

# **Annex 5**

## **Top-Down Benchmarking**

### **GD17**

**Final Determination**  
**15 September 2016**



# About the Utility Regulator

The Utility Regulator is the independent non-ministerial government department responsible for regulating Northern Ireland's electricity, gas, water and sewerage industries, to promote the short and long-term interests of consumers.

We are not a policy-making department of government, but we make sure that the energy and water utility industries in Northern Ireland are regulated and developed within ministerial policy as set out in our statutory duties.

We are governed by a Board of Directors and are accountable to the Northern Ireland Assembly through financial and annual reporting obligations.

We are based at Queens House in the centre of Belfast. The Chief Executive leads a management team of directors representing each of the key functional areas in the organisation: Corporate Affairs; Electricity; Gas; Retail and Social; and Water. The staff team includes economists, engineers, accountants, utility specialists, legal advisors and administration professionals.

## Our Mission

Value and sustainability in energy and water.

## Our Vision

We will make a difference for consumers by listening, innovating and leading.

## Our Values

Be a best practice regulator: transparent, consistent, proportional, accountable, and targeted.

Be a united team.

Be collaborative and co-operative.

Be professional.

Listen and explain.

Make a difference.

Act with integrity.

# TABLE OF CONTENTS

|   |  |    |
|---|--|----|
| 1 | Introduction .....   | 3  |
|   | Why benchmark companies? .....                                     | 3  |
| 2 | Data .....   | 6  |
|   | Network and business characteristics .....                         | 7  |
|   | Iron mains .....   | 7  |
|   | Company comments on benchmarking and company-specific issues ..... | 8  |
|   | Data adjustments .....   | 10 |
|   | Regional Wage Adjustment .....                                     | 13 |
|   | Levels of service considerations .....                             | 17 |
| 3 | CSV Approach and Special Factors .....                             | 19 |
|   | Precedents for using a CSV approach .....                          | 19 |
|   | Iron mains variable .....  | 20 |
|   | Special factor assessment criteria .....                           | 20 |
|   | Submissions on special factors .....                               | 21 |
|   | UR decision on special factors .....                               | 23 |
|   | Submissions on atypicals .....                                     | 24 |
|   | UR Decision on atypicals .....                                     | 24 |
|   | Chosen CSV weights .....   | 24 |
| 4 | Econometric and Unit Cost Results .....                            | 27 |
|   | Chosen sample .....  | 27 |
|   | Preferred models .....   | 27 |
|   | Chosen benchmark .....   | 29 |
|   | Statistical tests .....  | 32 |
|   | Disaggregated & unit cost analysis .....                           | 34 |
| 5 | Interpretation of Results .....                                    | 36 |
|   | Findings from the total modelled opex models .....                 | 36 |
|   | Findings from disaggregated approach .....                         | 39 |
| 6 | Next Steps for Benchmarking .....                                  | 40 |
|   | Annual reporting during GD17 .....                                 | 40 |
|   | Benchmarking in GD23 .....   | 41 |
|   | APPENDIX A: DETAILED RESULTS .....                                 | 42 |
|   | APPENDIX B: OPEX UNIT COSTS AT FD .....                            | 43 |

# 1 Introduction

- 1.1 For GD17 the Utility Regulator has undertaken benchmarking on Northern Ireland GDNs' operating expenditure (opex), involving a variety of benchmarking techniques typically adopted by economic regulators. These techniques involved Pooled Ordinary Least Squares (POLS) regression analysis as well as the more advanced estimation methods of Random Effects (RE) modelling and Stochastic Frontier Analysis (SFA). The Utility Regulator has also undertaken some unit cost comparisons.
- 1.2 The Utility Regulator was initially advised in the development of its benchmarking models by Cambridge Economic Policy Associates (CEPA). The Utility Regulator and CEPA met the NI Gas Distribution Network companies (GDNs) on 25 February 2015 to discuss the likely way forward for opex benchmarking in GD17 and beyond.
- 1.3 Deloitte LLP, utilising expert modelling advice from Dr Melvyn Weeks<sup>1</sup> assisted the Utility Regulator in refining the models for the GD17 draft determination. The analysis Deloitte LLP undertook was published in the draft determination's Annex 4: Deloitte LLP - GD17 Efficiency Advice – Relative Efficiency of Northern Ireland's Gas Distribution Networks (published in March 2016).
- 1.4 In parallel, the Utility Regulator has also been receiving expert advice on advanced econometric modelling techniques by Dr Alan Fernihough of Queen's University, Belfast for both the draft and final determination stages of GD17.
- 1.5 In our draft determination publication Annex 5: Indicative Findings from Top-Down Benchmarking, the Utility Regulator detailed the various data adjustments which were made to ensure a like-for-like comparison. We also showed our interpretation of the results of the econometric analysis and how each company business plan compared to predicted opex from the various models.
- 1.6 GDNs were invited to consider the modelling approach and model specifications and submit any relevant special factor and atypical adjustment claims within their response to the draft determination. These responses were considered by the Utility Regulator in order to further refine and improve the analysis undertaken at final determination.

## Why benchmark companies?

---

- 1.7 In a fully competitive market, customers will be free to choose from a number of companies who compete on price and quality. As the gas distribution companies are natural monopolies, there are unlikely to be cost benefits of allowing direct competition as it would lead to duplicate networks being laid. Regulatory benchmarking may therefore be necessary to drive down costs and improve quality of service in the absence of competitive pressures.
- 1.8 Benchmarking is essentially the process of comparing a firm's costs and performance to the industry best or best practices from other similar companies. For the Utility Regulator this

---

<sup>1</sup> Dr Melvyn Weeks is a Senior Lecturer in the Faculty of Economics at the University of Cambridge. He has provided advice to Ofgem for the RIIO-GD1, RIIO-T1, and RIIO-ED1 price reviews.

effectively means comparing the relative performance of Northern Ireland GDNs to those GDNs who operate in Great Britain (using Ofgem data).

- 1.9 Such approaches have been adopted by regulators around the world. In Great Britain, regulators such as Ofgem, Ofwat, ORR, WICS etc have undertaken comparative benchmarking since their introduction as regulators of their various network sectors.
- 1.10 In Northern Ireland, the Utility Regulator has undertaken econometric and unit cost benchmarking of NI Water for a number of its price controls (namely PC10, PC13 & PC15), with notable success. For example, since 2007-08 the Utility Regulator has seen NI Water's operational efficiency gap reduce considerably, from an estimate of 49% in 2007-08, to around 13% in 2014-15. Since the start of PC10, annual operational expenditure in the water and sewerage business has reduced by around £60m in real terms.<sup>2</sup>
- 1.11 The Competition and Markets Authority (CMA), formerly known as the Competition Commission (CC) has undertaken comparative benchmarking using a number of econometric modelling approaches, including the benchmarking of NIE for the RP5 price control and the recent determination for Bristol Water which related to Ofwat's PR14.
- 1.12 It is important to note that with any type of efficiency benchmarking analysis however, we are dealing with estimates and approximations of real-life effects. There will be a margin of error associated with any resulting point estimate of relative efficiency. Any analysis is dependent on the data inputs, the statistical estimation technique employed and any assumptions used in building the models.
- 1.13 The established GDNs in Northern Ireland were largely supportive of the principle of benchmarking, providing that it conforms to best practice. PNGL in their June 2014 business plan submission on benchmarking stated that:
- "UR has set out its intentions to review PNGL's capex and opex cost drivers and long-term business plan as part of the GD17 price control review process. UR's benchmarking analysis will inform this review. These benchmarking comparisons can be useful in helping PNGL to identify best practice and understand the drivers of cost and performance.*
- PNGL runs a lean and efficient business in line with industry-leading standards for cost efficiency."*
- 1.14 Firmus Energy, in their business plan submission welcomed the idea of benchmarking, but did express some caution as to how it was undertaken methodologically speaking:
- "Although the Utility Regulator's approach to GD17 in terms of benchmarking firmus energy against the GB GDNs and Phoenix in Northern Ireland is understandable, we believe it is a potentially problematic approach in which the sheer number of adjustments required in order to compare the companies meaningfully could call into question its overall value. We welcome the idea of benchmarking for GD17 in principle as a qualitative check on whether there is a reason to doubt that a utility's costs are efficient and reasonable, but would caution against a purely quantitative process."*
- 1.15 SGN NI have cautioned against top-down benchmarking, citing a number of issues which they believe would make the use of such analysis inappropriate in Northern Ireland.

---

<sup>2</sup> Calculated as the difference in operational spend between 2009-10 (year immediately before PC10) and 2014-15.  
[http://www.uregni.gov.uk/uploads/publications/final\\_Cost\\_and\\_Performance\\_Report\\_for\\_PC13\\_-\\_embargoed\\_until\\_1200\\_26th\\_Nov\\_2015\\_final\\_v.pdf](http://www.uregni.gov.uk/uploads/publications/final_Cost_and_Performance_Report_for_PC13_-_embargoed_until_1200_26th_Nov_2015_final_v.pdf)

- 1.16 In their response to the GD17 draft determination, the Consumer Council were supportive of the benchmarking analysis undertaken, stating:

*“The Consumer Council welcomes the benchmarking exercise UR has undertaken in GD17. The Consumer Council has witnessed the clear advantages and improvements brought to the water sector in NI through benchmarking and comparative regulation.*

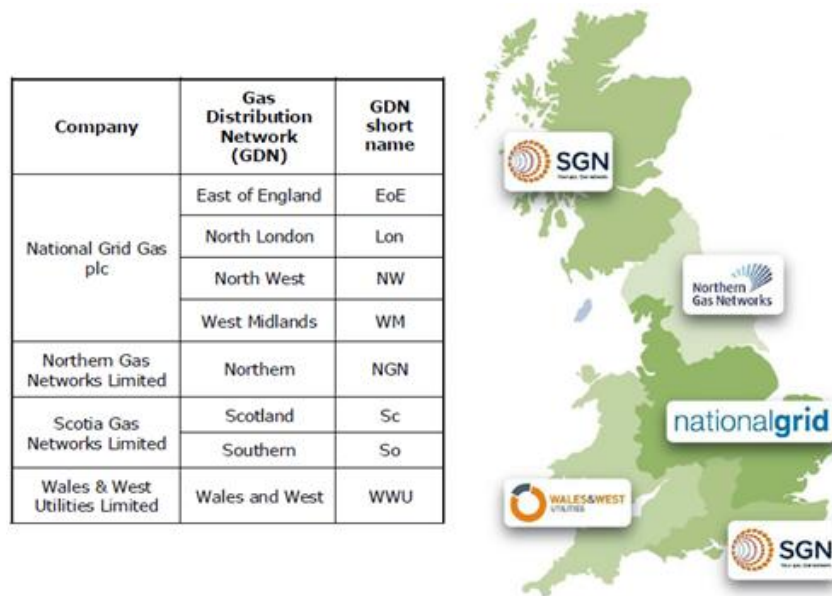
*The Regulator’s success at benchmarking within the local water industry gives the Consumer Council confidence that it can bring similar benefits to the natural gas industry.”*

- 1.17 In their consultation responses, the NI GDNs were critical of some elements of the benchmarking approach taken by the Utility Regulator at draft determination. However, it is clear from the analysis provided by both PNGL and FE that the companies have engaged with the process and have made constructive and rational comments on the methodology adopted. This has assisted the Utility Regulator in refining its models for final determination.

