RIIO-GD2 and T2: Cost Assessment – Advice on Frontier Shift policy for Final Determinations

Ofgem

27 November 2020

FINAL REPORT

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EXECUTIVE SUMMARY

Frontier shift is the rate at which a company at or close to the efficiency frontier can change its outputs relative to inputs. It captures changes in both the volume of inputs needed to produce a given level of output (or output produced for a given level of inputs) and in the price of inputs used.

In other words, frontier shift is ongoing efficiency (OE) net of Real Price Effects (RPEs). For example, if an efficient company makes a 1% annual efficiency gain but its input prices were also rising in real terms at 1% a year, it would be expected to keep the cost of producing its outputs approximately constant over time – i.e. the frontier shift would be zero.

This document discusses the responses received to Ofgem's proposals for the OE challenge and RPE indexation in the GD-2 and T-2 Draft Determinations (DD). Specifically, this report addresses the issues covered in the CEPA report on Frontier Shift published alongside the Draft Determinations ('Frontier Shift DD report').[1]

Treatment of the impact of COVID-19

COVID-19 has had a widespread and large impact across the economy in 2020, with the disruption expected to continue well into 2021, particularly for specific industries and areas of the country which are affected by tighter restrictions to prevent the spread of the virus. Although the crisis directly affects the energy network sector less materially than other sectors (such as hospitality and transport), it still poses questions in relation to the Frontier Shift mechanisms for RIIO-2, such as:

- How could COVID-19 change the level of OE improvements that can be achieved in the energy network sector?
- How could COVID-19 change the exposure of network companies to RPEs in ways not captured by the proposed indexation mechanisms?

Ofgem has asked us to separately consider the COVID-19 impacts on OE and RPE so that it can use the advice to inform its COVID-19 policy response, which could be broader than Frontier Shift. As part of work for the Final Determinations (FD), Ofgem will consider whether and how the overall price control framework can appropriately respond to the effect of COVID-19 on the energy network companies during RIIO-2.

For example, Ofgem's options include, but are not limited to:

- changing the ex-ante approach to setting the OE challenge and/or the RPE indexation mechanism for all of RIIO-2;
- changing the ex-ante approach to setting the OE challenge and/or the RPE indexation mechanism for some of the years in RIIO-2; or
- using existing or new uncertainty mechanisms, including reopeners, to allow changes to be made as and when more evidence is available on the size and duration of the impact of COVID-19 on network companies.

COVID-19 has resulted in a large shock to the economy which has reduced productivity this year (i.e. negative productivity growth). However, we have not seen compelling evidence of the impact of the wider economic changes on the productivity of the energy network companies. This means that the scale of the impact of COVID-19 on the productivity of network companies during RIIO-2 remains uncertain and difficult to predict.

COVID-19 has already had a significant impact on the UK labour market and therefore the labour cost indices used in the RIIO-2 RPE indexation mechanism. These pressures are likely to continue into 2021, meaning that the

[1] CEPA (2020) RIIO-GD2 and T2 Cost Assessment – Frontier shift methodology paper.

companies may face a negative true-up at least in the first year of the price control. At this stage, it is hard to be confident about the size of any adverse impact on the reliability of the input data for the RPE indexation approach as a proxy for the real cost pressures faced by energy network companies.

We consider that the impact of COVID-19 actually supports the case for RPE indexation, which reduces the likelihood that companies benefit from windfall gains or losses brought about by 'forecast error' in face of the current uncertainty.

In our view, it remains very hard to make a confident judgement about the impact of COVID-19 on productivity and real input prices for the energy network sector even over the initial years of the RIIO-2 period, let alone the whole period. This would be a major challenge in implementing an ex-ante adjustment as part of the FD process, rather than relying on existing or new uncertainty mechanisms to respond once more and better information is available.

The CMA reached a similar conclusion in its provisional findings on the appeals against Ofwat's PR19 final determinations. It stated "*that the best mechanism for taking direct account of impacts of COVID-19 is for Ofwat to consider these as part of an industry-wide process; Ofwat has proposed it will consider the needs for any ex post adjustments at a time aligned to its normal PR19 reconciliation process.*"[2]

Approach to setting the OE challenge

Setting a suitably stretching OE challenge is an important part of Ofgem's role in ensuring value for money for consumers through the RIIO-2 price control process. Our Frontier Shift DD report described different types of evidence that could be considered by Ofgem in its decision in setting an OE challenge.

In general, respondents to the DD agreed on the importance of using a range of evidence to inform the OE challenge. There was broad support for the types of evidence that we considered, although some respondents, particularly the GDNs and TOs, disagreed with the interpretation and weighting placed on different pieces of evidence.

The main area of evidence that the GDNs and TOs stated was inappropriate to consider at all was an assessment of how RIIO-1 innovation funding should be considered when setting the OE challenge for RIIO-2. In its RIIO-2 DD, Ofgem included a specific uplift of 0.2% in the OE challenge to reflect the RIIO-1 innovation funding. Ofgem is taking forward the question of whether there should be a specific uplift in the OE challenge to reflect RIIO-1 innovation funding. Therefore, further discussion of any such specific uplift is outside the scope of this report.

Use and interpretation of growth accounting measures of productivity

There was general agreement in the DD responses that growth accounting measures of historical productivity improvements (such as from EU KLEMS) provide an important input into setting the OE challenge. However, many respondents, particularly the energy network companies and their advisors, disagreed with our presentation of the growth accounting analysis, and Ofgem's interpretation of the analysis and the weighting it put on different measures.

It is important to reiterate the use of growth accounting analysis in informing the OE challenge set by regulators. There is not a single combination of period, productivity measures, and comparator sectors that can be described as an exact match for the frontier productivity improvements that could be achieved by energy network companies over RIIO-2.

Therefore, multiple historical productivity estimates are typically used to inform the lessons from past productivity improvements when considering the scope for future productivity improvements at the efficiency frontier of a regulated sector. Ultimately, the aim is to provide an OE challenge for the energy network sector informed by the levels of sustainable productivity growth achieved in past circumstances with some, albeit imperfect, comparability.

[2] CMA (2020), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Provisional findings, available online, September.

For the FD, we suggest that when setting the OE challenge, Ofgem should take into account eight historical productivity measures based on a combination of the following elements:

- The period between 1997 and 2016 (1).
- Gross Output (GO) and Value Added (VA) measures (2).
- Total Factor Productivity (TFP) measures for capex/repex and opex; and labour productivity measures (LP and LEMS) for opex (2).
- Two industry comparator sets (2):
    - A 'targeted' (or narrow) comparator set: construction, wholesale and retail trade: repair of motor vehicles and motorcycles; transportation and storage; and financial and insurance activities.[3]
    - An economy-wide comparator set: a weighted average of all industries excluding real estate, public admin, education, health and social services.

Table 1 sets out the eight historical productivity measures produced by the combination of the above elements.

Table 1: Set of EU KLEMS productivity estimates for consideration in setting OE challenge at FD

Productivity measure	Expenditure category for possible application	Targeted comparator set	Economy-wide comparator set
VA LP at constant capital	opex	0.8%	1.0%
VA TFP	capex, repex, opex	0.5%	0.9%
GO LEMS at constant capital	opex	0.3%	0.5%
GO TFP	capex, repex, opex	0.2%	0.4%

Source: CEPA analysis of 2019 EUKLEMS

Some responses to the DD place seem to suggest that all EU KLEMS figures presented in the Frontier Shift DD report should be considered valid and given equal consideration in setting the OE challenge – rather than appreciating that some numbers were included to illustrate the impact of exploring approaches suggested by those same companies (e.g. shorter period). Setting the OE challenge should be seen as a process of taking account of different pieces of evidence, rather than a purely statistical analysis of EU KLEMS.

When considering the weight to be placed on different results from the growth accounting analysis, Ofgem will need to take a view on:

- The strength of the recent past as a guide to the future, especially given the large falls in productivity seen around the time of the global financial crisis in 2008/9. We note that the recent CMA provisional finding on PR19 stated that the water companies (and by implication other regulated utility sectors) may not have been so badly affected by the recent slowdown in wider productivity growth. [4]
- The relative weighting given to GO and VA productivity measures; both of which have typically been considered by regulators in the OE challenge set in recent energy and water price control decisions in the UK.

[3] These four industries represent about 40% of the economy-wide comparator set, based on share of value added or gross output.

[4] CMA (2020), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Provisional findings, available online, September.

- The balance between TFP and partial factor productivity measures, including putting some weight on labour productivity measures when considering productivity potential for opex. This has been done in recent price control settlements in the energy and water sector.
- The difference between insights from the productivity estimates produced by targeted comparator sets compared to historical developments in economy-wide productivity.

Ofgem has historically looked at long periods when setting productivity challenges, i.e. it has avoided setting OE challenges based on high or low current values. If it deviated from this approach in RIIO-2, e.g., it decided to make an adjustment for near term productivity trends, then in future it may need to take account of short term high productivity in order to avoid rewarding the networks by switching back to a long term trend approach.

Other evidence on OE

Other evidence to be considered by Ofgem in addition to growth accounting analysis includes relevant recent regulatory precedent, and network companies' stated ambitions for OE in terms of what they embedded in the RIIO-2 cost forecasts submitted in their business plans.

Our DD Frontier Shift report also discussed the use of economy-wide productivity forecasts. The scale and unevenness of economic disruption caused by COVID-19, and associated uncertainty about the impact on productivity potential in the energy network sector, means that our updated assessment is that little, if any, weight should now be put on those near-term forecasts when setting the OE challenge for the whole of the RIIO-2 period.

Setting the OE challenge

Setting the OE challenge requires consideration of multiple pieces of evidence to make an informed judgement on the frontier productivity improvements that could be achieved by energy network companies over RIIO-2.

It is instructive to start by considering what the companies themselves state that they have assumed for OE in their business plan submissions. We suggest that these should be considered by Ofgem as a potential lower bound for the OE challenge to avoid setting one that was less ambitious than that indicated by the companies themselves. All but one of the company OE assumptions are at or above 0.5%.

Achieving an annual OE improvement of 0.5% would fall in the middle of the set of historical productivity figures from EU KLEMS analysis shown in Table 1; i.e. it is not outside the bounds of what has been achieved in the historical comparators.

Therefore, in light of the levels of ambition set out by the companies, it seems reasonable to set 0.5% as a lower bound for the OE challenge for capex/repex and opex.

In setting the OE challenge, Ofgem should judge how much weight it places on the following factors that we consider would together support **a more stretching OE challenge of up to 0.95% on capex/repex and 1.05% on opex:** [5]

- Regulatory precedent, including the recent CMA provisional finding for PR19 which set a OE challenge for totex of 1.0%.[6] The rationale for this level of challenge included factors such as greater weighting on productivity growth before 2007, and that EU KLEMS data does not capture cost savings from quality improvements that are 'embodied' in the inputs used by the network companies.
- OE challenges suggested by most ambitious companies, such as 1% (totex) by SGN, 1% (totex) by SPT, and 1.1% (opex) by NGET and NGGT.

[5] This should not be seen as being equivalent to using a single data point considered in our growth accounting analysis; even if by coincidence, 1.0% is the highest value shown in Table 1.

[6] CMA (2020), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Provisional findings, available online, September.

- Placing greater weight on VA productivity measures, and/or economy-wide historical productivity improvements.
- Consideration of labour productivity measures in setting the OE challenge for opex.
- Placing less weight on the wider productivity slowdown in recent years, which would effectively see the productivity puzzle as being less relevant for regulated utility sectors – e.g. because of greater revenue and investment certainty in the regulated sectors. Hence for these sectors, productivity growth potential would be assessed as looking more like the level seen before the financial crisis than may be the case for competitive sectors.
- Considering the large productivity decline in 2009 as an outlier, which excessively drags down the 1997-2016 average for productivity growth. The decline is not matched in magnitude by the recovery in subsequent years.
- The benefits of innovation funding provided in RIIO-1 in improving the potential for the network companies to achieve productivity levels closer to those in the better performing competitive sectors. This is a different issue to whether innovation funding provides a specific top-up on productivity potential above those higher performing sectors.[7] Even DD responses that criticised the innovation top-up on the OE challenge noted that one of the drivers for innovation funding was to encourage the sector to match investment in innovation that would be seen in other sectors (rather than necessarily investment in excess of those sectors). There will be multiple types of benefits from innovation of which improved scope for cost savings is one.

Ofgem could also consider the impact on potential productivity improvements in the energy sector of economy-wide shocks to growth and productivity over the RIIO-2 period. The possible impact of these shocks can be seen in recent downward revisions of productivity forecasts for the UK economy for the next few years. These shocks include the possible negative productivity impacts from COVID-19 or the move to new trading arrangements with the EU from 1 January 2021. Again, we note that in its provisional PR19 finding, the CMA decided that it was not appropriate to make an explicit downward adjustment at this stage to capture the possible impact of COVID-19.

Approach to Real Price Effects

In its RIIO-2 Sector-Specific Methodology Decision paper (SSMD), Ofgem confirmed its intention to make use of indexation to account for RPEs.[8] This will replace the approach of fixing RPE allowances ex ante that was used in RIIO-1.

Our DD Frontier Shift report set out the five steps required to set forecasts for these allowances at the start of the RIIO-2 period. There will be an annual true-up of the RPE allowances after the relevant index/indices are published each year, and a final true-up will occur at the end of RIIO-2 as part of the close-out process.

This report sets our updated position on each of the five steps:

1. **Determination of input cost structures.** We have updated the cost structure information to reflect the share of each expenditure category (e.g. direct opex, indirect opex, capex, repex) in the indicative totex allowances for FDs rather as submitted in the business plans.[9] However, the weighting of each cost category (e.g. labour, materials, etc.) within each expenditure category is still taken from the December 2019 business plans. This is because Ofgem does not produce that information as part of the allowance

[7] If Ofgem wants to apply a specific top-up for innovation to the figures presented in this report, then it should take that into account when setting the OE challenge based on the figures presented in the report to ensure that innovation benefits are not counted twice.

[8] Ofgem (2019) *RIIO-2 Sector-Specific Methodology – Core document.* Decision Paper.

[9] Data provided for GD on 21 October 2020 and for ET and GT on 30 October 2020.

calculation process. The overall impact has been small changes in the weighting of each cost category compared to the DD weightings.

2. **Materiality.** We use the same materiality tests as at the DD. The tests have been rerun with updated cost structure information based on provisional FD allowances. There is no change in the cost categories judged as being material.
3. **Selection of the indices for each cost category.** We have reviewed the indices used at the DD, alongside alternatives put forward by respondents to the DD. We have updated the selected list of indices, mainly through the removal of indices used in RIIO-1 rather than through the inclusion of new indices.
4. **Developing forecasts for the indices.** Forecasts are no longer used for 2019/2020 as Ofgem is using actual data for that year in setting FD allowances. We have used the same high-level forecasting approach as at DD for the updated set of indices, using new information where it is available. We have switched to using OBR forecasts for inflation and for average earnings rather than HMT forecasts. This is to be in line with Ofgem guidance on the inflation forecasting used in the financial modelling. We continue to apply a simple approach to weighting the indices when producing the RPE forecasts for each cost category. These weights have been updated in line with changes in the number of indices used for each cost category.
5. **Treatment of cost areas not subject to RPE indexation.** We suggest no change from what was set out at the DD. Our assessment was that Ofgem should continue to apply non-zero OE assumptions to non-indexed costs. It can consider any issues with this approach as one factor to inform its judgements of selecting its final OE assumptions from the range of evidence available

RPE Forecasts

Table 2 shows the totex-level RPE forecasts, which are produced by weighting the category-level RPEs by the notional cost structure of each network.

Table 2: Forecasts for Totex RPE (net of 'Ofgem inflation index', to 1 d.p.)

Network	2020/21	2021/22	2022/23	2023/24	2024/25 – 25/26
Corresponding inflation index	RPI (using OBR forecast)	CPIH (using OBR CPI forecast)			CPIH (long-term avg.)
GDNs	0.9%	1.4%	1.1%	1.0%	0.9%
NGGT (TO)	1.0%	1.5%	1.2%	1.1%	1.0%
NGGT (SO)	0.9%	1.3%	1.0%	0.9%	0.9%
NGET	0.7%	1.1%	0.9%	0.8%	0.7%
SHET	0.6%	1.0%	0.8%	0.7%	0.7%
SPT	0.5%	0.9%	0.7%	0.6%	0.6%

Source: CEPA analysis
Note: The Ofgem inflation index refers to using the Retail Prices Index (RPI) during RIIO-1 years and the Consumer Prices Index including owner occupiers' housing costs (CPIH) during RIIO-2. Where available, OBR forecasts from March 2020 were used: in RIIO-1 we used OBR's forecast of RPI, and for 2021/22 to 2023/24 we used OBR's forecast of CPI (OBR has not published forecasts of CPIH).

Across the period, the forecast RPEs in Table 2 are lower than at the DD – the fall is largest for TOs at about 0.5%. The reduction is only about 0.2% for GDNs and 0.1% for NGGT (TO and SO). For all sectors, the removal of RIIO-1 indices and updating of indices (e.g. switching to newer series) both contribute to lower forecast RPEs compared to the DD. The magnitude of the impact of the two changes are similar in gas; whereas the removal of RIIO-1 indices has a much bigger effect in electricity. For all the network companies, the change in index weights partially offsets these falls in the forecast RPE compared to the DD position.

1. INTRODUCTION

Ofgem commissioned a partnership of CEPA, AFRY Management Consulting (AFRY) and Economic Consulting Associates (ECA) to provide economic advice for RIIO-2. This independent report has been prepared by CEPA under this Economic Strategic Partner contract for RIIO-2.

1.1. DEFINITION OF FRONTIER SHIFT

Frontier shift is the rate at which a company at or close to the efficiency frontier can change its outputs relative to inputs. It captures changes in both the volume of inputs needed to produce a given level of output (or output produced for a given level of inputs) and in the price of inputs used.

In other words, frontier shift is ongoing efficiency (OE) net of Real Price Effects (RPEs). For example, if an efficient company makes a 1% annual efficiency gain but its input prices were also rising in real terms at 1% a year, it would be expected to keep the cost of producing its outputs approximately constant over time – i.e. the frontier shift would be zero.

1.2. SCOPE OF THIS REPORT

This report discusses the responses received to Ofgem's proposals for the OE challenge and the RPE indexation in the GD-2 and T-2 Draft Determinations (DD).

It addresses the issues covered in our DD Frontier Shift report.[10] For each issue, we set out how, in the light of the DD responses and further evidence we have gathered, we have updated our assessment of the issues faced by Ofgem in setting the OE challenge and RPE indexation for the RIIO-2 Final Determinations.

The focus of this report is on addressing points raised in the DD responses in relation to:

- **Analytical approach:** Analytical choices that had been made, e.g. periods used in the analysis for the OE challenge; or the assessment of suitable indices for use in the RPE indexation mechanism.
- **Interpretation of the evidence:** Both the interpretation of individual pieces of analysis or evidence, and how different pieces of evidence – e.g. from EU KLEMS analysis – were presented for consideration by Ofgem in its decision on the OE challenge and RPE indexation mechanism.

Many responses raised issues in relation to OE and RPEs that were not covered in our DD Frontier Shift Report. Therefore, those responses are not addressed in this report.

For example, network companies strongly argued against Ofgem's choice of OE estimate from the top of the range discussed in our DD Frontier Shift report. Ofgem's decision on where to set the OE challenge is outside the scope of our report as it is a matter for regulatory judgement. We have also not commented on responses received on other areas of regulatory judgement, such as the interaction between the level of the OE challenge, the cost benchmarking approach and strength of cost reduction incentives.

Similarly, we have not reviewed issues on which companies have asked Ofgem to change the policy framework for the OE challenge and RPE indexation. For example, this includes responses supporting policies such as:

- a return to ex ante RPE allowances (as used for RIIO-1);
- a company-specific cost structure rather than a notional cost structure in the RPE indexation mechanism for GDNs; or

[10] CEPA (2020) RIIO-GD2 and T2 Cost Assessment – Frontier shift methodology paper.

- the OE challenge to be differentiated for each company according to its size.

Respondents also raised points in relation to the detailed application of OE and RPE in the cost assessment modelling process. This includes issues such as:

- The appropriate treatment of OE assumptions embedded in the RIIO-2 business plans submitted by the network companies.
- Formula and computational errors relating to OE and RPEs in the cost assessment files.
- The application of the OE challenge to specific elements of totex.

Again, as these issues were not covered in our DD Frontier Shift Paper, we do not cover them in this report.

1.3. Structure of the report

The rest of this report is structured as follows:

- Section 2 discusses the use of growth accounting analysis to estimate historical productivity improvements to inform the OE challenge for RIIO-2.
- Section 3 explores evidence for Ofgem to consider in setting the OE challenge in addition to growth accounting analysis.
- Section 4 sets out the analysis undertaken to develop the RPE indexation mechanism and forecasts for RIIO-2.
- Section 5 explores the evidence currently available on how the COVID-19 crisis may affect the productivity improvements and changes in real input prices in the energy network sector.

Appendix A details the two-stage assessment process used to select the list of indices to be used in the RPE indexation mechanism in RIIO-2.

2. GROWTH ACCOUNTING ANALYSIS

This section of the report describes our advice on the use of historical productivity estimates from the EU KLEMS data set in the setting of the OE challenge for RIIO-2. For the overall approach to growth accounting analysis, as well as the following four main elements of the growth accounting analysis, we consider in turn the DD responses received and our updated assessment to inform Ofgem's FD position:

- The period(s) over which the long-term average is calculated.
- The use of Gross Output (GO)[11] or Value Added (VA)[12] measures.
- The difference between Total Factor Productivity (TFP) and partial factor productivity measures, typically Labour Productivity (LP or LEMS).
- The choice and weighting of comparator industries out of the set of more than 40 potential comparators in the 2019 EU KLEMS data set.

2.1. APPROACH TO GROWTH ACCOUNTING ANALYSIS

2.1.1. Approach taken for the DD

Our DD Frontier Shift report set out that there is a well-established methodology of using growth accounting analysis of historical productivity improvements to inform the OE challenge for regulated companies.[13] Although backwards-looking in nature, this analysis is used to assess the scope for future improvements in productivity by regulated companies. This is done by considering what lessons can be drawn from past productivity improvements in situations with some, albeit imperfect, comparability to the energy network companies in RIIO-2.

