Water & Sewerage Services Price Control 2015-21

Draft Determination - Annex R

Calculation of the Operational Efficiency Gap

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Annex R – Calculation of the Operational Efficiency Gap

1.0 Introduction

1.1. Purpose

1.1.1 There are a number of different techniques available to assess the economic efficiency of a decision-making unit. These range from:

- Unit cost comparisons;
- Econometric modelling (OLS and COLS[1]);
- Stochastic frontier analysis (SFA); to
- Data envelopment analysis (DEA).

1.1.2 The established methodology within the water industry has been a top-down comparison of companies based on linear regressions (including logs) and unit costs.

1.1.3 The purpose of this annex is to give a brief explanation of the models used and how this translates into an assessment of relative efficiency for NI Water. A more detailed description of the regressions is found on the Ofwat website.[2]

1.1.4 Once the efficiency gap is established, the UR must then decide upon the rate of catch-up. This enables reasonable but challenging efficiency targets to be applied.

1.1.5 This document sets out the detail behind the efficiency process.

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

2.0 Efficiency Models

2.1. Background

2.1.1 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 their 1994 price review. The Utility Regulator (UR) has adopted these models and amended them as time has progressed.

2.1.2 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.

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

Table 2.1 – Water service models

Functional Area	Model Type	Explanatory Variables
Water Distribution	Log regression	Composite variable including mains length, connected properties and DI
Water Resource and Treatment	Linear regression	Number of sources per distribution input (DI) and the proportion of supplies from boreholes
Water Power	Log regression	Distribution input multiplied by average pumping head
Business Activities	Log regression	Number of properties billed for water

Table 2.2 – 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 produced/disposed by route
Business Activities	Unit cost	Number of billed properties for sewage

2.2. Modelling issues

2.2.1 Since 2010-11, companies in England and Wales have not been required to complete June Returns. This has made continued use of our comparative analysis problematic. Since then, the approach adopted is to compare current (2012-13) NI Water spend against the 2010-11 models.

2.2.2 This involves using the same figures, but inflating England and Wales costs to current prices (or deflating NI Water costs to 2010-11 prices). Industry cost may not however move at the same pace as RPI (Retail Price Index) inflation. To allow for this, predicted costs are adjusted to reflect the change in actual industry costs (derived from company regulatory accounts).

2.2.3 Data in the regulatory accounts also enables an update of the actual total cost movement in the frontier companies.

2.2.4 NI Water adopted the same efficiency approach, but raised some significant concerns. These include:

a) Models have become outdated and less robust over time;

b) The method used to allow for real opex changes may introduce bias as each companies costs do not move uniformly;

c) The frontier companies may now be different due to changing opex; and

d) Inclusion of PPP costs increases uncertainty of the models.

2.2.5 It is recognised that the situation is not optimal. No model will be 100% accurate. This is why certain steps help to reduce uncertainty e.g. residual adjustments, special factors and partial catch-up rates.

2.2.6 For PC15, the UR has gone further to ensure that inappropriate targets are avoided. This involves additional modelling to verify the scale of the efficiency gap.[3]

2.2.7 In attempting to address the specific concerns raised, the following triangulation approach was undertaken:

a) The UR developed total opex (topex) models using the latest PR14 August submission data. These models are used as a check to ensure that the COLS findings are robust;

b) The topex models incorporate 2012-13 costs and explanatory variables. This should help avoid any historic bias;

c) Efficiency is compared using an upper quartile approach. This involves the second, third and fourth ranked WaSC average, rather than choosing an individual company as the frontier; and

[3] Alternative models are discussed in Annex Q, *Alternative Efficiency Modelling.*

d) The UR has given NI Water opportunity to strip out any PPP costs it considers inappropriate in the annual information return.

2.2.8 The additional analysis tends to support the findings of the COLS models. This helps provide assurance that the current approach is robust. The UR has therefore retained the historic models as the main efficiency tool for PC15.

2.2.9 Each of the models is discussed below. The regressions include data from England and Wales uplifted to 2012-13 prices.

