'RIIO-2 Draft Determinations - Core Document', July, p. 44.
[25] Oxera (2019), 'Scottish Hydro Electric Transmission's cost assessment', 4 December.

2 Total factor productivity measures: gross output versus value added

Ofgem does not take CEPA's advice about using the GO productivity measure and, instead, *solely* uses the VA measure to set the ongoing efficiency target.[26] Ofgem cited 'practical difficulties' as the reason for its decision, which goes against the established approach of estimating GO from VA when data on the former is unavailable.[27]

GO measures can better reflect an industry's technical change, and can explicitly account for the role of intermediate inputs. Therefore, in a TOTEX context (which includes intermediate inputs), at the firm level, **GO measures are generally preferred** even when a range based on both measures is presented and considered.

For these reasons, historically, utility regulators in the UK and elsewhere in Europe have tended to focus more on GO TFP measures in a TOTEX context. For example, energy regulators in Belgium and the Netherlands have used GO TFP measures, with some estimates derived from VA TFP measures, using the EU KLEMS dataset,[28] while the German energy regulator has used GO-based measures using data from the regulated sectors directly. Similarly, Ofwat's consultant, Europe Economics, stated in its frontier shift analysis for PR19:

> We believe TFP growth measured in *gross output terms is a more accurate measure of frontier shift if applied to botex or totex* (which includes spending on intermediate inputs), but nevertheless that *some lesser weight should also be placed on TFP growth in value added terms*.[29] [emphasis added]

Ofgem has also recognised the limitations of VA measures in past price reviews. For example, in RIIO-T1/GD1, it noted that:

> The VA measure of productivity only allows us to evaluate the impact of the use of labour and capital on outputs, thus *limiting the costs that this can be applied to*. Therefore to fully evaluate the productivity improvements that a network company can make would require making additional assumptions about the use of intermediate inputs.[30] [emphasis added]

Ofgem's decision to focus *solely* on the VA-based measure is inappropriate and leads to an upward bias of the ongoing efficiency target.

2.1 CEPA and Ofgem approaches

In a growth accounting context, productivity growth is defined as the difference between output growth and (weighted average) input growth.[31] In measuring output growth, practitioners typically consider either GO or VA measures. GO represents the total output of a firm, industry or economy and can be considered as the 'end-product'. VA, on the other hand, represents the incremental value that a firm, industry or economy has added in the production process. In other words, VA is GO less any intermediate input consumed in the production process (such as materials, services procured from external organisations, and energy consumed in the

[26] Ofgem (2020), 'RIIO-2 Draft Determinations - Core Document', July, pp. 48–49.
[27] For example, see Economic Insights (2020), 'Frontier Shift for Dutch Gas and Electricity TSOs', May, p. 6.
[28] For example, see CEPA (2012), 'Ongoing efficiency in new method decisions for Dutch electricity and gas network operators', November, pp. 43–44; Oxera (2020), 'The necessity and magnitude of frontier shift for the Flemish electricity and gas distribution operators over 2021–24', February, p. 18.
[29] Europe Economics (2018), 'Real Price Effects and Frontier Shift', January, p. 6.
[30] Ofgem (2012), 'RIIO-T1/GD1: Initial Proposals – Real price effects and ongoing efficiency appendix', July.
[31] The weights are derived using each input's contribution to the total output.

production process). The GO and VA TFP measures are related via the share of VA in GO. As the scaling factor is greater than 1 by construction,[32] TFP(VA) will be larger in absolute terms than TFP(GO), in cases of productivity growth.

GO has the advantage that it is the more natural measure of output in a competitive industry as it accounts for the contribution of all inputs to output. The inclusion of all inputs can avoid biases in the VA measure when the mix of inputs used in the production process changes.[33] Furthermore, the GO measure is closely related to the decisions made by companies, as it assumes that all inputs in the production process are controllable. In fact, **the OECD has concluded that the VA-based measure is 'not a good measure of technology shifts at the industry or firm level**'.[34]

One limitation with the GO measure of output is data uncertainty. While labour and, to a lesser extent, capital volumes can be measured with relative ease, intermediate input volumes are typically harder to estimate at an industry level.[35] Nonetheless, GO measures are typically the preferred estimates of productivity growth in regulatory TOTEX contexts, given the conceptual advantages outlined above.

CEPA has undertaken and presented the analysis to establish an efficiency benchmark based on both GO and VA measures. CEPA has also set out that both approaches have pros and cons and that the results from both should be considered:

> This means it is typically seen as good regulatory practice to consider the information provided by both methods when developing a range for ongoing efficiency estimates. This is consistent with Ofgem's approach in RIIO-1 and with Ofwat's approach in PR19.[36]

However, **Ofgem has chosen not to take its consultant's advice, thereby contradicting its own rationale in previous reviews, by not considering the GO measures**.[37]

2.2 Issues identified in CEPA and Ofgem approaches

In its work for the Dutch energy regulator, CEPA stated that **the GO-based measure was preferred for setting cost allowances**:

> While we have presented both measures we consider that the gross output measure is more appropriate as it better reflects the business decisions made by the companies.[38]

[32] As VA is equal to GO minus intermediate inputs, and intermediate inputs cannot be negative, GO is always greater than (or equal to) VA. The scaling factor is the inverse of the share of VA in GO which is always greater than (or equal to) 1.
[33] Strictly speaking, the VA measure assumes that intermediate inputs are additive in the production of outputs, while the GO measure assumes that all inputs (labour, capital and intermediate inputs) are substitutes. For this reason, regulators either make additional adjustments to account for intermediate inputs when considering productivity growth estimated using the VA measure or apply the VA measure to subset of costs (specifically, capital and labour), while the GO measure are applied to total costs (that include intermediate inputs).
[34] OECD (2001), 'Measuring Productivity OECD Manual Measurement of Aggregate And Industry-level Productivity Growth', p. 16.
[35] Indeed, data on intermediate input volumes is not available in the EU KLEMS dataset for the UK. The standard approach in such cases is, therefore, to approximate the GO measure from the VA measure, which CEPA has followed and presented in its analysis.
[36] CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, p. 12.
[37] Ofgem (2020), 'RIIO-2 Draft Determinations - Core Document', July, pp. 48–49.
[38] CEPA (2012), 'Ongoing efficiency in new method decisions for Dutch electricity and gas network operators', November, pp. 43–44.

In fact, several regulators in the UK and elsewhere in Europe have focused *exclusively* on GO measures.

- **Netherlands Authority for Consumers and Markets (ACM)**. The Dutch regulator has solely used GO measures, with some of these estimates derived using VA measures, to set cost allowances for gas and electricity network operators.[39]
- **Office of Rail Regulation (ORR)**. Analysis conducted by CEPA on behalf of the ORR focused exclusively on GO measures. Indeed, CEPA stated: 'We [CEPA] consider that gross output TFP is more appropriate than value-added TFP for comparisons to a specific company's productivity improvements as it better reflects how a company is managed and records its inputs and outputs'.[40]
- **Bundesnetzagentur**. The German energy regulator uses data from the energy distribution and transmission industries to estimate frontier shift targets.[41] The output measure is a measure of TOTEX (which includes expenditure on intermediate inputs), which is equivalent to GO.[42]

Even when evidence from both GO and VA measures is used to set allowances, regulators typically attach greater weight to the former in a TOTEX context. For example, the Flemish energy regulator (Vlaamse Regulator van de Elektriciteits- en Gasmarkt, VREG) used TFP estimates based on both GO and VA measures to derive a feasible range of frontier shift targets. However, more weight was attached to the GO measures when deriving a point estimate from the range.[43]

Moreover, Ofwat used GO-based measures to set the feasible range of frontier shift estimates as part of PR19, with its consultant, Europe Economics, noting that:

> We believe TFP growth measured in *gross output terms is a more accurate measure of frontier shift if applied to botex or totex* (which includes spending on intermediate inputs), but nevertheless that *some lesser weight should also be placed on TFP growth in value added terms*.[44] [emphasis added]

Indeed, Ofgem also recognised the limitation of VA measures in past price reviews. For example, in RIIO-T1/GD1, it noted that:

