

December 2019

PR19 final determinations

**Overall stretch on costs, outcomes
and cost of capital policy appendix**



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Amendment	Date
Page 21, amendment made to the title of Table 4 to replace 'energy' to 'water'	30 April 2020

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PR19 final determinations: Overall level of stretch across costs, outcomes and allowed return on capital appendix

This annex considers the overall level of stretch imposed on companies. The overall level of stretch is a combination of the stretch across outcomes, cost efficiency and the allowed return on capital. There are important interactions between all three elements, as each element works on a standalone basis and combines to set a stretching and efficient final determination.

Each of the three elements contributes to a company's revenue allowance, however there is a degree of uncertainty in all of them. There is a risk that, if the overall level of stretch is too strong across all three elements, a company may end up underfunded overall. Likewise if our level of stretch is too "conservative" it is possible a company may be overfunded, and customers will be paying too much. We have considered the overall level of stretch on each element individually and in the round.

This annex covers the following areas, and provides a summary and response to the representations in each area:

1. A summary of our approach on the overall level of stretch
2. A summary of our approach at the draft determinations
3. Overall stretch on costs
4. Overall stretch on outcomes
5. Overall stretch on outcomes and costs
6. The impact of stretch on the allowed return on capital

1. Summary

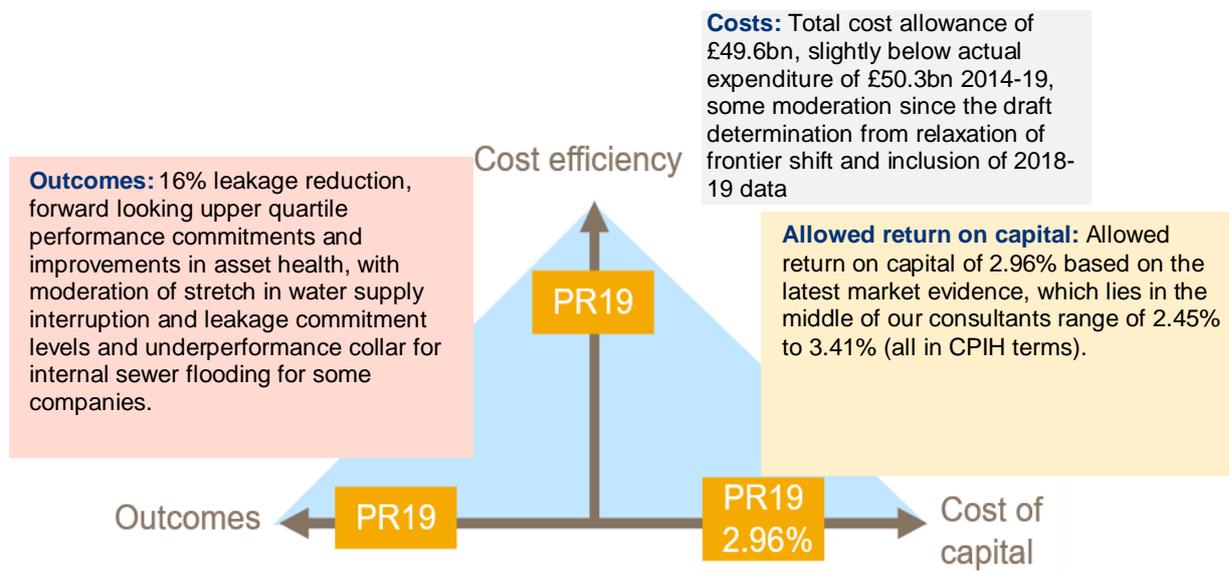
Water companies are monopolies and do not face competitive pressure and the threat of entry which might otherwise drive them to improve service and efficiency. Water companies also have better information than us on how much they can reduce costs or improve service levels¹. In setting final determinations, it is important that we set a stretching but achievable level of overall challenge to meet our duties in the round. This helps to ensure that current and future customers pay no more than efficient costs and receive high quality services from their water company.

We have considered the overall stretch across costs, outcomes and the allowed return on capital at final determination. Where appropriate we make adjustments to our approach at draft determination. Overall these reduce the level of stretch on companies in our final determinations. These include reducing our frontier shift estimate from 1.5% to 1.1% per year, refining our approach to base cost modelling by including 2018-19 data, amending the way that catch-up and frontier shift efficiency are applied, providing additional funding to reduce leakage for better performing companies and reviewing the stretch on water supply interruptions and other performance commitments and adjusting collars to limit penalties in early periods on specific outcomes.

Based on these changes we consider that the overall challenge across costs, outcomes and the allowed return on capital is stretching but achievable, and that the final determinations are financeable.

¹ The importance of information asymmetries is set out in National Infrastructure Commission report, [Strategic investment and public confidence](#). The price review is an asymmetric process with asymmetric information between companies and the regulator. The process allows companies to make representations and provide evidence to draw attention to areas where they may deserve a higher allowance. Companies have less incentive, and other stakeholders less ability, to draw attention to situations where we may have made an over generous allowance

Figure 1: illustration of our overall level of stretch at the final determinations



Stretch on costs

We set cost allowances for an efficient company to deliver required service to customers. Our cost allowances consist of an allowance for base or business as usual costs and the additional cost for service enhancements such as from a change in statutory requirements. We set our cost allowances on the basis of the costs of the best performing companies in the sector and the frontier shift or the expected performance improvement for the best companies over the price review period. This means that poorer performing companies face a catch up efficiency challenge as well as a frontier shift challenge.

At final determination, we set cost allowances on the basis of a 1.1% per year improvement in frontier efficiency and catch up efficiency challenge of 4.6% for wholesale water, 2.0% for wholesale wastewater and 15.4% for retail.

At draft determination, we set cost allowances on the basis of a frontier shift of 1.5% per year and catch up challenge of 4.2% for wholesale water, 1.4% for wholesale wastewater and 16.5% for retail, based on the upper quartile company.

Despite large improvements in productivity of 3-4% per year following privatisation, there has been little improvement in water sector productivity in more recent years. In contrast, our advisers, Europe Economics, have examined productivity growth in comparator sectors and found reasonable productivity growth elsewhere.

On the basis of productivity growth in these sectors post financial crisis and over the longer term, Europe Economics forecasts the water sector should be able to achieve ongoing productivity growth of 0.6% to 1.2% per year. Europe Economics' report shows that these forecasts are consistent with government forecasts and productivity estimates used recently by other regulators, including Ofgem and the CMA. Europe Economics advise that a number towards the upper end of their range is appropriate. These points are covered in more detail in Annex 3 to our 'Securing cost efficiency technical appendix'.

We also continue to consider that there is potential for additional outperformance from innovation using the totex and outcomes framework. However, updated data suggests the scope for this may be lower than we estimated at draft determinations.

Based on the above, further internal assessment, and the subsequent analysis of the challenge that we are imposing through our outcomes performance commitments, we are reducing the frontier shift efficiency challenge from 1.5% to 1.1% per year but increasing the scope of costs to which it should be applied to cover all wholesale base costs and metering as well as Water Industry National Environment Programme (WINEP) enhancement costs. The overall effect is a reduction in the challenge imposed compared to draft determinations. The overall level of challenge to company business plans is now 0.4% on base costs and 5.0% on total expenditure.

Stretch on outcomes

We set performance commitments to reflect stretching but achievable performance from within base costs and to take account of expected improvement from enhancement allowances. At final determination, we use forward looking business plan forecasts and historical data to set stretching but achievable performance commitments.

At draft determination we set performance commitments based on forecast improvement in business plans and evidence of historical improvement. In particular we set:

- Three common forward looking upper quartile performance commitment levels for water supply interruptions, internal sewer flooding and pollution incidents.
- More than 15% reduction in leakage and up to 13% reduction in per capita consumption on the basis of improvement from historical levels and consistent with Government expectations in England and Wales.
- Statutory compliance levels for water quality (compliance risk index) and water treatment compliance.

- Asset health performance commitments based on historical levels and targeted improvements

At final determination, we carefully consider company arguments to reduce stretch and representations from other stakeholders on the level of stretch. We continue to use forward looking and historical improvements to set performance commitment levels. After considering further the overall stretch we impose on companies and historic trends in performance, we are moderating the stretch on water supply interruptions, reducing the leakage challenge for some companies (although it is still at least 15% improvement on PR14 levels) and amending collars for some companies to limit downside risk in early years.

The overall stretch for forward looking common performance commitments is similar to the stretch achieved in PR14 and has been tested and tempered against historical improvements. Some companies have achieved substantial improvements in performance in PR14 by operational and management improvement, for example Northumbrian Water has reduced supply interruptions by 65% and Severn Trent Water has reduced internal sewer flooding by 40%, indicating the scope for to improve performance. Nevertheless, for internal sewer flooding, we limit potential downside payments with collars to reduce exposure of three poorer performing companies (Yorkshire Water, Northumbrian Water and United Utilities) in early years. This allows them time to transition to an efficient level of performance. However we do not consider that customers should accept lower levels of service simply because their company is performing less well than its peers.

Our approach to setting stretch on outcomes builds on our approach at PR14, where we set common performance commitment levels on the basis of historic upper quartile (based on 2011-12 to 2013-14 data), with a glidepath over the first three years of the review to upper quartile, recognising this was a new level of performance. In looking back at performance in PR14, we found that, in many cases, companies exceeded historical upper quartiles on performance commitments at the start of the review, given the two year lag between time of benchmark data and the start of the review period. This suggested to us that setting performance requirements at the historical upper quartile was not always going to be sufficiently stretching. The stretch on common performance commitments in PR19 is in line with the stretch in PR14, but puts some weight on forecast improvement in performance such as company forecasts of the forward looking upper quartile, reflecting experience from PR14.

The current level of leakage is about 21% of total water supplied by the industry. At a sector level there has been little progress in reducing leakage since 1998-99 despite significant technological improvements. During the 1990s, the sector reduced

leakage by more than 30%. The static sector level performance since 2000 has masked some large reductions in leakage from individual companies and deterioration in other companies. In our PR19 methodology, we challenged companies to consider reducing leakage by 15% in their business plans and the best previous performance in the sector, at no additional cost to customers. We are pleased that companies have responded positively to the challenge and proposed improvements of more than 15% in their business plans, although a number of companies sought additional funding to achieve this improvement.

Stretch on costs and outcomes

We consider that the overall stretch on costs and outcomes is achievable. It is vital that companies do not make cost efficiencies at the expense of cutting service quality and that challenge to achieve stretching improvements in service are not obviated by companies being able to pass extra costs onto customers.

At final determination, we use company forecasts of the forward looking upper quartile, evidence of historical improvements and benchmarking across companies to set stretching performance commitment levels. We use historical cost based benchmarks with a frontier shift to set cost allowances. We consider that the combination of stretching but achievable outcome performance commitments and efficient cost allowances are achievable as a whole for an efficient company.

In response to draft determinations, some companies claim it is not possible to achieve both upper quartile performance on costs and outcomes. This is not supported by historical evidence, which shows that some companies currently achieve good performance on both outcomes and cost efficiency. We provide examples of companies performing in the upper quartile on costs and outcomes in section 5.

In PR14 we did not provide additional funding to achieve historic upper quartile performance commitments. Most companies have achieved their PR14 upper quartile common performance commitments as well as outperforming on their upper quartile based cost allowances.

Better outcome performance should not necessarily increase cost. We observe there is a positive relationship between cost efficiency and high service quality across companies. This is because improvements to outcomes can be made by better management and operation of the business – improving both service and cost efficiency. Efficient and well managed companies should be able to improve both costs and outcomes. It is important that the price review regime protects customers from inefficient company performance.

