Capital maintenance relative efficiency modelling for the 2009 periodic review (Response to Ofwat consultation)

United Utilities Water
June 2007

Many thanks for giving us the opportunity to contribute to your review of the capital maintenance relative efficiency models that you plan to use for 2009 periodic review. We believe that there are some fundamental issues in this area that need serious consideration in advance of your final determinations. We fully support the five criteria as set out by Mark Stewart, but also believe that these should:

- be extended to include exclusion of companies who may have an undue influence on the models or the benchmark (a problem which appears prevalent in the capital maintenance models)
- be applied to the whole area of assessing at an efficient level of capital maintenance costs.

1. UU view on assessing efficient levels of capital maintenance

There are two general parts to setting efficient levels of capital maintenance, which are activity and price. These are best dealt with in the following ways:

1. **Activity** – the capital maintenance planning common framework - CMPCF (and further the new UKWIR Asset Management Plan Assessment Process - AMPAP) is a process for assessing the most efficient point at which to make a capital maintenance intervention, based on detailed forecasts of asset performance. As such, this would appear to be accepted as the most appropriate method for assessing the efficient level of activity.
2. **Price** – The cost base is used to compare the standard cost of a large number of specific idealised projects. As such, this would appear to be the most appropriate method for benchmarking the efficient average price for different types of capital maintenance activity.

It is well understood that the capital maintenance relative efficiency models measure elements of both historic activity levels and price. However, the activity element of the relative efficiency models is assessed in a very simplistic way, in that there is no normalisation for differences in asset condition and inheritance. This is implicitly accounted for in the CMPCF, which is generally accepted as the best method for assessing future activity levels. Therefore, it appears that there are two flaws with using the capital maintenance relative efficiency models to set cost allowances :

- **Duplication**: of assessments that are better performed by other methods
- **Incomplete**: in that a fundamental part of acceptable differences in activity (as a result of genuine differences in the probability of asset failure) is not taken into account.

Despite this, we accept that this assessment is based on the assumption that there is a clear link between a company's cost base and total cost of it's capital programme. Further, we accept that the CMPCF is an individual company assessment and is not a relative assessment. As such, we also accept the continuing need for the capital

maintenance relative efficiency models, although for a slightly different purpose. We consider that the capital maintenance efficiency targets should primarily (if not entirely) result from the cost base, and applied to the activity assessment implicit from the CMPCF.

The capital maintenance relative efficiency models would then be used on an overall check on the relativity between companies' capital maintenance costs, and will help Ofwat to target CMPCF assessments on those companies that have comparatively more (or less) maintenance costs than other companies. For example, it would seem natural for Ofwat to give extra scrutiny to a company that performs poorly on the relative efficiency models (i.e. already has a high level of cost), but is also making a case for large increases to capital maintenance under the CMPCF.

We expect that consideration of this use of the capital maintenance relative efficiency models will form part of the October consultation on the framework and approach to PR09.

2. General issues to resolve

Section 2.2 – Dating of explanatory variables

There are three main considerations here. First of all, Ofwat should use the most appropriate period over which to assess average capital maintenance expenditure. We support the use of an average in order to smooth out the 'lumpy' nature of capital expenditure. The current method results in a (i) six year average being applied, and it is not clear whether or not this is long enough, (ii) the length of the period changes each year because the date of the explanatory variables is fixed, and it is not sure if this is appropriate.

The second consideration is the impact of the regulatory cycle. By choosing year 3 of the prior period, companies may have been at different stages of their investment programmes. It may be more appropriate to use year 5 of the period before, as this may provide a better basis for comparison.

The final issue is whether or not using explanatory variables from only one year prior to the first year of the average cost assessment. Given that it will be a number of years before capital maintenance will be required at new facilities, consideration should be given to choosing the explanatory variables from a date a few more years prior to the start of the average cost assessment (e.g. retaining the CMER03 data from 1997/8, but commencing the average cost assessment from 2003/4 as planned).

It is clear that more assessment is required in this area (using historic June return data where available) to ensure that the most appropriate base year is selected, before the CMER data is collected next year.