> The VA measure of productivity only allows us to evaluate the impact of the use of labour and capital on outputs, thus *limiting the costs that this can be applied to*. Therefore to fully evaluate the productivity improvements that a network company can make would require *making additional assumptions about the use of intermediate inputs*.[45] [emphasis added]

[39] For example, see Oxera (2016), 'Study on ongoing efficiency for Dutch gas and electricity TSOs', January; and Economic Insights (2020), 'Frontier Shift for Dutch Gas and Electricity TSOs', May.
[40] CEPA (2012), 'Scope For Improvement In The Efficiency Of Network Rail's Expenditure On Support And Operations: Supplementary Analysis Of Productivity And Unit Cost Change', March, p. 30.
[41] In initial consultations, the Bundesnetzagentur proposed using analysis of comparator industries to set the ongoing efficiency factor (referred to as the 'synthetic approach'). Under this approach, both VA and GO measures would be used, with the final ongoing efficiency factor being determined as the average of the two estimates. However, this proposal was rejected. See WIK (2017), 'Gutachten zur Bestimmung des generellen sektoralen Produktivitätsfactor', July.
[42] Bundesnetzagentur (2018), 'Decision BK4-18-056', November.
[43] Oxera (2016), 'The necessity and magnitude of frontier shift for the Flemish electricity and gas distribution operators over 2021–24', February, p. 3.
[44] Europe Economics (2018), 'Real Price Effects and Frontier Shift', January, p. 6.
[45] Ofgem (2012), 'RIIO-T1/GD1: Initial Proposals – Real price effects and ongoing efficiency appendix', July.

In sum, the theoretical and practical foundations behind GO and VA based productivity measures, regulatory precedent, as well as the advice from Ofgem's own consultant, suggests that *at least* **both measures should have been considered by Ofgem in setting allowances**. Moreover, **regulatory precedent would appear to align with attaching a greater weight (or focus entirely) on GO measures.**

In our report for SHE-T, we provided a range for an appropriate ongoing efficiency assumption where the lower bound was drawn from a GO-based TFP growth benchmark and the upper bound from a VA-based TFP growth benchmark (0.3–0.8% for TOTEX and CAPEX, and 0.5–0.9% for OPEX).[46]

Ofgem decided to not consider the GO-based measure due to 'practical difficulties',[47] which, as we understand from Ofgem's document, refers to the lack of data available on intermediate input volumes needed to calculate GO-based measure directly. However, this overlooks the fact that GO-based measures can be approximated from VA, following the methodology set out by the OECD in 2001[48] and presented in CEPA's analysis. As highlighted, the relationship between GO and VA measures is commonly used in regulatory settings where relevant data is unavailable. Therefore, 'technical difficulties' cannot be considered a sufficient argument for Ofgem to avoid using the more appropriate GO measures.

2.3 Impact of the issues identified

As shown in the table below, the values of the benchmarks from GO measures are around half of those from VA measures, based on the same comparator sets and time period chosen by CEPA. Therefore, using only VA-based measures biases the estimate upwards.

Table 2.1 Efficiency benchmarks using GO vs VA measures

TFP measure	Unweighted average of selected industries (excl. manufacturing)	Weighted average of all industries (excl. real estate, public admin, education, health and social services)	Midpoint
TFP VA 1997–2016	0.6%	1.0%	0.8%
TFP GO 1997–2016	**0.3%**	**0.5%**	**0.4%**

Source: Oxera analysis of CEPA results. The TFP estimates are based on CEPA's preferred time period, comparator sets and aggregation approach determining the upper end of its range.

[46] Oxera (2019), 'Scottish Hydro Electric Transmission's cost assessment', 4 December.
[47] Ofgem (2020), 'RIIO-2 Draft Determinations - Core Document', July, pp. 48–49.
[48] OECD (2001), 'Measuring Productivity: OECD Manual'.

3 Use of partial factor productivity to determine the OPEX target

CEPA's use of partial factor productivity (PFP) measures (such as labour productivity) to set an ongoing efficiency target for OPEX is inappropriate, as these are not comprehensive measures of productivity. In particular, the productivity of any one input depends on the utilisation of other inputs, which implies that **partial measures such as labour productivity are not reliable measures of productivity**.

Importantly, sectors in CEPA's comparator set, such as 'construction', 'wholesale and retail trade; repair of motor vehicles and motorcycles', and indeed the market economy as a whole, exhibit a similar level of labour intensity in their production process to that of TSOs' OPEX at around 70–80%. Therefore, the TFP growth of these comparator sectors, and not *just* their labour productivity, can provide a more appropriate benchmark for the TSOs' ongoing efficiency assumption for OPEX and should therefore have been used instead of a labour productivity alone.

The ongoing efficiency challenge for OPEX would depend on the comparator set and aggregation approach used. **Based on CEPA's TFP analysis, the OPEX target should be 0.2% p.a. lower than that applied by Ofgem.** In our analysis for SHE-T, which considers a different set of comparators and aggregation approach, we estimate an ongoing efficiency assumption for OPEX that is about 0.1% p.a. higher than for CAPEX.

3.1 CEPA and Ofgem approach

While CEPA uses TFP for CAPEX and REPEX, its approach focuses on labour productivity for OPEX. It argues that network companies' OPEX activities are labour-intensive, hence labour productivity would be more relevant to set the ongoing efficiency target for OPEX.

3.2 Issues identified in CEPA and Ofgem approach

Partial productivity measures such as CEPA's use of labour productivity at constant capital do not take into account (the contribution of) all of the inputs used in the production process. These measures are not comprehensive measures of productivity as the productivity of any one input depends on the utilisation of other inputs. This implies that **partial measures are not likely to truly reflect the productivity of a particular input set**.

Specific to CEPA's ongoing efficiency analysis, labour accounts for around 80% of TSOs' OPEX[49] so these activities still require a certain level of capital and intermediate inputs. Therefore, it is *incorrect* to suggest that ongoing efficiency of the transmission companies can be correctly captured by assessing labour productivity alone. In addition, sectors in CEPA's comparator set, such as 'construction', 'wholesale and retail trade; repair of motor vehicles and motorcycles', and indeed the market economy as a whole, also exhibit similar levels of labour intensity in their OPEX at around 70%.[50] As such, the TFP growth of the identified comparator set, which can either be the same set used for CAPEX and REPEX or derived based on their relevance and labour–capital mix, can provide a more reliable benchmark for the TSOs' ongoing efficiency assumption for OPEX and should therefore have been used instead of a labour productivity alone.

[49] Oxera analysis of SHE-T data.
[50] Oxera analysis of EU KLEMS data.

3.3 Impact of the issues identified

As discussed above, the methodology for setting the ongoing efficiency challenge for OPEX should be based on TFP analysis. Using CEPA's analysis, this indicates that **the OPEX target should be 0.2% p.a. lower than that applied by Ofgem**.[51]

However, a different comparator set or weighting approach to the CAPEX analysis may be appropriate, given the difference in activities that are undertaken in each type of expenditure. For example, 'Professional, scientific, technical, administrative and support service activities' could be a relevant comparator for the indirect expenditure included in TSOs' OPEX, but is likely to be less relevant for direct OPEX or CAPEX.

The ongoing efficiency challenge for OPEX would depend on the comparator set and aggregation approach used. **In our analysis for SHE-T, we estimate an ongoing efficiency assumption for OPEX that is about 0.1% higher than for CAPEX**.[52]

[51] In CEPA's analysis, the comparator set and weighting approach does not differ across different types of expenditure. As such, using TFP to set the OPEX target is equivalent to using the CAPEX target, which is 0.2% lower than the OPEX target applied by Ofgem. See Ofgem (2020), 'RIIO-2 Draft Determinations - Core Document', July, pp. 48.
[52] Oxera (2019), 'Scottish Hydro Electric Transmission's cost assessment', 4 December.

4 Comparator set and weighting approach

Ofgem focuses on the upper bound of the range presented by CEPA to set its ongoing efficiency challenge. In so doing, it has relied *exclusively* on the **weighted average** TFP growth of the **all-industries** set, where the weights are based on the contribution of each sector to the wider UK economy. Ofgem has made two errors in adopting this approach.