Improvements in service quality and outcome performance are not fully captured in frontier shift efficiency estimates. We also expect some improvement in quality over time without increasing cost. We allow enhancement costs where there is good evidence that further improvements in service require an efficient company to incur higher costs.

The move towards a forward looking upper quartile for the three of the most comparable common outcomes (out of 15) is an increase in the level of stretch compared to commitments set at PR14. In our PR19 methodology we stated that “[a]verage performance now will not equate to efficient performance in the future” and were not expecting to provide companies with additional funding to meet this challenge. We have carefully considered the level of stretch implied by the forward looking data, taking account of historical improvement. For water supply interruptions, we reduce the stretch taking account of the historical evidence and companies’ evidence. For the other two measures, we consider that historical improvements demonstrate the expected stretch from forward looking upper quartile data is reasonable and achievable. We continue to expect companies to achieve service improvements from within base costs by improved management and operating performance, consistent with historical performance improvements.

For leakage in our PR19 methodology, we challenged companies to consider reducing leakage by 15% in their business plans, at no additional cost to customers. We consider that the 15% reduction in leakage is likely to be an additional challenge to some companies compared to their historic performance. It is a challenge that companies have voluntarily accepted. Much of this leakage reduction has already been included in water resource management plans. The scale of technological change over recent years should allow companies to reduce leakage efficiently. While there has been little overall improvement, some companies have substantially reduced leakage over recent years. We acknowledge that reducing leakage is likely to be more difficult for those companies that are already performing well. We are therefore providing additional funding to reduce leakage for companies that will be operating beyond the forecast upper quartile levels. Consistent with our approach on upper quartile common performance commitments, we consider that any costs for companies below this level will be covered by base funding. Our frontier shift efficiency challenge takes into account the increased challenge on outcomes performance, in particular the reduction in leakage.

Overall we consider that the relaxation of our frontier shift efficiency challenge, the reduced level of catch up efficiency compared to PR14, the reduced level of stretch on performance commitments together with the additional £200 million of funding for innovation included in the price control, will provide all companies with a reasonable

opportunity to meet both the service challenge from stretching outcomes performance commitments and our cost efficiency challenge.

The impact of the allowed return on capital

The final determinations are financeable. The allowed return on capital is based on the market evidence and so reflects the prevailing market conditions and cost of debt and equity.

We are setting stretching but achievable levels of cost efficiency and outcome performance commitments. The allowed return on capital could increase or reduce the overall level of stretch if it is set at an inappropriate level, not reflecting market evidence. We consider that in the final determinations we set the allowed return on capital consistent with market evidence and therefore do not increase or weaken the level of stretch we require of companies. We do not consider that it is necessary or appropriate to adjust the allowed return on capital to reflect the level of stretch on outcomes and cost efficiency.

We note other regulators are considering a reduction in the allowed return on capital to account for asymmetry of information in setting cost allowances and outcomes. While we understand the case for a downward adjustment, we do not consider that such an adjustment is required for PR19 as we have sufficient information to set efficient costs and stretching but achievable performance commitments.

Companies comment in response to draft determinations that they are exposed to downside skew in perceived returns from outcome delivery incentives and total expenditure. We have considered the representations and note that in the final determination, the potential for a downside skew on returns is reduced. We consider that any remaining downside skew in company forecasts is likely to be overstated and reflects information asymmetry and understanding of risks and opportunities rather than the expected outturn. An efficient company with a notional capital structure will be able to earn the allowed return on capital.

2. Our overall approach at draft determinations

2.1 Our approach to costs, outcomes and the allowed return on capital

The overall level of stretch in the draft determinations is a combination of the stretch across outcomes, cost efficiency and the allowed return on capital.

On cost assessment, we used comparative modelling to set the catch-up efficiency challenge on base and enhancement costs. For base expenditure we set the efficiency challenge based on upper quartile efficiency on historical cost data and expected frontier shift improvements over 2020-25. On enhancement we set bespoke efficiency challenges depending on the type of expenditure and approach to modelling, as well as the application of a frontier shift to some enhancement costs, wastewater WINEP. Any out or underperformance of our efficient cost allowance will be shared with customers through cost sharing. The 'Securing cost efficiency technical appendix' provides further detail on our approach to cost assessment.

On outcomes, we set the level of stretch based on a variety of approaches. For example, we used forward looking upper quartile performance for water supply interruptions, pollution incidents and internal sewer flooding, and comparisons to upper quartile performance for leakage and per capita consumption. For other performance commitments we made comparisons across companies, or based improvements on company proposals. We calibrated and sense checked the improvement in performance based on performance improvements achieved in previous periods. While we considered that this level of performance improvement should be delivered in base expenditure, as set out in our PR19 methodology, we also considered representations regarding unique circumstances that may require additional funding (through the cost adjustment claim process).

On the allowed return on capital, we reduced the wholesale return by 21 basis points in the draft determination compared to our early view, reflecting the market data at the time.

2.2 The level of stretch in the draft determinations

The overall level of stretch in the PR19 draft determinations was greater than that in PR14. The increased challenge came from costs (due to the inclusion of a net frontier shift challenge) and outcomes (from forward looking upper quartile on common outcomes and 15% leakage challenge). This reflected the sector's track

record of meeting challenges in previous price reviews and evidence from high performers in the sector. The allowed return on capital, as in PR14, was based on market evidence, and so should not be additional stretch.

At the draft determinations we set the following overall levels of stretch:

- **Cost efficiency** - catch-up efficiency based on upper quartile with a 1.5% per year reduction for frontier shift and 0.4% per year increase for real price effects. For comparison, at PR14 our catch-up efficiency was based on the upper quartile, with no explicit allowance for frontier shift and real price effects.
- **Outcomes** - forward looking upper quartile on comparable common performance commitments and a 15% reduction in leakage. For comparison, at PR14 our final determination was based on historical upper quartile on comparable common performance commitment with little net reduction in leakage.
- **Allowed return on capital** – allowed return on capital (in CPIH terms) was set at 3.19%, based on market evidence and was a mid-point of the overall range of our estimates at the time.

In response to our approach at draft determinations, nine companies (Anglian Water, Dŵr Cymru, Northumbrian Water, Southern Water, Thames Water, Wessex Water, Yorkshire Water, South East Water and SES Water) raised concerns regarding the overall level of stretch across four areas:

- **Level of stretch on costs:** some companies state that we have high productivity improvement assumptions compared to average UK productivity (which is flat), with an increased challenge compared to previous periods, without evidence of outperformance;
- **Level of stretch on outcomes:** some companies state that the forward looking upper quartile is more stretching than at PR14 and is more likely to lead to cost over-runs or higher penalties, and the level of stretch is out of line with previous improvements in performance.
- **Level of stretch on costs and outcomes:** several companies state that taking the upper quartile on costs and outcomes is not achievable, and that no company has previously delivered upper quartile cost efficiency and upper quartile outcomes;
- **Level of stretch on the allowed return on capital:** companies raise concerns that the downside skew in the forecast return in regulatory equity reflects increased risk and additional stretch from PR14, which should be reflected in a higher allowed return on capital. Companies also raise concerns that the combination of catch up, frontier shift efficiencies and outcomes stretch increased overall stretch make the draft determinations unfinanceable.

The remainder of this appendix responds in detail to company comments and concludes with our approach to managing the overall level of stretch for the final determinations. In particular, we review the stretch on costs in section 3, the stretch on outcomes in section 4, the stretch on the combination of costs and outcomes in section 5 and the impact on the allowed return on capital in section 6.

3. Overall stretch on costs

3.1 What we said in our draft determinations

Cost allowances at our draft determinations were based on catch up efficiency to the upper quartile, and included a frontier shift challenge of 1.5% per year and an allowance for a labour real price effect of 0.4% per year.

Our frontier shift challenge of 1.5% per year at draft determinations was consistent with using a frontier shift efficiency number towards the upper end of the 0.6% to 1.2% per year range identified by our advisors, Europe Economics, with an additional increment to take account of the impact of the totex and outcomes framework. A frontier shift of 1.5% per year was towards the middle of the range of 0.6% to 2.5% per year indicated by KPMG for the combined effect of frontier shift efficiency and the impact of the totex and outcomes framework.

3.2 Stakeholders' representations

Company comments regarding overall level of stretch on costs

In response to our draft determinations, several companies made representations regarding the overall level stretch on costs. These are summarised below.

- Companies state that we have high productivity improvement assumptions compared to average UK productivity (which they state is flat) - Economic Insight for Anglian Water, Dŵr Cymru, Northumbrian Water and Yorkshire Water state that analysis of productivity growth in comparator sectors post-crisis is a selective reading of the data, that too little weight is placed on recent evidence and that 'flatlining' of UK productivity is expected to continue in the near-term (e.g. Office of Budget Responsibility, IMF and Bank of England) with a prolonged period of uncertainty and weaker investment associated with Brexit.
- Companies state we are imposing an increased regulatory cost challenge compared to previous price controls without evidence of historical outperformance - Economic Insight for Anglian Water, Dŵr Cymru, Northumbrian Water and Yorkshire Water consider historical Return on Capital Employed performance and state that there is no evidence of substantial, systematic and persistent outperformance of water price controls that suggests the need for an additional efficiency challenge.

In addition, companies made more specific representations regarding our assessment of frontier shift and allowance for real price effects. These representations are addressed in the 'Securing cost efficiency technical appendix'.

3.3 Our assessment and reasons

Our overall level of stretch on base expenditure is reasonable

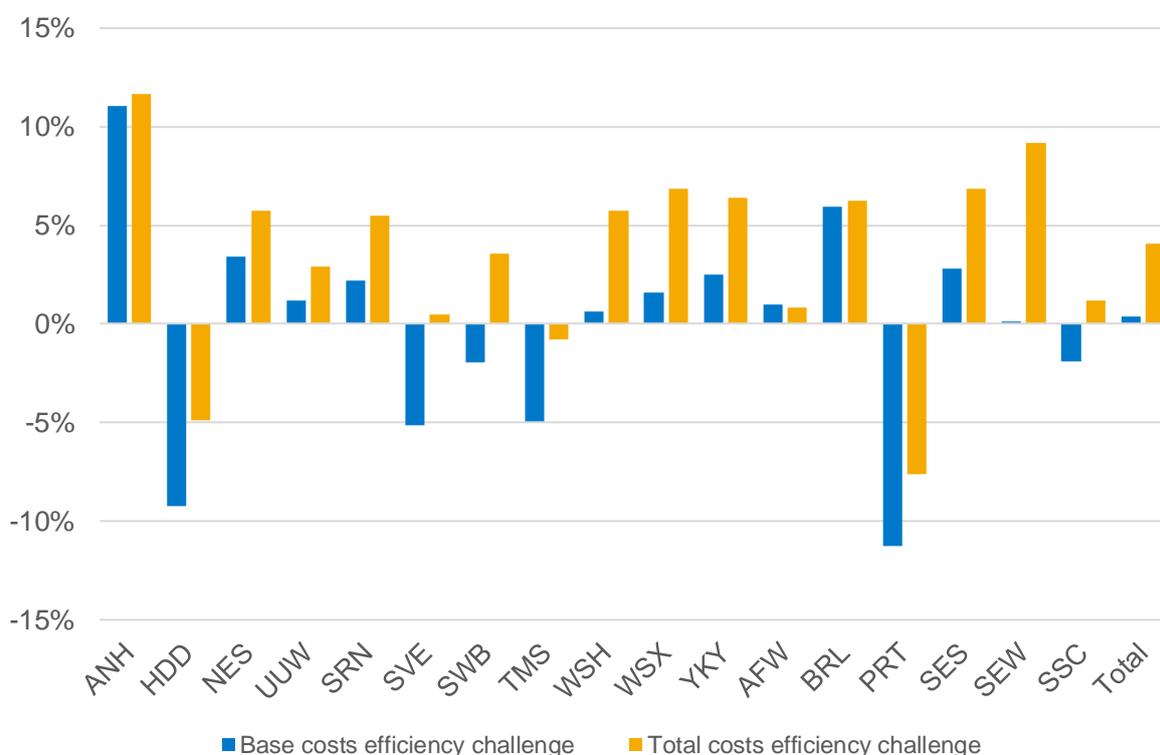
We consider our overall level of stretch on base expenditure is reasonable. For the final determinations we are making a number of changes to our calculation of base costs allowances,

- including data from 2018-19, which is a high cost year relative to historical years and to business plan forecast costs;
- recalibrating the catch-up efficiency calculation so that it is based on the 4th and 3rd company in wholesale water and wastewater rather than the upper quartile to ensure an appropriate level of challenge for companies;
- reducing frontier shift from 1.5% to 1.1% per year; and
- applying a frontier shift from 2019-20 (to reflect the base year of data) and expanding the scope to include all wholesale base costs (and to cover metering as well as WINEP enhancement costs).

