Affinity Water

Response to Consultation on Outcome Delivery Incentives

23rd March 2022

Contents

Executive Summary

- Overall, the proposed approach in the consultation appears to favour pragmatism in reaching a solution for the next price review period and does not give sufficient consideration to how the performance incentive framework can support objectives over the longer term.

- Removing marginal costs from assessment disregards important information necessary to ensure economic efficiency. Some of the alternatives to marginal cost estimation/assessment do not seem to be any easier for Ofwat to assess, nor is it obvious that they will yield more reliable results.

- There are reasons to expect that if companies were required to update their marginal costs for PR24, the results would show less variability than at PR19.

- We have modelled several scenarios for the proposed bottom-up incentive design and our analysis suggests that the incentive properties are imperfect. The incentives only seem to work where the assumption that marginal costs are zero holds. In outturn, across all common PCs, we think it more likely that marginal costs will be non-zero. Where this is the case, the incentives appear capable of deterring activity to recover service, can result in payoffs that exceed customer valuations and in other cases, fail to incentivise activity in all cases where marginal benefits exceed marginal costs. The incentives can also produce what appear to be unfair distributions of benefits between customers and companies.

- From our own analysis, we have shown that these imperfections can be mitigated by varying the benefit sharing factors X, according to ex-ante marginal cost estimates and totex outperformance sharing rates. Setting X factors in this way also produces equal distributions of benefits between customers and companies.

- The bottom up approach rests on the assumption that marginal benefit estimations will show improvements in accuracy and consistency from PR19. We will not know whether this assumption will be satisfied until after the methodology is finalised. The consultation does not discuss what should happen next if the marginal benefits research does not deliver the desired consistency.

- The asset health section is unclear in relation to incentive strength and impact. In places, the proposals can be read as incentivising investment in long term asset health, but elsewhere there are proposals that blunt those incentives, for instance setting underperformance only incentives and lower incentive rates for outperformance than underperformance.

- We see significant difficulties in the proposed approaches to estimating bottom-up incentive rates for asset health, whether customer valuations, inferred marginal costs or marginal costs. Instead, we suggest that Ofwat consider the role for price control deliverables in meeting its regulatory objectives.

- The top-down approach could work in principle and merits further exploration. However, our analysis has shown large variances in notional RCV equity which creates difficulties in the top-down option if it is to be simultaneously fair across companies, fair between the water and wastewater services and reconciled with customer valuation evidence.

- As there is little evidence yet either in support or against enhanced ODIs, we propose continuation of the current voluntary approach.

Overall

In previous consultation responses we supported Ofwat's PR24 objective for 'focusing on the long-term' and for ODIs, its commitment to 'focus on key outcomes which we will maintain in the long-term'.

To us, maintaining long term commitment implies stability in methodology and approach over multiple price reviews. In contrast, this paper advocates a pragmatic and proportionate approach to incentive rate setting for PR24 only. We interpret pragmatic and proportionate as requiring a high degree of regulatory judgement and pragmatic suggests an approach fit for the next 5 years, but not necessarily thereafter. We are therefore not convinced that the overall direction proposed in the consultation will promote the stability implied by 'focusing on the long term.' We would prefer a method based on economic principles rather than pragmatism to better serve the long-term objective.

Purpose of ODIs

We agree with the basic function of ODIs as helping align the interests of customers and water companies to find the right balance between reducing costs and maintaining and improving service levels. ODIs also provide helpful incentives towards outperformance as opposed to just meeting regulatory targets and can promote innovation and stretch.

We are less comfortable with the paper's suggestion that ODIs fulfil a customer compensation function. We see compensation as being very different from performance incentivisation. We make compensation for specific instances of service failure, for example to compensate customers for flood damage to their properties where we are liable, or payments made under Guaranteed Standards of Service. This differs from ODIs as the financial consequences of ODI penalties and rewards are general adjustments to price caps, not directly linked to the service outcomes

experienced by individual customers. To illustrate further, if we record a high number of mains repairs, we will incur an ODI penalty. Consequently, all our customers will benefit from lower charges through in-period adjustments, not just customers who may have been affected by problems with the mains. Therefore we consider that incentivisation and compensation are not the same and that compensation should not be a stated purpose for ODIs. Whilst this could be thought of as semantics, it is important because incentive rates and design set with an objective to compensate may be different from those set with other objectives in mind.

Developing our PR24 Approach

Marginal costs

The consultation proposes standard ODI incentive rates are set based on sharing marginal benefits, but unlike PR19, marginal costs are excluded from the method.

