Northumbrian Water response to Ofwat's March 2018 consultation on econometric cost modelling

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1 Overview

We welcome the opportunity to respond to Ofwat's consultation on econometric cost modelling. Given the tight deadline for responses we have focussed our analysis on the Ofwat models included in the consultation, which are the key ones for discussion.

We have previously emphasised the importance of Ofwat's models being regarded as independent of company alternative models.

The modelling results in the consultation at this stage reflect historical costs. In our business plan, we intend to set out efficiency targets to reach at least upper quartile efficiency rankings by 2020, with further annual frontier efficiency targets over 2020-25.

We welcome Ofwat's use of a base totex approach to cost assessment. This in our view allows for totex to be comparable across the industry, regardless of the varying size of the enhancement programme. It has clearly encouraged better specified models than those in place for PR14.

We also support Ofwat's preference for models that make intuitive sense and avoid undue complexity. In comparing Ofwat models to the ones suggested by companies, it is noticeable that Ofwat uses less drivers and a simpler approach, which we welcome. In our review of the Ofwat models, we have generally tried to identify which are the best of the Ofwat models presented and which are the most appropriate or inappropriate cost drivers within them.

We have completed the consultation response spreadsheet, with the scoring and comments consistent with this response.

We wish to make a number of points regarding the appropriate level of model aggregation which could not be made in the spreadsheet template. We believe that the aggregated models (both medium and high levels) are more stable and reliable than the disaggregated ones and that Ofwat should give greater weight to the aggregated models. In our view it is not surprising that more granular models are less stable as there is more scope for variation between companies in cost allocation or in the physical assets associated with narrowly defined sub service categories.

We believe there is a material error in Ofwat's calculation of industry actual base totex figures for wastewater bioresources. In calculating the industry costs, Ofwat has not included 'income treated as negative expenditure'. Income from energy generation is under management control and companies are required to account for this as a negative operating cost. This is a significant contributor to net bioresources costs. The correction is easily made and does not affect the models themselves, just the efficiency results. It is worth noting that for PR14, this negative opex was included in the cost modelling assessment. In Appendix 2 of Water 2020 (May 2016), Ofwat made clear the importance of preserving incentives for income generation from bioresources activities, and that efficiency was to be assessed net of this income.

Finally, we welcome Ofwat's clear statement on the costs to be excluded from the water models. We agree with all the exclusions proposed, in particular the reasoning behind excluding abstraction charges.

2 Cost Adjustments

We can confirm that, at this stage, we do not intend to submit any cost adjustment based on the published base totex models in our business plan. This is predicated on the assumption that Ofwat retains the exclusions from the cost models as set out in the consultation – specifically; abstraction charges, third party costs and enhancement expenditure. We also assume that Ofwat will include a deprivation cost driver in the retail cost assessment models, consistent with the six bad debt models.

We believe that, in not making any cost adjustment claims, our approach is consistent with best practice as outlined in Ofwat's PR19 methodology and in particular with the extract from that document provided below:

"We will take account of cost adjustment claims in assessing business plan totex efficiency in the initial assessment stage. We will consider the quality of claims and a company's approach to the process. Other things being equal, a company that raises cost adjustment claims only where necessary, and where the claims are well evidenced and efficient, is likely to score higher in the cost efficiency test than a company that uses the process less carefully, and whose claims are unwarranted and of low quality"

3 Principles of cost assessment in the price review

In our response to the call for cost models for evidence issued on 8th March, we set out a series of key principles that should be adopted when undertaking cost modelling. We are pleased to note that Ofwat has mirrored these very closely in its consultation.