Our June 2019 Frontier Shift paper[14] published alongside Ofgem's consultation on tools for cost assessment[15] identified the EU KLEMS dataset as the preferred dataset for growth accounting analysis. That approach had been supported by respondents to the Ofgem's Sector Specific Methodology Consultation (SSMC) [16] for RIIO-T2/GD2, who all favoured the continued use of the EU KLEMS data set to inform the OE challenge.

The EU KLEMS data set provides multiple choices for the calculation of long-term averages for different productivity measures across different groups of industries. Our DD Frontier Shift report explored the impact on the reported historical productivity measures of making different assumptions about the four main elements: period, GO or VA measures, TFP or LP measures; and different sets of industry comparators.

In Tables 2.2 and 2.3 of our DD Frontier Shift report, we presented 40 different estimates for historical productivity growth varying by:

- Period: 1997-2016; and 2006-2016 (2).

[11] The simple aggregate of output by one or more companies. The inputs used to make gross output are capital, labour and intermediate inputs (energy, materials, services). In simple terms, GO assumes that intermediate inputs are a factor in production (I.e., materials, contractors, etc) and therefore business will make decisions on production if prices change for intermediate inputs.

[12] Value added (VA) is equivalent to gross output minus the value of intermediate inputs required to produce the final output. VA inputs are therefore labour and capital only. This means that productivity changes resulting from variations in the use of intermediate inputs should not be captured in VA measures.

[13] CEPA (2020).

[14] CEPA (2019), RIIO-GD2 cost assessment – frontier shift.

[15] Ofgem (2019), RIIO-2 tools for cost assessment.

[16] Ofgem (2018), RIIO-2 Sector-Specific Methodology. Consultation Paper.

- VA and GO (2).
- TFP and LP/LEMS (2).
- Industry comparator sets (5).

This was intended to provide a comprehensive set of estimates of historical productivity measures for Ofgem to consider in setting the OE challenge. As the growth accounting analysis is necessarily an imperfect guide to the future, multiple estimates are normally reviewed in order to understand the sensitivity of historical productivity growth to different assumptions (e.g. period or comparator industry set). This includes whether there are common trends or particular outliers. This then informs judgements on the relevance of the historical evidence in setting the future OE challenge for the regulated companies.

Our DD Frontier Shift report presented a reference range for the OE challenge of 0.6% to 1.0% for capex/repex and 1.0% to 1.2% for opex. This was based on:

- The period between 1997 and 2006.
- VA measures.
- TFP for capex/repex and LP for opex.
- Two industry comparator sets, which gave rise to a range of values being presented:
    - A 'targeted' (or narrow) comparator set: (construction, wholesale and retail trade: repair of motor vehicles and motorcycles; transportation and storage; and financial and insurance activities).[17]
    - An economy-wide comparator set: weighted average of all industries excluding real estate, public admin, education, health and social services.

In relation to growth accounting analysis, we also noted that Ofgem should consider placing some weight on GO measures of productivity when setting the final OE challenge. We also set out that Ofgem should consider two pieces of wider evidence – economy-wide productivity forecasts from the OBR and BoE, and the case for an upwards adjustment of up to 0.2% to ensure that consumers receive a reasonable return on the innovation funding mechanisms provided to the companies in RIIO-1.

Ofgem set the DD OE challenge at 1.2% for capex/repex and 1.4% for opex. This represented the sum of the highest value in the reference range for growth accounting analysis[18] plus the full 0.2% uplift for innovation funding.

2.1.2. Responses to the DD

There was general agreement in the DD responses that EU KLEMS estimates of historical productivity improvements should be an important input into the OE challenge. However, respondents, particularly energy network companies and their advisors, disagreed with the interpretation and weighting put on different productivity estimates produced by our growth accounting analysis.

In the DD responses, there was a lot of commentary on both:

- CEPA's discussion and presentation of the different productivity measures, and the implications for how the analysis could be interpreted by Ofgem when setting the OE challenge.
- Ofgem's implicit selection of an OE measure based on a single productivity measure, and the implications for the technical application of that OE challenge to the cost base of energy network companies.

[17] These four industries represent about 40% of the economy-wide comparator set, based on share of value added or gross output.

[18] Although not explicitly stated by Ofgem, this was equivalent to using VA measures only, and placing no weight on GO measures.

The latter is outside the scope of our work and this report, and will be considered by Ofgem in setting the OE challenge for FD.

The First Economics response provided on behalf of the ENA (and also submitted by SGN, NGN and WWU) noted that it could not reconcile our EU KLEMS productivity figures with the published EU KLEMS values.[19] It wondered whether this suggested an error in our calculation approach – for example the use of arithmetic rather than geometric means.

2.1.3. Our assessment for the FD

It is important to reiterate the use of growth accounting analysis in informing the OE challenge set by regulators. There is not a single combination of period, productivity measures, and comparator sectors that can be described as an exact match for the frontier productivity improvements that could be achieved by energy network companies over RIIO-2. This is because:

- The past is not an exact guide to the future; so even if you were looking at productivity growth in the same sector, it does not automatically translate that future performance should automatically equal what was seen in the past.
- There are a variety of productivity measures available (e.g. GO v VA; TFP v LP), each with advantages and challenges for the applicability to the energy networks sector.
- There is no independent comparator set of sectors that can exactly map onto the energy networks.[20]
- It is not possible to put a firm dividing line between the energy networks and the improvements in productivity achieved in the wider economy in sectors outside the closest comparators.[21]

However, Ofgem still faces the challenge of setting an OE challenge to apply for RIIO-2.

Therefore, multiple historical productivity estimates are typically used to inform what lessons can be drawn from past productivity improvements when considering the scope for future productivity improvements at the efficiency frontier of the regulated sector. Ultimately, the aim is to provide an OE challenge for the energy network sector over RIIO-2 informed by the levels of sustainable productivity growth that has been achieved in past circumstances with some, albeit imperfect, comparability.

Main set of historical productivity values

For the FD, we suggest that when setting the OE challenge, Ofgem should take into account historical productivity measures based on a combination of the following elements:

- The period between 1997 and 2016 (1).
- GO and VA measures (2)
- TFP for capex/repex and opex; and LP/LEMS for opex (2)
- Two industry comparator sets (2):
    - A ‘targeted’ (or narrow) comparator set: construction, wholesale and retail trade: repair of motor vehicles and motorcycles; transportation and storage; and financial and insurance activities.

[19] First Economics (2020), Frontier Productivity Growth: A report prepared for the ENA, August, p15

[20] It is not appropriate to use energy sector measures directly from EU KLEMS as this does not provide a challenge based on what other similar sectors have achieved in productivity improvements.

[21] This tension was seen in DD responses which supported high weighting on EU KLEMS measures from a small number of sectors, whilst also arguing for significant consideration to be given to forecasts of slow productivity growth in the wider economy.

- An economy-wide comparator set: weighted average of all industries excluding real estate, public admin, education, health and social services.

Table 2.1 sets out the eight historical productivity measures produced by the combination of the above elements.

Table 2.1: Set of EU KLEMS productivity estimates for consideration in setting OE challenge at FD

Productivity measure	Expenditure category for possible application	Targeted comparator set	Economy-wide comparator set
VA LP at constant capital	opex	0.8%	1.0%
VA TFP	capex, repex, opex	0.5%	0.9%
GO LEMS at constant capital	opex	0.3%	0.5%
GO TFP	capex, repex, opex	0.2%	0.4%

Source: CEPA analysis of 2019 EUKLEMS

Regulatory precedent on OE challenge and use of historical productivity values

Table 2.2 shows how the OE challenge set and productivity measures considered by regulators in recent price controls in energy and water in the UK.

Table 2.2: OE challenge and productivity measures in recent energy and water price controls in the UK

Price control	Decision-making body	OE challenge set	Explicit use of GO and VA	Explicit use of TFP and LP
PR19 (Provisional Findings)[22]	CMA[23]	1.0%	Use both GO and VA	TFP
PR19[24]	Ofwat	1.1%	Use both GO and VA	TFP
RP6 (NIE)[25]	UR	1.0%	Use both GO and VA	Mainly a consideration of other regulatory decisions; these covered TFP and LP
GD17[26]	UR	1.0%	Use both GO and VA	Mainly a consideration of other regulatory decisions; these covered TFP and LP
GD14[27]	UR	1.0%	Use both GO and VA	Mainly a consideration of other regulatory decisions; these covered TFP and LP
RP5 (NIE)[28]	CC	1.0% for opex 1.0% for capex	Both discussed	Use both TFP (capex/repex) and LP (opex)
RIIO GD-1 and T-1[29]	Ofgem	1.0% for opex 0.7% for capex/repex	Use both GO and VA	Use both TFP (capex/repex) and LP (opex)

Consistency with published EU KLEMS values

EU KLEMS publishes its:

- Dataset.
- Methodology approach.

[22] CMA (2020), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Provisional findings, available online, September, page 186.

[23] The CMA use the term Frontier Shift to refer to the OE challenge.

[24] Ofwat (2019), PR19 Final Determinations – Securing Cost Efficiency. Technical Appendix.

[25] Utility Regulator of Northern Ireland (2017), Northern Ireland Electricity Networks Ltd, Transmission & Distribution 6th Price Control (RP6), Final determination, June; and Utility Regulator of Northern Ireland (2017), Annex C Frontier Shift: Real Price Effects & Productivity RP6 Final Determination; June.

[26] Utility Regulator of Northern Ireland (2016), Price Control for Northern Ireland's Gas Distribution Networks GD17 Final Determination; and Utility Regulator of Northern Ireland (2016), Annex 6 Real Price Effects & Frontier Shift GD17 Final Determination

[27] Utility Regulator of Northern Ireland (2013), GD14 Price Control for Northern Ireland's Gas Distribution Networks for 2014-2016 GD14 Final Determination. December; and Utility Regulator of Northern Ireland (2013), Price Control for Northern Ireland's Gas Distribution Networks GD14 Consultation Paper, July; and Competition Commission (2014) Northern Ireland Electricity Limited price determination, A reference under Article 15 of the Electricity (Northern Ireland) Order 1992, Final determination.

[28] Competition Commission (2014) Northern Ireland Electricity Limited price determination, A reference under Article 15 of the Electricity (Northern Ireland) Order 1992, Final determination.

[29] Ofgem (2012), RIIO-T1/GD1: Real price effects and ongoing efficiency appendix, December, and Ofgem (2012) RIIO-T1/GD1: Initial Proposals – Real price effects and ongoing efficiency appendix, July

- VA TFP, VA LP, and VA capital indices.

While EU KLEMS publishes its methodology, it does not publish the calculations that it uses to produce the productivity estimates.[30] Rather than using the final productivity values published by EU KLEMS, we calculated our own estimates of VA TFP, VA LP, GO TFP and GO LEMS using the underlying EU KLEMS data on output, capital, and labour.

To do this, we followed the methodology published by EU KLEMS to calculate VA TFP and VA LP estimates of productivity.[31] Specifically, we used Törnqvist indices and Divisia weights within our calculations.[32] This approach is also in line with OECD recommendations for estimating productivity change.[33]

We have discussed with the Vienna Institute for International Economic Studies (WIIW), the academic institution responsible for managing the EU KLEMS dataset, the differences between the productivity estimates presented in our Frontier Shift DD report and the productivity estimates that are published directly in EU KLEMS.

WIIW has informed us that they have used a Laspeyres formulation to calculate the published labour and capital services indices.[34] WIIW have told us that the published labour and capital Laspeyres indices do not however enter directly into the calculations used by WIIW to produce their productivity indices. This means that it is not possible to replicate the productivity growth rates published by EU KLEMS by applying the EU KLEMS methodology to the published labour and capital indices.

We understand that WIIW have used the Laspeyres formulation as this approach is normally chosen by national Statistics Agencies for National Accounts. The use of the Laspeyres formulation in this way is not set out in any of the published EU KLEMS documentation.[35] Therefore, in this report, we present the historical productivity growth rates based on the values published by EU KLEMS.

2.2. PERIOD FOR GROWTH ACCOUNTING ANALYSIS

2.2.1. Approach taken for the DD

We recommended that the appropriate period over which to consider the growth accounting analysis was 1997 to 2016. Our rationale for this recommendation is that the proposed period captures two complete business cycles, which is the maximum contained in the 2019 EU KLEMS data set.

We considered that a longer period over at least two business cycles is likely to reduce sensitivity to measurement error. This will result in an average productivity growth rate that may be more representative of long-run underlying factors. Including data for the most recent years available also addressed the point made by many of the network

[30] The Vienna Institute for International Economic Studies (WIIW, 2019), Industry Level Growth and Productivity Data with Special Focus on Intangible Assets – Report on methodologies and data construction for the EU KLEMS Release 2019, October.

[31] GO productivity growth values are not published for EU KLEMS and cannot be directly calculated from EU KLEMS data; so we have produced these by transformation of the VA values as described in our Frontier Shift DD report.

[32] WIIW (2019), pages 3 to 8.

[33] OECD (2001), Measuring Productivity: OECD Manual.

[34] We note that National Accounts typically use chain-linking with the Laspeyres index. This is intended to replicate the properties of superlative indices like the Törnqvist. The OECD describe superlative indices as: "*Superlative indices are price or quantity indices that are 'exact' for a flexible aggregator. A flexible aggregator is a second-order approximation to an arbitrary production, cost, utility or distance function. Exactness implies that a particular index number can be directly derived from a specific flexible aggregator.*"

[35] We understand that, as in growth accounts, mostly log growth rates are used, it is more appropriate to use an exponential index; and hence the WIIW will move away from using the Laspeyres transformation in this way in the next EU KLEMS update. This should result in the publication of labour and capital indices that can be used to replicate the historical productivity growth rates published by EU KLEMS.

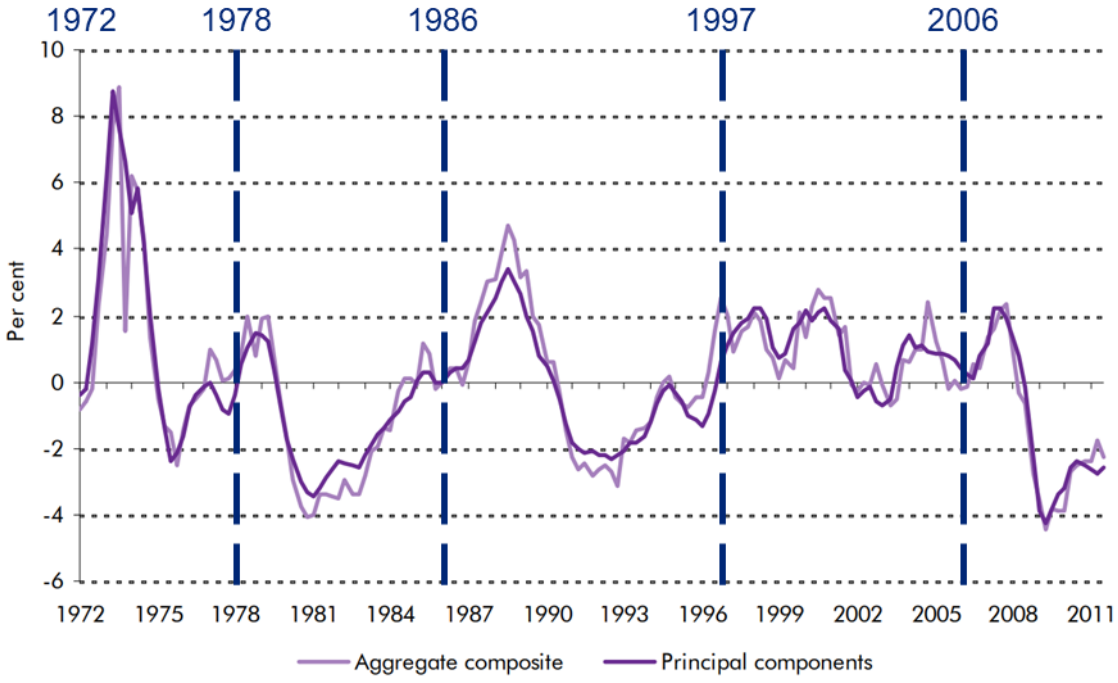
companies in their December 2019 business plan submissions that at least some weighting should be given to the slow growth in productivity seen since the global financial crisis of 2008-2009.

Our June 2019 Frontier Shift report[36] discussed the challenges of showing that a structural break has occurred in data series, which is particularly difficult when considering a cyclical variable like productivity. There was a period of highly unusual economic conditions around the financial crisis of 2008-2009, which account for about 20% of the shorter period of 2006-2016 that we explored in the Frontier Shift DD report. In addition, the Bank of England has reported that the fall in UK productivity since the financial crisis is attributable to the performance of four sectors which together accounted for one-third of total output: manufacturing, finance, ICT and professional services. Manufacturing and finance together accounted for three-quarters of the decline in productivity growth.

Our estimation of the timing of business cycles was based on our analysis of the OBR data on output gaps available at that time. Productivity is a highly cyclical variable which shows marked variation over the business/economic cycle. In general, it is pro-cyclical, as productivity growth tends to accelerate during periods of economic expansion and decelerate during periods of recession. Hence it is standard practice to consider productivity growth over complete economic cycles. We consider the following to be complete business cycles, reckoned as a point of zero output gap to another point of zero output gap, including both a peak and a trough. Based on the Office of Budgetary Responsibility's (OBR) data on the output gap, shown in Figure 2.1, the business cycles since 1972 are, by this definition:

- 1972 – 1978,
- 1978 – 1986,
- 1986 – 1997, and
- 1997 – 2006.

Figure 2.1: UK Output Gap (%) and identification of complete business cycles

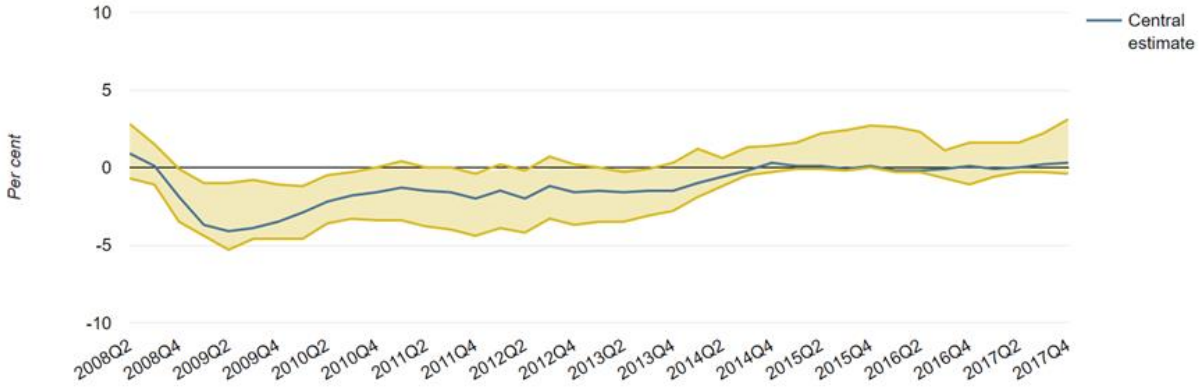


Source: CEPA analysis of figure in Working paper No.1: Estimating the UK's historical output gap, Office of Budget Responsibility, 2011

[36] CEPA (2019)

Given that the 2019 EU KLEMS dataset includes data beyond 2011, we considered data from OBR on the output gap in more recent years. As shown in Figure 2.2, the output gap reached zero in late 2014/early 2015 and remained there until 2016. Therefore, we include the period 2006 – 2016 as the most recent business cycle in our analysis of the 2019 EU KLEMS dataset. However, given this was a period of highly unusual economic conditions, the estimate for this period may not be as precise as for other periods in our analysis.

Figure 2.2: UK Output Gap (%) between 2008 and 2017



Source: The Output Gap, Office of Budget Responsibility, 2018

2.2.2. Responses to the DD

Most of the network companies criticised the analytical focus on the period between 1997 and 2016. Several respondents argued that CEPA and Ofgem mistakenly included, or placed too much weight on, pre- financial crisis trends in productivity growth (i.e. the 1997-2006 business cycle) because productivity growth in the wider UK economy had slowed markedly over the last business cycle (2006-2016).

Where supporting evidence was provided, this was generally in the form of showing that productivity growth for the economy or comparator sectors has been much lower in the past decade. This evidence was not accompanied by detailed descriptions of how this wider slowdown may have fed through into the productivity potential for the energy network companies in RIIO-2.

2.2.3. Our assessment for the FD

In our Frontier Shift DD report, we considered the case for putting greater weight on a shorter and more recent period in the growth accounting analysis (2006-2016). However, we noted that this period already accounts for just over 50% of the period (1997-2016) on which our growth accounting analysis is based. This is contrary to the implication in many of the DD responses from network companies that our analysis ignores that period.

Wider evidence on trends in UK productivity

Since the financial crisis of 2008-09, UK labour productivity growth has been historically weak. In the decade preceding the crisis, labour productivity growth was close to historical long-term averages of 2.0% per year, but in the decade since has only averaged 0.4% per year. This sustained period of low growth is unusual in the UK's economic history and has been labelled the UK's "productivity puzzle". Whilst other advanced economies have seen similar slowdowns, the UK's productivity puzzle is deeper and more persistent than elsewhere.[37]

In recent years, several theories have emerged seeking to explain the puzzle:

[37] ONS (2020), Productivity measurement – how to understand the data around the UK's biggest economic issue, available online; , March. See also OBR (2017) "The productivity puzzle" available online, September.

- Structural theories are based on long-term economic trends which are gradually eroding productivity growth, for example the depletion of North Sea oil and gas reserves, changes in financial regulation, and changing patterns of international trade.
- (Mis)management of resources, including weak UK management practices (often cited in international productivity comparisons), temporary labour hoarding, and labour misallocation (labour moving from high to low productivity industries).
- Misallocation of capital, including the hypothesis that UK banks had allowed "zombie firms" to continue trading by forbearing on bad loans, and a slowdown in business investment growth.
- Measurement arguments with two main hypotheses: first, that recent digital innovations are not well captured in the economic data; and second, that some activity that used to be counted towards GDP now falls outside the "productive boundary" and has moved to the household sector.
- Reduced innovation, exhibited either in a slowdown in the flow of ideas or new technologies, and/or in slower productivity growth by frontier firms.

Given the complexity of explaining UK economic performance over the past two decades, it is likely that the productivity puzzle is caused by the interaction between multiple causes. But as yet there is no firm consensus view amongst macroeconomists on the primary causes, or indeed the extent to which the current weaker trend amounts to a structural break, as was argued by the network companies in response to the DD consultation.

