September 2022

Creating tomorrow, together: consulting on our methodology for PR24

Bioresources control: supplementary document

Ofwat

About this document

In our draft methodology document[1] we recognised that some of our proposals regarding the bioresources control would require us to undertake our benchmarking modelling in a new way. To help test this and illustrate how our proposals could work in practice and their potential impact, we are publishing this supplementary document. This document:

- sets out the type of data we could use; and
- provides some example model results.

In this document we discuss potential refinements to how asset value and depreciation data could be calculated and request that wastewater companies provide this information based on our revised guidance.

Alongside this document we are also publishing:

- the depreciation and net Modern Equivalent Asset Value (MEAV) data that we previously received from companies
- the stata code used for our econometric analysis;
- the input data we have used.

The closing date for providing a response to our proposals regarding bioresources is **5pm Friday 16 September 2022**. The additional information we are requesting should be sent to us by **5pm Friday 23 September 2022**.

[1] Ofwat, 'Appendix 4: Bioresources control', July 2022, pp.4

Responding to this document

We would welcome any comments on this document. In section 4 we set out specific questions for stakeholders. Please email your response to: alexandros.maziotis@ofwat.gov.uk and CostAssessment@ofwat.gov.uk.

Please provide your response to our proposals regarding bioresources separately to your response to our other draft methodology proposals. The closing date for providing a response to our proposals regarding bioresources is **5pm Friday 16 September 2022**.

The additional information we are requesting should be sent to us by **5pm Friday 23 September 2022**.

If you wish to discuss any aspect of this consultation, please contact Alex Whitmarsh by email at alex.whitmarsh@ofwat.gov.uk.

We will publish responses to this document on our website at www.ofwat.gov.uk. Subject to the following, by providing a response to this discussion paper you are deemed to consent to its publication.

Information provided in response to this document, including personal information, may be published or disclosed in accordance with access to information legislation – primarily the Freedom of Information Act 2000 (FoIA), the General Data Protection Regulation 2016, the Data Protection Act 2018, and the Environmental Information Regulations 2004. For further information on how we process personal data please see our Privacy Policy.

If you would like the information that you provide to be treated as confidential, please be aware that under the FoIA there is a statutory Code of practice which deals, among other things, with obligations of confidence.

If you think that any of the information in your response should not be disclosed (for example, because you consider it to be commercially sensitive), an automatic or generalised confidentiality disclaimer will not, of itself, be regarded as sufficient. You should identify specific information and explain in each case why it should not be disclosed and provide a redacted version of your response, which we will consider when deciding what information to publish. At a minimum, we would expect to publish the name of all organisations that provide a written response, even where there are legitimate reasons why the contents of those written responses remain confidential.

Contents

1. Introduction

Bioresources (or sewage sludge) are the semi-solid by-products of wastewater treatment. With the right conditions, bioresources activities could help to create greater economic and environmental value. A well-functioning bioresources market could help achieve this.

In our draft methodology[2] we assessed alternative packages of options[3] for funding bioresources activities at PR24.

- **Option 1:** A business as usual scenario based on retaining the approach at PR19. With this approach the PR19 building blocks approach is maintained and a common catch-up efficiency challenge between wholesale wastewater and bioresources is used. Bioresources cost allowances are based on cost allocation using a combination of wholesale wastewater and bioresources models.
- **Option 2:** A 'partially reformed approach' where the building blocks approach is maintained but incorporates key changes such as a separate catch-up efficiency challenge for bioresources and enhancement costs are included in our econometric model.
- **Option 3:** A 'fully reformed approach' which reflected all our proposals such as including financing costs in our econometric models.

Annex 1 provides details of the options assessed in our draft methodology and this document.

In the draft methodology we stated that our proposed approach (Option 3) would best achieve our objectives and on balance would be in the best interests of customers.[4] However, we were concerned that there were potential downsides to our approach in terms of practicality and potential implementation challenges. We need to ensure that these could be addressed appropriately.

We are publishing this supplement to our draft methodology to provide further detail on our proposals, illustrate how these could work in practice and provide some example model results. We hope this will help inform responses to the draft methodology in this area.

The example model results in this document are not an indication of the allowed revenue that companies would receive at PR24 under any of the options considered. The results reflect current data and our initial, simplified attempt at modelling alternative options. This will evolve over time. Instead, the example model results are intended to indicate whether our

[2] Ofwat, 'Appendix 4 – Bioresources control', July 2022, pp. 43.
[3] For brevity in this document, we refer the different packages of options simply as 'options'.
[4] Ofwat, 'Appendix 4 – Bioresources control', July 2022, pp. 36-38.

proposed changes at PR24 could be implemented and, if so, indicate what further refinements might be required to help achieve this.

1.1 Structure of this document

This document is a supplement to our draft methodology for the bioresources control. It is structured as follows:

- Section 2 discusses the adjustments to the data set we used at PR19;
- Section 3 sets out the example model results; and
- Section 4 sets out our consultation questions.

The annexes are as follows.

- Annex 1 provides further details of the policy options;
- Annex 2 summarises key input data to our modelling;
- Annex 3 summarises key modelling assumptions;
- Annex 4 summarises key model calculations;
- Annex 5 provides further details of our econometric analysis;
- Annex 6 sets out our proposed methodology for calculating depreciation and asset values; and
- Annex 7 summarises stakeholder responses regarding data issues.

2. Data adjustments

At PR19 we developed a dataset to allow us assess the cost of companies' bioresources activities. We have retained the 'feeder model 1' wastewater dataset as our main dataset and updated it to include data up to 2020/21.

We have incorporated two datasets that we recently collected from wastewater companies which we have not previously used. These two datasets make important adjustments to the data used to model bioresources. We include this data in the 'feeder model 1' wastewater dataset we are publishing alongside this document.

The two datasets are discussed below. Annex 2 summarises this data.

Adjustment 1: Adjusting companies' historical costs to reflect our recent cost allocation guidance. This is the so-called 'backcasting adjustment'. It aims to account for our recently updated guidance on how to allocate the costs of sludge liquors treatment, energy generation and overheads. Accurate cost allocation across controls is important for setting a separate catch-up efficiency challenge for bioresources and network plus. Although we had not completed our query process on this data when we undertook our example modelling (discussed below), we had completed key steps to ensure this data is fit for purpose. We received queries and comments, reviewed the data and engaged with companies on specific issues as appropriate.

Annex 7 discusses in more detail the steps we have taken to help ensure that this data is fit for purpose. We have also found that incorporating this dataset improves our econometric models – see annex 5 for details.[5]

Adjustment 2: Using estimates of current cost accounting[6] (CCA) and net modern equivalent asset value[7] (MEAV) to implement our fully reformed approach (option 3). If we include financing costs in our econometric model then we will need this data to establish an asset base. This is because financing costs are estimated as the asset base multiplied by companies' allowed return. A measure of depreciation is used as our measure of capital costs, rather than capex. For the example modelling in this paper, we use:

- the depreciation and net MEAV figures from our recent information request up to 2020; and
- RCV and RCV run-off for the year 2020-21.

[5] Notably, the R-squared – a measure of how much the model can explain cost variation - of the bioresources models increased suggesting that the performance of the models has improved.
[6] CCA is a valuation method whereby assets used by water companies are valued at their actual or estimated current market prices.
[7]The Modern Equivalent Asset Value is what it would cost to replace an old asset with a technically up to date new asset with the same service capability.

We have identified potential improvements to the guidance we previously provided when we initially collected CCA depreciation and MEAV data. Based on this we:

- include additional guidance and options (in annex 6) for how companies could calculate this data; and
- request information to be provided to us on this basis by **5pm 23 September 2022**.

3. Example model results

3.1 Approach

As discussed above, in our draft methodology[8] we assessed the potential impacts of different packages of options we could take to funding bioresources.[9] The assessment of these options requires the use of data and econometric models. In this section we include the example models results from running these three packages of options.

We also include modelling results for an additional option to help explain the impact of a separate catch-up efficiency challenge for bioresources and other modelling changes. For all options we adjusted this dataset to account for companies' reallocation of historical costs ('Adjustment 1').[10]

A summary of the options we have modelled is as follows. (A more detailed description is in annex 1.)

- **Option 1: Business as usual approach:** We ran the suite of PR19 wholesale wastewater models and allocated costs to bioresources based on the share of companies' projected bioresources costs in their PR19 business plans. These models are total expenditure (totex) models. Although the reallocation of costs from bioresources to network plus was reflected in the data used for the econometric models ('Adjustment 1'), it would not be reflected in companies' PR19 business figures. These figures are used to allocate the total amount of wastewater allowed revenue between network-plus and bioresources. Therefore, **we expect this option to underestimate bioresources allowed revenues (and overestimate wastewater network plus revenues)**.

- **Option 1 + modelling adjustments:** This approach is based on bioresources models only. These models are total expenditure (totex) models. A separate catch-up efficiency challenge for bioresources can be calculated. This modelling adjustment corrects for the risk of underestimation described in option 1.

- **Option 2: Partially reformed approach**: This approach builds on the previous option with the key change that more enhancement costs are included in the econometric models, rather than being added as a separate adjustment. These models are unit

[8] Ofwat, 'Appendix 4- Bioresources control', July 2022, pp. 43.
[9] That said, not all elements of our packages of options are modelled. This is because some aspects are common to all options or are not the focus of our assessment at this time. For example, we do not model the impact of over- or under-forecasting sludge production and therefore the impact of volume risk.
[10] Ofwat, 'Reallocation of costs: Draft information request', December 2021.

cost models[11] and use totex per thousands of tonnes of dried solids sludge (ttds) as the dependent variable in the models.

- **Option 3: Fully reformed approach:** This approach implements all of our proposals, notably including financing costs in our models and excluding pre-2020 RCV related costs from the catch-up efficiency challenge[12]. We incorporate 'Adjustment 2'. Allowed revenues are determined more directly from econometric models rather than the building blocks approach as implemented through the financial model. These models are unit cost models.

To allow comparisons between options, we use the same set of data, assumptions and calculations across the packages of options wherever possible. Annexes 3 and 4 set out the assumptions and calculations we have used, respectively. We discuss below the key elements of our approach further.

3.2 Data used

We only use data up to 2020-21 in our econometric modelling as:

- our information request regarding net MEAV and depreciation only goes up to 2020-21; and
- our query process for companies' 2021-22 APR data was not complete at the time we undertook our modelling.

We adjusted this dataset to account for companies' reallocation of historical costs ('Adjustment 1').[13]

3.3 Example econometric modelling

Table 1 below shows i) the specification for the two bioresources models we used at PR19 (BR1 and BR2) and an alternative model specification we have developed for our fully reformed approach (BR3); and ii) the time period used for each option considered. At this stage we did not consider including alternative cost drivers in the models. All options use the same cost drivers as used in the PR19 bioresources-only econometric model specifications.

Table 1: Summary of econometric models used

[11] This is where we use the econometric models to estimate how it costs companies per unit of sludge, as opposed to the totex models which consider total costs.
[12] The approach we take is consistent with our proposals in our draft methodology document published in July.
[13] Ofwat, 'Reallocation of costs: Draft information request', December 2021.