Ofwat Principle	**NWL Comment**
1. Use engineering, operational and economic understanding to specify an econometric model, and form expectations about the relationship between cost and cost drivers in the model.	We support the use of a single scale driver in principle. We also support the importance of considering the operational and engineering basis of cost drivers.
2. Assess whether the estimated coefficients are of the right sign and of plausible magnitude	We agree that signage and size of coefficients should be plausible – cost drivers should be used in proportion to the costs they relate to.
3. Consider if the estimated coefficients are robust. For example, are they stable and consistent across different specifications? Are the estimated coefficients statistically significant?	We agree in principle that coefficients should be statistically significant.
4. Assess the consequences of cost drivers under management controls, in particular, the risk of any perverse incentive	We agree that costs drivers under management controls should be excluded. We have referred to this test in our review of the models as there are some models and drivers that fail this test in our view.
5. Consider the statistical validity of the model more widely – does the model perform well in terms of statistical tests and diagnostics?	We agree that statistical diagnostics should not drive the design of a model. We have not challenged the statistical powers of any of the Ofwat models, as we agree that

	maximising the adjusted R squared score is not the primary aim.
6. Consider the appropriate estimation method.	We agree with these tests, and we have considered them in our feedback on the Ofwat models.

4 Aggregation and Disaggregation

When considering the results from disaggregated models, Ofwat should ensure that the overall wholesale service baselines reflects what a notionally efficient company could reasonably be expected to achieve. It should not propose a cost allowance based on a virtual company that is the aggregate of the upper quartile from several models.

Using the best performers for each disaggregated cost model could generate an overall baseline that effectively classes all companies as inefficient by comparison with a hypothetical and unachievable benchmark.

If Ofwat does use disaggregated models, it should aggregate the results of those models before assessing an upper quartile baseline. This is particularly true for the components of the network plus control. This requirement for aggregation suggests to us that using the network plus models would be preferable to the disaggregated treatment & distribution models, as they have been designed and tested with aggregation in mind.

5 Water Resource & Treatment Aggregation: Water Resource Plus

We agree there is a close relationship between water resources, raw water transport and treatment. We believe the medium level of aggregation in the water resource plus models has the advantage of avoiding complex data allocation issues between joint costs. It is worth noting that raw water abstraction is only 9% of water totex, so can be affected by relatively small variations in company accounting treatment.

Should Ofwat take an aggregated approach, we suggest using companies' forecast business unit splits to allocate the baselines between the controls.

6 The omission of income treated as negative opex

In calculating the industry wastewater costs, Ofwat has not included 'income treated as negative expenditure'. The error is easily rectified, hence our emphasis. For PR14, this cost was included in the cost assessment.

Income generation is a significant contributor to net bioresources costs. This is shown as a negative cost as Ofwat regulatory guidelines require companies not to net off the income from renewables & generation against power consumed but to show each separately.

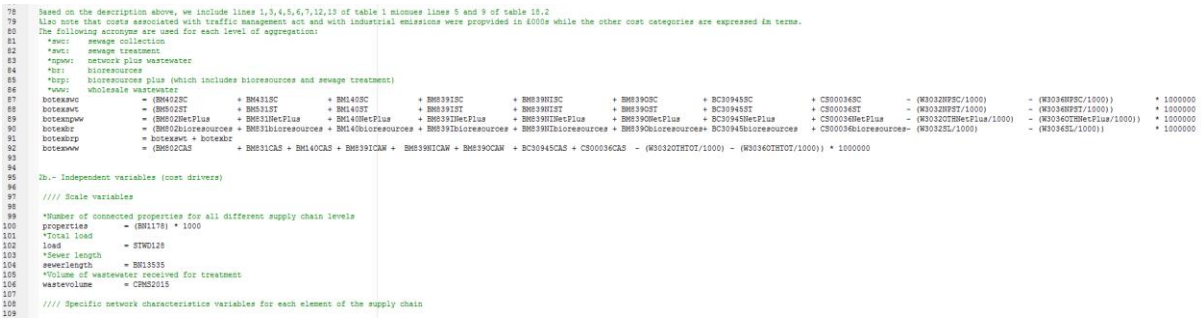
Ofwat should use the net cost position in its cost assessments as the amount of income generated is within management control and is a significant driver of efficiency. Excluding this negative expenditure in totex forecasts works against customer's interests, as it increases the totex baseline unnecessarily.