Amongst those who have looked closely at the data and the potential underlying drivers of the puzzle, Tenreyro (2018) notes that:

- Finance and manufacturing account for three-quarters of the slowdown in aggregate UK productivity growth post-2009. But the post-crisis productivity drag from finance should disappear as deleveraging runs its course. Slower manufacturing productivity growth may relate to a reduction in the impact of lower-priced imported inputs from China and other emerging markets.
- Persistently weak investment has also been playing an increasingly important role in the weakness of manufacturing and aggregate productivity.
- The remaining quarter of the slowdown is explained by ICT and professional, scientific and technical services.[38] With this context, it is worth noting the difficulties in measuring prices and productivity in the telecoms sector which may have contributed to an underestimatation of output over the last decade.[39]

Putting more weight on a shorter period (i.e. since 2008) in setting the OE challenge would represent an assumption that the global financial crisis has created a structural break in the long-term productivity of the UK economy, and also the energy network sector. However, it is not yet clear that the evidence exists for such a strong assumption when it is challenging to confidently identify a structural break in long-term productivity growth. One of the reasons for using a longer period is that often so-called structural shifts in economic fundamentals have turned out to be much less permanent than has been claimed at the time.

Impact of calculating historical productivity over different periods

Table 2.3 and Table 2.4 respectively show the GO and VA TFP measures over the period 1997-2006 (a single business cycle) as well as the periods of 1997-2016, and 2006-2016 shown in our Frontier Shift DD report. These tables illustrate the variability in growth accounting estimates produced over different business cycles.

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[38] Tenreyro, S. (2018), The fall in productivity growth: causes and implications, available online.

[39] The Economist (July 2020), Has the ONS solved the "productivity problem, available online; see also Jackson, G. (2019), Speech on the productivity puzzle available online and ONS (2020), Improvements to the measurement of UK GDP: an update on progress, July, available online.

Table 2.3: GO TFP measure for the targeted comparator set averaged over different periods

Period	Source	Value
1997-2006	CEPA analysis	0.7%
1997-2016	**CEPA analysis**	**0.2%**
2006-2016	CEPA analysis	-0.2%

Source: CEPA analysis of 2019 EU KLEMS

Table 2.4: VA TFP measure for the targeted comparator set averaged over different periods

Period	Source	Value
1997-2006	CEPA analysis	1.7%
1997-2016	**CEPA analysis**	**0.5%**
2006-2016	CEPA analysis	-0.5%

Source: CEPA analysis of 2019 EU KLEMS

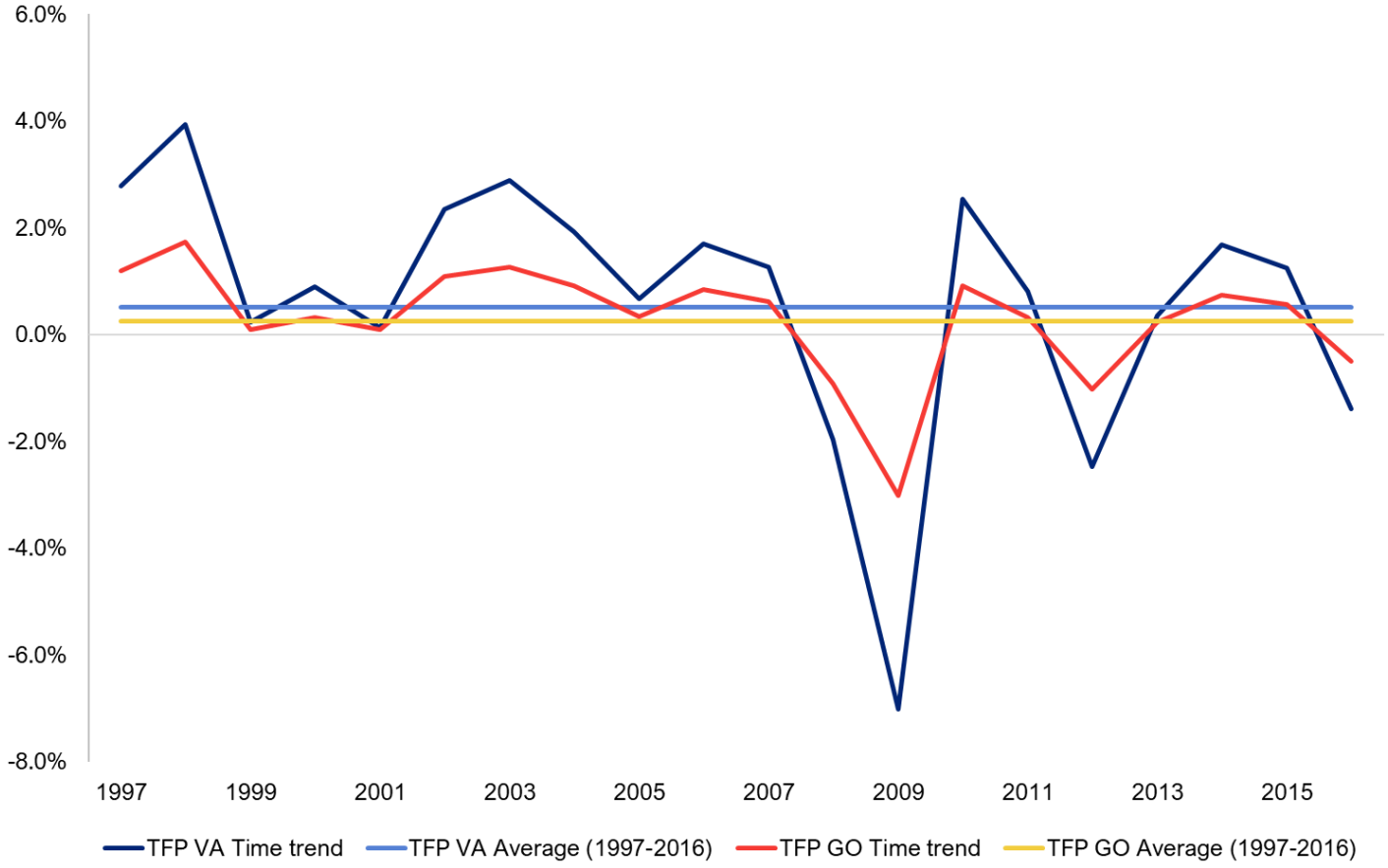
Time trends in TFP values for comparator sets of industries

We have further explored the time trends in productivity in the two main comparator sets proposed to inform the OE challenge:

- **Targeted comparator set:** Unweighted average of selected industries - Construction; Wholesale and Retail Trade: Repair of Motor Vehicles and Motorcycles; Transportation and Storage; Financial and Insurance Activities.
- **Economy-wide comparator set:** Average of all industries weighted by share of GO or VA. (excluding real estate, public admin, education, health and social services).

For the targeted comparator set, Figure 2.3 demonstrate the year on year variability in the GO TFP and VA TFP measures. This is compared to the average annual productivity growth over the period of 0.2% for GO TFP and 0.5% for VA TFP. Both productivity measures show a similar overall pattern, albeit with the VA measures having higher peaks and lower troughs, and highlight the strong impact of the global financial crisis in 2009. The annual change in productivity in 2009 is by far the single largest annual change in productivity over the period, with a fall of 2.8% in the GO TFP measure, and a fall of 6.6% in the VA TFP measure. There is not a bounce back in TFP of similar magnitude in the years following 2009. Whilst there is a return to positive productivity growth in 2010, it does not appear to be an outlier across the period, unlike the decline in 2009.

Figure 2.3: Annual values of GO TFP and VA TFP for targeted comparator set (1997-2016)



Source: CEPA analysis of EU KLEMS

Periods for EU KLEMS analysis in other recent price controls

It is instructive to look at the period used by the CMA to inform the OE challenge of 1.0% it set in its recent provisional findings in respect of PR19 in the water sector.[40]

The CMA reports that its GO TFP measure for its choice of comparator industries is 0.7% for the period 1990-2007. We cannot replicate the period used by the CMA using the 2019 EU KLEMS data set as it does not contain values on a consistent basis back to 1990. The GO TFP measure for the same comparator industries as used in PR19 would be 0.4% if measured between 1997 and 2016 (in the 2019 EU KLEMS data set we are using) – i.e. 0.3% lower than the CMA estimate.

Conclusion on period

We recognise that UK productivity growth has been weak over the past decade. In light of the current macroeconomic environment, it appears unlikely that economy-wider productivity growth will return to historic trends on a sustained basis for some time. We discuss forward-looking productivity estimates for the UK economy further in Section 3.1.

The underlying causes of weak productivity growth remain unproven, which makes it difficult to assess the extent to which the economy-wide slowdown is more or less relevant to the network companies. For example, none of the companies provided any evidence to suggest that the factors inhibiting business investment (such as uncertainty about the UK's future trading arrangements with the EU) were a serious concern for the productivity of the transmission and gas distribution sectors.

[40] CMA (2020)

Utilities have the protection offered by regulated revenue streams from a monopoly service. This should give them greater ability to protect innovation and investment activity and maintain scale during periods of low or negative productivity growth in the wider economy than comparable competitive sectors facing much greater uncertainty over demand.

In summary, we do not accept the network companies' DD responses (and business plan submissions) that it would be more appropriate to discount longer-term productivity trends. As discussed above, there is a sound methodological basis for using information over more than one business cycle. Focusing only on the most recent business cycle would place excess weight on the impact of the global financial crisis and would risk locking the sector into a self-reinforcing low productivity cycle.

In the context of setting the OE challenge for RIIO-2, we have not seen any compelling evidence for why the slow productivity growth in recent years should be considered to be the main or even sole benchmark for the productivity improvements that can be achieved by the energy network companies over the next five years; as opposed to considering the average productivity growth that has been achieved over a longer period.

Taking all of these arguments into account, we support the use of a longer period that includes business cycles both pre- and post-financial crisis, without putting too much weight on only one. This would mean that Ofgem places some weight on the strong pre-crisis period (1997-2006) and also on more recent trends since the crisis (2006-2016) when productivity growth has been subdued. We also note the particular impact of the 2009 economic crash on the overall average reported productivity growth.

2.3. GO AND VA PRODUCTIVITY METRICS

2.3.1. Approach taken for the DD

Our DD Frontier Shift report discussed the use of both VA and GO measures. We presented a reference range for the OE challenge that was based on VA measures.

However, we noted that Ofgem should consider placing some weight on GO measures of productivity when setting the final OE challenge. This reflected the fact that there is no consistent expert view on whether VA or GO are better productivity measures. Our report also explained that the rate of change in VA measures will always be greater in absolute terms that than the rate of change in GO measures.

Ofgem set the DD OE challenge at 1.2% for capex/repex and 1.4% for opex. This was based on the highest value in the reference range for growth accounting analysis. Although not explicitly stated by Ofgem, this was equivalent to using VA measures only, and placing no weight on GO measures.

2.3.2. Responses to the DD

The network companies commented on the use of GO and VA productivity measures, with the main points raised being that:

- Ofgem had placed too much weight on VA methods of TFP estimation, because previous regulatory decisions concluded that GO measures are more appropriate to measuring potential for efficiency improvement. Respondents highlighted that this point had been made by CEPA in published reports relating to other price control processes.
- First Economics argued that for consistency, any OE challenge based only on a VA measure should only be applied to a subset of expenditure that corresponds to the VA element, and no OE challenge should be applied to rest of totex. This would reduce the level of challenge applied to overall totex. [41]

[41] First Economics (2020).

2.3.3. Our assessment for the FD

We agree that as discussed in our Frontier Shift DD report, GO measures should be considered in the decision on where to set the OE challenge.

We do not agree however that the OE challenge should be set on the basis of GO measures only. Rather, as stated in our DD Frontier Shift report, good regulatory practice is to consider the information provided by both GO and VA measures. Neither measure is perfect for direct application to network companies, and none of which can be made perfect by further adjustments.

In our discussion of the overall approach to growth accounting analysis, we discussed how both GO and VA measures have been considered in recent price controls in energy and water in the UK (Table 2.2 in Section 2.1.3). This includes work by the CMA (and its predecessor, the Competition Commission), Ofgem, Ofwat and the UR (in Northern Ireland). Some of the price control decision documents themselves noted the importance on regulatory precedence in this area. For example, in its September 2020 provisional finding on PR19, the CMA stated that:

> *"We agreed with Ofwat that some weight should be placed on the value-added metric for two reasons:*
>
> *First, there was some theoretical basis for doing so. The OECD's manual on measuring productivity suggests that there is some empirical support for both approaches as a measure of technical change.*
>
> *Second, the gross output estimates may be more prone to error. This is because producing consistent sets of gross output measures across sectors requires careful treatment of intra-sector flows of intermediate products which may be difficult empirically."*[42]

Similarly, the UR's decision on GD17 notes the treatment of VA and GO in the CC's determination on NIE RP5, summarising that:

> *"The CC took a balanced view of both productivity measures. They noted that neither measure perfectly captures the productivity changes that could be expected in a company's cost base."*[43]

Several of these regulatory decisions have noted, as we did in our DD Frontier Shift Report, that VA productivity measures are systematically higher than GO productivity measures. Therefore, using an OE challenge that is based entirely on a VA measure will raise application questions if it is directly applied to totex.

However, we do not agree that this can be addressed by trying to precisely identify a subset of expenditure that corresponds to the VA spending as proposed by First Economics in its RIIO-2 DD response on behalf of the ENA. This creates risks of spurious accuracy to the exercise of using multiple pieces of evidence to estimate future productivity potential in the energy network sector.

First Economics itself has previously advised against adjusting the benchmarks produced by EU KLEMS analysis. In a report prepared for South East Water for PR14, First Economics stated that the:

> *"The definition of TFP growth that we have used is value-added TFP growth."*[44]

We cannot find any reference in the report to adjusting the VA TFP benchmark when applying it as an efficiency challenge to capex or opex. Indeed, elsewhere in the paper, when discussing other possible adjustments to the TFP benchmarks, First Economics cautions against that:

---

[42] CMA (2020), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Provisional findings, available online, September.

[43] Utility Regulator of Northern Ireland (2016), Price Control for Northern Ireland's Gas Distribution Networks GD17 Final Determination,. Annex 6 Real Price Effects & Frontier Shift GD17 Final Determination, para 3.21

[44] First Economics (2013), Water Industry Input Price Inflation and Frontier Productivity Growth. A report prepared for South East Water. available online, section 4.1

"Rather than make spuriously accurate adjustments to the table 4.2 figures, we prefer instead to leave the benchmarks as they are"[45]

Similarly, in previous price control decisions, regulators did not attempt to make a systematic adjustment to VA measures (or to GO measures) to make them directly comparable to each other. In its RIIO-T1/GD1 decision, Ofgem notes that to make such an adjustment would require "*additional assumptions about the use of intermediate inputs*".[46] Such an adjustment also risks inconsistent treatment of companies depending on the extent and classification of outsourced activities.

2.4. TFP AND LP PRODUCTIVITY METRICS

2.4.1. Approach taken for the DD

Our DD Frontier Shift report discussed the use of TFP measures for capex/repex and opex, alongside consideration of LP measures for opex (either GO LEMS or VA LP). This reflects that the TFP measures reflect particular mixes of inputs, which will include lower shares of labour than would be included in opex.

We presented a reference range for the OE challenge that was based on VA TFP measures for capex/repex, and VA LP measures for opex.

2.4.2. Responses to the DD

In its paper for the ENA, First Economics provided the main response on the use of TFP and LP measures.[47] It stated that it was inconsistent to apply an OE challenge based solely on LP measures to all opex, because opex includes non-labour costs.

2.4.3. Our assessment for the FD

As stated in our DD Frontier Shift report, there is much regulatory precedent for consideration of LP measures when setting the OE challenge for opex. This is in light of the high share of labour costs in opex.

For example, LP measures are included in the evidence base presented by Ofgem in RIIO-GD1 and T-1; however, Ofgem's decision did not explicitly state what weight it had placed on the LP measures in setting the efficiency challenge.[48]

In its decision on RP5, the CC stated that for the opex efficiency challenge, it considered that LP measures were a more appropriate benchmark than TFP; because NIE's opex costs were close to 80% labour compared to 50% for capex, stating that:

"This would support a marginally higher productivity assumption for opex than capex when using the EU KLEMS data."[49]

Section 3.4 describes the assumptions that the network companies have provided for the level of OE embedded in their business plans. Where companies provide separate assumptions for capex/repex and for opex, the opex value is always higher. Furthermore, the BoE and OBR productivity forecasts cited by network companies in their DD responses as evidence of productivity slowdown are themselves normally LP forecasts rather than TFP forecasts.

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[45] First Economics (2013)

[46] Ofgem (2012), RIIO-T1/GD1: Real price effects and ongoing efficiency appendix.

[47] First Economics (2020).

[48] Ofgem (2012).

[49] Competition Commission (2014).

We acknowledge the point made by First Economics in relation to the practicalities of application to all opex of an OE challenge based solely on LP measures.

Therefore, in this report, we continue to present TFP and LP measures to inform Ofgem's decision on where to set the OE challenge for opex. However, we suggest that rather than being the sole or main source of information on where to set the OE challenge for opex, LP estimates should be one of the factors taken into account alongside TPF measures and other pieces of evidence.

2.5. COMPARATOR SETS OF INDUSTRIES

2.5.1. Approach taken for the DD

In our DD Frontier Shift report, we produced historical productivity growth averages based on five different industry groupings in the EU KLEMS data set:

- A single sector: construction.
- A 'targeted' (or narrow) comparator set, as used in RIIO-1: wholesale and retail trade: repair of motor vehicles and motorcycles; transportation and storage; and financial and insurance activities.
- A wide comparator set: which added four manufacturing subsectors to the targeted comparator set.
- Weighted 'economy-wide' set: all industries in the EU KLEMS data set (excluding real estate, public admin, education, health and social services), with the weightings derived by share of GO or VA respectively.
- Unweighted 'economy-wide' set: all industries in the EU KLEMS data set (excluding real estate, public admin, education, health and social services).

We suggested that two of these groupings should be considered in the reference range – the targeted comparator set and the weighted economy-wide set.

By directly using the highest EU KLEMS value in our reference range to set its OE challenge, Ofgem implicitly relied only on the economy-wide comparator set. Although it did not explicitly state this in the DD documents.

2.5.2. Responses to the DD

As with other areas of the growth accounting analysis, the DD responses commented on both:

- our discussion and presentation of the different comparator sets, with the implications for how the analysis could be interpreted by Ofgem when setting the OE challenge; and
- Ofgem's selection of an OE challenge implicitly based on a single EU KLEMS value (representing a single productivity measure for a single comparator set over a single period).

Several respondents argued that the comparator industries used in the reference range was too wide and not reflective of the activities undertaken by network companies. particularly of the GDNs. This includes the weighting of the different industries within the targeted comparator set. Some respondents noted in particular that construction should be given a higher weighting.

Western Power Distribution (WPD) suggested that the EU KLEMS sector capturing productivity changes in 'Electricity, gas, steam and air conditioning supply (D)' should also be included in the targeted (or narrow) comparator set.[50]

[50] WPD (2020b), Appendix – Responses to specific questions from Ofgem Consultation on RIIO-2 Draft Determinations for Electricity and Gas Transmission (ET and GT) and Gas Distribution (GD), September.

Some consultants also provided lower TFP estimates based on a narrower comparator set than the targeted comparator set we presented at DD. However, we have not seen in their reports any explicit weightings of the constituent sectors used to produce these estimates.

The consultant reports submitted as DD responses acknowledged that using an economy-wide measure was established in previous regulatory decisions; however, they argued that Ofgem had in effect placed too much weight on the economy-wide set. It was stated that if Ofgem wanted to rely on the economy-wide productivity data, it should not ignore the slowdown in wider economy productivity growth in recent years. In addition, some respondents noted that we set the bottom end of the reference range above the GO TFP estimates for the targeted comparator set.

2.5.3. Our assessment for the FD

We acknowledge that judgement is required in defining and considering the comparator sets that should inform the OE challenge for energy network companies over RIIO-2. Many DD responses also considered multiple comparator sets. Many of the network companies supported a high weighting on EU KLEMS measures from a small number of sectors, whilst also arguing for significant consideration to be given to forecasts of slow productivity growth in the wider economy.

We support the use of multiple industry comparator sets, including targeted and economy-wide, to inform the OE challenge that Ofgem sets at FD, rather than directly using a point estimate for a single comparator set.

Consideration of economy-wide developments in productivity

The economy-wide productivity estimate is an important part of Ofgem's evidence base for setting the OE challenge. This reflects the fact there is no perfect comparator set for the energy networks. It is also not credible to say that the energy networks may not be able to replicate or benefit from some of the improvements in productivity achieved in the wider economy in sectors outside the closest comparators. There is no solid dividing line that can be drawn between the activities carried out in the energy network sector and some of the activities done in sectors that do not look like close comparators. There will be opportunities for energy network companies to learn from productivity improvements from other sectors and implement them in their own activities.

Considering the historical productivity trends in the wider economy, weighted by contribution to GO or VA, is also consistent with taking into account economy-wide productivity forecasts from BoE and OBR. Using these economy-wide productivity forecasts to inform the OE challenge was suggested by the network companies in their DD responses in support of a lower OE challenge.

Definition of targeted comparator set

We acknowledge that there is no comparator set of sectors that can exactly map onto the energy networks. However, understanding historical productivity trends in sectors carrying out some of the same activities can inform estimates of the productivity improvements that could be delivered in the future by energy networks.

Our judgement on what to include in a targeted comparator set considers factors such as:

- **Comparability:** The main activities undertaken in the chosen sector should be similar, in terms of the labour and materials used, to the full range of activities undertaken by the distribution and transmission networks.
- **Competitiveness:** This provides a benchmark for the productivity improvements that may be achieved through responding to competitive rather than regulated pressures.
- **Robustness:** The choice of sectors should help to reduce the chances of the historical productivity estimates being too volatile or driven by atypical changes. This would reduce the usefulness of the comparator set as a guide to future sustainable productivity improvements that may be achieved in the energy network sector.

Our selection of sectors for the targeted comparator set is the same as what Ofgem previously used for GDPCR and GD1. The four sectors capture the following activities of the energy networks – construction and installation of assets, repair and maintenance of assets, transporting and storing supply chain inputs for use across a geographical areas, and provision of business services to intermediaries (energy suppliers) and to end customers directly. The sectors are not a perfect match for the network company activities as that is not possible to achieve – rather they represent a reasonable proxy.

We do not agree with the WPD suggestion of including the energy and water sector in the targeted comparator set. This would frustrate the objective of growth accounting analysis providing an external benchmark from competitive sectors for the productivity improvements that could be achieved in the energy network sector.