2.3. Water distribution

2.3.1 The water distribution model takes the following functional form.

Table 2.3 – Water distribution model

Water Service:	**Water Distribution Expenditure**	
Data:	June Returns	
Modelled cost:	ln (distribution functional expenditure less power costs [£m])	
Explanatory Variables:	Coefficient	Standard Error
Constant	-4.679	0.347
Ln (CSV)	1.083	0.051
Form of Model:	ln (modelled cost) = -4.679 + 1.083 * ln {composite scale variable}	
Statistical Indicators:	Nr. of observations = 21	R^2 = 0.960
	Standard error = 0.286	F test = 0.000

2.3.2 This regression has changed since PC13. The previous model was a poor predictor of costs, particularly for companies with a long mains length.

2.3.3 In consultation with NI Water, a composite explanatory variable has been constructed. This consists of important network cost drivers i.e. mains length, connected properties and distribution input. The inputs are given a 20%, 35% and 45% weighting respectively.

2.3.4 Whilst the weights are open to debate, the findings suggest the explanatory variable is good at predicting network costs.

2.4. Water resource and treatment

2.4.1 The model format is given in the table below.

Table 2.4 – Water resource and treatment model

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	9.009	0.796
Number of sources divided by distribution input [Ml/day]	16.194	4.924
Proportion of supplies from boreholes	-7.730	1.956
Form of Model:	Modelled cost = 9.009 + 16.194 * {number of sources/DI} – 7.730 * {proportion of supplies from boreholes}	
Statistical Indicators:	Nr. of observations = 21	R^2 = 0.470
	Standard error = 2.081	F test = 0.003

2.4.2 The cost per person is dependent upon:

- The number of sources per DI; and
- The proportion of borehole supplies.

2.4.3 The explanatory variable rationale is that economies of scale exist at source level i.e. the fewer sources required, the lower the cost incurred.

2.4.4 The model also takes account of the difficulty of treatment depending on the water source. Borehole supplies are generally considered cheaper to treat than a river or reservoir supply.

2.4.5 The cost per population is preferred to a volumetric measure as the alternate may be unfairly influenced by leakage.

2.5. Water power

2.5.1 The regression estimates power costs based on the amount of water pumped (DI) and the vertical lift required (average pumping head).

2.5.2 The explanatory variable is designed to take account of company activity and topography (pumping head).

Table 2.5 – Water power model

Water Service:	**Water Power**	
Data:	June Returns	
Modelled cost:	ln power expenditure [£m]	
Explanatory Variables:	Coefficient	Standard Error
Constant	-8.098	0.181
ln (distribution input [Ml/day] multiplied by average pumping head)	0.930	0.017
Form of Model:	Modelled cost = -8.098 + 0.930 * ln {distribution input * average pumping head}	
Statistical Indicators:	Nr. of observations = 21	R^2 = 0.994
	Standard error = 0.103	F test = 0.000

2.6. Water business activities

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

2.6.2 It is anticipated that these costs will be influenced by the number of billed properties. It is expected that economies of scale exist around the billing volume.

2.6.3 In order to calculate an efficiency gap for NI Water, the UR decided that this model should be excluded. This conclusion was reached due to a lack of domestic charging.

2.6.4 The absence of 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.

2.6.5 The form of the model is illustrated below:

Table 2.4 – Water Business Activity Model

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	-2.788	0.293
ln (number of billed properties [000's])	0.846	0.045
Form of Model:	Modelled cost = -2.788 + 0.846 * ln {number of billed properties}	
Statistical Indicators:	Nr. of observations = 21	R^2 = 0.950
	Standard error = 0.248	F test = 0.000

2.7. Sewerage network

2.7.1 The sewerage network regression is given below. This model predicts unit cost as defined by the cost per sewer length.

2.7.2 Unit costs are explained by three variables:

a) Area of sewer district per kilometre of sewer;

b) Population per kilometre of sewer (connection density); and

c) Proportional size of the holiday population.

2.7.3 Holiday population is important since this will affect sewage volumes. Connection density is also included as the expectation is that urban areas with large sewers will cost more money.

2.7.4 The size of the area of the sewer district is an important factor. This will account for the impact of surface water drainage volumes. It may also explain costs faced by rural networks.