We understand that the marginal cost estimates provided by companies at PR19 showed unexpected variability across companies and the assumption that marginal costs and performance improvements are positively related may not hold in all circumstances. Therefore, we understand how this has reduced Ofwat's confidence in the marginal costs approach. However, as Ofwat sets both the base costs and comparative performance commitment levels for the industry, it is not unreasonable to expect that an industry view of marginal costs for service improvements can be achieved.

There are also reasons to expect lower variability in marginal costs at PR24, particularly for PCs where there is a common service level. We accept that this may not be the case across all PCs for example leakage, where companies are operating at different service levels, however we think it holds in most cases. Compared to PR19, companies now have more experience of delivery against common PCs which should have improved understanding of common PC delivery costs. Further, with publication of PR19 marginal costs, companies have access to comparative information not available at PR19. We would expect that these factors would be forces towards greater convergence. More prescriptive reporting guidance might also reduce inconsistencies in methods and approaches that could lie behind observed variability.

Removing marginal costs is of concern to us. It takes away important information about the relationship between marginal costs and benefits when economic theory would require equalisation of these for economic efficiency. Within the proposed bottom-up methodology, abandoning marginal costs will instead require Ofwat to reach regulatory judgements about the sharing factors X_{out} and X_{under} with no obvious cross-check of those judgements to marginal costs. It risks incentives set by regulatory judgements that differ markedly from the incentives that would otherwise result from an economics based understanding of marginal costs and benefits. The undesired consequences of mis-matching costs and benefits are highlighted in the paper when it refers to 'gold-plating', 'over-compensating customers' and 'companies being excessively risk averse'.

We show in the appendix to this paper that marginal costs are important to achieving equitable distribution of financial incentives between customers and companies. They also contain important information that could help other parts of the price review settlement, for example the question of what base buys versus what service improvement should be afforded through enhancement. Therefore, whilst we accept that marginal costs can be difficult for Ofwat to assess, we think there are good reasons why they should be retained.

Marginal benefits

The consultation relies on the assumption that the collaborative customer research will produce more robust, accurate and consistent estimates, however we will not know this until after the expected time of finalising the methodology. It is at least possible that the collaborative research does not deliver the expected accuracy or consistency. It is not clear what the implications of this would be for the bottom-up approach. We think the draft methodology should consider this possibility and, to provide transparency and predictability, indicate how Ofwat would manage this.

We note that the collaborative customer research is proceeding based on 'willingness to accept' (WTA) rather than 'willingness to pay' (WTP) as at PR19. As a general rule, individuals value avoiding a loss as twice the amount of receiving a corresponding gain, due to loss aversion. So there is reason to think that marginal benefits valuations will exceed those at PR19, perhaps by a factor of two.

Pragmatic and proportionate approach

Following discussion of the difficulties of estimating marginal costs and benefits, the consultation concludes that setting ODI rates requires a pragmatic and proportionate approach. As noted above this implies setting incentive rates based on regulatory judgements rather than making the best use of evidence on marginal costs and benefits as may be available. The strong implication that incentive rates would be the same (or very similar) across companies could lead to unfairness (see section on top-down approach below) and to the extent that marginal costs differ across companies, the strength of the incentives on individual companies, or between water and wastewater services, could be very different.

As noted earlier, we are concerned that a pragmatic approach implies an approach that may only be fit for the coming review PR24, and not necessarily one that will continue in PR29 and beyond. We are finding it difficult to reconcile pragmatism with focusing on the long term.

Options for standard ODI rates

Bottom-up approaches

The consultation goes on to consider how to resolve exclusion of marginal costs from the approach, by setting values for two parameters X_{under} and X_{out} so that marginal benefits can be shared between companies and customers. It is not immediately obvious to us that setting appropriate values for these parameters is any easier or more pragmatic than retaining the PR19 approach of using marginal cost information to inform incentive rates.