	Option 1: Business as usual approach / Option 1 + modelling adjustments		Option 2: Partially reformed approach		Option 3: Fully reformed approach
	BR1	BR2	BR1	BR2	BR3
Totex models	✓	✓			
Unit cost models			✓	✓	✓
Sludge produced	✓	✓	✓	✓	✓
Weighted average density	✓		✓		✓
Load treated in band sizes 1-3 (%)	✓		✓		✓
Sewage treatment works per connected property		✓		✓	✓
2011/12 - 2020/21	✓	✓	✓	✓	
2016/17 - 2020/21					✓

Note that option 1 and option 1 + modelling adjustments use the same econometric model specification. Option 1 runs a suite of wastewater and bioresources models, whereas option 1 + modelling adjustments runs bioresources models only. From the econometric results of this option:

- both wastewater and bioresources models derive a common catch-up efficiency challenge for wastewater and bioresources; and
- bioresources models derive a separate catch-up efficiency challenge for bioresources. This gives us option 1 + modelling adjustments.

For options 2 and 3 we estimate unit cost models. This is consistent with our plan to determine companies' allowed revenue per unit of sludge more directly from our econometric benchmarking models.[14] This has no meaningful impact on the econometric results as discussed in A5.2.

[14] The estimated unit cost from our benchmarking models depends on companies' historical costs and historical sludge production. During the price control period, a company's total revenue allowance for bioresources in each year would be calculated by multiplying the average revenue control for that company and year by the outturn volume of sludge produced in that year. A unit cost approach is less reliant on sludge forecasts and so less open to gaming.

For option 3 we used an alternative model specification for the following reasons.

- **A shorter time-period.** We consider that the asset value and data could be improved as discussed in annex 6. We have used more recent data in this modelling. This data is more likely to be accurate and provides better econometric results.

- **Including all cost drivers in a single model.** The PR19 model specifications (BR1 and BR2) did not perform well statistically under option 3 when estimated using the full historical time series (2011-12 to 2020-21). These results are presented in Annex A5.3. But including all cost drivers from PR19 models BR1 and BR2 into a new model and using a shorter time-period (BR3) improved the statistical significance of cost drivers (see the discussion below). As discussed below, one coefficient has a counter-intuitive sign and requires further consideration. We will continue to test alternative bioresources model specifications going forwards.

We have performed three tests to check the robustness of our results.

- **Significance of cost drivers.** We checked to see if the cost drivers – the variables we use to explain variations in company costs - used at PR19 remain statistically significant. If cost drivers become statistically insignificant it could indicate data quality issues which lead to less reliable results. Our results show that almost all estimated parameters are statistically significant and have the expected sign when capital expenditure is included in the models (Option 1, Option 1 + modelling adjustments and Option 2). This is in line with our PR19 model results. But models that are estimated using the full time series (2011-12 to 2020-21) do not yet produce statistically significant results when we include depreciation data in place of capex (Option 3). The results of these models are reported in annex 5.

  We considered whether a model that uses depreciation data may work with a shorter dataset (2016-17 to 2020-21) to use a potentially more accurate depreciation data series. However, one cost driver (number of sewage treatment works per connected properties) provides a counter-intuitive, negative sign which is inconsistent with the positive sign in the PR19 bioresources models.

- **Magnitude of the coefficient related to sludge production.** Our results show that with the options that use capex data (Option 1, Option 1 + modelling adjustments and Option 2) the value of the coefficient with respect to sludge production indicates diseconomies of scale. This means that further increases in sludge production could lead to higher bioresources unit costs. This result is consistent with the PR19 bioresources models.[15] Using depreciation data (Option 3) and a 2016-17 to 2020-21

[15] The estimated coefficient of the scale variable could deviate from the expected range (for example, due to inaccuracies related to a small sample, data quality and an “omitted variable bias”, where the coefficient

dataset, the coefficient of sludge production indicates the existence of economies of scale where increases in sludge production lead to lower unit bioresources costs.

- **Model specification.** We ran a statistical test to indicate if the model is missing non-linear terms.[16] If the model passes this test, we are more confident that the functional form is adequate.[17] Our results show that when using capex data (Option 1; Option 1 + modelling adjustments; and Option 2), the econometric models pass the model specification test. Models using depreciation data (Option 3) for the 2011-12 to 2020-21 period do not pass this test as shown in annex 5. Model BR3 that uses depreciation data with a 2016-17 to 2020-21 dataset passes the model specification test.

Table 2: Econometric results: bioresources (BR) models

	Option 1 Business as usual approach and Option 1 + modelling adjustments		Option 2: Partially reformed approach		Option 3: Fully reformed approach
	Totex models		Unit cost models		
	BR1	BR2	BR1	BR2	BR3
Sludge produced	1.242***	1.271***	0.332**	0.335	-0.032
Weighted average density	-0.218**		-0.227**		-0.373*
Load treated in band sizes 1-3 (%)	0.073***		0.070***		0.140***
Sewage treatment works per connected property		0.429**		0.405*	-0.655**
Constant term	-0.685	1.393*	-0.958	0.978	-3.818***
Observations	100	100	100	100	50
R-squared	0.854	0.823	0.292	0.14	0.636
RESET	0.444	0.176	0.44	0.438	0.629

Option 1: We find that the estimated coefficient of

"compensates" for the effect of an omitted factor). We do not consider that our model selection should be influenced by whether the estimated coefficient is slightly above one (or above zero when using unit cost models), despite the difference in theoretical interpretation of the coefficient on either side of unity (or zero when using unit cost models).

[16] This is called the regression specification error test (RESET).

[17] A failure of the reset test should prompt a search for a more flexible specification, but need not in itself be grounds for dismissing a model.

- sludge produced is higher than 1 indicating diseconomies of scale;
- weighted average density is negative indicating that bioresources cost decrease with density. A bioresources provider can use larger sewage treatment works for larger population centres with lower associated unit costs due to economies of scale; and
- both load treated in band sizes in 1-3 (that is, smaller works) and the number of sewage treatment works (STWs) per connected properties are positive. These results could suggest there are higher transport costs associated with operating in rural areas.

Option 2. These findings are consistent with Option 1 and Option 1 + modelling adjustments. The key differences are a lower coefficient on sludge produced and a low R-squared. Both are driven by using unit cost models under this option. The low R-squared is lower as this transformation removes the bulk of cost variation that could otherwise be explained by sludge produced. In practice, the use of unit cost models does not have a meaningful impact on the econometric results compared to using total cost models.

Option 3. These findings differ from the first two options. We find that:

- sludge produced is not statistically significant and has a negative sign. The negative sign indicates economies of scale (that is, an increase in sludge production leads to a decrease in unit costs), but we recognise it is not statistically different from zero;
- weighted average density and load treated in bands 1-3 drivers have the expected signs as per previous approaches but change in magnitude; and
- the number of sewage treatment works (STWs) per connected properties has a counter-intuitive sign and requires further consideration. It suggests that more STWs per connected properties reduce bioresources unit costs. This may be driven by interactions with other explanatory variables in the model. For example, we find a strong and positive correlation between STWs per properties and load treated in bands 1-3, and a strong and negative correlation between STWs per properties and weighted average density.[18]

3.4 Example efficiency scores

We estimate companies' relative efficiency and use this to set a catch-up efficiency challenge. The efficiency score is the ratio of actual costs to modelled costs. An efficiency score of more than one suggests cost inefficiency relative to the average efficient company in

[18] Our correlation analysis shows that the correlation coefficient between STWs per connected properties and load treated in bands 1-3 is 0.873. The correlation coefficient between STWs per connected properties and weighted average density and sludge produced was -0.895 and -0.842, respectively.

the historical period (and vice versa). The catch-up efficiency challenge is based on historical upper quartile of the efficiency scores for illustrative purposes.[19]

Our observations are as follows:

- **Ranking of companies**. There are some similarities across the options considered, for example Severn Trent and Northumbrian Water are consistently found to be relatively efficient. However, for some companies the efficiency score can change significantly from the first two options to the fully reformed approach under option 3.

- **Spread of efficiency scores**. The spread in companies' efficiency scores is measured through the standard deviation statistic. A low standard deviation means that efficiency scores are clustered around the mean (and vice versa). A relatively high standard deviation is not necessarily a problem, although it could indicate data quality issues or missing cost drivers that should be investigated. Options 1 + modelling adjustment and option 2 have a relatively high standard deviation.

- **Catch-up efficiency challenge**. We note that Options 1 and 3 provide a relatively low catch-up efficiency challenge. Option 1 + modelling adjustments and option 2 provide a relatively high catch-up efficiency challenge.

Table 3: Efficiency scores

Option 1: Business as usual approach		Option 1 + modelling adjustments		Option 2: Partially reformed approach		Option 3: Fully reformed approach	
Wastewater and bioresources models		Bioresources models only					
Water company	Efficiency scores	Water company	Efficiency scores	Water company	Efficiency scores	Water company	Efficiency scores
Severn Trent	0.87	Northumbrian Water	0.72	Severn Trent	0.63	Severn Trent	0.76
Wessex Water	0.96	Severn Trent	0.83	Northumbrian Water	0.67	Southern Water	0.85
Northumbrian Water	0.96	United Utilities	0.84	United Utilities	0.86	Dŵr Cymru	0.93
Thames Water	0.97	Southern Water	0.88	Southern Water	0.86	Northumbrian Water	0.96
South West Water	0.98	Anglian Water	0.99	Anglian Water	0.94	Wessex Water	1

[19] At PR19 we set the wholesale wastewater base cost efficiency benchmark at the third most efficient company. We discuss our position on the catch-up efficiency benchmark in Appendix 9 -Setting expenditure allowances pp43-45. We have made no decision on the level of the cost efficiency benchmark in PR24.

Option 1: Business as usual approach		Option 1 + modelling adjustments		Option 2: Partially reformed approach		Option 3: Fully reformed approach	
Wastewater and bioresources models		Bioresources models only					
Water company	Efficiency scores	Water company	Efficiency scores	Water company	Efficiency scores	Water company	Efficiency scores
Anglian Water	1.05	South West	1.1	Thames Water	0.99	South West Water	1.05
Dŵr Cymru	1.11	Wessex Water	1.19	South West Water	0.99	Yorkshire Water	1.07
United Utilities	1.13	Thames Water	1.23	Wessex Water	1.08	United Utilities	1.08
Yorkshire Water	1.15	Yorkshire Water	1.36	Yorkshire Water	1.34	Thames Water	1.11
Southern Water	1.17	Dŵr Cymru	1.44	Dŵr Cymru	1.37	Anglian Water	1.19
Standard deviation	0.1	Standard deviation	0.25	Standard deviation	0.25	Standard deviation	0.13
Upper Quartile	0.96	Upper Quartile	0.85	Upper Quartile	0.86	Upper Quartile	0.94

3.5 Example revenue allowances

In this section we report the allowed revenues under the different options assessed. We note that under option 3 revenue allowances are determined more directly from econometric models.[20] As mentioned previously, option 3 moves away from a building blocks approach because we include depreciation and financing costs as inputs in our econometric models. Therefore, under option 3 the allowed revenue is not determined from the financial model. In contrast, all the other options maintain the building blocks approach and therefore, revenue allowances are determined from the financial model.

Our observations are as follows:

- **Option 1 appears to underestimate bioresources allowed revenues.** This is for the reasons set in section 3.1.

[20] There is a separate adjustment for tax.

- **Including enhancement capex in our models provides a more generous allowance**. If our econometric models draw on enhancement capital expenditure (option 2), rather than a bespoke assessment (option 1 + modelling adjustments) they provide £82m more funding for enhancement activities.

- **Including financing costs in our modelling (option 3) gives a less generous allowance despite the protection we provide for pre-2020 RCV**. This could be explained by average depreciation values being lower than capital expenditure for the period assessed (2016-17 – 2020-21). Since depreciation is a form of smoothing capital expenditure, we would expect that any differences should even out over the long-run.

