

# INCENTIVISING NET ZERO

A REPORT FOR OFWAT

08 APRIL 2022

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## EXECUTIVE SUMMARY

### BACKGROUND AND PROJECT OBJECTIVE

The UK has a binding target to deliver net zero by 2050 along with an interim target of a 78% reduction by 2035 against the 1990 baseline.<sup>1</sup> Wales has committed to reduce emissions by 89% by 2040 and shares the UK-wide target of net zero by 2050.<sup>2</sup> The water sector is currently responsible for 1% of UK greenhouse gas emissions and decarbonisation of the industry is a key part of delivering against these targets.<sup>3</sup>

At PR19 only a proportion of water companies had performance commitments (PCs) related to their operational greenhouse gas emissions (i.e. emissions associated day-to-day activities of the company), and only 2 had PCs specifically related to embedded emissions (e.g. emissions associated with materials and processes involved in building assets or embedded in intermediate products used in operations).

**TABLE 1** EMISSIONS PERFORMANCE COMMITMENTS IN PR19

COMPANY	EMISSIONS TYPE	PC
SES Water	Operational	Kilograms of CO2 equivalent (kgCO2e) per Ml of water put into supply
Wessex Water	Operational	Kilotonnes of carbon equivalent (ktCO2e)
Northumbrian Water	Operational	Annual reductions in operational greenhouse gas emissions from a 2019-20 baseline expressed in tonnes CO2e
Yorkshire Water	Operational	% reduction in net operational carbon emissions from a 2019-20 baseline
Yorkshire Water	Embedded (capital carbon)	% reduction in capital carbon emissions from the delivery of the company's capital investment programme and carbon emissions arising from land the company owns
Anglian Water	Operational	% reduction in real terms of gross operational carbon equivalent emissions from a 2019-20 baseline
Anglian Water	Embedded (capital carbon)	% reduction in capital carbon emissions arising from construction activities during scheme delivery from a 2010 baseline.
Portsmouth Water	Operational	% reduction in net annual operational greenhouse gas emissions measured in kilograms carbon equivalent (kgCO2e) per million litres (Ml) of water put into supply from a 2019-20 baseline.
South East Water	Operational	Net annual operational greenhouse gas emissions measured in kilograms carbon dioxide equivalent (kgCO2e) per million litres (Ml) of water put into supply
South Staffs Water	Operational	Operational carbon emissions expressed as kilograms per connected property.

Source: Ofwat PR19 Final Determinations

<sup>1</sup> Section 1 of the [Climate Change Act 2008](#)

<sup>2</sup> Welsh Government. Accessed at: <https://gov.wales/climate-change-targets-and-carbon-budgets>

<sup>3</sup> Ofwat (2022). Net zero principles position paper. Accessed at: [https://www.ofwat.gov.uk/wp-content/uploads/2022/01/Net\\_Zero\\_Principles\\_Position\\_Paper\\_Jan\\_2022.pdf](https://www.ofwat.gov.uk/wp-content/uploads/2022/01/Net_Zero_Principles_Position_Paper_Jan_2022.pdf)

Looking forward to PR24, Ofwat has committed to strengthening the sector’s approach to climate change mitigation and guidance suggests that companies will need to take into account the long-term government targets on net zero as part of their business planning.<sup>4</sup> This is also highlighted in the DEFRA draft strategic priorities statement which expects water companies to account for the UK Net Zero Strategy and contribute to net zero by 2050.<sup>5</sup>

The objective of this work is to support Ofwat with its approach to regulating net zero at PR24 by identifying and assessing a range of options. This work builds on Ofwat’s net-zero principles paper.<sup>6</sup>

## OVERVIEW OF INCENTIVE FRAMEWORKS

We have identified a series of key choices for incentivising efficient net zero investment across the water sector, split into strategic decisions and detailed decisions. For each of these choices, we have considered the options available and associated trade-offs. For example, some options will place a greater emphasis on revealing and funding investments at efficient costs whereas others prioritise ensuring that all companies are able to make significant progress over the PR24 period (also known as AMP8).

**FIGURE 1** KEY DECISIONS

Strategic decisions	
Treatment of emission types	Should operational and embedded emissions be incentivised together or separately?
Pace of change	How fast should Ofwat set the pace of change within PR24 in the context of the longer-term glide path of net-zero at 2050?
Detailed decisions	
Policy tools	<p>The specific policy tools used to incentivise investment into net-zero:</p> <ul style="list-style-type: none"> <li>• Cost assessment</li> <li>• Bidding mechanics</li> <li>• PCs and PCDs</li> <li>• Management of uncertainty</li> </ul>
Funding	<p>How should funding for net-zero incentives be set?</p> <ul style="list-style-type: none"> <li>• Paid for by the customers of companies delivering net-zero investments?</li> <li>• Spread across all water customers?</li> </ul>

Source: Frontier Economics

We first assessed options for the strategic decisions (treatment of emissions types and pace of change) to reach a common starting point for the incentive frameworks:

- **Treatment of emission types.** We recommend separate approaches for operational and embedded emissions during PR24 to reflect the less-developed state of carbon accounting for embedded

<sup>4</sup> Ibid.

<sup>5</sup> DEFRA (2021). [The Government’s strategic priorities for Ofwat.](#)

<sup>6</sup> Ofwat (2022). [Net zero principles position paper](#)

emissions. However, an aggregate approach may be appropriate for PR29, and the sector should re-consider this approach when standardised embedded emissions reporting is more established.

- **Pace of change.** Companies should set out their view of an efficient net zero pathway in the context of the Government net zero targets as part of their long-term delivery strategies, taking into account Ofwat’s net zero principles. Ofwat should then make a decision on pace of change for the PR24 period based on risk appetite and expected technological advances beyond AMP8 to form the industry level carbon abatement target.

We then developed three packages for assessment, each of which represents a different combination of options for policy tools and funding. The figure below summarises these three packages followed by a summary of how each package would work in practice.

**FIGURE 2 PACKAGES FOR ASSESSMENT**

	Policy tools	Funding
Adapted PR19 Framework	<ul style="list-style-type: none"> <li>• Company level cost assessment for base and enhancement carbon-related investment, utilising benchmarking and unit cost models.</li> <li>• Performance commitments for operational emissions with efficient cost based ODIs.</li> <li>• Price control deliverables for embedded emissions</li> </ul>	<ul style="list-style-type: none"> <li>• Based on standard PR19 approach i.e. customers of the water company pay for its investments via their bills.</li> </ul>
Bidding framework	<ul style="list-style-type: none"> <li>• Baseline carbon abatement set using benchmarking for improvements delivered via base.</li> <li>• All additional carbon-related funding allocated using a bidding framework irrespective of whether carbon is the primary driver of that investment or a secondary co-benefit.</li> <li>• Performance commitments for operational emissions with efficient cost based ODIs informed by bids.</li> <li>• Price control deliverables for embedded emissions.</li> </ul>	<ul style="list-style-type: none"> <li>• Costs spread across all customers via a net-zero levy on customer bills.</li> </ul>
Blended approach	<ul style="list-style-type: none"> <li>• Baseline carbon abatement set using benchmarking for improvements delivered via base.</li> <li>• Enhancement funding for non-carbon drive investments that have secondary carbon co-benefits assessed as part of separate enhancement funding.</li> <li>• Additional net-zero enhancement funding focused on the most efficient companies.</li> <li>• Performance commitments for operational emissions.</li> <li>• Price control deliverables for embedded emissions.</li> </ul>	<ul style="list-style-type: none"> <li>• Based on standard PR19 approach i.e. customers of the water company pay for its investments via their bills.</li> </ul>

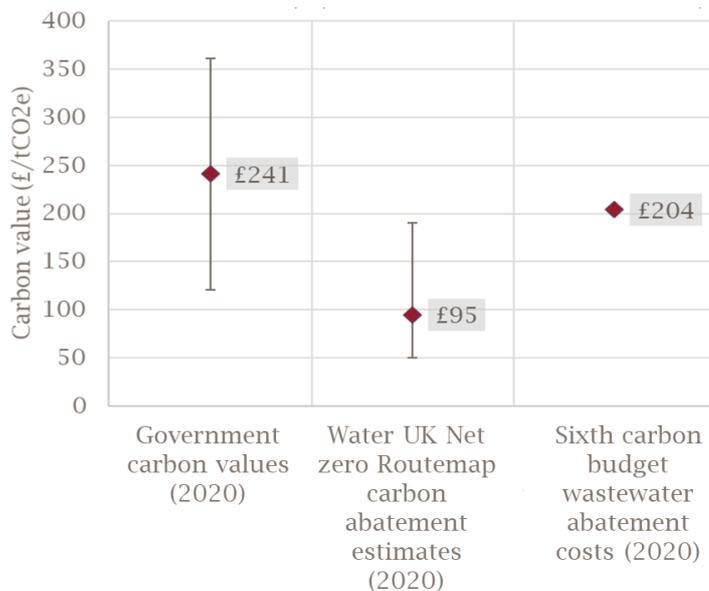
Source: Frontier Economics

### Adapted PR19 framework

This approach builds on the approach taken in PR19 for other outcomes and applies them to net zero. Companies would submit their business plan and long-term delivery strategy to Ofwat as part of the wider price control process, identifying the amount of carbon abatement that they feel is achievable under base and enhancement funding. Ofwat would evaluate these plans to establish a common baseline level of operational carbon abatement that all companies should deliver as part of base allowances. This would be informed by benchmarking and allow for company-specific circumstances where appropriate. This forms the baseline performance commitment level (PCL) for operational carbon which is coupled with an ODI rate set at benchmarked efficient costs.

We note that Ofwat’s latest ODI discussion paper<sup>7</sup> suggests that ODI rates should be based on marginal benefits as these are expected to be more robust at PR24 due to the central research. They should therefore be more reliable than marginal costs in most cases. The reason why we suggest using marginal costs for carbon specifically is because a marginal benefit approach raises questions on the type of benefit to use (e.g. water sector customer research on carbon vs government carbon values). Furthermore, using the government carbon values runs the risk of setting ODI rates that are much higher than marginal abatement costs (see figure below), leading to incentives to outperform targets that are stronger than they need to be. ODIs that reflect marginal costs (and the cost sharing rate) are likely to be most effective.

**FIGURE 3      COMPARISON OF CARBON VALUES**



Source: Data from BEIS Carbon values, Water UK Net zero Routemap, Climate Change Committee 6<sup>th</sup> Carbon Budget

Companies can propose additional enhancement funding for net zero, either as part of other enhancement schemes e.g. incorporating infiltration basins as part of a sustainable drainage system (SuDS) scheme that targets flooding, or as standalone carbon-driven investments e.g. switching to more efficient pumps to reduce energy consumption or moving to anaerobic wastewater treatment.

Where companies receive additional net zero related enhancement funding, their PCL will adjusted to reflect the additional benefits customers should see from this additional funding. For funding targeted towards reducing embedded emissions, this will likely be associated with a bespoke PC or price control deliverable (PCD) that Ofwat will assess at the end of the PR24 period and any non-delivery resulting in recovery of relevant allowances.

**Bidding framework**

Under this option Ofwat would still set a baseline level of carbon abatement that all companies are expected to deliver under base allowances. This would remain the baseline PCL. It will also set an overall PR24 industry carbon abatement target based on company long term delivery strategies. However, rather than assessing net zero related enhancement funding on a company-by-company basis, all companies would be required to submit their enhancement funding requests as part of a bidding competition. In order to maintain a rationing element to incentivise cost revelation, companies will be required to submit

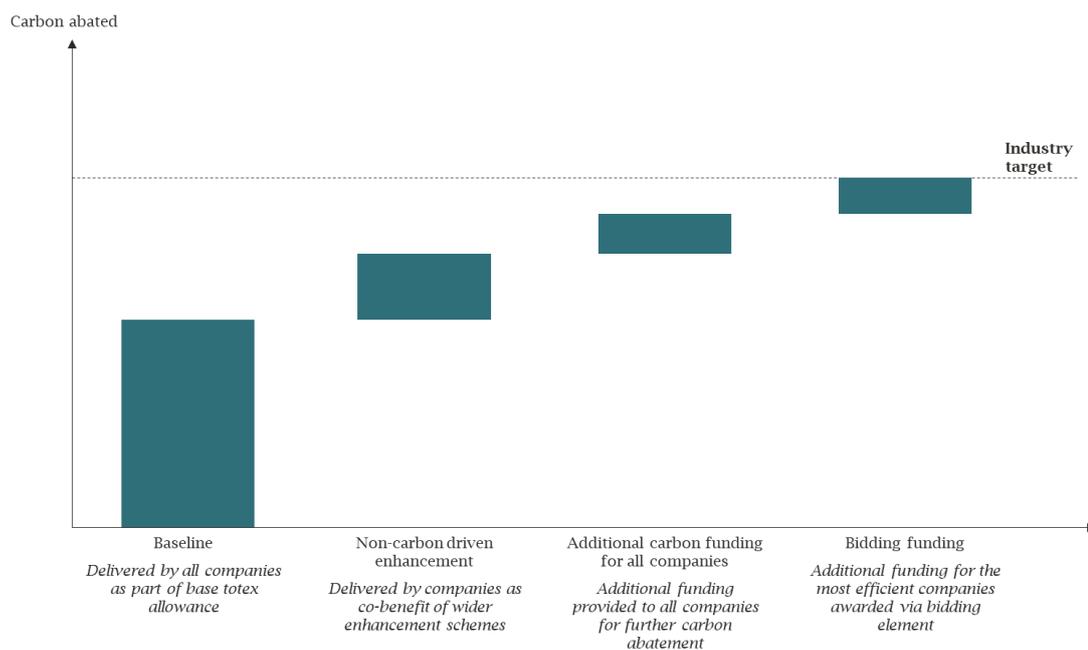
<sup>7</sup> Ofwat (2022). [PR24 and beyond: a discussion paper on outcome delivery incentives](#)

two plans: one that sets out investments required to remain on their efficient net zero company trajectory, and one with additional investments that would allow them to go further faster. Ofwat would then choose investments that receive funding up to the point where the overall PR24 industry carbon abatement target is met based on the efficiency of carbon abatement. This would require Ofwat to balance carbon outcomes against other benefits delivered by enhancement schemes.

### Blended approach

Under this option Ofwat would continue to set a baseline level of carbon abatement that all companies are expected to deliver under unadjusted base allowances. This would remain the baseline PCL. It would also set an overall PR24 industry carbon abatement target. However, unlike the bidding framework, assessment of enhancement schemes that are not primarily driven by carbon but still deliver carbon co-benefits will be carried out under the standard enhancement assessment process at a company level e.g. a SuDS scheme that is primarily driven by the need to reduce flooding but delivers carbon co-benefits would be assessed as part of the wider enhancement process that balances least-cost and best-value considerations. Once this is complete, the residual industry carbon abatement gap is equal to the difference between the industry carbon abatement target and carbon expected to be abated via the baseline and funded non-carbon driven enhancement schemes. Ofwat would fund this gap by allocating additional funding to companies based on the efficient cost for the schemes proposed, with more funding allocated to the most efficient companies.

**FIGURE 4      BLENDED APPROACH**



Source: Frontier Economics

### ASSESSMENT OF OPTIONS

We assessed these three packages against an assessment framework based on Ofwat’s net zero principles, alignment with wider PR24 objectives, and the Government’s guidance on regulatory principles.

We concluded whilst the bidding framework has the strongest incentives for information revelation, it has several key weaknesses that means it is unlikely to be suitable for PR24. The most significant of these

comes from assessing all enhancement schemes together as part of the bidding framework regardless of whether these schemes are primarily driven by carbon benefits or other outcomes. This means that it would not always be clear on what basis a project received funding. Going back to the SuDS example, the primary driver for this enhancement programme is surface management and flooding mitigation rather than carbon and it would be funded on this basis. However, it can also deliver carbon co-benefits so the funded £/tonne is likely to look comparatively high versus other carbon-driven investments. More generally, the pure bidding framework is complex to implement and does not offer benefits over and above the other two options.

The choice between the ‘Adapted PR19 framework’ and ‘Blended approach’ depends on Ofwat’s policy direction for PR24. We set out the main considerations for Ofwat in choosing between these two packages below.