## 2 Data

- 2.1 In Great Britain, there are eight GDNs which own and operate network assets within a defined geographical area. They transport 508 TWh of gas per year from the National Transmission System, across 270,000 km of network main to the homes and businesses of around 22 million consumers.<sup>3</sup> GDNs are responsible for the operation, maintenance and extension of the network and for providing a 24-hour gas emergency service.
- 2.2 Where these companies are situated, as well as details of their parent companies, are shown in the table and map below.<sup>4</sup>

**Figure 1: Map of GB GDNs**



- 2.3 In terms of number of customers, the eight GB GDNs currently range from approximately two million to four million customers. Operational expenditure (opex) for the eight GB GDNs was over £800m in 2014-15.<sup>5</sup> We are grateful to Ofgem (the Regulator of the gas and electricity industries in Great Britain) for providing the UR with detailed data which allows us to undertake this benchmarking analysis on operational costs.
- 2.4 PNGL has around 170,000 customers, around a tenth of the GB GDNs roughly speaking. FE has around 20,000 customers, which is approximately a hundredth of the GB GDNs' customer base. One notable feature of the NI GDNs, is that they are growing much faster (in overall percentage terms) than the more mature GB GDNs, in terms of customers, volumes and network length.

<sup>3</sup> <http://theswitch.co.uk/gas-distribution>

<sup>4</sup> Table and map from Ofgem:

[https://www.ofgem.gov.uk/sites/default/files/docs/2015/03/riio-gd1\\_annual\\_report\\_2013-14-final.pdf](https://www.ofgem.gov.uk/sites/default/files/docs/2015/03/riio-gd1_annual_report_2013-14-final.pdf)

<sup>5</sup> Documented within GB GDNs' RRP as "total opex".

- 2.5 SGN NI are set to supply gas to the west of Northern Ireland. They do not have any years of actual operational data as yet; therefore we have excluded them from this 'top-down' benchmarking analysis.
- 2.6 In order to facilitate as like-for-like a comparison as possible, it is necessary to make a number of data exclusions and adjustments to both the GB GDN data and the NI GDN data. This allows a spectrum of similar cost activities to be compared. As the Utility Regulator's Regulatory Instructions and Guidance (RIGs) are similar to Ofgem's, with similar categories of disaggregation, we can undertake this exercise relatively straightforwardly.

### Network and business characteristics

---

- 2.7 While all GDNs undertake the same activity of gas distribution, each company varies in its customer numbers, volumes, network length, topography, location and maturity. All of these characteristics (as well as other factors) may have some impact on operational costs and relative performance.
- 2.8 In terms of customer density, both PNGL and FE have a lower number of customers per network main than the eight GB GDNs. As customers continue to connect to these new networks, these numbers have increased steadily and are expected to increase further into the medium term. Due to its network serving a more rural customer base, even once it reaches maturity, it is likely that FE will have a relatively low customer density.
- 2.9 Volumes of gas per km of main are currently higher in the FE area than in the PNGL area and energy density (measured in terms of average volumes per customer) is also higher in the FE area than in the PNGL area, attributable to its large I&C customers. PNGL is slightly below the GB average figure with regards to average volumes per customer.
- 2.10 The Northern Ireland GDNs are newer than the GB GDNs. PNGL's licence was awarded in 1996 and FE's licence was awarded in 2005, whereas the GB GDNs are much longer established.

### Iron mains

---

- 2.11 The gas distribution network in Great Britain consists of 72,000 km of iron mains, representing 27% of the total mains population. The remainder is constructed mainly from polyethylene (PE) and steel.<sup>6</sup>
- 2.12 Data taken from the Health and Safety Executive (HSE) shows that while steadily decreasing, the quantity of iron mains in GB gas distribution networks remains significant.<sup>7</sup> The graph below shows the absolute level of iron mains remaining in each GDN's network.
- 2.13 These figures include iron mains removed due their condition or as part of other network maintenance or upgrading activities, as well as those decommissioned as part of the iron mains risk reduction programme. This Safety Performance Indicator (SPI) from the HSE is widely reported and is of strategic importance to the GDNs.<sup>8</sup>

---

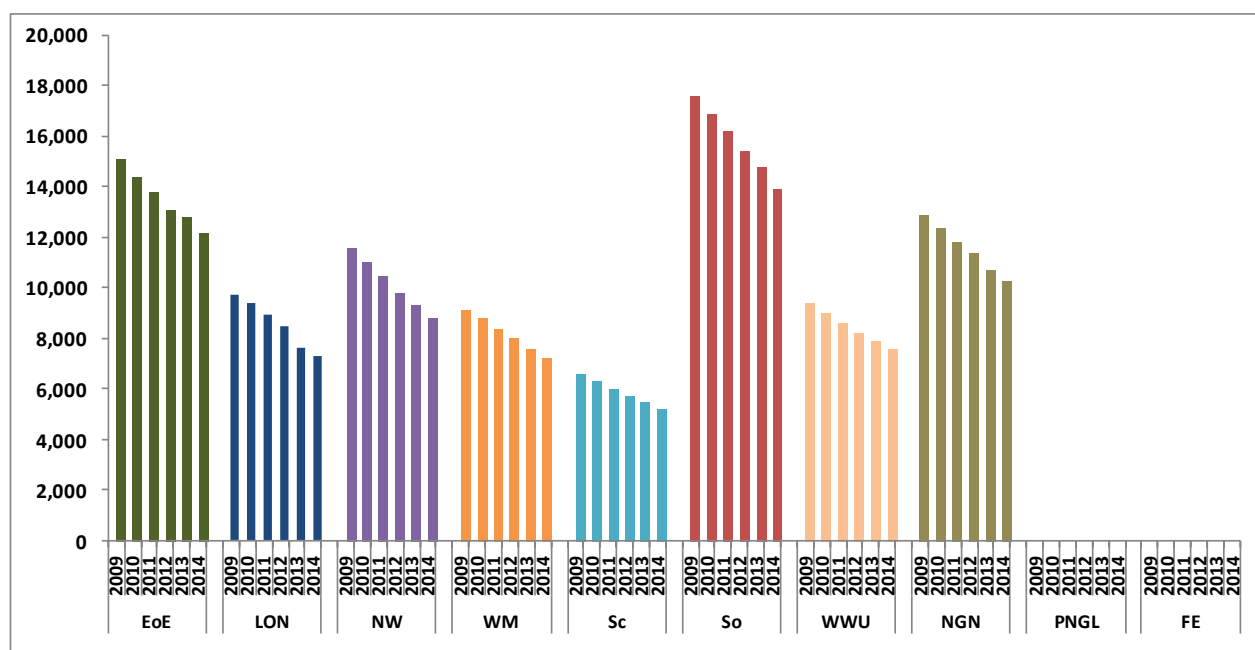
<sup>6</sup> <https://www.ofgem.gov.uk/publications-and-updates/riio-gd1-annual-report-2014-15>

<sup>7</sup> <http://www.hse.gov.uk/pipelines/annual-report13-14.pdf>

<sup>8</sup> It should be noted that each company will have a different total network length so such data does need to be normalised into the proportions of a network which consists of iron. This would show a more comprehensive picture, but such data is not available publically.



**Figure 2: Iron mains remaining (km) across GDNs (2009-2014)**



- 2.14 Older iron mains (still evident in Great Britain), would be more likely to leak, due to the effects of corrosion, than the more modern polyethylene pipes which have been installed in Northern Ireland. According to research undertaken by CEPA for the HSE for example, there would be substantial ongoing savings associated with the GB repex scheme – these have been estimated over the next 20 years to potentially amount to billions of pounds (£bn) of operational savings for the GB GDNs.<sup>9</sup>
- 2.15 GDNs in Northern Ireland, who are without these iron mains (see graph above) are at an advantage as they should have relatively less workload levels (impacting on emergencies, repairs and maintenance) than in GB as a result of their more modern network. The Utility Regulator have therefore controlled for this in some of our regression models.<sup>10</sup>

### Company comments on benchmarking and company-specific issues

- 2.16 We requested that the companies attempt to undertake their own benchmarking assessment of their own cost and performance within the submission of their business plans. We also requested that the GDNs submit special factor and atypical claims and any other information which they considered relevant for our analysis.
- 2.17 A short summary of what was received in the company business plans is summarised below for each company.

<sup>9</sup> <http://www.hse.gov.uk/research/rrpdf/rr888.pdf>

<sup>10</sup> The adoption of an iron mains variable has been used in Australia. <https://jemeni.com.au/documents/price-reviews/gas/our-revised-regulatory-proposal/appendices/appendix-05-02-economic-insights-updated-productiv>

## **PNGL**

- 2.18 PNGL undertook some benchmarking reviews of various aspects of operational activities such as staff turnover, absenteeism, health and safety and customer service.
- 2.19 Within their business plan submission, PNGL stated that benchmarking can be useful in identifying best practice and the drivers of costs. They did highlight some areas which should be taken into account in any benchmarking exercise however:
- “In any benchmarking exercise of PNGL it is important to understand the context and historical development of the business. The efficiency of PNGL’s costs and activities must be assessed in light of the specific history and present stage of PNGL’s development; and in consideration of the size of the business. This is particularly important when comparing PNGL against more established, larger GB companies. The relative size, location, and historical context of PNGL must be taken into account in the benchmarking models in an appropriate way.”*
- 2.20 PNGL also stated in their business plan that they looked forward to engaging closely with the Utility Regulator on the development of any benchmarking models for GD17 to help identify any data/comparability issues; understand the proposed benchmarking techniques; and ensure that any results are interpreted and applied robustly, and in line with good regulatory practice.

## **FE**

- 2.21 FE’s consultants Oxera undertook some benchmarking of opex on both a unit cost and econometric basis using Ofgem RIIO-GD1 coefficients. FE stated that they are forecasting increasing efficiency and productivity over the six years of GD17 on a number of metrics.
- 2.22 FE have also highlighted aspects of their business which they would like to be taken accounted of in the benchmarking. FE highlighted that in being such a small size, even the smallest GB GDN has 100 times more customers.

*“At this size it can be expected that the GB GDNs have some very significant cost advantages based on economies of scale. This must certainly apply in the case of general procurement of goods and services as well as to network operations carried out by contractors. Also, corporate overhead costs are spread across a large organisation and vast network .....It would not be reasonable therefore, on the basis of economies of scale alone, to expect firmus energy to achieve the same basic costs profile as those experienced by the GB GDNs.*

*The fundamental differences between firmus energy and the GB GDNs go beyond considerations of scale. The GB GDNs are also mature businesses with well-developed networks and higher customer densities. Inevitably this lower density implies higher costs for both investment and network operations. Of primary concern are the differences between firmus energy, SGN NI and Phoenix where the latter is at a much more mature stage of development and has its operations concentrated in a densely populated urban area.”*

- 2.23 FE's consultants Oxera, outlined how they were a sparse and rural network and contended that this may lead to the firm incurring higher unit costs to maintain its network and resource staff to attend to emergency calls.
- 2.24 FE also outlined in their business plan submission what they considered to be differences in scope between GB GDNs and NI GDNs. These included metering obligations, Pressure Systems Safety Regulations, treatment of controlled/uncontrolled gas escapes and facilitation of customer switching and relationships with shippers/suppliers. They also pointed out that they were undertaking a new build capex programme, compared to the replacement expenditure undertaken by GB GDNs.

## **SGN NI**

- 2.25 In their business plan submissions, SGN NI made a number of references to benchmarking, but primarily they outlined what they believed were the difficulties of comparing the costs of NI GDNs with each other and the GB firms.

*"The GB gas market serves over 20m gas consumers. This drives very different investment strategies and different efficiencies as well as a different focus and approach to issues such as customer service, stakeholder engagement and incentives;*

*The three networks are at significantly different levels of maturity and therefore have different cost bases, organisational structures, business priorities and investment decisions. This would mean great difficulty in analysing the networks by way of direct comparison as the necessary adjustments would be extremely challenging to accurately calculate."*

- 2.26 As noted earlier however, SGN NI do not have any years of actual operational data as yet; therefore we have excluded them from this 'top-down' benchmarking analysis. We have noted their comments on benchmarking.