Section 2.3 – Benchmark selection

As discussed in the first part of our response, we do not consider that the capital maintenance relative efficiency models are the most appropriate method for calculating catch-up efficiency targets. However, if Ofwat wish to select a benchmark company using these models, the following must be taken into account:

- Exclusion of companies with marginal or deteriorating serviceability – this may imply recent or historic underinvestment in capital maintenance.
- Exclusion of companies with poor OPA scores (or other service performance scores, e.g. leakage) – this may imply recent or historic underinvestment in capital maintenance.
- Exclusion of companies who perform poorly on opex efficiency – this may imply that differences in cost allocation or capex substitution, rather than relative efficiency, is the cause.
- Exclusion small companies – this is particularly appropriate for capital maintenance, where capital investment for small companies (with a smaller number of assets) is likely to be subject to a greater degree of variation
- Exclusion of companies with large special factors.
- Exclusion of companies with abnormally low (or high) capital maintenance expenditure on any of the capital maintenance models (e.g. Anglian on the Sewerage Non-Infrastructure model).

On the last point, companies with apparently abnormal (compared to other companies) levels of cost in any model should be excluded from that model (as Ofwat have done with Portsmouth on the Water Management & General model) as they can have an undue influence on the econometric models. As mentioned previously we believe that the “five criteria” as set out by Mark Stewart should be extended to include systematic exclusion of outliers, or companies that appear to have an undue influence on the slope of the regression line (or the unit cost where relevant) and/or have the potential to set an unrealistic benchmark for any of the reasons set out above.

The consultation also mentions "relevant asset-related data", but it is not clear what was meant by this. We support this if it includes asset related issues such as (for example) missing leakage target(s), hosepipe bans, consent failures/pollution incidents, foul flooding etc.

Section 2.4 – Special factors

We support the recommendations of the UKWIR efficiency study that special factor adjustments are made before modelling for both capital maintenance and opex efficiency.

We are keen to understand better Ofwat’s methodology and reasoning for applying “regional price adjustments”, given that the contractor market in water is largely national.

Section 2.5 – Future expenditure adjustment

We agree (in principle) with the reasoning behind the future expenditure adjustment, but note that this further reinforces our view that the CMPCF is the most appropriate method for assessing the appropriate level of capital maintenance expenditure. If a

company requires a high level of activity (justified by it's CMPCF case), then they would inevitably be measured as "inefficient" on the capital maintenance relative efficiency models. This is not 'consistent' and is therefore contrary to the principles of better regulation.

Other points raised by UU

We have four other general points:

- Ofwat's recent discussion document on expenditure and incentives implies that efficiency targets may be subject to (i) business planning incentives, or (ii) a menu scheme such as the one devised by Ofgem for DPCR4. It is not clear whether Ofwat envisage a change in the use of the capital maintenance relative efficiency models as a result of either of these innovations.
- The outcome of the UKWIR efficiency study recommended the use of time series panel data. We suggest that this is developed for operating costs in the first instance, and (if successful) consider reviewing this for capital maintenance for PR14
- Ofwat could consider further use of sub-company modelling, say on the water service.
- We are concerned that the timetable in section 4 of the consultation implies that there will be no further review of the models after the CMER for PR09 is shared with companies. We seek confirmation that Ofwat will be seek to share the CMER data at the earliest possible opportunity, and will remain open to suggestions for model improvements following this.

The following sections contain our detailed comments on the individual models, as well as suggestions for alternative models and explanatory variables. In numerous cases we suggest the exclusion of potential outlying companies:

- From the regression model - to ensure that the modelled cost relationship best reflects the majority of the industry
- From setting the benchmark – to ensure that the industry is not benchmarked against companies with apparently abnormally low level of capital maintenance investment in some cost areas

In particular, we consider that Anglian (Sewerage Non Infrastructure), Northumbrian (Sludge Treatment and Disposal), and Three Valleys (Water Treatment, and Water Distribution Non Infrastructure) all have instances of apparently abnormally low costs, and should not be used to set the benchmark in those cost areas.

3. Assessment of the models

3.1. Water service

There is some interrelationship between companies Quality and Maintenance programmes. Companies incur maintenance spend associated with quality investment schemes, which is reflected in allocations of expenditure on quality enhancement project to the maintenance expenditure category. This maintenance expenditure is frequently incurred earlier that would be the case if it was planned purely for maintenance reasons, and it is therefore likely that some existing assets will be written off early. As a result of this, companies with large Quality programmes in the assessment period are likely to have observed a higher level of capital maintenance expenditure. Therefore data should be collected for each model which enables the impact of Quality investment to be assessed.

Companies which inherited a relatively poor condition asset base prior to the period under consideration (e.g. at privatisation) will also incur higher capital maintenance costs than those with better condition assets. This should be considered for inclusion in the models using an appropriate measure of asset condition, for example the water quality operational performance index (OPI).