Table 4: Revenue allowances, £m

Company	Option 1: Business as usual approach	Option 1 + modelling adjustments	Option 2: Partially reformed approach	Option 3: Fully reformed approach
Anglian Water	454	466	477	399
Northumbrian Water	101	127	127	137
United Utilities	448	458	475	433
Southern Water	226	240	241	274
South West Water	114	126	118	133
Thames Water	784	781	820	858
Dŵr Cymru	171	212	210	204
Wessex Water	148	158	153	160
Yorkshire Water	361	378	388	353
Severn Trent	375	470	490	435
Total	3,182	3,417	3,499	3,387
Difference compared to option 1 (option 1 + modelling adjustments)		+235	+317 (+ 82)	+205 (-30)

We will set an average revenue control, so we have also assessed companies' allowed revenue per unit of sludge. Our observations are as follows:

- **The options where we set a separate catch-up efficiency challenge have a tighter range of allowed revenue per unit of sludge across companies than the PR19 approach.** We see this from the range[21] of option 1 being higher than the other options. We would expect a separate efficiency challenge to come closer to the gate price a market might produce and so promote competition.

- **Unit cost allowances vary in magnitude depending on the type of data used**. For example, using capital expenditure data Northumbrian Water shows the lowest cost per unit of sludge, whereas using depreciation data Severn Trent shows the lowest unit cost.

Table 5: Revenue allowances, £/ttds

Company	Option 1: Business as usual approach	Option 1 + modelling adjustments	Option 2: Partially reformed approach	Option 3: Fully reformed approach
Anglian Water	0.58	0.59	0.60	0.51
Northumbrian Water	0.27	0.35	0.34	0.37
United Utilities	0.45	0.46	0.47	0.43
Southern Water	0.36	0.39	0.39	0.44
South West Water	0.53	0.59	0.55	0.62
Thames Water	0.40	0.40	0.42	0.44
Dŵr Cymru	0.44	0.55	0.54	0.53
Wessex Water	0.42	0.45	0.43	0.45
Yorkshire Water	0.47	0.49	0.51	0.46
Severn Trent	0.30	0.38	0.40	0.35
Average	0.42	0.46	0.47	0.46
Range	0.31	0.24	0.26	0.27
Average: Difference compared to option 1 (option 1 + modelling adjustments)		+0.04	+0.05 (+0.01)	+0.04 (+0)

[21] This is calculated as the maximum minus the minimum £/ttds

As noted earlier, the example model results in this document are not an indication of the allowed revenue that companies would receive at PR24 under any of the options considered. The results reflect current data and our initial, simplified attempt at modelling alternative options which will evolve over time. This is particularly the case for option 3 'fully reformed approach' where model results could change significantly when we get refined CCA depreciation and asset value data for past years and more years of actual data. Update CCA depreciation and asset value data could also inform our decision on whether to use this or values based on companies' RCV over the 2020 to 2025 period.

4. Consultation questions

We welcome comments on any aspect of our proposals. In the box below we set out the questions from our draft methodology and additional questions related to this supplement.[22]

Questions in the July 2022 draft methodology document:

Section 2 questions

Q2.1: Do you have any comments on this section?

Q2.2: Do you have any further comments on our approach to a separate efficiency assessment, in particular the options we consider in section 2.4.2?

Section 3 questions

Q3.1: Do you have any comments on this section?

Our December proposals

Q3.2: Do you have any further comments on the draft methodology proposals which we propose to retain from our December document and our reasons for doing so?

Q3.3: Do you have any suggestions on how our approach to PR24 quality enhancements could be implemented in a way that achieves our objectives whilst addressing the concerns raised by stakeholders?

Updated proposals

Q3.4: Do you agree with, or have any comments on, the degree of regulatory protection we propose for pre-2020 RCV? Do you agree with our proposal to implement option 1 to achieve this?

Q3.5: Do you agree with, or have any comments on, our updated proposals for modelling financing costs in our benchmarking models?

Q3.6: Do you agree with, or have any comments on, our proposals in relation to managing volume risk? Do you agree with our preferred option, that is, option 2?

Q3.7: Do you agree with, or have any comments on, our proposals to make a separate adjustment for tax?

Q3.8: Do you agree with, or have any comments on, our proposal to continue to refer to the post-2020 asset base as RCV? Summary of potential impacts of different options

[22] Ofwat, 'Appendix 4 – Bioresources control', July 2022.

Q3.9: Do you have any comments on our option assessment in the annex?

Additional questions related to this supplement

QS.1: Do you have any comments on the type of data used for the example model results? Whist recognising the proposed refinements to establishing standardised depreciation in annex 6, do you have further comments on whether RCV and RCV run-off would provide an acceptable and/or more appropriate input to our econometric cost benchmarking models over the 2020 to 2025 period?

QS.2: Do you have any comments on the econometric models and results? How could our models be improved? For example, should we consider alternative specifications or cost drivers?

QS.3: Do you agree with, or have comments on, the proposed, updated approach to calculating asset values and CCA depreciation as set out in annex 6? In particular, do you:

- Agree with, or have any comments on, our proposed approach to calculating GMEAV and the alternative approach considered?
- Agree with, or have any comments on, our proposed approach ('gradual unwinding') and alternative approach to estimate changes in the value of the NPV adjustment?
- Agree with, or have any comments on, our proposed approach ('bottom-up method) to recording CCA depreciation?
- Agree with, or have any comments on, our proposed approach to the rules on asset life assumptions?
- Have any comments on the options to generate backcasting estimates of asset values and depreciation?

A1 Policy options

In our draft methodology we assessed the potential impacts of different packages of options we could take to funding bioresources.[23] In this supplement we also consider an additional option to help explain the impact of a separate catch-up efficiency challenge for bioresources and other modelling changes. In all options we would retain a revenue reconciliation, forecasting incentive and a separate adjustment for tax.

Note that not all elements of our packages of options are modelled. This is because some aspects are common to all options or are not the focus of our assessment at this time. For example, we do not model the impact of over- or under-forecasting sludge production and therefore the impact of volume risk.

Options package 1: Business as usual approach. This would maintain the same approach as PR19, that is:

- a building blocks approach based on the recovery of allowed revenue through PAYG, a return on capital and RCV run-off;
- a common catch-up efficiency challenge for bioresources and wholesale wastewater network-plus attained using the PR19 model suite;
- a separate assessment of base (that is, opex and capital maintenance capex) costs and enhancement costs;
- any bespoke cost assessment would consider whether there had been appropriate engagement with the market;
- no cost sharing for bioresources other than business rates; and
- a modified average revenue control.

Options package 1 + modelling adjustments: This makes the following adjustment to option 1:

- a separate catch-up efficiency challenge for bioresources (and wastewater network plus); and
- bioresources plus models are no longer used, revenue allowances are based only on network plus and bioresources models. Note that the econometric results of bioresources models under this option and the previous option are exactly the same.

Options package 2: Partially reformed approach. Under this approach, we would have:

- a building blocks approach as option package 1 + modelling adjustments;
- an assessment of base costs and growth enhancement capex within a single econometric benchmarking model;

[23] Ofwat, 'Appendix 4- Bioresources control', July 2022, pp. 43.

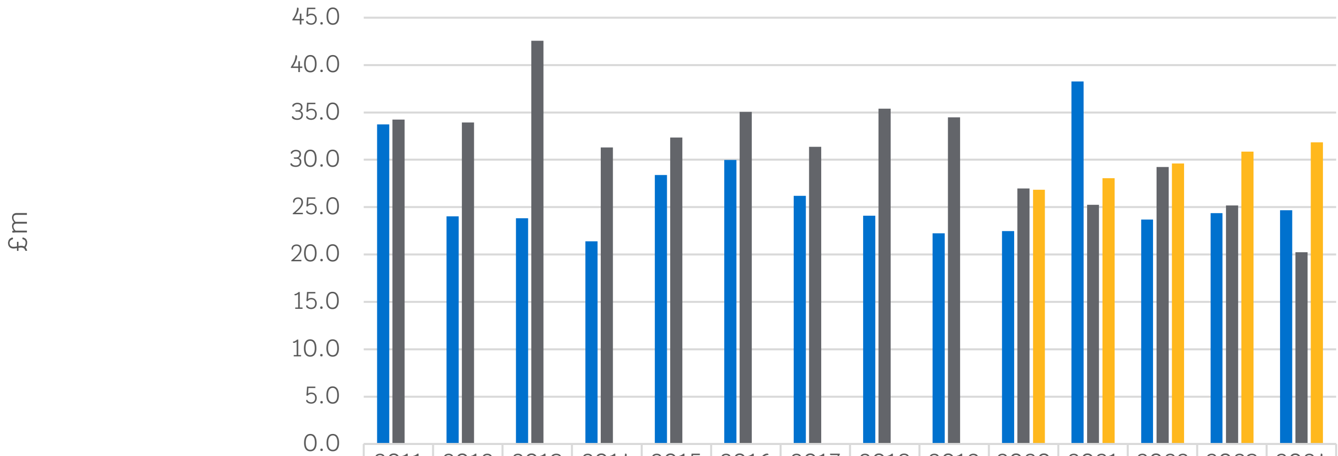
- a separate allowance for annualised costs over one regulatory period for new quality enhancement;
- any bespoke cost assessment would consider whether there had been appropriate engagement with the market;
- no cost sharing for bioresources including business rates; and
- an average revenue control.

Options package 3: Fully reformed approach. Under this approach, we would:

- have the same features as option 2 in terms of the catch-up efficiency challenge, cost sharing, new quality enhancements and average revenue control;
- include opex, depreciation and financing costs in our econometric benchmark modelling;
- consider using forecast costs in our econometric benchmark modelling;
- exclude legacy investment from the catch-up efficiency challenge; and
- move away from the PR19 building blocks approach.

A2 Summary of input data

Figure A2.1: Capital expenditure, RCV run-off and standardised depreciation data



	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Depreciation (standardised)	33.7	24.0	23.8	21.4	28.4	30.0	26.2	24.1	22.2	22.5	38.3	23.7	24.4	24.7
All capex	34.2	33.9	42.6	31.3	32.3	35.1	31.4	35.4	34.5	27.0	25.3	29.2	25.2	20.3
PR19 RCV run-off										26.8	28.1	29.6	30.9	31.8

Source: Ofwat analysis

Figure A2.1 shows the different sets of capital costs we can use in our models.

