Utility Regulator
ELECTRICITY GAS WATER

Water and Sewerage Service
Price Control 2013-2015

PC13 Annex C
Calculation of Operational Efficiency Gap and Efficiency Targets for PC13

Final Determination

December 2012

Water and Sewerage Service
Price Control 2013-15
PC13 Calculation of Operational Efficiency Gap and Efficiency Targets for PC13

Contents

Executive Summary

There are a number of different techniques and methodologies available for regulators to assess the economic efficiency of a decision making unit. These range from unit cost comparisons to econometric modelling (OLS and COLS[1]), stochastic frontier analysis (SFA) or data envelopment analysis (DEA).

The established methodology within the water industry in the UK involves a top-down comparison of companies based on linear regressions and unit costs.

The purpose of this Annex is to give a brief explanation of the models used, the impact on costs and how this translates into an assessment of relative efficiency for NI Water. More detailed explanations of the regressions can be found on the Ofwat website.[2]

In adopting the Ofwat COLS approach, the Utility Regulator estimates the total efficiency gap to the frontier in 2010-11 to be 38%. There is little difference between the water and sewerage service areas. This is in part due to the very good performance of Wessex Water at the frontier.

The results for PC13 suggest that for every £1 of opex spent by the notional benchmark company, NI Water spends £1.62. This is a marked improvement on the performance at PC10 where the equivalent figure was £1.96.

Once the efficiency gap has been established the Utility Regulator must then decide upon the rate of catch-up to enable reasonable but challenging efficiency targets across the price control period.

For the PC13 final determination the catch-up rates examined begin with those used by Ofwat and PC10 assumptions. These represent the minimum that the Utility Regulator might conceive and are applied to the 2-year PC13 period on a pro rata basis to 60% catch-up to the frontier industry benchmark over five years.

NI Water, as an NDPB subject to departmental Public Expenditure (PE) controls has as its functional objective, “spend to budget”. For this reason the Utility Regulator has considered setting challenges beyond the traditional rates of catch-up.

There is not the same imperative to incentivise NI Water to the extent that its efficiency targets are calibrated upon 60% catch-up to frontier performance, with the remaining 40% available for out-performance. Within the PE-world the type of out-performance evidenced by NI Water during PC10 ought to be, if at all possible, minimised.

To continue protecting consumers (and taxpayers), the Utility Regulator has examined alternative and higher catch-up rates and their impact on NI Water, using other available

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[1] OLS = Ordinary Least Squares
COLS = Corrected Ordinary Least Squares (The method adopted by Ofwat and subsequently the Utility Regulator in Northern Ireland).
[2] Relative Efficiency Assessment for operating expenditure 2008-09.

precedent. Such analyses included the consideration of whether to adopt WICS style catch-up rates of 80% over four years, or the ORR's choice of two thirds over five years.

Four scenarios were considered:

1. SCENARIO 1 – 60% catch-up over 5 years pro rata, equivalent to setting a catch-up efficiency target of 4.6% per annum.

2. SCENARIO 2 – 62.5% catch-up over 5 years, equivalent to setting a catch-up efficiency target of 5.0% per annum.

3. SCENARIO 3 – 68.7% catch-up over 5 years, equivalent to setting a catch-up efficiency target of 6.0% per annum.

4. SCENARIO 3 – 77.8% catch-up over 5 years, equivalent to setting a catch-up efficiency target of 7.5% per annum.

Given NI Water's performance during PC10 and ability to out-perform efficiency targets throughout, SCENARIO 1's overall catch-up assumption is insufficiently robust enough to deliver continued downward movement in operational expenditure which matches NI Water's likely performance through PC13.

On the other hand, moving to SCENARIO 4's much higher catch-up assumption whilst likely over at least a 5 year price control period (or 4 years under WICS regulation of Scottish Water), is perhaps too stretching for a company facing the next 2 year period of PC13 in a little over 3 months time.

The Utility Regulator has determined that setting a catch-up efficiency rate of 5% per annum (SCENARIO 2) will offer NI Water a robust and reasonable challenge in the interests of consumers (and taxpayers). This compares favourably with the equivalent 6.95% per annum catch-up rate applied at PC10. Given NI Water's success in reducing its efficiency gap, the Regulator has determined to somewhat relax its catch-up efficiency rate assumption in recognition of NI Water's track record to date.

The 5% catch-up rate also recognises NI Water representations on the rate of catch-up set at the draft determination. The Regulator has reduced the challenge in the final determination to bring the targets more into line with regulatory precedent and experience elsewhere.

Our 5% per annum catch-up remains within the lower bounds of the 5% to 7.5% per annum range as advised by our consultants (LECG and NERA) at PC10 and further substantiated by evaluative studies of regulated utilities from elsewhere. We see no reason to deviate from setting NI Water's efficiency catch-up target within this, "reasonable but challenging rate of catch-up for NI Water" (see PC10 final determination) based on what other regulated utilities have managed to deliver.