UU were privatised with the worst OPI performance in the industry, which has been recovered over time with a large quality investment programme, resulting in high levels of allocated maintenance spend.

Section 3.1.1 – Water Resources and Treatment

The first thing to consider on the existing model is the very wide spread of residuals produced by this model. The frontier company (excluding small companies) on this model alone is Three Valleys. The remainder of the industry would on average have to reduce costs by c.59% to achieve the same measured efficiency position as Three valleys, implying that average industry costs are c.2.4x that of Three Valleys. It does not seem feasible that such differences are due to efficiency alone. As such, we do not believe that Three Valleys should be used to set the efficiency benchmark, particularly as their costs are similarly outlying on another model (Water Distribution Non Infrastructure).

We consider that an econometric model for capital maintenance of water resources and treatment assets should take into account the treatment complexity required, as is recognised in the equivalent operating cost model. We also consider aqueduct stock by length should be a useful driver to inform maintenance costs and would like to understand the Ofwat's reasons for it being excluded on engineering grounds.

Examination of the data reveals that it is possible to obtain a much more satisfactory (although still not ideal) econometric model of the form:

Ln(Cost / scale variable)

as a function of:

% Water Treated from Surface Water Sources
Aqueduct Length / scale variable

where the scale variable is the current one (*Connected Properties*) or preferably a measure of the quantity of treated water, ether *Distribution Input* or *Distribution Input less Leakage*. In all cases, the explanatory factors are both valid exogenous drivers of cost and are both statistically significant (individually and in combination)

A volume related scale variable (*DI* or *DI less Leakage*) seems to be a far more appropriate variable than connected properties. We understand the concerns Ofwat may have regarding inclusion of full distribution input as this may reward companies that miss their leakage targets. However, although *DI* appears to be the most statistically robust scale variable, *DI less Leakage* is only marginally poorer, and appears to be more robust than connected properties. A better compromise may be to include the economic level of leakage (ELL), i.e. use *DI less Leakage plus ELL* as the scale variable. UU understand Ofwat's concerns regarding not rewarding companies for leakage but provided they are meeting their ELL targets then leakage is a factor that drives maintenance requirements and should be featured if significant in this model.

Finally, we would not support Ofwat discontinuing collection of data on assets in condition grade 4 and 5 for all models, but would rather Ofwat tighten the definition. At privatisation, UUW's asset stock was considered one of the oldest in the industry and a measure is needed to reflect the maintenance associated with assets dependant on their condition. We would be happy to discuss this matter further with Ofwat.

Section 3.1.2 – Water Distribution Infrastructure

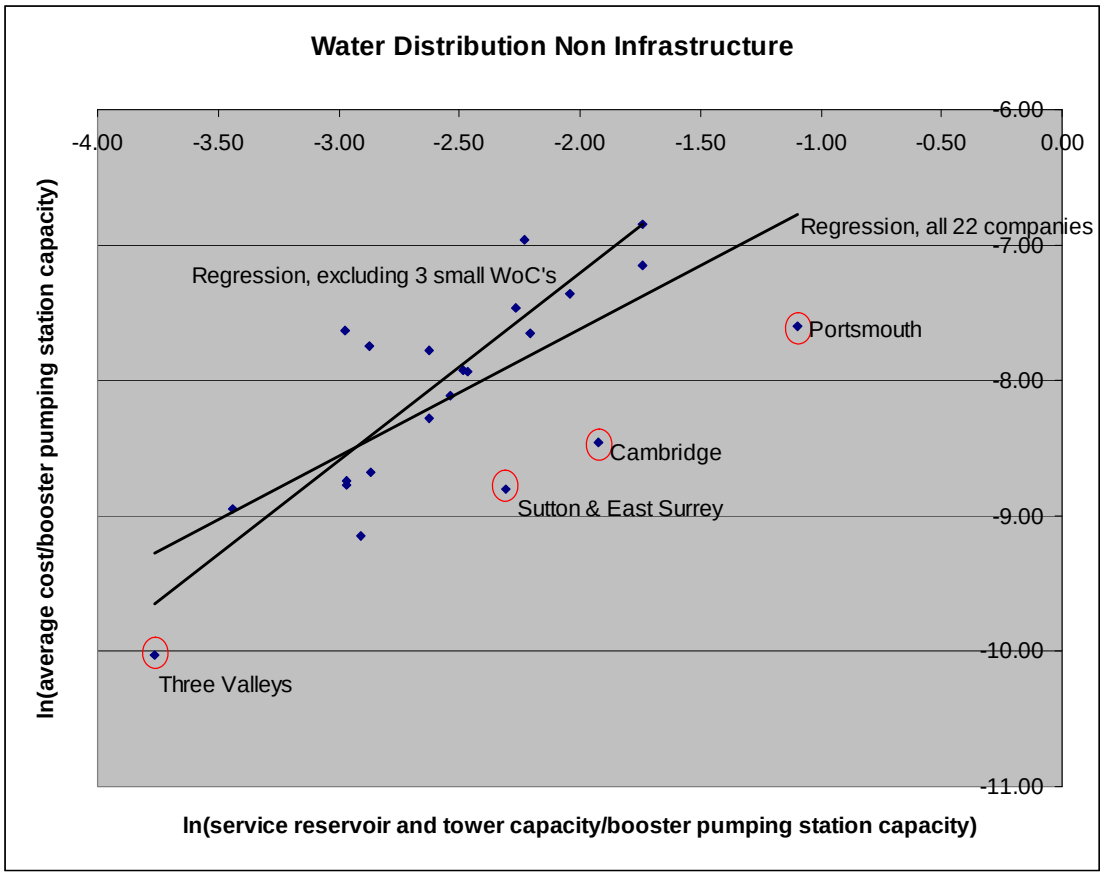
We agree with the form of the model, but consider that it should also include:

- a measure of historic asset serviceability – the data collected (e.g. mains bursts) do not appear to be statistically valid, indicating that other factors (or a combination of factors) are resulting in cost differences between companies.
- any relevant contribution from the quality programme that might have resulted in accelerated levels of maintenance relative to the explanatory variables included.

The existing model formulation would be valid if all companies were starting from an equal position on asset reliability, and in the absence of the section 19 programme.

Section 3.1.3 – Water Distribution Non- Infrastructure

We generally support the form of this model, but feel we must draw attention to the impact of a small number of outlying small companies on the overall assessment. Portsmouth, Cambridge, and Sutton & East Surrey all appear to have significantly lower predicted costs that average on this model, implying that other companies' actual costs are c.3x their cost levels. It is not reasonable to expect that this level of cost difference is due only to efficiency. Excluding these companies from the model (as Ofwat do for Portsmouth on the Water M&G model) has the effect of significantly improving the descriptive statistics, and is a far better representation of the cost relationship for the majority of the industry (see chart below).



Further, Three Valleys, who are the frontier company on this model, could also be considered as an outlier as (a) they are apart from the rest of the distribution of data points and have a large influence on the regression line, and (b) their costs are also significantly lower than the vast majority of the industry. For this reason (and because Three Valleys are also a cost outlier on the Water Resources and Treatment model), they should not be used to set the efficiency benchmark.

Section 3.1.4 – Water Management & General

We agree with Ofwat's view that this is a difficult area of expenditure to identify a single cost driver for. We agree that the current scale variable and cost driver are probably the most appropriate ones available. We are also pleased that Ofwat has recognised and excluded an outlying data point on this model.

The M&G model appears to be focussed on customer related activities (as a result of the % non household explanatory) with other costs assumed to be scalable. Another possible important factor is the proportion of the customer base covered by local authority collection arrangements as (in contrast to the % non households), these should reduce the companies reliance on it's own systems, particularly in the area of debt management.

3.2. Sewerage service

Section 3.2.1 – Sewerage Infrastructure

This model is an excellent example of the value of sub-company modelling. At a company level, Thames is unusual on the *Number of CSOs/Sewer Length* explanatory in that they have the least number of CSOs and the longest sewer length. This explanatory is statistically significant using a company level model, but becomes insignificant (t-stat of 0.7) if Thames are excluded. However, the disaggregated data provides a greater variety of regions with differing proportions of sewer lengths and numbers of CSOs such that even when Thames are excluded the cost relationship remains statistically significant (t-stat reducing from 6.4 to 2.4).

Despite this apparent success, the model is still not a very good overall explanator of cost with a wide variation remaining in the residuals. We consider that each of the five possible alternative explanatory variables could explain differences in capital maintenance expenditure, but none of them appear to be significant.

UUW believes that the proportion of combined sewers to be a key cost driver, and whilst the current model uses number of CSOs as an indicator of the extent of combined sewers, we believe that table CM4 could be modified to collect this information directly (total length of combined sewers).