## **Comments post-draft determination**

- 2.27 During the consultation exercise a number of respondents commented on the Utility Regulator's benchmarking analysis undertaken at the draft determination stage. As this largely involves specific comment on the methodology used within the benchmarking analysis, we deal with these matters within the relevant sections below.

## **Data adjustments**

---

- 2.28 In order to ensure that cost activities are comparable across the GDNs in the dataset, we make a number of adjustments.
- 2.29 A summary of the costs which have been included / excluded for our GD17 final determination modelling is shown below.

**Table 1: Breakdown of modelled opex**

| Cost Activity |                  |  | Included in Modelled Opex |  |
|---------------|------------------|--|---------------------------|--|
| Direct Costs  | Work Management  | Asset Management (Including Network Policy)  | ✓                         | Included   |
|               |                  | Operations Management (Including Contract Management)  | ✓                         | Included   |
|               |                  | Customer Management (including Customer Call Centre) & Network Support (Includes System Mapping) | ✓                         | Included   |
|               |                  | System Control   | ✓                         | Included   |
|               | Work Execution   | Emergency  | ✓                         | Included   |
|               |                  | Metering   | X                         | Excluded – only applicable in NI                                     |
|               |                  | Repairs  | ✓                         | Included   |
|               |                  | Maintenance  | ✓                         | Included   |
|               |                  | Independent Networks   | X                         | Excluded - only applicable to GB (namely Scotland)                   |
|               |                  | Other Direct Activities (inclusive xoserve)  | ✓                         | Included   |
|               |                  | xoserve  | -                         | A GB-only regime – we exclude 67% of xoserve from ODAs <sup>11</sup> |
| Indirect      | Business Support | R&D  | ✓                         | Included - only separately apportioned in GB 2009-2012.              |
|               |                  | IT & Telecoms  | ✓                         | Included   |
|               |                  | Property Mgt   | ✓                         | Included (network rates are excluded however)                        |
|               |                  | Insurance  | ✓                         | Included   |
|               |                  | HR   | ✓                         | Included   |
|               |                  | Finance, audit and regulation  | ✓                         | Included   |
|               |                  | Procurement  | ✓                         | Included   |
|               |                  | CEO and Group management   | ✓                         | Included   |
|               |                  | Stores & logistics   | ✓                         | Included   |
|               |                  | Training & Apprentices   | X                         | Excluded – not comparable  |
|               |                  | Advertising & Market Development   | X                         | Excluded – not comparable  |

- 2.30 Xoserve is a GB entity that is jointly owned by the gas distribution network companies and National Grid's transmission business, providing one consistent service point for the gas shipper companies. Xoserve was founded on 1st May 2005, and is an integral part of the restructured gas distribution market in Great Britain. Xoserve costs are included within the Other Direct Activities (ODA) opex category.
- 2.31 NI GDNs do not face xoserve costs. However, the Utility Regulator is mindful that some of the activities undertaken by xoserve may be performed internally by the local GDNs. At draft determination we therefore decided to exclude 75% of xoserve costs from ODAs. We considered that these adjustments should make the modelled opex more comparable than if we ignored such a material difference in the scope of activities.
- 2.32 FE's Consultants Oxera stated that FE undertake xoserve activities in-house, therefore considered that the reasoning for the Utility Regulator's 75% exclusion was unclear. Oxera also stated that the Utility Regulator had not taken into account the "huge economies of scale present on these costs". Oxera suggest that:

<sup>11</sup> This has been reduced to 67% at final determination from 75% at draft determination.

*“In order to account for this more extreme difference in scale, one option would be to exclude both Xoserve costs and FE’s costs for undertaking these activities. Alternatively, one appropriate adjustment could be to reduce FE’s costs rather than those of GB GDNs.”*

- 2.33 In reassessing its xoserve adjustment, the Utility Regulator partially accepts Oxera’s argument. However, while FE undertakes some xoserve functions in-house, we consider there are notable differences compared with the scope of activities undertaken within xoserve in GB. We therefore slightly amend our exclusion of xoserve from 75% at draft determination, to 67% at final determination (i.e. three-quarters exclusion to two-thirds).
- 2.34 In addition, following the draft determination the Utility Regulator has received additional historical opex data from Ofgem on xoserve costs. This has now been added to update our dataset with xoserve actual data, as opposed to having to backcast as at draft determination.<sup>12</sup>
- 2.35 The Training and Apprentices category covers (i) the costs of any operational training and (ii) the cost of training any employees engaged on approved formal training or apprentice programmes (either operational or non-operational). We believe that this excluding this cost category from modelled opex should improve the comparability of the data as there are differences in approach to Training & Apprenticeships between the GDNs in Northern Ireland and Great Britain.
- 2.36 Advertising & Market Development is not part of the regulated business of GB GDNs. We believe that this exclusion should improve the comparability of the data.
- 2.37 In addition to the above, we also exclude the following items from the GB GDN data to facilitate greater comparability of activities between GB and NI:
- Gasholder decommissioning
  - Environmental costs
  - Land remediation
  - Non-controllable costs (licence fees, network rates etc)
- 2.38 Deloitte LLP assisted the Utility Regulator in assessing whether these exclusions were appropriate and we believe that excluding these costs improves the comparability of the data. It is important to note that whilst the NI and GB regions are subject to slightly different regulatory arrangements with respect to gas distribution, the two regions operate within the UK national economy and use pound sterling as the currency.
- 2.39 Some atypical expenditure has also been removed from NI GDNs’ modelled costs,<sup>13</sup> so as to ensure a comparable profile of opex spend for the Northern Ireland firms over time.
- 2.40 FE’s consultants Oxera regarded most of the adjustments made by the Utility Regulator as appearing reasonable (such as for metering), but Oxera did have specific concerns regarding xoserve adjustments (discussed above) and the regional wage adjustment, which is discussed in detail below. PNGL and their consultants NERA also had some concerns about the regional wage adjustment, and this is also discussed below.

<sup>12</sup> In monetary terms the difference between the actuals and the backcast data has been relatively small.

<sup>13</sup> Such as historic CC costs for PNGL.

## Regional Wage Adjustment

---

- 2.41 In order to ensure that companies are not unfairly advantaged by being situated in a low-cost region for labour or disadvantaged by being situated in a high-cost region we undertake a regional wage adjustment (RWA) for each GDN, for each year being assessed 2009-2022.
- 2.42 Regional wage and price variations are taken into account by a number of economic regulators of network companies, including by Ofwat (PR14) and Ofgem (RIIO-GD1 and RIIO-ED1). The Competition Commission determination of NIE for RP5 made a wage adjustment between the different Distribution Network Operators (DNOs) used in its benchmarking, including NIE.
- 2.43 In PC15, in assessing NI Water's capex programme, the Utility Regulator undertook a regional price adjustment which took into account lower procurement prices in Northern Ireland than in England and Wales. For our opex efficiency models, we implemented a negative special factor upon NI Water to take account of lower wage levels in Northern Ireland for PC10, PC13 and PC15.
- 2.44 At GD17 draft determination, for the gas distribution top-down analysis the Utility Regulator applied a regional wage adjustment using ONS ASHE private sector median gross full-time weekly wage differentials between regions.<sup>14</sup> We used median wages as they can be regarded as less liable to be skewed than using the mean. Each GDN's opex was adjusted by this differential, using the assumption that 52% of opex relates to labour, therefore the index was applied to around half of opex. Private sector median wages were preferred over all employee jobs due to the fact that the firms are private regulated utilities.
- 2.45 We matched one or more of the twelve UK government office regions used by ONS to each respective GDN and weighted the regional wage by population. We treat Northern Ireland as a single region in our analysis.<sup>15</sup>
- 2.46 Using this methodology, from 2009-2015, private full-time weekly wages in Northern Ireland were around 82% of the UK average, leading to a differential of around -18%. As the Utility Regulator assumed that only 52% of opex relates to labour, for 2017 to 2022 we adopted a regional wage adjustment of -9.2% for Northern Ireland (i.e. opex costs are 9.2% lower for Northern Ireland due to effects of lower wages). This is an average of the historic ASHE figures and had the effect of adjusting NI GDNs' modelled costs upwards for the purposes of benchmarking.
- 2.47 The Consumer Council, in their consultation response to the GD17 draft determination stated that while they strongly support wage parity for NI employees compared to the rest of the UK, they accept and understand the rationale applied by the Utility Regulator regarding a regional wage adjustment. The Consumer Council also state that Northern Ireland has some of the lowest wages of any UK region, including the highest percentage of workers on or below the minimum wage.
- 2.48 PNGL and their consultants NERA, were critical in their response to the draft determination of aspects of our methodology for calculating a regional wage adjustment. In summary, PNGL and NERA had the following specific comments:
- (i) The use of private sector wages leads to a compositional bias as workers in irrelevant occupations are included in the differential. A weighted occupational

---

<sup>14</sup> Data from Office for National Statistics (ONS) Annual Survey of Hours and Earnings (ASHE).

<sup>15</sup> We do not sub-divide Northern Ireland into PNGL area and FE area.

approach using ASHE Standard Occupational Classification (SOC) codes would be a substantial improvement in their view.

- (ii) NERA propose using occupation groups (SOC codes) and weightings based on their interpretation of Ofgem and CC analysis. NERA calculated three different composite wage levels for each region under their 2, 3 and 4 digit approaches. NERA ultimately took an unweighted average of these numbers.
- (iii) NERA consider that hourly rates of pay should be used as opposed to weekly earnings so as to take into account different levels of hours worked across regions.
- (iv) Wage differentials should only be applied to half (50%) of the labour component (52%) of opex (i.e. 26%) as NERA contend that there would not be a need to locate all of a company's labour within its regional boundaries.<sup>16</sup>

2.49 While being critical of some of the Utility Regulator's methodology at draft determination, PNGL and NERA did not disagree with the principle of applying regional wage adjustments, to make comparisons between different firms situated in different regions more like-for-like.

2.50 In addition, PNGL and NERA agree with the Utility Regulator that a negative regional wage adjustment is warranted due to Northern Ireland being a relatively low-cost region with respect to labour. While our draft determination estimate of Northern Ireland regional wage adjustment was -9.2%, PNGL and NERA appear to indicate that an adjustment of around -2% to -3% would be more appropriate.

2.51 FE did not specifically comment on the wage differential that was used at draft determination (-18%) but did have reservations as to how it was applied to opex (52% labour component assumption). FE's Consultants Oxera stated that they regarded this application factor as too high:

*"FE's business plan indicates that the share of labour costs in its OPEX will decrease from 46% to 37% over the period. The higher percentage assumed by the Utility Regulator means that FE's costs will be uprated by a larger amount than they should be based on FE's actual cost structure. This would clearly disadvantage FE in the Utility Regulator's benchmarking analysis. Thus, this adjustment warrants further examination."*

2.52 Having considered all arguments made on the regional wage adjustment, the Utility Regulator recognises that the use of a private sector median wage differential may be at some risk of being too general a measure for accounting for regional wage differences for GDNs. We therefore adopt a weighted occupational approach for the final determination, as proposed by PNGL and NERA.

2.53 An occupational approach is in line with the regional wage methodologies adopted by other regulators. Ofgem adopted an occupational approach to determining regional wage differences in both RIIO-GD1 and RIIO-ED1, as did Ofwat in PR14. The Competition Commission in its RP5 determination for NIE also adopted an occupational approach to regional wage differences.