Overall this means that six water and wastewater companies have business plan costs below our efficient base costs, with an overall level of challenge across the sector on base costs of 0.4%. This compares to five companies and an overall challenge to sector on base costs of 4.8% at draft determinations.

We note that Anglian Water, the company with the largest remaining base cost difference to its plan, is proposing a 15.7% increase over its historical base expenditure. In comparison to historical costs, our final determination reflects a 3.0% efficiency challenge compared to historical expenditure. Some companies are proposing to go further than this for example United Utilities is proposing to reduce wholesale base expenditure by 7.9% compared to historical expenditure.

Figure 2: Efficiency challenge on base and total costs at final determinations



Despite large improvements post privatisation, water sector productivity has shown little improvement over more recent years

Productivity improvement across the water sector appears to have stagnated after large improvements immediately following privatisation. The Frontier Economics study for Water UK examined that the growth in total factor productivity, a measure of overall productivity growth, for the water sector since 1994. This showed that following privatisation productivity growth was 3 to 4% per year. However, since 2011 productivity growth has effectively been zero, even after allowing for quality improvements.

Table 1: Water sector total factor productivity improvement per year

Period	Average total factor productivity, not quality adjusted	Average total factor productivity, quality adjusted
1994-95	2.9%	3.5%
1996-00	2.2%	4.5%
2001-05	0.7%	2.0%
2006-10	1.4%	2.2%
2011-15	-0.5%	-0.2%
2016-17	-0.2%	0.0%
1994-17	1.0%	2.1%

Source: [Productivity improvement in the water and sewerage industry in England since privatisation: Frontier Economics for Water UK](#)

This contrasts with the reasonable productivity growth in comparator sectors despite little productivity growth across the whole of the UK economy

We consider that the best comparator sectors for the water sector are the manufacturing sector (as water and wastewater treatment involves similar processes to manufacturing and chemicals), construction (as water companies undertake a large amount of construction), transport and storage (as it involves the transport of water and wastewater over large distances) and support services (similar to other companies). Post the financial crisis productivity growth in these sectors has been an average of 0.6% per year (as shown in Table 2 below and in Annex 3 of our 'Securing cost efficiency technical appendix'). This compares to no growth in the overall economy.

Table 2: Total factor productivity pre and post financial crisis, based on gross output

Industry Comparators	Average (1999-2014)	Average Pre-crisis (1999-2007)	Average Post-crisis (2010-2014)
Chemicals and chemical products	0.8%	1.3%	-0.7%
Construction	-0.1%	0.2%	0.7%
Machinery and equipment n.e.c.	0.9%	1.2%	1.0%
Other manufacturing; repair and installation of machinery and equipment	1.0%	1.2%	1.3%
Professional, scientific, technical, administrative and support service activities	0.9%	1.1%	1.5%
Total manufacturing	0.6%	0.9%	0.3%
Transport and storage	0.0%	0.2%	0.5%
Average for comparators	0.6%	0.9%	0.6%
Market economy (for comparison)	0.2%	0.7%	0.0%

This is supported by more recent data on productivity from the Office of National Statistics which shows that productivity growth of comparator sectors has far outstripped that of the economy as a whole. We therefore reject the company argument that water sector productivity should reflect recent low growth across the economy as a whole.

This evidence of no productivity growth in recent years in the water sector compared to 0.6% per year growth from comparator sector could be the result of X-inefficiency. X-inefficiency is where the external environment, for example a lack of competitive pressure, leads to a lack of efficiency, as companies and management expend less

effort at reducing or controlling costs². This can accrue in a regulatory setting, where due to information asymmetry, despite the regulator's best efforts efficiency will be lower than in a competitive market³.

Our forecast of ongoing water sector productivity growth is based on growth in comparator sectors post financial crisis and longer term growth rates

Our forecasts of ongoing water sector productivity growth are based on work from our consultants Europe Economics. Europe Economics forecast water sector productivity growth of between 0.6% to 1.2% per year based on productivity growth of comparator sectors over recent years and longer term growth over full economic cycles. Europe Economics use the gross output measure of productivity growth, which takes account of growth of intermediate inputs. We apply productivity growth to all wholesale base costs (modelled and unmodelled) as well as some of the more generic enhancement schemes including water industry national environment programme and metering.

Europe Economics suggest two reasons why we should choose a value towards the upper end of the range:

- Some weight should be placed on productivity growth in value added terms, which by definition are higher in magnitude than the corresponding gross output measure, and so move towards the upper end of the range for productivity growth in gross output terms.
- The productivity estimates exclude embodied technical change. A true measure of frontier shift should take into account the potential cost savings from quality improvements 'embodied' in the inputs used by the sector (labour, capital and intermediate inputs), for example through investment in better equipment. However, the productivity estimates using EU KLEMS data reflect primarily 'disembodied' technical change which allows for increased output without additional investment, for example through better management processes. Though research on this issue is limited, some illustrative evidence suggests that productivity growth estimates might need to be uplifted by as much as 60 per cent to account for embodied technical change.⁴

² Leibenstein, H. (1966). Allocative efficiency vs. x-efficiency. *The American Economic Review*, 56(3), 392–415.

³ Laffont, Jean-Jacques and Tirole, Jean, Using Cost Observation to Regulate Firms, *Journal of Political Economy*, June 1986, 94, 614-41.

⁴ Europe Economics analysis of Uri (1983) and Hulten (1992), Real Price Effects and Frontier Shift – Final Assessment and Response to Company Representations, December 2019.

The Europe Economics' productivity growth estimate is consistent with Office of Budget Responsibility forecasts

The Office of Budget Responsibility (OBR) does not regularly produce total factor productivity forecasts. However it does produce forecasts of labour productivity. The OBR forecasts that UK wide labour productivity growth will increase from 0.5% per year from 2010 to 2014 to 1.1% per year from 2020-24. Separately [the OBR forecasts](#) that labour productivity growth of 1% per year is equivalent to total factor productivity growth of 0.4 to 0.6% per year. This relationship implies an OBR total factor productivity of between 0.4 to 0.7% per year over the forecast period, given the slightly higher labour productivity growth.

The Europe Economics productivity growth forecast is based on growth in comparator sectors, including manufacturing and construction, which has tended to outperform UK productivity in recent years (and also in the longer term). Growth in these comparator sectors has outstripped UK productivity by 0.5% to 0.6% per year. Assuming this relationship continues, this implies an OBR forecast for comparator sectors of 0.9% to 1.3% per year, towards the upper end of the range provided Europe Economics. We therefore consider that our productivity estimates are consistent with wider economic forecasts.

The Europe Economics range is consistent with that used previously by other regulators

The Europe Economics on-going frontier efficiency range of 0.6% to 1.2% and earlier work from KPMG that indicated a range of 0.4% to 1.3% per year (out of a total range of 0.6% to 2.5% including totex and outcomes), are both consistent with recent regulatory decisions of 0.7% to 1% per year as shown in Table 3 below.

Table 3: Overview of frontier shift efficiency challenges set by other regulators in recent periods

Regulator – Price Control	Sector	Years	Opex (%)	Capex (%)
ORR – PR13	Rail	2014-2019	-	0.4
Ofgem – RIIO-T1/GD1	Electricity and Gas Transmission	2013-2021	1.0	0.7
Ofgem – RIIO-ED1	Electricity Distribution	2013-2021	1.0	1.0
CMA Bristol Water – PR14	Water	2015-2020	1.0	
Competition Commission (CC) – NIE	Electricity	2013-2017	1.0	1.0
The Utility Regulator (UR) – GD14	Gas Distribution	2014-2016	1.0	1.0
UR – PC15	Water and Sewerage	2015-2021	0.9	-
UR – GD17	Gas distribution	2017-2022	1.0	1.0
UR – RP6	Electricity	2017-2024	1.0	1.0
CAA - H7 (consultation phase)	Aviation	2020-2024	0.9	-

We continue to consider that there is potential for outperformance from innovation using the totex and outcomes framework, although estimates may have reduced since draft determinations

In our draft determinations we made an additional allowance for productivity improvement from the impact of the totex and outcomes framework. This was based on work by KPMG who forecast that there could be an additional 0.2% to 1.2% per year improvement in efficiency from the impact of the totex and outcomes framework. The KPMG range was based, in part, on the median to upper quartile outperformance from the totex regimes in the water and energy sectors. The KPMG study was based on data up to 2017. We examine the potential impact of using the most up to date data on outperformance of the energy and water controls.

We have not replicated the KPMG analysis but have examined how outperformance forecasts for the period have changed with the latest data. The latest data suggest a reduction in the forecast outperformance for the water sector (as shown in Table 4 below) with little change for the energy sector.

Based on the latest data it appears that the better performing water companies have maintained their outperformance, however median outperformance has declined. There are a number of reasons for the reduction in outperformance, as set out in company annual performance reports, including additional or accelerated investments and improvements to resilience, water quality and leakage in preparation for the next regulatory period. Overall we consider that the additional uplift from outperformance of the totex and outcomes framework could be less than at our draft determination.

Table 4: Totex outperformance in the water⁵ controls (equivalent % per year)

Sector	Lower quartile	Median	Upper quartile
KPMG estimate (up to 2017)	0.0%	1.2%	2.7%
Ofwat estimate (up to 2017)	-0.1%	0.6%	2.5%
Ofwat estimate (up to 2019)	-0.3%	0.3%	2.4%

Annex 3 in our ‘Securing cost efficiency technical appendix’ provides further detail on the impact of the totex and outcomes framework on our frontier shift estimate.

The level of catch-up efficiency is lower than at PR14

The level of catch-up efficiency at PR19 for wholesale expenditure is lower than at PR14, as shown in Table 5. For retail, in PR14 we set an average rather than upper quartile based cost challenge as this was the first time we set price controls in this area, and so a comparison is not possible.