We have studied the properties of the proposed incentive formulas in some detail and attach our detailed discussion in the appendix. Our analysis shows that:

- Where the assumption that marginal costs are zero does not hold in outturn, *regulatory expectations of incentive amounts* and *actual amounts* diverge. This will need to be resolved in calibrating the risk and reward properties of final determinations.
- In the case of outperformance, for certain choices of X_{out}, the distribution of benefits is inequitable, and outcomes can be (Pareto) suboptimal as companies are made better off by making customers worse off.
- In the case of under-performance, companies can suffer dis-benefits that exceed customers' valuation of the service improvement, which as noted above, might double those at PR19 due to the use of WTA (rather than WTP).
- Also, in the case of underperformance, there are examples where companies and customers can be better off if the company does not incur a marginal cost, which risks deterring expenditure on service recovery.
- Whilst these effects differ in magnitude across different scenarios, they are robust across a range of values for X_{under} and X_{out} and ranges of possible values for s, the totex sharing rate.
- Within the framework proposed by Ofwat, it is possible to calculate values for X_{under} and X_{out} that mitigate these effects and equalise payoffs for companies and customers:

$$X_{out,under} = [\ MB - MC(2s-1)\ ] / 2.MB$$

Accordingly, if the formulas proposed in 4.1.1 are to be carried forward into PR24, Ofwat should consider choosing X values according to the formula above. We think this would improve the incentive properties, mitigate the risk of perverse outcomes and promote equitable distributions of benefits / disbenefits as between companies and customers. However, to do this it must be noted that it would be necessary to collect (or otherwise estimate) marginal costs.

Customer-facing and environmental PCs

We tend to agree with the proposals in this section as customer facing and environmental PCs share similarities with standard ODIs, so we do not consider there needs to be a separate or different approach.

Asset health-related PCs

We are concerned that the discussion of asset health in the consultation is unclear in relation to incentive strength and impact. The first section (p.14) sets out the argument for incentivising investment in long-term asset health (through asset health metrics and performance commitments). The next section (p.16) then warns of 'over-investment' and 'gold-plating' and suggests that for some asset health PCs there may be 'lower outperformance rates', or 'no outperformance rates at all'. We interpret this as equivocal support for the asset health objective and think the incentive system should more clearly support regulatory objectives in this area. Ofwat should reconsider the symmetry of its intended incentive design and how well underperformance only incentives will contribute to long-term asset health outcomes.

There are also mixed regulatory messages in the detail of the proposals. The paper suggests that marginal cost estimates might underpin a bottom-up approach to setting asset health incentive rates (p14), yet marginal costs appear to have been rejected for standard ODIs (p10) on the argument that they are unreliable. It is not clear to us why marginal costs would be too unreliable in one part of the incentive setting framework, but not so in another.

We do however agree that customers will struggle to express valuations of asset health service attributes, so it seems wise not to rely on customer valuations alone.

Using inferred marginal benefits is promising in principle, and Table 4.1 seems a good starting point to link customer facing and asset health related metrics. However, to succeed, the inferred marginal costs approach relies on being able to predict the likelihood of future customer facing service incidents because of asset failures. This is not straightforward and, if asked to do this, we think it likely that there will be a plurality of approaches across companies which would be at least as challenging for Ofwat to assess as it found with using marginal costs at PR19. Whilst it could be possible to develop a common industry methodology, this would take time so we doubt it could be delivered in time for finalisation of the PR24 methodology.

We have doubts therefore about the viability of the three options for bottom-up approaches, which leaves the question of how to set incentives for asset health outcomes unanswered. We suggest that instead of ODI incentivisation, asset health could be incentivised through Price Control Deliverables (PCDs). We note that Ofwat intends to publish information and consult on the role of PCDs in its forthcoming PR24 draft methodology. We propose that a section of this paper should consider the case for incentivising asset health with PCDs.

PCDs provide positive incentives to invest, a means of monitoring activity to ensure that the investments paid for by customers are delivered and can mitigate the risk that customers pay twice for investment to improve asset health. We see nothing in a PCD approach that would prevent collection and monitoring of asset health and customer facing metrics to measure trends in asset health, assess comparative performance and how PCD regulated maintenance investments were helping to prevent deterioration of asset and service performance.

Should Ofwat conclude that PCD incentivisation is not suitable and wishes to continue with ODI incentivisation for asset health outcomes, we favour an approach where incentive rates are based on economic principles of marginal benefits and costs. This should be calibrated with a top-down cross check of risk exposure that produces fairness between companies and water/wastewater services. This conclusion is in line with our arguments, analysis and interpretation of evidence presented throughout this response.

Top-down approaches

We consider that a form of top down calibration of incentives will be necessary. It will control risk exposure faced by companies and customers and could be a helpful cross check of incentive rates based on bottom-up calculations of marginal benefits, or marginal benefits and marginal costs. The proposals for top down approach would expose either a £m amount or an equal proportion of return on regulatory equity across companies, to risk of performance incentives. To equalise the strength of incentives across companies as it would be felt in shareholder returns, we suggest the proportion of regulatory equity is more appropriate than a fixed £m amount.