2.54 It is important to note however, any wage adjustment to opex is a proxy for accounting for the regional differences in labour costs which a utility company would face. It would be mistaken to imply that there is one set standard mechanistic approach for undertaking this adjustment. Indeed, the Competition Commission in its RP5 determination explicitly stated this in relation to NIE, as cited below:

---

<sup>16</sup>  $0.50 * 0.52 = 0.26$ .

*“There is no single ‘correct’ method for making a wage adjustment to the costs of NIE and GB DNOs as part of benchmarking analysis. Some methods would use relatively detailed or granular wage data on the type of occupations that are relevant to NIE’s business. But the sample size for this data is quite small and we have some concerns about its accuracy. However, if more aggregated data is used, there is a greater risk that estimation results are influenced by wage data for occupations that are not relevant to NIE’s activities.”*

- 2.55 The CC built upon this reasoning in its RP5 determination for NIE by producing econometric results from a range of different wage adjustment methods, rather than relying upon one single method.
- 2.56 It is important also to note that the base data being used to compute the regional wage differentials (ASHE data from ONS), has an intrinsic margin of error itself, given that it is based on samples.
- 2.57 In terms of implementation of the occupational wage approach, although we have followed some of the occupational wage approach PNGL and NERA have undertaken, the Utility Regulator has deviated from their methodology in the following specific ways:
- (i) We have solely used a 2-digit SOC approach. We consider that the use of such granular data within the 4-digit SOC approach could be problematic in small sample sizes sometimes evident in Northern Ireland’s ASHE survey.
  - (ii) The Utility Regulator has adopted different weights of SOC codes to those advocated by PNGL and NERA. In addition to this, the Utility Regulator considers that the resulting proposed labour cost differentials from PNGL and NERA contain degrees of variation which are at odds with our *a priori* expectations. For example, using their proposed methodology, the GDN of Scotland has a differential which is positive with magnitudes comparable to the wage differential for National Grid - London.<sup>17</sup>
  - (iii) The UR has compared results using weekly wages as opposed to hourly. Overall, we consider any difference between the two approaches to be small. We adopt full-time wages as it can allow a more like-for-like comparison, as all-employee results can potentially be distorted depending on proportions of workforce in each region engaged in part-time working.
  - (iv) We use median wages as opposed to mean wages. We consider that this gives results that are more stable over time and less liable to be skewed.
  - (v) We do not believe that a further application factor in addition to the assumed 52% labour component is warranted. With Northern Ireland being a low cost region we would be surprised if a company located half of its staff in a more expensive region of the UK.
- 2.58 In this top-down benchmarking, the Utility Regulator has adopted and developed separate economic models to those used by Ofgem at RIIO-GD1. As was the case in our comparative cost benchmarking of NI Water, we are not obliged in our gas benchmarking to rigidly follow the exact same methodological approach of a particular regulator. Indeed, the Utility Regulator, Ofwat, Ofgem and the CC / CMA all have adopted different approaches to regional wage adjustments for the various industries assessed depending on a range of contextual differences applying to the markets and sectors they regulate. In addition to

---

<sup>17</sup> Ofgem RIIO-GD1 had a negative RWA for Scotland GDN and highly positive one for National Grid – London.



some variation of methodological approach between regulators, these approaches can also vary within regulators over time – namely, from one price control to another.

- 2.59 The Utility Regulator therefore has decided to undertake its own occupational-based regional wage adjustment using its own considered view of relevant occupations and their attributed weights. These are quite similar to NERA's proposals, although differences in categories chosen and weights attributed are apparent. Details of the SOC codes used, and their associated weightings are given in Table 2 below. The Utility Regulator has been quite general in allocating weights to each category, settling on weights rounded to the nearest 5%, as opposed to being overly prescriptive.

**Table 2: SOC codes and weights used to construct RWA**

| Description   | SOC Code     | Weights     |
|---|--------------|-------------|
| <b>Managers, directors and senior officials</b>             | <b>1</b>     |             |
| Corporate managers and directors                            | 11           | 10%         |
| Other managers and proprietors                              | 12           |             |
| <b>Professional occupations</b>                             | <b>2</b>     |             |
| Science, research, engineering and technology professionals | 21           | 20%         |
| Health professionals  | 22           |             |
| Teaching and educational professionals                      | 23           |             |
| Business, media and public service professionals            | 24           | 5%          |
| <b>Associate professional and technical occupations</b>     | <b>3</b>     |             |
| Science, engineering and technology associate professionals | 31           | 20%         |
| Health and social care associate professionals              | 32           |             |
| Protective service occupations                              | 33           |             |
| Culture, media and sports occupations                       | 34           |             |
| Business and public service associate professionals         | 35           |             |
| <b>Administrative and secretarial occupations</b>           | <b>4</b>     |             |
| Administrative occupations                                  | 41           | 20%         |
| Secretarial and related occupations                         | 42           | 10%         |
| <b>Skilled trades occupations</b>                           | <b>5</b>     |             |
| Skilled agricultural and related trades                     | 51           |             |
| Skilled metal, electrical and electronic trades             | 52           |             |
| Skilled construction and building trades                    | 53           |             |
| Textiles, printing and other skilled trades                 | 54           |             |
| <b>Caring, leisure and other service occupations</b>        | <b>6</b>     |             |
| Caring personal service occupations                         | 61           |             |
| Leisure, travel and related personal service occupations    | 62           |             |
| <b>Sales and customer service occupations</b>               | <b>7</b>     |             |
| Sales occupations   | 71           | 5%          |
| Customer service occupations                                | 72           |             |
| <b>Process, plant and machine operatives</b>                | <b>8</b>     |             |
| Process, plant and machine operatives                       | 81           |             |
| Transport and mobile machine drivers and operatives         | 82           |             |
| <b>Elementary occupations</b>                               | <b>9</b>     |             |
| Elementary trades and related occupations                   | 91           | 10%         |
| Elementary administration and service occupations           | 92           |             |
|   | <b>Total</b> | <b>100%</b> |

- 2.60 Applying the the weights for years 2011-2015, we obtain a regional wage differential for a gas distribution company in Northern Ireland of -10.0% (i.e. wages are 90% of UK levels). As we assume that labour makes up 52% of opex, this analysis gives a regional wage adjustment of -5.2% for the Northern Ireland GDNs for the 2017 to 2022 years. This falls

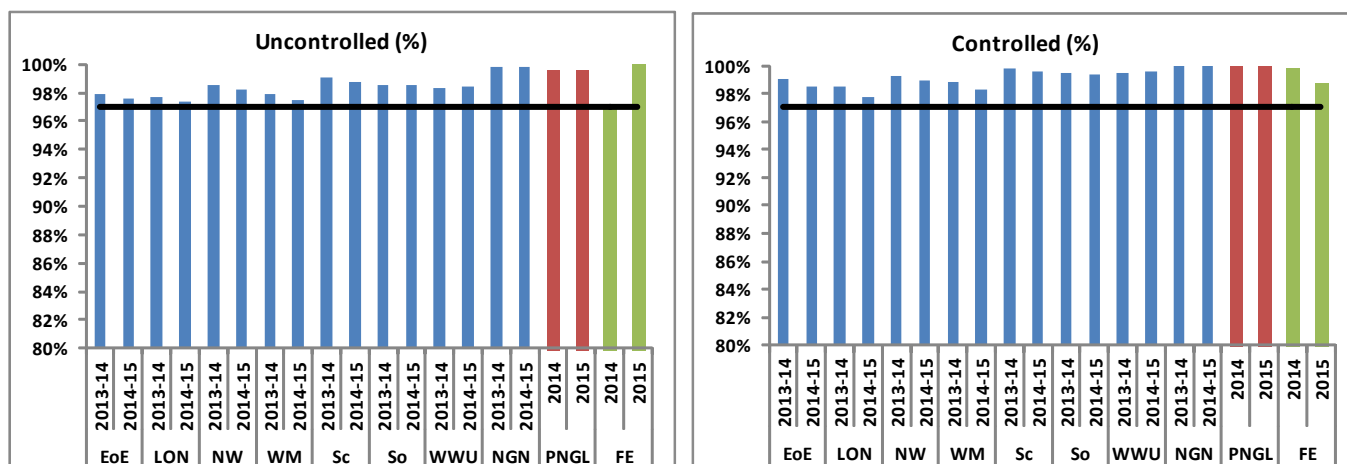
somewhat in-between our draft determination figure of -9.2% and PNGL's proposal of around -2% to -3%.<sup>18</sup>

- 2.61 As in the draft determination, we apply a regional wage adjustment to all GDNs' opex costs, including GB companies. National Grid - London for example has a positive RWA, as it is situated within a recognised high cost region.<sup>19</sup>
- 2.62 As stated above, it would be mistaken to state that there is one set mechanistic approach for undertaking this adjustment. In our analysis above, the Utility Regulator has adopted a relatively simple and logical approach, but a number of potential variants to this approach could have been reasonably followed. This will be considered in future benchmarking exercises where material sensitivities shall be assessed further.

## Levels of service considerations

- 2.63 While a company may have lower day-to-day costs than another, it is important to ensure that such performance is not at the expense of customer service and safety. In any benchmarking exercise it is therefore important to consider whether there may be potential for quality of service reasons to explain any differences in relative opex levels.
- 2.64 The Utility Regulator have therefore compared PNGL and FE to companies in Great Britain on a number of performance indicators, with the publicly available results from one of our service quality comparisons (emergency response) shown in the graphs below.

**Figure 3: Uncontrolled & controlled gas escapes attended within 1hr & 2hrs respectively<sup>20</sup>**



- 2.65 The black horizontal line in the graph above denotes the target of at least 97% of uncontrolled escapes responded to within one hour and controlled escapes responded to within 2 hours from the time of the report of the gas escape being received. All GDNs have exceeded this standard in the years examined and are at quite a similar level, relatively speaking.

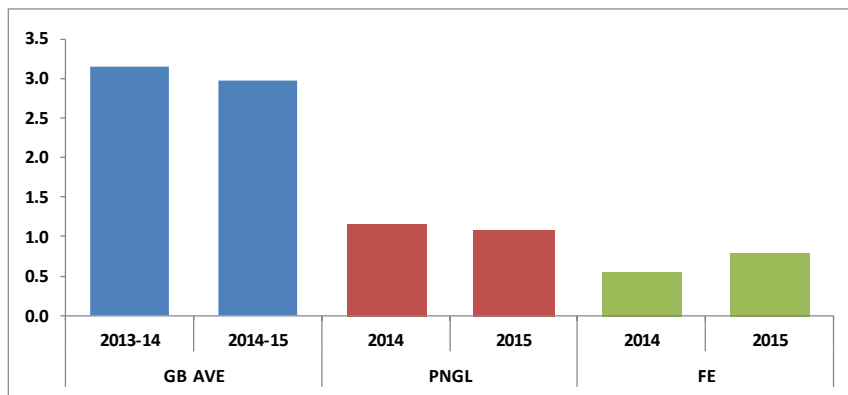
<sup>18</sup> It should be noted that due to the nature of the model workings and effects on the various model coefficients of any data change, a one percentage point change in Northern Ireland's RWA does not automatically translate into a one percentage point change in any efficiency gap estimate for a NI GDN.

<sup>19</sup> A positive RWA will mean that its opex costs are adjusted downwards in the models.

<sup>20</sup> GB GDN data calculated from each company's 2014-15 Regulatory Reporting Pack (RRP).