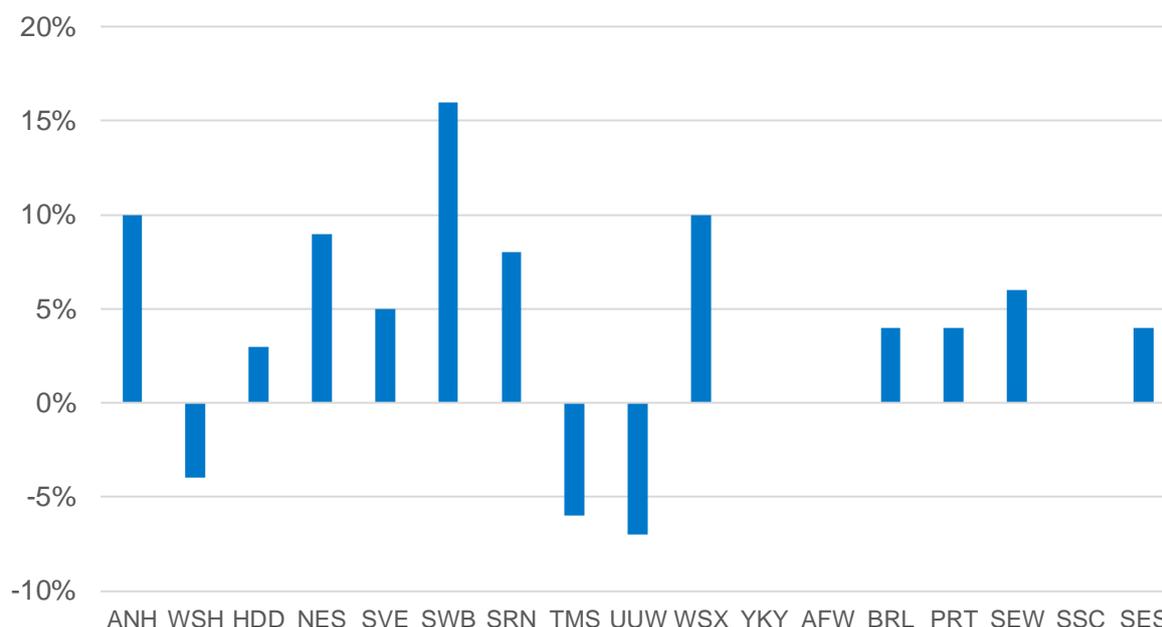
⁵ Amendment made to the title of table 4.

Table 5: Average catch-up efficiency improvement

Industry comparators	Water	Wastewater
Final determinations	4.6%	2.0%
PR14	6.5%	10.4%

Most companies have outperformed their PR14 cost allowances, despite some companies spending additional money on service improvements. For example in its latest half yearly results (released November 2019) United Utilities states that it is outperforming its PR14 allowance by £100m, while it is investing an additional £350m including £100m to get an early start for the next control period.⁶ Given this good cost performance, and the modest additional stretch compared to historical performance, we consider the catch-up efficiency is achievable.

Figure 3: Performance against PR14 wholesale cost allowance cumulative 2015-19



⁶ United Utilities 2019/20 half yearly results, released November 2019, https://www.unitedutilities.com/globalassets/z_corporate-site/investor-pdfs/half-year-results/half-year-results-announcement-2019-20-final-combined-clean.pdf

3.4 Our final determination decision

We have reviewed the arguments and evidence provided by water companies and their consultants regarding the overall level of stretch in costs.

Key findings from our analysis are that:

- Despite large improvements in productivity of 3-4% per year post privatisation, there has been little improvement over more recent years;
- This contrasts with the reasonable productivity growth in comparator sectors despite little productivity growth across the whole of the UK economy;
- Europe Economics forecasts of ongoing water sector productivity growth of 0.6% to 1.2% per year are based on growth in comparator sectors post financial crisis and longer term growth rates;
- These forecasts are consistent with Office of Budget Responsibility labour productivity forecasts;
- These forecasts are also consistent with productivity estimates used previously by other regulators;
- Europe Economics advise that a number towards the upper end of their range is appropriate, taking into account value added measures as well as embodied technological change;
- Embodied technological change is not normally taken into account by regulators and can add up to 60% to productivity growth. It also doesn't fully account for growth in quality of outputs, which we consider in the next section on stretch on outcomes;
- We continue to consider that there is potential for additional outperformance from innovation using the totex and outcomes framework, although this may have reduced since the draft determinations; and
- The catch-up efficiency challenge is lower than at PR14, with most companies outperforming the PR14 settlement, indicating that the catch-up challenge is achievable.

4. Overall stretch on outcomes

4.1 What we said in our draft determinations

In our PR19 methodology we found that setting performance commitment targets on the basis of historical performance (as was done in previous price reviews) was not sufficiently stretching. We proposed to set stretching common performance commitments with targets based on the forward looking upper quartile performance for three commitments for the sector. We set companies a leakage reduction challenge of 15% given the high priority placed on leakage, the large reductions in leakage in the late 1990s, but the limited sector level improvements since. For most other commitments, stretch was based on historical performance, comparative assessment and statutory requirements. Our draft determinations reflected our PR19 methodology.

4.2 Stakeholders' representations

Company comments regarding overall level of stretch on outcomes

Companies made a number of representations on the overall stretch:

- Northumbrian Water refer to the CMA's determination in the PR14 appeal by Bristol Water in relation to outcomes: "[F]or Ofwat to consider that upper quartile performance (historical or otherwise) would match economic levels appeared unlikely to us in general".
- Anglian Water and Wessex Water state that the move to forward looking upper quartiles is more stretching than at PR14 and is more likely to lead to cost over-runs or higher penalties, and the level of stretch is out of line with previous improvements in performance.

It should however be noted that, in their response to the draft determinations, most companies accepted the overall level of stretch on outcomes, and in particular the stretch on the common performance commitments and leakage.

4.3 Our assessment and reasons

In general companies have achieved the upper quartile common performance commitments set in PR14, therefore we consider appropriate to set more stretching targets

We set performance commitments so that they can be achieved by an efficient company. This does not mean that we expect all companies to achieve all performance commitments in every year – in some years there may be adverse conditions, notably relating to the weather, and some companies may also struggle in some years and not others. If all companies met all performance commitments in all years, it would suggest that we had not set performance commitments that were sufficiently stretching and companies would on average outperform. Nonetheless, we expect an efficient company to achieve its performance commitments on average.

In 2018-19 water companies achieved or exceeded 63% of their performance commitments, with eight companies achieving more than 70%. The extent of this outperformance has been significant - since the start of PR14 companies have received net payments of £112 million for the achievement of financial incentives on performance commitments.

In PR14 we set historical upper quartile based performance commitments for water supply interruptions, pollution incidents and internal sewer flooding.

Table 6 below shows company performance on three common performance commitments from 2015-16 to 2018-19. **Green** shading indicates that a company has met their performance commitment in 2018-19, **red** indicates that the company has never met the performance commitment in the period and **amber** indicates that they have met it at least once during the period but didn't meet it in 2018-19 (for supply interruptions Severn Trent and Hafren Dyfrdwy both passed in one part of their area in 2018-19 and failed in the other). **Blue** indicates the company does not have a performance commitment for the period.

In 2018-19 two companies achieved all three commitment levels, two companies achieved the two that they had, and six companies achieved two and didn't achieve the other one. Five water and wastewater companies met two performance commitments this year and the third commitment has been met at least once in previous years. Of the water only companies, two companies achieved the historic upper quartile this year. This demonstrates that the historic upper quartile is achievable by companies.

Table 6: Achievement of PR14 upper quartile performance commitments in 2018-19⁷

Company	Supply interruptions	Pollution incidents	Internal sewer flooding
Anglian Water			2019-20 target only
Dŵr Cymru			
Hafren Dyfrdwy			
Northumbrian Water			
Severn Trent Water			
South West Water			
Southern Water			
Thames Water			
United Utilities			
Wessex Water		-	
Yorkshire Water			
Affinity Water ⁸	-		
Bristol Water			
Portsmouth Water			
South East Water			
South Staffs Water			
SES Water			

In theory the economic level for a performance commitment is where the marginal benefits in terms of customer and wider benefits equal the marginal costs of improved performance. This can be difficult to gauge in practice. The robustness of customer research and customer valuations vary widely across companies. Due to information asymmetries efficient marginal costs and levels of stretch can be difficult to identify across companies. For example, companies respond to the commitments that they are set, often achieving far more than might be expected from examining historic performance, as shown below for PR14. We therefore set stretching but

⁷ While all three common performance commitments were set initially at the same level, there were differences in the definitions of individual performance commitments which has led to differences across companies.

⁸ Affinity Water had a 12 hour water supply interruptions commitment and was a fast track company and so we did not require it to have a 3 hour commitment too.

achievable performance commitments, backed up with financial payments, ensuring that companies have incentives to deliver performance at an efficient level.

PR14 provides an illustration of the impact of setting stretching performance commitments. In PR14 we expected companies to reach the historic upper quartile on water supply interruptions, pollution incidents and internal sewer flooding by 2017-18. The historic upper quartile was based on performance between 2011-12 and 2013-14. The table shows the number of companies that achieve the 2017-18 performance level in each year of the price control. More than half of the water companies had achieved the historic upper quartile by the first year of the price control, 2015-16. All this was achieved without additional funding, demonstrating the importance of setting stretching targets for companies.

Table 7: Count of companies who passed the 2017-18 target in each year

	2014-15	2015-16	2016-17	2017-18	2018-19 ⁹
Supply interruptions (out of 17)	8	8	11	8	9
Internal sewer flooding (out of 10)	2	6	6	9	9
Pollution incidents (out of 9)	2	6	8	8	8
Total	12	20	25	25	26
Total (%)	34%	56%	69%	69%	76%

The stretch on forward looking common performance commitments in PR19 is in line with the improvement achieved in PR14

We want to set performance commitments that are stretching but achievable. For the three common performance commitments where there is good quality data (i.e. water supply interruptions, pollution incidents and internal sewer flooding), there is no clear reason why companies should not be achieving the same stretching level of performance as each other. For all three measures, we set upper quartile performance commitments in PR14 which companies accepted as part of their determinations. For PR19, unlike PR14, we are using common definitions across all companies for each commitment (there were some differences across companies in PR14 although commitments were comparable). As we set out in the PR19 methodology we challenged companies to set their commitment levels in each of these three areas at the forecast upper quartile level. We are using company forecasts of the forward looking upper quartile to identify a stretching but achievable

⁹ 2018-19 supply interruptions does not include Severn Trent Water and Hafren Dyfrdwy due to the company boundary changes

level of future performance. We are expecting an efficient company to achieve this level of performance on average.

We use company forecasts of the forward looking upper quartile and historical data to set stretching but achievable performance commitments. At final determinations, we have tested the achievability of the challenge by considering historical rates of improvement for the sector for all three commitments. Based on historic trends we are moderating the stretch for water supply interruptions from 3 minutes to 5 minutes.

We continue to consider that using the forward looking upper quartile for the internal sewer flooding and pollution incidents is stretching but achievable. For internal sewer flooding this will require large improvements in performance for some companies. We are moderating the underperformance collar on this performance commitment for Northumbrian Water, United Utilities and Yorkshire Water, as explained in the 'Delivering outcomes for customers policy appendix', to limit the amount of downside exposure for these companies in the early years of the price control.

Nearly all companies accepted the level of stretch for the common performance commitments, although a few have requested additional funding to reach this level.

Table 8 below shows the level of stretch required by 2024-25 for each of the forward looking common performance commitments relative to companies' performance over the PR14 period. 'Stretch to 2024-25' compares what the company forecasts it will deliver in 2019-20 from the August 2019 representations relative to its performance commitment level in 2024-25. Negative numbers indicate the required performance improvement, positive numbers indicate the company is forecasting it will outperform the 2024-25 level in 2019-20 (i.e. the 2019-20 performance is better than the 2024-25 level).