Early indications suggest opex will be somewhat lower in 2012-13 than the Business Plan figures provided by NI Water. The Regulator has adopted a conservative approach and has not included any expected increase in efficiency for 2012-13 (although adjustment has been made for the higher baseline adopted by the Regulator). The company has argued that not all of these cost reductions are repeatable. The Regulator does not have

clarity on this but has accepted NI Water's position. The result is the adoption of the efficiency profile as outlined in the table below.

The following figures also include the Utility Regulator's frontier shift assumptions for PC13. This is an estimate of the changes in productivity and real price effects not associated with catch-up. Further details on Frontier Shift for PC13 are provided in the separate Annex D – The Rate of Frontier Shift Affecting Water Industry Costs.

Table A – Overall PC13 efficiency profile[3]

	PC10			PC13		PC15
	2010-11	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**
Frontier Shift	Base Year	0.25%	0.25%	0.21%	-0.14%	0.87%
Catch-Up Target	Base Year	7.617%	3.804%	5.000%	5.000%	5.000%
Cumulative Target	Base Year	7.848%	11.575%	16.175%	20.255%	24.902%

[3] The figure given for the first year of PC15 is indicative only. The efficiency challenge for PC15 will be recalibrated as part of a separate price control.

1 Efficiency Models

1.1 Background

1.1.1 The Ofwat econometric models were developed in the early 1990's, including expert advice and input by Professor Mark Stewart. The analysis was first used in the 1994 price review. It has been an integral part of subsequent determinations in England and Wales.

1.1.2 The benefit of the models is that they focus on separate areas of the business and can identify where cost differentials exist between comparable companies. This 'yardstick' approach allows regulators to identify either 'good' or 'bad' operators in relative terms compared to either the average or frontier performance.

1.1.3 There are nine areas where Ofwat look at costs as a function of external variables. These models consist of econometric regressions and simple unit cost comparisons. The models include:

Table 1.1 - Water service models

Functional Area	Model Type	Explanatory Variables
Water Distribution	Log regression	Length of main per connected properties
Water Resource and Treatment	Linear regression	Number of sources per distribution input and the proportion of supplies from boreholes
Water Power	Log regression	Distribution input multiplied by average pumping head
Water Business Activities	Log regression	Number of properties billed

Table 1.2 - Wastewater service models

Functional Area	Model Type	Explanatory Variables
Sewerage Network	Log regression	Sewer length, area of sewer district, resident population and holiday population
Large Sewage Treatment Works	Log regression	Total load, type of treatment used and the effluent consents
Small Sewage Treatment Works	Unit cost	Total load by treatment type
Sludge Treatment and Disposal	Unit cost	Dry solids disposed by route
Sewerage Business Activities	Unit cost	Number of billed properties

1.1.4 To assess the relative efficiency of NI Water, the Utility Regulator has applied their asset data to the regressions in order to predict what costs would be for the average water utility. This is then compared to actual NI Water expenditure in order to assess the level of efficiency.

1.1.5 The Utility Regulator has used 2010-11 as the base year for modelling. The results of the various models are given in the tables below alongside an explanation of the model rationale.

1.2 Water Distribution

1.2.1 The water distribution model takes the following functional form.

Table 1.3 – Water distribution model 2010-11

Water Service:	**Water Distribution Expenditure**	
Data:	June Returns	
Modelled cost:	ln (distributional functional expenditure less power costs [£m], divided by number of properties connected at year end [000's])	
Explanatory Variables:	Coefficient	Standard Error
Constant	-2.926	0.841
Ln (length of main [km], divided by number of connected properties [000's])	-0.376	0.318
Form of Model:	ln (modelled cost) = -2.926 – 0.376 * ln {length of main / connected properties}	
Statistical Indicators:	Number of observations = 21	R^2 = 0.069
	Model standard error = 0.317	F test = 0.252

1.2.2 The regression estimates cost per property as a function of mains length per connected property. The independent variable in this case is used as a proxy for urbanisation. The rationale is that costs are expected to be higher in more urban areas.

1.2.3 Unfortunately the regression has proven to be a very poor predictor of costs, as evidenced by the statistical properties of the model. The model is particularly bad at estimating NI Water's costs. This is the result of the company being a significant outlier in terms of mains per property.

1.2.4 NI Water and the Utility Regulator recognised this issue prior to PC13. In an effort to be proportionate it was decided that the model would be retained. Correction would be made via the special factors process.

1.2.5 As part of this analysis the Utility Regulator developed a new model for distribution costs. This used a composite scale variable combining population, connected properties, distribution input and mains length impacts. Further details on this can be found in Annex A.