- 2.66 It can be seen that for the years examined PNGL are amongst the best of the GDNs in terms of their response to controlled and uncontrolled gas escapes. FE are above their target minimum levels and are in line with the other GDNs.<sup>21</sup>
- 2.67 The Utility Regulator has also examined the total number of uncontrolled and controlled gas escapes which each GDN experiences each year. As is evident in Figure 4 below, Northern Ireland GDNs experience significantly less uncontrolled and controlled gas escapes per km gas main than the GB GDNs.

**Figure 4: Total uncontrolled and controlled gas escapes per km gas main**



- 2.68 In addition to the above metrics which examined the number of gas escapes and the company's response to gas escapes, the Utility Regulator also examined NI GDNs' relative performance on guaranteed standards payments. The guaranteed standards of performance that Northern Ireland GDNs adhere to are similar to standards in the GB scheme.<sup>22</sup>
- 2.69 We note that on all the particular measures we examined, that the GDNs in Northern Ireland have comparable and sometimes better service quality than their counterparts in Great Britain. As noted above with respect to iron main levels in Great Britain, GDNs in Northern Ireland are at somewhat of an advantage with having a relatively new network, thus leading to reduced day-to-day workloads which will lead to positive experiences for customers.
- 2.70 From the analysis we have undertaken, we consider that comparing the relative costs of NI GDNs with the GB GDNs to be entirely appropriate from a service quality point of view. While there are naturally differences in the levels of service between all the GDNs used in the benchmarking, none of these differences are so material as to invalidate any cost comparison between the various GDNs. There does appear to be a marked difference in workload levels between GB and NI GDNs (such as the level of gas escapes for example), but these are to the advantage of companies in Northern Ireland, who would face less day-to-day work. The Utility Regulator has attempted to account for these workload differences in the modelling by using a proxy for network quality (an iron mains variable).
- 2.71 In conclusion, following the data adjustments being made by the Utility Regulator, we consider the GDNs to be a relatively homogenous dataset of firms, both in terms of service function and service performance.

<sup>21</sup> [http://www.uregni.gov.uk/publications/overall\\_standards\\_of\\_performance\\_for\\_gas](http://www.uregni.gov.uk/publications/overall_standards_of_performance_for_gas)

<sup>22</sup> [http://www.uregni.gov.uk/publications/the\\_gas\\_individual\\_standards\\_of\\_performance\\_regulations\\_northern\\_ireland\\_20](http://www.uregni.gov.uk/publications/the_gas_individual_standards_of_performance_regulations_northern_ireland_20)

### 3 CSV Approach and Special Factors

- 3.1 All of our preferred econometric models use a Composite Scale Variable (CSV) of customer numbers, volumes and network length. A CSV is used instead of separate explanatory variables so as to avoid multicollinearity, which can occur when two or more predictors are highly correlated with each other.<sup>23</sup>
- 3.2 Multicollinearity, in extreme cases, can lead to coefficient estimates that are unstable, the wrong sign and can make it difficult to isolate each variable's impact. A correlation matrix undertaken on the three variables shows they have a very high positive correlation – as would be expected. A CSV approach is warranted in our view.
- 3.3 With the CSV, the cost relationship is such that modelled costs are estimated based on the scale and 'size' of the company. A company with more customers, volumes of gas delivered and/or longer network length than another can be expected to have higher predicted costs according to these models.
- 3.4 The Utility Regulator considers that such an approach is likely to be somewhat 'fairer' to the Northern Ireland GDNs than if we for example applied models solely based on a company's workload and activity levels. Although difficult to state categorically (in the absence of running the models themselves), these models may be unlikely to predict similar levels of costs than the CSV approach due to the different documentation and categorisation of workloads in Great Britain.<sup>24</sup>

#### Precedents for using a CSV approach

---

- 3.5 Composite Scale Variables of various forms and weightings have been used by a number of regulators to assess cost relationships. The Utility Regulator used a similar CSV as we adopt in GD17 in its water distribution model for its efficiency assessment of NI Water in PC15, combining connected properties, distributional input (ML/d) and mains length (km) into one composite variable.<sup>25</sup>
- 3.6 The Utility Regulator and the Competition Commission used a CSV of customer numbers, units distributed (MWh) and line length (km) in its assessment of Northern Ireland Electricity's (NIE) relative efficiency for RP5.<sup>26</sup>
- 3.7 Ofgem have used the CSV approach using various elements (such as customer numbers and external condition reports in their emergency model) in assessing GDNs in RIIO-GD1. Ofgem also adopted CSVs of various compositions for assessing DNO costs within their RIIO-ED1 regression models.

---

<sup>23</sup> Explanatory variables would be correlated to some degree with each other. Problems arise when such correlations are moderate or strong.

<sup>24</sup> Ofgem models predict costs based on drivers such external condition reports etc, which are not as applicable in Northern Ireland. For the GB GDNs, condition reports may be correlated with company size however.

<sup>25</sup> [http://www.uregni.gov.uk/uploads/publications/UR\\_PC15\\_FD\\_Annex\\_R\\_-\\_Calculation\\_of\\_the\\_Opex\\_Efficiency\\_Gap\\_0200.pdf](http://www.uregni.gov.uk/uploads/publications/UR_PC15_FD_Annex_R_-_Calculation_of_the_Opex_Efficiency_Gap_0200.pdf)

<sup>26</sup> [https://assets.digital.cabinet-office.gov.uk/media/535a5768ed915d0fdb000003/NIE\\_Final\\_determination.pdf](https://assets.digital.cabinet-office.gov.uk/media/535a5768ed915d0fdb000003/NIE_Final_determination.pdf)

### Iron mains variable

---

- 3.8 In one of our chosen models (Model 5), we introduce an iron mains variable to establish cost differences which may be associated with having an older or newer gas network. At draft determination this model provided a good comparison with Model 3 (CSV + time-trend) and enabled the Utility Regulator to estimate costs based on correcting for the impact of iron mains.
- 3.9 FE's consultants, Oxera questioned the use of the iron mains variable, given potential collinearity issues with the time-trend variable. Oxera also stated that the variable was not sufficiently reliable to be included in the model, given that it was not statistically significant.
- 3.10 As to the magnitude of the iron mains coefficient, Oxera questioned if the Utility Regulator had considered whether the estimated coefficient is aligned with economic and engineering expectations. They also suggest that the impact of iron mains may be somewhat overstated in the model:
- "In particular, iron mains would have an impact on only maintenance and repair activities, which make up at most 25% of the GB GDNs' direct and indirect OPEX. Deloitte's model 5 implies that a 10% increase in iron mains results in a 5.5% increase in OPEX. This is high, given that a considerably lower proportion of the cost base is affected by iron mains. This will bias FE's estimated inefficiency upwards."*
- 3.11 Deloitte LLP advised the Utility Regulator at draft determination there may also be some collinearity issues with the time-trend variable and the iron mains variable, and the Utility Regulator acknowledges this. As the sample size is small, with a limited number of years of data, the Utility Regulator recognises that the model may have some difficulty in estimating the impact of network quality to a high degree of precision.
- 3.12 The Utility Regulator calculates a higher percentage of opex relating to the three categories of emergencies, repairs and maintenance than Oxera calculated above, as there is a difference in the denominator used by the Utility Regulator i.e. between total opex and modelled opex (which has some data exclusions).
- 3.13 Given that repairs, maintenance and emergencies makes up a sizeable proportion of modelled opex for the GB GDNs, the Utility Regulator would expect the proportion of iron mains to have a material effect on opex levels.

### Special factor assessment criteria

---

- 3.14 Special factors are adjustments made to company costs to take account of company-specific issues which would lead to costs being higher or lower than comparators. Ofgem for example at RIIO-GD1 applied a company-specific factor adjustment to the GDN of National Grid – North West for additional costs associated with a salt cavity in their area.
- 3.15 At draft determination the Utility Regulator did not apply any special factors for any of the GDNs. As our various model specifications take into account customer numbers, volumes and network length as well as the proportion of iron mains, various characteristics of the business are already taken into account in the models themselves.
- 3.16 However, in presenting the indicative findings of our top-down benchmarking at draft determination, the Utility Regulator requested that in their responses to the draft determination it was important that GDNs in Northern Ireland quantify the value of any

special factor and / or atypical claim. These would then be considered by the Utility Regulator for the analysis at final determination.

- 3.17 Atypical costs are “one-off” expenditures which would be classed as exceptional, not typical of the company’s day-to-day operating expenditure. We consider that excluding these costs gives a truer picture of a company’s underlying relative efficiency. Some atypicals may be positive in nature, i.e. it may be possible to adjust costs upwards if they are unusually low for a particular year.
- 3.18 At draft determination we did apply some atypical adjustments to operating costs when undertaking our efficiency benchmarking. For example, we excluded Competition Commission costs from PNGL historic costs as this would not represent typical day-to-day expenditure for the company. As was the case with special factors, companies were asked by the Utility Regulator to substantiate any further atypical adjustments in their responses to the draft determination. These would then be considered by the Utility Regulator for the analysis at final determination stage.
- 3.19 The Utility Regulator stated that the means by which we would assess company submissions on special factors would be against the following criteria:<sup>27</sup>
- (i) *What is different about the circumstances that cause materially higher cost claims which amount to greater than 1% of total opex?*
  - (ii) *Why do these circumstances lead to higher costs?*
  - (iii) *What is the net impact of these costs on prices over and above that which would be incurred without these factors? What has been done to manage the additional costs arising from the different circumstances and to limit their impact?*
  - (iv) *Are there any other different circumstances that reduce the company’s costs relative to industry norms? If so, have these been quantified and offset against the upward cost pressures?*
- 3.20 Any atypical claims are assessed on a case-by-case basis, primarily assessing whether such expenditure can be deemed atypical for that company and/or atypical when compared with other GDNs’ day-to-day operational expenditure.
- 3.21 As we are chiefly concerned with assessing the efficiency of business plan expenditure, it is more important to focus on whether special factors and atypicals apply for the GD17 period than the historic years. While assessing relative efficiency of historic spend is useful and informative, for this final determination we have focused on assessing costs for 2017-2022.

### Submissions on special factors

---

- 3.22 In their response to the GD17 draft determination PNGL did not quantify specific special factors for top-down benchmarking, stating:
- “In addition to our concerns with UR’s real wage adjustment, PNGL also has other potential concerns with the top-down modelling around model-specification, and in particular, adjustments for special factors. However, despite a request from PNGL, UR has not provided the data set and modelling analysis for us to effectively respond to UR’s top-down modelling on these issues.”*

---

<sup>27</sup> Special factor assessment criteria detailed by the UR in correspondence to the NI GDNs on 18 August 2015.

- 3.23 While it is the case that the UR is not in a position to release confidential Ofgem data, we would encourage the NI GDNs to establish working relationships with the GB GDNs with the potential outcome of some data sharing amongst each other.
- 3.24 FE and Oxera in their response to the GD17 draft determination made arguments on potential special factors which they believed should be applied by the Utility Regulator. FE's requested special factors were on the following four areas:
- Network sparsity
  - Scale
  - Age and growth of the network
  - Xoserve costs
- 3.25 The special factor claims covered a number of areas and were fairly detailed. We outline only the main aspects of FE's proposed special factors in the paragraphs below.

### **Network Sparsity - FE**

- 3.26 The first special factor requested by FE and Oxera primarily centres around population sparsity and low network penetration:
- "the level of sparsity in a GDN's operational area affects its costs, and Ofgem has recognised this point by allowing for company-specific sparsity allowances — i.e. the more sparsely populated the area is, the more expensive it is for a company to maintain its network on a per-customer basis and resource staff to attend to emergency calls. Given how sparse FE's area is, it has a long network for a given customer base and it incurs higher unit costs to maintain its network and resource staff to attend to emergency calls. Its low penetration exacerbates this issue...."*
- 3.27 Oxera remarked that in RIIO-GD1, Ofgem allowed a sparsity factor adjustment (in 2009/10 prices) of £1.3m for Scotland and £2.6m for Wales and West Utilities (WWU), based on a population served over district level area measure.