**TABLE 2 KEY CHOICE BETWEEN THE ‘ADAPTING PR19 FRAMEWORK’ AND ‘BLENDED APPROACH’**

	<b>ADAPTING PR19 APPROACH IS MORE APPROPRIATE...</b>	<b>BLENDED APPROACH IS MORE APPROPRIATE...</b>
Pace across the industry	If the objective is to ensure that all companies are able to remain on their proposed net zero pathways.	If the objective is to move the industry forward at the most efficient cost and Ofwat is comfortable with some companies receiving more funding for net zero – including implications for benchmarking at PR29.
Productive efficiency	If there is comfort in being able to benchmark efficient costs as part of Ofwat’s wider cost assessment process and efficient costs are similar across companies.	If there are concerns around data on efficient costs as only a subset of companies had carbon emissions PCs in PR19, and the bidding element will help to reveal efficient costs. Bidding would also help allocate carbon funding more proportionately to the abatement efficiency of each company – more efficient companies would receive a higher share of the funding.
Simplicity and alignment with wider PR24	If developing new unit cost models for benchmarking is more practical to deliver than incorporating a new bidding mechanic into the price control.	If a pragmatic bidding framework entails similar levels of company and regulatory burden, while delivering additional efficiency and information revelation benefits.
Integration of net zero with wider schemes	If almost all net zero benefits are expected to be co-benefits of investments that have other primary drivers.	If there is confidence that companies can put forward enough carbon-driven investments to retain a rationing element under a bidding framework, which is a necessary requirement for a bidding mechanic to deliver efficient costs.

Source: Frontier Economics

We note that Ofwat could choose to implement one of these packages with some modifications. For example, under the blended approach Ofwat could choose to close the carbon abatement gap using a bidding framework for all carbon-driven solutions rather than providing additional allowances for all companies.

Finally, the final package should be informed by further consideration on the practical feasibility of implementing net zero incentive mechanisms.

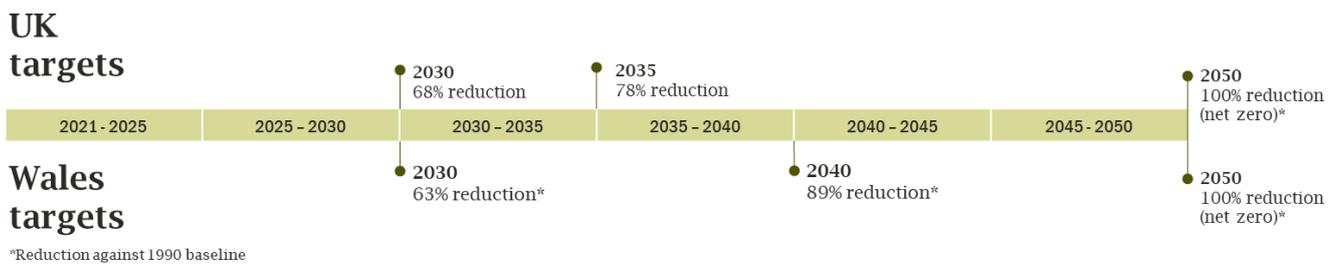
# 1 INTRODUCTION

The UK Government has committed to achieving net zero by 2050<sup>8</sup>. This is supported by a series of carbon budgets with the Government legislating an interim target to reduce UK emissions by 78% compared to 1990 baselines by 2035 following the Sixth carbon budget which runs from 2033 to 2037.<sup>9</sup>

Net zero is a flow concept rather than a stock concept and refers to emissions produced in-year. This means that by 2050, the UK will achieve an overall in-year balance between greenhouse gas emissions (GHG) produced and GHG emissions taken out of the atmosphere, and that any residual emissions would be "balanced by schemes to offset an equivalent amount of greenhouse gases from the atmosphere, such as planting trees or using technology like carbon capture and storage".<sup>10</sup>

The Welsh Government shares this legal commitment to achieve net zero by 2050<sup>11</sup> supported by its own set of carbon budgets and interim targets, which currently consist of a 63% reduction in carbon emissions compared to 1990 by 2030 and 89% by 2040.<sup>12</sup> The current carbon budget 2, which covers 2021-2025, targets an average 37% reduction in emissions, all of which must be achieved by action taken in Wales (i.e. 0% international offsets).

**FIGURE 5 SUMMARY OF UK GOVERNMENT NET ZERO TARGETS**



Source: Frontier Economics, based on UK and Welsh Government net zero commitments

## 1.1 THE ROLE OF THE WATER SECTOR IN MEETING GOVERNMENT TARGETS

### 1.1.1 NET ZERO AT PR19

The water sector is responsible for 1% of UK GHG emissions and has a key role in achieving national net zero targets.<sup>13</sup> At PR19 only a proportion of water companies had performance commitments ("PCs") relating to their GHG emissions. These were a mix of definitions, incentive types (under-performance only vs. under- and out-performance), and outcome delivery incentives ("ODIs").

<sup>8</sup> Section 1 of the [Climate Change Act 2008](#)

<sup>9</sup> See [Carbon Budget Order 2021](#) and HMG (2021). [Net Zero Strategy: Build Back Greener](#).

<sup>10</sup> BEIS (2019). Accessed at: <https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law>

<sup>11</sup> See Section 29(1) of the [Environment \(Wales\) Act 2016](#)

<sup>12</sup> Welsh Government. Accessed at: <https://gov.wales/climate-change-targets-and-carbon-budgets>

<sup>13</sup> Ofwat (2022). Net zero principles position paper. Accessed at: [https://www.ofwat.gov.uk/wp-content/uploads/2022/01/Net\\_Zero\\_Principles\\_Position\\_Paper\\_Jan\\_2022.pdf](https://www.ofwat.gov.uk/wp-content/uploads/2022/01/Net_Zero_Principles_Position_Paper_Jan_2022.pdf)

**TABLE 3 PR19 GHG PERFORMANCE COMMITMENTS**

COMPANY	EMISSIONS TYPE	PC	ODI FORM	ODI TYPE
SES Water	Operational	Kilograms of CO2 equivalent (kgCO2e) per Ml of water put into supply	Financial	Under-performance only
Wessex Water	Operational	Kilotonnes of carbon equivalent (ktCO2e)	Financial	Under-performance only
Northumbrian Water	Operational	Annual reductions in operational greenhouse gas emissions from a 2019-20 baseline expressed in tonnes CO2e	Financial	Out and under-performance
Yorkshire Water	Operational	% reduction in net operational carbon emissions from a 2019-20 baseline	Financial	Out and under-performance
Yorkshire Water	Embedded	Percentage reduction in capital carbon emissions from the delivery of the company's capital investment programme and carbon emissions arising from land the company owns	Reputational	Non-financial
Anglian Water	Operational	% reduction in real terms of gross operational carbon equivalent emissions from a 2019-20 baseline	Reputational	Non-financial
Anglian Water	Embedded (capital carbon)	Percentage reduction in capital carbon emissions arising from construction activities during scheme delivery from a 2010 baseline.	Reputational	Non-financial
Portsmouth Water	Operational	Percentage reduction in net annual operational greenhouse gas emissions measured in kilograms carbon equivalent (kgCO2e) per million litres (Ml) of water put into supply from a 2019-20 baseline.	Reputational	Non-financial
South East Water	Operational	Net annual operational greenhouse gas emissions measured in kilograms carbon dioxide equivalent (kgCO2e) per million litres (Ml) of water put into supply	Reputational	Non-financial
South Staffs Water	Operational	Operational carbon emissions expressed as kilograms per connected property.	Reputational	Non-financial

Source: Frontier economics

Note: Based on Ofwat final determinations for PR19

## 1.1.2 NET ZERO AT PR24

### WATER UK NET ZERO ROUTEMAP

In 2019, Water UK developed a series of Public Interest Commitments (“PICs”), one of which was to “achieve net zero carbon emissions for the sector by 2030”.<sup>14</sup> In 2021 the water companies in England came together with Water UK to develop the Net zero Routemap.<sup>15</sup> This set out a plan for the industry to achieve net zero across the majority of its operational emissions (i.e. all operational emissions excluding chemicals) based on current and emerging technologies. This industry Routemap has formed the basis for individual company plans for net zero. However, it does not fully address the pathway to the Government’s targets as it excludes both chemical operational emissions and embedded emissions (emissions emitted in producing materials e.g. concrete).<sup>16</sup>

### OFWAT NET ZERO PRINCIPLES

Looking forward to PR24, Ofwat’s net zero principles position paper<sup>17</sup> lays out three key principles:

- Ofwat expects companies’ plans to align with national government net zero targets;
- Action on net zero should address operational and embedded emissions in parallel; and
- Companies need to prioritise the reduction of GHG emissions before the use of offsets, as set out in the GHG management hierarchy.

### DEFRA SPS

The government’s strategic priorities for Ofwat include a need to protect and enhance the environment and highlights the need for water companies to have regard for policies and proposals set out in the government’s net zero strategy.

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**We welcome the commitment by water companies to achieve net zero operational emissions by 2030. Water companies should also have regard for the policies and proposals set out in the net zero strategy, which shows how all parts of our economy can contribute to our national target of net zero greenhouse gas emissions by 2050. Ofwat will have an important role in scrutinising and challenging companies’ business plans**

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**DEFRA  
2022 STRATEGIC PRIORITIES STATEMENT**

The above notwithstanding, neither the DEFRA SPS nor the Government’s net zero strategy places explicit targets for the water sector. While the general interpretation of the government’s ambition on net zero is

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<sup>14</sup> Water UK (2019), Public Interest Commitment, <https://www.water.org.uk/publication/public-interest-commitment/>

<sup>15</sup> Water UK (2021). <https://www.water.org.uk/routemap2030/wp-content/uploads/2020/11/Water-UK-Net-zero-2030-Routemap.pdf>

<sup>16</sup> The Routemap also excludes emission associated with customer use water is generally considered to be the responsibility of customers.

<sup>17</sup> Ofwat (2022). Net zero principles position paper. Accessed at: [https://www.ofwat.gov.uk/wp-content/uploads/2022/01/Net\\_Zero\\_Principles\\_Position\\_Paper\\_Jan\\_2022.pdf](https://www.ofwat.gov.uk/wp-content/uploads/2022/01/Net_Zero_Principles_Position_Paper_Jan_2022.pdf)

that all companies make their contribution, there are no clear and specific targets for water companies at this stage. Further clarity on how the Government's targets apply specifically to the water sector would therefore be helpful to supporting planning and achievement of the overall net zero policy objective.

## **1.2 PURPOSE OF THIS WORK**

The objective of this work is to support Ofwat's development of the PR24 net zero incentives framework, by providing options for:

- Different approaches to identify and facilitate funding and incentivisation of efficient net zero investment and subsequent benefits such as emissions reductions.
- Tracking delivery of investment benefits and incentivising performance.
- Disseminating efficient costs, benefits, and intervention types.
- Implementation practicalities and recommendations for next steps.

The outputs from this project are intended to help Ofwat develop the PR24 methodology to achieve its net zero principles and ensure that water companies take into account long-term Government targets when setting out their own business plans. This work covers both England and Wales, and where appropriate we have given specific consideration to Wales which has separate Government commitments. In this report we set out the initial options and their relative strengths and weaknesses to enable Ofwat to make an informed choice.

## **1.3 STRUCTURE OF THIS REPORT**

The remainder of this report is structured as follows:

- Section 2 sets out objectives for the net zero transition in water;
- Section 3 provides a categorisation of net zero investments to inform the options development;
- Section 4 examines the strategic policy decisions associated with incentivising net zero;
- Section 5 discusses the detailed policy decisions when it comes to incentivising net zero; and
- Section 6 assesses the packages of policy tools and lays out our conclusions and recommended next steps.

## 2 OBJECTIVES FOR THE NET ZERO TRANSITION IN WATER

Whilst the Government has set interim and end targets for the net zero transition, it has not defined the specific pathway for achieving these targets.<sup>18</sup> Decisions on pace, risk, and cost will each play a key role in deciding which path the industry takes and the trade-offs within. Therefore in order to develop robust options and recommendations for PR24, we must first answer the question of “what does a good net zero transition look like?”. This will form the basis for the key objectives of the incentive framework. We draw on both Ofwat’s net zero principles paper and its wider publications on PR24 to define these objectives.

### 2.1 OFWAT NET ZERO PRINCIPLES

Ofwat published its net-zero position paper earlier this year and set out the three key principles discussed above. Ofwat is keen that water companies take a long-term view when setting out their plans for net zero, and that these plans should be within the context of the Government targets. This will require companies to look beyond AMP8 and consider what activities will be required in order to lay the groundwork for emissions reductions beyond PR24.

Ofwat has also highlighted the risks of focusing disproportionately on operational emissions alone. The Government targets cover operational and embedded carbon<sup>19</sup> and the sector will need to progress solutions across both these areas during the next asset management period (AMP). Furthermore, there is a risk that actions to reduce operational emissions will lead to an increase in embedded emissions. For example, storage tank covers are one option to reduce operational emissions from wastewater treatment<sup>20</sup>. However, the manufacture of these lids, especially if they are made from concrete, releases significant emissions which contribute to water company embedded emissions.

Finally, Ofwat has addressed the prioritisation of reductions and approach to offsets, making it clear that they expect companies to prioritise elimination and reduction of GHG emissions before the use of offsets.

### 2.2 ALIGNMENT WITH WIDER PR24

In addition to Ofwat’s net zero position paper, we have also considered Ofwat’s wider proposed approach to PR24 to ensure that the final proposals support a cohesive price control framework. Relevant principles include:

- **Efficiency and innovation.** Ofwat has stated in its PR24 guidance the need ‘to ensure consumers do not pay more than they need to’<sup>21</sup> and for water companies to deliver improvements via efficiency and innovation. Our view is that the need to deliver efficiency is particularly relevant to net zero interventions for two reasons. Firstly, not all companies had GHG PCs in PR19 and those without a relevant PC may have invested less in carbon abatement measures, reducing the amount of information available for benchmarking in PR24. Secondly, some low-carbon solutions currently have a low technology readiness level (TRL), particularly those targeting process emissions from wastewater and

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<sup>18</sup> The Government net zero Strategy lays out high level policies for delivering net zero but does not specify the individual pathway by sector.

<sup>19</sup> Embedded emissions for a water company will be an operational emission for the company supplying the material e.g. embedded emissions associated with the manufacture of concrete used for an enhancement project will be an operational emissions for the concrete manufacturer.

<sup>20</sup> Campos et al (2016). Greenhouse Gases Emissions from Wastewater Treatment Plants: Minimization, Treatment, and Prevention.

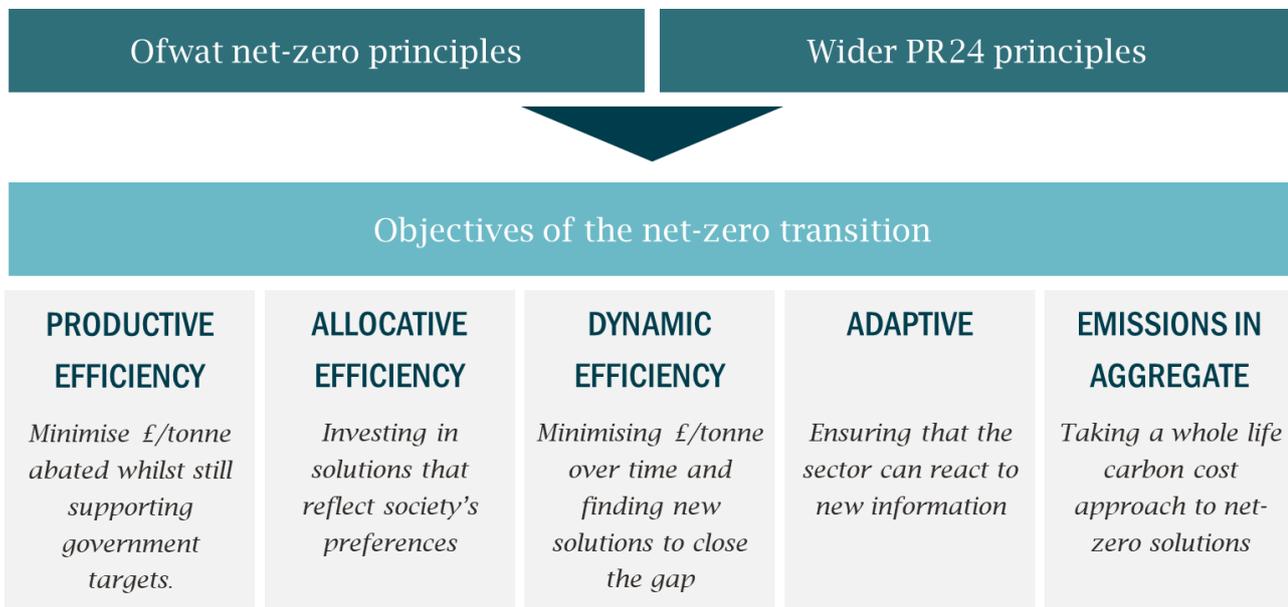
<sup>21</sup> Ofwat (2021). PR24 and beyond: Creating tomorrow, together. Accessed at: [PR24-and-Beyond-Creating-tomorrow-together.pdf](#) ([ofwat.gov.uk](#))

embedded emissions. The costs of these solutions are likely to fall over time as they reach maturity and therefore Ofwat must strike a balance between certainty in achievement of net zero targets and minimising the cost of doing so.