1.3 Water Resource and Treatment

1.3.1 The model format is given in the table below.

Table 1.4 - Water resource and treatment model 2010-11

Water Service:	**Water Resource and Treatment**	
Data:	June Returns	
Modelled cost:	Functional expenditure less power costs [£m], divided by resident winter population [millions]	
Explanatory Variables:	Coefficient	Standard Error
Constant	8.339	0.737
Number of sources divided by distribution input [Ml/day]	14.989	4.558
Proportion of supplies from boreholes	-7.155	1.810
Form of Model:	Modelled cost = 8.339 + 14.989 * {number of sources/DI} – 7.155 * {proportion of supplies from boreholes}	
Statistical Indicators:	Number of observations = 21	R^2 = 0.470
	Model standard error = 1.926	F test = 0.003

1.3.2 The cost per person is dependent upon the number of sources per distribution input (DI) and the proportion of borehole supplies. The explanatory variable rationale is that economies of scale exist at source level i.e. the fewer sources required the lower the cost incurred.

1.3.3 The model also takes account of the difficulty of treatment depending on the water source since borehole supplies will generally be cheaper to treat. The cost per population is preferred to a volumetric measure as this may be unfairly influenced by leakage.

1.4 Water Power

1.4.1 This regression estimates power costs based on the amount of water pumped (DI) and the vertical lift required (average pumping head). The explanatory variable is designed to take account of company activity (DI) and topography (pumping head).

Table 1.5 - Water power model 2010-11

Water Service:	**Water Power**	
Data:	June Returns	
Modelled cost:	ln power expenditure [£m]	
Explanatory Variables:	Coefficient	Standard Error
Constant	-8.176	0.181
ln (distribution input [Ml/day] multiplied by average pumping head)	0.930	0.017
Form of Model:	Modelled cost = -8.176 + 0.930 * ln {distribution input * average pumping head}	
Statistical Indicators:	Number of observations = 21	R^2 = 0.994
	Model standard error = 0.103	F test = 0.000

1.5 Water Business Activities

1.5.1 Business activities incorporate various costs. These include customer services expenditure, scientific services and the charge associated with doubtful debt arising from non-payment of bills.

1.5.2 It is anticipated that these costs will be influenced by the number of billed properties and that economies of scale exist around the billing volumes.

1.5.3 For the purpose of calculating an efficiency gap for NI Water, the Utility Regulator decided that the business activities model would be excluded from the analysis. This conclusion was reached due to non-implementation of domestic charging.

1.5.4 Lack of domestic charging means that NI Water does not have a comparable level of billing costs, complaints or meter reading expenditure. Doubtful debts also differ somewhat as most of NI Water's revenue is generated from government subsidy. The form of the model is however illustrated below.

Table 2.6 – Water Business Activity Model 2010-11

Water Service:	**Water Business Activities**	
Data:	June Returns	
Modelled cost:	ln (business activity expenditure [£m] plus doubtful debts [£m])	
Explanatory Variables:	Coefficient	Standard Error
Constant	-2.865	0.293
ln (number of billed properties [000's])	0.846	0.045
Form of Model:	Modelled cost = -2.865 + 0.846 * ln {number of billed properties}	
Statistical Indicators:	Number of observations = 21	R^2 = 0.950
	Model standard error = 0.248	F test = 0.000

1.6 Sewerage Network

Table 1.7 - Sewerage network model 2010-11

Sewage Service:	**Sewerage Network**	
Data:	June Returns	
Modelled cost:	ln (network functional expenditure [£m] plus terminal pumping station costs [£m], less service charges [£m], per km of sewer)	
Explanatory Variables:	Coefficient	Standard Error
Constant	-5.177	0.469
ln (area of sewer district per km of sewer)	0.184	0.042
ln (resident population [000's] per km of sewer)	0.935	0.242
Holiday population divided by resident population [000's]	2.150	1.446
Form of Model:	Modelled cost = -5.177 + 0.184 * ln { area of sewer district per km of sewer } + 0.935 * ln {resident population [000's] per km of sewer} + 2.150 * {holiday population / resident population}	
Statistical Indicators:	Number of observations = 61	R^2 = 0.371
	Model standard error = 0.318	F test = 0.000

1.6.1 The sewerage network model is given above.

1.6.2 Network modelling estimates unit costs based on sewer length, area of sewer district, resident population and holiday population. Population is considered important since this will impact on sewage volumes.

1.6.3 The size of the area of the sewer district is considered a factor given that it will impact on surface water drainage volumes. Recognition is also given to the higher costs associated with serving an area where population can increase significantly during holiday periods.

1.7 Large Sewage Treatment Works

1.7.1 This model accounts for the costs associated with treatment of sewage at large works (i.e. at least 25,000 population equivalent[4]). Costs are shaped by a number of factors, detailed in the model format below.