Table 2.7 – Sewerage network model

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	-5.100	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 = -5.100 + 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:	Nr. of observations = 61	R^2 = 0.371
	Standard error = 0.318	F test = 0.000

2.8. Large sewage treatment works

2.8.1 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.

[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."*

Table 2.8 – Large sewage treatment works model

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	-0.650	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 = -0.650 + 0.733 * ln {total load} + 0.248 * {activated sludge} + 0.114 * {tight effluent consent}	
Statistical Indicators:	No. of observations = 387	R^2 = 0.700
	Standard error = 0.455	F test = 0.000

2.8.2 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.

2.8.3 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.

2.9. Small sewage treatment works

2.9.1 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 2.9 – Small Sewage Treatment Works

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	1.21	1.40	1.29	1.90	1.87	1.51	2.03	2.19	0.00	0.00
Size Band 2	0.52	1.03	0.89	1.11	0.99	0.87	0.94	0.00	0.00	0.00
Size Band 3	0.16	0.57	0.44	0.67	0.67	0.48	0.49	0.00	0.00	0.00
Size Band 4	0.13	0.33	0.23	0.37	0.40	0.27	0.30	0.00	0.00	0.00
Size Band 5	0.00	0.23	0.16	0.29	0.22	0.19	0.18	0.00	0.00	0.00
Number of observations			500							

2.10. Sludge treatment and disposal

2.10.1 Treatment and disposal of sludge is modelled on a unit cost basis. Costs are predicted based on the amount of solids produced.

2.10.2 For NI Water, a significant proportion of these costs are incurred by PPP operators and paid via the unitary charge.

Table 2.10 – Sludge Treatment and Disposal

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 = 221.21
Number of observations	10

2.11. Sewerage business activities

2.11.1 The business activities models are excluded from the NI Water efficiency analysis. Our reasons behind such treatment are the same as the water business activities.

2.11.2 Results for the water industry in England and Wales are as follows:

Table 2.11 – Sewerage Business Activities

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 = 17.48
Number of observations	10

3.0 Results for NI Water

3.1. Running the models

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

Table 3.1 – NI Water efficiency results in 2012-13

Functional Area	NI Water Actual Expenditure (£m)	Average Predicted Expenditure (£m)
Water Distribution	24.83	23.41
Water Resource and Treatment	22.02	18.58
Water Power	14.67	10.73
Water Business Activities	6.81	16.90
Sewerage Network	23.85	10.74
Large Sewage Treatment Works	13.96	10.26
Small Sewage Treatment Works	14.78	13.77
Sludge Treatment and Disposal	14.75	8.49
Sewerage Business Activities	6.52	10.81
TOTAL	**142.19**	**123.69**

1. *All figures given in 2012-13 prices.*
2. *Costs may not sum due to rounding.*

3.1.2 The modelled costs (£142m) represent 82.5% of NI Water's reported opex (£172m) in their Annual Report. Costs excluded from the analysis include rates, third party services and elements of the PPP unitary charge.

3.1.3 Comparing to England and Wales, the table would suggest a reduction of 13% is required if the company is to be considered averagely efficient. Such a conclusion would be flawed. Other factors need to be considered before an efficiency gap can be established.

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

a) Sewerage network model is by some distance the most inefficient area. This may indicate a special factor. NI Water has included just such a claim in their business plan;

b) Both business activity models are showing the company to be much more efficient than the average. The result is inconsistent with the findings of the other models. This lends support to our decision to exclude both water and sewerage business activity models from our efficiency analysis; and

c) The company's best performance would appear to be in the area of sewage treatment and water distribution.

4.0 Calculating the Efficiency Gap

4.1. Step-by-step methodology

4.1.1 The regressions compare NI Water's costs against the average. To set efficiency targets, the UR must measure the efficiency gap to what it considers to be frontier performance. To do so a variety of adjustments must be made.

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

Table 4.1 – 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. Such factors will have an impact on costs which are unrelated to efficiency so must be considered as part of the modelling process. For PC15, the following factors apply: • Rural sewage network costs; • Power costs; and • Regional wages resulting from location.
↓
(+/-) 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 2012-13, NI Water had a variety of such costs.