First, while the all-industries comparator set can provide a useful estimate of economy-wide productivity growth—which would anyway be captured in the CPIH to which revenues are indexed[53]—it contains a number of sectors that are unrelated to the activities conducted by TSOs, such as 'Agriculture, forestry and fishing' and 'Accommodation and food service activities'. These sectors are likely to use a different mix of inputs to TSOs (and certainly produce very different outputs), and technological advances in these sectors are therefore unlikely to be representative of the scope for productivity improvements in the electricity transmission sector. Therefore, Ofgem's sole use of an economy wide benchmark is inappropriate for constructing a benchmark for the TSOs that should account for their mix of activities.

Second, CEPA's weighting approach based on the relative contribution of the sectors in the economy is inappropriate. For example, based on this approach, the 'Professional, scientific, technical, administrative and support service activities' sector, which is not considered as a relevant sector for the energy networks by CEPA, is given the largest weight (18.2%); while 'Transportation and storage', a sector that CEPA deems to be relevant to energy networks, is only given a 6.4% weight.[54] These bear no relation to the importance of the activities within a TSO and the same benchmark would be determined for the digital sector or telecoms sector as has been determined for TSOs. Therefore, Ofgem's aggregation approach is inappropriate for constructing a benchmark for the TSOs.

An appropriate aggregation approach would be to derive the weights based on mapping the comparator sectors to the activities that TSOs undertake. Such 'activity weights' would result in a robust ongoing efficiency target and would be more consistent with regulatory precedent. An unweighted average, where each relevant comparator sector is given equal importance (as considered by CEPA in determining the lower end of its range), can also be informative and considered alongside the activity weights.

Under Ofgem's assumptions regarding the time period of analysis and output measure, **the bias induced by CEPA's approach to comparator selection and aggregation is approximately 0.2% p.a.**

4.1 CEPA and Ofgem approaches

CEPA sets out four different samples of comparator sectors in the analysis of the EU KLEMS database, based on different considerations of selected sub-industries.

- **Construction only**
- **Selected industries**. This includes: (i) manufacturing with the following selected sub-industries: chemicals and chemical products; computer,

[53] Note that CPIH, as a consumer price index, captures the net effect of economy-wide productivity growth and economy-wide changes in input prices. As revenues of the companies are indexed to it, there is a need to ensure that there is no double counting of productivity gains by using the all-industry set to determine ongoing efficiency. In this regard, the inconsistency with the treatment of real price effects by indexing costs to input-specific price indices also requires examination.
[54] CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, Table A5, p. 58.

electronic and optical products; electrical equipment; and transport equipment; (ii) construction; (iii) wholesale and retail trade, repair of motor vehicle and motorcycles; (iv) transportation and storage; and (v) financial and insurance activities.

- **Selected industries (excluding manufacturing)**. This is defined as above, but excludes the manufacturing sub-industries.
- **All industries**. This incorporates all sectors of the UK economy, excluding real estate, public admin, education, health and social services.

CEPA use two aggregation approaches:

- CEPA aggregates the productivity growth from each sector using an unweighted average approach. This gives each sector equal weight to each sector's productivity estimate in the aggregation process.
- Additionally, CEPA uses a weighted average approach to aggregate the all-industries comparator set, where the weights are based on the relative contribution of each sector to the wider UK economy.

CEPA uses the same comparator sectors and aggregation approaches to assess the productivity potential of the gas distribution, gas transmission and electricity transmission companies.

4.2 Issues identified in CEPA and Ofgem approaches

To provide as like-for-like a benchmark as possible, the set of comparators should reflect the activities and operations that represent as closely as possible those of the energy networks. A framework for identifying relevant sectors of the economy should comprise the following elements.

- **Cost allocation exercise**. This involves defining the key, distinct activities undertaken by the energy networks and determining the contribution of each activity to providing distribution or transmission services. This could be undertaken using a cost allocation exercise in which activity cost centres of a network are created, and costs are allocated to the activities based on defined activity metrics (e.g. the intensity, importance or proportion of spend on each activity). The resulting estimate is a measure of the importance of each activity to the overall organisation and is typically referred to as the 'weight' of the activity. It is likely that the activities and respective weights will differ across the gas distribution, gas transmission and electricity transmission sectors.[55]
- **Mapping exercise**. Once activities have been identified, individual sectors can be mapped directly to the most relevant activities. For instance, the construction sector may be relevant to maintenance and construction activities in the electricity transmission industry, but not to indirect OPEX activities, such as human resources. Multiple sectors can be assigned to each activity without necessarily attaching specific weights within that activity—an industry's contribution to an activity is typically averaged equally with other relevant industries if multiple industries are deemed relevant to that activity.

[55] An example of how gas and electricity transmission companies may differ in their activities is presented in Oxera (2016), 'Study on ongoing efficiency for Dutch gas and electricity TSOs', January, Figure 4.1.

- **Deriving weights**. The relative importance of each industry (i.e. the weight attached to each industry in the aggregation process) is derived by aggregating the weights of the activities to which it is mapped.

In practice, this procedure may have some data and incentive challenges. In particular, allocating costs to activities and mapping them to the comparator sectors can be subjective, and the allocation exercise requires regulatory scrutiny to ensure that the weights reflect as closely as possible the true activity structure of an *efficient* company.

Nevertheless, to arrive at a robust estimate of the relevant efficiency targets, ongoing efficiency analysis needs to reflect the activities and operations of the distribution and transmission sectors as closely as possible. Given that the data provided by the energy networks follows established regulatory guidelines and has been subject to external audits, one option would be to consider a weighted average (based on the activities of energy networks) in the evidence base. Given the challenges with the mapping and allocation exercise, unweighted averages can also be considered alongside activity weights.

The sample and weights used by Ofgem, in general, are not in line with this principle. In particular, as Ofgem has selected the upper end of the range provided by CEPA, it has focused exclusively on the **weighted average** TFP growth of the **all-industries** set. Issues with relying solely on this approach are discussed below.

4.2.1 Sole focus on the all-industries comparator set

Economy-wide information can serve as a cross-check to the core analysis. However, the all-industries sample is a very broad benchmark that does not account for the specific activities undertaken by TSOs. As such, it is not specifically focused at the potential productivity improvement of TSOs—the outcome would be the same for whichever sector was being regulated (water, transport, telecommunications, digital or energy), which clearly do have different potentials for productivity improvements. For example, the all-industries comparator set includes sectors such as ‘agriculture, forestry and fishing’ and ‘arts, entertainment and recreation’. We consider it highly unlikely that these sectors are sufficiently similar to energy networks in terms of the type of technology used in production or the type of outputs produced to provide a robust benchmark of the productivity potential.

Ofgem does not explain why the *sole* focus on an economy-wide benchmark is appropriate in this context. Comparator sectors are selected among the full set of sectors in the economy precisely because their activities are considered to match most closely the activities of the energy sectors. In using only CEPA’s all-industries based benchmark, Ofgem’s approach goes *counter* to the logic of formulating a comparator set and is *inconsistent* with the use of a growth accounting methodology in regulation.

Moreover, CPIH, the consumer price index that companies’ revenues are indexed to, captures the net effect of economy-wide productivity growth and economy-wide changes in input prices. Thus, there is a need to ensure that there is no double counting of productivity gains by using the all-industry set to determine ongoing efficiency, which Ofgem has failed to do. In this regard, the inconsistency with the treatment of real price effects by indexing costs to input-specific price indices also requires examination.

4.2.2 Exclusive focus on the weighted average aggregation approach

CEPA considers two aggregation approaches to derive a benchmark: (i) a weighted average of the productivity growth in all industries, where the weights are derived based on the contribution of each sector to the wider UK economy; and (ii) an unweighted average of the productivity growth of the selected industries. The former provides an economy-wide benchmark and leads to an estimated productivity growth of 1.0% p.a., and the latter leads to an estimated productivity growth of 0.6% p.a.[56] Ofgem only uses the former to set the ongoing efficiency target.