For water supply interruptions, Portsmouth Water, SES Water and Yorkshire Water forecast that their 2019-20 performance will be better than their 2024-25 performance commitment level. These three have been shaded in **blue** to reflect the outperformance of the level in Table 8 below.

In addition, some companies have outperformed the 2024-25 level during the current price control period (although this may not be reflected in their 2019-20 forecasts). These instances are shaded in **green** in Table 8:

- Portsmouth Water and SES Water have already outperformed their 2024-25 performance commitment level for supply interruptions in the current price control period, as well as forecasting to outperform it in 2019-20.

- Northumbrian Water has outperformed their 2024-25 performance commitment level on both supply interruptions and pollution incidents in the current control period.
- Southern Water has outperformed their 2024-25 performance commitment on supply interruptions.
- Anglian Water, South West Water and Wessex Water have all outperformed their 2024-25 performance commitment level for internal sewer flooding.

The table also shows the improvement achieved in PR14. 'Improvement PR14' is calculated separately for each of the three performance commitments as follows:

- **Water supply interruptions** - historic delivery is assessed between 2012-13 and 2016-17, to exclude the effect of freeze thaw in 2017-18 and subsequent recovery in 2017-19.
- **Pollution incidents** - historic delivery is assessed between 2013 and 2018 calendar years due to the Environment Agency's reporting and to capture a five year period for comparability to the length of the price control.
- **Internal sewer flooding** - historic delivery is assessed between 2015-16 and 2018-19.

Table 8: Level of stretch required by 2024-25 compared to improvement achieved in PR14¹⁰

	Supply Interruptions		Internal Sewer Flooding		Pollution Incidents		
	Stretch to 2024-25	Improvement PR14	Stretch to 2024-25	Improvement PR14	Stretch to 2024-25	Improvement PR14	
ANH	-55%	-15%	-21%	-30%	-33%	-55%	
WSH	-58%	-77%	-33%	-19%	-33%	-16%	
HDD	-58%	35%	-23%	-	-39%	-	
NES	0%	-65%	-43%	-13%	-22%	-71%	
SVE	-43%	-65%	-21%	-40%	-29%	-35%	
SWB	-35%	-20%	-24%	-51%	-58%	-38%	
SRN	-19%	-61%	-33%	-22%	-33%	-53%	
TMS	-53%	-21%	-36%	-40%	-30%	-51%	
UUW	-58%	-24%	-73%	-32%	-20%	-10%	
WSX	-59%	-47%	-16%	24%	-11%	-4%	
YKY	25%	-4%	-47%	-15%	-41%	-6%	
AFW	-17%	8%					
BRL	-59%	-47%					
PRT	25%	25%					3%
SEW	-50%	-2%					
SSC	-29%	-47%					
SES	79%	79%					-71%
Sector	41%	40%	41%	26%	30%	39%	

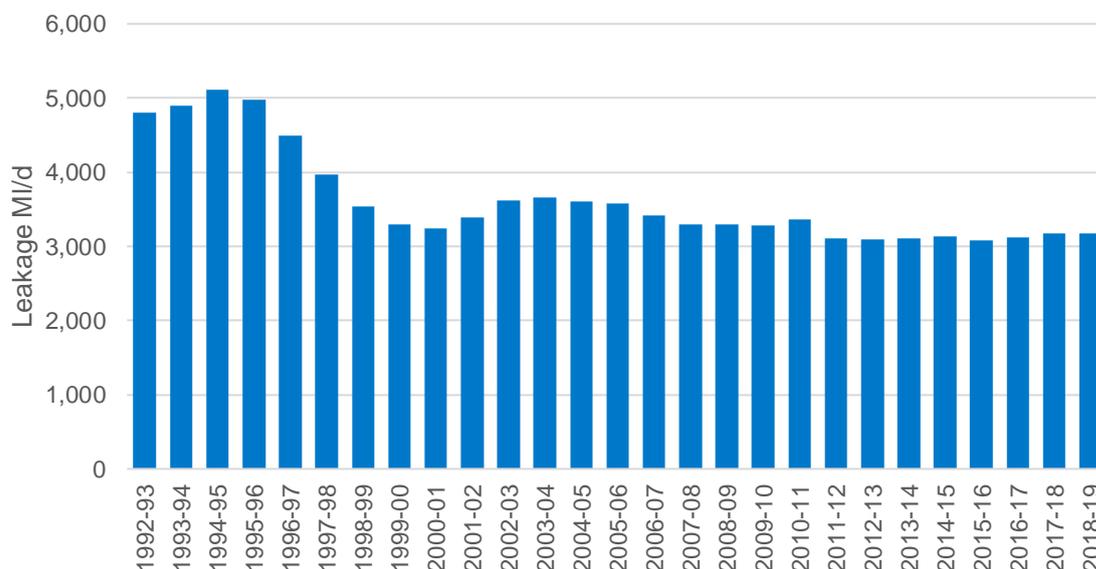
Even though there has been little progress in reducing leakage since 1999-2019 we consider that our stretch is achievable given significant technological improvements over this period

Leakage is a priority area for many customers, and is often seen as a pre-requisite for customers reducing their own consumption. As illustrated in Figure 4 below, overall leakage level declined by 37% between 1994-95 and 2000-01. However

¹⁰ The company specific figures are normalised and the sector figures are not normalised.

since then it has shown little change and in 2017-18 leakage levels were similar to 2000-01. This is despite large changes in technology in this area over this period.

Figure 4: Total Leakage (ml/day) 1992-93 to 2017-18



Since 2012-13 overall leakage has increased by 2.3%. While figures vary year on year, this has masked large improvements by individual companies, including Portsmouth Water reducing leakage by 17% and Dŵr Cymru by 8% since 2012-13 and increases by 25% for Southern Water and by nearly 10% for Yorkshire Water.

Figure 5: Net change in leakage (MI/day) from 2012-13 to 2018-19 as a % of 2012-13

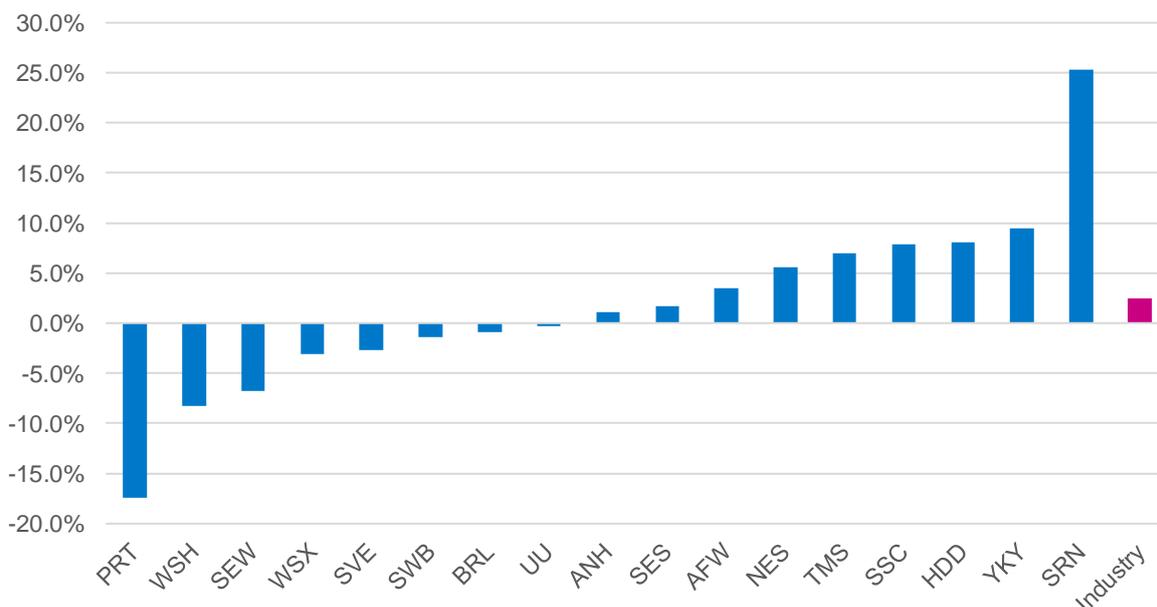
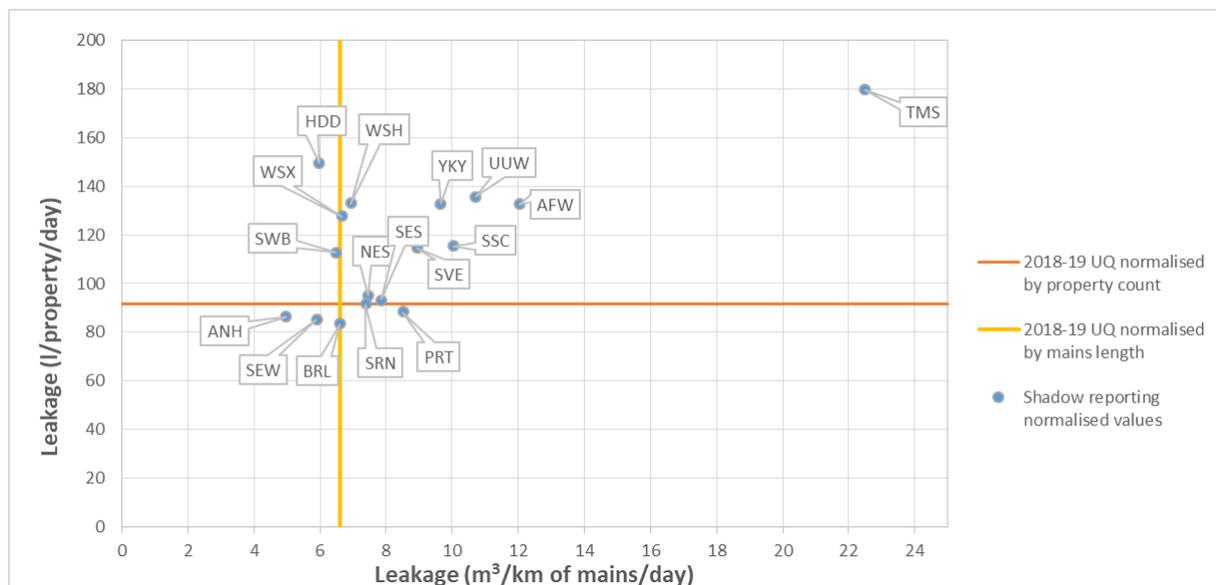


Figure 6 below illustrates the variation in normalised leakage performance by company.

Figure 6: Normalised leakage position



Given the lack of overall progress over recent years we set all companies a challenge in the PR19 methodology, to reduce leakage by at least 15%, and the best performance in the sector at no additional cost. All companies accepted this challenge although a number of companies requested additional funding. Given the large reductions achieved by some companies, the significant technological improvements, the increased customer and stakeholder focus, and the key role of leakage reductions as part of water resource management plans, we continue to consider the 15% challenge is appropriate. For the final determinations we have moderated the leakage challenge for some companies, where we consider the reductions to be particularly stretching.

Nearly all companies have accepted the proposed level of stretch in our final determinations in our outcomes performance commitments

Nearly all companies accepted the proposed level of stretch on key common performance commitments. This is illustrated in Table 9, where it is shaded in green where the company has accepted the level of stretch that we propose in our final determination performance commitments (based on their August 2019 representations). Where the company has not accepted the performance commitment level, it is shaded in amber and the size of the difference is reported.