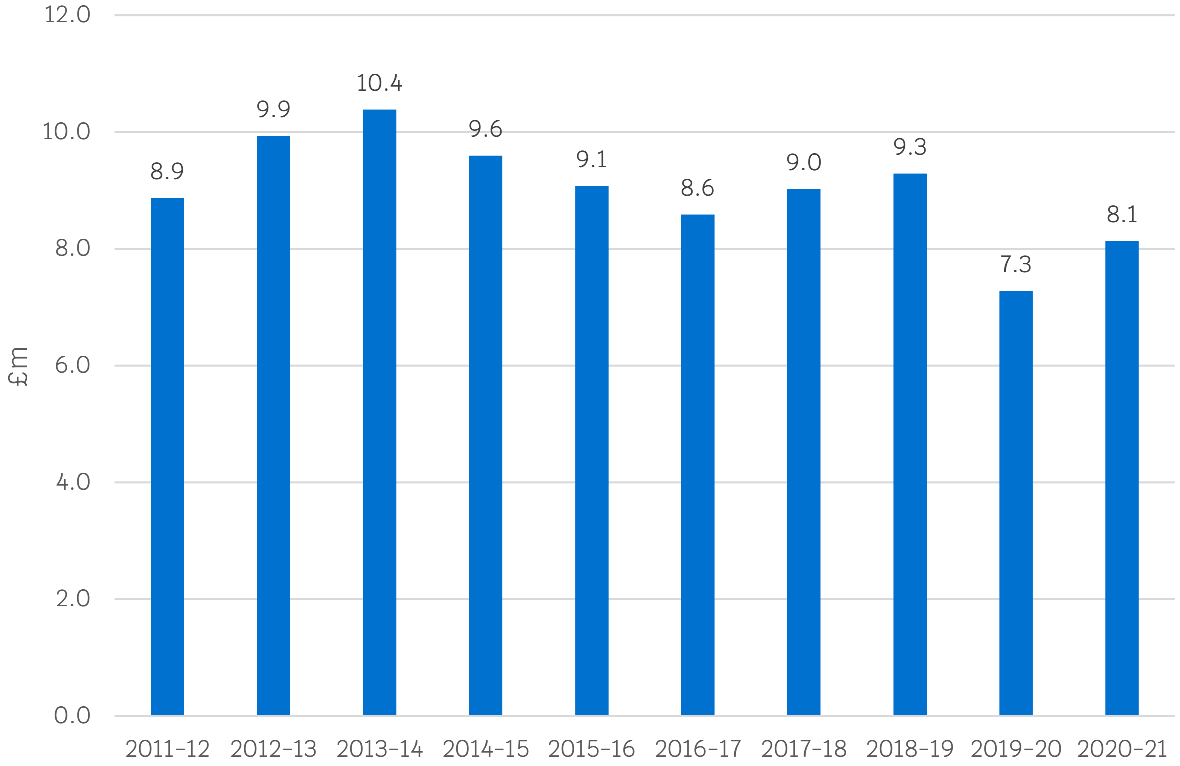
- 'All capex' includes both base and enhancement capital expenditure. This is used as input to our econometric benchmarking cost models under option 1, option 1 + modelling adjustment and option 2.
- Depreciation is calculated on a straight-line basis (standardised measurement) as per our guidance in the December consultation document. [24] Data from 2016-17 to 2019-20 is used in option 3.
- PR19 RCV run-off is the forecast RCV run-off established for bioresources at PR19. Data for 2020-21 is used in option 3.

Depreciation is smoothed capital (both base and enhancement) expenditure and in the long run we expect depreciation and capital expenditure to match.

During the 2011-12 to 2020-21 period (that is, our cost assessment period) depreciation values are lower than capital expenditure values.

[24] Ofwat, 'Our proposed approach to funding bioresource activities at PR24', December 2021.

Figure A2.2: Backcasting cost data, average



Source: Ofwat analysis

Figure A2.2 shows the average backcasting adjustment made for each company ('Adjustment 1'). This is the so-called 'backcasting adjustment' and is related to operating costs. It refers to the adjustments companies did to their historical costs to reflect our recent cost allocation guidance. This adjustment aims to account for our recently updated guidance on sludge liquors, energy generation and overheads.

Our findings show that on average bioresources costs would go up by around £9m every year over the 2011-12 to 2020-21 period. Since this backcasting adjustment is a transfer of costs from sewage treatment (network plus) to bioresources, sewage treatment costs would go down by the same amount.

A3 Modelling input assumptions

Approach	Assumptions and reasoning
Time period for model inputs This used to determine coefficients in our econometric models.	**For option 1, option 1 + modelling adjustment and option 2:** 2011-12 to 2020-21. **For option 3:** 2016-17 to 2020-2021. Please note that for this option we also run a model using the data from 20211-12 to 2020-21. **2020-21 to 2024-25.** For forecast data. This matches the output period.
Time period the model outputs	**2020-21 to 2024-25**. This replicates the PR19 period.
Time period used for % of pre-2020 RCV	**2025-26 to 2029-30**. The projected share of pre-2020 RCV over this period is applied over the output period. This is to give a better indication of our proposed approach to providing a different level of regulatory protection. (The share over the 2020 to 2025 period is higher, so would overstate the level of protection.)
Sources of data	We use data from the wastewater the feeder model 1 as our starting point. This has been updated to take account of companies' 2020-21 annual performance reports. **Cost reallocation**: We adjust operating costs to reflect current cost allocation guidance ('Adjustment 1'). **Depreciation and asset base.** For option 3 we apply adjustment 2. Up to 2020: We use the depreciation and net MEAV information from our data request. From 2020 onwards: RCV and RCV run-off for bioresources.

Approach	Assumptions and reasoning
Allowed return	PR19 WACC post tax in real terms.
Enhancement costs	**Option 1 and Option 1 + modelling adjustments:** We have added the PR19 enhancement costs to the allowance provided through the benchmarking model. **Options 2 and 3**. As historical growth and enhancements costs are included in the data entering the benchmarking model, we have added a separate allowance for new quality enhancements.
Capex-opex split	We keep the capex-opex mix within totex in line with PR19 levels.
Other adjustments	At PR19 we used PAYG and RCV run-off rates to increase in-period cash flows where this is required to improve weak financial ratios. In this modelling we reverse any adjustments used to advance revenue to support financeability. We also remove any fast-track rewards from the PR19 models (although this does not impact the bioresources control directly, it could have an effect of the allocation of tax).
Modelling approach	All options other than option 3 make use of the PR19 building blocks approach. These are run through the PR19 financial model with updated expenditure allowances. Option 3 is modelled outside of the financial model to calculate a grossed up tax value from the cost modelling pre tax revenues.

A4 Model key calculations

Output	Calculation
Option 3: Estimated financing costs. Used as an input to the econometric model.	Net MEAV (historical period up to 2019-20) x Allowed return (forecast period) PR19 RCV (2020-21) x Allowed return (forecast period)
Option 3: Assumed split of opex, depreciation and financing costs. Option 3 implements our proposal to provide a different level of regulatory protection for pre-2020 RCV. As a first step, modelled costs are split into these three categories.	Calculated as the average share of opex, depreciation and financing costs over 2016-17 to 2020-2021. We recognise that calculating this over the output period is an alternative and may have merit.
Option 3: Assumed split of depreciation and financing costs on legacy and new assets. As a second step to implementing a different degree of regulatory protection for pre-2020 RCV, we undertake the above split.	Calculated based on PR19 information on pre-2020 RCV and post-2020 RCV. The derived split between pre-2020 and post-2020 RCV used RCV values for the period 2026-30. The % of RCV allocated to pre-2020 is derived as the sum of RPI and CPIH average RCV divided by the sum of RPI, CPIH and post-2020 average RCV. Consequently, the % of RCV allocated to post-2020 is derived as 1 minus the % of RCV allocated to pre-2020. Please note that average RCV is defined as (Opening RCV + Closing RCV)/2.

Output	Calculation
Split of wastewater network-plus and bioresources costs	**Option 1:** Funding is shared between bioresources and network-plus in accordance with companies' projected cost apportionment from their PR19 business plans. **Other options:** Costs are allocated in accordance with their actual costs in the historical period.
Tax	**Option 1, option 1 + modelling adjustments and option 2:** Tax is calculated in the financial model as it would have been at PR19. **Option 3:** The proportion of tax revenue calculated in the financial model under option 2 has been applied to the pre tax revenues under option 3 to give an indicative value for tax associated with option 3.

A5 Econometric analysis

A5.1 Impact of using backcasting data on the PR19 bioresources base cost models

Table A5.1 shows that using the backcasting data improves the performance of the PR19 bioresources econometric models. We find the overall predictive power of the bioresources models increases, as indicated by a higher R-squared. This means that the explanatory variables explain a higher proportion of the variation in bioresources costs.

These results give us confidence in the possibility of setting a separate catch-up efficiency challenge for bioresources at PR24.

Table A5.1: Econometric results: bioresources (BR) models with and without backcasting data

	Option 1: Business as usual approach and Option 1 + modelling adjustments			
	Totex models – backcasting data		Totex models – no backcasting data	
	BR1	BR2	BR1	BR2
Sludge produced	1.242***	1.271***	1.392***	1.407***
Weighted average density	-0.218**		-0.372**	
Load treated in band sizes 1-3 (%)	0.073***		0.071**	
Sewage treatment works per connected property		0.429**		0.520**
Constant term	-0.685	1.393*	-0.469	1.310*
Observations (2011-12 to 2020-21)	100	100	100	100
R-squared	0.854	0.823	0.77	0.732
RESET	0.444	0.176	0.672	0.255

A5.2 Impact of total cost vs. unit cost models

In table A5.2 we show the impact of total and unit cost models on the econometric results of options 2 and 3. We find that:

- The change from a total cost to a unit cost model does not have a meaningful impact on the econometric results. The normalization of total costs with sludge produced[25] impacts the estimated coefficient of sludge produced only (that is the variable used to divide total costs). For example, using the results reported in table A5.2 for option 2 (BR1) the estimation coefficient of the sludge produced for a unit cost model is 0.332 which is equivalent to 1.332 (= 1 + 0.332) under a total cost model.

- We note that by specifying the dependent variable as cost per unit of sludge produced does not, by itself, impose restrictions on our unit cost models. In particular, it does not impose the restriction that costs vary in the same proportion to the sludge produced[26]. To allow for economies (or diseconomies) of scale we have included a variable that relates to sludge produced as an explanatory variable in our models.

Table A5.2: Econometric results: total cost vs unit cost bioresources (BR) models

	Option 2: Partially reformed approach				Option 3: Fully reformed approach	
	Totex models		Unit cost models		Total cost model	Unit cost model
	BR1	BR2	BR1	BR2	BR3	BR3
Sludge produced	1.332***	1.335***	0.332**	0.335	0.968***	-0.032
Weighted average density	-0.227**		-0.227**		-0.373*	-0.373*
Load treated in band sizes 1-3 (%)	0.070***		0.070***		0.140***	0.140***
Sewage treatment works per connected property		0.405*		0.405*	-0.655**	-0.655**
Constant term	-0.958	0.978	-0.958	0.978	-3.818***	-3.818***
Observations	100	100	100	100	50	50
R-squared	0.845	0.811	0.292	0.14	0.939	0.636
RESET	0.069	0.098	0.44	0.438	0.133	0.629

[25] That is, total costs divided by sludge produced.
[26] This is known as "constant returns to scale".

A5.3 Option 3: fully reformed approach

In table A5.3 we report the econometric results from option 3 using: i) the specification for the two bioresources models we used at PR19 (BR1 and BR2); and ii) the 2011/12 to 2020/21 period. We find that:

- Models do not provide statistically significant results. This means that none of the cost drivers included in the models had a significant impact on explaining variations in company's bioresources costs. This could indicate data quality issues which affect the reliability of the results.
- Several cost drivers such as weighted average density and sewage treatment works per connected properties do not have the same expected signs reported at PR19 bioresources model. For instance, and as discussed in previous sections, the negative sign of the sewage treatment works per connected properties is inconsistent with engineering rationale.
- Models do not pass the RESET test. This means that we may need to include non-linear terms in the models.

Overall, the models that include depreciation and financing costs and a long time period, ie. 2011/12 to 2020/21, do not provide robust results. This could be driven by data quality issues which require further consideration. In annex 6 we discuss potential refinements to depreciation and asset values data and a request that wastewater companies provide this information based on our revised guidance.