CEPA's weighting approach does not consider the relevance of the identified sectors to the activities of the energy networks, which would reflect a more appropriate approach to aggregation. Indeed, CEPA's weighting approach is inconsistent with the sectors that CEPA itself deems most relevant for energy networks. For example, the 'professional, scientific, technical, administrative and support service activities' sector is given the largest weight in CEPA's weighted average analysis (18.2%), yet CEPA does not include this sector in the network-specific comparator set. Meanwhile, 'transportation and storage', a sector that CEPA deems to be relevant to energy networks, is given only a 6.4% weight. [57]

This approach appears to be at odds with CEPA's previous advice, as CEPA supported an activity-based weighting approach based on TSOs' cost structure in a report for a Dutch regulator in 2012, citing data limitations as the reason for not performing this analysis, and eventually considered a combination of TFP (weighted and unweighted averages),[58] output price indices and unit cost analysis. It noted that:

> If more data had been available the selected industries could have been weighted by the relative share of expenditure by the DNOs for the different activity types e.g. financial intermediation would be weighted to the relative share of expenditure on financial business support activities (pension management, financing, etc).[59]

Indeed, in previous work for ORR, CEPA used an activity-based weighted average approach to estimate ongoing efficiency targets for Network Rail's OPEX.[60]

Moreover, in a recent court decision by the Dutch Trade and Industry Tribunal (CBb) on this issue,[61] the CBb explicitly highlighted the importance of aggregating the sectoral productivity estimates using a representative set of weights reflecting the relevance of the sector to the activities undertaken by network operators.[62] This led to Ecorys, the consultant advising the ACM,

[56] This is based on the VA measure of productivity growth in CEPA's long time period (1997–2016). See CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, table 2.2.
[57] CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, Table A5, p. 58.
[58] The weighting approach eventually adopted was based on the contribution of each sector to the overall economy.
[59] CEPA (2012), 'Ongoing efficiency in new method decisions for Dutch electricity and gas network operators', November, p. 45.
[60] CEPA (2012), 'Scope For Improvement In The Efficiency Of Network Rail's Expenditure On Support And Operations: Supplementary Analysis Of Productivity And Unit Cost Change', March, section 3.2.5.
[61] ECLI:NL:CBB:2018:346 (GTS) en ECLI:NL:CBB:2018:347 (TenneT).
[62] Oxera advised the Netherlands Authority for Consumers and Markets (ACM) on this issue and, while our study noted the importance of weighted aggregation based on the mapping of operator activities to sectors, we had to rely on an unweighted (i.e. simple) average of sectoral performance due to a lack of granular data from the network operators. In the appeal by the network operators against the decision, the CBb concluded that the ACM must also consider information from weighted aggregation in informing the decision on the productivity factor, which the ACM subsequently did.

establishing a set of weights for the gas and electricity transmission operators based on the cost allocation and activity mapping exercises noted above. The weights are represented in Table 4.1.

Table 4.1 Example sector weights—Ecorys

	Core weights	Cross-check
Telecommunications	5%	11%
IT and other information services	6%	9%
Professional, scientific, technical, administrative and support service activities	7%	14%
Construction	24%	12%
Financial and insurance activities	2%	10%
Transportation and storage	13%	12%
Other manufacturing; repair and installation of machinery and equipment	24%	10%
Electricity, gas and water supply [1]	20%	23%

Note: The weights presented in the Ecorys paper did not sum to 100%. [1] In the EU KLEMS 2019 release, this sector is disaggregated into 'electricity, gas, steam and air conditioning supply' and 'water supply; sewerage; waste management and remediation activities'.

Source: Ecorys (2019), 'Wegingsfactoren voor frontier shift TSO's', January.

The first column ('core weights') presents the weight for each comparator industry, where the weight is determined by the relevance of the sector to gas and electricity transmission. The second column ('cross-check') estimates weights based on the similarity of the comparator sector in terms of capital structure, workforce and use of materials. In both sets of estimates, 'construction', along with 'other manufacturing; repair and installation of machinery and equipment' and 'electricity, gas, and water supply', have the highest weights.

While these weights relate to the operations of Dutch electricity and gas TSOs, based on discussions with SHE-T, we understand that these sector weights reflect the operations and activities undertaken by transmission companies in the UK as well.

Ofwat's consultants also used an activity-based weighting approach in PR99, PR04 and PR09.[63] Ofwat did not undertake an ongoing efficiency analysis in PR14 as the frontier shift was already captured in its cost models.[64] Ofwat's approach to ongoing efficiency in PR19 is being contested at the Competition and Markets Authority.[65]

In summary, our view, which is supported by regulatory precedents is that both *activity*-based weights and unweighted averages are appropriate in aggregating the productivity estimates of the comparator sectors. More

[63] Europe Economics (1998), 'Water and Sewerage Industries General Efficiency and Potential for Improvement', final report by Europe Economics and Professor Nick Crafts for Ofwat, October; Europe Economics (2003), 'Scope for Efficiency Improvement in the Water and Sewerage Industries', final report; Reckon (2008), 'PR09 Scope for efficiency studies', final report, 17 October.
[64] Specifically, Ofwat's econometric models (estimated on historical data) included a time trend and therefore accounted for changes in productivity (and input prices) over time. The econometric models used in PR14 can be found in the basic cost threshold populated feeder models here: https://webarchive.nationalarchives.gov.uk/20150603214121/http://www.ofwat.gov.uk/pricereview/pr14/prs_web1408ddfeederbasiccostpop [last accessed 26 August 2020].
[65] Specifically, Ofwat has not aggregated productivity growth from each sector into a composite measure, but has relied exclusively on sector-specific productivity growth to establish a range. This has been challenged by Yorkshire Water Services Ltd. For example, see Yorkshire Water Services (2020), 'PR19 redetermination: Yorkshire Water Services: Response to Ofwat Reply', May, p. 260.

weight could be attached to the former if sufficiently robust data is available, as in the case of the Dutch electricity and gas TSOs.

4.3 Impact of the issues identified

For the reasons outlined above, we consider that the comparator selection and weighting approach proposed in our report for SHE-T is appropriate. The magnitude of the bias induced by Ofgem's inappropriate focus on economy-wide productivity growth and lack of consideration of other aggregation approaches can be approximated through comparison to these estimates.

As shown in Table 4.2, using these comparators and weights over the time period that Ofgem/CEPA has focussed on[66] and for the VA measures[67] reduces the ongoing efficiency target from 1% p.a. to 0.8% p.a. Therefore, the **bias induced by CEPA's comparator selection and weighting approach is approximately 0.2% p.a.**

Table 4.2 Unweighted vs weighted average for all industries

Time period	Oxera comparators and weighting approach[1]	CEPA's all-industry comparators and weighting approach[2]	Estimated bias
TFP VA (1997–2016)	0.8%	1%	0.2%

Source: [1] Oxera analysis of EU KLEMS data. The methodology for this approach can be found in Oxera (2019), 'Scottish Hydro Electric Transmission's cost assessment', December, section 3.2. [2] CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', Table 2.2.

[66] See section 5 for our assessment of CEPA's time period of analysis.
[67] See section 2 for our assessment of the use of VA measures.

5 Time period of analysis

Productivity growth is typically 'pro-cyclical'. That is, productivity growth is larger in times of macroeconomic growth and smaller (sometimes negative) in times of macroeconomic decline. For this reason, productivity growth should be estimated over complete business cycles that include both above-average and below-average trends. CEPA does not perform any primary analysis to estimate business cycles, but references two publications from the OBR.[68] CEPA states that the period 1997–2016 includes two complete business cycles based on these publications.

The publications that CEPA cites use outdated data that might have been subject to material revisions which have an impact on the position of the business cycle. Importantly, CEPA has not validated whether the business cycles identified by the OBR are supported by analysis of the EU KLEMS dataset that it uses to estimate productivity growth. Indeed, our analysis of EU KLEMS data indicates that the 1997–2016 period is characterised by *incomplete* business cycles. Specifically, it includes one complete business cycle in the period 2007–16 and one incomplete business cycle in the period 1997–2007. As the period 1997–2007 is characterised by sustained, above average economic growth, CEPA's estimate of productivity growth is likely to be biased upwards and therefore inappropriate.

Using CEPA's own analysis, **shortening the time period to 2006–16** (which is close to one complete business cycle in 2007–16) **leads to a reduction in the ongoing efficiency target of 0.3–0.6% p.a. in the VA-based measure for CEPA's comparator sectors.**[69]

5.1 CEPA and Ofgem approach

CEPA considers two time periods of analysis: 1997–2016 and 2006–16. According to CEPA, the former represents two complete business cycles while the latter represents the most-recent business cycle only.