We have also excluded manufacturing (sub) sectors from the targeted comparator set. This reflects the concerns raised in RIIO-GD1 about comparability of productivity improvements in manufacturing and energy networks, because of the capital intensity of some of the manufacturing sectors, specifically chemical manufacturing. Typically, productivity growth in manufacturing has been relatively high; so not including the manufacturing sectors reduces the historical productivity estimates for the targeted comparator set.

With respect to the targeted comparator set, we have not seen any compelling evidence for exploring a more complicated weighting approach for different sectors. We are not aware of any regulatory precedent in favour of this. Indeed, the CMA in its PR19 provisional finding considered an unweighted estimate of the productivity growth of its chosen comparator set.[51]

Activity-based weighting would require several subjective assumptions. A more sophisticated weighting approach is a search for precision that cannot be supported by the growth accounting analysis and runs the risk of spurious accuracy.

We acknowledge that there is a subjective element in selecting the sectors for inclusion in the targeted comparator set. This supports consideration by Ofgem of multiple pieces of evidence when setting the OE challenge.

[51] CMA (2020).

3. OTHER EVIDENCE TO INFORM THE OE CHALLENGE

In our Frontier Shift DD report, we discussed options for other sources of evidence in addition to growth accounting analysis that could be considered by Ofgem in setting the OE challenge:

- forward-looking productivity forecasts for the UK economy;
- historical productivity improvements in the energy sector;
- sector-specific drivers of possible productivity improvements in the gas and electricity networks, e.g. as a result of innovation funding received by the network companies during RIIO-1; and
- the OE levels assumed by the network companies in their RIIO-2 submissions.

The following sections of this report describe our DD position on the use of these pieces of evidence, the DD responses received and our updated assessment to inform Ofgem's FD position.

In addition, we advise that Ofgem considers the regulatory precedent for the OE challenge in regulated sectors in the UK. The OE challenge set in recent energy and water price controls is listed in Table 2.2 in Section 2.1.3. In summary, regulators have continued to set an OE challenge of around 1% in price controls over the last 5-10 years. This includes a figure of 1.0% (totex) used by the CMA in its recent provisional findings on PR19. [52]

3.1. FORWARD LOOKING ECONOMY-WIDE PRODUCTIVITY ESTIMATES

3.1.1. Approach taken for the DD

In our DD Frontier Shift report, we presented forecasts for productivity improvements in the UK economy as an alternative source of evidence to inform Ofgem's decision on the OE challenge. We did so in the context that several respondents to the SSMC had suggested that Ofgem also use Bank of England (BoE) and Office for Budget Responsibility (OBR) labour productivity (LP) forecasts in addition to the growth accounting analysis.

TFP is a productivity measure used in growth accounting analysis to inform the OE challenge for capex, repex and opex. The BoE's January 2020 *Monetary Policy Report* included assumed annual TFP growth (across the UK economy) of 0.1% between 2020 and Q1 2023.[53]

We also considered labour productivity forecasts as that is an additional productivity measure considered in the growth accounting analysis, particularly in relation to opex (as discussed in Section 2.4). At the time that we prepared our DD report, both the BoE and the OBR were assuming that LP growth would improve. This was despite the fact that UK productivity has been relatively weak since the global financial crisis in 2008-09.

The OBR forecasts available at the time of our DD Frontier Shift report assumed that hourly productivity growth would increase gradually from 2020, reaching 1.2% in 2024 and steadily rising towards 1.5% over the long term.[54] However, the OBR also stressed that the outlook for productivity growth remained uncertain. For example, the OBR noted that its forecasts at that time had not quantified the impact of a possible wider COVID-19 slowdown in offsetting relatively tight labour market conditions. On the other hand, it also cited possible tailwinds, such as reduced uncertainty after the end of the EU exit transition period, which could support business investment and lead to a stronger-than-expected pickup in productivity growth.

In our DD Frontier Shift paper, we stated that the EU KLEMS analysis should remain the main source of evidence for the OE challenge. However, we advised that Ofgem should place some weight on the economy-wide

[52] CMA (2020).

[53] Bank of England (2020), Monetary Policy Report – January 2020: Supply and spare capacity, January, Table 4.A

[54] Office for Budget Responsibility (2020) Economic and Fiscal Outlook, March

productivity forecasts to capture some additional insight into the scope for productivity potential beyond simply extrapolating historical trends. This suggsted a slight increase in the OE challenge for opex, based on labour productivity forecasts. Conversely, there would be a reduction in the OE challenge for capex, based on the TFP forecasts available at that time.

In its DD documents, Ofgem said that it had considered the OBR and BoE productivity growth forecasts, but concluded that they were influenced by short and medium term risks to the economy such as the UK's exit from the EU and COVID-19. In the context of a rising trend in longer term productivity forecasts, Ofgem chose not to place significant weight on these risks, as network companies are not as exposed to these short-term risks to volume and/or revenue as similar companies operating in the wider economy.

3.1.2. Responses to the DD

WPD supported greater weight being placed on the BoE and OBR forecasts, as they are highly reputed and developed through consultation with other independent forecasters. They suggested that this represented a *"more robust, cross-referenced and triangulated view"* than the EU KLEMS analysis.[55]

Several other respondents to the DD consultation argued that too much weight had been given to the OBR LP forecasts because they had proven consistently over-optimistic since at least 2010. At the same time, respondents stated that Ofgem should take account of the latest BoE and OBR labour productivity forecasts which had been revised down in the light of COVID-19.

NERA, on behalf of National Grid and SPT, noted that the BoE's August 2020 Monetary Policy Report lowered its LP growth forecast to 0.75% in both 2021 and 2022, and that it now averaged 0.75% growth during RIIO-T2. [56] In light of these latest estimates, it was suggested that the reference values for the forward-looking estimates be updated. First Economics, on behalf of the ENA, also pointed out that the OBR and the BoE had released an updated outlook after the publication of the DD.[57]

WPD disagreed with the rising trend in longer term productivity forecasts implied by the forecasts, arguing that the data suggested otherwise, as well as noting the short term impact of COVID-19 on productivity.[58] Oxera (on behalf of WWU[59] and SHET[60]) and [REDACTED][61] also mentioned the UK's exit from the EU as the basis for a downwards adjustment to the OE challenge.

3.1.3. Our assessment for the FD

Since our DD Frontier Shift paper, the BoE and the OBR have revised their LP forecasts. The changes in these forecasts have largely been driven by developments in the outlook for the COVID-19 crisis and new data on the economic impact so far. The recent changes in the BoE and OBR productivity forecasts as a result of COVID-19 are discussed further in Section 5.2.2.

Recent revisions to the LP forecasts have been relatively large, especially for 2020 and 2021, reflecting the extent of economic disruption caused by COVID-19, The impacts have also been unevenly distributed across the economy with some sectors, such as hospitality, faring much worse than others.

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[55] WPD (2020b), p10.

[56] NERA (2020), Frontier Shift at RIIO-T2 Draft Determinations: Report prepared for National Grid and SPT, September, p8.

[57] First Economics (2020), p15.

[58] WPD (2020b), p10.

[59] Oxera (2020a), A review of Ofgem's RIIO-2 ongoing efficiency analysis. Prepared for Wales & West Utilities Limited, September, p8.

[60] Oxera (2020b), Critique of RIIO-2 ongoing efficiency analysis. Prepared for Freshfields on behalf of SHE Transmission, September, p25.

[61] [REDACTED]

The extent of uncertainty about even short-term economy-wide productivity forecasts can be seen in the range of outcomes captured in the OBR's 3 scenarios for LP growth to 2024. On average over the period Q4 2019 to Q4 2024, average annual output per hour growth for the upside, central and downside scenarios is 1.13%, 0.68% and 0.26% respectively.

Beyond COVID-19, there are many uncertainties related to the ultimate economic impact of the UK's exit from the EU. The impact on productivity will depend largely on the UK's trading arrangements with the EU and the rest of the world, which remains mostly unresolved. Most economic studies find that the higher the barriers to trading with the EU, the larger the negative impact on the UK economy.[62] There are several papers which find that the vote to leave the EU has already stifled business investment and may have reduced productivity by between 3% and 5% since 2016. Possible explanations have included the diversion of management time towards EU exit planning, reduced spending on intangibles like R&D, software and training, reduced business investment and lower supplies of skilled foreign workers in anticipation of weaker UK economic fundamentals.[63] The direct impact of this on the energy network sector is uncertain. There will be implications for supply chains; however the network companies are not selling goods and services to the EU; and then do not face a risk of disruption to markets and uncertainty around levels of demand.

The effect of the UK's exit from the EU is not reflected in the backwards-looking growth accounting analysis since we use EU KLEMS data up to 2016. On the other hand, the OBR and the BoE forecasts make certain assumptions about the UK's future trading arrangements based on current UK Government policy – specifically, that there is an immediate but orderly move to a comprehensive free trade agreement with the EU on 1 January 2021.[64] Negotiations with the EU continue and the outcome of these are uncertain. Therefore, it is difficult to confidently identify a firm ex ante adjustment that can be made to the OE challenge to reflect the new trading arrangements post 1 January 2021.

As explained in Section 5.2, we conclude that, on balance, the COVID-19 crisis does not change our assessment of the use and reliability of the EU KLEMS data used in our analysis to inform an ex-ante OE challenge. Indeed, we suggest that little, if any, weight should now be put on economy-wide productivity forecasts. This reflects the scale and unevenness of economic disruption caused by COVID-19, and associated uncertainty about the impact on productivity potential in the energy network sector.

3.2. HISTORICAL EFFICIENCY IMPROVEMENTS IN THE ENERGY SECTOR

3.2.1. Approach taken for the DD

In our Frontier Shift DD report, we did not support using the historical productivity performance of the companies to directly inform the OE target for RIIO-2. Ofgem agreed with this position.

3.2.2. Responses to the DD

As far as we are aware, no DD responses supported the use of historical productivity performance of the energy network companies as evidence for setting the OE challenge.

[REDACTED][65] [REDACTED]

[62] Institute for Government (2018), Understanding the economic impact of Brexit, available online, October.

[63] For example, see Bloom, N. et al (2019), The impact of Brexit on UK firms: reduced investments and decreased productivity, available online, September.

[64] Bank of England (2020), Monetary Policy Report: August 2020, p5, available online, August.

[65] [REDACTED]

3.2.3. Our assessment for the FD

We continue to advise that Ofgem should not consider the historical productivity performance of the companies to directly inform the OE challenge for RIIO-2.

[REDACTED]

[REDACTED]

3.3. SECTOR-SPECIFIC DRIVERS OF POSSIBLE PRODUCTIVITY IMPROVEMENTS

3.3.1. Approach taken for the DD

Our Frontier Shift DD report discussed the innovation funding provided to network companies during RIIO-1. We estimated a baseline of 0.2% for the annual (incremental) cost savings required to make providing the innovation allowances seem a reasonable investment for customers. This was based on a stated set of assumptions.

We noted that when Ofgem considered how much of the 0.2% estimate to incorporate into the OE challenge, it would need to take a view on:

- the benefits that accrue to customers beyond cost savings – i.e. no account is taken in the 0.2% figure of other benefits such as environmental benefits and quality of service; and
- the extent to which any additional OE driven by innovation funding in RIIO-1 is already embedded in the baseline spending plans submitted by the companies – the 0,.2% figure assumes no such OE improvements are embedded in the baseline spending plans.

In its RIIO-2 DD, Ofgem included the full 0.2% figure in setting the OE challenge.

3.3.2. Responses to the DD

The network company responses set out strong views that it was not appropriate to include in the OE challenge an uplift to reflect RIIO-1 innovation funding. Respondents also questioned the approach used to calculate such an uplift.

3.3.3. Our assessment for the FD

Ofgem is taking forward the question of whether there should be a specific uplift in the OE challenge to reflect RIIO-1 innovation funding. Therefore, further discussion of any such specific uplift is outside the scope of this report.

3.4. COMPANIES' PROPOSALS ON ONGOING EFFICIENCIES

3.4.1. Approach taken for the DD

Ofgem assessed company business plans and issued questions to the network companies to understand the OE assumption embedded in the costs submitted by each company. The OE assumption is different to catch-up efficiency: OE relates to the productivity improvements that can be delivered at the efficiency frontier, rather than by moving to the efficiency frontier.

Understanding the OE assumptions made by the network companies is useful because:

- firstly, it indicates the level of ambition that the companies have embedded in their business plans; and
- secondly, it informs any potential adjustment to company submissions needed to avoid the double-counting of OE when Ofgem applies its own OE challenge (i.e. if Ofgem's OE challenge is added on top of the OE already embedded in the forecast costs submitted by the company).

Based on this information, our Frontier Shift DD report presented the following values for embedded OE for each company (all shown on an annual basis unless otherwise stated):

- Northern Gas Networks (NGN) estimated that it could achieve OE of around 0.5% across the RIIO-2 period.[66]
- Wales & West Utilities (WWU) estimated that it could achieve OE of around 0.5% per annum over RIIO-2.[67] An Oxera paper provided as part of the WWU submission describes an estimated range for TFP of 0.4% to 0.8%, and LP of 0.9% to 1.2%, with an overall benchmark for OE improvement of 0.4% to 0.8%.[68]
- Cadent cited a 'central' OE target for an efficient company of 0.53%.[69] However, its business plan submission sets an OE target for its own networks of 0.94% whilst stating it will be a frontier company by the start of RIIO-2 (suggesting that its own OE target represented what could be achieved by a frontier company).
- SGN stated that its plan includes average productivity improvements across its two networks of 1.4% per annum on opex and 0.7% on capex and repex. This equates to around 1% per annum improvement on totex.[70]
- National Grid Gas Transmission (NGGT) presented an OE target for opex of 1.1%. NGGT implies an 0.8% OE target for capex, based on a 4% capex reduction target over the course of RIIO-2.[71]
- National Grid Electricity Transmission (NGET) referred to an OE target for opex of 1.1% in its business plan submission. An equivalent figure for capex is not explicitly set out in the business plan published by NGET.[72]
- Scottish Hydro Electric Transmission (SHET) stated an OE assumption of 0.5% per annum for opex and 0.3% for capex.[73]
- Scottish Power Transmission (SPT) suggests a frontier shift of zero as RPEs and OE improvements are expected to cancel each other out. This is consistent with an OE assumption of 1%.[74]

3.4.2. Responses to the DD

There was little comment in the responses on the level of OE assumed for different network companies. [REDACTED][75]

There was a lot of comment in responses on the treatment of embedded OE in the cost assessment process, and whether it had properly been accounted for in setting allowances. In particular, the transmission companies noted no evidence of any adjustment for embedded OE being made in the cost assessment process. As issues related to

[66] Northern Gas Networks (2019), RIIO-GD2. Business Plan 2021 – 2026.

[67] Wales & West Utilities (2019), Our business plan for 2021 – 2026. A sustainable business in a changing and dynamic sector.

[68] Oxera (2019), Establishing an appropriate efficiency challenge. Prepared for Wales & West Utilities Limited.

[69] Cadent (2019). Transforming Experiences. Customers. Communities. Colleagues. Our Plan for 2021-2026.

[70] SGN (2019), RIIO-GD2 Business Plan. Appendix 5 Cost Efficiency.

[71] National Grid Gas Transmission (2019), Delivering the future gas transmission system. National Grid Gas Transmission's Business Plan 2021-2026.

[72] National Grid Electricity Transmission (2019), Delivering the future electricity transmission system. National Grid Electricity Transmission's Business Plan 2021-2026.

[73] Scottish Hydro Electric Transmission (2019), RIIO-2 Business Plan Data Tables. Table A1.6.

[74] SP Energy Networks (2019), RIIO-T2 Business Plan 2021-2026.

[75] [REDACTED]

the technical application of the OE challenge in the cost assessment process were not discussed in the DD Frontier Shift report, we do not discuss them further in this report.

3.4.3. Our assessment for the FD

The OE concept shift is a top-down construct that is applied relatively smoothly over time and should be achievable by all companies. However, the total efficiencies in the business plan can be affected by bottom-up views of delivery of different projects, as well as different starting points and ambitions for the companies in terms of efficiency position (as captured in a benchmarking assessment.

This means that, as illustrated in the DD responses and other sharing of information by the companies, it has been challenging for the companies to separate out a comparable measure to the OE challenge for frontier shift from the overall efficiencies embedded in their cost submissions. For example, Cadent stated that it was the frontier company and could achieve nearly 1% per year in OE; however, its view on what could be achieved by the sector was 0.5%.

Given these challenges, Ofgem issued another supplementary question to GDNs (CA13) to confirm the level of OE that the companies have embedded in their business plan submissions. As a result of the responses received, there was no change to the OE assumptions made for NGN, SGN[76], and WWU. For Cadent, a figure of 0.5% was assumed for the FD cost assessment process.

All but one of the company OE assumptions are at or above 0.5%. Given that most of the sector believes it can deliver an OE of at least 0.5% for capex/repex and for opex, 0.5% seems a reasonable lower bound for Ofgem to assume in setting the OE challenge to avoid it setting one that is less ambitious than that indicated by the companies themselves.

[76] [REDACTED]

4. REAL PRICE EFFECTS

This section describes our advice on the indices to be used in the indexation of RPEs in RIIO-GD2 and T2. We apply weights to a forecast of each index to produce an overall RPE forecast for each company, which could be used to set allowances as part of Ofgem's Final Determinations (FD). We also describe how we have responded to stakeholder responses to our draft recommendations set out in our DD Frontier Shift report[77]. Where comments were already addressed in our draft recommendations (e.g. because they repeat comments in a company's business plan) we do not cover them again in this report.

Comments were also provided on Ofgem's policy of indexing RPEs in RIIO-2 and on the general approach that such indexation should take. As our advice builds on the policy decisions regarding RPEs that Ofgem made at the SSMD stage and in its accompanying consultation on RIIO-2 tools for cost assessment,[78] addressing comments on Ofgem's stated policy positions are beyond the scope of our advice. Hence, such comments are not discussed further in this report.

4.1. TASKS IN IMPLEMENTATION OF INDEXATION APPROACH

The SSMD and Ofgem's accompanying consultation on the RIIO-2 tools for cost assessment described how Ofgem intended to approach the five main tasks required to set up the indexation approach for use in RIIO-2:

1. **Determination of input cost structures.** Setting the indexation mechanism requires Ofgem to assess the share of totex by input category (e.g. labour costs, materials, transport).
2. **Materiality.** Ofgem will apply indexation to cost areas where there is strong evidence suggesting that the company's input prices (e.g. labour, materials) will materially track above or below general economy inflation over RIIO-2 (based on the Consumer Prices Index including owner occupiers' housing costs (CPIH)). Ofgem will use materiality thresholds, with the burden being predominantly on the companies to demonstrate where RPEs are expected to be material – companies are required to provide robust evidence that the general economy measure of inflation is not a suitable proxy for the input price inflation.
3. **Selection of the indices for each cost category.** For input costs where RPEs are expected to be material, Ofgem will use a series of tests to identify the index/indices to be used as a proxy for the input price inflation faced by the companies over RIIO-2.
4. **Developing forecasts for the indices.** Ofgem will develop forecasts for the input cost areas that will be subject to indexation for the RIIO-2 period. There will then be an annual true-up after the relevant index/indices are published each year, and a final true-up will occur at the end of RIIO-2 as part of the close-out process.
5. **Treatment of cost areas not subject to RPE indexation.** Ofgem will need to decide its approach for the input costs that are not expected to differ materially from general economy inflation.

In the sections that follow, we describe the evolution of our approach in light of stakeholder responses to the Draft Determinations (DD). This covers input cost structures, materiality, and selection of indices. We then present an updated forecast, and address comments received on the approach to costs not subject to RPE indexation.

[77] CEPA (2020), RIIO-GD2 and T2: Cost Assessment – Frontier shift methodology paper.

[78] Ofgem (2019), RIIO-2 tools for cost assessment.

4.2. DETERMINATION OF INPUT COST STRUCTURES

4.2.1. Approach taken for the DD

At the DD stage, we assumed the same notional cost structure for all GDNs and used a company-specific structure for each of the transmission companies.[79] This approach was consistent with that taken by Ofgem at RIIO-1 and with Ofgem's policy at SSMD. The notional structure was constructed using an unweighted average of the cost structures stated by the eight GDNs in their business plan submissions.

4.2.2. Responses to the DD

We note the following specific responses on the way we applied Ofgem's policy:[80]

- [REDACTED][81]
- [REDACTED];[82] [REDACTED].[83]

4.2.3. Our assessment for the FD

We acknowledge the concerns raised but consider that the limitations of a notional cost structure were known at the time Ofgem made its policy decision, and the information provided does not change that.[84]

In Ofgem's Core document for RIIO-GD2/T2, Ofgem stated its intention that:

> *"We will update the analysis of our materiality assessment for Final Determinations to reflect our final views of company cost allowances rather than company cost forecasts."*[85]

For this report, Ofgem provided us with its provisional views as to how its RIIO-2 FD allowances will be split between the following expenditure categories: direct opex, indirect opex, capex, repex (GD only) and other costs. We multiplied those weights by the share for each expenditure category of labour, materials, plant & equipment, transport and other inputs in each network company's business plan data tables as submitted in December 2019. This produced a notional cost structure that is informed by Ofgem's final views of cost allowances for RIIO-2.

The weights provided by Ofgem did not contain any regional variations, and we note that allowances for regional factors are made elsewhere in the cost assessment process. Similarly, Ofgem made no adjustments made for any inconsistencies in how the companies reported their costs, whether any such inconsistencies were perceived or

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[79] By a 'notional' cost structure we mean an indicative structure based on sector averages. This cost structure may not match the cost structure of any one company. Note that the use of a notional *cost structure* in the context of RPEs is distinct from the use of a notional *financial structure* in the context of the cost of capital – although both seek to distinguish the assumptions that Ofgem uses to set allowances from the decisions made by the companies themselves.

[80] Other responses, including from DNOs, expressed concern with the use of a notional cost structure for GDNs. Whilst this is a policy decision already taken by Ofgem and hence outside the scope of our advice, we note that the use of notional assumptions has a well-established regulatory precedent (e.g. as part of calculating the weighted average cost of capital).