As a general principle, incentive systems should put in place similar rewards and penalties for similar service outcomes across companies. RCV variation means that different ODI rates are needed to ensure that a similar share of return on equity is exposed to performance incentives across companies. The difficulty with this is that for companies with proportionately small RCVs, the ODI incentive rate per unit of performance may be smaller than the customer valuation of the service attribute. For RCV intense companies, incentive values per unit could exceed the customer valuation. It could be problematic to reconcile incentive rates with customer valuations across all companies.

We have explored the share of regulatory equity approach by analysing RCV across companies. The table below shows 2020/21 average RCV for the water service for each company, along with normalising factors – population, connections and mains length. In the table, it can be seen for example that the highest water RCV per head of population is Wessex Water at £833 per head. This is almost 4 times higher than the lowest, Portsmouth Water at £211. The 4 times multiple is similar when RCV is measured as £ per connection but the multiple is over 14 times higher for RCV £ per metre of mains. It is clear then that there are large differences between companies in RCV intensity relative to measures of their size. About a third (6 out of 17) companies are more than one standard deviation above or below the industry weighted average.

	Nominal Year Average Water Service RCV £m	Winter Population (000s)	Connections (000s)	Mains length km	RCV £ per head	RCV £ per Connection	RCV £ per metre main
	2020/21	**2020/21**	**2020/21**	**2020/21**	**2020/21**	**2020/21**	**2020/21**
Anglian	3,061	4,754	2,270	38,764	644	1,348	79
Hafren	75	222	106	5,190	338	708	14
Northumbrian	2,108	4,604	2,079	26,253	458	1,014	80
Southern	1,136	2,597	1,143	13,973	437	993	81
Severn Trent	4,694	8,121	3,676	47,354	578	1,277	99
South West	1,555	2,231	1,073	18,433	697	1,449	84
Thames	6,578	10,193	3,937	31,750	645	1,671	207
United Utilties	4,149	7,433	3,376	42,538	558	1,229	98
Welsh	1,959	3,080	1,456	27,777	636	1,345	71
Wessex	1,144	1,373	636	12,055	833	1,798	95
Yorkshire	2,889	5,304	2,347	32,012	545	1,231	90
Affinity	1,258	3,831	1,547	16,837	328	813	75
Bristol	549	1,245	555	6,904	441	990	80
Portsmouth	155	732	327	3,370	211	473	46
Sutton & E.Surrey	266	725	299	3,524	367	888	75
South East	1,377	2,282	1,037	14,843	603	1,327	93
South Staffs	395	1,754	763	8,622	225	518	46
Total	**33,348**	**60,481**	**26,627**	**350,199**	**551**	**1,252**	**45.8**
Ratio Max:Min					3.9	3.8	14.3

If instead the top down amount were set at a fixed £m amount, the reverse problem seems probable. Fixed amounts imply that companies with low RCVs would have a greater share of their return on equity exposed to incentivisation than RCV intense companies. Under this approach the effect on rate of return on equity for carrying out one additional mains repair could be larger than for another company who also had to make an additional mains repair, simply because they happened to have a larger notional RCV equity over which to spread the penalty.

Our conclusion is that there is a role for top down calibration, at least as a cross check of risk exposure from incentives produced by bottom-up methods and also a way to calibrate the overall value at risk for companies and customers. Of the proposed approaches, the proportion of regulatory equity seems fairest as it tends to equalise incentive strength as it would be felt by investors. However there are significant problems to overcome to set incentives using a top-down method because of the variance in RCV intensity evident across companies. It seems difficult to achieve objectives simultaneously that similar service successes or failures result in similar incentive effects across companies as felt by their investors and that incentive rates are reconcilable to evidence from customer valuations.

Our analysis of RCV has concentrated on water RCVs, not wastewater. The problems identified with the top down approach are likely compounded if the strength of incentivisation is to be similar and fair across the water and wastewater services. We think Ofwat should aim for balance of incentives across the two services, so that that there is fairness as between WoCs and WaSCs but also that WaSCs are not over incentivised in one of their services relative to the other. Evidence from the first year of PR19, and the outcomes from PR14 overall suggest skewness in water ODIs compared to wastewater, as penalties are observed more frequently in water and rewards are less frequent.

Enhanced ODIs

As only one year of the current price control has elapsed, it is difficult to reach an evidence-based conclusion on the performance of enhanced ODIs. We know that no company has yet achieved enhanced rewards or suffered enhanced penalties, nor is it clear whether enhanced ODIs have caused companies to over concentrate on enhanced rewards at the expense of other service attributes. There will only be one additional year of performance results by the time of the final methodology, still insufficient we think, to reach evidenced conclusions.