Table 1.8 - Large sewage treatment works model 2010-11

Sewage Service:	**Large Sewage Treatment Works**	
Data:	June Returns	
Modelled cost:	ln (sewage treatment functional expenditure [£000's], less service charges [£000's], less terminal pumping costs [£000's])	
Explanatory Variables:	Coefficient	Standard Error
Constant	-0.728	0.244
ln (total load [kg COD/day])	0.733	0.027
Activated sludge	0.248	0.053
Tight effluent consent	0.114	0.046
Form of Model:	Modelled cost = - 0.728 + 0.733 * ln {total load} + 0.248 * {activated sludge} + 0.114 * {tight effluent consent}	
Statistical Indicators:	No. of observations = 387	R^2 = 0.700
	Model standard error = 0.455	F test = 0.000

[4] Population equivalent is defined by Ofwat in their Glossary of Terms as, *"The capacity of a sewage treatment works is measured in terms of the amount of organic material that can be treated. It is assumed that one person is equivalent to a load of 60g of biochemical oxygen demand. Effluent may also include industrial wastewater treated at works. Hence, the population equivalent served by a works can greatly exceed the population served in the catchment, especially if a large volume of industrial effluent is also treated."*

1.7.2 The explanatory variables in this model represent the amount of sewage treated, types of treatment and the level it is treated to. All are thought to have a positive impact on costs.

1.7.3 Within the model, both activated sludge and effluent consents take the form of a dummy variable. That is, they take a value of zero or one to indicate absence or presence respectively.

1.8 Small Sewage Treatment Works

1.8.1 Predicted costs for small works are calculated on a unit cost basis. Expenditure is dependent on the load treated [kg BOD/day] and the type of treatment applied e.g. primary, secondary activated sludge etc. Results are as follows:

Table 1.9 - Small Sewage Treatment Works 2010-11

Sewage Service:	**Small Sewage Treatment Works**
Data:	June Returns
Unit cost model:	A unit cost approach has been used, consisting of ten treatment types and five different size bandings. Comparison is made of annual expenditure (direct costs less service charges plus G&S [£000's]) with predicted costs (weighted average industry cost multiplied by the company load [kg BOD5/day]).

Weighted average industry unit cost: £000's / (kg BOD5/day)

Treatment Type	Primary	Secondary Activated Sludge	Secondary Biological	Tertiary A1	Tertiary A2	Tertiary B1	Tertiary B2	Sea Outfall Preliminary	Sea Outfall Screened	Sea Outfall Unscreened
Size Band 1	1.12	1.30	1.20	1.76	1.74	1.40	1.88	2.02	0.00	0.00
Size Band 2	0.48	0.95	0.82	1.03	0.92	0.81	0.87	0.00	0.00	0.00
Size Band 3	0.15	0.53	0.41	0.62	0.62	0.44	0.45	0.00	0.00	0.00
Size Band 4	0.12	0.30	0.21	0.34	0.37	0.25	0.27	0.00	0.00	0.00
Size Band 5	0.00	0.21	0.15	0.27	0.20	0.18	0.17	0.00	0.00	0.00
Number of observations			500							

1.9 Sludge Treatment and Disposal

1.9.1 Expenditure associated with the treatment and disposal of sludge is modelled on a unit cost basis. Costs are predicted based on the amount of solids produced [thousand tonnes of dry solids {ttds}].

Table 1.10 – Sludge Treatment and Disposal 2010-11

Sewage Service:	Sludge Treatment and Disposal
Data:	June Returns
Unit cost model:	The unit cost reflects the industry cost of treating and disposing of sludge per thousand tonnes of dry solids produced. Comparison is made of functional expenditure less service charges (£000's) against predicted costs (the company sewage sludge produced [ttds] multiplied by the weighted average industry unit cost).
£000's / ttds	Weighted average industry unit cost: 204.752
Number of observations	10

1.10 Sewerage Business Activities

1.10.1 The business activities models have been excluded from the NI Water efficiency analysis. Results for the water industry in England and Wales are as follows:

Table 1.11 – Sewerage Business Activities 2010-11

Sewage Service:	Sewerage Business Activities
Data:	June Returns
Unit cost model:	The unit cost reflects the industry cost of business activities per billed property. Comparison is made of business activity expenditure plus doubtful debts (£m) against predicted costs (billed properties multiplied by the weighted average industry unit cost).
£'s / billed property	Weighted average industry unit cost: 16.178
Number of observations	10

2 Results for NI Water

2.1 Running the Models

2.1.1 Applying NI Water asset data to the various regressions allows the Utility Regulator to establish what an 'average' company would spend under such circumstances. Comparisons are then made with what NI Water's actual costs are.