[81] [REDACTED]

[82] [REDACTED]

[83] [REDACTED]

[84] In the CMA's decision on Norther Powergrid's appeal of the RIIO-ED1 determination, the CMA took the view that it is appropriate for RPEs – particularly those relating to labour costs – to reflect the cost inflation of other industries rather than needing to exactly match Northern Powergrid's cost pressures. Our approach in this report of using a notional cost structure and publicly available indices of costs is consistent with the CMA's view. See: CMA (2015), Northern Powergrid (Northeast) Limited and Northern Powergrid (Yorkshire) plc v the Gas and Electricity Markets Authority, Final determination, paras 5.23-5.59

[85] Ofgem (2020), RIIO-2 Draft Determinations – Core document, July, Para 6.24

otherwise.[86] Based on guidance from Ofgem we do not adjust the notional cost structures for regional differences, or for differences in the way different companies reported their costs.

As in our DD Frontier Shift report, the main cost areas are related to:

- labour, [REDACTED]; and
- materials, [REDACTED].

In line with the approach taken in RIIO-1, the 'Other' category is assumed to track the general inflation level in the economy, and so was not considered in the materiality analysis.

Table 4.1: Notional cost structure of each network company

Input category	GDNs	NGGT (TO)	NGGT (SO)	NGET	SHET	SPT
Labour	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Materials	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Plant & equipment	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Transport	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Other	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: CEPA analysis using data provided by Ofgem

4.3. Assessing materiality of RPEs

4.3.1. Approach taken for the DD

We applied the approach set out as part of Ofgem's consultation on tools for cost assessment.[87] This approach focuses on two tests such that a category is deemed material if it:

- makes up at least 10% of a company's totex; or
- makes up at least 5% of a company's totex **and** the expected impact of real price movements in the category represents at least 0.5% of totex.

For the GDNs, these tests are based on the notional cost structure rather than for each individual company cost structure.

We concluded that the following input cost categories passed the materiality tests:

- Labour for all companies (combining general and specialist labour).
- Materials for all companies.
- Plant & Equipment cost area for SHET only.

4.3.2. Responses to the DD

The majority of comments on the materiality tests repeated points that had been made in the companies' business plans and, as such, already informed the approach we recommended for the DD. Those comments are not repeated here. We highlight two new comments:

[86] A review of the consistency of the cost allocation approach by each company was not in the scope of our advice.

[87] Ofgem (2019), RIIO-2 tools for cost assessment.

- NGGT said that materiality tests we applied were inconsistent with the materiality thresholds that apply elsewhere in RIIO-2 – specifically for uncertainty mechanisms.[88]
- NERA, advising National Grid and SPT, requested that the materiality test be performed using Ofgem's cost allowances for the FD, as these may bring up different results from materiality tests that are based on companies' submitted costs.[89]

We discuss each of these in further detail below.

4.3.3. Our assessment for the FD

Ofgem's rationale for having a materiality test is to strike a balance to be struck between transferring significant risks which are external to the companies onto customers, and the complexity of the indexation mechanism. Where companies could make substantial windfall gains or losses, there is a positive case for indexation. However, it is much more marginal where cost categories are a small share of totex and annual variations can be expected to only have a small impact on total costs.[90] This therefore informed the design of the RPE materiality tests.

In light of the specific point raised by NGGT about the consistency of the materiality thresholds for uncertainty mechanisms and for RPEs, we have compared the two materiality thresholds on a like for like basis.

Ofgem's DD documents set out a materiality threshold beyond which any uncertainty mechanisms would be triggered. This is consistent across the gas distribution, gas transmission and electricity transmission sectors and is defined as of 1% of annual average base revenue, multiplied by the Totex Incentive Mechanism (TIM) efficiency incentive rate. [91]

The RPE materiality tests are defined in terms of totex, whereas Ofgem's thresholds for uncertainty mechanisms are defined in terms of allowed revenue. The relationship between totex and revenues is not simple or linear – for example, it would be affected by the capitalisation rate used (proportion of 'fast' and 'slow' money) and by the depreciation profile used. However, for the purpose of understanding the consistency between the RPE materiality thresholds and uncertainty mechanism threshold, we can convert Ofgem's 1% of revenue threshold for uncertainty mechanisms into totex terms. We compare this threshold to the 0.5% change in totex, which we expect to be a binding criteria in our second RPE materiality test. Our analysis of the cost categories and indices suggests that it is highly unlikely that a category that makes up less than 5% of totex would result in an impact on totex of more than 0.5%.

Table 4.2 presents the results of this analysis based on the allowances set by Ofgem in the RIIO-GD2 and RIIO-T2 DD documents. We find that the 0.5% materiality threshold we used for RPEs is lower than would be implied by Ofgem's 1% of revenue threshold for uncertainty mechanisms. Therefore, whilst there is a difference in the thresholds, the direction of the difference in in line with our expectations – i.e. the RPE threshold is lower than the uncertainty mechanism threshold. Uncertainty mechanisms would be expected to only come into effect in relatively unlikely situations, whereas RPE indexation is to be applied annually irrespective of the gap between forecast and outturn input cost pressures. We are, therefore, satisfied that the approach to materiality tests of cost categories is consistent with other elements of the RIIO-2 framework.

Our comparison of the materiality thresholds for RPE indexation and for uncertainty mechanisms is based on Ofgem's Draft Determination allowances. However, the results are sufficiently clear for us to be comfortable that

[88] NGGT (2020), 3. National Grid Gas Transmission Response to RIIO-2 Draft Determination: Core Document, September, p8

[89] NERA (2020), Frontier Shift at RIIO-T2 Draft Determinations: Report prepared for National Grid and SPT, September, p39

[90] In its provisional determination of water companies' PR19 appeal, the CMA explored using the same materiality tests that we applied but found that applying this test would not change its conclusions on RPEs. See: CMA (2020), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, Provisional findings, September, paras. 4.413 – 4.415

[91] Ofgem (2020), para 8.28-8.30.

changes to Ofgem's allowances for the Final Determination are unlikely to result in a different conclusion being drawn.

Table 4.2: Calculation of RPE materiality threshold in terms of allowed revenue (based on Ofgem's Draft Determinations)

		East	London	North West	West Midlands	Northern	Southern	Scottish	Wales & West	SPT	SHET	NGET	NGGT TO	NGGT SO
A	UM materiality threshold	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
B	Allowed revenue (£m)	2,591	1,928	1,979	1,475	1,981	1,463	3,268	1,993	1,652	2,183	8,682	4,136	562
C = A * B	UM threshold in revenue terms (£m)	25.1	17.8	19.0	13.4	17.5	12.3	31.2	19.4	13.5	14.1	99.3	51.4	3.1
D	RAV additions (£m)	788	578	618	481	657	533	1,104	571	848	1,391	2,734	1,131	176
E	Fast pot (£m)	548	465	413	332	464	339	610	455	163	304	1,062	532	334
F = D + E	Totex (£m)	1,335	1,043	1,031	813	1,121	872	1,714	1,026	1,011	1,694	3,796	1,663	510
G = C / F	UM threshold / Totex	1.9%	1.7%	1.8%	1.6%	1.6%	1.4%	1.8%	1.9%	1.3%	0.8%	2.6%	3.1%	0.6%
	RPEs totex threshold	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
	RPE threshold equal to or lower than Ofgem UM revenue threshold?	**TRUE**	**TRUE**	**TRUE**	**TRUE**	**TRUE**	**TRUE**	**TRUE**	**TRUE**	**TRUE**	**TRUE**	**TRUE**	**TRUE**	**TRUE**

Source: CEPA analysis using Ofgem figures for RIIO-GD2 and T2 Draft Determinations

NERA, advising National Grid and SPT, also requested that the materiality test be performed based on Ofgem's FD allowances.

As discussed for the cost structure used for the FD (in Section 4.2.3), at DD stage, Ofgem proposed to update the materiality assessment for FD based on its final view of company allowances. We explained in Section 4.2.3 how we updated the cost structure using information from Ofgem's indicative FD allowances on expenditure category weights. There was no change from the DDin terms of which cost categories passed the first materiality test of being more than 10% of totex – as shown above in Table 4.1.

For NGGT (TO), NGET and SPT, we re-ran the second materiality test for the Plant & Equipment cost category, which we had also carried out at the DD stage. Applied to input cost categories representing between 5% and 10% of totex, this test considers whether the expected impact on totex of price movements in a cost category exceeds 0.5% of totex over RIIO-2. We re-ran the test for Final FD because of a change we are recommending for the indices used for this category; as described for Section 4.4.3.

We compared the simple average outturn values of the two indices over the last ten years against the evolution of the CPIH. This gives an indication of the level of RPEs that would have occurred over that period if an indexation mechanism had been in place for this cost category. We then calculated the impact on totex of the estimated price volatility for this cost area. Over the last ten years, the estimated impact of RPEs in the Plant & Equipment cost would have been no higher than 0.12% of totex (2 d.p. in absolute terms) for any of the three companies in question. This is significantly below the threshold of 0.5%.

To summarise, our materiality tests result in the following categories being recommended for RPE indexation in RIIO-GD2 and T2 – these are the same categories as recommended at DD:

- Labour for all companies (combining general and specialist labour).
- Materials for all companies.
- Plant & Equipment cost area for SHET only.

4.4. PROCESS FOR SELECTING INDICES FOR THE INDEXATION MECHANISM

4.4.1. Approach taken for the DD

For the DD, our assessment of which indices to include in the RIIO-2 indexation mechanism started with the indices used during the RIIO-1 calculation of an ex-ante RPE allowance. We concluded that these indices remained suitable for use for the cost categories identified as material in RIIO-2 for the GDNs and the transmission companies. Therefore, we did not further investigate whether new indices would also be suitable for use in RIIO-2.

4.4.2. Responses to the DD

Responses to the DD and our report can be categorised as follows:

- **Application of the selection criteria.** A report by NERA on behalf of SPT and National Grid argues that the approach taken in our report for the Draft Determination was inconsistent with the selection approach proposed in CEPA's June 2019 report on Frontier Shift report.[92] The NERA report highlights that we did not present an assessment against the nine detailed criteria from CEPA's June 2019 report.[93]
- **Consideration of a wider set of indices.** NERA points out that our report for the Draft Determination only presented an assessment of the RIIO-1 indices.[94] Cadent, NGN, SGN, and NERA for National Grid and SPT,

[92] CEPA (2019).

[93] NERA (2020), p31.

[94] NERA (2020), p v.

identified alternative or additional indices, including ones that were proposed as part of their December 2019 business plans. The companies argued that the alternative indices they identified were better suited and more reflective of their costs.

- **Analysis of cost trends**. NERA makes the argument that our report for the Draft Determination included insufficient consideration of whether the RIIO-1 (or other) indices reflect movements in cost pressures faced by the companies – as would be implied by the 'accuracy' criteria from our June 2019 report.[95]

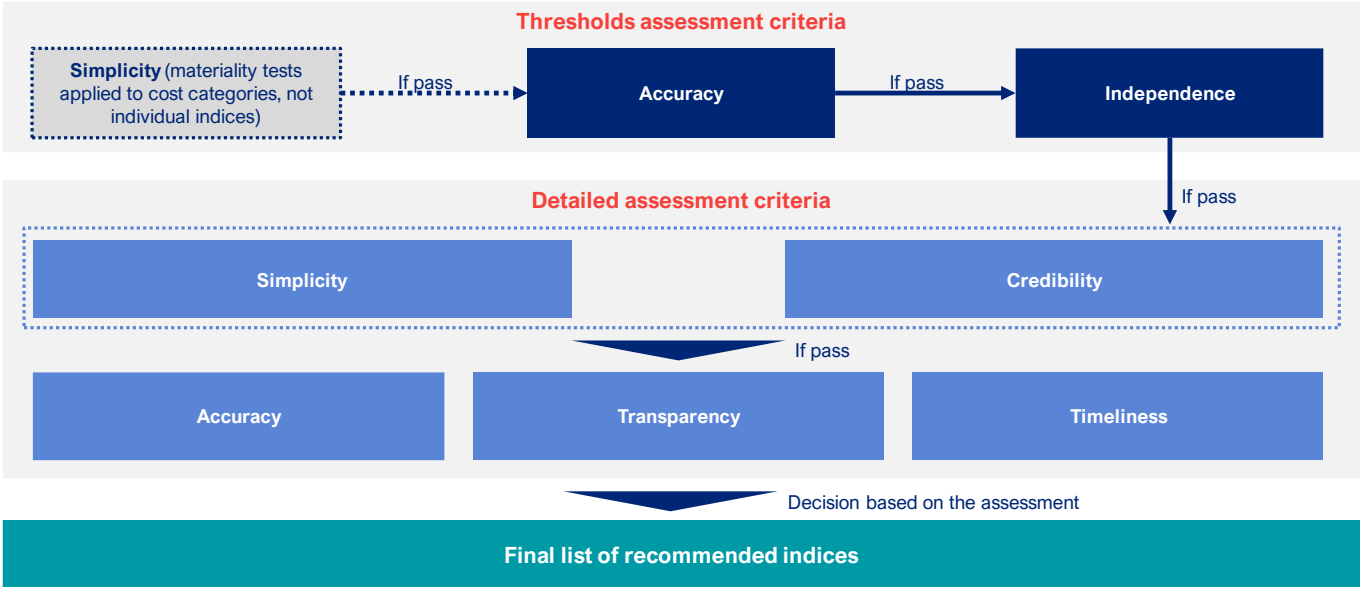
4.4.3. Our assessment for the FD

In light of the comments raised on the DD, we agreed with Ofgem that for the FD, we would review the full set of indices suggested by companies. This is a departure from the agreed position for DD where we focused on identifying through a Stage 1 assessment of the RIIO-1 set of indices whether there were any obvious reasons to move away from those indices to consider other indices.

We have applied the two-stage approach from CEPA's June 2019 report to the RIIO-1 indices and to the indices proposed in companies' business plans and Draft Determination responses. [96] Where companies referred to a general source of indices rather than a specific index, we applied our judgement to select specific indices that appeared to be most relevant.

Figure 4.1 summarises the assessment process we have applied in selecting the indices used to produce the RPE forecast in this report. Our assessment started with the 'threshold criteria' from the June 2019 report. For indices that passed those criteria, we then applied the 'detailed criteria' from the June 2019 report in order to identify the final list of indices. Appendix A details the selection criteria applied in the assessment of the indices presented in this report.

Figure 4.1: Process for selecting indices



Source: CEPA

Table 4.3 summarises the findings of that detailed assessment, with further details on the assessment results set out in Appendix A.

[95] See: NERA (2020), p v.

[96] NERA (2020), p31.

Table 4.3: Summary of index selection

Index (RIIO-1 indices in italics)	Applied to	Proposed by	Outcome	Reason for rejecting
Labour (general and specialist)				
AWE: private sector (K54V)	*All*	*RIIO-1*	Accepted	N/A
AWE Private Sector data less Arts, Entertainment & Recreation, Accommodation & Food service activities, and Retail Trade & Repairs.	All	[REDACTED]	Rejected	Required adjustments to published indices introduce considerable complexity and judgement into the indexation process.
AWE: transport & storage (K5B7)	*All*	*RIIO-1*	Rejected	Based on DD responses, unlikely to represent a material share of labour costs
BCIS General Labour (1161)	All	[REDACTED]	Rejected	Coverage similar to other indices already included, and methodology appears to be somewhat outdated.
AWE: professional, scientific, and technical	All	NGN	Rejected	Historically not materially different from the AWE: private sector index to justify the additional complexity.
AWE: administrative and support services	All	NGN	Rejected	Lack of clarity on drivers of large historical movements in the index.
AWE: electricity, gas and water supply	All	NGN	Rejected	Unlikely to be independent of network companies.
AWE: Construction (K553)	*All*	*RIIO-1*	Accepted	N/A
BCIS PAFI civil engineering (4/CE/01) (replacing *PAFI civil engineering (1701)*)	*All*	*RIIO-1*	Accepted	N/A
BEAMA: electrical engineering	*ET*	*RIIO-1*	Accepted	N/A
Materials				
BCIS FOCOS Resource Cost Index of Infrastructure: Materials (7467)	*All*	*RIIO-1*	Accepted	N/A
LEBA	All	NGN	Rejected	Relates to energy prices. Unlikely to represent network companies' direct costs.
Oanda	All	NGN	Rejected	Relates to commodity prices. Unlikely to represent network companies' direct costs.
BCIS 4/CE/24 Plastic Products (including pipes)	*GD*	*RIIO-1*	Accepted	N/A

Index (RIIO-1 indices in italics)	Applied to	Proposed by	Outcome	Reason for rejecting
*(*replacing *BCIS Plastic pipes and fittings (2/32))*				
PIEWEB Plastic prices (PE80 and PE100)	GD	NGN	Rejected	Relates to the quasi-commodity price of plastics, rather than of PE pipes. Series only dates back four years.
ICIS PE Pipe Black HDPE 100	GD	[REDACTED]	Rejected	Relates to the quasi-commodity price of plastics, rather than of PE pipes.
BCIS 3/58 copper pipes and accessories	*GD and ET*	*RIIO-1*	Rejected	Based on DD responses, unlikely to represent a significant share of materials costs
BCIS 4/CE/EL/03 Electrical cables	ET	NGET, SPT	Rejected	Cost of electrical cables is included in BCIS 4/CE/EL/02 Electrical engineering materials.
BCIS 4/CE/EL/02 Electrical engineering materials	ET	NGET, SPT	Accepted	N/A
BCIS 2/S2 Electrical installations – Cost of materials	ET	NGET, SPT	Rejected	Series retired by BCIS.
BCIS 3/S3 Structural steelwork – Materials: Civil Engineering Work	*GD and GT*	*RIIO-1*	Accepted	*N/A*
BCIS 2/S2 Steelwork – Cost of Materials	All	NGET, SPT	Rejected	Series retired by BCIS.
BCIS 4/CE/26 Metal Structures	All	NGET, SPT	Rejected	Relates to structures such as bridges. Unlikely to represent a material share of network companies' materials
Plant & equipment				
PAFI plant and road vehicles (1702)	*SHET*	*RIIO-1*	Accepted	N/A
ONS Machinery & equipment output PPI (K389)	*SHET*	*RIIO-1*	Accepted	N/A
ONS Machinery & equipment input PPI (MB4U)	*SHET*	*RIIO-1*	Rejected	Relates to inputs into manufacturing process. Unlikely to represent network companies' direct costs.
BEAMA large power transformers	SHET	NGET, SPT[1]	Rejected	Unlikely to be independent of TOs.
BEAMA basic electrical equipment	SHET	NGET, SPT[1]	Rejected	Relates to materials rather than equipment.

Source: CEPA analysis
Note: [1] NGET and SPT refer to a general BEAMA electrical equipment series. We identified these two indices as the most likely to be relevant from within that broader series.

To summarise the changes in selected indices from our Frontier Shift DD report, we recommend:

- Removing the AWE transport and storage (labour) and BCIS 3/58 copper pipes and accessories (materials) used in the DD, on the basis of further evidence that they do not reflect a material portion of costs for network companies.
- For ET only, replacing the BCIS 3/58 copper pipes and accessories (materials) index with BCIS 4/CE/EL/02 electrical engineering materials. This decision was based on responses and assessment that identify this index as a more accurate measure of ET materials costs.
- Removing the ONS Machinery & equipment input PPI (plant and equipment[97]) on the basis that network company machinery and equipment costs are more likely to reflect output producer prices, not input producer prices.

4.5. FORECASTS FOR THE INPUT PRICES SUBJECT TO RPES

4.5.1. Approach taken for the DD

At the DD stage, we produced RPE forecasts for each of the expenditure categories that we recommended for indexation:

- Labour (for all companies).
- Materials (for all companies).
- Plant & Equipment (for SHET only). [98]

In summary, we forecast each index in nominal terms, following the approach used for forecasting indices in RIIO-1. We used independent forecasts of annual growth rates for a given index, where they existed; with our source being HM Treasury's consensus forecasts for the UK economy which were published in March 2020. For the periods and indices not covered by an independent forecast, we applied the long-term average annual growth rate from 2000 onwards.[99] We excluded data from 2009/10 and 2010/11 from this calculation because of concerns that the financial crisis around this period could cause growth rates not to be reflective of long-term trends.

Economy-wide inflation

For RIIO-2, Ofgem is proposing to apply the Consumer Prices Index including owner occupiers' housing costs (CPIH) as general inflation measure as a replacement for the Retail Prices Index (RPI) which was used in RIIO-1. HM Treasury collates independent forecasts for a range of economic indicators in 2021 and 2022, including CPI forecasts.[100] However, it does not provide CPIH forecasts.

CPIH includes a component for owner occupiers' housing costs, which accounts for around 16% of the index. This is the main driver of the between the Consumer Prices Index (CPI) and CPIH inflation rates. Based on the average

[97] SHET was the only company with an RPE for the Plant and Equipment category at the DD stage.

[98] Please see Section 4.5 of our DD Frontier shift report for more detail on the methodology. That detail is not repeated here in the interests of conciseness.

[99] We also explored an approach using linear regression based on CPIH. However, as we do not have long-term CPIH forecasts so this would add variation to the long-term forecast; and hence it did not meet the burden of proof to switch from the RIIO-1 approach.

[100] HMT (2020), Forecasts for the UK economy, March. For the purposes of this analysis, we assumed that the 2021 forecasts were a reasonable proxy for the equivalent growth rate in the 2021/22 financial year and so on.

difference between CPI and CPIH in the most recent three years of available data, we produced a proxy for a CPIH forecast by a 0.1% reduction to the average of the independent CPI growth rate forecasts collected by HM Treasury.

For the period beyond the time horizon of the forecasts collated by HM Treasury, we calculated the long-term average annual growth rate for CPIH based on data from 2000 onwards. This implied that the economy would generally return to an equilibrium in which monetary variables revert to their average growth rates.

Labour

Short-term forecasts for 2020 and 2021 were drawn from the HM Treasury consensus forecasts for average earnings for the whole economy. For 2022/2023 onwards, we used forecasts for the following indices based on the long-term average, all of which were used in RIIO-1:

- the average weekly earnings (AWE) for the private sector;
- the AWE for the construction industry;
- the AWE for the transport & storage industry;[101]
- the Price Adjustment Formula Index (PAFI) for civil engineering labour;[102] and
- the BEAMA labour index for electrical engineering (which is included for ET only). [103]

The forecast for each index was based on the long-term trend. The overall Labour RPE was constructed as an unweighted average of the indices. For the GDNs and NGGT, each index had a weighting of 25%. For ET, five indices were used which meant that each had a weighting of 20%.

Materials

We used the same indices for Materials as were used to set the ex-ante allowances for RIIO-1. Forecasts for each of the indices used to construct the Materials RPE were based on the long-term average of each index. This was because we could not identify forecasts from independent sources that satisfied our robustness criteria.