If the omission of this negative cost line is not a simple error it may be that Ofwat intends to treat this as a cost pass through item. This would also be incorrect as income generation is within management control and there should be an incentive to generate the maximum possible income thereby reducing net costs and benefitting customers. If the negative

operating cost is treated as cost pass through this reduces the incentive to generate income, which is one of the main efficiency opportunities available in bioresources and works against the interests of customers.

In evidence of our point: the stata code for income treated as negative expenditure is BM836CAS. It is not included in any of the bioresources, bioresources + or wholesale models.

This excerpt from the stata codes illustrates this, there is no BM836CAS in the formula:
Botexwww = (BM802CAS + BM831CAS + BM140CAS + BM839ICAW + BM839NICAW + BM839OCAW + BC30945CAS + CS00036CAS - (W3032OTHTOT/1000) - (W3036OTHTOT/1000)) * 1000000



7 Water: Ofwat Cost Models, NWL comments on cost drivers used

Cost Driver	Models	Green Amber Red	Comments
Connected properties	Resources	Green	Exogenous
Average Pumping Head	Resources, Treatment, Resources Plus, Network Plus, Wholesale	Green	Significant power cost driver, captures topography
Total water treated	Treatment	Red	Not exogenous, connected properties is a better driver
% of DI coming from boreholes	Treatment	Green	Significant reduction in costs for boreholes compared to other sources
% of water treated in WTW levels 3-6	Treatment, Wholesale	Green	Significant difference in costs
Density / Weighted average density	Treatment, Resources Plus, Wholesale	Amber	Seems to offset the length of mains driver – urban areas have less mains/prop but higher costs
Distribution input per source	Resources Plus	Amber	Endogenous issue with leakage & efficiency
Number of sources	Resources Plus	Amber	Unclear how this is normalised
Length of mains	Distribution, Wholesale	Amber	Not as exogenous as properties
% of mains length refurb & renewed	Distribution, Network Plus, Wholesale	Amber	Under management control
Booster pumping	Distribution, Network	Amber	Queries on data quality

stations per length of main	Plus, Wholesale		
Service reservoirs per length of main	Distribution, Network Plus, Wholesale	Amber	Queries on data quality
% of mains length laid post 1981	Distribution, Network Plus, Wholesale	Red	Not exogenous. Under management control AND low confidence grade data

8 Review of Water Models

For all water models, the key driver with a 1% significance level throughout is **connected properties.** We support this driver as it is clearly exogenous, has no perverse incentives associated with it and does not require compensatory adjustments in the same way that using lengths of main requires a density adjustment.

8.1 Water Resource Models

OWR1 & OWR2

NWL favoured model: OWR2 (although preference is for an aggregated model such as water resources plus)

It is worth noting that raw water abstraction is only 9% of water totex, so can be affected by relatively small variations in accounting treatment. The close relationship between resources and treatment means we prefer the use of the water resource plus models.

We support the inclusion of average pumping head water resources in the model. Energy costs are around 23% of modelled raw water abstraction costs and a cost driver is required to reflect this significant proportion of costs.

8.2 Water Treatment Models

OWT1 to OWT10

NWL favoured models: OWT3 & OWT9

We note that for the even numbered models OWT2, OWT4, OWT6, OWT8 and OWT10, Ofwat have used total water treated as the scale driver.

This contradicts Ofwat's endogeneity test as described in the water resource models. It would provide the same perverse incentive on water efficiency. For this reason, we favour using connected properties as the scale driver – the five odd numbered models. We note that water treated is not used as a cost driver in the resources plus, network plus or wholesale water models.

Around 20% of water treatment costs are energy related, so a driver for pumping costs such as average pumping head is required.

We agree that a negative coefficient for % of Distribution Input (DI) from boreholes is appropriate. We operate borehole, reservoir and river abstractions and we can confirm that boreholes are in general cheaper to treat.

8.3 Water Resources Plus Models

OWRP1 to OWRP8

NWL favoured models: OWRP6 & ORWP8.