Table 2.1 – NI Water efficiency results 2010-11

Functional Area	NI Water Actual Expenditure (£m)	Predicted Expenditure of an Average Company (£m)
Water Distribution	33.24	11.65
Water Resource and Treatment	27.06	16.31
Water Power	16.16	12.64
Water Business Activities	8.53	15.37
Sewerage Network	24.81	9.58
Large Sewage Treatment Works	12.53	9.23
Small Sewage Treatment Works	16.47	13.06
Sludge Treatment and Disposal	14.68	7.80
Sewerage Business Activities	6.44	9.84
TOTAL	**159.90**	**105.49**

1. *All figures given in 10-11 prices.*
2. *Costs may not sum due to rounding.*

2.1.2 The modelled costs (£159.90m) represent 87% of NI Water's reported opex (£183.88m) in their Annual Report. Costs excluded from the analysis include rates, third party services and elements of the PPP unitary charge.

2.1.1 Comparison to English and Welsh performance would suggest a reduction of 34% would be required if the company was to be considered averagely efficient. Such a conclusion would be flawed. Other factors need to be considered before an efficiency gap can be established.

2.1.2 It is worth considering some areas of interest in the findings. For example:

a) The water distribution model is a clear outlier. The gap between predicted and actual cost is such that other factors outside inefficiency must be

influential e.g. a poor cost predictor model. This influence is considered in the special factor process.

b) Both business activity models are showing the company to be much more efficient than the average. This result is inconsistent with the findings of the other models. This lends support to the decision to exclude these models.

c) The company's best performance would appear to be in the area of sewage treatment. Power usage also seems reasonable once the special factor is accounted for.

3 Calculating the Efficiency Gap

3.1 Step-by-Step Methodology

3.1.1 The model approach compares NI Water's costs against average performance. For the purpose of setting efficiency targets, the Regulator is concerned with measuring the efficiency gap to the frontier. To do so a variety of adjustments must be made.

3.1.2 The various steps in this process are demonstrated by the flow chart.

Table 3.1 – Flowchart for establishing the efficiency gap

Establishing the Efficiency Gap
NI Water Actual Expenditure
(+/-) Special Factors Special factors relate to ongoing circumstances whereby a company is disadvantaged (or benefits) compared to other companies by virtue of uncontrollable exogenous factors e.g. location. Such factors will obviously have an impact on costs which are unrelated to efficiency so must be considered in the models. For PC13 the Regulator has decided the special factors to apply include: • Water distribution model adjustments; • Power costs; • Regional wages resulting from location; and • A small allowance for governance and compliance costs associated with being a Non-Departmental Public Body (NDPB).
(+/-) Atypical Expenditure Atypical expenditure relates to one-off costs that are exceptional in nature. This might include the costs of dealing with a flood or some other exogenous factor. In 2010-11 NI Water had a variety of

such costs. These are detailed in Annex B. For the purpose of PC13 efficiency modelling the Utility Regulator has also treated BIP and VER/VS[5] as atypical. The Utility Regulator has followed the precedent set in Scotland and recognised the fact that NI Water lags behind other companies who have been privatised much longer. Atypical allowance of transformation costs for this price review is considered reasonable. The Utility Regulator does not anticipate adopting such treatment for PC15.

Residual Adjustment

The residual adjustment is a recognition that not all of the gap in costs may be due to efficiency. Other factors may be of relevance including errors in the modelling, omitted variables, sampling or measurement errors. The Utility Regulator has revised predicted costs by 10% of the water residual and 20% of the sewerage residual for efficiency modelling purposes.

Business Activities Adjustment

The business activity adjustment is particular to NI Water. This involves removing these models from the analysis entirely. The Regulator further adjusts special factors and atypical costs downward by the same proportion. This accounts for the fact that the models in question have been removed.

Frontier Adjustment

After adjustments to NI Water costs, predicted costs must shift to reflect the out-performance of the frontier company against average expenditure. For instance, if the frontier performer is 10% below the average, the predicted costs for NI Water will also fall by 10% to reflect frontier performance.

Final comparison between NI Water adjusted costs and the benchmark predicted costs

[5] BIP is the Business Improvement Programme designed to transform the business. VER/VS is the Voluntary Early Retirement/Voluntary Severance scheme associated with staff leaving the business.

3.1.3 Calculation of the efficiency gap is demonstrated below. Figures are shown prior to removing the business activity models.

Table 3.2 – Calculation of the efficiency gap to the average and frontier (all models approach)

Efficiency Gap Calculation					
	Category	**Process Rule**	**Water (£m)**	**Sewerage (£m)**	**Total (£m)**
A	NI Water actual cost		84.98	74.93	159.90
B	Less Atypical cost		3.93	3.47	7.40
C	Less Special Factors		6.97	6.15	13.12
D	**Modelled Cost**	**A - B - C**	**74.07**	**65.31**	**139.38**
E	Predicted Cost (average)		55.98	49.51	105.49
F	Difference	D – E	18.09	15.80	33.89
G	Adjustment Factor (%)		10%	20%	
H	Residual Adjustment	F * G	1.81	3.16	4.97
I	**New Predicted Costs**	**E + H**	**57.78**	**52.67**	**110.45**
J	Frontier Adjustment (%)		-8.06%	-13.87%	
K	**Frontier Predicted Costs**	**I * (1 + J)**	**53.13**	**45.37**	**98.49**
L	Efficiency Gap (to average)	D – I	16.28	12.64	28.92
M	**Efficiency Gap % (to average)**	**L / D**	**21.99%**	**19.35%**	**20.75%**
N	Efficiency Gap (to frontier)	D – K	20.94	19.94	40.89
O	**Efficiency Gap % (to frontier)**	**N / D**	**28.27%**	**30.54%**	**29.33%**

N.B. Figures may not sum due to rounding.