### **Scale - FE**

- 3.28 The second special factor request focuses on the fact that FE is a small company. FE and Oxera set the context of FE's size as follows:
- "Firmus energy's customer base currently accounts for around 25,000 customers, around 10% of the scale of the Belfast licence area and 1% of the largest GB GDNs. We are unable to capture some of the economies of scale enjoyed by these significantly larger companies. The Utility Regulator's consultants Deloitte recognise this in Draft Determination Annex 5, page 5, Paragraph 2.4 stating: "FE has around 20,000 customers, which is approximately a hundredth of the GB GDNs' customer base."*
- 3.29 Oxera argue that as a result of using a log-linear Cobb-Douglas model specification, the efficiency estimates will be biased for FE as it assumes the same economies of scale as the GB GDNs. They re-state their position that the assumption that FE and bigger, more mature GB GDNs have the same economies of scale, is unlikely to be the case.
- 3.30 Oxera also question whether the testing of the issue of economies of scale at draft determination is adequate. Oxera consider that the inferences from the model results at



draft determination imply that FE has a different cost function to that which is based on PNGL and GB data or solely GB data.

### **Age and Growth of the network - FE**

- 3.31 The next special factor request deals with the fact that FE is newer than the GDNs in Great Britain and are still growing their network. Oxera outline that:

*“Firmus energy indicated that its current network penetration rate (around 33%) is significantly lower than that of mature GB GDNs (around 82%) and Phoenix (around 58%). Our network is also still growing and not in the steady state of GB GDNs. As noted in Draft Determination Annex 5, page 5, Paragraph 2.4 “One notable feature of the NI GDNs, is that they are growing much faster than the more mature GB GDNs, in terms of customers, volumes and network length.””*

- 3.32 Oxera state that FE’s network penetration levels should be accounted for in a special factor, if not accounted for in the models.

### **Xoserve - FE**

- 3.33 FE’s special factor request for xoserve costs has already been discussed by the Utility Regulator within Chapter 2 on data adjustments above.
- 3.34 The Utility Regulator believes there is some merit in Oxera’s comments on xoserve so we have reduced the amount excluded from 75% to 67% of costs.

### **UR decision on special factors**

---

- 3.35 PNGL have not submitted any special factor applications, and the Utility Regulator has not applied any special factors to the company’s opex costs in this final determination analysis. However, as stated above we have made amendments to our regional wage adjustment methodology following proposals from PNGL’s consultants NERA.
- 3.36 All of FE’s special factor requests have been well presented and argued by Oxera. As stated above, we have partially accepted FE and Oxera’s argument that a sizeable proportion of xoserve functions are undertaken in-house by the NI GDNs. After due consideration we have reduced the amount excluded from 75% at draft determination to 67% of costs at final determination.
- 3.37 On the issue of sparsity, the question for the Utility Regulator is whether any additional costs are material, and also, whether the model adequately allocates opex for this given that Ofgem made company specific adjustments for GB networks (Scotland, Wales and West) for costs associated with sparsity as well as adjustments made for urbanity (London and Southern). It should also be noted that Ofgem’s models at RIIO-GD1 did not employ a CSV of the same composition as the Utility Regulator’s - any special factors cannot be readily transferable from one set of models to another.
- 3.38 The Utility Regulator CSV model has a sizeable 25% weighting for network length, which will have the effect of attributing opex for those companies that have a relatively high length of network main due to their rural licenced area. If there is a risk that for a company like FE this weighting is not fully adequate, it should be noted that somewhat counterbalancing this, FE does have a high volume per customer due to the prevalence of large I&C customers amongst its customer base.



- 3.39 With FE being materially smaller than their GB counterparts there may be risk in this top-down benchmarking that scale and network underutilisation may not be fully accounted for in the model, but such a risk can be two-way. Indeed, as Deloitte LLP stated in their advice to the Utility Regulator at the draft determination:

*“The GB GDNs all operate on a scale materially greater than either FE or PNGL. Whilst the econometric analysis seeks to allow for economies of scale the extent to which this is fully captured is challenging as the dataset is dominated by larger GDNs. As a result the impact of scale on costs, and subsequently relative efficiency, may be over or underestimated.”<sup>28</sup>*

- 3.40 It is the case that for FE historic opex data is quite volatile in nature. Theoretically, a new company with initial fixed costs would typically be expected to experience quite a flat opex profile over time. As customers connect, ‘spare capacity’ gets used up (especially applicable with respect to business support). Due to the volatility of the opex data we cannot grant this special factor as it is not possible at the present time to distinguish between improvements in operational efficiency and utilised spare capacity.
- 3.41 However, with some additional years of data, the Utility Regulator will be able to take a more decisive view on the quantification of any special factors in future analyses. As we cannot be certain as to the whether these special factors have a material impact on costs, we have decided not to make any special factor adjustments for the top-down modelling for GD17.
- 3.42 Given some uncertainty, we therefore believe that the most pragmatic approach for the GD17 final determination would be to continue to assess a range of modelling results for both PNGL and FE.
- 3.43 The Utility Regulator is aware that the lack of comparators at the scale and age of FE is a potential issue for this top-down benchmarking analysis. Therefore, some caution should be shown when interpreting the results for FE for GD17. As SGN NI becomes operational, the Utility Regulator will be able to compare costs of the two relatively small rural networks in the medium to long-term future.

### Submissions on atypicals

---

- 3.44 None of the respondents to the GD17 draft determination proposed any further atypical adjustments to be made to the top-down modelling data.

### UR Decision on atypicals

---

- 3.45 We have not made any notable adjustments to the GDN data for atypical expenditure beyond what was undertaken by the Utility Regulator at draft determination stage.

### Chosen CSV weights

---

- 3.46 The CSV variable acts as a proxy measure of company size, therefore at draft determination the Utility Regulator decided to adopt CSV weights which were considered best reflective of the scale and size of a company. Our *a priori* and statistical judgement at

---

<sup>28</sup> See page 4 of Deloitte LLP Report - Annex 4 to GD17 Draft Determination  
[http://www.uregni.gov.uk/uploads/publications/GD17\\_Annex\\_4\\_-\\_GD17\\_Efficiency\\_Advice\\_Deloitte\\_LLP.pdf](http://www.uregni.gov.uk/uploads/publications/GD17_Annex_4_-_GD17_Efficiency_Advice_Deloitte_LLP.pdf)

draft determination settled upon weights of 50%, 25% and 25% for customer numbers, volumes and network main respectively.

- 3.47 In their response to the GD17 draft determination, FE's Consultants Oxera stated that the weights the UR adopted in the CSV could bias FE's estimated efficiency. Oxera also stated that the Utility Regulator's view does not appear to have been substantiated by any engineering evidence and is inconsistent with most of regulatory precedent.
- 3.48 Oxera contend that while Ofgem placed 50% weight for customers in its GDPCR1 models for opex, this is now out of date and Ofgem has subsequently developed, refined and improved its data collection, modelling and understanding of the drivers of gas distribution costs. Oxera further state that, specifically at RIIO-GD1, Ofgem only included customer numbers in the CSV for emergency opex model and for IT and telecom. They also state that gas volumes were not considered by Ofgem to be a driver of any direct activities.
- 3.49 Oxera suggest that:
- "The sub-section above indicates that it could be argued that customers should have no more than about a 15% weight in CSV, and gas volumes minimal weight. Thus, one approach to mitigating FE's currently low penetration rate, due to it operating a relatively new network, would be to amend the weights used in the CSV. However, we note that this, in itself, would not be sufficient to reflect accurately FE's relative efficiency, since by comparing its cost performance to the GB GDNs, other structural differences would need to be evened out as well.*
- Alternatively, length of network, MEAV, or Ofgem's CSV of MEAV, emergency, repair and maintenance cost drivers could be used as the main cost driver. Also, modelling at the activity levels (e.g. maintenance) could be pursued, which would allow the capturing of specific scale, activity and structural cost drivers appropriate for that activity."*
- 3.50 The Utility Regulator agrees that MEAV<sup>29</sup> can be a useful explanatory variable in benchmarking regulated networks; however, the Utility Regulator is yet to be fully confident that MEAV values for NI GDNs can be readily constructed on a like-for-like basis with the GB figures.
- 3.51 Secondly, although Ofgem have moved towards employing different models than those used in previous price controls (such as GDPCR1), there is precedent for regulated utilities in Northern Ireland to be subject to modelling based on a previous methodology. This was the case in our latest price control for NI Water (PC15), which employed the same, or similar models as Ofwat's PR09 (COLS models (opex) and cost base models (capex)), rather than following the Ofwat modelling approach adopted at PR14.<sup>30</sup> It should be noted that in its final triangulation, the CC in RP5 adopted a CSV modelling approach from Ofgem's DPCR4 to assess NIE, rather than relying upon more recent Ofgem model specifications.
- 3.52 Assuming that any models used are economically and statistically sound, the Utility Regulator considers that there is a strong argument for adopting a proven and effective method to assessing the costs of regulated companies in Northern Ireland.
- 3.53 For final determination, the Utility Regulator will keep the same CSV approach, with the same weights as were adopted at draft determination. In summary, the rationale for our chosen weights for customers, volume and network length is as follows:

<sup>29</sup> MEAV stands for Modern Equivalent Asset Value, i.e. the current replacement value of an asset.

<sup>30</sup> The Utility Regulator's PC15 price control was undertaken around the same time as Ofwat's PR14.

- It can be difficult to untangle any opex cost impact of a particular element (customer numbers, volume and network length) in causal terms. All elements are correlated with modelled opex and so the composite should have sizeable weightings attributed from all elements.
- As the three variables are highly correlated with each other, weight can be placed on our *a priori* judgement of what ratios are appropriate.
- Customers should influence nearly all the opex cost categories in our view (within direct and business support) to varying extents; the other two variables of network length and volumes arguably to a lesser degree.
- Some of the literature points toward customer numbers being a key variable in such regressions, thus indicating that it should have a high ratio.<sup>31</sup> Ofgem have used customer numbers in their various models over the years.
- At draft determination, our consultants Deloitte LLP undertook a large number of regressions on the data,<sup>32</sup> varying the weights each time, and have indicated that our chosen weights are close to the optimal in terms of model fit, although it should be stressed that the differences in model fit are marginal between the various potential models.

3.54 The formula to calculate the CSV is shown below:

$$CSV = \ln(\text{customer numbers}^{0.5} * \text{volumes of gas}^{0.25} * \text{network length}^{0.25})$$

---

<sup>31</sup> <https://www.ofgem.gov.uk/sites/default/files/docs/2007/07/ngg---response---section-3---non-confidential.pdf>

<sup>32</sup> See Section 4.3 of Deloitte LLP Report - Annex 4 to GD17 Draft Determination  
[http://www.uregni.gov.uk/uploads/publications/GD17\\_Annex\\_4\\_-\\_GD17\\_Efficiency\\_Advice\\_Deloitte\\_LLIP.pdf](http://www.uregni.gov.uk/uploads/publications/GD17_Annex_4_-_GD17_Efficiency_Advice_Deloitte_LLIP.pdf)

## 4 Econometric and Unit Cost Results

- 4.1 As was the case at draft determination, for final determination the Utility Regulator has estimated 11 separate econometric models. Re-running the regressions is necessary as we have made further adjustments to our data since the draft determination as a result of consultation feedback, including some methodological changes to our regional wage adjustment.
- 4.2 The Utility Regulator has discontinued the approach of standardising the opex by the national wage. This results in only a small impact on estimates and GD17 forecast results. As a result of this data change we have modified the specification of Model 6, which previously included a log of regional wage levels as one of its explanatory variables.