For the purpose of PC15 efficiency, the UR has treated VER/VS[5] as atypical. Business improvement spend is no longer considered atypical.

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 UR has revised predicted costs by 10% of the water residual and 20% of the sewerage residual for modelling purposes.

Business Activities Adjustment

The business activity adjustment is particular to NI Water. This involves removing these models from the analysis entirely. The UR 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. This is the 'corrected' element of COLS.

Final comparison between NI Water adjusted costs and the benchmark cost

[5] VER/VS is the Voluntary Early Retirement/Voluntary Severance scheme associated with staff leaving the business.

4.1.3 Calculation of the efficiency gap is demonstrated below. Figures show costs prior to removing the business activity models.

Table 4.2 – 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		68.33	73.86	142.19
B	Less atypical cost		0.87	0.93	1.80
C	Less special factors		2.48	2.68	5.16
D	**Modelled cost**	**A-B-C**	**64.99**	**70.25**	**135.24**
E	Predicted cost (average)		69.61	54.08	123.69
F	Real opex industry adjustment	Input	-2.32%	10.09%	
G	New predicted cost (average)	E * (1 + F)	67.99	59.54	127.53
H	Difference	D - G	-3.00	10.71	7.71
I	Residual adjustment factor (%)		10%	20%	
J	Residual adjustment	H * I	-0.30	2.14	1.84
K	**New predicted costs (average)**	**G + J**	**67.69**	**61.68**	**129.37**
L	Frontier adjustment (%)	Input	-8.01%	-10.35%	
M	**Frontier predicted costs**	**K * (1 + L)**	**62.27**	**55.29**	**117.56**
N	Efficiency Gap (to average)	D - K	-2.70	8.57	5.87
O	**Efficiency Gap % (to average)**	**N / D**	**-4.16%**	**12.20%**	**4.34%**
P	Efficiency Gap (to frontier)	D - M	2.72	14.95	17.67
Q	**Efficiency Gap % (to frontier)**	**P / D**	**4.18%**	**21.29%**	**13.07%**

Figures may not sum due to rounding.

4.1.4 The analysis shows 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.

4.1.5 The frontier adjustment is calculated based on how the benchmark companies (Yorkshire Water and Wessex Water) perform against average costs.

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

4.1.7 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 4.3 – 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		61.52	67.34	128.86
B	Less atypical cost		0.78	0.85	1.63
C	Less special factors		2.23	2.44	4.67
D	**Modelled cost**	**A-B-C**	**58.51**	**64.05**	**122.56**
E	Predicted cost (average)		52.71	43.27	95.98
F	Real opex industry adjustment	Input	-2.32%	10.09%	
G	New predicted cost (average)	E * (1 + F)	51.49	47.64	99.13
H	Difference	D - G	7.02	16.41	23.43
I	Residual adjustment factor (%)		10%	20%	
J	Residual adjustment	H * I	0.70	3.28	3.98
K	**New predicted costs (average)**	**G + J**	**52.19**	**50.92**	**103.11**
L	Frontier adjustment (%)	Input	-5.19%	-12.29%	
M	**Frontier predicted costs**	**K * (1 + L)**	**49.48**	**44.66**	**94.14**
N	Efficiency Gap (to average)	D - K	6.32	13.13	19.45
O	**Efficiency Gap % (to average)**	**N / D**	**10.80%**	**20.50%**	**15.87%**
P	Efficiency Gap (to frontier)	D - M	9.03	19.39	28.42
Q	**Efficiency Gap % (to frontier)**	**P / D**	**15.43%**	**30.27%**	**23.19%**

Figures may not sum due to rounding.

4.1.8 To catch-up to average performance, NI Water would need to reduce costs by 16% approximately.

4.1.9 Results of the analysis estimate the efficiency gap to the frontier to be circa 23%. The gap is greater in the sewerage service area. This is in part due to the good performance of Wessex Water, which is the best-ranked company.