3.1.4 The analysis highlights the efficiency gap including all models. Figures are skewed downward by virtue of inclusion of the business activity regressions. The table does however demonstrate the process of establishing the efficiency gap.

3.1.5 The frontier adjustment is calculated based on how the benchmark companies perform against average costs.

3.1.6 Removing the business activity models provides a better assessment. In order to make appropriate allowance, the Utility Regulator amends the special factor and atypical costs by a factor equal to the proportion of business activity costs.

3.1.7 A new frontier adjustment is also calculated. This again reflects frontier company performance against average costs. The difference being that business activity models are excluded. The findings are illustrated in the table below.

Table 3.3 – Calculation of the efficiency gap to the average and frontier (excluding business activity models)

Efficiency Gap Calculation					
	Category	**Process Rule**	**Water (£m)**	**Sewerage (£m)**	**Total (£m)**
A	NI Water actual cost		76.45	68.49	144.94
B	Less Atypical cost		3.54	3.17	6.71
C	Less Special Factors		6.27	5.62	11.90
D	**Modelled Cost**	**A - B - C**	**66.64**	**59.70**	**126.33**
E	Predicted Cost (average)		40.61	39.67	80.27
F	Difference	D – E	26.03	20.03	46.06
G	Adjustment Factor (%)		10%	20%	
H	Residual Adjustment	F * G	2.60	4.01	6.61
I	**New Predicted Costs**	**E + H**	**43.21**	**43.67**	**86.88**
J	Frontier Adjustment (%)		-4.23%	-15.74%	
K	**Frontier Predicted Costs**	**I * (1 + J)**	**41.38**	**36.80**	**78.18**
L	Efficiency Gap (to average)	D – I	23.43	16.02	39.45
M	**Efficiency Gap % (to average)**	**L / D**	**35.16%**	**26.84%**	**31.23%**
N	Efficiency Gap (to frontier)	D – K	25.26	22.90	48.16
O	**Efficiency Gap % (to frontier)**	**N / D**	**37.90%**	**38.36%**	**38.12%**

N.B. Figures may not sum due to rounding.

3.1.8 To catch-up to average performance, NI Water would need to reduce costs by 31% approximately.

3.1.9 Results of the analysis estimate the total efficiency gap to the frontier to be 38%. There is little difference between the water and sewerage service areas. This is in part due to the very good performance of Wessex Water at the frontier.

3.1.10 The results suggest that for every £1 of opex spent by the notional benchmark company, NI Water spends £1.62.

4 Setting Efficiency Targets

4.1 Catch-Up Efficiency

4.1.1 Calculation of the efficiency gap is the fundamental factor in setting catch-up efficiency targets for NI Water. Once established, the Utility Regulator must then decide the rate of catch-up to enable reasonable but challenging efficiency targets across the price control period.

4.1.2 For the final determination the catch-up rates examined begin with those used by Ofwat and PC10 assumptions. These represent the minimum that the Utility Regulator might conceive and are applied to the 2-year PC13 period on a pro rata basis to 60% catch-up to the frontier industry benchmark over five years.

4.1.3 That said, NI Water as an NDPB subject to departmental PE controls has as its functional objective, "spend to budget". For this reason the Utility Regulator has considered setting challenges beyond the traditional rates of catch-up.

4.1.4 There is not the same imperative to incentivise NI Water to the extent that its efficiency targets are calibrated upon 60% catch-up to frontier performance, with the remaining 40% available for out-performance. Within the PE-world the type of out-performance evidenced by NI Water during PC10 ought to be, if at all possible, minimised.

4.1.5 To continue protecting consumers (and taxpayers), the Utility Regulator has examined alternative and higher catch-up rates and their impact on NI Water, using other available precedent. Such analyses included the consideration of whether to adopt WICS style catch-up rates of 80% over four years, or the ORR's choice of two thirds over five years.

4.1.6 Four scenarios were considered:

1. SCENARIO 1 – 60% catch-up over 5 years pro rata, equivalent to setting a catch-up efficiency target of 4.6% per annum.