The reference range set out by CEPA relies on only the longer time period, with the argument that using a longer time period would reduce sensitivity to measurement error and outlier years, as well as avoiding the need to arbitrarily determine cut-off points for a shorter time period. Ofgem agrees with CEPA's recommendation and proposes to focus solely on the 1997–2016 period.

5.2 Issues identified in CEPA and Ofgem approach

While in principle it can be the case that more data points generally tend to lead to a more reliable estimate, this alone is not sufficient to justify the choice of a particular time period in productivity analysis.

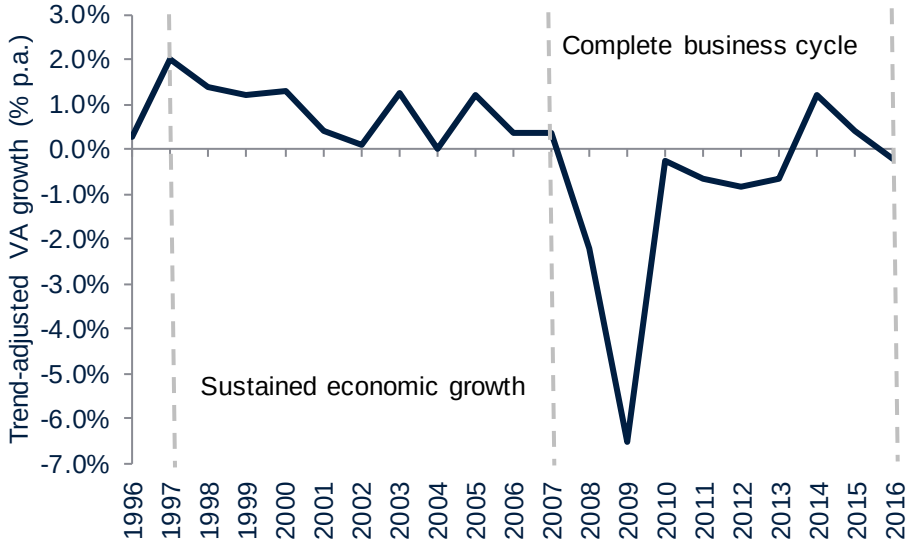
First, CEPA relies on OBR data to determine the time period while using EU KLEMS data to estimate productivity growth. CEPA does not perform any primary analysis to support its choice of the 1997–2016 period, but references two publications from the OBR.[70] The data used by these OBR

[68] Office for Budget Responsibility (2011), 'Estimating the UK's historical output gap', Working paper 1; Office for Budget Responsibility (2014), 'Output gap measurement: judgement and uncertainty', Working paper 5.
[69] Note that CEPA's most-recent business cycle is the period 2006–16. See CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, Table 3.2.
[70] Office for Budget Responsibility (2011), 'Estimating the UK's historical output gap', Working paper 1; Office for Budget Responsibility (2014), 'Output gap measurement: judgement and uncertainty', Working paper 5.

papers is outdated and might have been subject to material revisions that have an impact on the position of the business cycle. In addition, the OBR references several methods of decomposing output growth into business cycles, and it is not clear exactly which method CEPA uses to identify its business cycles.

Second, our analysis of the EU KLEMS dataset[71] (which CEPA uses to estimate TFP growth) illustrates an important limitation of using this longer period of 1997–2016. Figure 5.1 shows the trend-adjusted growth in VA terms at the economy-wide level[72] over the whole 1997–2016 period (i.e. the deviation of VA from its long-term average). It demonstrates that the 1997–2016 period is characterised by *incomplete* business cycles. Specifically, the period consists of ten years of sustained, above-average growth (1997–2006) followed by one full business cycle during 2007–16, instead of two full business cycles as CEPA claims.

Figure 5.1 Business cycle analysis

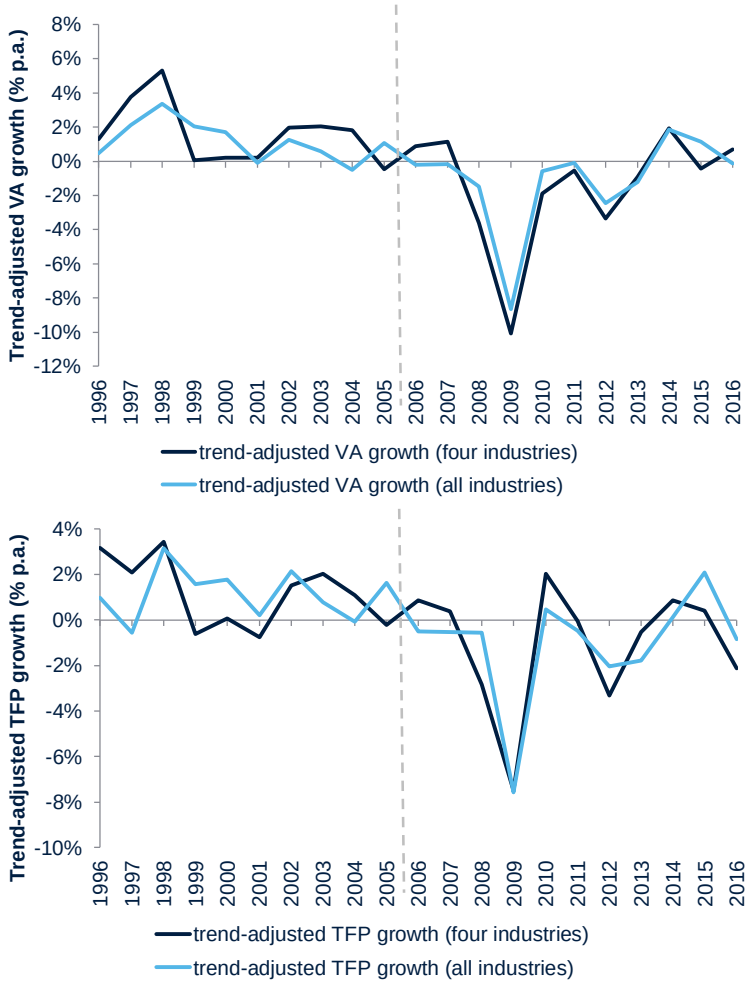


Source: Oxera analysis of EU KLEMS data. We define a business cycle as beginning and ending with a 0% output gap, i.e. after a period of below- and above-trend output growth. The output gap is defined as the difference between the actual output growth and the 'potential' output growth of an economy. Potential output growth is usually estimated as the long-run average output growth of the economy.

Even when considering CEPA's comparator sectors, we find that both trend-adjusted VA (at the top of Figure 5.2 below) and productivity growth (at the bottom) show similar patterns of a period of sustained, above-average growth during 1997–2006 and a full business cycle during 2007–16.

[71] We have not had enough time to examine the implication of applying the OBR's approaches to the EU KLEMS data, but will examine this post submission.
[72] The examination of trend-adjusted output growth to identify business cycles is common in regulatory applications and has been used by CEPA. For example, see CEPA (2012), 'Ongoing efficiency in new method decisions for Dutch electricity and gas network operators', November, pp. 40–42.

Figure 5.2 Trend-adjusted VA and TFP growth in CEPA's comparator sectors



Source: Oxera analysis of EU KLEMS data.

It is widely accepted in the academic and regulatory literature that productivity growth is 'pro-cyclical'. That is, productivity growth is higher in periods of economic growth and lower in periods of economic decline (e.g. recessions). Because of this pro-cyclicality, regulators typically assess productivity growth over *complete business cycles* when setting ongoing efficiency targets. Indeed, CEPA itself has used this approach in previous work for regulators.[73] Ofgem also acknowledges this point and concludes that choosing a timeframe with incomplete business cycles could bias estimates of historical productivity gains.[74]

5.3 Impact of the issues identified

The 1997–2016 period is characterised by *incomplete* business cycles. Specifically, it includes one complete business cycle in the period 2007–16 and one incomplete business cycle in the period 1997–2007. As the period

[73] For example, see CEPA (2012), 'Scope For Improvement In The Efficiency Of Network Rail's Expenditure On Support And Operations: Supplementary Analysis Of Productivity And Unit Cost Change', March.
[74] Ofgem (2020), 'RIIO-ED2 Sector Methodology Consultation: Annex 2. Keeping bills low for consumers', 30 July, para. 6.33.