We see enhanced ODIs as supporting stretch and innovation and on balance are in favour of their retention. We think it should remain for companies to propose enhanced ODIs in their business plans and are not in favour of extending enhanced ODIs to all companies. This is because some companies are already leading and at or near the frontier so are more likely to be able to respond to enhanced incentives. Most are in a position of catching up to the leaders and so enhanced incentives are likely less meaningful.

We would add that the contribution of enhanced ODIs to the overall RORE range be reviewed as further evidence of their operation emerges. If no company manages to achieve enhanced incentives, then top down calibrations or regulatory judgements that assume they would, become questionable.

Other points

In-period adjustments and bill volatility

Although not a subject that is directly part of this consultation, we highlight the in-period adjustment mechanism for reflecting ODI rewards and penalties in charges. Our experience, and evident for other companies, has been that the adjustments are a source of bill volatility as net rewards/penalties cause a significant increase/drop in charges. These effects are additional to CPIH & K factor indexation and now that inflation is high, could potentially cause difficulties with respect to the 5% expectation set in the charging rules. To help manage these effects, the in-period adjustment process already allows the possibility of deferrals, but only with evidence of customer support and with regulatory support from Ofwat.

Ofwat might consider for PR24 if in-period adjustments can be adjusted so that by default, the effects on price limits are spread over 5 years, with suitable discount rates to ensure that the time value of money is recognised. We see the advantage of this as being greater bill stability which is supported by customers, as demonstrated in evidence in our PR19 customer research, and a simpler process that avoids the need to agree deferrals.

Appendix

We have explored the operation of the incentive design proposed in 4.1.1 of the consultation. We studied several scenarios to consider how actual outcomes might differ from regulatory expectations if determinations were set assuming marginal costs were zero, but outturn marginal costs were non-zero. We also studied how customers and companies are made better or worse off because of the incentives proposed in section 4.1.1 under different choices that might be made for values of X and s.

We summarise our conclusions in the bullets below, the sections after providing our detailed workings and discussion of our results.

Summary

- Where the assumption that marginal costs are zero does not hold in outturn, regulatory expectations of incentive amounts and actual amounts diverge. This will need to be resolved in calibrating the risk and reward properties of final determinations.
- In the case of outperformance, for certain choices of X_{out}, the distribution of benefits is inequitable, and outcomes can be (Pareto) suboptimal as companies are made better off by making customers worse off.
- In the case of under-performance, companies can suffer dis-benefits that exceed customers' valuation of the service improvement.
- Also in the case of underperformance, there are examples where companies and customers can be better off if the company does not incur a marginal cost, which risks deterring expenditure on service recovery.
- Whilst these effects differ in magnitude across different scenarios, they are robust across a range of values for X_{under} and X_{out} and ranges of possible values for s, the totex sharing rate.
- Within the framework proposed by Ofwat, it is possible to calculate values for X_{under} and X_{out} that mitigate these effects and equalise payoffs for companies and customers:

$$X_{out,under} = [\ MB - MC(2s-1)\ ]/\ 2.MB$$

Case One – Outperformance

Case 1a

In our first case, we consider an example where $X_{out} = 1$, marginal benefits MB =100 and the cost sharing rate is 50%. We have allowed marginal costs to vary from 100 to -100 to explore the differences in the outcomes between Ofwat's assumption that marginal costs be disregarded (MC=0) with alternatives where marginal costs are non-zero.

In our table below, we calculate company and customer benefits as follows, taking the second row of the table for example:

Company benefits are the sum of:

+ ODI reward received = X_{out}. MB = 1.00 x 100 = 100

+ Marginal cost incurred = -MC = (80)

+ Share of marginal cost borne by customers = s.MC = 0.5 x 80 = 40

Equals 60

Customer benefits are the sum of:

+ Customer valuation of benefit delivered = MB = 100

+ ODI reward paid = $-X_{out}$. MB = (1.00) x 100 = (100)

+ Share of marginal cost borne by customers = -s.MC = (0.5) x 80 = (40)

Equals (40)

Total benefit to society:

+ Company benefits = 60

+ Customer benefits = (40)

Equals +20 (meaning society overall has benefited)

The table shows that where X_{out} = 1.00, s=0.5 and using Ofwat's assumption MC=0, Ofwat would expect companies that achieved the marginal unit of outperformance to receive a reward of 100, whilst customers get 0.