Table 9 also shows whether companies accepted the final determinations level of stretch on leakage. For final determinations we accept Thames Water’s and Yorkshire Water’s proposals for lower leakage levels in response to our draft determination. We also amend leakage levels for Portsmouth Water, South Staffs Water and United Utilities to make them easier to achieve and consistent with the wider sector challenge to reduce leakage with base cost allowances.

For Anglian Water, Bristol Water and South East Water, we are providing enhancement funding as these companies are beyond the forecast upper quartile. We are amending their proposed leakage levels to make them more difficult to achieve, to align them with the additional enhancement funding being provided.

Table 9: Acceptance of final determination performance commitment levels

	Difference between Ofwat final determination performance commitment level and company August 2019 representation			
	Supply Interruptions	Pollution incidents	Internal sewer flooding	Leakage
ANH	10%			3.7%
WSH	37%	7%	20%	
HDD				
NES				
SVE				
SWB				
SRN				
TMS	17%			
UU				
WSX				
YKY				
AFW				
BRL				6.1%
PRT				
SES				
SEW				0.1%
SSC				

4.4 Our final determination decision

We have reviewed the arguments and evidence provided by companies and their consultants regarding the overall level of stretch in outcomes. For final determinations, based on historic performance, we are moderating the stretch on water supply interruptions, collaring underperformance payments for internal sewer flooding for some companies and reducing the leakage challenge for some companies. Overall we continue to consider that the overall challenge in outcomes is stretching but achievable as:

- in general companies have achieved the upper quartile common performance commitments set in PR14;
- the stretch on common performance commitments in PR19 is in line with what has been achieved in PR14, and takes into account forecast improvements in PR19;
- at a sector level, while there was a 37% reduction in leakage in the 1990s, there has been little progress in reducing leakage since 2000 despite significant technological improvements;
- this has masked some large reductions in leakage from individual companies, demonstrating what can be achieved; and
- most companies have accepted our proposed level of stretch on both leakage and common performance commitments.

5. Overall stretch in outcomes and costs

5.1 What we said in our draft determinations

In our draft determination we set stretching performance commitment targets and a strong cost challenge, including the application of a 1.5% per year frontier shift efficiency. Overall, as in PR14, we considered that an efficient company could deliver its performance commitment targets and meet our cost challenge.

In our draft determinations we made no additional allowances for funding to specifically meet performance commitment targets across common performance areas, although we provided additional funding to companies which were performing beyond the upper quartile to meet their leakage reduction performance commitments.

5.2 Stakeholders' representations

Company comments regarding overall level of stretch on outcomes

Several companies expressed concerns that delivering our overall stretch on outcomes was not possible without sacrificing cost efficiency. These comments are summarised below:

- Anglian Water suggests it costs more to deliver stretching outcomes. To support this it provides analysis showing that it has higher service quality than other companies across leakage, water quality and customer service, and submits that achieving this has required it to spend more money than companies that are performing less well.
- Dŵr Cymru, Thames Water and Wessex Water state that as cost allowances are based on historical data, they do not allow for service improvements implied by forward looking upper quartile levels for outcomes. To support this each company provides comparisons of cost versus outcome performance across companies.
- Dŵr Cymru and Thames Water suggests that challenge is particularly stretching for companies performing significantly under our current efficiency and service targets.
- Wessex Water submits that the lack of additional cost allowance for delivering improvements to leakage, supply interruptions, pollutions, water quality events and mains repairs is the equivalent of an additional c.2.2% per year productivity challenge on top of the 1.5% included in cost allowances, but states that Ofwat has no accompanying rationale for this additional efficiency challenge.

- Thames Water, Northumbrian Water and South East Water state that our approach expects upper quartile performance for both costs and outcomes, but that no comparable company has delivered this benchmark previously, making it unrealistic.
- Southern Water states that as the leakage reduction costs included in our models are associated with historical leakage reduction, and as leakage reduction has been relatively flat for the last 20 years, the modelled allowance is insufficient to fund the 15% leakage reduction target. It also states that the marginal cost of leakage reductions increases as further investment is required.
- An Economic Insight report for Anglian Water, Dŵr Cymru, Northumbrian Water and Yorkshire Water states that we have made “methodological changes that increase the overall efficiency challenge relative to prior price controls. These include [...] not allowing glidepaths for improved performance.” Thames Water states: “A further important feature of Ofwat’s [...] approach to PR19 is the absence of appropriate glide-paths and arrangements to enable the package to be reasonably delivered.”

5.3 Our assessment and reasons

This section responds to company comments on the overall level of stretch across costs and outcomes and sets out our analysis to respond to these concerns.

The analysis of the cost and quality trade off put forward by water companies is flawed

We consider that the companies’ analysis on cost and outcome performance is flawed, and have carried out our own analysis, which we set out below. Analysis conducted by companies includes:

- Anglian Water shows relative performance across water and wastewater companies across a combination of service quality measures, and states that this good performance increases costs. However the measures that Anglian Water uses are overly focused on customer satisfaction (which relate to four of the seven measures chosen) rather than overall service performance. While it provides analysis on the outcomes’ side, which shows that Anglian Water and Wessex Water perform well, Anglian Water does not provide a comparative analysis of cost performance to show a direct link between good performance and higher costs. As set out later in this section, Anglian Water and other companies such as Wessex Water and Portsmouth Water have performed well on both outcomes and costs.

- Thames Water provides a comparison of performance on common outcomes against the gap between our view and the company view of costs at draft determinations. Its analysis shows the companies with the smallest cost gaps, which Thames Water suggest is indicative of good cost performance, are not necessarily in the upper quartile for water supply interruptions, pollution incidents or internal sewer flooding. We consider that this analysis to be misleading as business plans are not a good guide to cost efficiency and it would be better to compare historical cost efficiency and outcome performance, as we set out below.
- Dŵr Cymru and Wessex Water provide some comparisons of modelled cost performance and outcome performance. Welsh Water only considers water cost performance and supply interruptions. Wessex Water considers water and wastewater performance separately, however it looks at a wide range of outcomes, many of which we do not set upper quartile commitments on, and states that companies would need to provide upper quartile cost performance as well as upper quartile outcome performance on each measure. This is inaccurate. We provide our own analysis of cost and outcome performance below.

Companies have achieved their PR14 upper quartile common performance commitments as well as outperforming on their upper quartile based cost allowances.

In PR14, both cost allowances and common performance commitments were based on upper quartile levels. Table 10 below outlines companies' performance in 2018-19 against PR14 performance commitment levels. **Green** cells indicate where targets were met and **red** indicates where targets were failed. The wholesale cost percentages show the PR14 cumulative under/overspend against targets, where a negative percentage shaded in red indicates the company has overspent its PR14 allowance to 2018-19. We use cumulative performance to remove the impact of timing differences between expenditure and allowances.

This analysis indicates that it is possible for companies to perform well on costs and meet targets based on (historical) upper quartile levels. For example, Anglian Water, Hafren Dyfrdwy, Southern Water and Yorkshire Water have met all PR14 common performance commitment targets in 2018-19 without overspending. In total eight of the eleven water and wastewater companies outperformed on their cost allowances (on a cumulative basis) and met more two or more common performance commitments. In addition Portsmouth Water also outperformed on costs and water supply interruptions. This was without additional funding to meet these targets. This analysis is supported by analysis in the [service delivery report 2019](#) which shows that it is possible to perform well on costs and a wide range of outcome measures. Table 10 also shows that most companies that have overspent have also

underperformed in at least one area, including Dŵr Cymru, Thames Water and United Utilities.

Table 10: Achievement of PR14 performance commitments and cost allowances in 2018-19

Company	Wholesale cost	Supply interruptions	Pollution incidents	Internal sewer flooding
Anglian Water	10%			2019-20 target only
Dŵr Cymru	-4%			
Hafren Dyfrdwy	3%	Met 1 of 2 PCs		
Northumbrian Water	9%			
Severn Trent Water	5%	Met 1 of 2 PCs		
South West Water	16%			
Southern Water	8%			
Thames Water	-6%			
United Utilities	-7%			
Wessex Water	10%		-	
Yorkshire Water	0%			
Affinity Water	0%	-		
Bristol Water	4%			
Portsmouth Water	4%			
South East Water	6%			
South Staffs Water	-0%			
SES Water	4%			

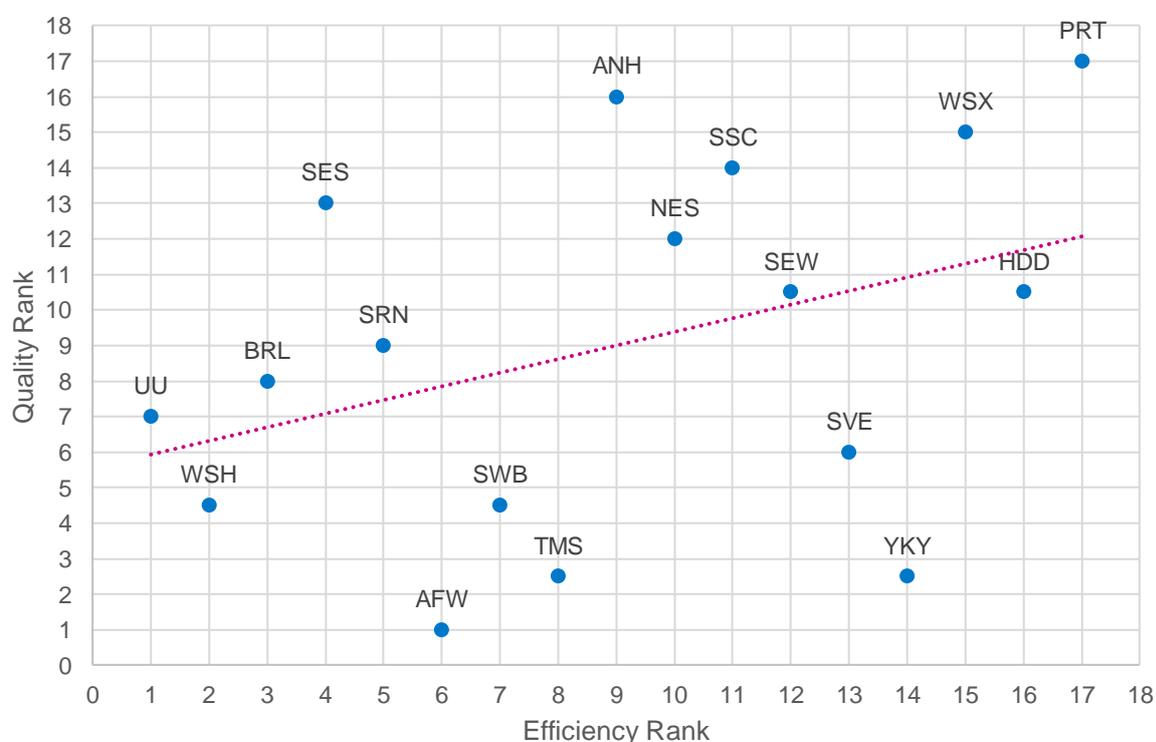
Better outcome performance should not necessarily increase cost

We compare historical cost and outcomes data to analyse the relationship between cost efficiency and service quality performance.

Figure 7 shows our estimate of cost efficiency plotted against service quality rankings of companies (1 being the worst performance, 17 being the best). Service quality is based on a combined average ranked score across the measures that we use in the service delivery report: leakage, water supply interruptions, water quality contacts, pollution incidents, internal sewer flooding and the service incentive mechanism. These measures reflect customers' priorities.