2. SCENARIO 2 – 62.5% catch-up over 5 years, equivalent to setting a catch-up efficiency target of 5.0% per annum.

3. SCENARIO 3 – 68.7% catch-up over 5 years, equivalent to setting a catch-up efficiency target of 6.0% per annum.

4. SCENARIO 4 – 77.8% catch-up over 5 years, equivalent to setting a catch-up efficiency target of 7.5% per annum.

4.1.7 Given NI Water's performance during PC10 and ability to out-perform efficiency targets throughout, SCENARIO 1's overall catch-up assumption is insufficiently robust enough to deliver continued downward movement in operational expenditure which matches NI Water's likely performance through PC13.

4.1.8 On the other hand, moving to SCENARIO 4's much higher catch-up assumption whilst likely over at least a 5 year price control period (or 4 years under WICS regulation of Scottish Water), is perhaps too stretching for a company facing the next 2 year period of PC13 in a little over 6 months time.

4.1.9 The Utility Regulator has determined that setting a catch-up efficiency rate of 5% per annum (SCENARIO 2) will offer NI Water a robust and reasonable challenge in the interests of consumers (and taxpayers). This compares favourably with the equivalent 6.95% per annum catch-up rate applied at PC10. In recognition of NI Water's success in reducing its efficiency gap, the Utility Regulator has determined to somewhat relax its catch-up efficiency rate assumption.

4.1.10 The overall catch-up equivalent rate over the five years from 2010-11 is 62.5% which is predicated upon a catch-up rate of 5% per annum compared to 6.95% per annum adopted at PC10.

4.1.11 The 5% catch-up rate also recognises NI Water representations on the rate of catch-up set at the draft determination. The Regulator has reduced the challenge in the final determination to bring the targets more into line with established regulatory precedent.

4.1.12 The recent movement in NI Water's efficiency gap translates into the following. Whilst at PC10 (2007-08 baseline) for every £1 spent by its peers NI Water was incurring £1.96, this had declined to £1.64 in 2009-10. The further reduction to 2010-11 equates to a £1.62 operational spend for every £1 spent by its peers.

4.1.13 Our 5% per annum catch-up remains within the lower bounds of the 5% to 7.5% per annum range as advised by our consultants (LECG and NERA) at PC10. We see no reason to deviate from setting NI Water's efficiency catch-up target within this, "reasonable but challenging rate of catch-up for NI Water" (see PC10 final determination) based on what other regulated utilities have managed to deliver.

4.1.14 Further substantiation of our own central range of efficiency catch-up can be found with reference to work undertaken by Oxera[6] for the ORR which found that 'inefficient companies' could deliver 5% to 7% per annum operational efficiencies compared to 'average companies' whose delivery was slightly lower between 4% and 6.5% per annum.

4.2 Efficiency Profile

4.2.1 In determining PC13 as a two year price control, catch-up from the base year also incorporates PC10 years where targets have already been set. To avoid potential problems, the Utility Regulator has adopted the following approach:

[6] http://www.rail-reg.gov.uk/upload/pdf/pr08-oxeraeffic-160408.pdf

a) Accept all NI Water efficiency figures for PC10. This seems reasonable given the company are projecting opex outperformance during these years.

b) Extra efficiency credit has been given for 2012-13 as the Regulator's baseline is higher than NI Water's.

c) Amend annual targets to profile a catch-up efficiency which meets either five year cumulative performance equivalent to 60% or 78% over five years under SCENARIO 1 or 4 respectively; or,

d) Impose a catch-up efficiency rate somewhere between SCENARIO 1 and 4 (i.e. between 4.6% and 7.5% per annum).

4.2.2 The out workings of the approach under SCENARIO 2 result in the following efficiency targets.

Table 4.1 – PC13 efficiency profile[7]

	PC10			PC13		PC15
	2010-11	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**
Annual Target	Base Year	7.617%	3.804%	5.000%	5.000%	5.000%
Cumulative Target	Base Year	7.617%	11.131%	15.574%	19.796%	23.806%

4.2.3 A problem exists by virtue of the fact that early indications suggest opex will be somewhat lower in 2012-13 than the Business Plan figures.

4.2.4 The Regulator has adopted a conservative approach and not included any expected increase in efficiency for this year. The company has argued that not all of these cost reductions are repeatable. The Regulator does not have clarity on this but has accepted NI Water's position.

4.2.5 The Utility Regulator considers the catch-up percentage to be reasonable but challenging. NI Water has argued for a 60% catch-up profile over 10 years. The company argue for the longer profile due to difficulties and restrictions placed on them as a result of NDPB status.

4.2.6 The Utility Regulator is not inclined to accept this approach and has provided a separate special factor allowance for extra compliance requirements. Our objections to other elements of NI Water's argument include:

1. There was insufficient evidence to support a move to a 60% catch-up over 10 rather than 5 years.

[7] The figure given for the first year of PC15 is indicative only. The efficiency challenge for PC15 will be recalibrated as part of a separate price control.