Where Ofwat's assumption does not hold and MC>0, which might better reflect most cases in outturn, companies achieve less than the regulatory expectation 100, so there is divergence between regulatory expectations and actual rewards. This would need to be taken into account in assessing the risk/reward of determinations as the simplifying regulatory assumption used to set incentive rates is not likely to hold. It would be unsafe to assume it would hold when calculating expected RORE ranges for example.

We note that where MC>0 companies are always better off and customers always worse off. This is Pareto sub-optimal because one group has been made better off at the expense of another group.

Finally in this case, we note that where MC<0, where companies find they can achieve the outperformance but need to spend less than the determination assumed, companies and customers can both be better off, but companies accrue a greater proportion of the total benefits. This could be justifiable if the company has improved its efficiency, arguably it deserves a larger share of benefits because it has produced service outperformance at lower cost than determined. However, this

allocation begins to look less equitable if instead of efficiency, the outperformance resulted from an exogenous factor such as favourable weather conditions.

Table 1a

MB	X_{out}	S	MC	Company Benefit	Customer Benefit	Total Benefit to Society
100	1.00	0.50	100	50	-50	0
100	1.00	0.50	80	60	-40	20
100	1.00	0.50	60	70	-30	40
100	1.00	0.50	40	80	-20	60
100	1.00	0.50	20	90	-10	80
100	1.00	0.50	0	100	0	100
100	1.00	0.50	-20	110	10	120
100	1.00	0.50	-40	120	20	140
100	1.00	0.50	-60	130	30	160
100	1.00	0.50	-80	140	40	180
100	1.00	0.50	-100	150	50	200

Case 1b

In our next case, we considered how the results from Case 1a would change for a company that had 25/75 cost sharing rates rather than 50/50. We found that the same conclusions hold. There is divergence between the regulatory expectation of benefit accruing to the company and what would obtain if MC>0. The divergence is greater than in Case 1a. As before the company is always better off and customers are always worse off where MC>0 so the outcome is Pareto sub-optimal.

Where MC<0, companies and customers are both better off, and the distribution of benefits is more equitable than before, but the company still accrues the largest share, which is only partly mitigated by the 25/75 sharing rate.

Table 1b

MB	X_{out}	S	MC	Company Benefit	Customer Benefit	Total Benefit to Society
100	1.00	0.25	100	25	-25	0
100	1.00	0.25	80	40	-20	20

100	1.00	0.25	60	55	-15	40
100	1.00	0.25	40	70	-10	60
100	1.00	0.25	20	85	-5	80
100	1.00	0.25	0	100	0	100
100	1.00	0.75	-20	105	15	120
100	1.00	0.75	-40	110	30	140
100	1.00	0.75	-60	115	45	160
100	1.00	0.75	-80	120	60	180
100	1.00	0.75	-100	125	75	200

Case 1c

In this case we consider how a different value for X_{out} would alter the distribution of benefits between customers and companies. Case 1c is identical to Case 1b above with the exception that the value for X_{out} is set arbitrarily to 0.5.

Under this scenario, Ofwat's expected company payoff would be 50 because X_{out} = 0.5. This is accomplished when MC=0. Wherever actual MC>0, the company does not achieve the full regulatory expected payoff. It is also worth noting that in this case, where outturn MC=80 and MC=100 the company achieves a negative payoff even though it has delivered the additional unit of outcome. With these parameters, the system can dis-incentivise outperformance even in these cases where MB exceeds MC.

Turning to the distribution of benefits, in this case customers are generally able to obtain a greater share of the benefits than companies. The incentives to outperformance and cost reduction are still positive for companies, but less rewarding. In circumstances where outperformance is the result of exogeneous factors, customers gain a larger share than companies, and this may not be equitable.

Table 1c

MB	X_{out}	S	MC	Company Benefit	Customer Benefit	Total Benefit to Society
100	0.50	0.25	100	-25	25	0
100	0.50	0.25	80	-10	30	20
100	0.50	0.25	60	5	35	40
100	0.50	0.25	40	20	40	60

100	0.50	0.25	20	35	45	80
100	0.50	0.25	0	50	50	100
100	0.50	0.75	-20	55	65	120
100	0.50	0.75	-40	60	80	140
100	0.50	0.75	-60	65	95	160
100	0.50	0.75	-80	70	110	180
100	0.50	0.75	-100	75	125	200

Case 1d

Rather than set an arbitrary value for X_{out}, it is possible to solve a value for X_{out} in terms of MB, s and MC that produces an equitable 50/50 sharing of benefits between companies and customers, no matter what the circumstances:

$$X_{out} = [\ MB - MC\ (2s - 1)\ ]\ /\ 2.MB$$

The table below is as Case 1c, but now uses the formula above to set values for X_{out} considering the sharing rate s, and marginal costs.