Table A5.3: Econometric results: bioresources (BR) models

	Option 3: Fully reformed approach	
	Unit cost models	
	BR1	BR2
Sludge produced	-0.145	-0.232
Weighted average density	0.032	
Load treated in band sizes 1-3 (%)	0.017	
Sewage treatment works per connected property		-0.024
Constant term	-0.326	0.185
Observations	100	100
R-squared	0.092	0.032
RESET	0.034	0.006

A6 Methodology for calculating asset values and CCA depreciation

In our December document, we considered how we could establish an asset base and rate of depreciation to use in our econometric cost benchmarking models.[27] We proposed:

- before 2020: a standardised approach; and
- from 2020 onwards: using either a standardised approach based on current cost accounting (CCA) depreciation and NMEAV or a RCV run-off and RCV balance.

To inform our assessment we collected data from companies using a standardised approach back to 2011-12. This was based on CCA depreciation and net MEAV figures. We published our response to companies' queries on this topic.[28] We further sent out queries to companies after receiving the depreciation and asset value data on 10 February 2022.

Some of the issues that arose (which were identified both by us and companies) through our initial attempt at gathering this information data included:

- how to make adjustments for inflation;
- clarifying reported trends in additions and depreciation values;
- clarifying what the adjustments line should include; and
- the level of assurance required.

At this stage, we are not making a decision on whether we would use RCV run-off and RCV balances post 2020. However, we have learned from our initial attempt to implement a standardised approach how this approach could be improved. In particular:

- that we could be clearer how to calculate these figures;
- that greater disaggregation in the data companies provide to us would provide more assurance that companies' approaches are consistent; and
- the potential limitations of companies' datasets.

We have also further considered the approach we took at the PR19 revaluation exercise and what data can be taken from this.

In this annex we set out updated proposals for how the NMEAV and GMEAV of water companies' bioresources assets could be calculated over time in light of the figures from the asset valuation exercise and subsequent developments. This involves an updated methodology for the calculation of NMEAV and GMEAV from one year to the next and for the associated annual CCA depreciation figures.

[27] Ofwat, 'Our proposed approach to funding bioresources activities at PR24', December 2021.
[28] Ofwat, 'Bioresources net MEAV and depreciation data: Data request', January 2022.

This annex is structured as follows:

- A6.1 provides background discussion;
- A6.2 discusses ways to calculate post-2020 asset values;
- A6.3 sets out further guidance on the calculation of CCA depreciation;
- A6.4 discusses ways to calculate pre-2020 depreciation and asset values.

A6.1 Background: Recap on the outputs from the PR19 valuation exercise

At PR19 the sector undertook an asset valuation for bioresources. That exercise produced the following:

- **GMEAV at 31 March 2020**. This is the gross modern equivalent asset value for a company's bioresources assets at 31 March 2020, which we also referred as the estimated hypothetical new-build cost. The GMEAV is an input into this valuation exercise.

- **NMEAV at 31 March 2020**. This is the net modern equivalent asset value for a company's bioresources assets at 31 March 2020, which we also referred to as the economic value of bioresources assets. The NMEAV is calculated as the GMEAV minus a set of adjustments which are intended to capture differences between the hypothetical new-build assets used for the GMEAV figures and the actual assets owned by the company, which affect the value of those actual assets.

To go from GMEAV to NMEAV the following adjustments were allowed for.

- **Actual asset age:** Actual assets are generally older than hypothetical new-build assets. They therefore have a shorter remaining economic life and so a lower economic value. The older the actual assets are, the lower would be NMEAV relative to GMEAV.

- **Operating costs and maintenance:** A difference in the future operating and maintenance costs between the actual assets and those of the hypothetical new-build assets would affect its economic value. For example, if the actual assets have higher operating costs than the hypothetical assets then this would tend to decrease NMEAV relative to GMEAV.

- **Revenue generation capabilities:** A differences in the revenue generation capabilities (for example, from electricity generation) between the actual assets and the hypothetical new-build assets would affect its economic value. For example, if the actual assets have lower revenue generation capabilities than the hypothetical assets then this would tend to decrease NMEAV relative to GMEAV.

Under the proposed approach to bioresources benchmarking the NMEAV would be used as a measure of the asset value to which a notional cost of capital would be applied. This would calculate the notional finance costs for that company. This figure would then feed into the calculation of the cost per unit of sludge for each year of available data.

The aggregate GMEAV for each company would not feed into the cost data for the bioresources cost benchmarking exercise directly. GMEAV data, either for specific assets of specific components of the business, would be drawn on to calculate the CCA depreciation charges feeding into the benchmarking. GMEAV data can also help to explain differences in NMEAV and depreciation figures across companies and over time (and the impacts of any future bioresources asset valuation exercise).

For the PR19 valuation exercise companies produced detailed, bottom-up spreadsheet models to calculate the overall GMEAV and NMEAV estimates. This drew on a set of granular data at the level of individual sites and a series of asset categories within each site. The granular data included for following.

- Information on the modern equivalent, or hypothetical new-build, assets at each site, broken down by asset category.
- Estimates of the cost of those hypothetical new-build assets.
- Estimates of the economic lives of those hypothetical new-build assets.
- Information on the age of the company's actual assets.
- Adjustments for differences between actual assets and hypothetical new-build assets in terms of operating costs and revenue generation capabilities.

This bottom-up asset valuation model supported the figures for the bioresources NMEAV and, in turn, the RCV allocation between bioresources and wastewater network plus at PR19.

A6.1.1 Financial years covered by the PR19 valuation

The main aim of the valuation exercise was to produce an estimate of the economic value or NMEAV of each company's bioresources assets at 31 March 2020. The exercise started in 2017-18 so involved forecasts of how bioresources assets were expected to evolve over the period from the start of the year in which the valuation process commenced until 31 March 2020.

As part of the data tables that we issued for the PR19 valuation exercise, we required companies to provide estimates of:

- NMEAV at 31 March 2017.
- NMEAV at 31 March 2020.

- The additions and depreciation in the years 2017-18, 2018-19 and 2019-20 which explain the movement in net MEAV from 31 March 2017 to 31 March 2020.

Taken together, therefore, the PR19 valuation exercise produced NMEAV figures for four points in time: 31 March 2017, 31 March 2018, 31 March 2019 and 31 March 2020. It also produced CCA depreciation figures for three financial years: 2017-18, 2018-19 and 2019-20.

A6.2 Calculations for the evolution of GMEAV and NMEAV

A6.2.1 Introduction

This section sets out calculations to calculate GMEAV and NMEAV over time. The main focus is the evolution of GMEAV and NMEAV from 2019-20 going forwards. This draws on the outputs from the PR19 bioresources asset valuation exercise and updated data and analysis. We note the following points in relation to these calculations.

These calculations are designed with the specific aim of supporting the proposed approach to benchmarking water companies' bioresources costs. This involves benchmarking a measure of costs – covering operating expenditure, depreciation and finance costs – rather than benchmarking a measure of cash expenditure. While GMEAV and NMEAV, and related concepts such as CCA depreciation concepts have been used in the water industry in the past, this was for different purposes.

We take the bioresources RCV value at 31 March 2020 as the starting point for calculations of NMEAV given its role in the formal split of the wastewater RCV between bioresources and wastewater network plus. That is, we take:

- the RCV value at 31 March 2020 as the value of closing NMEAV for 2019-20 and then provide formulae for NMEAV for subsequent years.
- the corresponding gross asset value figure for 31 March 2020 from the PR19 asset valuation for the closing GMEAV for 2019-20 then provide formulae for GMEAV for subsequent years.

For each financial year we need to distinguish between the opening values of the NMEAV and GMEAV and the closing values.[29]

The calculations for GMEAV and NMEAV are specified in nominal terms in each financial year. For some purposes, such as econometric benchmarking using a panel dataset, we may want to put the annual data into a consistent price base. Although we provided guidance on

[29] In our December 2021 consultation, in the data request issued to companies, we distinguished between NMEAV b/f (brought forward) and NMEAV c/f (caried forward), which are essentially the same concepts.

the treatment of inflation in our response to companies' queries,[30] we can ensure this is done in a consistent way in a separate step after first deriving nominal values.

We distinguish between the NMEAV in respect of assets at 31 March 2020 and the NMEAV for assets added from 1 April 2020 onwards. This is relevant given our policy to apply different degrees of regulatory protection to the pre-2020 and post-2020 bioresources RCV.

In section A6.4 we discuss how figures for years prior to 2019-20 might be calculated for the purposes of compiling a longer historical dataset to feed into benchmarking analysis.

A6.2.2 Calculation for the evolution of GMEAV

This section sets out our proposed method for estimating GMEAV values over time from 31 March 2020. This is in nominal terms.

We recognise that as part of PR19 we only converted part of the RPI-indexed bioresources RCV to CPIH indexation over the 2020-25 period.[31] We nonetheless consider that CPIH is appropriate for the calculations of NMEAV from April 2020 onwards for the following reasons.

- CPIH is a better measure of inflation. Our PR19 decision to only partially transition away from RPI indexation was to enable company financing to adjust to the new measure of inflation and help companies manage the impact on bills.[32] We considered this important in particular due to the sector's high share of RPI-linked debt which would unwind slowly over time. This factor is less relevant given the UKSA's proposed reforms to RPI from 2030.[33] We are proposing to fully index the RCV to CPIH for PR24.[34]
- NMEAV is not intended to match RCV over time (for example, it will differ because NMEAV will reflect actual expenditure rather than price control expenditure allowances).
- The purpose of the NMEAV data is to set price control allowances for the 2025-30 period, which is a period over which we propose to inflate the RCV only by CPIH.
- We propose that for the bioresources benchmarking we would use a forward-looking WACC for the 2025-30 period. It would be internally inconsistent to apply a forward-looking WACC to historical NMEAV figures that have been rolled forward using RPI inflation. In our calculations of finance costs, a lower NMEAV (from using CPIH rather than CPIH/RPI) should be offset by using a CPIH-real rather than hybrid CPIH-real / RPI-real WACC for the notional finance costs in 2020-25.

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[30] Ofwat, 'Bioresources net MEAV and depreciation data: Data request', January 2021.
[31] Half of RCV at as 1 April 2020 was inflated by RPI and half was inflated by CPIH. Additions from 1 April 2020 was inflated by CPIH.
[32] Ofwat, 'Water 2020: our regulatory approach for water and wastewater services in England and Wales', May 2016, p5
[33] The UKSA is proposing to bring the methods and data sources of CPIH into RPI from 2030 (see: Response to the joint consultation on reforming the methodology of the Retail Prices Index – UK Statistics Authority)
[34] Ofwat, 'Appendix 10 Aligning risk and return', July 2022, pp.17.

Box 1: Calculation of nominal GMEAV over time

For financial years from t=2020-21 onwards:

$$GMEAVO_t = GMEAVC_{t-1} \times [CPIH_{t-1}/CPIH_{t-2}]$$

$$GMEAVC_t = GMEAVO_t + CPX_t - DISP_t$$

Where:

$$GMEAVO_t \text{ is the nominal value of the opening GMEAV for bioresources in financial year } t$$

$$GMEAVC_t \text{ is the nominal value of the closing GMEAV for bioresources in financial year } t$$

$$CPIH_t \text{ is the average value of the monthly value of CPIH in financial year } t$$

$$CPX_t \text{ is the nominal value of bioresources capital expenditure in year } t$$

$$DISP_t \text{ is the GMEAV (in current prices) of assets disposed of in year}$$

A potential issue with this formula is that the value of disposals ($DISP_t$) may not be directly observable and verifiable. Due to the practicalities of companies' accounting systems, the disposal of specific assets might not always be recognised immediately.[35] Also, there might not be a straightforward relationship between the actual assets of the water company which are disposed of in year t and the set of assumed hypothetical assets that underpin the value of GMEAV estimated during the valuation exercise at PR19, especially where the hypothetical assets assumed for the valuation differed significantly to the actual assets owned by the water company at the time of the valuation. These issues risk errors and inconsistencies in the values of the closing value of GMEAV estimated under this approach.