We agree that connected properties is the appropriate scale driver, as per the separate resource and treatment models.

We agree that a negative coefficient for % of DI from boreholes is appropriate. We operate borehole, reservoir and river abstractions and we can confirm that borehole water is in general materially cheaper to treat.

Over 20% of water resources and treatment costs are power related, so the use of average pumping head captures an important exogenous cost driver.

8.4 Treated Water Distribution Models
OWTD1 to OWTD8
NWL favoured models: OTWD 1 & OWTD2

As with the other models, we support the use of connected properties as a cost driver.

Issues with OWTD 3-8 – % of mains length laid post 1918

Ofwat have included the % of mains lengths laid post 1981 as a cost driver on models OWTD 3-8. We believe this driver fails the exogenous test. The level of past investment in mains refurbishment is a management decision, and it would be perverse to make an adjustment to the models to reverse the efficiency that could be due to past investment decisions.

Were this model to remain in place, companies would have to consider the negative impact on the efficiency models of their decisions to upgrade or improve their mains network, a disincentive that would be contrary to customer preferences for improved asset health and resilience.

We have reviewed the confidence grades companies assigned to this driver,

Reliability	Number of Companies	**Accuracy** Band	Grade	Number of companies
A Sound records	7	Within +/- 1%	1	1
B Minor shortcomings	7	Within +/- 5%	2	9
C Extrapolation	4	Within +/- 10%	3	5
		Within +/- 25%	4	3

These are very poor confidence grades, particularly in comparison to the other drivers, which are typically A1 or A2. Eight companies, including NWL, have accuracy bands beyond +/- 5%, making this driver the least reliable of the ones chosen.

% of mains length refurbished and relined

We are also unclear on the engineering reasoning behind using the driver % of mains length refurbished and relined. Levels of refurbishment and relining is typically a management decision, and there could be a perverse incentive for companies to forecast high levels of refurbishment for 2020-25 to drive higher levels of allowed totex. Such forecast levels would not be defined as outcomes and therefore there would be no obvious adjustment mechanism were they not delivered. Our preference is thus for this driver to be removed.

The models present two network complexity cost drivers; booster pumping stations and service reservoirs. These are shown as alternatives, which seems unusual to us as operationally, they are independent, so we would expect to see both included if significant.

Reviewing our GMEAV asset valuations, service reservoirs are over 8 times the value of booster pumping stations, so we would expect service reservoirs to be the more significant cost driver of the two options.

Finally, we note that inclusion of weighted average density seems to affect the reset test scores. Given the problem of a large coefficient for density, it does seem to us that inclusion of mains length and density creates modelling issues that are best avoided by using connected properties.

On reviewing the dataset, the averages are heavily influenced by Thames, who have a weighted average density more than 3 times as high as the industry average. In our view, it would be better to consider the unique density of Thames' operating area as a cost adjustment claim rather than to try to include a cost driver that is only materially different for one company.

8.5 Network Plus Models
ONPW1 to ONPW8
NWL favoured models ONPW1 & ONPW3

We would expect the drivers for the treatment and distribution models to be included in this model.

The average pumping head for water treatment is in most treatment models and we would expect it to apply for all Network Plus models.

We note that density is included with a positive coefficient.

8.6 Wholesale Water Models
OWW1 to OWW12
NWL favoured models: OWW1,2,3 OWW 7,8,9,10,11,12

Our concerns are the same as with the treated water distribution model:
- The use of % of length of mains laid or refurbished post 1981.
- The % of mains length refurbished and relined.

As with the resources plus model, we support the use of average pumping head as a significant driver of a material cost, so we do not support OWW4, 5 & 6.