Section 3.2.2 – Sewerage Non-infrastructure

An econometric model is easily obtainable on this model subject to the exclusion of Anglian as a clear outlier, using either capacity or number of pumping stations as an explanatory. It appears that any model formulation results in a significant amount of predicted cost over and above their actual costs, implying the presence of a positive special factor. For this reason we consider that Anglian should not be used to set the benchmark for other companies.

We also believe that the number of detention tanks (in various bands) may be a key cost driver.

Section 3.2.3 – Sewage Treatment

We have found it difficult to suggest alternative models with the available data. It is notable that cost correlates very poorly with the main scale variable, even at the level of total company sewage treatment cost.

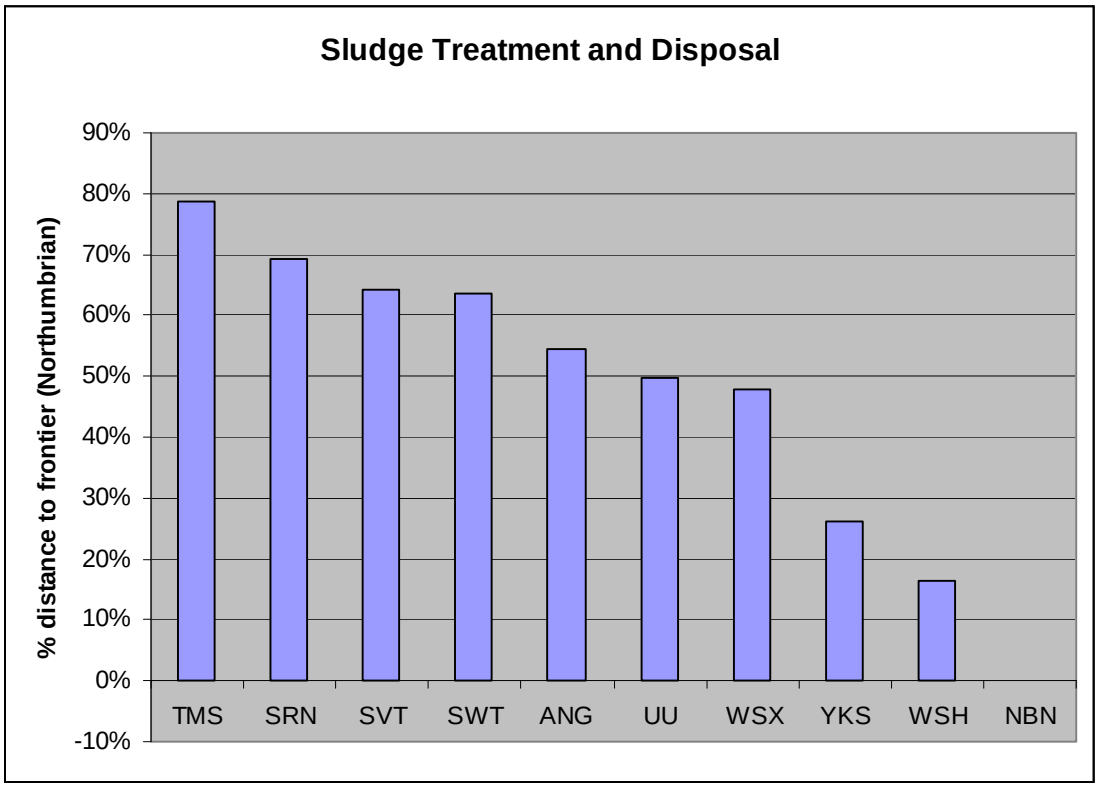
We have the following comments on the possible alternative variables.

- Split tertiary treatment to separate capital intensive process – we believes this may be a valid cost driver
- Number of pumping stations – we assume this refers to interstage pumping on treatment works. We believe this may be a valid cost driver
- Odour control - We believe this to be a valid cost driver
- Consent standards – we do not believe this measure to be a key cost driver. This tries to assess when companies will need to maintain assets based upon an assumption of age and an assumption of asset life – both of which are

unsubstantiated. We would suggest the use of asset life and asset age breakdown, which is provided in the asset inventory submission to identify the proportion of old short life assets.

Section 3.2.4 – Sludge Treatment and Disposal

Northumbrian, and to a lesser extent Welsh and Yorkshire, have significantly lower costs in this area (see chart)



Given that the 1997/8 explanators used currently indicate that Northumbrian disposed of 80% of their sewage sludge to sea, it is clear that the majority of their expenditure in this area has been in constructing new sludge treatment and disposal assets, rather than on capital maintenance. As such, we believe that they should not be used as the industry benchmark for capital maintenance.