An alternative calculation is set out in box 2. This does not use data $DISP_t$ data. It assumes that the GMEAV of assets disposed of in year t (that is, $DISP_t$) equals the value of capital maintenance expenditure, such that these elements cancel out and GMEAV grows in line with the value of capital enhancement expenditure.

Box 2: Alternative calculation of nominal GMEAV over time

$GMEAVO_t$ calculated as in box 1.

$GMEAVC_t$ calculated as follows for all financial years:

$$GMEAVC_t \approx GMEAVO_t + ECPX_t$$

Where:

[35] For example, replacement of components of larger assets that are not disaggregated for accounting purposes.

$$ECPX_t \text{ is the nominal value of bioresources capital enhancement expenditure in year } t$$

The alternative approach set out above does not require any additional data. It uses data for the first approach and data on enhancement expenditure which is collected routinely. However, it has potential downsides as it:

- is an approximation – for example it ignores the possibility that assets are disposed of without corresponding capital maintenance expenditure;[36]
- it relies on the accuracy of companies' cost allocations between enhancements and capital maintenance; and
- ignores that capital maintenance would be subject to efficiency challenges over time such that the value of GMEAV also decreases over time before adding enhancement expenditure.

Our current preference is to use the first set of calculations above, subject to the requirement that:

- companies use all available evidence to report $DISP_t$, including data on capital maintenance expenditure; and
- provide an explanation in the event that $DISP_t$ is materially less than the value of capital maintenance expenditure in the relevant year.

This would draw on insight from the second approach above, without artificially constraining $DISP_t$ to the level of capital maintenance expenditure. This hybrid approach would address a practical risk with the first approach while avoiding being locked into the approximations that are involved in the second approach.

A6.2.3 Calculations for evolution of NMEAV

This section sets out our proposed method for estimating NMEAV values over time from 31 March 2020. This is in nominal terms.

The calculations box 3 are complicated by a need to distinguish between the NMEAV in respect of pre-2020 assets (that is, asset value at 31 March 2020) and the NMEAV in respect of post-2020 assets (that is, assets created from 1 April 2020 onwards).

Box 3: Calculation of nominal NMEAV over time[37]

[36] For example. assets disposed of as part of reductions in capacity provided in specific locations, or assets disposed of as part of enhancement projects.
[37] This calculation excludes proceeds from disposals. These could be included as part of companies' costs (effectively, income offsetting operating expenditure) that are used for benchmarking.

For financial years from t=2020-21 onwards:

$$NMEAVO_t = NMEAVOA_t + NMEAVOB_t$$

$$NMEAVOA_t = NMEAVCA_{t-1} \times [CPIH_{yet-1}/CPIH_{yet-2}]$$

$$NMEAVOB_t = NMEAVCB_{t-1} \times [CPIH_{yet-1}/CPIH_{yet-2}]$$

$$NMEAVC_t = NMEAVCA_t + NMEAVCB_t$$

$$NMEAVCA_t = NMEAVOA_t - CCDA_t + \Delta AHA_t - DWOA_t + AOA_t$$

$$NMEAVCB_t = NMEAVBO_t + CPX_t - CCDB_t - DWOB_t + AOB_t$$

$$CCD_t = CCDA_t + CCDB_t$$

$$DWO_t = DWOA_t + DWOB_t$$

Where:

$NMEAVO_t$ *is the nominal value of the opening NMEAV for bioresources in financial year t*

$NMEAVOA_t$ *is the component of* $NMEAVO_t$ *which captures the opening value of pre − 2020 assets*

$NMEAVOB_t$ *is the component of* $NMEAVO_t$ *which captures the opening value of post − 2020 assets*

$NMEAVC_t$ *is the nominal value of the closing NMEAV for bioresources in financial year t*

$NMEAVCA_t$ *is the component of* $NMEAVC_t$ *which capures the closing value of pre − 2020 assets*

$NMEAVCB_t$ *is the component of* $NMEAVC_t$ *which capures the closing value of post − 2020 assets*

CCD_t *is the nominal CCA depreciation amount for year t*

$CCDA_t$ *is the nominal CCA depreciation amount for pre − 2020 assets for year t*

$CCDB_t$ *is the nominal CCA depreciation amount for post − 2020 assets for year t*

ΔAHA_t is the *change* in the value of the Net Present Value (NPV) adjustment for differences in revenues and operating costs between hypothetical and actual assets from the start of year t to the end of year t

$DWOA_t$ ($/DWOB_t$) is the value of pre-2020 (/post-2020) assets disposed of in year t which have not been fully depreciated at their disposal date (i.e. nominal GMEAV of those assets less total of the depreciation amounts for that asset to date).

AOA_t ($/AOB_t$) *is the value of other adjustments to the pre* $-$ 2020 (/*post* 2020) *asset value in year to which we determine to apply in year t*

Change in the value of the NPV adjustment

As discussed in section A6.1, the calculation of NMEAV at 31 March 2020 was adjusted for differences between the hypothetical assets costed in the PR19 valuation exercise and a water company's actual assets, either in terms of ongoing operating costs or in terms of revenue generation capabilities. This adjustment would have been applied to NMEAV but not GMEAV.

That adjustment is specific to a point in time. As the company replaces and updates its assets, we expect the difference between the company's actual assets, and the assets assumed as modern equivalents during the PR19 valuation, to gradually reduce. Therefore, it does not seem appropriate to hardcode these adjustments.

Therefore, we include the term ΔAHA_t. This enables a gradual unwinding of these adjustment. For example, a positive adjustment under ΔAHA_t might be made when assets with low energy generation assets come to be replaced. The appropriate set of adjustments for ΔAHA_t would depend on the details of the adjustments applied to NMEAV at the PR19 valuation exercise.

We see two main ways that a company might populate the ΔAHA_t term, in cases where it made material adjustments at the PR19 valuation for differences between actual and hypothetical new-build assets, in respect of ongoing operating costs or in terms of revenue generation capabilities.

- **Gradual unwinding.** The company could take the value of the adjustment at PR19 and then depreciate it on a straight-line basis from 1 April 2020 onwards. This would use a reasonable assumption on the average remaining asset life for those actual assets were considered to have higher running costs or lower revenue generation for the purposes of the adjustment calculated for the PR19 asset valuation.
- **Case-by-case adjustment.** The company could determine an appropriate adjustment on a case-by-case basis each year from 1 April 2020, taking account of (i) which specific actual assets were considered to have higher running costs or lower revenue generation for the purposes of the adjustment calculated for the PR19 asset valuation; and (ii) the date at which those assets come to be replaced.

Under both of these approaches, the calculation of ΔAHA_t should recognise that, since the formulae we set out above for NMEAV are expressed in nominal terms, and involve CPIH inflation indexation over time, the value of any adjustments for operating costs or revenue generation applied in year t should be calculated in a way that takes appropriate account of the impact of CPIH inflation in the period from 31 March 2020 to year t.

For example, if a company made an adjustment of £10m (in 2019-20 prices) which it decides to depreciate over five years from 1 April 2020 under the first approach above, then the value of ΔAHA_t in say 2023-24 would not be £2m but rather £2m updated for cumulative inflation indexation from 2019-20 to the 2023-24.

Our current view is that 'gradual unwinding' should be used by companies. This seems more proportionate and provides a clearer and more reliable pathway for adjustments to be unwound over time.

To avoid any double counting, the unwinding of adjustments for operating costs or revenue generation should not be made implicitly within the CCD_t term above. For example, for any assets for which such an adjustment was applied at the PR19 valuation, the straight-line depreciation charge feeding into CCD_t should reflect the assumed asset life and the GMEAV of those assets, without taking that adjustment into account.

Other adjustments

We do not plan to allow companies open-ended flexibility to make adjustments to reported NMEAV. This could pose an unnecessary risk to customers.

We have allowed for the possibility for us to make other adjustments to the calculation of NMEAV above (the AOA_t and AOB_t terms) where appropriate. This flexibility is appropriate especially at this early stage of the proposed approach for the bioresources price control when the type of calculations set out above are new. That said, given the detailed guidance we provided on the PR19 valuation, the feedback and review process and companies' own assurance requirements, we would not expect any significant errors to be identified.

A6.2.4 Potential adjustments for updated asset values

The economic value of asset values could change in a way that is not captured by the adjustments for inflation in the calculations above. For example, from 2025 onwards the costs of some types of assets might rise at a faster rate than CPIH and others more slowly than CPIH.

However, for PR24 at least, we do not plan to permit special adjustments for inflation (that is, for changes in prices other than CPIH) or updated information on the estimated value of hypothetical new-build assets. This is for customer protection purposes. To take an extreme example, if all companies revalued existing bioresources assets based on a view that asset costs have risen by more than CPIH inflation since 1 April 2020 this could, via benchmarking at PR24, lead to windfall gains to water companies (at least without compensating action). Our approach here is, in effect, a regulatory policy decision on the allocation of inflation risk (we would still be taking account of expectations of cost inflation when we make assumptions on productivity growth, frontier shift and RPEs at the price review). Our approach would also protect companies from under-remuneration in a situation where asset values have, in practice, risen by less than CPIH inflation.

There may be value in some form of asset revaluation exercise in the future. This should be done in a controlled and structured way which considers how best to protect the interests of customers in context of changing asset values. A full revaluation at PR24 is not proportionate or a well-targeted use of the sectors resources given the exercise done at PR19.

Therefore, companies should use GMEAV and NMEAV figures derived from – and consistent with – the asset valuation from PR19, governing by explicit formulae as set out above.

A6.3 Further guidance regarding CCA depreciation

A key component in the calculations above for $NMEAV_t$ (and for our proposed approach to bioresources cost benchmarking) is the depreciation amount on a current cost accounting basis (CCD_t). CCD_t is likely to differ substantially from depreciation figures captured in companies' internal accounting systems and used for either statutory financial reporting purposes or regulatory reporting purposes which is done a historical cost basis.

We have considered different ways that companies could calculate CCD for the purposes of the bioresources cost benchmarking and the extent we should provide flexibility for how CCD figures are reported. We describe two alternative approaches below, some further considerations and our current thinking on the most appropriate approach for PR24.

A6.3.1 Bottom-up method to calculate depreciation

Under this approach a company would maintain and annually update the bottom-up and granular asset-level spreadsheet used for the PR19 bioresources asset valuation exercise (including the data on hypothetical new-build asset values and asset lives). The value of CCD_t for each year might be calculated directly from that spreadsheet, in a consistent way to that used to derive the NMEAV figure for PR19. The company would not need to provide the updated asset-level spreadsheet to us each year. However, this would need to be maintained internally and available on request, for example, in the event of significant queries or concerns about the aggregate depreciation data to us.

As part of the annual update of its bottom-up spreadsheet the company would need to do the following.