- **Adaptive planning.** Another key theme in Ofwat’s guidance is the move to an adaptive planning approach to better optimise investment under uncertainty. Again we consider this particularly relevant to net zero investments as solutions for key sources of emissions such as process emissions and embedded carbon are still in early stages and investments should therefore be made on as flexible a basis as possible, avoiding sunk costs associated with switching to better solutions over the AMP8 period and beyond.

We have taken into account both Ofwat’s net zero position paper and the wider approach to PR24 to develop a set of key objectives for the net zero transition. It is important to recognise that no incentive framework will be able to maximise outcomes across all of these objectives. Instead, any option will represent a trade-off across these objectives.

**FIGURE 6 OBJECTIVES OF THE NET ZERO TRANSITION**



Source: Frontier economics  
 Note: Based on Ofwat publications

**TABLE 4 WHAT WOULD THESE OBJECTIVES LOOK LIKE AS A SOLE OBJECTIVE?**

OBJECTIVE	WHAT WOULD THIS LOOK LIKE AS THE SOLE OBJECTIVE?
Productive efficiency	Minimise costs, companies incur the lowest costs over the next 25 years to achieve the Government’s net zero targets.

Allocative efficiency	The balance between net zero and other service improvements within water would perfectly reflect customer preference at any point in time, even if this did not align with the government's net zero targets. <sup>22</sup>
Dynamic efficiency	Focus on developing or implementing innovative solutions to drive down overall costs (but with potentially higher upfront costs).
Adaptive	Ensuring that decisions on net zero investments take into account investment timeframes and sunk costs for different solutions along with trade-offs between moving earlier to support learning-by-doing vs. waiting to reduce uncertainty on cost and value. Where circumstances change, providing the right degree of flexibility in the price control for the sector to react.
Emissions in aggregate	Reducing total emissions in the most efficient way e.g. ranking investments by cost per tonne abated regardless of whether they refer to operational or embedded emissions

Source: Frontier Economics

We use these objectives as the basis for evaluating potential incentive frameworks. We supplement these objective-based criteria with more practical considerations based on established principles of good design, recognising that the success of any net zero incentive framework will need to be practical and ideally simple. We draw on the recent Government Economic Regulation Policy Paper's good principles for economic regulation<sup>23</sup>, focusing on the principles that have the greatest applicability to net zero investment.

**TABLE 5 GOOD PRINCIPLES FOR ECONOMIC REGULATION**

PRINCIPLE	TREATMENT IN THIS WORK
<b>Accountability.</b> Ensuring regulation takes place within a framework set by Government, and that respective roles and responsibilities are enacted by the body that has the appropriate legitimacy, expertise and capability and are scrutinised accordingly.	We do not explicitly consider this principle in this work as Ofwat's remit to challenge companies on net zero investments is based on the Defra SPS for England, and the Welsh SPS once this is published.
<b>Focus.</b> Economic regulators have clearly defined, articulated, and prioritised responsibilities, but adequate discretion to choose the appropriate means to best achieve desired outcomes	We consider a range of incentive framework options against Ofwat's desired net zero outcomes and assess these against the risk of generating " <b>perverse incentives and unintended consequences</b> " as well as " <b>distributional impacts</b> " for consumers to ensure any mechanism consider is appropriate.

<sup>22</sup> This refers to allocative efficiency within the water sector rather than across sectors where there are differing marginal abatement costs.

<sup>23</sup> BEIS (2022). Economic Regulation Policy Paper.

PRINCIPLE	TREATMENT IN THIS WORK
<b>Predictability.</b> Ensuring the framework for economic regulation is stable, allowing long-term investment to be supported with confidence and receive a reasonable return, subject to the normal risks inherent in markets.	We introduce a <b>‘futureproof’</b> criterion which assesses whether the incentive framework can be applied at PR29 and beyond.
<b>Coherence.</b> Ensuring the framework for economic regulation forms a logical part of the Government’s broader policy context, enabling cross-sector delivery of policy goals where appropriate.	The purpose of introducing net zero incentives into PR24 is to align with the Government’s broader net zero policy. To support this we also introduce a <b>“protection from non-delivery”</b> objective which assesses whether the incentive framework provides sufficient accountability for customers are protected from non-delivery which would undermine the UK’s net zero ambitions.
<b>Adaptability.</b> Ensuring the framework for economic regulation has the capacity to evolve to respond to changing circumstances and continue to be relevant and effective over time.	Adaptability is already an objective-based criteria following Ofwat’s emphasis on adaptive planning for PR24.
<b>Efficiency.</b> Ensuring policy interventions are proportionate and cost-efficient, whilst decision making is timely and robust	We introduce two additional criteria: <ul style="list-style-type: none"> <li>▪ <b>“Simplicity”</b>. This assesses whether the net zero incentive framework is simple to administer for companies and Ofwat.</li> <li>▪ <b>“Alignment with PR24”</b>. This evaluates whether the incentive framework is coherent with wider PR24.</li> </ul>

Source: BEIS economic regulation policy paper

## 2.3 EVALUATION CRITERIA

Based on the objectives for the net zero transition and Government guidance on regulatory principles, we have developed a set of evaluation criteria to assess options for the net zero incentive framework. These are summarised in the table below.

**TABLE 6 EVALUATION CRITERIA**

CRITERIA	DESCRIPTION
<b>Effectiveness</b>	Does the policy mechanism deliver the desired net zero reduction?
<b>Productive efficiency</b>	Does this approach minimise the £/tonne abated across the water industry as a whole while still supporting achievement of Government targets?

<b>CRITERIA</b>	<b>DESCRIPTION</b>
<b>Allocative efficiency</b>	Does this approach help ensure that companies are investing in solutions that reflect society's preferences, including the trade-off between carbon abatement and other customer priorities?
<b>Dynamic efficiency</b>	Does this approach allow water companies to trial new solutions and partnerships, and share best practice to drive down £/tonne abated over time and reduce the need to rely on offsets?
<b>Emissions in aggregate</b>	Does this approach incentivise companies to reduce both operational and embedded carbon and avoids undesirable trade-offs between the two?
<b>Adaptive</b>	Does this solution provide sufficient scope to allow Ofwat and companies to react to new information and minimise the risk of large sunk-costs and stranded assets?
<b>Protection from non-delivery</b>	Does this framework ensure that customers get what they pay for, especially when benefits are delivered outside of this AMP?
<b>Alignment with wider PR24</b>	Does this solution align with the wider PR24 approach to base and enhancement costs, and existing thinking on outcomes?
<b>Simplicity</b>	Is this mechanism simple for both companies and Ofwat to administer?
<b>Future-proof</b>	Can the framework be applied at PR29 and beyond?
<b>Distributional impact</b>	Does this framework result in undesirable distributional impacts for customers?
<b>Perverse incentives and unintended consequences</b>	Does this mechanism have risks for introducing perverse incentives and unintended consequences amongst companies e.g. understating baseline emissions abatement?

Source: Frontier Economics

### 3 CATEGORISING NET ZERO INVESTMENTS

Before considering options for incentive mechanisms, we consider it useful to clarify:

- How emissions are typically categorised;
- What are the primary sources of emissions in the water sector;
- How investments are typically funded in water price controls;

Based on this, we then go on to develop a framework for considering net zero investments in the water investments which are used to structure the evaluation of options for incentive frameworks in later sections.

#### 3.1 HOW ARE EMISSIONS CATEGORISED?

As per the Government’s Environmental Reporting Guidelines<sup>24</sup>, GHG emissions are categorised into three groups or 'scopes':

- **Scope 1.** Direct emissions: Emissions originating from activities owned or controlled by the organisation.
- **Scope 2.** Energy indirect emissions: Emissions associated with the organisation’s consumption of purchased electricity, heat, steam and cooling.
- **Scope 3.** Other indirect emissions: Emissions that are a consequence of the organisation’s actions, which occur at sources which the organisation does not own or control and which are not classed as Scope 2 emissions.

Companies are required to regularly report their GHG emissions from the 2021/22 Annual Performance Reporting (APR) period onwards. The current scope of regulatory reporting covers a broader category of emissions known as “operational emissions”. These emissions relate to activities directly associated with the day-to-day business of delivering clean water and removing and treating wastewater. Operational emissions cover all Scope 1 and 2 emissions, as well as Scope 3 emissions which relate to day-to-day operations of water companies. Examples of operational emissions for scope 1, 2, and 3 emissions are set out in the table below.

**TABLE 7**      **EXAMPLES OF OPERATIONAL EMISSIONS IN WATER AND WASTEWATER**

EMISSIONS TYPE	SCOPE	EXAMPLE
Operational	1	Methane and nitrous oxide from sewage treatment
Operational	2	Grid electricity used to pump water
Operational	3	Emissions from contractors and outsourced services

Source: Based on Ofwat, *Playing our part – reducing greenhouse gas emissions in the water and sewerage sectors, Supporting information, July 2010* ([link](#))

<sup>24</sup> HM Government, “Environmental Reporting Guidelines: Including streamlined energy and carbon reporting guidance”, 2019

Embedded emissions, also referred to as capital emissions or embodied emissions, are another broad category of emissions that companies will be expected to take action on within the upcoming AMP. These are a subset of Scope 3 indirect emissions and relate to the materials, manufactured products and processes involved in the construction of an asset. For example, whilst replacing diesel vehicle fleet with electric vehicles (EVs) will reduce operational emissions, the emissions from manufacturing those EVs will contribute to a company’s embedded emissions. Standardised reporting guidelines for embedded emissions are expected to be developed to allow for mandatory standardised reporting in the 2022/23 APR process.

To reach Net Zero targets, companies are expected to reduce both operational and embedded emissions. This report focuses on incentive mechanisms which cover these two categories of emissions. Other Scope 3 indirect emissions, as well as emissions from non-regulated activities, are not covered by this piece of work. The diagram below illustrates how the categories and scopes of emissions correspond to one another.

**FIGURE 7 CATEGORISATION OF EMISSIONS**

<b>Regulatory scope</b>	<b>Within scope</b>				<b>Out of scope</b>
<b>Emissions categories</b>	<b>Operational emissions</b>			<b>Embedded emissions</b>	<b>Other indirect emissions</b>
<b>Emissions scopes</b>	<b>Scope 1 - Direct emissions</b>	<b>Scope 2 - Indirect Energy Use</b>	<b>Scope 3 - Indirect emissions which are accounted for</b>	<b>Scope 3 - Embedded Emissions</b>	<b>Scope 3 - Indirect emissions which are not accounted for</b>
<b>Examples</b>	<ul style="list-style-type: none"> <li>Direct emissions from burning of fossil fuels</li> <li>Process and fugitive emissions</li> <li>Company owned or leased vehicles</li> </ul>	<ul style="list-style-type: none"> <li>Purchased electricity - pumping and treatment of water / sewerage</li> <li>Purchased electricity - buildings and facilities</li> <li>Purchased heat</li> </ul>	<ul style="list-style-type: none"> <li>Business travel</li> <li>Outsourced activities</li> <li>Purchased electricity and heat - transmission and distribution</li> </ul>	<ul style="list-style-type: none"> <li>Embedded emissions from construction and manufacturing activity</li> </ul>	<ul style="list-style-type: none"> <li>Customer's use of energy to heat water</li> <li>Release of emissions from sludge disposal outside company land</li> </ul>

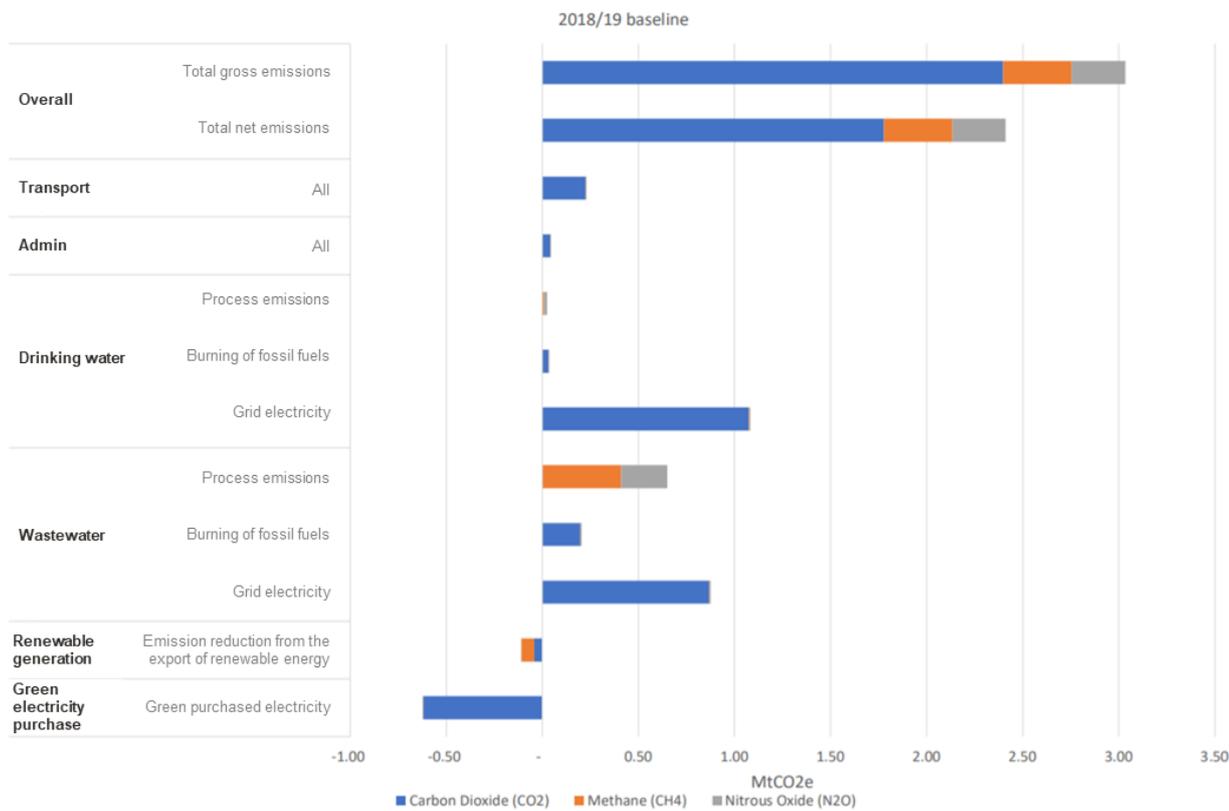
Source: Frontier Economics, based on Ofwat, *Playing our Part - reducing greenhouse gas emissions and sewerage sectors*, Supporting information.

### 3.2 EMISSIONS WITHIN THE WATER SECTOR

The main sector emissions come from grid electricity (carbon dioxide) and from wastewater and sludge treatment processes (biomethane and nitrous oxide), with the latter accounting for around two thirds of the total greenhouse gas output by water and sewerage companies<sup>25</sup>. As a result, there is a significant imbalance in the average emissions produced by water services and sewerage services.

<sup>25</sup> Utility Week, *Wastewater treatment: Reducing emissions while adding value*, June 2021 <https://utilityweek.co.uk/wastewater-treatment-reducing-emissions-while-adding-value/>

**FIGURE 8 UK WATER SECTOR GHG EMISSIONS BASELINE 2018-19 AS REPORTED IN UKWIR'S CARBON ACCOUNTING WORKBOOK (CAW)**



Source: Water UK 2030 Net Zero Routemap, November 2020 <https://www.water.org.uk/routemap2030/wp-content/uploads/2020/11/Water-UK-Net-zero-2030-Routemap.pdf>

Note: The Carbon Accounting Workbook (CAW) is a spreadsheet-based tool that allows companies to estimate their emissions from all aspects of water and sewerage activity. This provides a consistent means of calculating a company's operational emissions that all companies can apply. The CAW is updated annually and is reflective of carbon reporting and emissions guidance from DEFRA.

### 3.3 HOW ARE INVESTMENTS CATEGORISED AND FUNDED?

During PR19 Ofwat took a building block approach to considering total expenditure, breaking down costs into three categories:

- **Base costs.** Base costs refer to routine, year on year costs that companies incur in the normal running of their business, and which are required to maintain the current level of service. Base costs are further categories into modelled costs where Ofwat has econometric models to assess efficient costs, and unmodelled costs.
- **Enhancement expenditure.** Enhancement expenditure refers to investments intended to deliver a step change improvement in service levels or expansion in capacity beyond current levels. It often relates to larger and non-routine investments and is assessed based on individual enhancement categories.
- **Retail.** Residential retail costs, such as debt management costs, customer service costs and meter reading costs.



Source: Ofwat (2019). *Securing cost efficiency technical appendix*.