4.1.10 The results suggest that for every £1 of opex spent by the notional benchmark company, NI Water spends £1.30.

4.2. Upper quartile approach

4.2.1 NI Water raised some concerns that the historic frontier companies may no longer be the best comparators. The UR also had some concerns with this issue given the movement in actual costs since Ofwat stopped producing the models.

4.2.2 By way of a check, the UR compared NI Water to an upper quartile, rather than an individual company. The upper quartile was derived from the results of the second, third and fourth ranked WaSC's.

Table 4.4 – Calculation of the efficiency gap to the average and upper quartile (excluding business activity models)

Efficiency Gap Calculation					
	Category	**Process Rule**	**Water (£m)**	**Sewerage (£m)**	**Total (£m)**
A	NI Water actual cost		61.52	67.34	128.86
B	Less atypical cost		0.78	0.85	1.63
C	Less special factors		2.23	2.44	4.67
D	**Modelled cost**	**A-B-C**	**58.51**	**64.05**	**122.56**
E	Predicted cost (average)		52.71	43.27	95.98
F	Real opex industry adjustment	Input	-2.32%	10.09%	
G	New predicted cost (average)	E * (1 + F)	51.49	47.64	99.13
H	Difference	D - G	7.02	16.41	23.43
I	Residual adjustment factor (%)		10%	20%	
J	Residual adjustment	H * I	0.70	3.28	3.98
K	**New predicted costs (average)**	**G + J**	**52.19**	**50.92**	**103.11**
L	Frontier adjustment (%)	Input	-15.05%	-2.63%	
M	**Frontier predicted costs**	**K * (1 + L)**	**44.34**	**49.58**	**93.92**
N	Efficiency Gap (to average)	D - K	6.32	13.13	19.45
O	**Efficiency Gap % (to average)**	**N / D**	**10.80%**	**20.50%**	**15.87%**
P	Efficiency Gap (to frontier)	D - M	14.17	14.47	28.64
Q	**Efficiency Gap % (to frontier)**	**P / D**	**24.22%**	**22.59%**	**23.37%**

Figures may not sum due to rounding.

4.2.3 The efficiency analysis to average performance is unaffected by our choice of upper quartile. In overall terms, the efficiency gap to frontier is slightly higher. However, it can be seen that there is not much difference in efficiency levels between water and sewage. The shift in overall efficiency is too small to merit any change from our established approach.

5.0 Setting Efficiency Targets

5.1. Catch-up efficiency

5.1.1 Calculation of the efficiency gap is the key element in setting targets for NI Water. Once established, the UR must then decide the rate of catch-up. This enables reasonable but challenging efficiency targets to be set across the price control.

5.1.2 PC15 spans a much greater period than any of its predecessors. The price control is six years long. The company will have eight years (including PC13) to reduce their PC15 efficiency gap based on the base year of 2012-13.[6]

5.1.3 The rate of catch-up depends on a number of factors e.g.

- Size of the efficiency gap;
- Length of price control;
- Regulatory precedent; and
- What other utilities have achieved.

5.1.4 In terms of catch-up rates, regulatory precedent is quite mixed. In 2008, ORR set Network Rail targets at 66% catch-up over five years. Ofwat have tended to impose targets based on 60% of the gap to the frontier over five years, with most companies out-performing.

5.1.5 In 2002, WICS imposed a catch-up of 80% in four years. This changed to 50% over four years in 2006 and most recently, WICS required a 100% closure to the upper quartile in 2010.

5.1.6 In PC10 and PC13, the UR has followed the Ofwat precedent quite closely, amending for the length of the control period.

5.1.7 On a geometric basis, a 60% catch-up rate over five years equates to a 16.7% per annum closure. Extrapolated over eight years, this is equivalent to a 77% catch-up rate.

5.1.8 NI Water has chosen a catch-up of 75% over the eight years form 2012-13. This is a reasonable figure to assume. For the draft determination, the UR has increased the challenge slightly to 80%. This is in line with Ofwat precedent and the approaches taken at PC10 and PC13.

[6] In operational terms, NI Water has less than seven years to meet the cumulative targets as the 2013-14 financial year is over. The statement simply refers to the fact that PC13 achievement is included in the PC15 catch-up plan.