- Maintain a version of the bottom-up asset valuation for each year from 2020-21 onwards, for example, as a separate tab on the same sheet.
- Adjust all asset values for inflation without making any further adjustments for changes in asset value.
- Distinguish between pre- and post-2020 assets.
- Recognise disposals for the modern equivalents of assets that are disposed of in each year, including assets replaced through capital maintenance expenditure, via removal of these assets from the spreadsheet (or at least removal from influencing key outputs such as GMEAV, NMEAV and depreciation values).
- Add assets and associated value to the spreadsheet for all assets purchased from 1 April 2020, covering capital maintenance and enhancements, based on the expenditure incurred on these assets.
- Make asset life assumptions for all new assets without changing the asset life assumptions for existing assets.
- Calculate the annual depreciation charge for each year by combining granular asset-level information with corresponding asset life assumptions and using a straight-line basis.
- Be able to reconcile this to the fixed asset register maintained for statutory purpose, that is, to recognise hypothetical assets versus actual assets to ensure completeness and consistency of assets.

As with the calculation of GMEAV in section A6.2 above, a complication concerns disposals which might be difficult to recognise in a context where the hypothetical assets included in the bottom-up valuation spreadsheet differ substantially from a company's actual assets, in a way that makes it difficult to link actual asset disposals (for example, as part of capital maintenance expenditure) to the spreadsheet. Furthermore, the structure of the spreadsheet for the valuation exercise at PR19 was not designed for the purpose of producing annual depreciation charges and tracking asset values over time.

A6.3.2 Method involving split between business as at 1 April 2020 and subsequent enhancements

An alternative approach to the calculation of depreciation would not require annual updates of the full bottom-up valuation spreadsheet. This would distinguish two components of the overall bioresources GMEAV:

- the GMEAV for the bioresources assets required as at 31 March 2020; and
- the GMEAV attributed capital enhancements from 1 April 2020 onwards.

The first component would reflect the scale and scope of assets assumed to be required as at 31 March 2020 for the purposes of the PR19 valuation exercise.

Using this decomposition of total bioresources GMEAV, a simpler approach to calculating depreciation would be used for the first component, as an approximation. Depreciation would be calculated separately for each component before being aggregated across the two.

Note that the distinction used here is not the same distinction as for pre-2020 and post-2020 investment for the purposes of our policy on the bioresources RCV. As we envisage here, the GMEAV of any post-2020 capital maintenance expenditure to maintain the scale, scope and quantity of services at levels at 31 March 2020 would be captured under the GMEAV bioresources assets required at 31 March 2020.

CCA depreciation for bioresources assets required at 31 March 2020: The annual depreciation would be calculated by taking the GMEAV of the overall bioresources business which is not attributable to enhancement expenditure from 2020-21 onwards (with GMEAV calculated in a way that in consistent with the approach in section A6.2), and then dividing this by an assumption for the weighted-average asset life. The assumption for the weighted-average asset life would be calculated by taking the GMEAV calculated for 2019-20 from the PR19 valuation spreadsheet and dividing this by a corresponding annual depreciation charge for 2019-20 calculated using granular data on asset values and asset lives from this spreadsheet.

An issue with this approach is that, at that point, all assets would be assumed to be fully depreciate yet half of the assets would still remain in use. This means this approach would tend to overstate depreciation before this point and understate it thereafter.

CCA depreciation attributed to capital enhancements from 1 April 2020: For this component, each company would develop an asset-level spreadsheet for its outturn enhancement expenditure from 1 April 2020 onwards. This would draw on the same granular asset categories as used for the PR19 valuation exercise, but organised in a way that allows for annual depreciation charges to be calculated for each year from 2020-21. Within this spreadsheet:

- Asset values from enhancements should be increased each year by CPIH, in a way that feeds through to the depreciation charges.
- Depreciation would be calculated on a straight-line basis based on asset life assumptions for the enhancement assets.
- The spreadsheet should recognise any disposal of enhancement assets that were created from 1 April 2020 onwards.
- The same spreadsheet could be applied over time in a consistent way.

It is possible that the figures coming out of the asset-level spreadsheet for enhancements referred to above could be similar to the depreciation charges calculated for statutory financial reporting purposes in respect of enhancement assets, perhaps with differences due to the adjustments for inflation. Nonetheless, it would be important for transparency to have a spreadsheet as envisaged above which shows how reported capital enhancement expenditure relates to the reported CCA depreciation figures. This would also help avoid impacts on the depreciation figures used for cost benchmarking purposes of aspects of statutory financial reporting which might not be appropriate to take into account for those purposes.

Under this simplified approach, the assets disposed of in year t which have not been fully depreciated at their disposal date (the $DWOA_t$ and $DWOB_t$ terms in the NMEAV equations in box 3) should be set to zero, other than for post April 2025 enhancement assets, to avoid double counting given the approximate way that depreciation for the bioresources assets required at 31 March 2020.

A6.3.3 Proposed approach to recording CCA depreciation

Our preferred approach is the bottom-up method to calculate depreciation. Our experience from collecting depreciation data and our example modelling indicates that it is important that this data is provided in a clear, accurate and consistent manner. We consider this is best achieved through this approach. As companies already have access to a breakdown of the asset used for the PR19 valuation exercise, this should not impose a significant additional burden.

A6.3.4 Rules on asset life assumptions

The depreciation figures reported by companies would depend on estimates of the economic life of bioresources assets. These estimates are subject to uncertainty. Over time an improved understanding of asset lives might be gained, which might call for reconsideration of asset lives that have been assumed.

In our December document, we proposed that companies would have the option to reassess asset life data compared with 2017.[38] We have considered this further. We now consider that it is important that companies are not permitted to make any retrospective changes to asset life assumptions, whether for assets valued at PR19 or subsequent enhancement assets. This is for the purposes of customer protection.

For instance, if companies were to extend the assumed asset life of assets included in their GMEAV value at 31 March 2020, there are risks that this could lead to excessive costs to

[38] Ofwat, 'Our proposed approach to funding bioresources activities at PR24', December 2021, pp. 20

customers via the depreciation charges reflected in the cost benchmarking exercise. This could arise, for example, if the impacts of changes to an asset life assumption were applied retrospectively such that the reported NMEAV of the bioresources assets increased simply as a consequence of changes to asset life assumptions.

In principle, this issue could be dealt with through recognition of a capital gain of some form when an asset life is extended, and then deducting the value of that gain from costs feeding into the benchmarking, or by ensuring that any changes to asset life assumptions only have a forward-looking and not retrospective effect. However, our updated view is that, in the interests of proportionality, it would be better not to permit companies to change assets life assumptions for any assets arising from expenditure incurred in previous years.

Companies would be able to make use of improved understanding of asset lives when making forward-looking assumptions on asset lives for new capital additions.

A6.4 Backcast data for 2019-20 and before

The calculations for GMEAV and NMEAV above relate to the period from 1 April 2020 onwards. For the purpose of our bioresources benchmarking there are potential advantages to using a longer time series of historical data as it can improve the precision of model estimates.

We have considered further what data from the period before 1 April 2020 might be compiled as potential input to our benchmarking at PR24. This takes account of our initial experience of collecting this data. We discuss three approaches below.

A6.4.1 Backcast option A: Calculations consistent with approach from 1 April 2020 onwards

Under this approach, the calculations implied by the formulae for NMEAV in section A6.2 and the methods proposed for calculation of depreciation in A6.3 would be used directly to calculate NMEAV and CCA depreciation figures for the period before 31 March 2020. This approach would be most conceptually correct and consistent over time, but would be more demanding in terms of data requirements and resource.

A6.4.2 Backcast option B: Approximation of depreciation and NMEAV in period before 2019-20

This approach starts with the opening NMEAV at 1 April 2020 and the depreciation charges for 2020-21 based on the PR19 asset valuation (and excluding depreciation for any enhancements from 1 April 2020 onwards) and the approach set out in section A6.3 above. It then works backwards to derive approximate estimates for CCA depreciation and NMEAV for prior years.

This approach involves a number of approximations for the purposes of simplification and proportionality, relative to the calculations for NMEAV in section A6.2 and the methods proposed for calculation of depreciation in A6.3.

- It builds on the assumptions involved in the simplified alternative approach to GMEAV in section A6.2 and the method for calculating depreciation by splitting between the bioresources business a 1 April 2020 and subsequent enhancements from section A6.3.
- It ignores several elements of the NMEAV calculation from section A6.2 (e.g. the ΔAHA_t) term.
- It implicitly assumes that depreciation that is not attributable to enhancements is the same as capital maintenance expenditure in each year, so that these cancel out and are ignored from the calculation of NMEAV.

The calculations for this are in box 4. This approach starts with the 2020-21 figures and then works backwards in time, so shows calculations for values in year t as a function of values in years t+1.

Box 4: Potential formula for the calculation of historical nominal depreciation and NMEAV

For financial years from 2019-20 and prior to that:

$$NMEAVO_t \approx NMEAVC_t - ECPX_t + CCDE_t$$

$$NMEAVC_t = \frac{NMEAVO_{t+1}}{[CPIH_t/CPIH_{t-1}]}$$

$$CCD_t \approx \frac{CCD_{t+1} - CCDE_{t+1}}{CPIH_{t+1}/CPIH_t}$$

Where:

$CCDE_t$ is that part of CCD_t which is attributable to enhancements made between year t and 2019-20 (inclusive)

A6.4.3 Backcast option C: Use data from 2017-18 from PR19 valuation

As highlighted in section A6.1, the PR19 bioresources allocation exercise produced figures for NMEAV at 31 March 2017, 31 March 2018, 31 March 2019 and 31 March 2020, as well as the additions and depreciation in the years 2017-18, 2018-19 and 2019-20 which explain the movement in NMEAV from 31 March 2017 to 31 March 2020.

On the one hand, these figures are readily available although they would need to be adjusted for the applicable inflation index to place into nominal terms as specified in sections A6.2 and A6.3

On the other hand, this data is not necessarily consistent with the approach in sections A6.2 and A6.3 above. For example, in relation to the way that CCA depreciation is calculated and the degree of transparency on this.

A6.4.4 Adjustments for inflation in the historical data series

When we carry out benchmarking analysis, we would first deflate all nominal costs by CPIH to produce figures in a constant price base, before using the data into our econometric cost benchmarking models. This assumes that, as proposed in annex A6.2, the NMEAV of bioresources in nominal terms at 31 March 2020 is consistent with the RCV for bioresources at that data in nominal terms.

Some data from the PR19 valuation exercise will be reported in the historical price base used for the PR19 review (2017-18 prices). Where this is the case, we consider that RPI indexation should be used to produce nominal figures for 31 March 2020, as the RPI was the applicable inflation index for the period to the end of 2019-20.

A6.4.5 Discussion of backcast options

We consider that there are pros and cons of each approach.

- For a longer historical series, option A could be most appropriate. This could provide a time series of historical data that is consistent with our post-2020 approach. However, Option B would be simpler for companies to implement.
- For a shorter historical series, option C may be most appropriate. This would provide figures consistent with the PR19 revaluation exercise.

At this stage, we do not have a preferred approach. Before making a decision, we would like to collect data using these three approaches and consider stakeholders' views.

A7 Summary of stakeholder responses

In December 2021 we consulted on a proposed approach to funding companies' bioresources activities.[39] In our draft methodology document, published in July, we summarised stakeholder responses and provided our assessment to most of these proposals.[40] We said we would cover relevant issues to do with data in this supplement. These are discussed below.