Companies were required to submit their business case across these cost categories which were then assessed by Ofwat. As part of this assessment, Ofwat will have checked whether investments funded under the price control are: (1) cost-beneficial from a societal point of view and (2) within the scope for a water business and its statutory obligations. This means that the societal benefits delivered by an investment exceed its societal costs to give a positive benefit-cost ratio (“BCR”). This is typically assessed using a cost-benefit analysis (“CBA”) which attempts to value all relevant costs and benefits from the perspective of water customers as a whole. Furthermore, investments should be funded at their efficient cost to protect customers from paying more than they should for their water and wastewater services<sup>26</sup>. Ofwat’s cost assessment processes evaluates company business plans to set an efficient cost allowance for each company. Where information is asymmetric, incentives to support information revelation will support this process. Finally, the overall business plan should have buy-in from water customers, including testing for acceptability of the bill impact.

### 3.4 CATEGORISING NET ZERO INVESTMENTS FOR PR24

Investments in delivering net zero do not always fall neatly into base and enhancement expenditure. The societal need to reduce carbon emissions has been known about for a long time so can be considered base, but a significant step change from current service levels could be considered to fall under the definition of enhancement expenditure. Also net zero solutions are rarely standalone. Instead, they are often extensions of a company’s existing base or enhancement expenditure. We define the following categories for considering net zero investments for this work based on the primary driver of any given investment:

- **Non-carbon driven investments.** This refers to investments that are primarily driven by non-carbon outcomes but deliver carbon benefits alongside the primary driver. For example, company plans will include investments to manage surface water and reduce sewer flooding as part of their statutory requirements. This may include installing sustainable urban drainage systems (SuDS). In addition to its primary driver of reducing the risk of sewer flooding, green infrastructure (nature-based solution) as part of SuDS schemes can capture and store carbon.<sup>27</sup> Adapting an enhancement scheme – choosing green over grey infrastructure – to deliver greater carbon abatement benefits would therefore be considered a non-carbon driven investment that delivers carbon co-benefits.
- **Carbon-driven investments.** These investments are primarily driven by carbon benefits e.g. covering tanks in order to capture and treat emissions or switching to anaerobic wastewater treatment. These investments may or may not have wider co-benefits e.g. improvement in amenity value associated with tree planting, but are not the main driver for investment

<sup>26</sup> Ofwat (2021). [PR24 and beyond: Creating tomorrow together](#).

<sup>27</sup> Environment Agency. [Benefits of SuDS Tool](#)

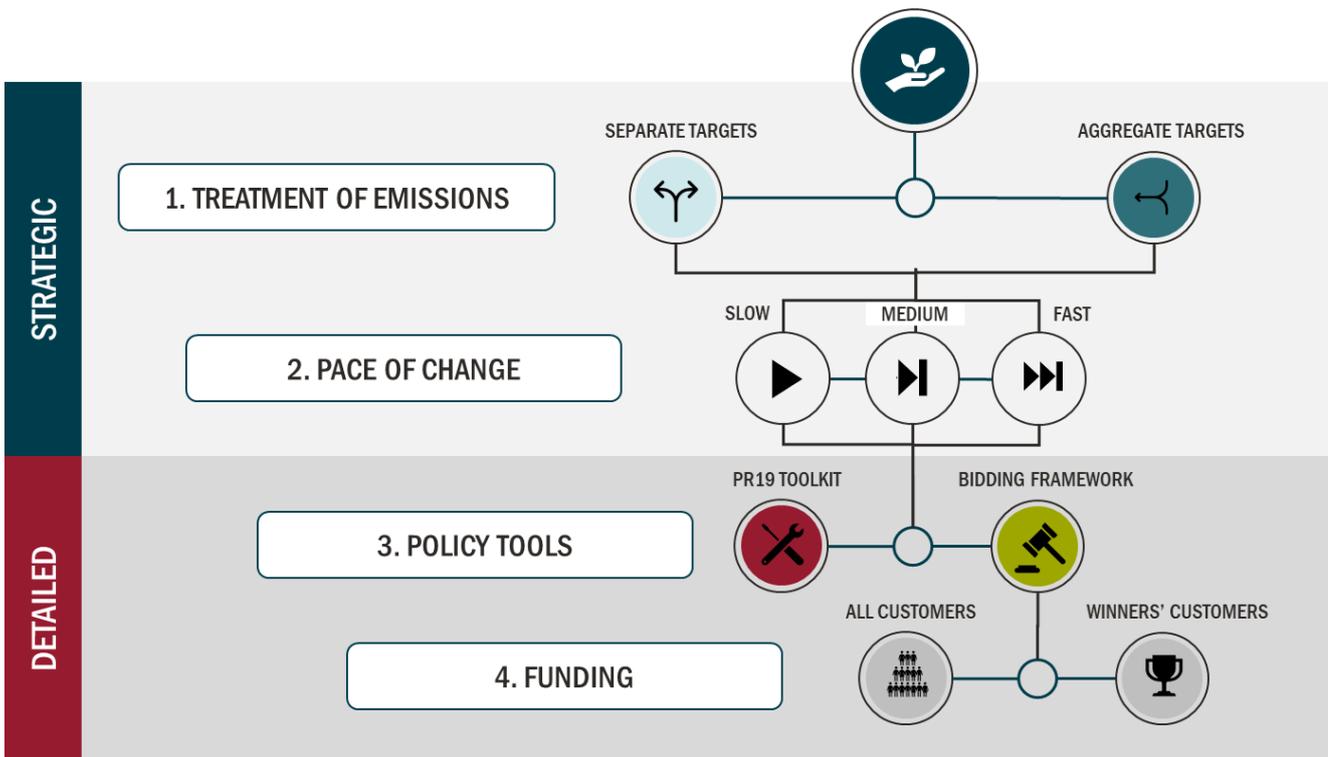
## 4 POLICY OPTIONS: STRATEGIC CHOICES

To structure the development of options, we define a hierarchy of decisions:

- **Strategic choices.** These choices define the overarching approach for the net zero incentive framework and relate to (1) the treatment of operational and embedded emissions in aggregate vs. separately and (2) the desired pace of change.
- **Detailed decisions.** Once the strategic choices are made, there are several detailed decisions on the specific policy tools and their implementation.

The remainder of this section will discuss the strategic choices.

FIGURE 9 HIERARCHY OF DECISIONS



Source: Frontier Economics

### 4.1 TREATMENT OF EMISSIONS

Ofwat’s net zero position paper emphasises the need for water companies to consider both operational and embedded emissions in parallel. This means any approach needs to reflect both types of emissions. However, there remains a choice on whether operational and embedded emissions should be considered as separate targets, with separate incentive mechanisms, or in aggregate.

Much of this decision will be influenced by the feasibility of reporting embedded emissions based on current carbon accounting standards. An aggregated approach is dependent on robust carbon accounting practices for both embedded and operational emissions. Water companies have been voluntarily reporting operational emissions using their own definitions since 2007 and a standardised reporting approach was introduced from 2020/21. Companies now report their operational emissions using a common carbon

accounting rulebook from 2020/21 and mandatory reporting was introduced from 2021/22 onwards.<sup>28</sup> Whilst there is still scope for improvement in operational emissions reporting<sup>29</sup>, there is a consensus that reporting standards are sufficiently developed to both establish a reasonable baseline and enable annual reporting against targets and there should be few issues with operational emissions reporting.

The same cannot be said for embedded emissions where accounting, reporting, and monitoring approaches are still in their infancy. The UK Water Industry Research (UKWIR) has been working with the sector to develop a standardised approach to embedded emission reporting.<sup>30</sup> However, the approach has not yet been agreed and work is still ongoing to enable mandatory standardised reporting by 2023/24.<sup>31</sup> This issue is not unique to the water industry but a wider challenge across all sectors.

This gap between reporting readiness for operational versus embedded emissions means that an aggregate approach is challenging for both Ofwat and the companies to implement and could lead to windfall losses or gains as a result of changes in accounting.

Practical implementation barriers aside, we also carried out an evaluation on the theoretical benefits and drawbacks of each approach which set out below. Each approach is assessed against the evaluation criteria set out in section 2 on a red-amber-green (RAG) basis. Where an evaluation criterion is broadly agnostic to an aggregate versus separate approach, this has been marked in grey.

**TABLE 8 EVALUATION OF OPTIONS FOR TREATMENT OF EMISSIONS**

CRITERIA	AGGREGATE APPROACH	SEPARATE APPROACH
<b>Certainty of delivery</b>	Greater reliance on innovation in other sectors e.g. construction to find solutions to embedded carbon, although mitigated in part by innovation fund focused on net zero.	Gives a clear signal to supply-chains on appetite for embedded carbon solutions.
<b>Productive efficiency</b>	Incentivises companies to invest in the cheapest solutions today irrespective of whether this targets operational or embedded emissions.	Stronger incentive for companies to invest in solutions for embedded and operational emissions, even when doing would raise the average £/tonne abatement cost. However, companies can still actively choose to trade-off between targets depending on the incentive rates set.
<b>Allocative efficiency</b>	Trade-off of carbon benefits with other societal outcomes will depend on relative value of carbon.	Trade-off of carbon benefits with other societal outcomes will depend on relative value of carbon.
<b>Dynamic efficiency</b>	An aggregate approach is likely to result in companies focusing on operational emissions and could limit innovation in embedded emissions within the sector.	Requires companies to consider alternative solutions on embedded carbon and accelerate technological process as well as creating a market for these solutions to stimulate innovation along the supply-chain.

<sup>28</sup> Ofwat (2021). [Consultation on regulatory reporting for the 2021-22 reporting year.](#)

<sup>29</sup> Ofwat (2022). [Consultation - changes to the CAW version reference in the 2020-25 PCs.](#)

<sup>30</sup> UKWIR. [A framework for accounting for embodied carbon in water industry assets.](#)

<sup>31</sup> Ofwat (2021). [Consultation on regulatory reporting for the 2021-22 reporting year.](#)

CRITERIA	AGGREGATE APPROACH	SEPARATE APPROACH
<b>Emissions in aggregate</b>	Companies likely to focus on operational emissions during AMP8 although it does limit benefit of reducing operational carbon at the expense of embedded (assuming adequate capital carbon accounting).	Requires companies to make progress on both operational and embedded although care must be taken to avoid solutions that improve one metric at the expense of the other. Care must be taken when setting ODI rates to ensure companies don't actively choose to perform less well on embedded carbon due to higher abatement costs.
<b>Adaptive</b>	Likely to limit appetite for companies to consider staged investments in embedded carbon and go further faster on operational before re-assessing during future business plans.	Companies can trial use of carbon efficient materials in early tranches and reassess benefit in future price controls.
<b>Protection from non-delivery</b>	Lack of consistent reporting standards for embedded emissions make confirmation of delivery difficult.	Separate targets allow Ofwat to account for differences in reporting standards between embedded and operational emissions.
<b>Alignment with wider PR24</b>	Both separate and aggregate targets can be operationalised within the wider PR24 framework.	Both separate and aggregate targets can be operationalised within the wider PR24 framework.
<b>Simplicity</b>	Current lack of common reporting framework for embedded emissions makes reporting difficult under an aggregate target.	Separate targets can reflect differences in maturity of carbon accounting for embedded and operational carbon although challenges will remain. If there are financial incentives for both operational and embedded emissions, there would be additional complexity from setting separate ODI rates and companies may trade-off investments across the two categories.
<b>Future-proof</b>	Pursuing an aggregate approach prematurely can make it more difficult to set appropriate incentives for future price controls.	Separate targets will support development of embedded carbon reporting for future AMPs and help to identify the point at which embedded emissions reporting is sufficiently robust to allow for aggregate reporting.  An aggregate approach may be more appropriate in the future which would require a transition from separate to aggregate targets. However, this will need to be assessed as part of PR29.
<b>Distributional impact</b>	Both approaches allow for different funding options.	Both approaches allow for different funding options.
<b>Avoidance of perverse incentives and unintended consequences</b>	Lack of consistent embedded carbon reporting limits ability of Ofwat to confirm reductions in embedded carbon and performance against overall targets. Companies may choose to make operational emissions reductions at the expense of embedded emissions if the abatement costs of doing so are lower.	This approach requires companies to consider operational and embedded emissions separately and means that companies cannot focus solely on operational emissions without risking penalties from under-performance on embedded emissions.  Separate targets also makes it easier to identify where a company maybe focusing on

CRITERIA	AGGREGATE APPROACH	SEPARATE APPROACH
		<p>operational emissions at the expense of increasing their embedded emissions, and any trade-offs being made.</p> <p>Even under a separate approach, companies would be required to evidence how their proposals for reducing operational emissions do not come at the expense of embedded emissions as part of the business plan assessment process. Investment proposals that are expected to have a large capital carbon cost are likely to face greater scrutiny.</p>

Source: Frontier Economics

In theory an aggregate approach delivers greater productive efficiency, allowing companies to freely optimise their investments to target the ultimate outcome of carbon abatement rather than separating performance for embedded vs. operational carbon. However, current practical barriers mean that an aggregate approach is unlikely to be feasible at this time. The industry is currently developing a consistent embedded carbon accounting approach, but this is likely to require revisions and may not be sufficiently robust for PR24.

More generally, solutions to address embedded carbon are less developed than operational carbon, and embedded carbon abatement investments could be ‘lumpier’ than operational carbon investments due to their relationship with large enhancement projects. There are also significant uncertainties around the pace of decarbonisation in the construction industry (similar to earlier questions around pace of decarbonisation of the energy network).

On this basis, we recommend that Ofwat takes a separate approach to setting incentives for operational and embedded emissions in PR24, although targets for both should be set in the context of the companies’ long-term plans for their net zero pathway. At the same time, industry and Ofwat should continue to work together on ensuring that there is a single consistent approach to reporting embedded emissions as part of the regulatory accounting guidelines. This will allow the sector to reassess the merits of an aggregate approach in future price controls.

## 4.2 PACE AND RISK APPETITE

The Government’s interim 2035 target sets an ambition for a 78% reduction in UK aggregate emissions. However, there may be opportunities for companies to go ‘further faster’. This is likely to result in higher costs for customers in the short run as well as tilting the balance of consumer outcomes towards net zero and away from other priorities. In making a decision on pace, the sector will need to account for key trade-offs between net zero and other consumer outcomes to ensure that it strikes an appropriate balance and to maximise societal outcomes.

Making a recommendation on the desired pace of change for the water sector is outside the scope of this work. However, we recommend that the ultimate decision on pace of change is informed by companies’ long-term plans for net zero, which should have regard for both the Government’s interim targets and the net zero principles set out by Ofwat. These plans should address gaps in the industry’s existing thinking, in particularly around what is possible to achieve on embedded emissions in the upcoming AMP.

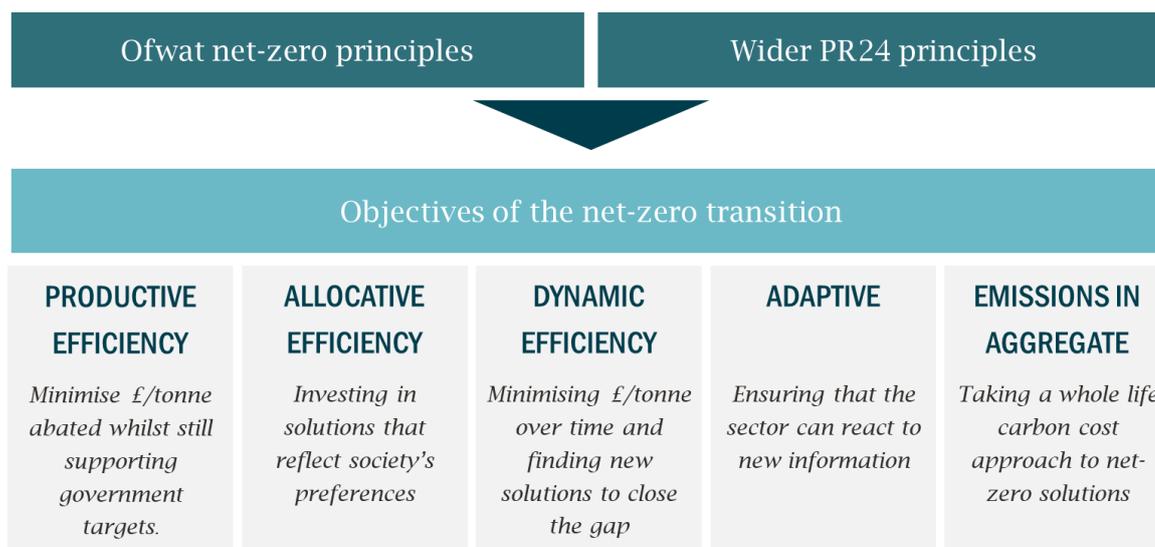
In order to retain flexibility, the options developed in this work can be adjusted to reflect a fast, medium, or slow approach to achieving the Government's net zero targets.