As these indices were intended to reflect the mix of materials purchased by network companies for opex and capex (including repex for GDNs), the weighting of the indices differed according to sector. The FOCOS resource cost index of infrastructure (materials) was judged to offer a reasonable proxy for opex materials across all the sectors.[104] To proxy changes in the costs of capex/repex materials purchased different sectors, the following indices were used:

- **GDNs:** An unweighted average of PAFI indices for steelworks, copper piping and accessories, and plastic pipes[105] (i.e. weighting of 33% for each index).
- **GT:** 100% weighting on the PAFI index for steelworks.
- **ET**: 100% weighting on the PAFI index for copper piping and accessories.

These weightings were then compounded by the weighting of opex to capex (and repex spend) to create the overall weightings. The cost structure for materials for most of the network companies led to a weighting for materials of 25% for opex and 75% for capex (and repex). SPT's business plan implied a slightly greater use of

[101] All three AWE indices available from the ONS.

[102] Published by BCIS.

[103] Labour index published British Electrotechnical and Allied Manufacturers Association (BEAMA).

[104] Published by BCIS.

[105] Published by BCIS.

materials in opex activities. As such, for SPT, the copper piping index was given a weight of 65% rather than 75% in the composite RPE.

Plant & equipment

As a result of materiality tests, our finding was that Plant & Equipment would be subject to RPE indexation for SHET only. As with the materials category, we did not identify any suitable independent forecasts. Our forecasts were therefore based on the long-term averages of the indices used in the RIIO-1 analysis, as these passed our selection criteria. We used an unweighted average of three indices (i.e. weighting of 33% on each index):

- PAFI for plant and road vehicles;[106]
- the input Producer Price Indices (PPI) for machinery & equipment;[107] and
- output PPI for machinery & equipment

4.5.2. Responses to the DD

Ofgem's RIIO-2 Challenge Group supported the approach to forecasting RPEs.

In terms of specific comments from the network companies on the RPE indices forecasting approach, we note the following from NERA (advising National Grid and SPT):

- By combining the labour indices using an unweighted average, no attempt to link the indices to the companies' costs has been made. It is highly unlikely that each of the labour indices selected would correspond to 20/25% of labour costs and no attempt has been made to justify that equal weights are appropriate.[108]
- Weightings used for the materials indices may be arbitrary, but no details on how they have been calculated have been provided.[109]

Other DD responses from the networks typically focused more generally on consideration of the impact of COVID 19 on the selected indices and the resulting impact this will have on forecasted RPEs. SGN also suggested introducing reopener/ex-post assessment to assess whether indices have reflected the impact of COVID 19 on RPEs for GDNs.[110] The impact of COVID-19 is discussed further in Section 5.

4.5.3. Our assessment for the FD

We describe below how we have updated the RPE forecasts for each of the expenditure categories that we have recommended for indexation. We do not show figures for 2019/2020 as Ofgem has said that it will use actual company data for 2019/2020 in setting the FD allowances

Table 4.4 lists the indices used to calculate the forecast RPE for each cost category. The selection process is described in Section 4.4.

[106] Published by BCIS.

[107] The input and output price indices are both available from the ONS.

[108] NERA (2020), p34.

[109] NERA (2020), p38.

[110] SGN (2020), Response to Draft Determination: Section C: Ensuring efficient cost of service, p92

Table 4.4: Updated list of Indices selected used for use in setting the RPEs

Selected price indices
Labour costs (general and specialist)
Office for National Statistics (ONS) Average Weekly Earnings (AWE) private sector (K54V)
ONS AWE construction (K553)
Price Adjustment Formulae Indices (PAFI) civil engineering (4/CE/01)
British Electrical Allied Manufacturers Association (BEAMA) electrical engineering (only for Electricity Transmission)
Materials costs
BCIS FOCOS Resource Cost Index of Infrastructure: Materials (7467)
BCIS 4/CE/24 Plastic Products (including pipes)
BCIS 4/CE/EL/02 Electrical engineering materials
BCIS 3/S3 Structural steelwork – Materials: Civil Engineering Work
Plant & equipment costs
PAFI plant and road vehicles (1702)
ONS Machinery & equipment output PPI (K389)

Source: CEPA analysis

As at DD, we have forecast each index in nominal terms, following as far as possible the approach used for forecasting indices in RIIO-1. This approach:

- uses independent forecasts of annual growth rates for a given index, where they exist; and
- applies the long-term average annual growth rate, where an independent forecast does not exist.

The real price effects shown in Table 4.6, Table 4.7 and Table 4.9 are calculated relative to forecast CPIH. Indices are then weighted to form a composite RPE index for the given cost category. The forecasts and weightings described in this section are included in the RPE files that we provided to Ofgem alongside this report.

Economy-wide inflation

In order to align with Ofgem's policy on inflation indices and forecasts in RIIO-2, we have revised our approach to forecasting economy-wide inflation for the Final Determinations:

- for RIIO-1 (specifically, 2020/21), we use the latest available forecasts from the Office for Budget Responsibility (OBR) of the RPI;
- for RIIO-2 we use PBR forecasts of the CPI, where available; [111]
- beyond the years for which OBR forecasts are available, we use the long-term historical average of the CPIH.

Table 4.5 sets out the resulting forecasts for CPI and CPIH to the end of the RIIO-2 period.

[111] In line with Ofgem's approach, we do not adjust this forecast for any difference between CPI and CPIH

Table 4.5: Forecast economy-wide inflation

Index	2020/21	2021/22	2022/23	2023/24	2024/25 and 2025/26
Approach	**OBR forecast (March 2020)**			**Long-term avg.**	
RPI (ONS code CHAW)	2.3%				
CPI (ONS code D7BT)		1.9%	2.1%	2.0%	
CPIH (ONS code L522)					2.0%

Source: *CEPA analysis of data from OBR and ONS*

Labour

To ensure consistency with our approach to general inflation forecast (discussed above), we have used the latest available OBR forecasts of average earnings. For years where no OBR forecast is available, we retained our approach from the Draft Determination of using forecasts based on the long-term average for each index:

- the average weekly earnings (AWE) for the private sector,
- the AWE for the construction industry;
- the Price Adjustment Formula Index (PAFI) for civil engineering labour;[112] and
- the BEAMA labour index for electrical engineering[113] (which is included for ET only).

We apply an unweighted average of the relevant indices to calculate the overall Labour RPE. For the GDNs and NGGT, each index has a weighting of 33.3%. For ET, four indices are used which means that each has a weighting of 25%. We consider that an unweighted average remains appropriate and proportionate given the aims of RPE indexation policy to set a benchmark for RPEs rather than provide a precise pass-through based on detailed company cost structures. This is also consistent with the views of the CMA in Northern Powergrid's RIIO-ED1 appeal. [114]

Table 4.6: Forecast RPE for labour indices (net of 'Ofgem inflation index')

Index	2020/21	2021/22	2022/23	2023/24	2024/25 – 25/26
Corresponding inflation index	RPI (using OBR forecast)	CPIH (using OBR CPI forecast)			CPIH (long-term avg.)
OBR forecast for average earnings (March 2020)[1]	1.1%	1.6%	1.2%	1.1%	
ONS AWE private sector (K54V)					1.0%
ONS AWE construction (K553)					1.2%
PAFI civil engineering (4/CE/01)					0.6%
BEAMA electrical engineering (ET only)					1.2%

Source: CEPA analysis of data from OBR, ONS, BCIS, and BEAMA
Note: [1] At the time of preparing this report, there was an inconsistency between the average earnings forecasts presented in the OBR's Economic and fiscal outlook - March 2020 report and those shown for March 2020 in the OBR's historical official

[112] Published by BCIS.

[113] Labour index published British Electrotechnical and Allied Manufacturers Association (BEAMA).

[114] CMA (2015), Northern Powergrid (Northeast) Limited and Northern Powergrid (Yorkshire) plc v the Gas and Electricity Markets Authority, Final determination, paras 5.23-5.59

forecasts database. Based on discussions with the OBR, we understand that the correct forecast is the one from the March 2020 Economic and fiscal outlook. Therefore, we used those figures in our report.

Materials

To construct the Materials RPE for the Final Determination, we have used the indices listed in Table 4.7. Forecasts for each index are again based on the long-term average of the particular index.

We apply the FOCOS resource cost index of infrastructure (materials) index to all sectors, and the following indices to specific sectors:

- **GDNs:** Structural steelworks - materials: civil engineering work; and Pipes and accessories: plastics.
- **GT:** Structural steelworks - materials: civil engineering work.
- **ET**: Electrical engineering materials.

Table 4.7: Forecast RPE for material indices (net of 'Ofgem inflation index')

Index	2020/21	2021/22	2022/23	2023/24	2024/25 – 25/26
Corresponding inflation index	RPI (using OBR forecast)	CPIH (using OBR CPI forecast)			CPIH (long-term avg.)
BCIS 4/CE/24 Plastic Products (including pipes)	0.0%	0.4%	0.2%	0.3%	0.3%
BCIS 3/S3 Structural steelwork – Materials: Civil Engineering Work	1.7%	2.1%	1.9%	1.9%	2.0%
BCIS 4/CE/EL/02 Electrical engineering materials	-1.6%	-1.1%	-1.3%	-1.3%	-1.3%
BCIS FOCOS Resource Cost Index of Infrastructure: Materials (7467)	2.0%	2.4%	2.2%	2.2%	2.3%

Source: CEPA analysis of data from OBR and BCIS

We have also changed our approach to weighing these indices, in light of stakeholder responses to the DD. As shown in Table 4.8, we have used equal weights for all indices within the materials category rather than distinguishing between opex and capex. As well as simplifying the calculation, we consider that it also is more likely to be representative of network companies' cost pressures relating to the purchase of materials since a closer review of the FOCOS index identified that it covered the cost of materials that may be used in opex and capex (and repex for GD), whereas for the DD we only applied the FOCOS index to opex materials.

Similarly, we consider that an unweighted average is appropriate and proportionate given the aims of RPE indexation policy to set an efficient benchmark (rather the provide a pass-through) of RPEs. We also consider that an unweighted average is appropriate and proportionate given the aims of RPE indexation policy to set an efficient benchmark (rather the provide a pass-through) of RPEs. These approaches are consistent with the views of the CMA in Northern Powergrid's RIIO-ED1 appeal.

Table 4.8: Material index weighting

Index	GDNs	NGGT TO & SO	NGET, SHET & SPT
BCIS 4/CE/24 Plastic Products (including pipes)	33.3%	0%	0%
BCIS 3/S3 Structural steelwork – Materials: Civil Engineering Work	33.3%	50%	0%
BCIS 4/CE/EL/02 Electrical engineering materials	0%	0%	50%
BCIS FOCOS Resource Cost Index of Infrastructure: Materials (7467)	33.3%	50%	50%

Plant & equipment

As at the DD, the result of the materiality tests is that Plant & Equipment will be subject to RPE indexation for SHET only. Our Plant & Equipment RPE forecast is based on the unweighted average of the long-term averages of the two indices listed in Table 4.9 (i.e. weighting of 50% on each index).

Table 4.9: Forecast RPE for Plant & Equipment indices, SHET only (net of 'Ofgem inflation index')

Index	2020/21	2021/22	2022/23	2023/24	2024/25 – 25/26
Corresponding inflation index	RPI (using OBR forecast)		CPIH (using OBR CPI forecast)		CPIH (long-term avg.)
PAFI plant and road vehicles (1702)	0.3%	0.8%	0.6%	0.6%	0.6%
ONS Machinery & equipment output PPI (K389)	-0.4%	0.0%	-0.2%	-0.2%	-0.1%

Source: CEPA analysis of data from ONS and BCIS

Findings of forecasting RPEs over the RIIO-2 period

The tables below summarise the forecast composite RPEs for each category produced using the indices and forecasting approach for RIIO-1.

Table 4.10: Forecasts for Labour RPE (net of 'Ofgem inflation index')

Networks	2020/21	2021/22	2022/23	2023/24	2024/25 – 25/26
Corresponding inflation index	RPI (using OBR forecast)		CPIH (using OBR CPI forecast)		CPIH (long-term avg.)
GDNs and GT	1.1%	1.6%	1.2%	1.1%	0.9%
ET	1.1%	1.6%	1.2%	1.1%	1.0%

Table 4.11: Forecasts for Materials RPE (net of 'Ofgem inflation index')

Networks	2020/21	2021/22	2022/23	2023/24	2024/25 – 25/26
Corresponding inflation index	RPI (using OBR forecast)	CPIH (using OBR CPI forecast)			CPIH (long-term avg.)
GDNs	1.2%	1.6%	1.5%	1.5%	1.5%
GT	1.8%	2.3%	2.1%	2.1%	2.1%
ET	0.2%	0.6%	0.5%	0.5%	0.5%

Table 4.12: Forecasts for Plant & Equipment RPE, SHET only (net of 'Ofgem inflation index')

Network	2020/21	2021/22	2022/23	2023/24	2022/23 – 25/26
Corresponding inflation index	RPI (using OBR forecast)	CPIH (using OBR CPI forecast)			CPIH (long-term avg.)
SHET	0.0%	0.4%	0.2%	0.2%	0.2%

Finally, Table 4.13 combines the above category-level RPEs weighted by the notional cost structure of each network to produce a totex-level RPE estimate.

Table 4.13: Forecasts for Totex RPE (net of 'Ofgem inflation index', to 1 d.p.)

Network	2020/21	2021/22	2022/23	2023/24	2024/25 – 25/26
Corresponding inflation index	RPI (using OBR forecast)	CPIH (using OBR CPI forecast)			CPIH (long-term avg.)
GDNs	0.9%	1.4%	1.1%	1.0%	0.9%
NGGT (TO)	1.0%	1.5%	1.2%	1.1%	1.0%
NGGT (SO)	0.9%	1.3%	1.0%	0.9%	0.9%
NGET	0.7%	1.1%	0.9%	0.8%	0.7%
SHET	0.6%	1.0%	0.8%	0.7%	0.7%
SPT	0.5%	0.9%	0.7%	0.6%	0.6%

4.6. Approach to cost areas not subject to RPE indexation

4.6.1. Approach taken for the DD

We advised that, on balance, Ofgem should continue to apply non-zero OE assumptions to non-indexed costs. We suggested that Ofgem could consider any issues with this approach as one factor to inform its judgements of selecting its final OE assumptions from the range of evidence available.

4.6.2. Responses to the DD

We did not identify specific comments on our recommendation that non-indexed costs should be subject to a non-zero OE assumption. Comments from Oxera[115], echoed in submissions by WWU [116] and Northern Powergrid,[117] focused more generally on perceived inconsistencies between Ofgem's policy to index RPEs and having a fixed OE assumption, and on the fact that some costs are excluded from RPE indexation because of the materiality thresholds.

4.6.3. Our assessment for the FD

We acknowledge the concerns raised but consider that the different approaches to RPEs and OE were understood at the time Ofgem made its policy decision. The information provided does not change that. We retain our view that, on balance, Ofgem should continue to apply non-zero OE assumptions to non-indexed costs. It can consider any issues with this approach as one factor to inform its judgements of selecting its final OE assumptions from the range of evidence available.

[115] Oxera (2020a), A review of Ofgem's RIIO-2 ongoing efficiency analysis. Prepared for Wales & West Utilities Limited, September, p10-11.

[116] WWU (2020), RIIO-2 Draft Determinations – WWU response, September, p28.

[117] Northern Powergrid (2020), T2 and GD2 draft determinations response, September, p14.

5. IMPACT OF COVID-19 ON OE AND RPE

Whilst the challenges for the wider economy presented by COVID-19 are now better understood now than when Ofgem published the Draft Determinations (DD), there remains significant uncertainty about the duration and scale of the full economic impact. It is increasingly clear that the pandemic will continue to affect society for some time, but it is unlikely that there will be greater certainty around the duration of the crisis and timing of the recovery by the time of the Final Determinations (FD).

Although the crisis directly affects the energy network sector less materially than other sectors (e.g. hospitality, transport), it still poses questions in relation to Frontier Shift mechanism for RIIO-2, such as:

- How could COVID-19 change the level of OE improvements that can be achieved in the energy network sector?
- How could COVID-19 change the exposure of network companies to RPEs in ways not captured by the proposed indexation mechanisms?

In preparing the FD, Ofgem will consider whether and how the overall price control framework can appropriately respond to the effect of COVID-19 on the network companies during RIIO-2. Therefore, Ofgem asked us to separately review the possible impacts of COVID-19 on OE and RPEs in the transmission and gas distribution sectors.

Our understanding is that Ofgem requested us to consider the COVID-19 impacts separately so that our advice can inform its overall COVID-19 policy response for FD, which could be broader than Frontier Shift. For example, Ofgem's options include (and are not limited to):

- changing the ex-ante approach to setting the OE challenge and/or the RPE indexation mechanism for all of RIIO-2;
- changing the ex-ante approach to setting the OE challenge and/or the RPE indexation mechanism for the initial years in RIIO-2; and
- using existing or new uncertainty mechanisms, including reopeners, to allow changes to be made as and when more evidence is available on the size and duration of the impact of COVID-19 on network companies.

5.1. Approach to the DD

At the time of the DD, the impact of the COVID-19 crisis was still emerging. It was very unclear whether and to what extent the pandemic would affect energy network companies specifically, beyond the restrictions on working practices introduced by the UK Government in the immediate response. Ofgem noted that COVID-19 had far-reaching consequences for most, if not all, sectors of the economy. Given the level of uncertainty at that time, we agreed with Ofgem that we would not consider the impact of COVID-19 in our Frontier Shift DD report.

5.2. Ongoing Efficiency

In this section, we set out views set out in DD responses and our assessment of the impact of COVID-19 on productivity trends in the wider economy, and what it might mean for the OE that can be achieved by the GDNs and transmission companies during RIIO-2.

5.2.1. Responses to the DD

Outlook for the impact of COVID-19 on productivity during RIIO-2

In their DD responses, none of the companies provided detailed evidence of how COVID-19 would specifically affect their productivity levels during RIIO-2. However, most of them argued that their ability to deliver productivity

improvements is affected by productivity growth outside the energy network sector, with this being an important part of how the OE challenge is set. However, they noted that when setting its OE challenge, Ofgem had not taken account of the forecast negative impact on productivity in the wider economy.

Impact of COVID-19 on the use and reliability of input data for the OE challenge

In their DD responses, the companies noted that that the outlook for productivity improvements was more uncertain as a result of COVID-19. This covers both the reliability of historical performance as a guide to the potential for future productivity improvements as well as current productivity forecasts.

The 2019 EU KLEMS data set only contains data to 2016, and hence does not reflect the impact of COVID-19. Two reports submitted by network companies suggested that, to the extent that COVID-19 has a lasting or permanent downwards impact on productivity, an EU KLEMS based assessment would be over optimistic about future productivity gains.

Reports produced on behalf of several of the companies in response to the DD consultation argued that Ofgem should not place excessive weight on labour productivity (LP) forecasts produced by the Office for Budget Responsibility (OBR) because these forecasts had proven systematically over-optimistic since at least 2010. [118,]

Nonetheless, respondents also noted that Ofgem should take account of how these forecasts had been revised downwards since the publication of the RIIO-2 DD. As a result, they stated that more weight should be put on forward-looking estimates which take COVID-19 into account.· For example, NERA (on behalf of National Grid and SPT), [119] First Economics (on behalf of the ENA) [120] and WPD[121] all suggested that the weaker forward-looking productivity forecasts from the BoE and OBR provided evidence that Ofgem's OE challenge was unjustifiably high.

The network companies also noted the uncertainty in current productivity forecasts. This is reflected in the significant revisions to the forward-looking estimates produced by the BoE and the OBR during 2020.

Impact on the robustness of the ex-ante OE methodology

Several network companies queried the use of an ex ante OE challenge in light of COVID-19.

WWU suggested that in light of COVID-19, Ofgem should change the methodology to include *"an annual adjustment mechanism which ensures timely corrections are made to charges to take account of increases in actual cost vs allowances"*.[122] Oxera, who produced reports for both WWU and SHET, suggested that Ofgem should true-up the OE targets, alongside RPEs, over the course of RIIO-2 depending on how the wider economy and the sector performs.[123]

Some DNOs also commented on this issue with reference to RIIO- ED2. ENWL said that COVID-19 had been *"underplayed and underassessed"* in the DDs and that Ofgem's OE assumptions needed to consider the unknown impact of COVID-19.[124] WPD said that it would be more appropriate to select the mid-point of the proposed range to take account of the potential long-term impact, rather than select the top as Ofgem had done.[125]

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[118] NERA (2020), Frontier Shift at RIIO-T2 Draft Determinations: Report prepared for National Grid and SPT, September, p7-8.

[119] NERA (2020).

[120] First Economics (2020), Frontier Productivity Growth: A report prepared for the ENA, August, p15

[121] WPD (2020b). Appendix – Responses to specific questions from Ofgem Consultation on RIIO-2 Draft Determinations for Electricity and Gas Transmission (ET and GT) and Gas Distribution (GD), September

[122] WWU (2020), RIIO-2 Draft Determinations Response, September, p55.

[123] Oxera (2020), A review of Ofgem's RIIO-2 ongoing efficiency analysis. Prepared for Wales & West Utilities Limited, September, p10.

[124] ENWL (2020), Appendix 1: response to RIIO-2 Draft Determinations Core Document questions, September, p8.

[125] WPD (2020a), Consultation on RIIO-2 Draft Determinations for Electricity and Gas Transmission (ET and GT) and Gas Distribution (GD), September, p13.