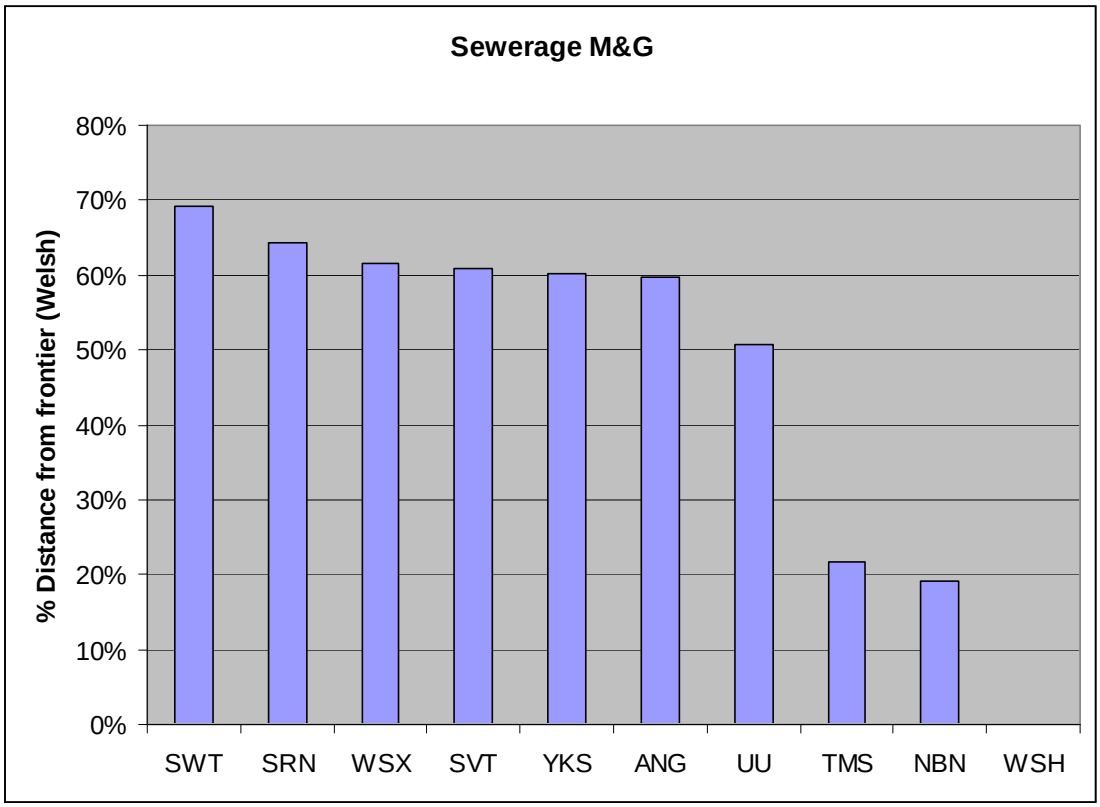
The simple unit cost formulation of this model does not capture the different unit costs associated with different types of sludge treatment and disposal activity, which we believe to be a key cost driver. Capital maintenance costs will vary significantly between disposal routes, and the extent of dewatering.. Disposal to land will attract minimal costs whilst disposal to incineration, given the mechanically intensive nature of the process, will be significantly more expensive

However, the data available appears contrary to our intuition, and implies that land disposal is more costly, and incineration leads to lower levels of capital maintenance. However, this may simply reflect recent history of extensive quality enhancements to move away from disposal to sea.

We further recommend that this model is reviewed along with the Sludge Treatment and Disposal opex model, where companies have provided Ofwat with additional information which may also prove to be useful in the context of capital maintenance, and may indicate what additional information should be collected in the CMER.

Section 3.2.5 – Sewerage Management & General

The existing unit cost model is a very poor explanator of the cost differences between companies. The chart below shows the spread of residuals, rebased as distance from the frontier company on this model (Welsh Water). The majority of the industry has similar cost levels, with Thames and Northumbrian having significantly lower costs, and Welsh significantly lower costs than them.



We suggest that this model should mirror the Water M&G model with *ln(cost/connected properties)* and a function of *% non household properties*. The explanatory variable is borderline significant (t-stat = 1.6), but we believe that it should still be considered. Alternatively, the model could just be an econometric model of *ln(cost)* as a function of *ln(connected properties)*.

In either case, consideration should be given to the impact of individual companies on the slope of the regression line, particularly Welsh, Thames and Northumbrian.