9 Wastewater: Ofwat Cost Models, NWL comments on cost drivers used

Cost Driver	Models	Green Amber Red	Comments
Load / Sludge produced	Treatment, bioresources	Green	A direct cost driver, exogenous as not influenced by companies
Connected properties	Bioresources, Treatment	Amber	Not as direct a relationship as load / sludge produced
% intersiting work done by truck	Bioresources	Amber	Under management control?
% sludge disposed to farmland	Bioresources	Amber	Under management control?
% of load treated in STWs bands 1 to 3	Treatment	Green	Agreed as material cost driver

% of biological load treated by STWs with ammonia consent	Treatment	Green	Agreed as material cost driver
% of trade effluent load	Treatment	Green	Agreed as material cost driver
Volume	Collection	Red	Endogenous, increasingly under management control, would create a perverse incentive to removing surface water (e.g. SUDS)
Pumping stations per sewer length	Collection	Green	Could capture geography
% of lengths replaced or renewed post 2001	Collection	Amber	Under management control

10 Review of wastewater models

10.1 Wastewater Bioresources Models

OBR1 to OBR3
NWL favoured models: OBR2, OBR3
and
Bioresources Plus models
OBP1 to OBP7
NWL favoured models: OBP 4, OBP6

We note earlier that, when assessing company costs, it is critical that Ofwat include 'income treated as negative opex' (renewables income & export) as part of the bioresources costs.

The scale driver for bioresources should be load: sludge produced. This is directly related to costs and we agree with Ofwat that for a vertically separated bioresources provider, sludge produced is not under management control. We further note there is no equivalent to water efficiency for sewerage load, so there are no perverse incentives.

Sludge produced is also the driver for the bioresources price control. It is important to have the same volume driver for costs and revenue, particularly if volumes change due to trading.

We note all the company proposed bioresources models use sludge produced as the scale driver.

We are not convinced that the driver % sludge disposed to farmland for models OBP2 & OBP3 is necessary. As negotiating and arranging access to farmland is under management control, we believe this is endogenous. Eight companies have disposal to farmland % rates of at least 90%, with the other two using other routes that are not demonstrably more or less expensive.

It is thus more appropriate to exclude this driver and instead consider a cost adjustment case from the other two companies. This will place the requirement on the two companies to prove their choice of alternative routes is not under management control.

10.2 Sewage Treatment Models

OWST1 to OWST6
NWL favoured models: OWST1, OWST 3, OWST5

We favour using load as the scale driver rather than properties. Load is exogenous in our view as there is no wastewater treatment equivalent to water efficiency.

10.3 Sewage Collection Models
OSWC1 to OSWC5
NWL favoured models: OSWC2, OWSC4, OWSC5

We believe that using volume as a scale driver would cause perverse incentives and can be influenced by management control. To reduce sewer flooding, water companies and developers frequently separate surface water flows from foul flows, sending surface water to sustainable urban drainage systems (SUDS) rather than treatment works. This is viewed as best practice by all stakeholders and encouraged by Government policy (e.g planning guidance following the Pitt review).

It would be extremely undesirable for the implementation of SUDS and Government policy to be perversely undermined by a cost model that increased cost allowances for higher levels of surface water sent to treatment works.

Connected properties is an independent driver that is exogenous and has no perverse incentives on SUIDS implementation.

10.4 Network Plus Wastewater Models
ONPW1 to OWPW10
NWL favoured models: ONPW1,2,4,5,6,8,9,10

We favour the network plus models over the disaggregated treatment and distribution ones. Our analysis suggest they are more stable and less prone to accounting allocation or operational trade-offs. The models themselves are less variable in terms of variation of company rankings by model chosen.

As with the sewage collection models, we believe that volume should not be used as a cost river due to endogeneity and perverse incentives in relation to the implementation of sustainable drainage.

10.5 Wholesale Wastewater Models
OWWW1 to OWWW8
NWL favoured models: OWWW1,3,5,6,8

Our only challenge on these models is the driver % sludge disposed to farmland. As negotiating and arranging access to farmland is under management control, we believe this is endogenous. Eight companies have disposal to farmland % rates of at least 90%, with the other two using other routes that are not demonstrably more or less expensive.

It is thus more appropriate to exclude this driver and instead consider a cost adjustment case from the other two companies. This will place the requirement on the two companies to prove their choice of alternative routes is not under management control.