5.2.2. Evidence on the impact of COVID-19 on productivity during RIIO-2

Emerging evidence of the impact of COVID-19 on productivity so far

Initial estimates for UK economic performance since the start of the COVID-19 crisis have been released by the Office for National Statistics (ONS) since Ofgem published the DD. The latest revised GDP estimates show that output is still 9.6% lower than it was compared to the same quarter a year ago,[126] whilst total weekly hours worked fell by 12.1% over the same period.[127]

The "flash" productivity estimates for Q3 2020 show that UK output per hour grew year-on-year (+3%) but output per worker (-8.8%) fell over the same period.[128] Beneath these headline figures however, there has been significant variation between industries. Table 5.1 shows examples for some of the comparators sectors considered in our historical productivity analysis (EU KLEMS) as discussed in Section 2.5.[129]

Table 5.1: Change in LP (output per hour) by selected industry, Q3 2020 compared to Q3 2019

Industry	Change in labour productivity
All industries	**3.0%**
Construction	9.3%
Transportation and Storage	(1.0%)
Financial and insurance activities	(6.4%)
Manufacture of Chemicals & Chemical Products	21.8%
Manufacture of Computer, Electronic and Optical products; Manufacture of Electrical Equipment	(3.0%)
Manufacture of Transport Equipment	(9.0%)
Water supply	3.7%
Energy	6.1%

Source: CEPA analysis of ONS flash productivity estimates, November 2020

We note that the water supply industry saw a 3.7% increase in output per hour; this is a sector like energy networks whose workforce was classified as "essential" and therefore exempt from lockdown regulations. Working under the conditions seen during the lockdown would present challenges for energy networks (for example, availability of staff to work onsite owing to caring commitments and/or shielding requirements). However, it is possible that working under these conditions could provide some advantages for utilities. For example, lower levels of traffic could make it easier for staff to travel between sites where physical presence is required.

External productivity forecasts

In November 2020, the Bank of England (BoE) updated its LP forecasts for 2020 to 2023. Compared to January 2020 figures which we cited in our Frontier Shift DD report and to the August 2020 figures quoted in DD responses, the BoE has revised up its productivity growth estimates for both 2020 and 2022 are revised up, whilst 2021 has been revised down.

[126] ONS (2020), GDP first quarterly estimate, UK: July to September 2020, available online, November.

[127] ONS (2020), LFS: Total actual weekly hours worked (millions) UK, Seasonally Adjusted (YBUS), available online, September.

[128] ONS (2020), UK productivity flash estimate: July to September 2020, available online, November.

[129] We note that the flash productivity estimates are often subject to revisions made in subsequent releases.

Table 5.2: Changes in the BoE's LP (output per hour) growth forecasts

Monetary Policy Report	2020	2021	2022	2023
January 2020	0%	0.75%	1.25%	N/A
August 2020	-0.25%	0.75%	0.75%	N/A
November 2020	1.75%	-2.25%	1.75%	0.5%

Source: Bank of England, Monetary Policy report – January 2020, Table 1.C, Bank of England, Monetary Policy report – November 2020, Table 1.B

Recent revisions to the BoE's LP estimates for 2020 and 2021 are relatively large, but this is not unexpected. The response to COVID-19 has resulted in a large reduction in economic output ("GDP") this year and an even larger reduction in hours worked across the economy. The change in LP simply reflects the net impact of the changes in output and hours worked. As new data and subsequent revisions become available to better understand the scale of this impact, so the near-term productivity estimates are also revised.

In addition, the BoE is forecasting a net reduction in LP by 2022 (relative to its January forecast). This is consistent with scenarios subsequently considered by the OBR and other macroeconomic forecasters that assume some 'scarring' effects from COVID-19 driven in part by falling business investment and stranded capital.

Table 5.3 compares the OBR's July 2020 scenarios for output per hour forecasts to its March 2020 forecast. It shows that the OBR expects a near-term improvement in productivity relative to the March forecast in both the central and upside scenarios. This is change to the net effect of major changes in hours worked and output in particular sectors, which are sometimes characterised as 'compositional effects'. The scarring effects of COVID-19 reduce productivity growth over the longer term in both the central and downside scenarios.

Table 5.3: OBR output per hour forecast (July 2020): scenarios versus March 2020 forecast (Q4 2019 = 100)

	Q4 2019	Q4 2020	Q4 2021	Q4 2022	Q4 2023	Q4 2024
March 2020 forecast	100.0	101.0	102.2	103.3	104.5	105.8
July 2020 forecast						
Upside scenario	100.0	105.8	104.1	103.6	104.6	105.8
Central scenario	100.0	103.5	102.5	101.7	102.5	103.5
Downside scenario	100.0	100.6	98.1	98.2	99.9	101.3

Source: CEPA analysis of OBR July 2020 Fiscal sustainability report: Chart 2.10

Analysis of the COVID-19 impact presented by Ofwat for PR19

Ahead of the PR19 Final Determinations, Ofwat's consultants (Europe Economics) analysed the potential impact of the COVID-19 crisis on frontier shift in the water sector.

With regards to productivity trends in the context of COVID-19, Europe Economics analysed TFP growth in comparator sectors in four past recessionary periods covered by the EU KLEMS datasets: 1973-1974; 1980-1981; 1990-1991 and the 2008-2009 recessions. It then examined TFP growth over a 5-year period from the start of each recession to align with the duration of the next 5-year price control period for the water sector.

The report did not find strong evidence to change the proposed OE challenge.[130] Whilst TFP (GO) growth rates typically slow down (or turn negative) in the recession years, this is followed by a recovery in the years immediately

[130] There are several differences between Ofwat's approach at FD and Ofgem's DD approach to OE. These include, but are not limited to, Ofwat's focus on GO measures of TFP, which resulted in Europe Economics recommending an OE challenge of 0.6% to 1.2%. Ofwat also use the term 'frontier shift' to describe what is referred to as the 'OE challenge' in our report.

following. Average TFP GO growth for the comparator sectors varied across the four recessions studied, but the average across recessions was 0.6%. When focusing on TFP GO growth of the stronger performing comparator sectors, a figure of 1.2% was supported by two of the four recessions considered, with a third recession supporting a figure of up to 1.1%.

Europe Economics further analysed asset betas for the comparator and water sectors, which suggested that the water sector is much less exposed to the business cycle. Europe Economics also found that the EU KLEMS dataset showed that water sector TFP growth is decoupled from the wider economy. As a result, they suggest that any reduction in productivity growth of comparators over recessionary periods is likely to overstate the impact on the OE that can be achieved in the water sector.

Other evidence on impact of COVID-19 on productivity

We reviewed early research on the impact of COVID-19 on the construction industry, commissioned by Balfour Beatty, GKR, Kier, Mace, Morgan Sindall and Skanska.[131] The researchers interviewed representatives of six construction projects to better understand the impact of the changes made on site, what benefits may arise from the adoption of these changes longer term and what measures might be needed to ensure that new 'good behaviours' are retained.

The research found that five of the six sites had increased the amount of time spent planning work and ensuring that there were not too many workers in each site area. There was a general view that this was beneficial and, in most cases, had contributed to increased worker effectiveness, improved productivity and site tidiness. On the other hand, overall project progress was variable, influenced by a range of factors including having fewer workers on site, difficulty accessing materials, and the reduced availability of specialist suppliers. Some tasks took longer to complete due to the need for workers to maintain social distancing.

Whilst it is only an early snapshot, the research illustrates how the construction sector has adapted to the challenges of COVID-19. We consider that there may be parallels between the construction sector and the network companies. This means that network companies may also be to exploit potential opportunities to move forward with innovations which might otherwise have taken several years to embed, and to challenge some conventional thinking about the ways in which projects are planned and undertaken. Beyond the immediate impact of having to adjust to the impact of COVID-19, this research highlights the possibility of productivity upside over the longer term as a result of the new ways of working adopted over the past year.

5.2.3. Our assessment for the FD

Outlook for the impact of COVID-19 on productivity during RIIO-2

We recognise that COVID-19 has had a widespread impact across the economy in 2020 and that the impacts are expected to continue well into 2021, particularly for specific industries and areas of the country which are affected by tighter restrictions to prevent the spread of the virus.

The critical questions are (i) whether, and to what extent, these effects are likely to apply to the network companies, and (ii) what is the impact on productivity *trends* in the energy network sector?

The scale of the impact of COVID-19 on the productivity of network companies during RIIO-2 remains uncertain and difficult to predict. It is likely to depend on factors such as:

- the duration of the pandemic;
- the length of time that restrictive social distancing measures are in place;

[131] Jones, W., Chow, V. and Gibb, A. (2020), COVID-19 and construction: Early lessons for a new normal?" available online, September.

- the impact on the wider economy (and the energy sector) once the furlough scheme and other Government interventions have ended; and
- the longer-term impacts of social responses (e.g. increased home working).

COVID-19 has resulted in a large shock to the economy which has reduced productivity this year (i.e. negative productivity growth). However, we have not seen compelling evidence of the impact of the wider economic changes on the productivity of the energy network companies. The emerging ONS productivity data shows that labour productivity trends in 2020 have been varied across different industries, with for example, improved productivity in the water sector, and the energy industry being less affected than the wider economy.

Social distancing guidelines, and various other changes to normal working practices in the infrastructure construction sector, have been designed to minimise the number of staff onsite at any given time. These will have adversely affected network company productivity and delayed construction schedules. We also acknowledge that there will be some staffing challenges particularly for staff with caring commitments and/or shielding requirements, whose job requires a physical presence at a site. In these circumstances, working from home is not a viable option to meet the normal needs of the job. But it is uncertain what the scale of this impact is – none of the companies provided evidence to quantify it – or for how long this impact will persist.

We note that it is uncertain exactly what the net impact has been on companies' capital programmes, since whilst many schemes might have been delayed or paused, other works might have been brought forward to take advantage of a period of reduced economic activity. We have seen some evidence that on-site worker productivity has improved, and that construction companies have been able to identify working practices that should be retained going forwards, including greater acceptance of remote working and video inspections. Indeed, the crisis will enable the network companies to identify additional productivity improvements in the delivery of work, which may not have been fully incorporated within their business plan submissions but could be realised during RIIO-2.

Impact of COVID-19 on the use and reliability of input data for the OE challenge

We agree that the impact of COVID-19 is not reflected in our EU KLEMS analysis of historical productivity trends. However, by covering the business cycles included in the EU KLEMS database (1997-2016), the impact of downturns on productivity is captured in our analysis – even if the historical data does not contain a downturn of this severity and speed. In addition, our consideration of historical growth accounting analysis already takes into account that the past is at best an imperfect guide to the future.

We also agree that there is a high level of uncertainty in current productivity forecasts. In its November 2020 forecast, the OBR has produced three "scenarios" to consider the medium-term impact of COVID-19 amidst the uncertainty about the scale and duration of the pandemic, and the impact of the policy response on economic activity.

The scale and duration of the pandemic and associated policy response, combined with the timing of the recovery, remains uncertain. In addition, forward-looking productivity estimates consider economy-wide productivity whereas the impact of COVID-19 is very varied by sector. The scale of economic disruption caused by COVID-19 means that economy-wide LP forecasts are being driven by major changes in hours worked and output in specific sectors – these trends do not appear relevant for the energy networks.

Since the emerging evidence on the economic impact of COVID-19 suggests that some industries have been more affected than others, the comparability of these forward-looking estimates with the targeted comparator set in the EU KLEMS analysis is less than might be expected under more normal economic conditions.

The productivity forecasts do not cover the whole RIIO-2 period (2021-2026). The BoE LP forecast runs to 2023, and the OBR LP forecast runs to Q1 2025. This raises the challenge of what assumptions to use for the latter years of the RIIO-2 period, given the uncertainty around the impact of COVID-19 on the network companies and the UK economy more widely. If the average of the forecast period is used for those years beyond forecast horizon, the longer-term forecasts will be affected by the impact of the COVID-19 crisis on near-term forecasts; rather than representing a more sustainable level of productivity growth.

We conclude that, on balance, the COVID-19 crisis does not change our assessment of the use and reliability of the EU KLEMS data used in our analysis to inform the OE challenge. In fact, we suggest that little, if any, weight should now be put on economy-wide productivity forecasts given the scale and unevenness of economic disruption caused by COVID-19.

Impact on the robustness of an ex-ante OE methodology

Some DD responses appear to question the appropriateness of the policy decision to combine an ex ante OE challenge with the (ex post) RPE indexation approach, rather than the robustness of an ex ante OE challenge per se. But none of the responses provided compelling evidence to justify why this combination is a flawed approach.

This policy position is ultimately a decision for Ofgem and one that it confirmed in the SSMD. We consider that it remains coherent to set an ex ante measure for efficiency improvements in combination with RPE indexation that provides protection from windfall gains / losses due to real price forecast errors made at the time that cost allowances are set.

The CMA reached a similar conclusion in its provisional report on the appeals against Ofwat's PR19 final determinations. It stated "*that the best mechanism for taking direct account of impacts of COVID-19 is for Ofwat to consider these as part of an industry-wide process; Ofwat has proposed it will consider the needs for any ex post adjustments at a time aligned to its normal PR19 reconciliation process.*"[132]

We also considered whether there were any factors which might prevent Ofgem from practically implementing its proposed methodology for the OE challenge. The OE challenge is set ex-ante, drawing on both backwards-looking and forward-looking analysis. Therefore, it is not affected by the discontinuation or major disruptions to particular data sources during RIIO-2 as a result of COVID-19.

5.3. Real Price Effects (RPEs)

In this section we set out views set out in DD responses and our assessment of the impact of COVID-19 on the RPEs faced by the network companies, and what this might mean for the application of RPE indexation in RIIO-2.

5.3.1. Responses to the DD

Outlook for the impact of COVID-19 on input price trends during RIIO-2

In their DD responses, some of the network companies noted that the impact of COVID-19 was already visible in some of the proposed labour RPE indices[133]. They argued that that they might be penalised for negative wage shocks in the wider labour market which do not reflect their actual labour costs. For example, NERA's report on behalf of National Grid and SPT noted a decline in the ONS AWE Private Sector and Construction series between February and June 2020.[134]

None of the responses explicitly described the impact to date of COVID-19 on the prices of other inputs, i.e. materials, and plant and equipment.

Impact of COVID-19 on the use and reliability of input data for RPE indexation

NERA noted that the labour cost indices are not just a measure of changes in rate of pays but also changes in hours worked, and that the ONS indices have fallen in part because of a reduction in hours worked across the economy. These trends are not relevant to the network companies if they have not furloughed workers (or otherwise reduced total hours worked across the business) to the same extent as other industries.

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[132] CMA (2020), Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations: Provisional findings, available online, September.

[133] Figure 5.1 in Section 5.3.2 shows recent trends in these labour indices.

[134] NERA (2020), p34.

[REDACTED].[135] [REDACTED]. Similar concerns were raised by the electricity DNOs, notably Northern Powergrid[136].

The companies do not question the reliability of the indices in terms of the data collected (which we believe is unchanged) but rather that COVID-19 has reduced their reflectiveness of the actual cost pressures faced by the companies themselves.

Impact on the robustness of the RPE indexation methodology

Only three stakeholders explicitly commented on the impact of COVID-19 on the robustness of the RPE methodology, of which two were electricity DNOs.

[REDACTED][137]

WPD referred to the potential impact of COVID-19 on company cost structures in the context of suggesting that Ofgem should complete a wider, forward looking review of the notional cost structure. [138] It was concerned that the RPE indices may penalise companies that adopt a different but efficient mix of inputs. ENWL states that Ofgem should consider the impact of COVID-19 and its impact on indexation.[139]

None of the responses to the DD consultation commented specifically on any impact of COVID-19 on Ofgem's ability to practically implement RPE indexation during RIIO-2.

5.3.2. Evidence on the impact of COVID-19 on RIIO-2 input price trends

During a recession we would typically expect the prices of goods and services in aggregate to fall, and for unemployment to rise, due to lower demand and weaker economic activity. But this is not always the case, particularly if the recession is in part associated with a short term supply shock (e.g. due to the full or partial closure of workplaces, as was the case in the UK for much of 2020).

Labour costs

For the four labour cost indices proposed for use in the RIIO-2 FD, Figure 5.1 shows growth trends in recent years using monthly data.

Prior to the introduction of the first policy measures to limit the spread of COVID-19 in March 2020, private sector wages in the UK were growing steadily at around 2.5%–3.5% per year and had been growing faster than inflation. However, as wider economic activity fell in response to those policy measures, both the AWE Private Sector and AWE Construction indices began to fall in real and nominal terms, particularly over the period March to June 2020. There has been some recovery in nominal weekly earnings over the period June to August as various industries have begun to reopen. But the ONS Construction index shows weekly earnings that are still falling, whilst the latest PAFI Civil Engineering Labour & Supervision data shows no growth over the past 12 months.

Figure 5.1: Comparison of monthly labour indices against CPIH since August 2018 (Year-on-Year growth (%))

[REDACTED]

Source: CEPA analysis of ONS, PAFI and BEAMA data

The trends in the ONS AWE indices have been driven primarily by a reduction in hours worked due to the closure of workplaces, the furlough scheme and other measures introduced to shield the population from the virus. For the month of May, the ONS estimates that 6.6 million fewer hours were worked across the economy compared to January (-18%). The ONS also estimated that approximately 22% of employees were furloughed during 15 June to

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[135] [REDACTED]

[136] Northern Powergrid (2020), T2 and GD2 draft determinations response, September, p14.

[137] [REDACTED]

[138] WPD (2020a), p14.

[139] ENWL (2020), p8.

28 June 2020, with the construction sector reporting the largest proportion of the workforce returning from furlough during that period, at 21%.[140] This helps to explain the partial "bounce back" in earnings in the graph above, as certain industries reopened and economic activity recovered.

It is not yet clear why the PAFI Labour and Supervision: Civil Engineering and BEAMA Electrical Engineering indices have been less affected by COVID-19. Possible explanations might include:

- Workers in these occupations had greater flexibility to work remotely, although this seems unlikely to be the complete answer in the context of civil and electrical engineering projects.
- Employers in these sectors were reluctant to furlough or lay off skilled workers, either in anticipation of a relatively prompt resumption of activity, or because work continued on site throughout.
- Methodological differences between these surveys and the ONS indices.

The full impact of COVID-19 on average earnings (as measured by the proposed indices) remains uncertain. It depends in part on what measures the UK Government may introduce or remove to support economic activity, and on the future path of unemployment. Table 5.4 shows a range of average earnings forecasts recently compiled by HM Treasury, which suggest that decline or stagnation in average earnings during 2020 may prove temporary as wages recover in 2021.

Table 5.4: Comparison of forecast growth in average earnings (% change)

Source of forecast	Date of forecast	2020	2021
Non-City forecasters	Varied	0.1%	2.2%
New forecasts	October	-0.2%	2.0%
City forecasters	Varied	0.0%	1.4%
OBR: central scenario	July	0.2%	3.7%

Source: HM Treasury (October 2020) "Forecasts for the UK economy: a comparison of independent forecasts" available online

Materials prices

Figure 5.2 shows the recent evolution relative to CPIH of three of the materials indices proposed for use in the FD RPE methodology, as described in Section 4.4.3. We have not included the *PAFI Plastic Pipes and Fittings* and *ICIS Pipe Black Compounded* indices in this analysis, because monthly data is not available.

Figure 5.2: Change in selected monthly materials indices since August 2018 (Year-on-Year growth (%))

[REDACTED]

Source: CEPA analysis of ONS, PAFI, FOCOS and BCIS datasets

The chart shows a relatively volatile monthly pattern for the PAFI Structural Steelwork Materials index since August 2018. However, there does not appear to be any clear change in trend during 2020.

Year on year growth in the FOCOS Resource Cost Index has been gradually declining since before August 2018 and turned negative around the end of 2019. However, this downward step pre-dates the COVID-19 pandemic.

Growth in the BCIS Electrical Engineering Materials index (used for ET only) had been on an increasing trend up until October 2019. However, it has since declined and the latest data suggests that prices are falling in real terms. Whilst this trend occurs over a similar period to the outbreak of COVID-19 around the world, this may be coincidence rather than causation as there have been similar changes in growth rates earlier in this period

[140] ONS (2020), Average weekly earnings in Great Britain: August 2020, available online, August

In summary, the recent monthly figures for these indices do not provide evidence of any systematic impact of COVID-19 on the cost of materials.

Plant and equipment prices

Figure 5.3 shows how the proposed plant and equipment RPE indices have evolved relative to CPIH in recent years using monthly data.

Figure 5.3: Change in selected monthly plant & equipment indices since August 2018 (Year-on-Year growth (%))

[REDACTED]

Source: CEPA analysis of ONS, PAFI, FOCOS and BCIS datasets

The chart shows a gradually declining trend in the PAFI Plant and Road Vehicles index since August 2018, broadly tracking the trend in inflation. The ONS PPI Machinery and Equipment n.e.c. index has been more stable in nominal terms with a gradual decline from around October 2019.

The latest data for the PAFI Plant and Road Vehicles index shows a sharp fall in nominal (and real) prices since June 2020. Whilst this may reflect factors related to COVID-19 such as the closure of factories and interruptions to the ability to move plant and equipment on time, there may be multiple other factors which are as (if not more) relevant to the price of these materials. It is too early to form a view on whether this latest data point is likely to become a significant or sustained trend, or whether it is in fact linked to COVID-19.

5.3.3. Our assessment for the FD

Outlook for the impact of COVID-19 on input price trends during RIIO-2

COVID-19 has already had a significant impact on the UK labour market and therefore the labour indices. These pressures are likely to continue into 2021, meaning that the companies may face a negative true-up at least in the first year of the price control.

We recognise that COVID-19 is likely to have an impact on at least some of the indices proposed for the RPE indexation approach. In particular, the labour indices are likely to be subdued in the near term by the economic impact of the COVID-19, and the longer and deeper the recession lasts, the more pronounced this impact may be.

Given the scale of the impact that the crisis has had on the global economy, we would also expect some effect also on the materials indices, and on the plant and equipment indices as well. Though this will be offset to some degree by increased government spending on infrastructure projects. In the near term, COVID-19 is likely to reduce the cost pressures faced by the network companies, and as we have set out in the sub-sections above, we expect this to be reflected in the indices selected for use in the RPE indexation methodology for FD.

Impact of COVID-19 on the use and reliability of input data for RPE indexation

As the network companies' workforce was classified as 'essential' during lockdown, total hours worked across the companies was unlikely to have declined to the same extent as other industries. As a result, we agree that the companies are unlikely to have faced the same reduction in internal labour costs during 2020 as is captured in the ONS AWE Private Sector and AWE Construction indices.

However, the aim of the RPE indexation approach is not to perfectly match the companies' actual cost pressures. This would be both difficult to achieve and potentially counter to the objective of incentivising efficiency, particularly if the network companies themselves represent a significant share of the chosen indices.

Rather, the aim is to provide a reasonable proxy for the efficient labour cost changes faced by the companies, recognising that for some non-technical and non-specialised roles the companies compete for labour across a much wider pool of employers and industries (including, potentially, retail and leisure). This requires a balance between broad indices, such as the AWE Private Sector and AWE Construction indices, and indices which capture more specialist labour, such as the BEAMA electrical engineering labour index for the ET companies.

Moreover, whilst we found that the proposed indices were the most appropriate set to use in what one might term "normal" conditions, there may inevitably be extreme circumstances under which the indices diverge from the costs facing the network companies.