5.1.9 Having assessed the gap at 23.2%, an 80% catch-up generates an efficiency target of 18.6%. As the company has eight years to achieve this target, a straight-line efficiency profile would look as follows:

Table 5.1 – PC15 straight-line efficiency profile

	PC13		PC15					
Efficiency	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Annual Catch-Up	2.53%	2.53%	2.53%	2.53%	2.53%	2.53%	2.53%	2.53%
Cumulative Target	**2.53%**	**5.00%**	**7.41%**	**9.75%**	**12.04%**	**14.26%**	**16.43%**	**18.55%**

5.2. Efficiency profile

5.2.1 In determining PC15, catch-up from the base year also incorporates PC13 years where targets have already been set. NI Water's business plan has claimed for opex beyond the level determined in PC13.

5.2.2 The UR sees no reason why the opex claim should be above the PC13 level, unless unknown atypical costs arise. To avoid potential problems, the Utility Regulator has adopted the following approach:

a) Accepted or rejected additional cost claims based on merit;

b) Amended PC13 efficiency levels to ensure an opex allowance in line with the previously determined 2014-15 figure; and

c) Revised the PC15 efficiency profile to ensure a catch-up of 18.6%, in harmony with the straight-line profile.

5.2.3 The impact of the adjustments gives the following profile for PC15.

Table 5.2 – PC15 actual efficiency profile

	PC13		PC15					
Efficiency	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Annual Catch-Up	1.48%	1.48%	2.88%	2.88%	2.88%	2.88%	2.88%	2.88%
Cumulative Target	**1.48%**	**2.93%**	**5.73%**	**8.45%**	**11.08%**	**13.64%**	**16.13%**	**18.55%**

5.2.4 The cumulative efficiency is the same at the end of the PC15 period. Annualised targets have shifted upwards to 2.9% from 2.5%. This figure is much lower than previous price controls, reflecting the improving efficiency position.[7]

[7] In 2007-08, NI Water was ranked as a band E company. Having halved their efficiency gap we now observe their status as a much-improved company, ranked within the C efficiency band.

5.3. Frontier shift

5.3.1 The second part of the efficiency target is frontier shift. This is an estimate of changes in industry productivity not associated with catch-up. Frontier shift consists of three elements:

- Inflation (RPI) forecasts;
- Productivity estimates; and
- Input price movements in the water industry cost base.

5.3.2 If water industry prices are forecast to be greater than RPI and productivity combined, the efficiency challenge will be reduced. If not, the result will be an increased target.

5.3.3 Annex S on frontier shift provides detail of these forecasts. On a cumulative basis, the frontier element adds a further small challenge to the catch-up target.

Table 5.3 – Overall PC15 efficiency profile

	PC13		PC15					
Efficiency	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Catch-Up (Ann)	1.48%	1.48%	2.88%	2.88%	2.88%	2.88%	2.88%	2.88%
Catch-Up (Cum)	1.48%	2.93%	5.73%	8.45%	11.08%	13.64%	16.13%	18.55%
Frontier Shift (Ann)	1.22%	-0.46%	-0.30%	-0.01%	1.08%	0.44%	-0.51%	0.57%
Frontier Shift (Cum)	1.22%	0.76%	0.47%	0.46%	1.54%	1.97%	1.47%	2.03%
Cumulative Target	**2.68%**	**3.67%**	**6.17%**	**8.86%**	**12.45%**	**15.34%**	**17.36%**	**20.20%**

Figures may not sum due to rounding

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

Table 5.4 – Utility Regulator's target opex profile (2012-13 prices)

	PC15					
	2015-16	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Baseline Opex – (£m)	142.16	142.16	142.16	142.16	142.16	142.16
Plus Additional Opex – (£m)	10.66	11.66	11.65	11.65	11.93	11.93
Plus Opex From Capex – (£m)	1.47	1.79	2.21	2.32	2.54	2.95
Less Efficiencies – (£m)	-9.52	-13.79	-19.42	-23.95	-27.20	-31.72
Plus BI Costs – (£m)	0.00	0.00	0.00	0.00	0.00	0.00
Plus VER/VS – (£m)	0.00	0.00	0.00	0.00	0.00	0.00
Plus Adjustments – (£m)	0.00	0.00	0.00	0.00	0.00	0.00
Plus Total PPP Unitary Charge (Post Efficiency) – (£m)	43.35	42.96	42.36	41.81	41.42	40.92
Total Opex Profile – (£m)	**188.12**	**184.77**	**178.96**	**173.99**	**170.86**	**166.24**

Figures may not sum due to rounding.