2. No regulatory precedent has been offered in support.

3. The company expressed concern that we had not funded the 'toolsets' to deliver efficiencies ie Voluntary Early Retirement / Voluntary Severance (VER/VS) and Business Improvement (BI) projects. This is not the case as we remain funding business improvement staff in PC13 and support both this and VER/VS related initiatives for PC13.

   However to ensure consumers were not charged twice, we stated that funding of these activities would have to come from public expenditure to compensate for under spend in these activities during the previous price control.

   We have engaged with officials from the Department for Regional Development (DRD) and the Department of Finance to clarify this position. The Department of Finance has stated they are, "very keen to support VER/VS schemes or any other 'invest to save' proposals", and have issued a letter to this effect to the DRD, the company shareholder.

4. The majority of opex is repetitive in nature and largely unaffected by NDPB status i.e. chemicals and power costs etc.

5. NI Water has evidenced outperformance and significant opex efficiency gains in PC10 in spite of their current corporate structure. This outperformance excludes underspends on BIP and VER/VS, which we do not view as an efficiency.

6. Many of the NDPB restrictions on procurement, financial and terms & conditions of employment have helped support NI Water's drive to lower its cost base and meet the efficiency challenge. Other additional governance costs the company attribute to NDPB status would also likely be replaced by alternative requirements attributable to alternative operating models.

7. Evidence from evaluative studies of other utility price controls shows that bigger efficiency challenges are achieveable from the 2nd and subsequent price controls rather than the first such price control applying.[8]

4.2.7 A fuller explanation of the Utility Regulator's determination on Special Factors and treatment of NDPB status can be found at Annex A.

4.2.8 The Utility Regulator expects an improvement in relative performance. Unfortunately the scale of convergence is clouded by two factors:

- Allowance of additional opex; and
- Performance of frontier companies.

[8] http://www.rail-reg.gov.uk/upload/pdf/pr08-oxeraeffic-160408.pdf

4.2.9 These factors make it somewhat difficult to assess what the efficiency gap may be at the end of PC13, even if NI Water meets all their objectives. Consequently, no target for relative performance has been made.

4.3 Frontier Shift

4.3.1 The other element of the efficiency target is frontier shift. This is an estimate of changes in productivity of the industry not associated with catch-up. Frontier shifts consists of two elements

- Productivity estimates; and
- Real price effects for the water industry.

4.3.2 A full report on this element of the target has been completed by First Economics and published as part of this determination at Annex D – The Rate of Frontier Shift Affecting Water Industry Costs.

4.3.3 The Utility Regulator has accepted the frontier shift assumptions made by NI Water for PC10. Thereafter the findings of First Economics have been used. The overall efficiency target after incorporating frontier shift is illustrated in the table below.

Table 4.2 – Overall PC13 efficiency profile[9]

	PC10			PC13		PC15
	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Frontier Shift	Base Year	0.250%	0.250%	0.213%	-0.139%	0.870%
Catch-Up Target	Base Year	7.617%	3.804%	5.000%	5.000%	5.000%
Cumulative Target	Base Year	7.848%	11.575%	16.175%	20.255%	24.902%

4.3.4 Applying the targets as stated above results in the following opex profile.

Table 4.3 – Utility Regulator's target opex profile for PC13 (2010-11 prices)

	PC10			PC13	
	2010-11	2011-12	2012-13	2013-14	2014-15
Baseline Opex	£154.50m	£154.50m	£154.50m	£154.50m	£154.50m

[9] The figure given for the first year of PC15 is indicative only. The efficiency challenge for PC15 will be recalibrated as part of a separate price control.

Plus Additional Opex		(£4.08m)	(£1.10m)	£0.90m	£0.90m
Plus Opex From Capex				£2.91m	£3.47m
Less Efficiencies		(£11.81m)	(£17.76m)	(£25.61m)	(£32.18m)
Plus Busines Improvement	£1.97m	£1.51m	£0.97m	£0.80m	£0.80m
Plus VER/VS	£2.62m	£1.94m	£1.81m	£0	£0
Plus Adjustments	£0.30m	(£4.23m)	£0	£0	£0
Plus Total PPP Unitary Charge (Post Efficiency)	£43.92m	£42.43m	£42.03m	£41.91m	£41.38m
Total Opex Profile	**£203.31m**	**£180.27m**	**£180.47m**	**£175.41m**	**£168.87m**

N.B. Figures may not sum due to rounding.

5 Conclusions

5.1 Summary

5.1.1 The purpose of this Annex is to detail how the relative efficiency gap has been calculated. The subsequent impact this has on setting efficiency targets has also been provided. The adopted approach is considered reasonable and supported by historical precedent.

5.1.2 The Regulator has taken on board NI Water representations with respect to rates of catch-up and the efficiency achievement in PC10. This has resulted in the PC13 challenge reducing to 5% per annum. By the close of PC13 NI Water is now expected to reduce costs by 17% in real terms (from £203.3m to £168.9m).