### Chosen sample

---

- 4.3 Although using NI GDN data increases both the sample size and the explanatory power of the models in statistical terms, the Utility Regulator is conscious that NI companies may be outliers and may distort the analysis for either PNGL or FE, or both.
- 4.4 As FE is relatively small,<sup>33</sup> the Utility Regulator has concerns that it will have a disproportionate influential impact on the model in terms of leverage on the regression line.<sup>34</sup> The Utility Regulator is also concerned that FE's possible outlier status will affect the assessment of PNGL as they sit between FE and the GB GDNs in terms of size.
- 4.5 This reasoning also holds for PNGL, who are also smaller than the GB GDNs, but not to the same extent as FE.
- 4.6 In applying the modelling results to GD17 business plans, the Utility Regulator has decided therefore to rely solely upon the coefficients from the GB GDN data sample results (n=56). This is in keeping with the approach taken by the Utility Regulator in its assessment of NI Water's opex efficiency gap in PC10, PC13 and PC15, where NI Water was excluded from the estimation sample. It was therefore the case that the Utility Regulator solely relied upon England and Wales water and sewerage data to derive estimates of efficient costs, to which NI Water was compared.

### Preferred models

---

- 4.7 In the draft determination Deloitte LLP estimated 11 econometric models. The Utility Regulator selected Model 3 (CSV + time-trend) and Model 5 (CSV + time-trend + iron mains %) as its preferred models to estimate efficient costs at GD17.
- 4.8 In their response to the GD17 draft determination PNGL stated that they had potential concerns with the top-down modelling, with respect to model specification and in particular, adjustments for special factors. However, PNGL also state that as they have not been

---

<sup>33</sup> Given that we are using a *scale* variable, in econometric terms FE has an X value substantially smaller than the mean explanatory value, thus giving these observations high leverage.

<sup>34</sup> It should be noted that high leverage will not disproportionately impact on model coefficients if the observation does not have a high discrepancy value. The inclusion of good leverage points can improve the model.

provided with the dataset and modelling analysis, they have been unable to effectively respond to Utility Regulator's top-down modelling. PNGL state that:

*"The only reasonable conclusion that UR can draw from the top-down analysis is that PNGL's costs are efficient. To draw any other conclusion based on the current real wage adjustment, would be inconsistent with sound economic principles, and established regulatory practice. UR has also not provided us with the model dataset for PNGL to effectively respond to other modelling issues which means that no reliance should be placed on the modelling results."*

- 4.9 FE's Consultants Oxera had a number of issues with the specifications of the models. Amongst these, Oxera believed that the cost implications of iron mains were overstated in Model 5. They also state that there may be collinearity issues between the time-trend and the iron mains variable as well as issues with extrapolating backwards the cost function of GB GDNs to predict FE's costs, given the especially small size of the firm.
- 4.10 Oxera stated that Pooled OLS can produce biased and inconsistent parameter estimates under certain situations, and that these exist for the UR's modelling, in their view. In addition, Oxera had some specific comments on the Random Effects models and Stochastic Frontier Analysis undertaken at draft determination.
- 4.11 On the issue of undertaking statistical tests for the final determination, Oxera also go on to state that statistical diagnostics may not be as pertinent as what they believe to be economic issues with the models:
- "Nevertheless, given the small sample period, and significant differences in the operating profiles of FE and its comparators, we consider that the economic issues discussed above are far more important than the statistical diagnostics in this case."*
- 4.12 The Consumer Council in its response to the GD17 draft determination, were very supportive of the benchmarking analysis undertaken, and had the following specific comment on the two of the Utility Regulator's preferred models (Model 3 and Model 5):
- "UR has outlined its position that both models have advantages and disadvantages; however Model 5 is more sophisticated as it takes NI's gas network quality into consideration. We therefore believe that Model 5 is most appropriate to deliver the best benchmarking results."*
- 4.13 The Utility Regulator is cognisant that none of the respondents seem to have disputed the expected directional relationship that a company with a higher proportion of iron mains would ordinarily face higher operational costs (all other things being equal).<sup>35</sup> While it is difficult to decisively quantify this effect using the limited dataset available, for the companies in GB it is likely to amount annually to millions of pounds of additional operational expenditure.
- 4.14 For final determination the Utility Regulator will continue therefore to use Model 3 and Model 5 to assess the NI GDNs' opex costs, with the specification of Model 5 changing slightly for the final determination.
- 4.15 As was the case at draft determination Model 3 uses a CSV of customer numbers (50% weighting), gas volumes (25%) and network length (25%) along with a time trend variable. Model 5 uses the same CSV, but also includes an iron mains variable which consists of the

---

<sup>35</sup> Instead of having a network quality explanatory variable, another potential solution may be to make downward adjustments to GB costs to account for and remove additional day-to-day opex spend associated with iron mains. A constrained linear regression approach based on engineering expectations of the iron mains variable may also be a potential alternative modelling approach.

proportion of a GDN's network length comprising of iron. For final determination, given the feedback from FE and Oxera, we have dropped the time-trend variable from Model 5 as there may be a degree of collinearity between the time-trend variable and the iron mains variable. This change of approach works slightly to the NI GDNs' favour with regards the estimation of efficiency gaps.<sup>36</sup>

- 4.16 For comparison purposes, we have a revised Model 6, which has the same specification as Model 5 but includes a time-trend variable. As noted above, differences in results between Model 5 and Model 6 are very slight.
- 4.17 For final determination, Models 4, 5 and 6 are estimated using a robust regression approach, which the Utility Regulator regards as likely to be a better estimation method than Ordinary Least Squares (OLS) for these models. Robust regression applies a weighting to each of the squared residuals, with the weights selected to dampen the influence of outliers, making the estimates less sensitive to the presence of influential observations when compared to OLS. For these models, the robust regression approach leads to smaller efficiency gap estimates for the NI GDNs than standard OLS.
- 4.18 It should be noted however that the robust regression technique should only be used when the benefits of using it outweigh the costs. While robust regression does moderate the influence of outliers, it can lead to bias in certain circumstances and the technique is evidently not as widely used as OLS.<sup>37</sup> For these reasons we only use the robust regression technique for those models which use the iron mains variable as a predictor (namely Models 4 to 6).
- 4.19 We will re-evaluate the appropriateness of using the robust regression technique in future econometric benchmarking analyses. This will be reconsidered in conjunction with the possibility of assessing direct and business support costs separately, as well as examining other potential modelling approaches for accounting for network quality differences between GDNs (discussed in brief above).
- 4.20 Given some uncertainty therefore about which models are most applicable for assessing the NI GDNs' cost performance, for the final determination the Utility Regulator has decided to assess GD17 opex costs using both Model 3 and Model 5, which provides the Utility Regulator with an efficiency range. The results should be interpreted in this context.

### Chosen benchmark

---

- 4.21 At draft determination, the Utility Regulator's analysis compared the NI GDNs' historic and forecast opex costs to the 3<sup>rd</sup> best company in each regression sample. We regard this as being equivalent to the upper quartile benchmark (or 75<sup>th</sup> percentile).<sup>38</sup>
- 4.22 The upper quartile benchmark was adopted by Ofgem in RIIO-ED1 and RIIO-GD1 and by Ofwat in PR14. The Utility Regulator has adopted the upper quartile and frontier companies in its benchmarking of NI Water for both capex and opex. Monitor, the Regulator for health services, adopted the upper decile (90<sup>th</sup> percentile) in its assessment of the NHS Acute Sector; however, this more challenging benchmark was largely possible due to the

---

<sup>36</sup> i.e. the efficiency gap estimate is slightly lower for the NI GDNs in dropping the time-trend variable from Model 5.

<sup>37</sup> Robust regression estimation was used during specific CC workings for Bristol Water in PR09, see:

[http://webarchive.nationalarchives.gov.uk/20111108202701/http://competition-commission.org.uk/inquiries/ref2010/bristol/pdf/appendices\\_and\\_glossary\\_merged.pdf](http://webarchive.nationalarchives.gov.uk/20111108202701/http://competition-commission.org.uk/inquiries/ref2010/bristol/pdf/appendices_and_glossary_merged.pdf)

<sup>38</sup> 3<sup>rd</sup> ranked company out of 8 GDNs in sample.

relatively large sample size involved. Ofcom have benchmarked to upper decile in both the post and telecommunications sectors.<sup>39</sup>

- 4.23 The CMA, in their Bristol Water determination outline that there is regulatory precedent for comparing to an upper quartile benchmark, providing the models are sufficiently robust to allow such a benchmark:

*“Besides Ofwat’s approach to PR14, there is regulatory precedent from Ofgem, as well as the CC’s Northern Ireland Electricity price determination in 2014, for an approach that sets price control expenditure allowances on a basis that requires a greater level of efficiency than industry-average efficiency. Ofwat’s PR14 price control framework, including its approach to the cost of capital, was developed in this context.*

*The regulatory precedent from Ofgem and the CC has also recognised that a less demanding benchmark than the upper quartile may be appropriate in cases where there was less confidence in the modelling results. The effect of modelling error and limitations will tend to mean that an upper quartile benchmark will require levels of efficiency that are, in practice, greater than the upper quartile.”*<sup>40</sup>

- 4.24 Although the CMA did not apply an upper quartile adjustment in its Bristol Water determination, this appears to have been due to specific issues encountered with its water models:

*“We were concerned that an efficiency benchmark based on an upper quartile efficiency concept would be overly demanding if applied to the results of the econometric models that we used. This was a judgment in the light of the issues we had identified both from our review of Ofwat’s econometric models and from our development of alternative models.”*

- 4.25 In their reponse to the draft determination, FE’s Consultants Oxera questioned the appropriateness of using upper quartile benchmark in the GD17 top-down econometric modelling given the inherent uncertainty of the models in measuring inefficiency. Oxera contend that Ofgem used an upper quartile efficiency challenge in comparing a group of relatively homogenous GDNs, that did not have the issues which the Utility Regulator’s modelling of NI GDNs encountered.

- 4.26 The Utility Regulator partly agrees with Oxera and recognises that there is naturally some inherent uncertainty and estimation error in the models, especially as the number of companies in the sample is small.