As before, the regulatory expected payoff remains 50 because of the assumption that MC=0, and as before, where actual MC>0, the company will not accomplish the expected payoff.

What is different in this example is that X_{out} is allowed to vary. The outcome is that the share of benefits is now always 50/50 between customers and companies. Unlike Case 1c there is always a positive incentive to outperform wherever MB > MC so this approach has corrected a difficulty seen in Case 1c when X_{out} was set arbitrarily. It corrects the difficulties seen in Cases 1a, 1b and 1c, in terms of Pareto optimality. With these parameters it is no longer possible to make one group better off at the expense of another group.

Table 1d

MB	X_{out}	S	MC	Company Benefit	Customer Benefit	Total Benefit to Society
100	0.75	0.25	100	0	0	0
100	0.70	0.25	80	10	10	20
100	0.65	0.25	60	20	20	40
100	0.60	0.25	40	30	30	60
100	0.55	0.25	20	40	40	80

100	0.50	0.25	0	50	50	100
100	0.55	0.75	-20	60	60	120
100	0.60	0.75	-40	70	70	140
100	0.65	0.75	-60	80	80	160
100	0.70	0.75	-80	90	90	180
100	0.75	0.75	-100	100	100	200

Case Two - Underperformance

Case 2a

In our second case, we consider an example where X_{under} = 1, marginal benefits MB =100 and the cost sharing rate is 50%. We have allowed marginal costs to vary from 100 to -100 to explore the differences between Ofwat's proposition that marginal costs be disregarded for incentive rate setting (MC=0), with cases where MC take non-zero values in outturn.

In our table, we calculate company and customer benefits as follows, taking the second row for example:

Company benefits are the sum of:

+ ODI penalty paid = X_{under}. -MB = 1.00 x (100) = (100)

+ Marginal cost incurred = -MC = (80)

+ Share of marginal cost borne by customers = s.MC = 0.5 x 80 = 40

Equals (140)

Customer benefits are the sum of:

+ Valuation of service attribute not provided = -MB = (100)

+ ODI penalty received = X_{under}. MB = 1.00 x 100 = 100

+ Share of marginal cost borne by customers = -s.MC = (0.5) x 80 = (40)

Equals (40)

Total benefit to society:

+ Company benefits = (140)

+ Customer benefits = (40)

Equals (180)

The table shows that where X_{under} = 1.00, s = 0.5 and using Ofwat's simplifying assumption MC=0, Ofwat would expect companies that did not deliver the marginal unit of performance to accomplish a payoff -100, whilst customers get 0.

Where MC>0, which might better reflect most cases in the real world, companies achieve a dis-benefit that is worse than regulatory expectation, so there is divergence between regulatory expectations, with similar implications for risk/reward balance as in earlier examples.

We note that where MC>0 companies are always worse off (as they have under-delivered) but so are customers. The share of dis-benefits is weighted towards companies and companies can incur losses that are greater than the customer valuation of the marginal benefit of the service increment.

In cases where MC<0, companies are always worse off and customers better off. However, it can be seen that the company can minimise its own dis-benefit and maximise customer benefits by not incurring the marginal cost. It is better off cutting expenditure (MC<0) than spending according to its determination (MC=0) or spending more (MC>0) to prevent underperformance (assuming that the spend fails to produce the intended service outcome). In other words, the incentive outcome is a deterrent to expenditure on performance recovery.

Table 2a

MB	X_{under}	S	MC	Company Benefit	Customer Benefit	Total Benefit to Society
-100	1.00	0.50	100	-150	-50	-200
-100	1.00	0.50	80	-140	-40	-180
-100	1.00	0.50	60	-130	-30	-160
-100	1.00	0.50	40	-120	-20	-140
-100	1.00	0.50	20	-110	-10	-120
-100	1.00	0.50	0	-100	0	-100
-100	1.00	0.50	-20	-90	10	-80
-100	1.00	0.50	-40	-80	20	-60
-100	1.00	0.50	-60	-70	30	-40
-100	1.00	0.50	-80	-60	40	-20
-100	1.00	0.50	-100	-50	50	0

Case 2b

In our next case, we considered how the results from Case 2a would change for a company that had 25/75 cost sharing rates rather than 50/50. We found that the same conclusions hold. As before, there is divergence between the regulatory expectation of benefit accruing to the company and what would obtain if MC>0. The divergence is greater than in Case 2a. As before customers and companies are always worse off where MC>0, but the distribution of the dis-benefits is tilted more towards the company than before.