## 5 POLICY OPTIONS: DETAILED DECISIONS

Having made its key strategic choices, Ofwat will need to design an incentive framework that delivers the desired pace of change while balancing the key objectives set out in section 2. In this section we describe the various policy tools that Ofwat has at its disposal and assess them against the key objectives. We then combine these tools into coherent packages to allow for an overall evaluation.

### 5.1 POLICY TOOLS

**FIGURE 10 REVISITING THE OBJECTIVES FOR NET ZERO**



Source: Frontier Economics

We begin by revisiting the objectives discussed in section 2 and identify policy tools that target these objectives with the exception of the 'emissions in aggregate' objective which is primarily influenced by the treatment of emissions strategic decision (discussed in section 4). This approach is designed to ensure that the final incentive framework incorporates a sufficient range of policy tools to deliver against the objectives of the net zero transition. This exercise focuses on options within the existing price control toolkit in order to maximise feasibility.

**TABLE 9 POLICY TOOLS MAPPED TO OBJECTIVES**

CRITERIA	TOOLS	DESCRIPTION
<b>Effectiveness</b>	PCs	Rewards/penalties linked to achievement of a specified level of outcome known as the PCL. These can be financial or reputational (see ODIs below).
	Price control deliverables ("PCDs")	Funding linked to specific outputs rather than outcomes. PCDs can be particularly useful where an investment is expected to deliver a specific outcome, but this is expected to materialise outside of the AMP period.

CRITERIA	TOOLS	DESCRIPTION
<b>Productive efficiency</b>	Cost allowance	Upfront cost allowances set in line with estimated efficient costs, plus cost sharing rates that encourage outperformance.
	Bidding framework	Competition for funding that incentivises companies to reveal their efficient costs.
	ODI rates	To promote productive efficiency ODI rates based on efficient marginal costs, particularly those that incorporate an efficiency challenge, means companies will only invest further if they can deliver benefits at or below the efficient cost. These are set and calibrated against PCLs.
<b>Allocative efficiency</b>	CBA	Relative valuation of customer outcomes in cost-benefit analyses should result in socially optimal investment portfolio.
	ODIs	ODI rates that reflect customer valuations allow companies to optimise investments in line with overall customer preferences.
<b>Dynamic efficiency</b>	Adaptive pathways	Where investments can be phased, taking a modular and adaptive investment approach to funding i.e. funding a fraction of the total investment required to avoid large sunk costs in the event of a subsequent reassessment as part of the adaptive pathway <sup>32</sup> . This includes tools to promote long-term planning and regulatory consistency.
	Innovation fund	Funding to develop and trial new innovative solutions without linking to certainty of success or applicability, reflecting the R&D process.

Source: Frontier Economics

Based on this mapping, we have developed three incentive frameworks, each of which consists of a package of different policy tools:

- “Adapted PR19” - based on adapting existing PR19 policy tools to address carbon emissions outcomes;
- Bidding framework - based on an auction mechanic to deliver carbon abatement at the most efficient cost for carbon abatement projects;
- Blended approach - a hybrid option that tries to capture the benefits of both options.

The remainder of this section sets out these frameworks in further detail.

<sup>32</sup> Further information on the adaptive planning approach for PR24 can be found here: [Ofwat \(2021\). PR24 and beyond: Long-term delivery strategies and common reference scenarios.](#)

## 5.1.1 ADAPTED PR19 TOOLKIT

FIGURE 11 SUMMARY OF “ADAPTED PR19 TOOLKIT”

Adapted PR19 toolkit	
Cost allowance	Individual company business plans assessed against efficiency: <ul style="list-style-type: none"> <li>• Uniform or baseline for all companies based on efficient carbon abatement funded via <b>base totex allowance</b></li> <li>• Enhancement net-zero funding to deliver additional abatement <b>for all companies on an individual basis</b></li> </ul>
PC	PCLs set in line with funding provided via cost allowance (see above)
ODI rate	Efficient abatement cost OR based on value depending on appetite for pace of change
PCD	PCD for funded investments with long benefit delivery horizons
Innovation fund	Innovation fund targeted at areas currently without solutions and rely on offsets and strengthening supply-chains
Uncertainty	Adaptive pathways with modular funding

Policy tools specific to this incentive framework  
 Policy tools common across all incentive frameworks

Source: Frontier Economics

This framework builds on the tools in PR19 to incentivise net zero. Based on their long-term net zero plans, companies would submit as part of their business plans the efficient level of carbon emissions abatement that can be achieved in AMP8. This should be split between baseline achievement which receives no additional funding (beyond base allowances), and incremental carbon abatement activity which require additional cost allowances (via enhancement).

Ofwat would benchmark baseline reductions and assess the cost efficiency of the incremental investment using benchmarking models where possible, as well as reviewing the split between baseline and incremental carbon. The final forecast carbon abatement across baseline and incremental spend will form the basis for the PCL and associated ODI penalty and reward rates. Where significant funding is provided for schemes in AMP8 that are not expected to deliver benefits until beyond the AMP, this could be linked to a PCD for the AMP8 period to ensure that customers receive what they are paying for.<sup>33</sup> Where appropriate, these investments should be considered in future price control periods e.g. when setting PCLs for future price control periods.

Alongside funding for short-medium term net zero investments, Ofwat would continue to operate the innovation fund, focusing future net zero challenges on the hardest to decarbonise areas such as process emissions, and areas that require greater collaboration with the supply chain such as embedded emissions.

The remainder of this section will set out the components of the “Adapted PR19 toolkit” framework in more detail.

### COST ALLOWANCE

Determining the cost allowance and performance commitments is a joint decision, with one informing the other. Ofwat can choose to either challenge companies on costs associated with delivering a proposed level

<sup>33</sup> Ofwat is currently undertaking wider work on best value which includes options for multi-AMP incentives.

of service improvement, or challenge companies on the level of service improvement that can be delivered within a given cost envelope, or both. This section first discusses how Ofwat would assess cost allowances followed by a discussion on PCs and ODIs below.

Under the “Adapted PR19 toolkit” approach, companies will set out, as part of their long-term plans, their proposed investments for delivering net zero by 2050 and the underlying abatement profile between now and 2050. This should be separated into carbon abatement that can be achieved under base totex allowances, and carbon abatement that requires additional net zero enhancement funding.

### Base allowances

Ofwat defines base costs as “routine, year on year costs, which companies incur in the normal running of their business to provide a base level of service”.<sup>34</sup> Ofwat’s existing base models will account for carbon emissions reductions that have occurred in the historical period and capture progress made by companies during the PR19 period to reduce their carbon emissions within base allowances. We anticipate that companies who have existing carbon emissions PCs will have made the most progress during PR19 and will act as a benchmark for assessing expected baseline carbon reductions, particularly the ‘catch-up’ element of any efficiency challenge.

### Enhancement funding

We expect that there will be a gap between the industry carbon abatement target for PR24 and what can be delivered across the companies using base allowances alone. This gap will need to be addressed using enhancement funding which will be split between non-carbon driven investments and carbon-driven investments.

- **Non-carbon driven enhancement.** Assessment of these plans is expected to follow Ofwat’s wider business plan assessment methodology for enhancement funding which strikes a balance between lowest cost and best value enhancement schemes. We anticipate that this will include enhancement allowances for schemes such as nature-based solutions that will deliver carbon benefits alongside their primary driver.
- **Carbon-driven enhancement.** Company business plans should propose carbon-driven enhancement investment where the primary driver for the investment is to reduce carbon emissions. These solutions will include proposals to deliver activities funded via base costs differently (representing a step change in technology and emissions), or standalone carbon solutions e.g. covering wastewater treatment tanks to capture methane and nitrous oxide emissions. Ofwat will assess these proposals to confirm that they represent the least cost way<sup>35</sup> of meeting the company’s carbon target for its long-term delivery strategy. Funding for carbon-driven enhancement will be key for companies that can deliver carbon abatement efficiently but have limited enhancement programmes for PR24 and therefore will not receive net zero funding as part of non-carbon driven enhancement funding.

Given that carbon emissions abatement has not previously been a common performance commitment for water companies, and Ofwat’s existing econometric modelling is unlikely to fully account for forward-looking carbon abatement costs, we anticipate that Ofwat will need to rely on other approaches for assessing cost efficiency including:

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<sup>34</sup> Ofwat (2019). [PR19 draft determinations. Securing cost efficiency technical appendix](#)

<sup>35</sup> For solutions that are primarily driven by carbon and have limited co-benefits, the least cost option will be equivalent to the best value option as the only benefit will be carbon abatement.

- **Simple econometric models.** Simpler econometric models similar to those used in the WINEP programme are likely to be more feasible, particularly for solutions that have precedent outside of the water industry.
- **Unit cost benchmarking.** Comparison of historical and forecast data, particularly for companies with financial and reputational emissions PCs during PR19 to benchmark unit costs for common solutions. Due to limited historical data on carbon solutions, unit cost benchmarking may not currently be feasible, but in the future it could be undertaken by different net zero solutions to reflect differences in abatement costs across solutions. This process would result in a suite of models rather than a single model.
- **Deep dives.** Where modelling is challenging, evaluation of evidence provided by companies on the need for investment, options appraisal, robustness and efficiency of costs, and customer protection where appropriate. Where companies are proposing alternative carbon efficient solutions for enhancement projects, Ofwat will require a greater level of supporting evidence including options appraisal to evidence the incremental cost and carbon benefit, adjustment for certainty of the technology, and overall cost-benefit analysis.

## PERFORMANCE COMMITMENTS AND PCDs

The performance commitment framework can be used to challenge companies to achieve efficient operational carbon abatement and deliver against their allowed net zero cost allowances. In order for PCs to be effective, they must be supported by consistent measurement and accounting framework across all companies. Without this, differences in performance across companies may reflect inconsistencies in measurement approach rather than true differences in performance.

As we discuss in section 4.1, standardised reporting for operational emissions is currently more mature than for embedded emissions. Feedback from water companies and Water UK to Ofwat's recent consultation on regulatory reporting includes concerns that embedded emissions reporting is currently subject to a higher degree of judgement and lower confidence in data, making comparability across companies difficult<sup>36</sup>. Furthermore the link between embedded carbon and large capital projects means that embedded carbon is considered to be 'lumpier', making in-period comparisons between companies more challenging than operational carbon.<sup>37</sup> Whilst some of these challenges will be addressed as the industry moves to mandatory standardised embedded emissions reporting by 2022/23, we expect that this will not be sufficiently robust for financial PCs for all companies in PR24.

Combined with Ofwat's intention that all PCs will be financial at PR24, we recommend that only operational emissions are subject to a common PC. Where funding is allocated to companies to reduce embedded emissions, this will likely be linked to a PCD rather than a PC (discussed further below).

Ofwat could choose to continue exploring the feasibility of a bespoke embedded PC with companies that are further ahead with their embedded carbon reporting, acknowledging the benefits that a bespoke PC could provide over a PCD to incentivise outperformance. However, we recognise that Ofwat's PR24 guidance indicates that there will be fewer bespoke PCs in PR24, and these will be limited to instances where a company has local circumstances or provides poor service on a common issue that is not a priority for customers of other companies.<sup>38</sup> Any bespoke PCs would have to be based on robust carbon accounting

<sup>36</sup> Company responses can be accessed here: <https://www.ofwat.gov.uk/consultation/consultation-on-regulatory-reporting-for-the-2021-21-reporting-year/#Responses>

<sup>37</sup> Water UK (2021). [Response to Ofwat Consultation: Consultation on regulatory reporting for the 2021-22 reporting year.](#)

<sup>38</sup> Ofwat (2021). [PR24 and beyond: Performance commitments for future price reviews](#)

with an agreed change protocol and consistency across bespoke PCs. This is likely to be challenging to achieve. We note that a bespoke PC is not always a substitute for a PCD as the former requires outcomes to be delivered within AMP8 whereas the latter can be used to target outcomes that require investment in the AMP8 period but will not deliver outcomes until beyond the period.

Within operational emissions, separate PCs for water and wastewater may be required to reflect significant differences in carbon emissions between the two (see section 3.2). This should be combined with a normalisation exercise to account for factors such as company size and enable comparability and benchmarking across the sector. Potential normalising factors could include:

- Megalitres per day of distribution input in wholesale water price controls.
- Megalitres per day of treated wastewater in wholesale wastewater price controls.
- Tonnes of dry solids for the bioresources price control.

## PERFORMANCE COMMITMENT LEVELS

The setting of carbon PCLs and cost allowances are intrinsically linked. For a given company, the starting point for the operational carbon PCL should reflect the efficient level of carbon abatement expected under its base cost allowances, which in turn will be aligned with the amount of carbon abatement required of the company across the AMP.

Where companies have enhancement funding that is expected to deliver significant carbon benefits, Ofwat may choose to either uplift their PCL to reflect these projects<sup>39</sup> or exclude carbon abatement from these investments for PC accounting purposes. We envisage that this would only apply where enhancement funding is expected to deliver carbon emissions abatement that goes significantly beyond performance across the industry. The remainder of this discussion will focus on setting baseline PCLs for carbon abatement expected to be delivered as part of base totex allowances.

Ofwat has flexibility to set carbon PCLs across companies for AMP8, but this will need to be in the context of the long-term statutory targets (the 78% reduction target for AMP9 PCLs and the Net Zero target for AMP12 PCLs). We expect that the PCLs will therefore be informed by company long term delivery strategies which should set out their forecast pathway to achieving net zero by 2050 and the investments required in AMP8 to remain on that pathway. This would then be split into annual targets for the PCL.

Based on a common operational carbon PC, Ofwat's options for PCLs at PR24 include<sup>40</sup>:

- Company-specific PCLs
- Industry-wide common PCL

In both cases, PCLs should be set at normalised levels to allow for comparison between companies.

## COMPANY SPECIFIC PCLs

Under the company-specific approach, companies would propose PCLs individually and Ofwat would challenge each PCL individually informed by comparative benchmarking. This approach would be most

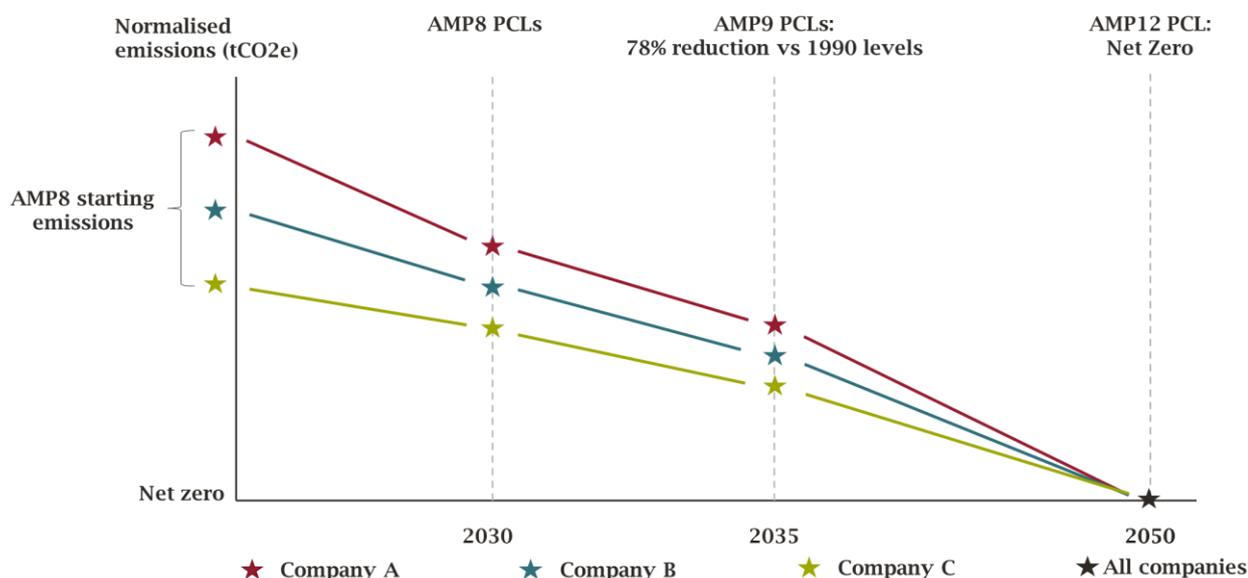
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<sup>39</sup> Similar to the approach taken for leakage during PR19.