11 Retail Household Models

11.1 Retail Bad Debt Models
ORDC1 to ORDC6
NWL favoured models: All

The models include bill size as a cost driver, which is very important as it normalises the difference on bad debt between single service and dual service customers.

We were surprised to see Ofwat choosing the % of households in default (Equifax) rather than the IMD income score as the measure of deprivation. As defaulting is in part influenced by company debt management behaviour, we feel that the IMD score is more clearly exogenous of company behaviour.

We believe that all three measures effectively include the circumstances of private renters, so there is no need for a further driver.

11.2 Retail Totex less bad debt

OROC1 to OROC4

NWL favoured models: All, but preference for an aggregated approach

We note Ofwat's concern over the adjusted R2 score for the models. In our view, this suggests either an average cost to serve approach with an adjustment for dual service customers or using the retail totex models ORTC3 or ORTC4.

11.3 Retail totex models

ORTC1 to ORTC4

NWL favoured models: ORTC3 & ORTC4

The retail totex models do seem better equipped to forecast the retail totex less bad debt component. Given the strong performance of the retail bad debt models, we believe there has to be a deprivation driver in the retail totex models, as bad debt is typically 50% of total retail costs and the bad debt models clearly demonstrate a high level of significance for the various deprivation measures

For this reason, we favour ORTC3 and ORTC4 and reject ORTC 1 & ORTC2.

If either ORTC1 or ORTC2 were chosen as models, we would have to consider a cost adjustment claim for our high levels of deprivation.

12 Enhancement Models

12.1 Lead Standards

NWL favoured model: OE3

In our view, this should be a unit cost model per meter of lead pipe replaced. The test of the models should be, if a company does not propose any lead communication pipes to be replaced, does the model predict zero costs? If not, it would be unfortunate were a company to receive an allowance for a programme that does not exist (or a very small programme).

We also note that the cost assessment tables record the total number of lead communication pipes. Given that these are inherited from before privatisation, in our view, a simple average unit cost approach applied to the proposed company programme should be sufficient, with a simple true up approach taken for variations.

12.2 Water New Development and new connections

NWL favoured model: OE5

We favour model OE5 as this appears to take into account the specific forecasts of new properties that companies submit. We do wonder whether a simpler unit cost per new

property would suffice for this category. Companies will be forecasting new properties in their Water Resource Management Plans and their business plans.

As receipts from new development should broadly match expenditure, there should be no incentive for companies to over/underestimate the levels of properties built.

12.3 First time sewerage costs

NWL favoured model: OE7

As this is for a relatively low proportion of enhancement costs, we feel a simple unit cost per connected property might suffice. If not, we favour model OE7, as the simplest of the three.

12.4 Sewage Growth

Models OE9 to OE12

NWL favoured models: None unless amended

We believe the scope and definition of these models need more work. New development and growth at sewage treatment works can both be viewed as supply demand expenditure and thus driven by the number of new properties. In this way, a unit cost approach would suffice.

The inclusion of reducing sewer flooding risk as enhancements is extremely problematic. Sewer flooding is a Common Outcome, for which companies are expected to be targeting upper quartile performance. The costs of getting to that level are expected to be in base costs, not enhancements. The costs of going beyond upper quartile are funded through the ODI regime, coupled with the totex incentive rate.

As such, sewer flooding expenditure should not be included in enhancements for PR19. The same logic applies for all common outcomes – leakage, PCC, interruptions etc.

13 Further Enhancements

Finally, there do not yet appear to be cost assessment models for major enhancement programmes such as the WINEP programme. It will be difficult to develop robust econometric models for the WINEP programme although it may be possible to develop models for certain aspects – such as schemes to address phosphate removal. We believe that much of the WINEP programme will need to be considered on a bespoke basis through scrutiny of company costings.

Resilience schemes will be similarly difficult to assess using econometric models and may well have to be assessed on a bespoke basis.

Northumbrian Water
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