1997–2007 is characterised by sustained, above average economic growth, CEPA's estimate of productivity growth is likely to be biased upwards.

Using CEPA's own analysis, **shortening the time period to 2006–16** (which is close to one complete business cycle in 2007–16) **leads to a reduction in the ongoing efficiency target of 0.3–0.6% p.a. in the VA-based measure for CEPA's comparator sectors.**[75]

Relatedly, we discuss in the next section the importance of choosing a time period that is representative for the RIIO-2 price control, given the macroeconomic forecasts and forward-looking uncertainty.

[75] Note that CEPA's most-recent business cycle is the period 2006–16. See CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, Table 3.2.

6 Addressing forward-looking uncertainty

CEPA recommends that Ofgem to place some weight on the OBR and Bank of England (BoE) forecasts of productivity growth to adjust the ongoing efficiency target. Ofgem has ignored this advice.

By not taking its consultant's advice on the forward-looking uncertainty, Ofgem has over-estimated the potential productivity gains that can be achieved during RIIO-2. Since the next five years are uncertain owing to the UK's exit from the European Union and the COVID-19 pandemic, caution must be exercised in determining the target. This is particularly important in light of the productivity slowdown experienced in the UK in recent years, which is in contrast to the 'rising long-term productivity forecasts' stated by Ofgem.

Ofgem's decision to not adequately consider these uncertainties, combined with the other methodological issues discussed in the sections above, results in a significant overestimate of ongoing efficiency. These macroeconomic uncertainties suggest that it would be prudent to reduce the ongoing efficiency benchmark. In addition, Ofgem may need to further reflect the forward-looking uncertainties by choosing to true-up these targets over the course of RIIO-2 depending on how the economy and sector perform.

6.1 CEPA and Ofgem approaches

CEPA recommends that Ofgem place some weight on the OBR and BoE forecasts of productivity growth to adjust the ongoing efficiency target.[76] We agree with this suggestion. However, Ofgem rejects its consultant's advice on the grounds that (i) the TSO sector is protected from short-term macroeconomic shocks and (ii) these short-term forecasts are not relevant in the context of rising long-term productivity forecasts.[77] Neither of these reasons are sufficient to ignore CEPA's recommendation.

6.2 Issues identified in CEPA and Ofgem approaches

While the TSO sector *might* be less exposed than other sectors to macroeconomic shocks, **it is unlikely that the transmission companies are completely insulated from significant economic downturns**. In fact, existing evidence shows that over the past 15 years, value added growth in the 'Electricity, gas, steam and air conditioning supply' has experienced more pronounced contractions than the overall economy compared to the long-term trend.[78] Moreover, with uncertainty over the next five years owing to the UK's exit from the European Union and the COVID-19 pandemic, caution is needed in determining the target.[79]

This is particularly important in light of the productivity slowdown experienced in the UK in recent years,[80] which is in contrast to the 'rising

[76] CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, p. 36.
[77] Ofgem (2020), 'RIIO-2 Draft Determinations - Core Document', July, para. 5.39.
[78] Based on Oxera analysis of EU KLEMS data.
[79] Economic activity has fallen significantly as a result of COVID-19 and the measures implemented to contain it. While there are currently wide bands of uncertainty around any estimates of activity, the BoE's most recent Monetary Policy Report shows that UK GDP is expected to be close to 30% lower in 2020 Q2 than it was at the end of 2019. Based on BoE's scenario analysis, UK GDP is expected to fall by 14% in 2020 as a whole. Activity is expected to pick up in the latter part of 2020 and into 2021 after social distancing measures are relaxed, although it is not forecast to reach its pre-COVID level until the second half of 2021. In 2022, GDP growth is around 3%. See Bank of England (2020), 'Monetary Policy Report', May.
[80] Crafts, N. (2018), 'The productivity slowdown: is it the "new normal"?', *Oxford Review of Economic Policy*, **34**:3, p. 443.

long-term productivity forecasts' stated by Ofgem. In fact, this productivity slowdown is expected to persist at least in the medium term and is likely to be worse than the forecast of annual TFP growth at 0.1%[81] between 2020 and the first quarter of 2023—which CEPA refers to—based on the BoE's January 2020 Monetary Policy Report.

Furthermore, Ofgem is conceptually inconsistent in its position:

- On the one hand, Ofgem uses the economy as a benchmark (upwardly biased from the period of analysis being heavily influenced by a growth period) and ignores a more activity based (i.e. TSO specific) benchmark.
- On the other hand, Ofgem consider that the energy sector is less affected by economy-wide recession, so consider that there is no need to adjust for likely macro-economic effects.

If economy-wide productivity provides an appropriate benchmark for TSOs, then the benchmark should be adjusted to account for the impact of likely macro-economic effects as economy-wide productivity will be affected.

If TSOs are less affected by macro-economic effects than the economy as a whole, then the productivity benchmark should be based on a TSO activity specific benchmark.

6.3 Impact of the issues identified

Ofgem's decision to not adequately consider these uncertainties, combined with other methodological issues discussed in the sections above, results in a significant overestimate of the scope for ongoing efficiency in RIIO-2. To account for these uncertainties, it would be prudent to reduce the ongoing efficiency benchmark. In addition, Ofgem may need to further reflect the forward-looking uncertainties by choosing to true-up these targets over the course of RIIO-2 depending on how the economy and sector performs.

[81] Bank of England (2020), 'Monetary Policy Report', May.

7 Uplift for innovation funding

The innovation fund provided by Ofgem during RIIO-1 is around £330m. CEPA considers that this fund will produce a 0.2% annual improvement in ongoing efficiency during RIIO-2. CEPA made several overly simplistic and therefore inappropriate assumptions in its analysis, including (i) the only benefit arising from the innovation fund is cost reduction; (ii) none of the impact of the innovation fund has already been accounted for in Ofgem's cost assessment framework; and (iii) the benefits of innovation funding last for 20 years.

We have identified the following issues relating to double counting and simplistic assumptions with this assessment.

- Ofgem uses a combination of historical (RIIO-1) and forecast (RIIO-2) data to set cost allowances for TSOs. To the extent that there have already been some benefits from the innovation fund in RIIO-1, and companies have accounted for the impact of innovation funding in their business plans, the impact of innovation funding on costs is (at least partially) **already accounted for in Ofgem's cost assessment framework**.
- Productivity improvements associated with innovation funding in energy and research and development (R&D) activities in comparable sectors are likely to be **already embedded within the TFP estimates derived from the EU KLEMS analysis** (which CEPA acknowledges). In fact, the 'electricity, gas, steam and air conditioning supply' sector spends less on R&D (at 0.06% of its output) than most industries that are included in CEPA's comparator set.
- The assumptions that feed into CEPA's analysis of the 0.2% uplift are **not sufficiently motivated**, and have a material impact on the estimated uplift. For example, the duration of benefit from innovation is 20 years and assuming that the only benefits arising from innovation funding relate to cost reduction is inappropriate.

Considering the incorrect rationale and unjustified assumptions used in this analysis, **no further innovation overlay is appropriate**.

7.1 CEPA and Ofgem approaches

The innovation fund provided by Ofgem during RIIO-1 is around £330m, for which CEPA arrives at a 0.2% annual improvement in ongoing efficiency during RIIO-2, based on the following assumptions.

Table 7.1 CEPA's assumptions in its innovation funding uplift

Element	Assumption
Return of investment on the innovation funding provided in RIIO-1	4.2%
Ongoing annual efficiency improvement in the absence of innovation funding	1%
Duration of benefits from innovation	20 years
Other assumptions	• The only benefits arising from the innovation funding relate to cost savings, and no considerations for other benefits such as environmental benefits and quality of service • None of the efficiency derived from projects funded by Ofgem's various innovation mechanisms during RIIO-1 has been accounted for in the wider cost assessment framework

Source: Oxera, based on CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, pp. 25–26.

With the last two assumptions ('other assumptions' row) in the table above, CEPA recommends that Ofgem considers them when deciding how much uplift for innovation funding to include in the ongoing efficiency challenge.