The data suggests there is a positive correlation between our estimates of historical cost efficiency and outcome performance. This suggests that better outcomes could be associated with lower costs. This could reflect better managed companies performing well on both costs and outcomes. Figure 7 does not suggest that there is a negative relationship between historical cost efficiency and good outcome performance. We therefore do not consider that companies with better outcome performance should necessarily be associated with increased cost.

Figure 7: Scatter plot of total efficiency and quality ranks



It is possible to have upper quartile outcome performance and upper quartile cost efficiency

Table 11 below shows the relative cost and service quality rankings of companies. 1 being the highest and shaded in **green**. 17 the lowest for water metrics, or 10 for the lowest wastewater metrics, are shaded in **red**. Ratings in between are shaded **green-amber-red** based on their score from 1 to 10 or 17. The best performing companies are those with the most **green** in their row while the worst performing have the most **red**. This table shows that while some companies are upper quartile on cost efficiency and a number of service quality metrics (shaded **green**), such as Portsmouth Water and Wessex Water, all companies are below upper quartile on at least one metric (shaded **amber-red**).

We have also looked at this at a more disaggregated level. For both wholesale wastewater (Table 13) and retail (Table 14) there are companies performing at both the upper quartile on costs and outcomes, indicating that the upper quartile benchmark does reflect companies performing well on both costs and outcomes. SES Water is the only company in the bottom quartile on cost efficiency that is upper quartile on more than one outcome, suggesting there is little evidence for a negative relationship between costs and outcomes. The picture for wholesale water (shown in Table 12) is more mixed, with some companies that are upper quartile on costs performing at the upper quartile on some service quality metrics, such as supply interruptions and water quality contacts (for example Portsmouth Water), whereas others are performing at the upper quartile on leakage (such as Hafren and South West Water).

We do not expect companies to be upper quartile on all outcomes, as we are not expecting a company to be good at everything. However this provides evidence that several companies are upper quartile on costs and some outcomes, so demonstrating that companies can perform well on both costs and outcomes.

Table 11: 2014-2019 cost efficiency vs performance ranks

Company	Efficiency rank	Leakage rank	Supply interruptions rank	Water quality contacts rank	Internal sewer flooding rank	Pollution incidents rank
PRT	1	11	2	2	-	-
HDD	2	2	10	16	-	-
WSX	3	4	8	9	1	2
YKY	4	12	5	12	10	8
SVE	5	13	12	11	4	4
SEW	6	5	15	14	-	-
SSC	7	14	3	8	-	-
NES	8	10	1	7	9	7
ANH	9	1	6	5	2	6
TMS	10	17	13	1	6	3
SWB	11	3	11	15	5	10
AFW	12	16	14	4	-	-
SRN	13	7	4	6	7	9
SES	14	9	7	3	-	-
BRL	15	8	17	10	-	-
WSH	16	6	16	17	3	5
UU	17	15	9	13	8	1

Table 12: 2014-2019 Wholesale water cost efficiency vs performance ranks

Company	Efficiency rank	Leakage rank	Supply interruptions rank	Water quality contacts rank
PRT	1	11	2	2
YKY	2	12	5	12
HDD	3	2	10	16
SRN	4	7	4	6
SWB	5	3	11	15
SSC	6	14	3	8
WSX	7	4	8	9
NES	8	10	1	7
SEW	9	5	15	14
ANH	10	1	6	5
AFW	11	16	14	4
TMS	12	17	13	1
SVE	13	13	12	11
UU	14	15	9	13
SES	15	9	7	3
BRL	16	8	17	10
WSH	17	6	16	17

Table 13: 2014-2019 Wholesale wastewater cost efficiency vs performance ranks

Company	Efficiency rank	Internal sewer flooding rank	Pollution incidents rank
WSX	1	1	2
SVE	2	4	4
YKY	3	10	8
TMS	4	6	3
ANH	5	2	6
NES	6	9	7
SRN	7	7	9
SWB	8	5	10
WSH	9	3	5
UU	10	8	1

Table 14: 2014-2019 Residential retail cost efficiency vs SIM rank

	Efficiency rank	SIM score rank
YKY	1	10
ANH	2	3
NES	3	5
WSX	4	2
BRL	5	8
SVE	6	11
SEW	7	7
PRT	8	1
HDD	9	13
SWB	10	12
TMS	11	17
AFW	12	15
SSC	13	4
UU	14	6
SES	15	14
WSH	16	9
SRN	17	16

Some company requests for additional funding for service quality improvements lack evidence

In response to the draft determinations, a number of companies request additional funding to improve service quality, half of which related to leakage. A number of these cost requests are from companies that are already performing well on individual outcomes, where the additional stretch is limited.

Our PR19 final methodology proposed three performance commitments would be set at a common level based on forward looking upper quartile. We have taken account of wider evidence to calibrate stretch of these performance commitment levels for an efficient company and consider two of these (pollution incidents and internal sewer flooding) remain appropriate. This is out of a total of 15 common performance commitments and typically 30 bespoke outcomes for a water and wastewater company. And the challenge on both commitments has tested against historical improvements. The move to forward looking upper quartile was a key part of the PR19 methodology. At the time we stated that “[a]verage performance now will not equate to efficient performance in the future” and were not expecting to provide

companies with additional funding to meet this challenge. As we set out earlier, the additional stretch on these outcomes is in line with the improvement in performance in PR14. In PR14 we did not provide companies with additional funding to meet these common performance commitments. Consistent with the approach in PR14 and our PR19 methodology, we consider that the base funding allowance is sufficient for companies to make on-going improvements in outcomes performance and meet common their common performance commitments. We do not consider that customers should not pay twice, where companies' performance falls short in the current period.

On leakage in our PR19 methodology, we challenged companies to consider reducing leakage by 15% in their business plans, at no additional cost to customers. Although we have not previously challenged companies to reduce leakage by this amount we consider that companies should be able to achieve this with their base allowance:

- the scale of technological change over recent years should allow companies to exploit productivity gains to reduce leakage efficiently;
- the 15% reduction challenge was voluntarily accepted by all companies, they could have proposed alternative lower level of reduction within base funding, but choose not to do so;
- three companies have committed to achieving a 15% reduction within base costs; and
- a number of companies have reduced leakage in the past, without extra base funding.

In leakage we do not expect companies to achieve a common level of service by the end of the 2020-25 period. This is different to internal sewer flooding, pollution incidents and water supply interruptions where we expect all companies to reach the same level of performance from their base allowance. For leakage, the performance commitment for leading companies is to a lower level of leakage than that for lagging companies. For a company with a performance commitment that goes beyond the upper quartile of companies' forecast 2024-25 performance level, we allow enhancement expenditure for the leakage reduction it forecasts in 2020-25 beyond the upper quartile threshold up to its performance commitment level.

We have introduced glidepaths where required

Some companies suggest that we should introduce glidepaths on the forward looking common performance commitments (supply interruptions, pollution incidents and internal sewer flooding) to give companies more time to improve performance.

In PR14 we included glidepaths so that companies had three years to reach the historical upper quartile. As set out above most companies achieved this level of performance in the first year of the price control. Each of the outcomes where we are setting forward looking upper quartile commitments were subject to an upper quartile performance commitment in PR14. The overall stretch for forward looking common outcomes is similar to the stretch achieved in PR14 and has been tested and tempered against historical improvements. As part of final determinations we are reducing the stretch on water supply interruptions and providing a glidepath for improvements over the 2020-25 period. The leakage reduction is a progressive challenge over the 2020-25 period. We do not consider that further cross-industry glidepaths are required. Therefore if we were allowing a company-specific glidepath, as the companies suggest, then this would simply allow poorer performing companies more time to catch up with their better performing peers, with customers paying for the poorer performance with a lower level of service.

Due to differences in the definition of some PR14 performance commitments (which we are harmonising as part of PR19) some companies have more to do than others at PR19, even if they are meeting their PR14 commitments. Therefore, where appropriate we moderate downside penalties with collars to limit the exposure of poorer performing companies. This is the case for internal sewer flooding for Northumbrian Water, United Utilities and Yorkshire Water. Some companies achieved substantial improvements in performance in PR14 by operational and management improvement, for example Northumbrian Water has reduced supply interruptions by 65% and Severn Trent Water has reduced internal sewer flooding by 40%, indicating the scope for companies to improve performance. We do not consider that customers should accept lower levels of service going forwards simply because their company has been performing less well than its peers. We therefore did not include company-specific glidepaths.

Frontier shift efficiency estimates do not take full account of quality improvements

In theory, productivity analysis takes into account changes in the quality of outputs. This is through the use of quality adjusted price deflators, which take into account quality when calculating whether the price of goods have increased over time. However in practice productivity analysis does not properly adjust for changes in quality.

For example, in the water and utility sectors quality is not accurately reflected in EU KLEMS or ONS productivity analysis. For the water sector the ONS uses the volume of delivered water to measure water sector output which does not take into account benefits of higher service quality and a better environment. This is a significant

omission, given the amount that water companies invest to improve water quality, improve reliability and reduce environmental impact, and results in measured productivity appearing to fall. For companies also investing in demand management programmes, costs would also increase while measured output would decline, further reducing forecast productivity. This is unlikely to be an isolated problem, given that similar issues also impact on other utility sectors. Consequently even productivity estimates for comparator sectors are unlikely to properly account for changes in quality.

This is supported by other commentators for example the IMF states that “There is a very strong likelihood some price-determining characteristics will be unmeasured in any quality adjustment situation. Compilers cannot produce timely statistics if they are perpetually seeking more characteristics data to produce a still better quality adjustment.”¹¹ Lichtenberg and Griliches also note “less than half of quality change is adjusted for in the PPI, so conventional productivity statistics underestimate “quality-adjusted” productivity growth by 43%.”¹²

Our base cost allowances take into account quality improvements

Our overall cost allowances take into account quality improvements in both base cost and enhancement funding.

Most quality improvements are covered by enhancement funding. In PR19 we are providing £13bn of funding for the sector to improve service quality and industry outcomes beyond the on-going improvements we expect the sector to make in base expenditure.

In the past regulators have not adjusted the efficiency challenge on base costs to allow for on-going improvements in service quality. For example, we did not provide additional funding for the move to upper quartile common performance commitments in PR14.

Any potential for double-counting of quality improvements and productivity improvements is limited to the degree to which on-going quality improvements which are reflected in our base cost allowance represent a frontier shift.

¹¹ Producer Price Index Manual: Theory and Practice, International Monetary Fund, September 2004, <https://www.elibrary.imf.org/view/IMF069/05446-9781589063044/05446-9781589063044/ch07.xml?lang=en&redirect=true>

¹² Lichtenberg, F.R. and Griliches, Z., 1989. Errors of measurement in output deflators. *Journal of Business & Economic Statistics*, 7(1), pp.1-9.

For water supply interruptions, pollution incidents and internal sewer flooding, a number of companies have, are, or are forecast to be by 2019-20, performing better than their 2024-25 performance commitment level. For leakage we are providing funding for companies going beyond the forecast upper quartile. The stretch in on-going outcomes performance therefore reflects catch up rather than frontier shift. We therefore do not consider that there is double counting of quality improvements.

Overall six companies' forecasts are within our efficient base cost allowances. Of these five have accepted our performance commitment stretch. We therefore consider that while stretching, our PR19 final determinations are achievable.