<sup>40</sup> A third option is to introduce an industry-wide common % reduction for normalised emissions levels similar to leakage PCLs at PR19. However, this approach is likely to penalise companies that have already invested in reducing carbon emission during PR19 as they may face higher marginal abatement costs (after exhausting 'low-hanging fruit' opportunities). This approach to PCLs will also give the least ability to align companies to the efficient path for future targets, such as the target for 78% reductions in emissions by 2035, and therefore a more company-specific approach to PCLs will likely be required at future periodic reviews.

appropriate if there are large legitimate differences in companies' marginal abatement cost curves ("MACCs") and their optimal paths to net zero due external factors.

**FIGURE 12 COMPANY-SPECIFIC PCLs**



Source: Frontier Economics

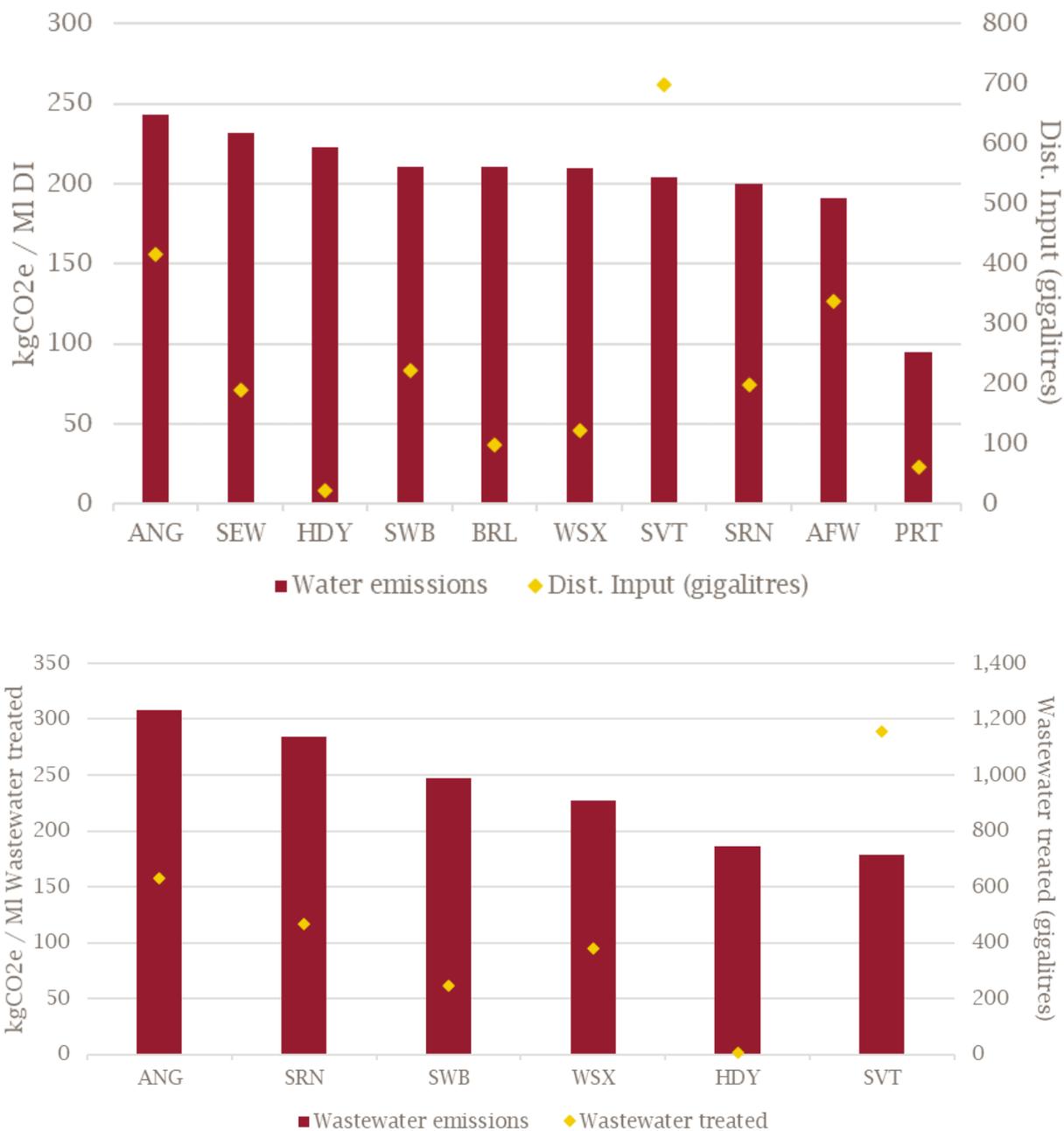
Note: Unadjusted for any future enhancement funding that will reduce carbon emissions of specific companies.

This approach could still lead to PCLs being set a common level, but the starting point is to account for differences between companies. Whilst companies may be at different starting points at the beginning of PR24, data from the 2021/21 APR and company annual reports (Figure 13) suggests that current normalised carbon emissions shows a relatively consistent picture for water (with one outlier) and a mixed picture for sewerage. It should be noted that this data is subject to several limitations. During the 2020/21 period standardised reporting for operational emissions is voluntary and therefore this data is a mix of APR reporting and annual reports and does not cover the whole industry. Therefore Ofwat will need to do additional analysis of future APRs to verify the suitability of a common baseline PCL. Differences between companies could reflect a number of factors, such as proactive actions taken to reduce emissions in previous AMPs, carbon inefficiencies or genuine differences between companies due to company-specific factors. Furthermore, it is also not clear that marginal abatement curves vary significantly as some of the options for abatement (e.g. electric vehicles) will be similar across companies.

In any case, Ofwat needs to assess data on emissions provided as part of the 2021/22 APR, which will be the first year with standardised mandatory reporting and offer higher quality data.

One of the key drawbacks of taking a company specific approach is that it puts companies that have already invested in reducing operational carbon at a relative disadvantage (as they may have used their base cost allowance at PR19 to achieve these reductions) and also disincentivises further reductions ahead of PR24 if companies have different starting points.

**FIGURE 13**      **COMPARISON OF 2020/21 WATER AND WASTEWATER EMISSIONS**



Source: Data for 2021/21 period. Data for 6 companies sourced from voluntary reporting. Data for 9 companies sourced primarily from their annual company reports. No information found for 2 companies.

Note: Mandatory reporting was introduced for the 2021/22 period, but this data is not due until summer 2022. Data has been collated across voluntary reporting and annual reports. This is likely to result in differences across companies in the methodology used to measure emissions and limit comparability.

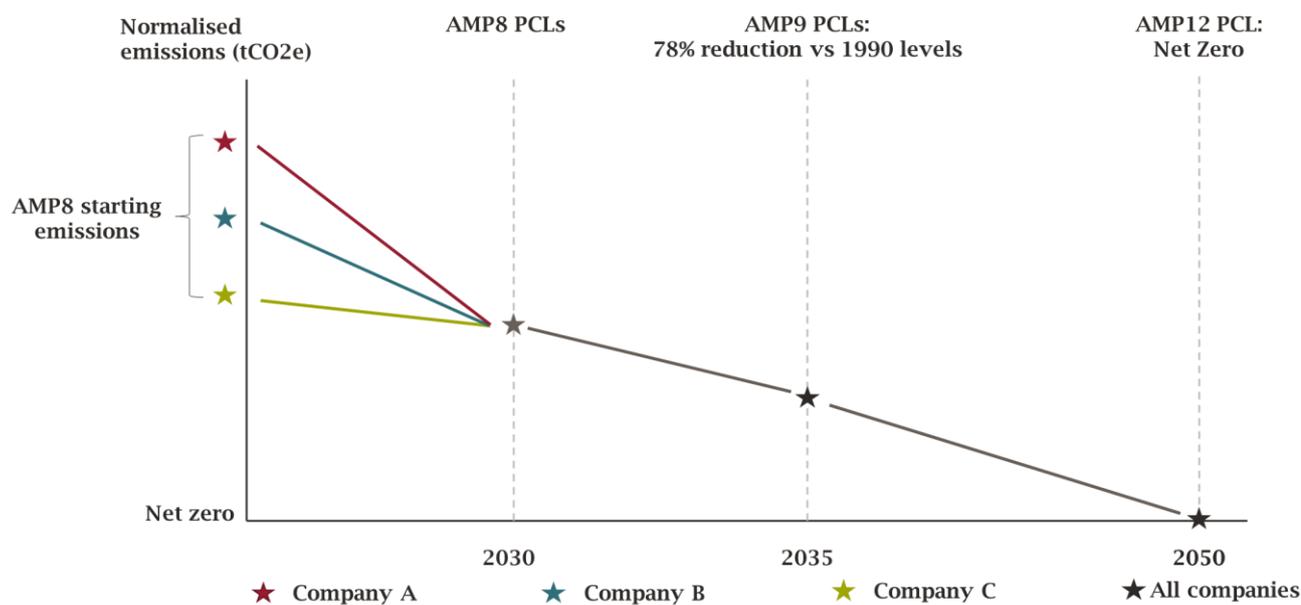
**COMMON PCL**

Rather than taking a company specific approach, Ofwat could instead set an industry-wide common PCL for carbon abatement expected to be deliverable under base allowances. This approach would be similar to common PCs with common PCLs at PR19 (e.g. water supply interruptions) and companies would be required to achieve a common level of normalised carbon emissions for specific price controls. Where companies have proposed significant enhancement spend that would materially reduce carbon emissions, this should be taken into account separately.

A common approach to PCLs would still allow companies to go through the standard cost adjustment process which would require companies to submit robust evidence to justify any legitimate difference in external circumstances that affects companies' optimal path to net zero.

This approach means that companies that have already made progress towards net zero are rewarded as part of PR24. On the flip side this means that companies that have made less progress towards net zero due to lower focus on carbon abatement during AMP7 as part of base allowances will have a more stretching challenge for PR24. However, if Ofwat signals this approach as part of its PR24 draft methodology, companies may have an opportunity to introduce carbon abatement activity before PR24 within their current base allowances.

**FIGURE 14 COMMON PCL FOR BASELINE CARBON EMISSIONS ABATEMENT**



Source: Frontier Economics

Note: Unadjusted for any future enhancement funding that will reduce carbon emissions of specific companies.

To determine the common carbon PCL for AMP8, this should be based on benchmarking across companies and considering company-specific circumstances where appropriate based on robust evidence. However, mandatory standardised reporting for operational emissions only started in 2021/22 and potential adjustments to the CAW for 2020-25 PCs are currently being considered<sup>41</sup>. These data challenges should be taken into account when benchmarking companies.

## ODIs

To incentivise performance against operational carbon PCs, ODIs can be used to provide companies with downside revenue risk linked underperformance against PCLs while also allowing the potential for outperformance payments if companies are able to efficiently achieve further abatement.

ODIs can be calibrated using several methods depending on the outcome measured, but the key principle for efficient ODI rates is that penalties and rewards reflect the value customers place on the corresponding

<sup>41</sup> Ofwat (2022). [Consultation – Changes to the CAW version reference in 2020-25 PCs](#).

change in outcomes. Ofwat has signalled that it is unlikely to rely solely on customer research for carbon ODIs at PR24, suggesting two options for calibrating ODI rates:

- ODIs based on external valuations, such as carbon values set by BEIS or the traded price of carbon; or
- ODIs based on company-submitted marginal costs.

## EXTERNAL CARBON VALUES

The Government has an agreed set of carbon values to be used in policy appraisal and evaluation, hereon referred to as the BEIS carbon values.<sup>42</sup> These are used to quantify the value of impacts of carbon on society resulting from a new investment or policy that impacts GHG emissions. This includes emissions captured within the UK emissions trading scheme (UK ETS) which currently applies to energy intensive industries, power generation, and aviation.<sup>43</sup>

Historically, these carbon values were set using a “social cost of carbon” (SSC) approach using traded, non-traded and modelled costs of carbon. However, BEIS has since moved away from the SSC approach, due to uncertainties surrounding the estimates of SSC and the need for carbon values to align with net zero targets.<sup>44</sup> Since 2019, BEIS carbon values are now set using a “target consistent approach”, reflecting economy-wide marginal abatement costs (MACs) of meeting the sixth Carbon Budget and 2050 net zero targets. The current BEIS carbon values are presented across a low, central and high range and increase over time to 2050, as required levels of abatement rise on the way to net zero.

These BEIS carbon values are used to evaluate the impact of new projects or policies that impact GHG emissions across all sectors including the water sector. However, these values are based on estimates of economy-wide MACs. There is therefore a risk that these values do not directly reflect relevant abatement costs in the water industry specifically. MAC estimates from the Water UK 2030 Routemap and the sixth Carbon Budget both point to potentially lower MACs in the water sector (Figure 15). In this case, using the BEIS carbon values to set the ODI rate would overestimate abatement costs in the water sector and lead to incentives to outperform targets that are stronger than they need to be.

Another alternative source for external carbon values is the traded cost of carbon, such as the carbon price in the UK emissions trading scheme (UK ETS). The UK ETS currently applies only to aviation, energy intensive industries such as steelmaking, and energy companies. These are referred to as the ‘traded sectors’ with all others falling under the ‘non-traded sector’. Under the ETS, a cap is set on the total amount of GHG that can be emitted by these sectors. Participants receive a certain level of free allowances and/or buy emissions allowances at auction or secondary market. This means that the value of carbon set by the ETS carbon prices reflect only the marginal abatement cost in these sectors.

The UK ETS price could still be used as a proxy for marginal abatement costs in the water sector if the marginal abatement costs in the water industry and sectors covered in the UK ETS are similar. However, Government guidance suggests that this is unlikely. Prior to the introduction of the revised approach to valuing GHG emissions in 2021, BEIS used separate carbon values for traded and non-traded sectors in policymaking as ‘it is unlikely that the (marginal) cost of meeting targets in the traded and non-traded sector is the same’ and therefore ‘changes in emission in the non-traded sector (i.e. EU ETS) should use the non-traded carbon value’. As the water sector does not currently participate in the UK ETS, the traded carbon price is unlikely to be applicable to carbon abatement costs in the water sector.

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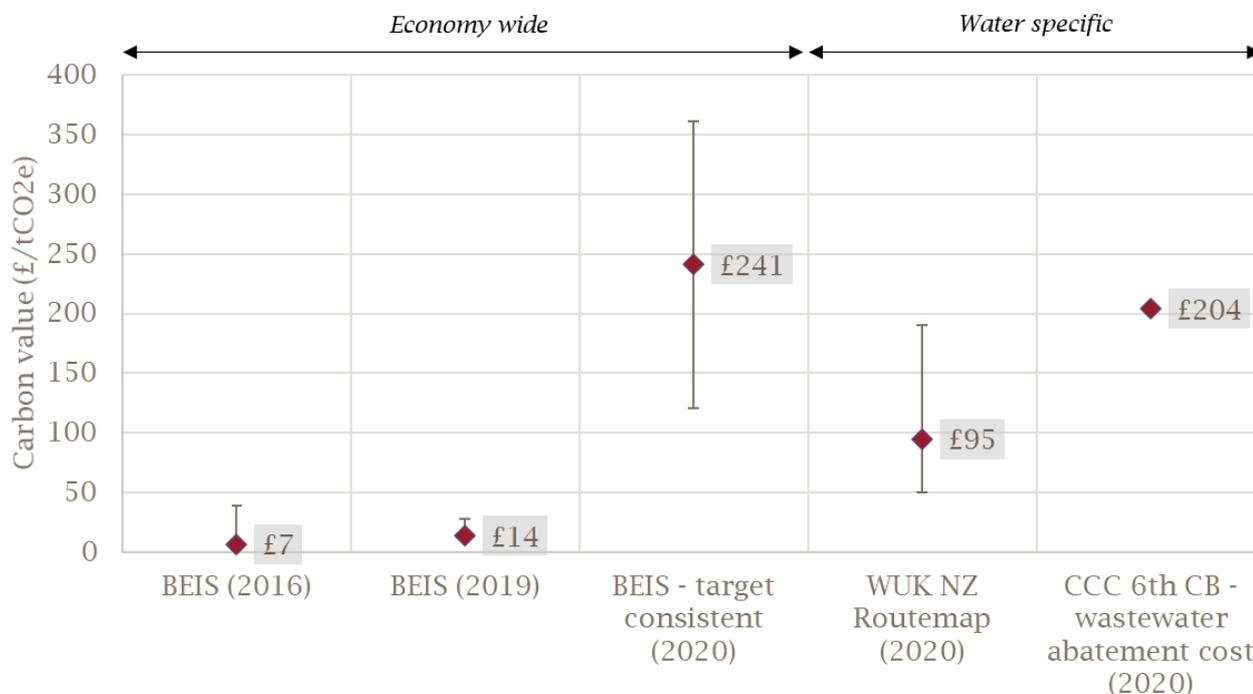
<sup>42</sup> BEIS website. [Carbon valuation](#)

<sup>43</sup> BEIS website. [Guidance: Participating in the UK ETS](#)

<sup>44</sup> DECC (2009). [Carbon Valuation in UK Policy Appraisal: A Revised Approach](#)

In summary, neither the BEIS carbon values nor the UK ETS traded cost of carbon are likely to be reflective of abatement costs in the water sector specifically. This limits their use as ODI rates which should be based on a water sector specific value where possible. However, they remain useful points of triangulation for reviewing efficient abatement costs submitted by companies as part of their business case submissions.