7.2 Issues identified in CEPA and Ofgem approaches

7.2.1 Double count (I): innovation included in both the outturn and forecast costs of the TSOs

A potential uplift for innovation funding, whether funded through shareholders or by consumers, is likely to have been accounted for in Ofgem's cost assessment. Ofgem's methodology is to benchmark to either historical (RIIO-T1) or forecast (submitted RIIO-T2) data, whichever results in a lower cost allowance for companies. If a historical benchmark is selected, then any benefits from the innovation fund that occurred in RIIO-T1 will have been captured. Similarly, if a forecast benchmark is selected, then any anticipated benefit of the innovation fund, if embedded, will already be accounted for. Ofgem states that it has removed the ongoing efficiency assumptions from companies' business plans prior to cost assessment. However, as discussed in section 8, our review of available material suggests that the figures provided by SHE-T as part of its business plan submission fed directly into the cost assessment model.

SHE-T described in its business plan efficiency savings from innovation of over £100m.[82] Within this £100m commitment in RIIO-T2 efficiency savings, £60m is allocated to downward trend in direct unit costs of asset investment from RIIO-T1 to RIIO-T2. In particular:

- SHE-T assumes that the level of benefits achieved through innovation projects—including those secured from Ofgem's innovation fund—that has already materialised during RIIO-T1 will continue to do so in RIIO-T2 at £30m.

[82] Scottish & Southern Electricity Networks Transmission (2019), 'A Network for Net Zero: RIIO-T2 Business Plan', December, p. 41, https://www.ssen-transmission.co.uk/media/3761/a-network-for-net-zero-final-business-plan.pdf

- The other £30m is additional forecast benefits, as continued and expanded deployment of these innovations would reduce RIIO-T2 expenditure further.

The combined enduring RIIO-T1 and forecast RIIO-T2 benefits, which amount to over £60m, will flow through to benefit SHE-T's customers in the following two ways.

- First, the RIIO TOTEX incentive mechanism will automatically return to consumers a significant proportion of the difference between lower outturn costs as a result of innovation projects and the counterfactual excluding-innovation level.
- The second channel is the outcome of the Strategic Wider Works (SWW) and reopener cost assessment process, i.e. the setting of adjusted ex ante allowances following a cost assessment process undertaken by Ofgem for additional network critical investment in RIIO-2.[83]

This indicates that network companies have considered the benefits of innovation projects funded by Ofgem, as well as their shareholders, during RIIO-1. While there is a degree of uncertainty in forecasting innovation benefits to be realised in RIIO-2, as these benefits may depend on future works that these innovations can be applied to, CEPA's assumption indicates that it has overlooked the fact that these benefits have already been captured in companies' business plans (see assumption in Table 7.1 above). CEPA's assumption is therefore inappropriate.

7.2.2 Double count (II): funding available to comparators

CEPA argues that innovation funding provided by Ofgem is not available for the industries in competitive markets considered in the EU KLEMS analysis, and thus it would be justifiable to include additional efficiency benefits from Ofgem's various innovation schemes on top of the baseline ongoing efficiency target estimate. However, innovation (resulting in cost reduction or quality improvements or both) is the main driver of productivity growth for both the comparator sectors as well as the transmission companies. Therefore, productivity growth from innovation, funded either publicly or privately, should be reflected in the EU KLEMS dataset.

Table 7.2 below presents the expenditure on R&D as a percentage of total output, by sector in the period 2010–16.[84] We see that the 'electricity, gas, steam and air conditional supply' sector spends less on R&D (at 0.06% of its output) than most industries that are included in CEPA's comparator set. For example, 'Wholesale and retail trade; repair of motor vehicles and motorcycles' and 'Financial and insurance activities' (the two sectors with the largest weight in CEPA's analysis) invest between twice and three times as much in R&D per GO as in the energy sector.

[83] Scottish & Southern Electricity Networks Transmission (2019), 'Efficient Capital Investment: Benchmarking and Cost Metric', December, pp. 59–60.
[84] Note that this time period simply reflects the full sample for which data is available. The high-level conclusions do not change if different time periods within this period are analysed.

Table 7.2 R&D per sector in 2010–16

	R&D as % of GO	Total R&D (£m)	GO (£m)
Chemicals and chemical products	0.89%	2,379	266,776
Computer, electronic and optical products	5.01%	6,902	137,771
Electrical equipment	1.31%	1,210	92,265
Construction	0.04%	581	1,631,684
Wholesale and retail trade; repair of motor vehicles and motorcycles	0.24%	5,262	2,169,695
Transportation and storage	0.01%	158	1,068,083
Financial and insurance activities	0.14%	2,500	1,790,073
Electricity, gas, steam and air conditioning supply	0.06%	419	726,293

Note: This is total R&D expenditure on projects executed by businesses, including both public and private funding. While R&D projects and expenditure may be defined differently in different sources, the comparison across sectors based on one dataset (the ONS) is valid and consistent.

Source: Oxera analysis of EU KLEMS and ONS data.

It is reasonable, therefore, to conclude that the **productivity improvements associated with innovation funding in energy and R&D activities in comparable sectors are likely to be embedded within the TFP estimates derived from the EU KLEMS analysis**.

CEPA acknowledges this double count, stating that:

> The EU KLEMS dataset will already take into account some of the productivity growth captured in Bond & Gucceri (2016). Therefore, there may be some scope for double-counting if the full relationship between innovation and productivity was used to estimate an innovation-related top-up to the ongoing efficiency estimates produced by EU KLEMS analysis.[85]

However, CEPA does not make any adjustment for this, which is unreasonable in the face of the evidence.

7.2.3 Unjustified assumptions in CEPA's analysis that Ofgem has not considered

While CEPA sets out its assumptions and acknowledges that Ofgem should consider some of these assumptions when using the 0.2% uplift, Ofgem has instead applied this uplift on top of the TFP estimates. We discuss the two main issues with CEPA's analysis below.

Innovation funding does not solely result in cost reductions

First, assuming all of the innovation funding in RIIO-1 would go into cost reduction for customers is highly unrealistic and results in a much higher estimate of efficiency improvement. Indeed, CEPA acknowledges this simplistic assumption (see Table 7.1 for the summary of CEPA's assumptions) and recommends that Ofgem take this into account when deciding on the innovation funding uplift.

[85] CEPA (2020), 'RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper', May, p. 22.

As set out by Ofgem, cost savings are only one of several criteria for a project to receive funding from either the Network Innovation Competition (NIC) or the Network Innovation Allowance (NIA):

> We provide essential backing to innovative projects which aim to help make the energy networks smarter, accelerate the development of a low carbon energy sector as well as deliver financial benefits to consumers.[86]

This is clearly demonstrated in the 'Resilience as a Service' (RaaS) project by Scottish and Southern Energy Networks, which was selected for funding from the Electric NIC 2019.[87] This project aims to trial an alternative to standby diesel and was chosen because it 'would accelerate the development of the low carbon energy sector'.[88] In this case, the main objective of innovation funding awarded to the RaaS project is not significant cost savings from network companies themselves, but rather helping to move the sector in the direction of government policy.

Going back further, the 2016 NIC projects aimed at exploring issues such as:[89]

- consumer benefit of accessing network data on energy usage, and developing apps to improve network performance (OpenLV);
- releasing additional capacity for renewable generators, and examining the contractual arrangements to establish new industry services (TDI 2.0).

Although some of the goals for these projects include financial savings for consumers,[90] most of the benefits would be realised in the form of better quality of service, e.g. having more control over energy usage and access to new industry services.

Examples of the innovation projects funded by Ofgem show that these projects delivered non-financial benefits to consumers rather than cost reduction.

Duration of benefit

Second, the assumption on the duration of benefit from innovation can have a significant impact on the efficiency improvement estimate. CEPA uses 20 years in its main scenario to arrive at the 0.2% annual improvement and 4.2% return. If we were to consider a 45-year duration and 4.2% return on innovation funding during RIIO-1, then the annual improvement would be around 0.1% instead, keeping other assumptions made by CEPA the same.