5.4. Opex differences

5.4.1 The table below details the difference in claimed and allowed opex. A further split is provided to illustrate the areas where the UR differs from NI Water.

Table 5.5 – Opex efficiency challenge (2012-13 prices)

Opex Efficiency Challenge	**NI Water PC15 Business Plan Claim**	**PC15 Draft Determination Allowance**	**Variance**	
Total Opex (post efficiency)	£1,119m	£1,063m	-5.0%	£56.4m
			Additional efficiencies	£37.2m
			PPP performance deductions	£2.2m
			Additional opex	£6.7m
			Transformation costs	£8.4m
			Opex from capex	£2.0m
Net efficiency challenge	1.67%	2.88%		

Figures may not sum due to rounding

5.4.1 The most material difference is explained by efficiency. This comprises a number of factors, for example:

- Size of efficiency gap;
- Rate of catch-up;
- Frontier shift differences; and
- Application of targets.

5.4.2 The size of the gap and the rate of catch-up are quite similar. Variance does however appear in the application of targets.

Business activities (BA)

5.4.3 The company has excluded all BA costs from catch-up targets. This approach is based on the premise that these functions are more efficient than the rest of the business.

5.4.4 To support their case, NI Water provided detail showing a £10.7m reduction in BA opex since 2007-08. The company further undertook benchmarking, which indicated an average level of efficiency for these costs.

5.4.5 The UR has made no such exclusion. In his audit, The Reporter made the following comment:

> *"We are not convinced at this stage that the BA costs provided can be directly comparable to E&W. We would expect NI Water to set out in more detail the basis of its analysis and why it is comparable to E&W. For example, NI Water advise that its BA costs include the cost of serving (but not billing) NI domestic customer base. However, billing queries are often significantly greater and hence will form a large portion of the customer services cost base for companies in E&W.*
>
> *At this stage, we do not believe that the business plan submission or supporting analysis makes a robust case that demonstrates the difference is due to efficiencies and not differences in scope."*

5.4.6 The UR shares this concern. Comparing on a unit cost basis may show average efficiency, but it is not clear that scope differences are fully considered.

5.4.7 When comparing current NI Water activity levels to 2010-11 data for England and Wales companies (latest June Return available), the scope difference is stark.

Table 5.6 – Business activity comparisons

	Written complaints per property	**Calls Received per property**	**Company Readings per property**	**Billing Contacts per property**
	Complaints / 000 property	Calls / 000 property	Readings / 000 property	Contacts / 000 property
E&W Industry Average	8.55	1,120	405	898
NI Water	4.17	288	87	101
Difference (%)	**-51.3%**	**-74.3%**	**-78.4%**	**-88.7%**

5.4.8 NI Water has worked hard to reduce unwanted contacts and complaints in recent years. However, it is also fairly certain that England and Wales companies have done the same. This scope impact needs to be accounted for.

5.4.9 The UR also has concerns about the non-domestic debt comparisons. It is always likely that these will be lower in Northern Ireland, but efficiency may not be the sole reason. Metered businesses locally receive a domestic allowance while those unmetered only pay 50% of their bill.

5.4.10 By way of a check, the UR carried out some efficiency modelling in this area. Costs were compared against activities in the form of complaints, calls, billing contacts and meter reads.

5.4.11 By no means perfect, the results suggest an efficiency gap still exists in this area. The findings do not therefore support the exclusion of BA costs from a catch-up challenge.

Rates

5.4.12 A revaluation from Land and Property Services (LPS) is likely to result in uplifts to water rates. NI Water has taken the view that the increase should not be subject to catch-up challenge, as it is outside company control. Current rate levels are however subject to challenge in the company plan.