5.4 Our final determination decision

Based on the results of our analyses, we do not consider that it is unreasonable to impose an upper quartile catch-up cost efficiency challenge and an upper quartile target to improve on quality. This is for the following reasons:

- The analysis of the cost and quality trade off put forward by water companies is flawed, with some evidence selective or focusing on irrelevant areas.
- Companies have achieved their PR14 upper quartile common performance commitments as well as outperforming on their PR14 upper quartile based cost allowances.
- Better outcome performance should not necessarily increase cost. To the contrary, there appears to be a positive correlation between cost efficiency and high service quality as companies that do well on outcomes generally also do well on cost efficiency.
- It is possible to have upper quartile outcome performance and upper quartile cost efficiency, with some companies performing in the upper quartile for both costs and outcomes.
- Company requests for additional funding for service quality improvements are not supported by evidence, with some companies requesting additional funding despite already outperforming the PR19 performance commitment level.
- Improvements in common performance commitments are generally in line with past reductions, and poorer performing companies have made substantial reductions in the past. We do not consider that customers of poorer performing companies should pay more for a lower quality of service.
- We are providing an additional £200m of funding to support innovation, allowing companies to encourage collaborative innovation and help deliver transformational change. We consider that this funding will help companies deliver additional efficiencies and service improvements during the 2020-25 period.

- We accept that the 15% reduction in leakage is likely to be an additional challenge to companies, particularly if they are currently performing well. Some companies have reduced leakage substantially over recent years. We are therefore providing additional funding for the reduction in leakage for companies at the upper quartile. However, we do not consider that customers should pay for inefficiency. The scale of technological change over recent years means that companies that have not reduced leakage in the recent past have an opportunity to do so at much lower cost than the estimates they put to us.
- Frontier shift efficiency estimates do not properly capture improvements in quality.
- Most quality improvements are covered by enhancement funding, where we are providing £13bn of funding for the sector to improve service quality and industry outcomes.
- In the past regulators have not adjusted the efficiency challenge to allow for ongoing improvements in service quality.
- Any potential overlap of ongoing quality improvements with frontier shift is relatively small, and is limited to the forward looking shift in efficient performance.
- For leakage we are providing additional funding for companies that are operating beyond the upper quartile.
- For the water supply interruptions, pollution incidents and internal sewer flooding a number of companies have, are, or are forecast to be by 2019-20, performing better than the 2024-25 performance commitment level.
- Five companies are within our efficient base cost allowances and have accepted our outcomes stretch.
- We are relaxing our frontier shift allowances to take account of the stretch in quality we are requiring, including the leakage reduction.

6. The impact of the setting of the allowed return on capital

6.1 What we said in our draft determinations

In our draft determination we set our appointee allowed return on capital (in CPIH terms) at 3.19%, based on market evidence (therefore mid-point stretch). We stated that while we expected our determinations to be stretching, to encourage companies to improve efficiency and levels of service improve over time, an efficient company, with a notional capital structure, should be able to achieve a return on regulatory equity that is equivalent to the cost of equity that is allowed in our return on capital over the period of the price control.

6.2 Stakeholders' representations

Companies raised two main issues on the impact of the overall level of stretch on the allowed return on capital:

- The downside skew in the forecast return in regulatory equity from outcome delivery incentives and totex performance reflects increased risk, and is an additional stretch from PR14. This should be reflected in a higher allowed return on capital (Anglian Water, South Staffs Water).
- The combination of catch up and frontier shift cost efficiencies, increased stretch on outcomes and a lower allowed return on capital make the draft determinations unfinanceable (raised by Anglian Water, Dŵr Cymru, Northumbrian Water, Wessex Water, Southern Water, Thames Water, Wessex Water, Yorkshire Water, South East Water, and SES Water).

6.3 Our assessment and reasons

The downside skew in the forecast return from outcome delivery incentives and totex should not be reflected in a higher allowed return on capital

In principle, information asymmetry between us and companies and a lack of a full understanding of risks and opportunities means that actual company performance can be very different to what companies predict at a price review. Due to X-inefficiency, a monopoly provider can have a degree of slack in its level of cost and service. In response to a regulatory challenge from a new price review, monopoly

providers may therefore be able to improve performance by improving efficiency and reducing slack.

In PR14 there was also a downside skew in the forecast return on regulatory equity for both totex and outcomes. During PR14 companies have on average outperformed on totex and outcome delivery incentives, as shown in below. In addition outcomes and cost performance risk should be diversifiable, in that it will affect a specific company positively or negatively, and so should not affect the overall industry allowed return on capital.

Figure 8: Total expenditure return on regulatory equity, PR14 forecast range and outturn

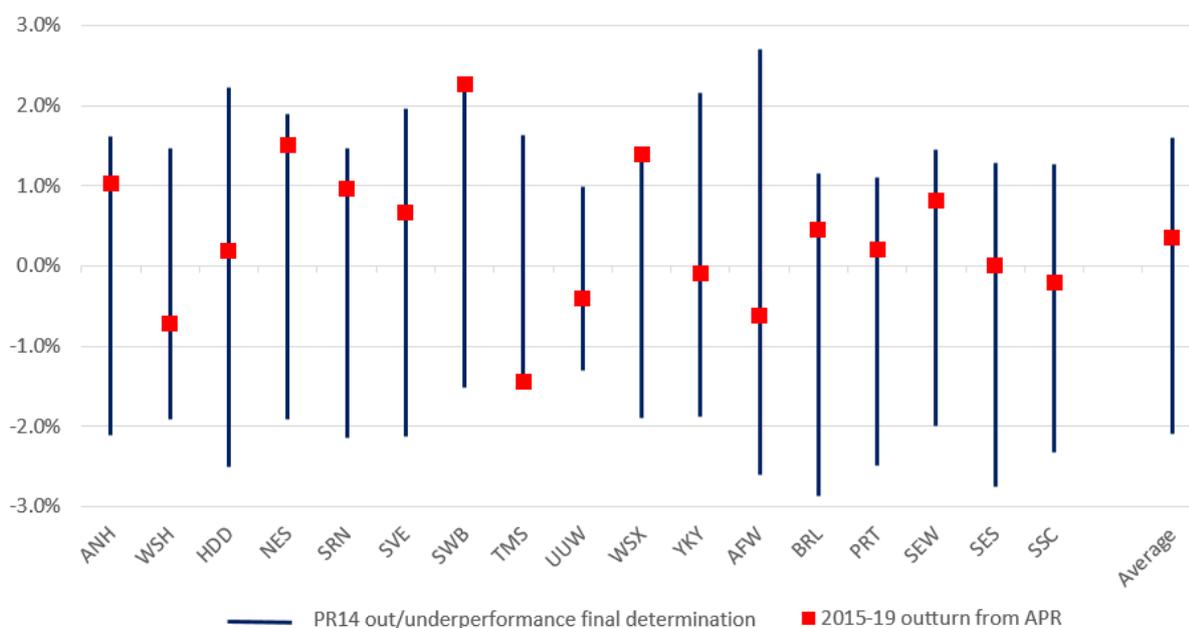
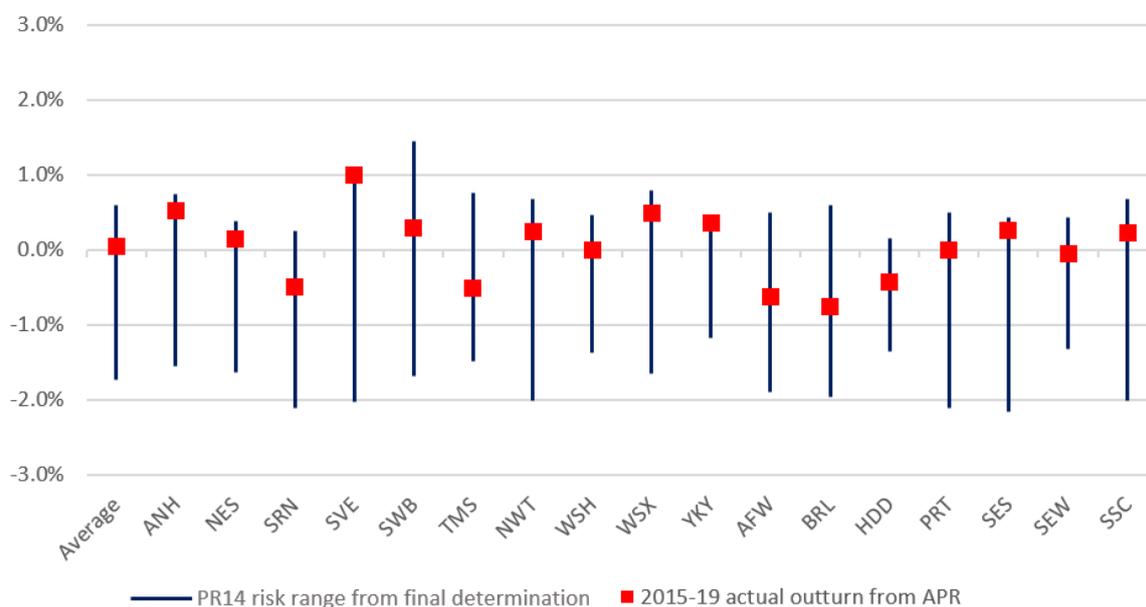


Figure 9: Outcome performance return on regulatory equity, PR14 forecast range and outturn



The final determinations are financeable for a company with the notional capital structure

Taking account of our duties, we consider we should be data-led in setting costs, outcomes and the allowed return on capital. We set stretching but achievable levels of cost efficiency and outcome performance commitments. Our allowed return on capital is based on the latest market evidence. In our final determination we have further reviewed and finalised the overall stretch on cost efficiency and outcome performance for each company. Where we identify that companies may encounter cash flow issues on the notional structure we make use of financial levers such as bringing forward revenue by increasing pay as you go or RCV run off rates to mitigate financeability constraints for company with the notional capital structure. On this basis we consider that the final determinations to be financeable.

6.4 Our final determination decision

The final determinations are financeable.

The allowed return on capital is based on the market evidence and so reflects the prevailing market conditions and cost of debt and equity.

We do not consider that we should increase the allowed return on capital to reflect the level of stretch on outcomes and totex. Neither do we consider it is necessary to adjust the allowed return on capital for expected outperformance against our determination (as advocated by some authors of a report for UKRN¹³). This is because we have set stretching but achievable levels of cost efficiency and outcome performance commitments. These take account of our assessment of a reasonable levels of productivity challenge, cost efficiency and stretch in performance commitment levels that take account of past and expected future performance.

The downside skew in company estimates of returns from outcome delivery incentives and totex is likely to reflect information asymmetry and understanding of risks and opportunities, where companies are more likely to focus on the downside rather than upside, rather than reflect the actual performance. Companies have an incentive to argue there is greater risk and a downward skew to reduce the stretch in our cost assessment or performance commitments, for example to increase scope for outperformance payments or limit underperformance payments. Company views may also reflect company-specific factors or inefficiency and historical issues on performance. This may be because companies are likely to focus on downside risk in their assessment, reaching views on risk before they have had the opportunity to further challenge themselves on the level of stretch in the context of the final determinations. We consider that companies will be incentivised to respond to the level of stretch. There was a similar downside skew in company estimates in PR14 and companies have on average outperformed the settlement.

We have used financial levers to ensure that companies are financeable if they had the notional capital structure.

Further details are set out in 'Aligning risk and return technical appendix'.

¹³ S. Wright, P Burns, R Mason and D Pickford 2018 '[Estimating the cost of capital for implementation of price controls by UK Regulators](#)'

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