CEPA has not substantiated its choice of a 20-year duration. More specifically, it has not considered that the lifetime of the asset can serve as

[86] Ofgem website, 'Network innovation', https://www.ofgem.gov.uk/network-regulation-riio-model/current-network-price-controls-riio-1/network-innovation
[87] Ofgem (2019), 'Decision on the 2019 Gas and Electricity Network Innovation Competition', November, https://www.ofgem.gov.uk/system/files/docs/2020/05/2019_nic_decision_document_for_publication_corrected_05.20.pdf
[88] Ofgem (2019), 'Decision on the 2019 Gas and Electricity Network Innovation Competition', November, p. 21, https://www.ofgem.gov.uk/system/files/docs/2020/05/2019_nic_decision_document_for_publication_corrected_05.20.pdf
[89] Ofgem (2016), '2016 Network Innovation Competitions Brochure', https://www.ofgem.gov.uk/system/files/docs/2016/11/innovation_competitions_brochure_to_upload.pdf
[90] Indeed, even when projects involve financial savings for consumers, these may not necessarily be driven by cost reductions in the TO sector. For example, SHE-T's investments in the HVDC sector will lead to material financial savings for consumers, but these will feed through cost reductions in the SO sector, and therefore will not be achievable for SHE-T.

a good starting point in determining the appropriate duration of benefits. In addition, there are potentially even longer-term benefits as newer technology which is built on the innovation happening today would deliver further benefits even when the innovation itself becomes obsolete.

Below, we assess the innovation projects completed by SHE-T during RIIO-T1 to illustrate why the 20-year duration in CEPA's analysis may not be sufficient.

SHE-T completed around 39 innovation projects using a mix of funding from NIC and NIA—which mostly focus on projects with non-financial benefits as discussed above—and 'business as usual' (BAU) funds that typically focus on delivering financial benefits. Putting to one side that these BAU-funded projects are not part of CEPA's overlay, and therefore should not be considered, their duration is of relevance when considering possible innovation-funded projects. Within SHE-T's 13 projects that were funded through BAU, the ones that cover innovations[91] are linked to network assets that are associated with a 45-year lifetime and included in the regulated asset value. As a result, it is not logical to exclude benefits from these projects when the asset is still expected to be operational. Moreover, process-based innovation projects such as future energy scenarios, commercial connection processes, and flexible connections, even have indeterminate lifetimes.

These examples show that the duration of 20 years is likely to be too short. Instead, it is more appropriate to consider a duration that is in line with average asset life, for example around 45 years for the transmission sector.

7.3 Impact of the issues identified

CEPA's uplift for innovation funding suffers from methodological flaws as the efficiency improvements from the innovation funding are captured in either the cost assessment process or the productivity analysis. CEPA also makes simplistic assumptions in its calculations, which suggest that the 0.2% uplift is likely to be a significant overestimate of efficiency improvement achieved from innovation funding. Thus, **no further innovation overlay is appropriate**. In fact, a *downward adjustment* for potential double counting is appropriate, as discussed in the next section.

[91] Examples include HVDC, composite overhead line conductors, composite poles, alternative to SF6 use in their substations, and whole system design.

8 Overlaying ongoing efficiency to forward-looking benchmarks

Ofgem applies its ongoing efficiency assumptions to the cost allowances derived from its cost assessment approach. In its assessment of the TSOs' business plan costs, Ofgem sets the benchmarks using a mixture of historical and forward-looking data. Ofgem states that it has removed companies' business plans before the cost assessment. However, we could not validate this statement with the analysis files provided and thus there is **potential for double counting of ongoing efficiency** that requires further examination.

8.1 Ofgem's approach

If the methodological errors in CEPA's analysis (highlighted in sections 2–7) are corrected, TFP analysis can provide a robust estimate of the scope for ongoing efficiency improvements. However, this estimate is calculated on a stand-alone basis (i.e. without reference to Ofgem's wider cost assessment approach) and it might not be appropriate to apply it incrementally to Ofgem's cost allowances.

The link between Ofgem's cost assessment and ongoing efficiency challenge is shown in Figure 8.1.

Figure 8.1 Ofgem's approach

Source: Oxera.

As shown in Figure 8.1, if benchmarks using business plan data are used to set cost allowances, this will already incorporate companies' ongoing efficiency expectations. Failure to adequately account for this could result in double-counting the impact of ongoing efficiency on companies' cost allowance.

Ofgem recognises the issue of double counting the frontier shift assumptions made by TSOs and states that:

> Prior to applying our OE [ongoing efficiency] challenge, we removed any network company-proposed OE from its plan.[92]

8.2 Issues identified in Ofgem's approach

We are not able to validate Ofgem's statement that it removed the ongoing efficiency assumptions from companies' business plans prior to cost assessment. Our review of available material suggests that the figures provided by SHE-T as part of its business plan submission fed directly into the cost assessment model. Therefore, contrary to its statement, Ofgem

[92] Ofgem (2020), 'RIIO-2 Draft Determinations - Electricity Transmission Annex', p. 62.

appears to have applied the frontier shift target of 1.2–1.4% p.a. on top of the assumptions already made by the TSOs.

Ofgem should have either stripped out the ongoing efficiency assumptions made by the TSOs before setting cost allowances or applied only the incremental part of its ongoing efficiency challenge relative to the TSOs' assumptions.[93] Either approach would have avoided the risk of double counting the efficiency challenge.

8.3 Impact of the issues identified

This issue is most relevant in expenditure models that use forward-looking benchmarks. For instance, in Ofgem's assessment of non-load related (NLRE) and load related (LRE) CAPEX, Ofgem capped expenditure at the business plan submission at a granular level, affecting £1,319m of SHE-T's submitted costs.[94] In these cases, the capped expenditure would already incorporate SHE-T's ongoing efficiency assumption in CAPEX of 0.3% p.a. To overlay an additional ongoing efficiency assumption of 1.2% p.a. would imply that the true scope for ongoing efficiency is 1.5% p.a., which is significantly greater than CEPA's estimate.

In other cases, expenditure was capped at the T2 transmission sector average weighted mean unit cost benchmark. In these cases, in addition to SHE-T's assumed ongoing efficiency improvement, the assumptions made by SPT and NGET will also have an impact on that implied ongoing efficiency assumption in Ofgem's approach. In Ofgem's assessment of NLRE and LRE CAPEX, this affected £72m of SHE-T's submitted costs.

As Ofgem has already acknowledged the need to remove the ongoing efficiency assumptions proposed by companies,[95] we expect that this issue will either be corrected or clarified in the Final Determinations.

[93] Indeed, Oxera's ongoing efficiency recommendation is not intended to be additional to any ongoing efficiency embedded in SHE-T's plan.
[94] Included in this are £948m of CAPEX subject to an engineering assessment and £371m subject to unit cost assessment.
[95] Ofgem (2020), 'RIIO-2 Draft Determinations - Electricity Transmission Annex', p. 62.

9 Link with RPEs

Our main critique here is the inconsistency in Ofgem's treatment of ongoing efficiency and RPEs. While the ongoing efficiency target is set on an ex ante basis, RPEs are indexed with an annual true-up for the transmission and distribution networks. In doing so, Ofgem overlooks the links between the two and the need to ensure consistency.

In the long run, at the economy-wide level, the growth in real wages equals labour productivity, so one approach would be to set a consistent target for both.[96] For example, if a relatively high rate of ongoing efficiency is assumed then the real wage growth assumption in the RPE should be commensurately high. Equally, if RPEs are to be indexed with true-ups, there is a need to review the ongoing efficiency assumption at the same time as the RPE true-ups.[97]

Moreover, significant uncertainty about the next five years in RIIO-2 (as discussed in section 6) will affect both ongoing efficiency and RPE estimates. The uncertainty relating to RPEs could be addressed through the true-up process. However, the uncertainty relating to ongoing efficiency is currently not addressed in Ofgem's framework. Given the link between RPEs and ongoing efficiency, this inconsistent application of true-up mechanisms places unnecessary risk on companies.

[96] The International Labour Organization suggests that the relationship between the growth in real wages and growth in productivity in the UK was quite close to being 1:1 over the 1999–2013 period. See ILO Global Wage Report 2014/15, p. 10. More research is required to examine this issue at the sectoral level.

[97] It is important to note that an annual true-up of RPEs would require data from companies that are subject to a significant time lag. Therefore, Ofgem should consider and design its RPE true-up process to reflect this practicality.

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