**FIGURE 15**    **COMPARISON OF CARBON VALUES**



Source: Data from BEIS Carbon values, Water UK Net zero Routemap, Climate Change Committee 6<sup>th</sup> Carbon Budget

**COMPANY COST SUBMISSIONS**

Rather than setting ODIs on external carbon values, an alternative approach is to base these on efficient costs submitted by companies as part of their business plans. Some ODIs were set under a cost basis at PR19 such as smart metering ODIs for Thames, Anglian and Northumbrian which are based on unit meter costs. These costs can be scrutinised using cost assessment tools (e.g. using benchmarking), although cost allocation for carbon benefits could be more challenging when they are delivered as part of wider base or enhancement programmes due to the interlinkages with other benefits. However, if Ofwat were to go with a common PCL across the industry, it is more likely that the marginal reduction costs will be similar across all companies and a common ODI rate is more appropriate.

If companies face specific factors that mean they have a higher marginal abatement cost curve, this can be accounted for via the usual cost adjustment process. Separate ODI rates may also be appropriate for water, wastewater and bioresources operational carbon PCs if expected efficient costs of carbon abatement differ significantly across these areas.

### Calibration of ODIs over time

One issue with ODI rates identified as early as PR14 is the calibration of rates over time. ODI rates generally cover the benefits (or costs) of a service improvement on an annual basis. For GHG this means the ODI would cover the annual cost of reducing emissions by  $x$  tonnes. This means if a company invests in capex (with an asset life beyond the AMP) that reduces emissions, an ODI rate that is based on annual costs or benefits will not cover the investment. The decision on whether to invest or not therefore depends on what the company believes will happen at the next price control. For example, if companies believe that comparative targets for GHG will be set at PR29, the investment may be worthwhile as it contributes to a better PR29 baseline. However, if the company believes that the investment could be fully funded at PR29 it would be better off waiting. As the long-term target for GHG is well-known and companies will report annual performance, the ODIs may be sufficient to encourage efficient investment (e.g. the reward is effectively for bringing investment forward).

## PRICE CONTROL DELIVERABLES

Ofwat are proposing to introduce price control deliverables as part of PR24 where outcomes-based incentives are less appropriate, and funding needs to be linked to specific outputs. In the context of carbon abatement, PCDs may play a key role for:

- **Embedded emissions.** As discussed earlier, the current state of embedded emissions carbon accounting means that introducing a PC on embedded emissions will be challenging. Instead, where companies have requested carbon related enhancement funding (either as part of a wider enhancement project or specifically driven by net zero) as part of their business plans, and this is approved, this should be linked to a PCD to ensure delivery for customers.
- **Operational emissions.** In a limited number of cases, companies may propose operational emissions solutions that require upfront investment in AMP8 but are not expected to deliver benefits until beyond the price control period. In this case funding could be accompanied by a PCD where appropriate. The use of PCDs for operational carbon should be limited to strike a balance between avoiding non-delivery of funded investments and overly prescriptive output-based regulation.

### Bespoke PCs vs. PCDs

As we discuss above, there is an option to introduce bespoke embedded carbon ODIs for companies that have more mature embedded carbon reporting processes in place that could support financial PCs. Bespoke PCs offer some advantages to PCDs. They avoid prescribing a solution and are more aligned to an outcomes-based approach, particularly as in the case of carbon customers are likely to care about the final outcome rather than the specific solution used to deliver it. They can also have a lower regulatory burden as they wouldn't require detailed ex-post evaluation to assess whether a PCD has been partially or fully delivered provided that embedded emission reporting is sufficient robust.

However, PCDs can be a more appropriate funding mechanism where investments are required in AMP8, but the benefits are not expected to be delivered until beyond AMP8, although this may be less relevant for embedded than operational carbon. If Ofwat is minded to progress with bespoke embedded emissions PCs for specific companies, this should be based on engagement with these companies to understand the timing profile of their proposed carbon-intensive projects.

## COMPANY COST SUBMISSIONS

Whilst Ofwat's detailed approach to PCDs is still being developed, its initial views on PR24 reference the use of PCDs in Ofgem's RIIO-2 framework. Under a similar model, if a company received funding for a carbon abatement scheme but did not deliver against its PCD, Ofwat would recover a proportional amount of its allowances. Depending on the specific PCD, this may be on a mechanistic or evaluative basis. For example, under a mechanistic adjustment, if a company received enhancement funding to use low-carbon concrete as part of a new capital scheme but ultimately used standard concrete without carbon abatement benefits for x% of its build, the value of allowances associated with the marginal cost of low-carbon concrete for that x% would be recovered. Alternatively, under an evaluative PCD the company may provide evidence that it has delivered a reduction in embedded carbon using an alternative method in which case its allowance would not be adjusted, or that it has partially delivered against its PCD.<sup>45</sup>

For operational carbon, as PCDs are expected to be used primarily where benefits are delivered outside of AMP8 the final outcomes associated with these schemes should not feed into the PCL

For embedded carbon, the current carbon accounting framework is not sufficient robust for a PC (see discussion on performance commitments above) and PCDs are the primary method to ensure delivery for customers.

## INNOVATION FUND

The Water UK net zero route map recognises that achievement of operational net zero (excluding chemicals) is dependent on the adoption of technology that has not yet been implemented at scale. Furthermore, in some areas there are no existing solutions and companies expect to rely on offsets for these emissions. The same can be said for solutions for embedded emissions.

Companies have shown throughout PR19 that they can deliver new innovative ways of working that reduce carbon emissions as part of their base allowances. Whilst we expect that this will continue in PR24 as part of baseline carbon abatement, we envisage that the current innovation fund will remain in place to explore new net zero solutions, strengthen domestic supply-chains for upscaling solutions that work, and promote collaboration across the industry. The innovation fund has already funded several net zero improvements including several alternative low-carbon approaches to wastewater treatment, one of the hardest to decarbonise areas.<sup>46</sup>

## MANAGING UNCERTAINTY

Irrespective of the decision on treatment of emissions or pace, taking an adaptive planning approach will help promote an efficient transition to net zero, particularly in areas where the cost and benefits of solutions remains uncertain. To inform Ofwat's assessments, companies would need to identify where investments can be funded in a phased manner and reflect this in their business plan submissions.

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<sup>45</sup> Ofgem (2020). [Price Control Deliverable Reporting Requirements and Methodology Document: Version 1 draft](#).

<sup>46</sup> Ofwat innovation fund website. Accessed at: <https://waterinnovation.challenges.org/winners-2/>

## 5.1.2 BIDDING FRAMEWORK

Whilst the “Adapted PR19 toolkit” approach has several benefits, including the opportunity to draw on existing learnings from incentivising other outcomes and avoidance of potential unintended interactions with the wider PR24 framework it also has several key challenges.

Firstly, in order to assess company plans, Ofwat will need to be able to benchmark efficient costs of incremental net zero investment. However, companies are not starting from the same point with some companies reducing carbon emissions to a greater extent than others during AMP7. These companies may have higher marginal abatement costs as they may have exhausted the lowest cost options.

At the same time there is information asymmetry as companies know their abatement cost whereas Ofwat has to rely on company information. It is not clear yet how or whether Ofwat will run a “fast-track” process that may incentivise information revelation and to what extent this could help with benchmarking efficient net zero costs.

Secondly, one of the challenges is the need to develop new benchmarking unit cost models to assess cost efficiency. Finally, there remains a broader question on whether Ofwat should take an industry-wide approach to delivering net zero, using PR24 as an opportunity to fund the most efficient solutions as abatement costs fall. The “bidding framework” approach attempts to address these challenges by adopting a more industry-wide approach with stronger information revelation incentives for companies (assuming sufficient rationing).

In the same way as the “Adapted PR19 toolkit”, Ofwat would set a baseline level of carbon abatement and PCL based on company business plans. However, rather than funding additional carbon abatement on a company-by-company basis, Ofwat would take a whole-industry approach to carbon related enhancement funding. Companies would submit their proposals for carbon related enhancement funding as part of a bidding framework. This would cover both non-carbon driven enhancement that has carbon co-benefits and carbon-driven enhancement.

Due to the rationing requirement for a bidding framework to succeed (see below), companies will be required to submit two plans as part of their business case submissions:

- **Efficient company net zero plan.** Investments required for their specific company to deliver net zero by 2050 without targeting an earlier date.
- **Enhanced net zero plan.** An enhanced net zero plan designed to achieve net zero faster. This may include accelerating investments originally planned for AMP9 and beyond, or alternatively solutions that companies have deprioritised due to anticipated funding constraints in AMP8.

If Ofwat chooses to pursue a bidding framework approach it should decide whether this should be for England and Wales as a whole, or whether instead there is a separate approach for Wales. Whilst a joint bidding framework across England and Wales would maximise productive efficiency, the risk of unequal funding between England and Wales means that it could be prudent to have a separate approach for Wales based on the PR24 toolkit. Efficient costs revealed via the bidding framework for England can be used to assess cost-efficiency for Welsh water companies. Ofwat will need to determine whether a different approach to regulating net zero investments in Wales is appropriate.

### When does a bidding approach work?

It is critical to recognise that bidding mechanisms only work when:

- Ofwat’s view of efficient abatement in AMP8 is **lower** than the total abatement submitted via company business plans; **and**
- water companies are aware that only a proportion of the total investment proposed will be funded by Ofwat.

If this is not the case, and Ofwat will end up funding all company proposals in order to reach the efficient AMP8 abatement level. Knowing this, companies will lose their incentive to reveal efficient costs and negate the potential benefits of the bidding framework whilst retaining the additional administrative complexity of this framework

**FIGURE 16** SUMMARY OF THE BIDDING FRAMEWORK

Alternative toolkit: Bidding framework	
Base allowance	Uniform or company specific baseline for all companies based on efficient carbon abatement without additional net-zero specific funding
Enhancement allowance	All enhancement funding that could deliver carbon benefits, whether they are primarily driven by carbon or non-carbon benefits, are assessed as part of a bidding framework, with solutions selected primarily on a least cost basis
PC	Baseline PC for all companies based on efficient carbon abatement without additional net-zero specific funding
	More challenging PCs for companies that receive funding under the bidding framework
ODI rate	ODI at “falling” efficient cost rate, based on winning rate
PCD	PCD for funded investments with long benefit delivery horizons
Innovation fund	Innovation fund targeted at areas currently without solutions and rely on offsets along with additional targeted funding to establish supply-chains for low-carbon solutions
Uncertainty	Adaptive pathways with modular funding
	Potential for multiple bidding tranches

Policy tools specific to this incentive framework  
 Policy tools common across all incentive frameworks

Source: Frontier Economics

### COST ALLOWANCE

As is the case under the “Adapted PR19 toolkit” framework, under the bidding framework companies would continue to set out their long-term net zero plans for achieving the Government’s 2050 target and identify carbon abatement that can be delivered as part of base allowances. Ofwat would use these plans, along with benchmarking analysis, and consideration of company specific circumstances, to set an efficient baseline.

Once the baseline performance has been agreed, the remaining shortfall to the industry carbon abatement target will be funded via a bidding framework. This will assess funding for non-carbon driven enhancement together with carbon-driven enhancement and will require companies to provide two sets of proposals:

- **Efficient plan AMP8 investments.** Investments that require funding in AMP8 to deliver net zero on the efficient long-term path to net zero by 2050.

- **Enhanced plan AMP8 investments.** Additional investments that would be funded if water companies can go further efficiently.

These proposals would be evaluated on an industry-wide basis rather than a company-by-company primarily on a least cost basis for delivering carbon abatement benefits.

As the bidding framework would cover all enhancement spending that deliver carbon benefits, including schemes that have other primary drivers, the selection process will need to account for outcomes beyond carbon abatement. This means that some non-carbon driven enhancement projects will need to be funded even if the £/tonne of their carbon benefits is higher than other carbon-only solutions. For example, companies may propose enhancement funding for SuDS schemes to address hydraulic flooding. Whilst these schemes also deliver carbon co-benefits, the £/tonne of carbon abated via these schemes is likely to be significantly higher than investments that are purely driven by carbon. However, even under this approach, taking an industry-wide approach means that if some companies can deliver carbon abatement more efficiently, they will receive a larger share of available funding. This allows progress to be made across the sector at an efficient cost.

We anticipate that it would be necessary to have two separate bidding pots, one for water and one for sewerage. This is due to the significant differences in carbon intensity associated with water and wastewater treatment if there were a single bidding pot judged on £/tonne of carbon abated. Ofwat would still do some degree of cost assessment to ensure costs submitted are efficient, but the information revelation benefits of a bidding approach means this would be lighter touch than under the PR24 bidding framework.

## **PERFORMANCE COMMITMENTS AND ODI RATES**

As before, Ofwat would set a common PCL for baseline carbon abatement informed by benchmarking and reflecting company-specific circumstances if appropriate. Companies that were awarded additional funding as part of the bidding framework for additional carbon abatement would have their PCL to reflect this funding.

In order to continue incentives for efficient investment into net zero, Ofwat could choose to set an outperformance ODI based on the efficient £/tonne derived from projects funded under the bidding framework. This would allow companies, even if they did not receive funding under the bidding framework, to invest in net zero initiatives provided that they have an efficient cost and promote innovation throughout the period.

Ofwat could choose to make this a two-sided ODI to provide an incentive for companies to meet baseline carbon abatement. For any penalty, Ofwat would need to ensure that the rate is higher than the avoided costs from not delivering the greenhouse gas emissions.

### **How the bidding framework could be implemented in practice**

Companies that are successful with their net zero investment bids will receive a specific increase in their cost allowances. If the bidding framework is initially run alongside PR24, we would expect these allowances to be part of their final determinations. In addition, the emission reduction that the company put in the bid will be added to its target so the performance commitment level is adjusted accordingly. For investments that are expected to reduce carbon beyond AMP8, PCDs are most appropriate as they will ensure customers are protected against any non-delivery.

Companies that are unsuccessful with their net zero investment bids can still earn a reward for outperforming their baseline PCL, with the reward ODI rate set based on the average £/tonne of investments funded via the bidding framework. This means that companies are still able to invest in carbon-abatement activities where these are cost-efficient.

### **PRICE CONTROL DELIVERABLES**

As above, where companies have been funded for projects that are not expected to deliver carbon abatement benefits until beyond the price control period, and this funding is material, Ofwat could introduce a related price control deliverable to ensure delivery.

### **INNOVATION FUND**

In all options we see the innovation fund continuing to run alongside the price control process to accelerate ongoing innovation for new solutions, with a focus of challenges on the hardest to decarbonise parts of the sector.

### **MANAGING UNCERTAINTY**

The bidding framework is able to incorporate the same options to manage uncertainty as the “Adapted PR19 framework” option, allowing companies to take a modular and adaptive approach to their net zero investments as part of their bid. Furthermore, Ofwat can choose to re-open ODI rates or PCL levels if there are significant changes within the AMP8 period.

In addition to the mechanisms above, Ofwat could choose to introduce additional flexibility by running a bidding framework in tranches, for example twice over AMP8. This would allow companies to update their net zero proposals to reflect ongoing technological innovation. However, a multi-tranche approach would introduce significant complexity due to the need to reopen the price control and PCLs.

## Risk of gaming and unintended consequences

The design of a bidding mechanism will impact the risk of potential distortion or potential gaming from companies, and the mitigations available.

- **Winner's curse.** A sealed first price auction format could result in the winner's curse where companies under-estimate the cost of delivering net zero investments in order to secure funding. Companies would be required to invest additional funding into delivering forecast carbon abatement due to adjusted PCLs or face underperformance payments. Where the latter is more financially optimal, would lead customers to lose out on carbon abatement that could have been delivered by companies that otherwise would have been awarded funding under the bidding framework. This can be mitigated by placing a larger burden of evidence on companies when submitting their bids to ensure that they have been realistic in the expected costs and benefits.
- **Artificially low ODI.** If companies are incentivised to under-estimate their investment costs in order to win funding under a bidding framework, this could push the estimated efficient cost below actual efficient costs and limit the amount of net zero investment carried out by efficient companies. As before, this can be mitigated by requiring greater evidence to support any cost and benefit estimates. Ofwat could also choose to set ODI rates based on average rather than the most efficient costs to further reduce this risk.
- **Inflating costs.** If instead companies anticipate that Ofwat will set a stretching industry carbon abatement target, they may choose to inflate costs knowing that the majority of carbon abatement proposals will need to be funded in order to achieve this target. This can be mitigated in part by clear messaging from Ofwat on the evidence required to validate costs and the fact that winning schemes will be funded at efficient costs.
- **Distortion of base, enhancement, and bidding framework.** Having separate 'pots' of funding judged on different criteria could result in companies shifting investments to maximise funding. For example, efficient companies may hold back some of their proposed investments from base expenditure and submit them as part of the bidding framework. This risk is greater under the blended approach discussed below as investment schemes can often deliver carbon benefits alongside other outcomes. In this case, companies can submit schemes with higher carbon abatement costs as part of non-carbon driven enhancement and lower carbon abatement costs as part of carbon-driven enhancement. The ability to exclude investments from base will depend on the final PCL level set, whereas clear guidance on the types of projects that are eligible for non-carbon driven vs carbon driven funding can help to minimise this distortion.