If some of the labour price indices have been temporarily depressed by numbers of hours worked, then there may be a bounce-back effect in those indices as average working hours increase as staff move off furlough back to normal working hours, alternative roles or unemployment. The network companies will benefit from any such bounce-back in the RPE received, if they do not face the same upward pressure in average earnings as a result of the bounce-back effect.

In addition, whilst wages can be "sticky" in the short term, the network companies have control over their wage structures and remuneration policies. These could be adjusted over the medium term to reflect the conditions in the wider labour market.

None of the companies raised specific COVID-19 related concerns with the proposed materials and plant and equipment indices.

Taking the above factors into consideration, we do not believe that COVID-19 has an adverse impact on the reliability and use of the input data used to apply the RPE indexation approach.

Impact on the robustness of the RPE indexation methodology

We recognise that network company cost structures are constantly evolving in ways that may not be exactly reflected in a notional cost structure based on FD allowances.[141] As this is not an issue specifically related to the impact of COVID-19; it is not clear that any such impacts of COVID-19 would justify a change to the notional cost structure approach.

We considered whether COVID-19 was likely to affect the continuation of any of the selected indices and therefore have an impact on Ofgem's ability to practically implement the true-ups during RIIO-2. We did not identify any specific concerns with the impact of COVID-19 on the production and continuation of the indices. We note that there is a general risk inherent in the indexation approach that the index providers withdraw an index product at a later date during the price control. We suggest that Ofgem mitigates this risk by engaging with the relevant index providers at regular intervals to ensure that it receives advance warning of any possible discontinuation, and to consult on how that index should, or should not, be replaced.

We recognise that COVID-19 has the potential to make consumer bills more volatile via the true-up mechanism, because the relevant RPE indices are unlikely to follow a smooth trajectory in the same way that an ex-ante RPE forecast might. RPE indices might also be sensitive to changes in macroeconomic conditions brought about by government restrictions activity in order to control the spread of the virus.

But, on the other hand, we consider that the impact of COVID-19 actually supports the case for RPE indexation, as it reduces the likelihood that companies benefit from windfall gains or losses brought about by 'forecast error'. For example, a deeper and longer recession might result in falling input prices that would not be captured in an ex-ante forecast used to set an RPE allowance, allowing the companies to make a windfall gain.

Taking the above factors into consideration, we do not believe that COVID-19 has an adverse impact on the robustness of the RPE indexation methodology.

In fact, given the uncertainty about the ongoing impact of COVID-19 on the network companies generally, we recognise that it may be more appropriate for Ofgem to deal with COVID-19 effects as part of the wider price control uncertainty mechanisms, rather than through a one-time ex ante adjustment to the RPE indexation approach.

[141] This is the approach proposed by Ofgem in the Core DD document for RIIO-GD2 and RIIO-T2.

An ex post approach can also consider the balance between any windfall gains and losses from the impact on COVID-19 on input price indices. For example, the network companies benefit from regulated revenue streams which are largely unaffected in a recession and allows for continuing investment. This may put them in a stronger position to negotiate cost reductions for future contracting work if there is spare capacity in the economy.

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Appendix A DETAILED PROCESS FOR RPE INDEX SELECTION

This annex provides further detail on the index selection process we followed to inform the recommendations presented in Section 4.4.

A.1. SELECTION CRITERIA

We followed the selection process set out in CEPA's June 2019 Frontier Shift methodology report for Ofgem.[142]. This consists of an initial 'threshold assessment' of a long list of indices, followed by a detailed assessment of the short-listed indices.

The threshold criteria are described in the table below.

Table A.1: Threshold assessment criteria for selection of input price indices

Criteria	Rationale for criteria	Substantiation	Grading
A. Simplicity			
The index represents a material cost or identifiable portion thereof	Proportion of costs covered by the given index	Share of sector totex and mapping to cost categories (>10%, or >5% and passes the criteria below)	Share of sector totex Pass / fail (subject to a threshold being set)
Movements in the index are likely to have a material impact on totex	Estimated impact on totex of movements in the index	As above or evidence from company submissions clearly demonstrating a material impact on totex (>0.5%)	Pass / fail
B. Accuracy			
Reflects movements in the respective input cost category (or a distinct portion thereof) for a notional efficient company in the sector	The index must reflect movements for a notional efficient company	Comparison of drivers of changes in the index and changes in input costs for companies in the sector	Pass / fail
C. Independence			
The index has a low or no chance of being manipulated by actions of companies in the sector[143]	Companies in the sector should not be able to manipulate the data series for financial gain	An assessment of the source of information used to create the data to consider the risk that the companies exert material influence over the index.	Pass / fail

Source: CEPA

The detailed assessment criteria are described in the table below.

Table A.2: Detailed assessment criteria for selection of input price indices

Criteria	Rationale for criteria	Substantiation	Grading
1. Simplicity			

[142] CEPA (2019), RIIO-GD2 cost assessment – frontier shift.

[143] This would also need to be monitored over time.

Criteria	Rationale for criteria	Substantiation	Grading
1a. Series does not capture ongoing efficiency	Avoidance of the need to adjust ongoing efficiency	Series represents the cost of an input for companies in the sector	True / false / unclear
2. Credibility			
2a. Data provider has provided indices for Ofgem/ other regulators and/ or is an established provider of statistical data	It will be important for the legitimacy of the mechanism and provides confidence that the series will be maintained in line with statistical best practice	Data provided by the organisation has been used or considered by a regulatory authority for the analysis of RPEs in the UK within the last ten years (or comparable recent reliance by a public body in a similar area)	Pass/ Fail
2b. Series has no known statistical or methodological flaws	Measurement error risk should be minimised	Analysis of index methodology, if available	True / false / unclear
2c. Number of years available	Mature indices are less likely to be discontinued or have methodological changes and assist with producing up-front forecasts	Verification of availability	Years
3. Accuracy			
3a. Level of confidence that use of the index will provide a more accurate reflection than the default approach to RPEs	The index must be at least as good as the default approach to RPEs (i.e. CPI/ CPIH indexation).	As above plus comparison with drivers of the value of the default approach to RPEs (e.g. economy-wide factors affecting CPI-based measures), and analysis of forecast deviations from CPI-based measures and relative volatility	Red / amber / green
3b. Large historical movements in the index can be explained	For a good index that is not affected by measurement error, it will be possible to understand the drivers of the magnitude and volatility of movements over time	Targeted analysis of historic values and press search	Red / amber / green
4. Transparency			
4a. Series is publicly available	Allows stakeholders to understand how the series has been calculated. Minimises costs of the process.	Verification of steps required to access data	Free / paid / false
4b. A forecast comparable to the index is available from a credible source	This makes it simpler for stakeholders to understand the potential future behaviour of the mechanism	Verification of availability	Yes, or available but from alternative credible source/ No
5. Timeliness			
5a. Time lag for provisional values to be published	A longer lag may lead to delays in adjustments for RPEs	Verification of data provider schedule for releasing updates to forecasts	Months
5b. Time lag for revised values to be provided	As above	As above	Months

During our detailed review of the indices, we came across new data series from BCIS (these are referred to as 'Series 3' and 'Series 4' indices by BCIS) that seemed to have similar coverage to the BCIS indices used in RIIO-1

(referred to as 'Series 2' indices). BCIS has indicated that Series 2 indices have generally been superseded by the newer indices. Therefore, where available we have used the newest series that closely matches the coverage of the index used in RIIO-1 – in some cases this means using a Series 3 index and in other cases it means using a Series 4 index. We have taken this approach to ensure that the indices we recommend for RIIO-2 are the most current set of relevant indices.

A.2. ASSESSMENT AGAINST THRESHOLD CRITERIA

The first set of threshold criteria relate to simplicity and set to only apply indexation to material cost categories. This assessment takes place at the level of cost categories, rather than published indices. The approach and findings from that analysis are presented in Section 4.3. The outcome of that step is to apply indexation to:

- Labour to all companies (combining general and specialist labour).
- Materials cost areas for all companies.
- Plant & Equipment cost area for SHET only.

A.2.1. Labour costs

We rejected two labour indices during the threshold assessment:

- AWE: transport & storage failed the accuracy criteria as transport and storage labour reflected a small portion of GDN labour costs. This was based on DD responses from multiple GDNs which reported that transport & storage make up slightly more than 1% of their labour costs.
- AWE: electricity, gas and water supply failed the independence criteria due to the likely impact on the index of the activities of electricity and gas network companies.

The remaining labour indices passed the threshold criteria and were passed on to the detailed assessment. Our assessment is summarised in the table below.

Table A.3: Threshold assessment - labour

Indices – labour costs	Accuracy Reflects movements in the respective input cost category (or a distinct portion thereof) for a notional efficient company in the sector	Independence The index has a low or no chance of being manipulated by actions of companies in the sector
AWE: private sector (K54V)	Y	G
AWE Private Sector data less Arts, Entertainment & Recreation, Accommodation & Food service activities, and Retail Trade & Repairs.	Y	G
AWE: transport & storage (K5B7)	N	
BCIS General Labour (1161)	Y	G
AWE: professional, scientific, and technical	Y	G
AWE: administrative and support services	Y	G
AWE: electricity, gas, and water supply	Y	R
AWE: Construction (K553)	Y	G
BCIS PAFI civil engineering (4/CE/01)	Y	G
BEAMA: electrical engineering	Y	G

A.2.2. Materials costs

We rejected four materials indices during the threshold assessment:

- LEBA and Oanda failed the assessment because they cover commodity and energy prices, respectively.
- BCIS 3/58 copper pipes and accessories failed the accuracy criteria because the index covers materials that are not a material portion of costs for GDNs. This reflects evidence included in responses from [REDACTED][144] and NGN[145]. This index is also not representative of the materials used by ET and GT companies.
- BCIS 4/CE/26 metal structures also failed the accuracy criteria as the index contains materials, such as those used for bridge construction, that are not relevant to network company materials costs. We found the alternative steelworks indices to be more reflective of network company costs.

Our assessment is summarised in the table below.

[144] [REDACTED]

[145] NGN (2020), RIIO-2 Draft Determination Consultation Response, Core Document, September, p6.

Table A.4: Threshold assessment - materials

Indices – materials costs	Accuracy Reflects movements in the respective input cost category (or a distinct portion thereof) for a notional efficient company in the sector	Independence The index has a low or no chance of being manipulated by actions of companies in the sector
BCIS FOCOS Resource Cost Index of Infrastructure: Materials	Y	G
LEBA	N	
Oanda	N	
BCIS 4/CE/24 Plastic Products (including pipes)	Y	G
PIEWEB Plastic prices (PE80 and PE100)	Y	G
ICIS PE Pipe Black HDPE 100	Y	G
BCIS 3/58 copper pipes and accessories	N	
BCIS 4/CE/EL/03 Electrical cables	Y	G
BCIS 4/CE/EL/02 Electrical engineering materials	Y	G
BCIS 2/S2 Electrical installations – Cost of materials	Y	G
BCIS 3/S3 Structural steelwork – Materials: Civil Engineering Work	Y	G
BCIS 2/S2 Steelwork – Cost of Materials	Y	G
BCIS 4/CE/26 Metal Structures	N	

A.2.3. Plant & equipment costs

We rejected three plant and equipment indices during the threshold assessment:

- ONS machinery & equipment *input* PPI was rejected as the index covers inputs into manufacturing processes, rather than the manufactured outputs that network companies procure. We recommend retaining the ONS machinery & equipment *output* PPI, which reflects manufactured outputs bought by network companies.
- BEAMA large power transformers failed the independence criteria on the basis that ET companies are likely the biggest purchasers of equipment for large power transformers.
- BEAMA electrical equipment failed the accuracy criteria as the components of the index do not cover ET plant and equipment.

Our assessment is summarised in the table below.

Table A.5: Threshold assessment - plant & equipment costs

Indices – plat & equipment costs	Accuracy	Independence

	Reflects movements in the respective input cost category (or a distinct portion thereof) for a notional efficient company in the sector	The index has a low or no chance of being manipulated by actions of companies in the sector
PAFI plant and road vehicles	Y	G
ONS Machinery & equipment output PPI	Y	G
ONS Machinery & equipment input PPI	N	
BEAMA large power transformers	Y	R
BEAMA basic electrical equipment	N	

A.3. ASSESSMENT AGAINST DETAILED CRITERIA

The indices that passed the threshold assessment were subsequently assessed against the detailed criteria, as summarised below.

Table A.6: Detailed assessment of shortlisted indices

Assessment criteria	Description of criteria	Assessment
1. Simplicity	1a. Series does not capture ongoing efficiency	Y/N
2. Credibility	2a. Data provider has provided indices for Ofgem/ other regulators and/ or is an established provider of statistical data	Y/N
	2b. Series has no known statistical or methodological flaws	RAG
	2c. Number of years available	# of years
3. Accuracy*	3a. Level of confidence that use of the index will provide a more accurate reflection than the default approach to RPEs (CPIH or other existing index in use)	RAG
	3b. Large historical movements in the index can be explained	RAG
4. Transparency*	4a. Series is publicly available	Y/Y (fee)/N
	4b. A forecast comparable to the index is available from a credible source	Y/N
5. Timeliness*	5a. Time lag for provisional values to be published	Weeks
	5b. Time lag for revised values to be provided	Weeks

** An index that does not pass the simplicity and credibility criteria is rejected and not assessed further.*

A.3.1. Labour costs

We rejected four labour indices during the detailed assessment:

- AWE: private sector *less* arts, entertainment & recreation, accommodation & food service activities, and retail trade & repairs failed the credibility criteria due to the need to manipulate a published index, difficulty determining the appropriate subsectors to remove, and difficulty justifying the removal of subsectors over the duration of the RIIO-2 price control.
- AWE: professional, scientific, and technical failed the accuracy criteria because other labour indices captured the occupations that make up the proposed index. Historical movements in the index did not appear to be materially different from the AWE: Private sector index. Overall, we took the view that including this index in the RPE calculation was unlikely to improve the accuracy of the resulting RPEs.

- AWE: administrative and support services failed the accuracy criteria due to administrative occupations already constituting 11% of the AWE: private sector index. There may be some overlap between administrative/support roles and other types of generalist labour. Therefore, using the broader AWE: private sector index is expected to be more representative of the cost pressures network companies may face with regard to non-specialised labour. Overall, we took the view that including this index in the RPE calculation was unlikely to improve the accuracy of the resulting RPEs.
- BCIS General Labour was rejected on the credibility criteria because its methodology appears to be less current than those of the other indices, while it covered professions that were generally captured in the other (RIIO-1) indices. For example, we understand that 70% of the BCIS index is made up of labour related to buildings, which is already captured in the AWE: construction index. Additionally, the BCIS General Labour index's methodology (which is part of the PAFI 'Series 2' family of indices) was last updated in 1993, whereas each of the four labour indices that we recommend using for RIIO-2 have had their methodology updated in 2017 or 2018.

Our assessment is summarised in the table below.

Table A.7: Detailed assessment - labour

Indices	Simplicity	Credibility			Accuracy		Transparency		Timeliness	
	1	2a	2b	2c	3a	3b	4a	4b	5a	5b
AWE: private sector	Y	Y	G	20+	G	G	Y	Y	6-7 weeks	10-11 weeks
AWE Private Sector data less Arts, Entertainment & Recreation, Accommodation & Food service activities, and Retail Trade & Repairs	Y	Y	R	20+						
AWE: professional, scientific, and technical	Y	Y	G	20+	A	G	Y	N	6-7 weeks	10-11 weeks
AWE: administrative and support services	Y	Y	G	20+	R	R	Y	N	6-7 weeks	10-11 weeks
AWE: Construction	Y	Y	G	20+	G	G	Y	N	6-7 weeks	10-11 weeks
PAFI 4/CE/01 civil engineering labour	Y	Y	G	10	G	G	Y (for fee)	N	4 weeks	Up to 12 weeks
BEAMA: electrical engineering	Y	Y	G	19+	G	A	Y (for fee)	N	5 weeks	N/A
BCIS General Labour (1161)	Y	Y	R	20+						

A.3.2. Materials costs

We rejected five materials indices during the detailed assessment.

We explored the index options for plastic pipes used by GDNs in depth, noting comments from some GDNs (e.g. [REDACTED]) that the plastic pipes index should reflect the high-quality polyethylene (PE) that they use.[146] We drew the following conclusions from our detailed assessment:

- PIEWEB plastic prices: failed the credibility criteria due to the lack of evidence on the number of monthly respondents to PIEWEB's online survey and telephone interviews regarding PE 80 and PE 100 prices.
- ICIS PE Pipe Black HDPE 100: we rejected this index following an in-the-round assessment, on the basis that the index covers plastic quasi-commodity prices rather than the price of the type of pipes (i.e. final product) purchased by GDNs.[147] As such, the index is likely to capture only part of the cost pressures that GDNs may face in purchasing plastic pipes. For example, Figure A.1 shows that the ICIS index has been more volatile than the BCIS 4/CE/24 Plastic Products (including pipes) index. This may reflect the dampening effect that manufacturing processes of the pipes would be expected to have on costs relative to the raw plastic materials. Overall, we consider that including the ICIS index in the RPE calculation was unlikely to improve the accuracy of the resulting RPEs.
- BCIS 4/CE/24 Plastic Products (including pipes): we determined that on balance this index is most likely to reflect price trends for the plastic products used by GDNs. While the index also includes pipe grades below those used by GDNs, we would expect the price *trends* of different grade plastic pipes to be broadly similar even if the *unit costs* differ by pipe grade.

The remaining rejected materials indices were as follows:

- BCIS 4/CE/EL/03 electrical cables: we rejected as electrical cables are already a component of the BCIS 4/CE/EL/02 electrical engineering materials index.
- BCIS 2/E2 electrical installations – cost of materials and BCIS 2/S2 steelwork – cost of materials: we rejected due to being superseded by BCIS Series 4 indices of the same materials categories.

[REDACTED][148] We reviewed the methodologies of the various BCIS (including PAFI) indices and consider that the indices we have recommended represent the most suitable proxies for network companies' materials RPEs from the indices available – including recommending the use of the FOCOS Resource Cost Index that only covers materials, rather than the averaged index that also captures labour. [REDACTED]

Our assessment is summarised in the table below.

[146] [REDACTED]

[147] We understand, based on discussions with ICIS, that prices of different grades (e.g. PE 80 and PE 100) tend to follow similar price trends. As such, we think it is not necessary for the plastics index to reflect the grade used by GDNs, as long as it reflects the type of product that GDNs purchase (i.e. manufactured pipes, rather than 'raw' plastics).

[148] [REDACTED]

Table A.8: Detailed assessment - materials

Indices	Simplicity	Credibility			Accuracy		Transparency		Timeliness	
	1	2a	2b	2c	3a	3b	4a	4b	5a	5b
BCIS FOCOS Resource Cost Index of Infrastructure: Materials	Y	Y	G	20+	G	G	Y (for fee)	N	4 weeks	Up to 12 weeks
BCIS 4/CE/24 Plastic Products (including pipes)	Y	Y	A	20+	G	G	Y (for fee)	N	4 weeks	Up to 12 weeks
PIEWEB Plastic prices (PE80 and PE100)	Y	Y	R	4						
ICIS PE Pipe Black HDPE 100	Y	Y	A	9	A	A	Y (for fee)	N	Weekly	No revision
BCIS 4/CE/EL/03 Electrical cables	Y	Y	A	10	A	A	Y (for fee)	N	4 weeks	Up to 12 weeks
BCIS 4/CE/EL/02 Electrical engineering materials	Y	Y	G	10	G	G	Y (for fee)	N	4 weeks	Up to 12 weeks
BCIS 2/E2 Electrical installations – Cost of materials	Y	Y	R	20+						
BCIS 3/S3 Structural steelwork – Materials: Civil Engineering Work	Y	Y	G	20+	G	G	Y (for fee)	N	4 weeks	Up to 12 weeks
BCIS 2/S2 Steelwork – Cost of Materials	Y	Y	R	20+						

The figure below presents the trend analysis that informed our assessment of the accuracy criteria for the BCIS and ICIS indices. It shows that the latter index has been more volatile, which we expect to reflect – at least in part – the dampening effect that manufacturing processes of the pipes would be expected to have on costs relative to the raw plastic materials.

Figure A.1: Trend analysis of selected plastic materials indices

[REDACTED]

Source: CEPA analysis of ONS, BCIS and ICIS data

A.3.3. Plant & equipment costs

All plant & equipment indices in the detailed assessment passed the criteria and no additional indices were rejected. Our assessment is summarised in the table below.

Table A.9: Detailed assessment - plant and equipment

Indices	Simplicity	Credibility			Accuracy		Transparency		Timeliness	
	1	2a	2b	2c	3a	3b	4a	4b	5a	5b
PAFI plant and road vehicles	Y	Y	G	20+	G	G	Y (for fee)	N	4 weeks	Up to 12 weeks

ONS Machinery & equipment output PPI	Y	Y		20+	G	G	Y	N	2-3 weeks	Up to 5 months

A.4. RPE INDICES FOR RIIO-2

The table below outlines our recommended RPE indices, following the index selection assessment.

- We have removed the AWE: transport and storage (labour) and BCIS 3/58 copper pipes and accessories (materials) used in the Draft Determination. These indices were removed on the basis of responses that indicate they do not reflect a materials portions of costs for network companies
- For ET only, we have replaced the BCIS 3/58 copper pipes and accessories (materials) index with BCIS 4/CE/EL/02 electrical engineering materials. This decision was based on responses and assessment that identify this index as a more accurate measure of ET materials costs.
- We have removed the ONS Machinery & equipment input PPI. This index was removed based on our assessment that network company machinery and equipment costs are more likely to reflect output producer prices, not input producer prices.

We list our recommended indices in the table below.

Table A.10: Recommended indices for FD

Recommended indices for FD	Application
Labour costs:	
AWE: private sector (K54V)	All
AWE: Construction (K553)	All
BCIS PAFI 4/CE/01 civil engineering labour	All
BEAMA: electrical engineering	ET
Materials costs:	
BCIS FOCOS Resource Cost Index of Infrastructure: Materials (7467)	All
BCIS 4/CE/24 Plastic Products (including pipes)	GD
BCIS 4/CE/EL/02 Electrical engineering materials	ET
BCIS 3/S3 Structural steelwork – Materials: Civil Engineering Work	All
Plant & equipment costs:	
PAFI plant and road vehicles (1702)	SHET
ONS Machinery & equipment output PPI (K389)	SHET

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