A7.1 Application of backcasting data

In our draft methodology document, we discussed the options we considered in relation to backcasting data.[41] We noted that most stakeholders supported our preferred approach which involves companies providing adjusted historical data, but also noted that some companies suggested we should take steps to ensure the data provided is accurate.

Below we consider specific points concerning how this data could be applied.

Stakeholder responses

Anglian Water, Dŵr Cymru, Thames Water, United Utilities, Wessex Water, South West Water and Northumbrian Water raised concerns about data quality. Companies were concerned that older data would be less robust. Severn Trent Water and Southern Water considered that the lack of consistent data would not enable appropriate modelling of proposals. Anglian Water, Yorkshire Water, Thames Water and Wessex Water all identified years before which they considered their data may be less reliable. They stated that the costs of sludge liquors and energy use were not reported at all for most of the years in question. Therefore, they need to make assumptions on how to back calculate this data which could affect the level of accuracy. Anglian Water and Wessex Water stated that we should consider using data from 2016-17 or 2017-18 onwards in the econometric models as this data will be more comparable. South West Water suggested postponing the proposed approach to PR29 to enable appropriate data to be collected in the meantime.

Severn Trent were confident that data for overheads and energy re-allocation could be provided to a good degree of accuracy. However, data for sludge liquor costs is expected to be harder to back-cast. Moreover, Severn Trent, United Utilities and Northumbrian Water outlined their assumptions on how they would backcast sludge liquors re-allocation costs and energy use. Northumbrian Water also stated that we should publish this data so that companies could compare their adjusted data with others.

[39] Ofwat, 'Our proposed approach to funding bioresources activities at PR24', December 2021.
[40] Ofwat, 'Appendix 4 – Bioresources control', July 2022.
[41] Ofwat, 'Appendix 4 – Bioresources control', July 2022, pp.14 -17.

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We have taken steps to ensure companies' approach to this work is appropriate.

- We undertook a query process in advance of companies submitting data to us to understand and provide feedback on companies' potential approaches and assumptions used for this.
- We took steps to ensure companies' allocation of costs between cost lines was done in a standardised manner that was consistent with our guidance. In many cases, we intervened to suggest reallocations to companies' costs ourselves. Examples of these steps are as follows:
  - ensuring the recharge data for sludge liquors is in the appropriate data column, that is, recharged to sludge treatment rather than remaining in network plus;
  - ensuring both opex and capex sludge liquors costs are recharged appropriately;
  - the difference of the energy recharges from network plus to bioresources attributable to the new methodology are added appropriately; and
  - asking companies for confirmation that they followed the Jacobs methodology on sludge liquors recharge calculation.

In annex 2 we provide a summary of the adjustments we have made which has informed the modelling in this supplement. However, we recognise that at the time of publication we had not undertaken a full review and are undertaking further checks on the data.

We will include all bioresources data, including necessary back-casting adjustments, in the full base modelling dataset to be published in Autumn 2022. We are going to publish a draft base modelling dataset later in September which will consider changes applied as a result of the queries process we are undertaking. We would welcome stakeholders' comments on the bioresources back-casting data included in the draft dataset.

A7.2 Depreciation data vs. expenditure data

In our December document, we considered the relative merits of using capex data and depreciation data in our econometric cost benchmarking models.[42]

Stakeholder responses

Most companies considered there were pros and cons of each set of data, were indifferent and/or considered both sets of data should be tested.

[42] Ofwat, 'Our proposed approach to funding bioresource activities at PR24', December 2021.

Anglian Water, Southern Water, Northumbrian Water and Thames Water said it would be more appropriate to use capex data than depreciation data. Points raised included that companies' investment plans are not in a steady state, using depreciation data adds complexity and depreciation data can be distorted by the application of different accounting policies. Dŵr Cymru requested further clarification on the proposals regarding depreciation.

Thames Water stated that if depreciation data was used it should be normalised to allow direct comparisons across companies and assets. For instance, it noted that the choice of a different asset life (or a different depreciation profile) for a similar asset by two different companies should not be allowed to impact on whether one company is considered more efficient than another.

Yorkshire Water, Severn Trent and Wessex Water noted that if the switch from capital expenditure to depreciation data is implemented, then we would need to ensure consistency and comparability of depreciation data. Wessex Water also noted that a full MEAV revaluation to inform the depreciation could be another valid option.

Northumbrian Water stated that separating operating expenditure and capital costs would not be consistent with the totex regime. It stated that this may create an opex or capex bias in investment decisions or accounting policies, which totex was designed to avoid. Moreover, modelling of depreciation could mean that costs already incurred are subject to a second round of catch-up efficiency challenge.

Wessex Water noted that our proposed approach considers benchmarking costs based on companies' subjective and hypothetical MEAV and CCD estimates.

South West Water and United Utilities noted that both approaches should be tested.

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We agree that both sets of data should be tested. In this document, we set out example model results using these two different sets of data.

We agree that depreciation data, if used, should be as far as possible comparable and consistent. We also agree our approach should be clearer. We set out further guidance to help achieve this in annex 6. As part of this we propose that companies should not be allowed to change the asset life of existing assets for customer protection reasons.

We do not agree that our proposed approach could create opex or capex bias in investment decisions. We consider that our proposed approach would allow companies to find the most efficient solutions to their bioresources needs by exploring trading opportunities. In our PR24 draft methodology we set out the different degree of regulatory protection for pre-2020 and post-2020 assets.

We do not agree that a revaluation is appropriate at this time given the recent exercise undertaken for PR19. This is discussed further in annex 6.

A7.3 A standardised approach to capital costs before 2020

In our December document we proposed a light-touch approach to current cost accounting based on straight-line depreciation.[43] This would apply before 2020 when no separate RCV for bioresources exists.

Stakeholder responses

In general, stakeholders support our proposed approach.

Thames Water said that as a MEAV valuation will not be materially different to the RCV valuation, there would not be any benefit in creating additional work to produce a new asset value that is effectively the same. The RCV valuation is well understood by all parties. Other key points that were made by other stakeholders were:

- further consultation on the data would be required before including this in a cost assessment exercise;
- it may make reconciliation with the bioresource RCV allocation exercise more challenging;
- it could add noise to our models especially if companies use different methodologies;
- we should be clear on how inflation should be treated;
- ofwat should also consider using the RCV-run off rates as these were by default the natural rates; and
- we should consider the annuity approach across a shortened historic period in case this provides for a smoother capital cost.

Our assessment and draft methodology proposals

We are publishing the data companies provided to us alongside this document.

We retain the view that (compared to full current cost accounting) a lighter-touch approach to current cost accounting (that is, taking account of the PR19 revaluation exercise and updating this by taking into consideration CPIH inflation and other changes in assets) and a straight-line approach to depreciation is suitable for the purposes of collating data on depreciation for our approach to bioresources cost benchmarking at PR24.

We are though setting out further refinements and clarifications regarding our approach to estimating depreciation and asset values in annex 6. Our updated proposals will, amongst

[43] Ofwat, 'Our proposed approach to funding bioresource activities at PR24', December 2021.

other things, help to ensure that inflation can be treated consistently and the asset values reported can be reconciled with those of the PR19 revaluation exercise. One change to our proposals is that companies would not have the option to reassess existing asset life data compared with 2017. We welcome views from stakeholders on our updated proposals.

As regards the choice of straight-line depreciation rather than alternative methods (that is, the reducing balance method and present value method), we make the additional observations as follows.

The reducing balance method has been used to calculate for RCV run-off. Depending on the methodology used for determining allowances for RCV run-off, the rate can vary by year and could be calibrated to fit with whatever depreciation profiles are considered appropriate or an average value across years can be taken as an approximation. For instance, the amount of RCV run-off could be derived entirely using a straight-line approach to depreciation applied to granular asset data, with the run-off rate then calculated by dividing the aggregated depreciation amounts by the forecast RCV in each year. And even if the same rate is applied over a five-year period, this might be taken as a simplified approximation for an underlying depreciation profile.

The use of the present value approach for the purposes of the PR19 valuation exercise reflects the specific context and role of that exercise. In that exercise, there was no direct need for annual depreciation charges. Instead, there was a need to make adjustments for the difference in estimated economic value between hypothetical new-build assets, which had been assumed for valuation purposes, and a company's actual assets which would generally have shorter remaining asset lives than the assumed new-build assets. These differences could be substantial – for instance, an actual asset might be 18 years old relative to an economic life of a corresponding new-build assets of 20 years. For these adjustments, there were a range of material issues affecting the valuation, and in turn the appropriate RCV allocation, including the time value of money, which could be better reflected under a present value approach than a straight-line approach. We consider that these issues are less important for the purpose of calculating annual depreciation amounts to use as inputs to the bioresources cost benchmarking exercise at PR24. We have not identified reasons why the considerable extra complexity of the present value approach would be proportionate for our purposes at PR24.

A7.4 Using RCV run-off as our measure of depreciation over the 2020-25 period

We proposed using companies' RCV and RCV run-off as the asset base and depreciation charge after 2020, rather than the standardised approach we propose for pre-2020 RCV. We considered that RCV run-off should provide an acceptable estimate for the annual depreciation charge (and asset base) that we would use in our assessment and may not be significantly different from the standardised approach. We said though that we would test whether our assumptions about the data are correct and review whether our preferred option is appropriate.

Stakeholder responses

Responses were mixed. Anglian Water supported our proposed approach even if the data could be different. Northumbrian Water supported this approach and confirmed that their RCV run-off was similar to the standardised approach. Thames Water said this approach was the most transparent and consistent approach.

United Utilities, South West and Dŵr Cymru raised concerns that PR19 RCV run-off might not be comparable across companies due to differences in run-off rates. Severn Trent Water said both approaches should be tested.

Our assessment and draft methodology proposals

We have considered whether the standardised approach and RCV run-off is materially different as shown in annex 2. We found that RCV run-off was higher than the standardised approach.

At this stage, based on the data we have received to date, we consider that our preferred approach is an appropriate method to use in our example modelling in this supplement. (Albeit, that at this stage this only affects one year of data in the sample used for our econometric modelling.) However, we are keeping our approach under review. In annex 6 we propose a refined approach to estimating depreciation and asset values.

A7.5 Standardising expenditure data

We said that if we did not use depreciation data we would standardise companies' capital expenditure data with a CPIH adjustment.

Stakeholder responses

All companies supported this. Anglian Water suggested 'triangulating' different methods.

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We remain of the view that such an adjustment would be appropriate.

A7.6 Depreciation and net MEAV data

Alongside our December 2021 document, we requested a timeseries of net MEAV and depreciation data.[44] We asked if there were any comments on this. We published a response to all the questions we have recently received on this topic.[45] On 10 February 2022 we received the information request file completed by all companies. Anglian Water, Northumbrian Water, South West, Welsh Water, Wessex Water and Yorkshire Water provided a commentary document to the above information request file. We reviewed the data and sent out further queries to several companies.

Stakeholder responses

United Utilities asked to review the data provided by companies. We have also received specific comments and queries through this consultation and our later engagement with companies as discussed in annex 6.

Our assessment and draft methodology proposals

We are publishing the data we received from companies. We have engaged with companies on their specific issues as appropriate. Annex 6 sets out updated proposals for how bioresources asset values and depreciation could be calculated over time.

[44] Ofwat, 'Bioresources net MEAV and description data: Data request', December 2021.
[45] Ofwat, Response to: ' Bioresources net MEAV and depreciation data: Data request', Jan 2022.

Ofwat (The Water Services Regulation Authority) is a non-ministerial government department. We regulate the water sector in England and Wales.

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