### 5.1.3 BLENDED APPROACH

The bidding framework approach aims to overcome the information revelation issues associated with the traditional cost assessment approach while maintaining incentives for all companies to invest in net zero via the ODI. However, it has several significant drawbacks:

- **Moving the whole industry to net zero.** There is a risk that under the bidding framework some companies will receive significantly less funding as their proposals have higher abatement costs. Whilst this may be beneficial from a productive efficiency point of view, it could leave some companies significantly behind of others by the end of 2029 and limit the long-term ability of those companies to

achieve net zero by 2050. There could be particular issues for the split between England and Wales if Welsh water companies receive a significantly smaller share of funding as this would undermine their ability to contribute to the Wales specific targets.

- **Mix of funding reasons.** It is not possible to separate carbon benefits for multi-benefit solutions, including those that are primary non-carbon driven enhancement projects. This means that in practice, the bidding framework either needs to be reduced to only carbon-driven solutions or encompasses much larger areas of the price control. The latter is impractical and adds unnecessary complexity to the process as the basis for funding each individual enhancement programme will be unclear.
- **Barriers to bidding.** Some companies, particularly smaller companies, may find it challenging to submit bids as part of a bidding framework and choose not to participate. This would undermine the benefits of information revelation in the bidding framework approach if more efficient firms may choose not to bid.
- **Future-proof.** As discussed above, if some companies received significantly more funding under the bidding framework, companies will have different starting points for PR29. This could introduce complexity to the regulatory accounting requirements.

To address these issues, Ofwat could implement a blended approach that provides additional funding for all companies to deliver net zero, with the most efficient companies receiving extra funding via a bidding mechanism.

**FIGURE 17 SUMMARY OF BLENDED APPROACH**

Alternative toolkit: Blended approach	
Base allowance	Uniform or company specific baseline for all companies based on efficient carbon abatement without additional net-zero specific funding
Enhancement allowance	Non-carbon driven enhancement assessed and funded as part of the wider enhancement funding process
	Remaining carbon-abatement gap funded through: <ul style="list-style-type: none"> <li>• Some degree of additional enhancement funding for all companies</li> <li>• Additional funding for the most efficient companies awarded under a least cost bidding mechanism</li> </ul>
PC	Baseline PC for all companies based on efficient carbon abatement without additional net-zero specific funding
	More challenging PCs for companies that receive funding under the bidding framework
ODI rate	ODI at “falling” efficient cost rate, based on winning rate
PCD	PCD for funded investments with long benefit delivery horizons
Innovation fund	Innovation fund targeted at areas currently without solutions and rely on offsets along with additional targeted funding to establish supply-chains for low-carbon solutions
Uncertainty	Adaptive pathways with modular funding

Policy tools specific to this incentive framework  
 Policy tools common across all incentive frameworks

Source: Frontier Economics

Under this model:

1. **Baseline.** Ofwat will determine the expected carbon abatement that all companies are expected to achieve under unadjusted base totex allowances. As before, this will be based on benchmarking analysis. This process will also benchmark efficient carbon abatement costs.
2. **Non-carbon driven enhancement.** Unlike the bidding framework, enhancement projects that are not primarily driven by carbon will be assessed separately via Ofwat's wider enhancement assessment process. This will include evaluating the benefits of carbon abatement co-benefits in the round and adjusting PCLs where appropriate to avoid double counting.
3. **Industry-wide net zero funding.** Ofwat will provide additional funding to all companies at the efficient cost to deliver net zero reductions beyond the baseline, up to x% of the total industry abatement target.
4. **Bidding net zero funding.** In order to close the gap, Ofwat will award additional funding to for carbon-driven solutions on a least cost basis. As is the case under the pure bidding framework, in order for the bidding element to be successful there must be a degree of rationing for this funding. Companies will therefore still need to consider two sets of investments, one which relates to their own efficient net zero pathway and one that considers additional investments to go further.

Under this approach all companies will receive funding to move beyond baseline carbon abatement even if they do not receive funding under the bidding element. Furthermore, non-carbon driven enhancement funding is now assessed separately and the bidding element is restricted to carbon-drive solutions which is all assessed on a least cost basis.

## 5.2 FUNDING

Under the "Adapted PR19 toolkit" and "blended" approach, cost allowances for net zero incremental investment would be funded in the same way as cost allowances for any other area of investments.

However, under the bidding framework approach, there are two potential distributional issues:

- **Affordability.** Under the bidding framework there is a risk that the majority of net zero funding is awarded to a small number of companies, and the bill impact of this investment is shouldered by the customers of these companies alone whereas customers of other companies face higher bills at a later date when their water companies receive funding as part of future price controls. Given the scale of investment required to decarbonise the sector, this could be a significant increase during a time of cost-of-living concerns.
- **Equity.** Unlike other customer outcomes such as environmental improvement or water quality, the benefits of emissions abatement are not localised to the catchment of individual water companies. Instead a tonne of carbon abated in one area will benefit the whole of the UK as climate change is a global phenomenon.

To address these issues, Ofwat could consider an alternative funding mechanism similar to the current approach to funding the innovation fund which would spread net zero costs across all water customers irrespective of the companies receiving funding.

However, this process is likely to be complex and introduce additional costs for customers including the need to appoint a third party to collect and redistribute funding across the water companies. It could also contribute to views of inequity cross the water companies. Finally, where companies are awarded funding as part of a bidding mechanism, this would accelerate their individual path to net zero, bringing forward investments that would likely have been delivered at a later date and which their own customers would pay

for at that time. This could reduce the justification of a shared industry model, although this should be balanced against customer research on intergenerational fairness and the likelihood that abatement costs may fall over time.

### 5.3 PACKAGES FOR ASSESSMENT

In this section we have set out three broad packages for incentivising net zero, each of which can be modified to suit Ofwat's desired pace of change. These form the three packages that will be assessed against the evaluation criteria:

- **Adapted PR19 toolkit.** Company business plans are assessed on an individual basis (but with cross industry cost benchmarking) to agree an efficient level of net zero incremental spend for each company. These form the basis of company PCLs and ODI rates are set to reflect the estimated efficient marginal abatement costs. This option will require Ofwat to carry out detailed benchmarking analysis and development of benchmarking unit cost models were possible.
- **Bidding framework.** Company business plans are assessed on an industry-wide basis and carbon related enhancement projects funded primarily on a least cost basis until the total industry target for carbon abatement in PR24 is achieved, taking into account the need to deliver against wider outcomes.
- **Blended approach.** All companies will receive funding to deliver carbon abatement at the efficient cost. The most efficient companies will receive additional funding, awarded via a bidding mechanism, to go further and meet the industry-wide target for carbon abatement.

## 6 ASSESSMENT OF INCENTIVE FRAMEWORKS AND CONCLUSIONS

### 6.1 EVALUATION OF INCENTIVE FRAMEWORKS

We assessed each of the incentive frameworks set out in section 5 against the evaluation criteria, with the exception of how the package performs against the ‘emissions in aggregate’ criteria which is addressed via the treatment of emissions.

Evaluation criteria	Adapted PR19 toolkit	Bidding framework	Blended approach
<b>Effectiveness</b>	<p>Ofwat can scale cost allowance to reflect total ambition for net zero and ensure that each company receives sufficient funding to remain on its pathway to net zero.</p>	<p>Risk that a pure bidding framework will be overly complex to deliver due to difficulty of isolating carbon benefits from multi-benefit investments. It may also result in only some companies receiving funding, placing the rest of the industry further behind on their long-term net zero journey with limited ability to catch-up as they have not developed the internal skills required during PR24.</p>	<p>All companies will receive funding for net zero at the efficient cost moving the whole industry forward whilst ensuring that the most efficient companies can deliver additional carbon abatement.</p>
<b>Productive efficiency</b>	<p>Limited benchmarking data (as not all companies had carbon PCs in PR19) limits cost assessment and could result in customers overpaying.</p>	<p>Bidding mechanism can help to establish efficient costs where it is difficult to benchmark due to uncertainties around cost. However, if some efficient companies choose not to participate due to perceived bidding costs this would lower productive efficiency.</p>	<p>Blended approach retains a degree of information revelation incentives as companies risk losing the chance of funding via the bidding element if they submit inefficient costs. This information can be used to estimate efficient costs for funding provided to all companies.</p>
<b>Allocative efficiency</b>	<p>Allows Ofwat to vary achievement based on prioritisation of wider societal benefits and pace of</p>	<p>Assessing non-carbon and carbon-driven projects together means that the basis for funding a project is not always clear.</p>	<p>Funding for enhancement projects that do not have carbon as their primary driver but still deliver carbon co-benefits will be</p>

	change to reflect societal preferences		assessed in the round, balancing least-cost and highest-value.  Pure carbon projects will be funded on a least cost basis – these projects are likely to have fewer co-benefits for other outcomes and the least-cost and highest-value solutions may therefore be the same.
<b>Dynamic efficiency</b>	<p>The impact of this option on dynamic efficiency is unclear:</p> <ul style="list-style-type: none"> <li>On one hand, all firms will receive some degree of funding for net zero, allowing them to trial new solutions and develop internal expertise and skills. This can be supplemented by the innovation fund for more experimental solutions.</li> <li>On the other hand, there is less pressure to invest in innovations that reduce abatement costs vs. a bidding approach.</li> </ul>	<p>The impact of this option on dynamic efficiency is unclear:</p> <ul style="list-style-type: none"> <li>On one hand, a bidding mechanism will allow industry leaders to move first and share learnings with industry. If companies believe that the bidding framework will run in future price controls, there is greater incentive to invest in innovations that reduce abatement costs.</li> <li>On the other hand, some companies may receive significantly less funding than others which limits their ability to innovate. Furthermore, in a competitive market, companies that are further behind may exit the market but this is not the case in the water industry.</li> </ul>	<p>The impact of this option on dynamic efficiency is unclear and potential impacts include those described under the “Adapted PR19 toolkit” and “bidding framework”, acknowledging the fact that these are mitigated in part by the blended nature of this framework.</p>
<b>Adaptive</b>	A modular capital approach will incentivise companies to be adaptive in their business plans.	A modular capital approach will incentivise companies to be adaptive in their business plans.	A modular capital approach will incentivise companies to be adaptive in their business plans.
<b>Protection from non-delivery</b>	Customers are protected from under-performance with ODI	Customers are protected from under-performance with ODI penalties on	Customers are protected from under-performance with ODI penalties on

	penalties on operational carbon solutions. Significant investments expected to deliver benefits beyond the AMP, as well as funding for embedded carbon abatement, will be tied to PCDs.	operational carbon solutions. Significant investments expected to deliver benefits beyond the AMP, as well as funding for embedded carbon abatement, will be tied to PCDs.	operational carbon solutions. Significant investments expected to deliver benefits beyond the AMP, as well as funding for embedded carbon abatement, will be tied to PCDs.
<b>Alignment with wider PR24</b>	Consist of existing “Adapted PR19 toolkit” allowing strong alignment with other parts of framework.	The bidding framework assess all enhancement funding that delivers carbon benefits under a bidding framework and is a significant departure from the approach taken in PR19.	The blended approach acts as a more streamlined approach to the PR24 framework and can draw on learnings from the innovation fund. However, it will require greater consideration of interactions with the wider price control as it introduces a blended mechanism not currently delivered by Ofwat.
<b>Simplicity</b>	Easier to operate but requires more analysis to benchmark costs leading to greater uncertainty.	More complex for companies who will need to produce two sets of long-term plans for net zero, one which sets out the efficient pathway for achieving net zero by 2050 and one which sets out an accelerated pathway with additional investment in the AMP8 period. However, the bidding approach may be easier for Ofwat to administer.	Complex for companies who will need to produce two sets of long-term plans for net zero, one which sets out the efficient pathway for achieving net zero by 2050 and one which sets out an accelerated pathway with additional investment in the AMP8 period.
<b>Future-proof</b>	This approach will become more powerful over time as Ofwat builds up a database of historical costs to allow for better benchmarking, although the innovative nature of net zero means that it will always face	If the bidding framework results in some companies receiving the majority of net zero funding, it will be more challenging for Ofwat to benchmark across companies in the future and introduces significant complexities to the regulatory accounting framework.	The blended approach mitigates the risk that some companies will receive the majority of funding although it will still result in the most efficient companies receiving more funding which should be taken into consideration as part of future benchmarking

	difficulties in benchmarking new solutions.	NB. The mechanism itself is futureproof but has been rated RED to reflect interactions with other elements of the price control in the future	NB. The mechanism itself is futureproof but has been rated RED to reflect interactions with other elements of the price control in the future.
<b>Distributional impact</b>	Unlikely to raise more distributional impacts than wider PR24	Distributional impacts will depend on funding mechanism. A national levy approach (section 5.2) would spread the cost of net zero investments across all water companies. However, this levy approach may increase distributional impacts if carbon abatement projects are linked to localised benefits e.g. peatland restoration schemes improve water quality and local recreation value in addition to acting as a carbon sink.	Under the blended approach funding will be spread more equally across companies compared to the bidding framework and only the most efficient companies would receive more funding limiting distributional impacts.
<b>Perverse incentives and unintended consequences</b>	Information asymmetry for cost benchmarking is a key concern due to current uncertainty on marginal abatement costs.	If only some companies receive funding, it is reputationally challenging for the sector if some companies are 'left behind' or can't fund existing commitments.  Potential for companies to inflate costs for the bidding framework if they expect Ofwat to set a stretching carbon abatement target for AMP8 although this can be mitigated by clear messaging.	Potential for companies to game enhancement funding by submitting less cost-efficient plans as part of non-carbon driven enhancement which is assessed on a balance of least cost and high value and submit cost efficient projects as part of carbon-driven enhancement to win funding under the bidding element.

This report aims to explore potential options for incentivising net zero in PR24, recognising the technical challenges associated with carbon accounting, cost-benchmarking, and implementation and presenting a range of options to overcome these challenges. We now summarise our conclusions and recommended next steps.

## 6.2 CONCLUSIONS

Ultimately the optimal net zero incentive scheme will depend on Ofwat's overall policy objectives for the sector and the trade-offs it wishes to take with respect to the objectives discussed in this report:

**Focused on moving all companies forward.** If Ofwat's priority is to ensure that all companies continue on their proposed net zero long-term pathway, the "Adapted PR19 toolkit" approach allows all companies to make progress. However, this comes at a cost to efficiency as it does not allow the most efficient companies to move the industry further at the least cost. However, limited historical or comparative information on carbon abatement costs means that consumers are more likely to overpay for this activity over AMP8.

**Allowing the most efficient companies to lead the way.** If instead Ofwat would like to use the PR24 period as an opportunity for the most efficient companies to lead the way, the blended approach allows these companies to go further and share these learnings with the rest of the industry. This approach will also reduce overall costs of carbon abatement across the industry by increasing allowances for the most efficient companies.

**The pure bidding framework is unlikely to be feasible.** Whilst assessing all investments that could deliver carbon benefits together would minimise costs in theory, in practice this is not feasible as many of these investments are driven by other outcomes and will be funded on that basis.

## 6.3 NEXT STEPS

This work sets out several options for incentivising net-zero in PR24. Irrespective of the final direction taken, the approach will require further development relating to the practical feasibility of implementing the incentive framework. This includes questions around standardised carbon accounting for embedded carbon and integration of net zero benefits with other benefits that could limit the number of carbon-driven investments.

To answer these questions and ensure that the final solution is feasible, we recommend that Ofwat conducts further engagement with the industry. This should include at a minimum:

- Carbon accounting experts to advise on art of the possible for incentivising, monitoring, and reporting embedded emissions based on the current available technology and accounting standards.
- Supply chain partners, including those involved in the net zero innovation fund challenges, to advise on the pace of technological change.
- Carbon and environmental plan owners to understand whether companies currently have a good understanding of their carbon abatement curve.

As part of this engagement, Ofwat should work with the industry to clarify how the Government's net zero targets apply to the water companies, drawing on water company long-term net zero plans.

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