As in Case 2a, where MC<0 companies reduce their dis-benefit by not incurring marginal costs and this could be dis-incentivising expenditure on performance recovery. The more aggressive sharing rates in the scenario means customers have even more to gain if the company does not incur the marginal costs.

Table 2b

MB	X_{out}	S	MC	Company Benefit	Customer Benefit	Total Benefit to Society
-100	1.00	0.25	100	-175	-25	-200
-100	1.00	0.25	80	-160	-20	-180
-100	1.00	0.25	60	-145	-15	-160
-100	1.00	0.25	40	-130	-10	-140
-100	1.00	0.25	20	-115	-5	-120
-100	1.00	0.25	0	-100	0	-100
-100	1.00	0.75	-20	-95	15	-80
-100	1.00	0.75	-40	-90	30	-60
-100	1.00	0.75	-60	-85	45	-40
-100	1.00	0.75	-80	-80	60	-20
-100	1.00	0.75	-100	-75	75	0

Case 2c

In Case 2c we consider how outcomes change when the value for X_{under} is set arbitrarily to 0.5.

Under this scenario, Ofwat's expected company payoff to one unit of underperformance would be -50 because $X_{under} = 0.5$. This is only accomplished when MC=0. However, wherever actual MC>0, the company suffers an outcome that is

worse than when MC=0. As before, this represents divergence between regulatory expectation and situations likely to materialise in outturn.

Turning to the distribution of benefits, in this case customers are exposed to a lower share of the dis-benefits than companies. The incentives to recover performance at lowest cost are still positive for companies, but less rewarding. In circumstances where under-performance is the result of exogeneous factors, customers gain a larger share than companies and this may not be equitable.

Table 2c

MB	X_{out}	S	MC	Company Benefit	Customer Benefit	Total Benefit to Society
-100	0.50	0.25	100	-125	-75	-200
-100	0.50	0.25	80	-110	-70	-180
-100	0.50	0.25	60	-95	-65	-160
-100	0.50	0.25	40	-80	-60	-140
-100	0.50	0.25	20	-65	-55	-120
-100	0.50	0.25	0	-50	-50	-100
-100	0.50	0.75	-20	-45	-35	-80
-100	0.50	0.75	-40	-40	-20	-60
-100	0.50	0.75	-60	-35	-5	-40
-100	0.50	0.75	-80	-30	10	-20
-100	0.50	0.75	-100	-25	25	0

Case 2d

Rather than set an arbitrary value for X_{under}, it is possible to solve a value for X_{under} in terms of MB, s and MC that produces an equitable 50/50 sharing of benefits between companies and customers, no matter what the circumstances:

$$X_{under} = [\ MB - MC\ (2s - 1)\ ] / 2.MB$$

The table below is as Case 2c, but now uses the formula to set a value for X_{under} considering the sharing rate s, and marginal costs.

The share of dis-benefits is now always 50/50 between customers and companies. Unlike Cases 2a, 2b and 2c customers' payoffs are now better aligned with regulatory objectives in that customers no longer stand to benefit if the company cuts back on spending on performance improvement. Companies no longer have to operate knowing that if they underperform, they haven't made their customers even worse off

by spending on performance improvement. Companies are still incentivised to make their marginal costs as low as they can as their payoff becomes less negative if costs can be controlled. Unlike cases 2a, 2b and 2c above, it is no longer possible for the company disbenefits from underperformance to exceed the customer valuation of the service attribute.

To be able to use this formula in the way we describe, it is necessary to have estimates for MC and this can be an argument for continuing to collect and estimate marginal costs as part of the system.

Table 2d

MB	X_{out}	S	MC	Company Benefit	Customer Benefit	Total Benefit to Society
-100	0.25	0.25	100	-100	-100	-200
-100	0.30	0.25	80	-90	-90	-180
-100	0.35	0.25	60	-80	-80	-160
-100	0.40	0.25	40	-70	-70	-140
-100	0.45	0.25	20	-60	-60	-120
-100	0.50	0.25	0	-50	-50	-100
-100	0.45	0.75	-20	-40	-40	-80
-100	0.40	0.75	-40	-30	-30	-60
-100	0.35	0.75	-60	-20	-20	-40
-100	0.30	0.75	-80	-10	-10	-20
-100	0.25	0.75	-100	0	0	0