5.4.13 It is not clear why one element of rates should be subject to targets but not others. This suggests an inconsistency in the business plan.

5.4.14 By contrast, the UR has applied efficiency to all rates. This follows Ofwat precedent and our approach at previous price controls.

5.4.15 In PR14, Ofwat companies are also facing a revaluation (though at a later date). Within company plans, most are suggesting a notified item with an uncertainty sharing mechanism. This involves Ofwat fast-tracked companies bearing at least 20% of any subsequent uplift in rates. In effect, pain sharing is an efficiency challenge by another means.

5.4.16 The UR believes that targets are still merited. This will incentivise NI Water to bear down on its rates costs. By the end of PC15 the efficiency discount applying to any new rates cost will amount to just over 20% (cumulative of both catch-up to frontier efficiency and frontier shift).

5.5. Conclusions

5.5.1 The various differences in approach result in the decreased allowance of the draft determination. The UR believes its approach follows historical precedent and is still appropriate in PC15.

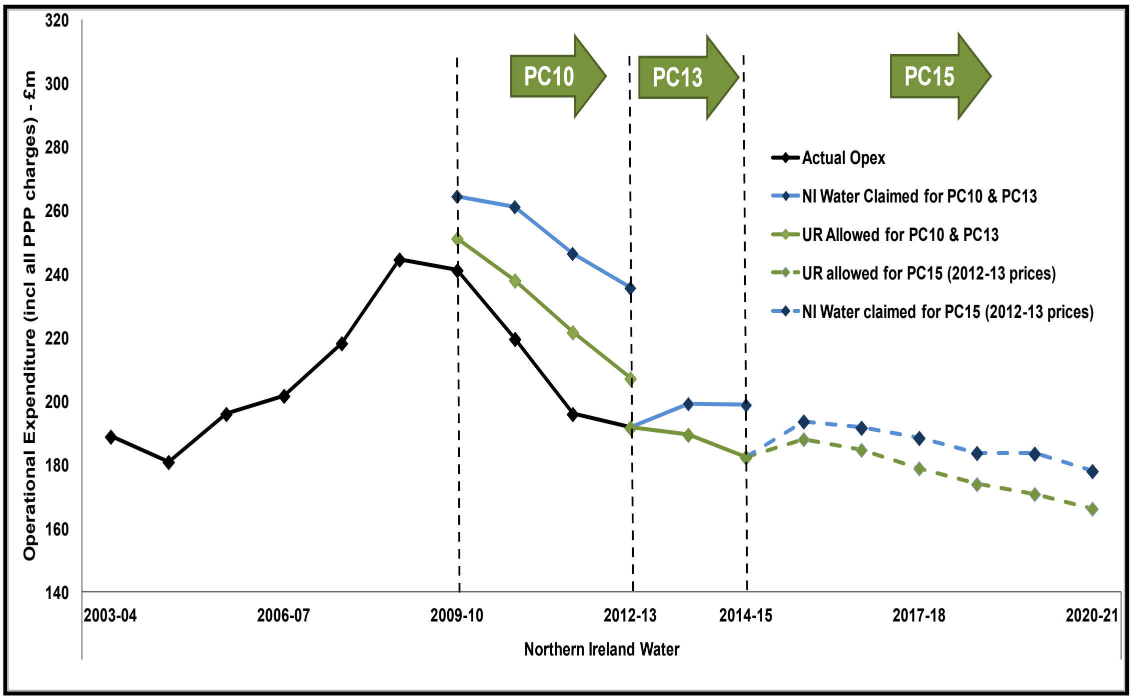
6.0 Conclusions

6.1. Summary

6.1.1 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 precedent.

6.1.2 The result is a targeted opex of £166m (2012-13 prices) by the end of the price control period. This represents a £25.5m (13.3%) real terms reduction from the base year.

Figure 6.1 – PC10/13/15 claimed versus allowed and actual (2012-13 prices)



6.1.3 The challenge is significant. Considering the targets include a £10m uplift in rates, the reduction represents a Value for Money outcome for both consumers and taxpayers alike.