- 4.27 As Deloitte LLP illustrate in Figure 5 below, under pure Corrected OLS the line of best fit is shifted to the company of least cost (efficient frontier). Oxera explain in an independent submission to Ofgem however, how this approach can sometimes be problematic:

*“This shift can be based on the maximum negative residual of the regression model, resulting in the pure COLS frontier. If the residuals are not consistently estimated, the resulting frontier might be incorrect. For example, the presence of outliers can affect the frontier significantly.”*<sup>41</sup>

<sup>39</sup> See page 12 of Deloitte LLP Report on Econometric Benchmarking in UK Postal Sector:

<http://stakeholders.ofcom.org.uk/binaries/consultations/royal-mail-review/annexes/benchmarking-report.pdf>

<sup>40</sup> Taken from CMA determination of Bristol Water:

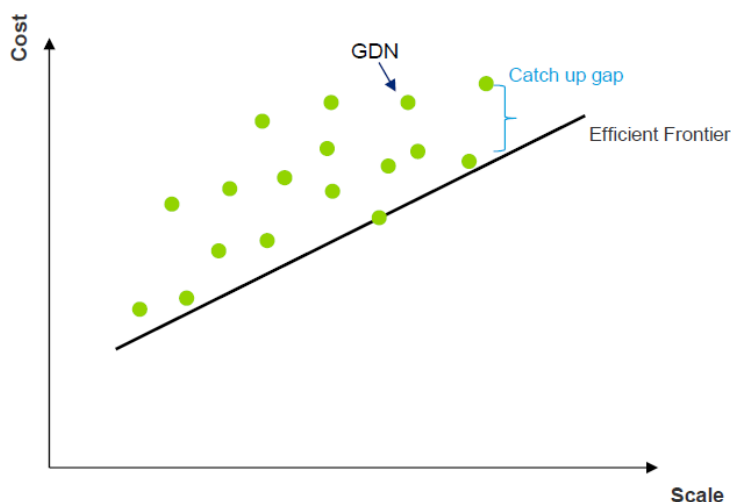
[https://assets.publishing.service.gov.uk/media/56279924ed915d194b000001/Bristol\\_Water\\_plc\\_final\\_determination.pdf](https://assets.publishing.service.gov.uk/media/56279924ed915d194b000001/Bristol_Water_plc_final_determination.pdf)

<sup>41</sup> <http://www.oxera.com/Oxera/media/Oxera/Community/Recommendations-on-cost-assessment-approaches-for-RIIO-ED1.pdf?ext=.pdf>



- 4.28 The Utility Regulator considers that by moving the benchmark back from frontier company to upper quartile, we mitigate for some of the inherent uncertainty and estimation error in the models. In addition, our assumption of upper quartile as the third best out of the eight GDNs would not be generally considered an unreasonable or strict definition of upper quartile efficiency.

**Figure 5: Illustrative example of the efficient frontier<sup>42</sup>**



- 4.29 Additionally, for our final determination, we adopt the use of a robust regression estimation approach for Model 5 (which includes an iron mains variable). This reduces the influence of any outliers on the model coefficients.
- 4.30 Furthermore, it is the case that we estimate a range of efficiency catch-up rates for each GDN from two separate models (Model 3 and Model 5), rather than relying upon one point estimate from a single model. This moderates the potential for an extreme interpretation of the results.
- 4.31 Finally, as a principle, the Utility Regulator believes that companies should strive to be amongst the best in the industry in terms of operating practices and effective management, rather than seeking to emulate the 'average' company's performance. Providing that any particular models are robust enough to allow comparisons to the best companies in an industry, if the Utility Regulator only compared to averagely efficient companies, we may be understating the potential efficiency gains for gas distribution firms in Northern Ireland.
- 4.32 In conclusion, given that we have taken a number of steps outlined above to mitigate for uncertainty and estimation error in the models, for the final determination the Utility Regulator considers that it is appropriate to benchmark the NI GDNs to the upper quartile company in its top-down econometric analysis.

<sup>42</sup> Graph from Deloitte LLP: [http://www.uregni.gov.uk/uploads/publications/GD17\\_Annex\\_4\\_-\\_GD17\\_Efficiency\\_Advice\\_Deloitte\\_LL.Pdf](http://www.uregni.gov.uk/uploads/publications/GD17_Annex_4_-_GD17_Efficiency_Advice_Deloitte_LL.Pdf)



## Statistical tests

---

- 4.33 For the final determination we have also undertaken a number of statistical tests on our chosen models, in line with some of Ofgem's statistical tests at RIIO-GD1 and RIIO-ED1. What we consider the two most relevant tests are as follows:
- **Ramsey RESET test** – The Ramsey Regression Estimation Specification Error Test is a general test of model misspecification and assesses whether variables may need to be transformed, for example into higher order powers.
  - **Normality test** – This is a combined skewness and kurtosis test to ascertain whether the model residuals are normally distributed. Although normality of residuals is not necessary to obtain parameter estimates with good properties, it is an indication of a well behaved model.
- 4.34 Heteroskedasticity can cause the standard errors and inference using hypothesis tests to be biased. Our models use clustered bootstrapped standard errors to allow for the fact that the set of observations in the panel are not independent, but clustered by GDN.
- 4.35 The econometric results for regressing on the GB-only sample are presented below.<sup>43</sup>

---

<sup>43</sup> Detailed model results for Models 3 and 5 are shown in Appendix A.

**Table 3: Econometric Regression Results**

Dependent Variable:  $\ln\_m\_tot\_opex$  (Bootstrap Std. Err)

|                    | (model1)<br>POLS     | (model2)<br>POLS     | (model3)<br>POLS    | (model4)<br>RREG     | (model5)<br>RREG     | (model6)<br>RREG   | (model7)<br>POLS    | (model8)<br>POLS     | (model9)<br>POLS  | (model10)<br>RE     | (model11)<br>SFA     |
|--------------------|----------------------|----------------------|---------------------|----------------------|----------------------|--------------------|---------------------|----------------------|-------------------|---------------------|----------------------|
| main               |                      |                      |                     |                      |                      |                    |                     |                      |                   |                     |                      |
| csv                | 0.782***<br>(5.46)   | 0.780***<br>(5.46)   | 0.779***<br>(5.47)  | 0.784***<br>(5.70)   | 0.781***<br>(6.02)   | 0.781***<br>(5.34) |                     |                      | 7.064<br>(0.17)   | 0.717***<br>(3.50)  | 0.764***<br>(3.97)   |
| year1              |                      | 0.0765<br>(1.37)     |                     | -0.0614<br>(-0.42)   |                      |                    |                     |                      |                   |                     |                      |
| year2              |                      | 0.0536<br>(0.88)     |                     | -0.0732<br>(-0.53)   |                      |                    |                     |                      |                   |                     |                      |
| year3              |                      | 0.0317<br>(0.56)     |                     | -0.0892<br>(-0.67)   |                      |                    |                     |                      |                   |                     |                      |
| year4              |                      | 0.0527<br>(1.07)     |                     | -0.0550<br>(-0.48)   |                      |                    |                     |                      |                   |                     |                      |
| year5              |                      | 0.0165<br>(0.42)     |                     | -0.0789<br>(-0.78)   |                      |                    |                     |                      |                   |                     |                      |
| year6              |                      | 0.0441***<br>(2.77)  |                     | 0.00745<br>(0.12)    |                      |                    |                     |                      |                   |                     |                      |
| year               |                      |                      | -0.00943<br>(-0.94) |                      |                      | 0.00898<br>(0.42)  |                     |                      |                   | -0.00983<br>(-0.98) | -0.00952*<br>(-1.86) |
| iron_pct           |                      |                      |                     | 0.661<br>(0.80)      | 0.627<br>(1.15)      | 0.681<br>(0.75)    | 0.478<br>(0.69)     | 0.582<br>(1.04)      |                   |                     |                      |
| ln_cust            |                      |                      |                     |                      |                      |                    | 0.800***<br>(5.37)  | 0.811***<br>(5.81)   |                   |                     |                      |
| ln_km_per_cust     |                      |                      |                     |                      |                      |                    | -0.0805<br>(-0.13)  |                      |                   |                     |                      |
| ln_vol_per_cust    |                      |                      |                     |                      |                      |                    |                     | 0.114<br>(0.57)      |                   |                     |                      |
| csv^2              |                      |                      |                     |                      |                      |                    |                     |                      | -0.216<br>(-0.15) |                     |                      |
| constant           | -6.842***<br>(-3.28) | -6.852***<br>(-3.28) | 12.17<br>(0.62)     | -7.006***<br>(-3.45) | -7.019***<br>(-3.70) | -25.10<br>(-0.57)  | -7.821**<br>(-2.53) | -8.052***<br>(-3.96) | -52.52<br>(-0.18) | 13.88<br>(0.70)     | 12.39<br>(1.10)      |
| R-sqr              | 0.780                | 0.789                | 0.785               | 0.841                | 0.809                | 0.812              | 0.832               | 0.834                | 0.783             | 0.785               | .                    |
| BIC                | -72.910              | -51.074              | -70.344             | .                    | .                    | .                  | -80.209             | -80.695              | -69.708           | .                   | .                    |
| RESET(p-value)     | 0.248                | 0.515                | 0.522               | 0.921                | 0.642                | 0.779              | 0.980               | 0.711                | 0.250             | 0.692               | .                    |
| Normality(p-value) | 0.004                | 0.034                | 0.043               | 0.000                | 0.053                | 0.006              | 0.004               | 0.017                | 0.012             | 0.015               | .                    |
| Observations       | 56                   | 56                   | 56                  | 56                   | 56                   | 56                 | 56                  | 56                   | 56                | 56                  | 56                   |
| Firms              | 8                    | 8                    | 8                   | 8                    | 8                    | 8                  | 8                   | 8                    | 8                 | 8                   | 8                    |

t statistics in parentheses

\* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

- 4.36 Although we estimate our models using GB-only GDN data (8 GDNs over 7 years gives a sample size of 56), we can apply the coefficient estimates from the GB sample to the NI GDN explanatory data to obtain predictions for our selected catch-up assessment year of 2014.
- 4.37 As can be seen in the table below, in terms of catch-up efficiency the results show that PNGL's catch-up efficiency estimates (relative to the third most efficient GDN) for 2014 range from 5.2% (Model 3) and 21.6% (Model 5). As a result of changes to the data and adjustments following consultation feedback, this gives a moderately lower efficiency range than the 7.8% to 25.5% range estimated by the Utility Regulator at draft determination.<sup>44</sup>

**Table 4: Catch-up efficiency estimates (2014 year) at final determination**

| GDN  | Model | Specification    | 2014  |
|------|-------|------------------|-------|
| PNGL | 3     | CSV + time_trend | 5.2%  |
|      | 5     | CSV + iron_pct   | 21.6% |
|      |       |                  |       |
| FE   | 3     | CSV + time_trend | 10.8% |
|      | 5     | CSV + iron_pct   | 26.6% |

- 4.38 For FE the catch-up efficiency results show that PNGL's catch-up efficiency estimates (relative to the third most efficient GDN) for 2014 range from 10.8% (Model 3) and 26.6% (Model 5). As a result of changes to the data, adjustments and modelling approach following consultation feedback, this gives a somewhat narrower efficiency range than the 9.7% to 29.2% range estimated by the Utility Regulator at draft determination.
- 4.39 Some caution should be applied to the top-down results for FE. As FE is a clear outlier in terms of scale compared to PNGL and the GB GDNs, the top-down benchmarking for FE at GD17 final determination should be used for indicative purposes.

### Disaggregated & unit cost analysis

- 4.40 The Utility Regulator considers that in any benchmarking analysis it is advantageous to assess particular discrete areas of business operations. Such disaggregated analysis can highlight to companies particular areas of expenditure which could be improved upon to reduce any overall efficiency gap which may be evident in the top-down analysis.
- 4.41 In the recent determination of Bristol Water, the CMA recommended that due to potential risk of inaccuracy from the high level regression models, these should also be complemented with more disaggregated or granular benchmarking models.<sup>45</sup>

<sup>44</sup> See page 19 of draft determination Annex 4: Deloitte GD17 Efficiency Advice

[http://www.uregni.gov.uk/uploads/publications/GD17\\_Annex\\_4\\_-\\_GD17\\_Efficiency\\_Advice\\_Deloitte\\_LL.Pdf](http://www.uregni.gov.uk/uploads/publications/GD17_Annex_4_-_GD17_Efficiency_Advice_Deloitte_LL.Pdf)

<sup>45</sup> See page 44 of CMA determination of Bristol Water:

[https://assets.publishing.service.gov.uk/media/56279924ed915d194b000001/Bristol\\_Water\\_plc\\_final\\_determination.pdf](https://assets.publishing.service.gov.uk/media/56279924ed915d194b000001/Bristol_Water_plc_final_determination.pdf)

- 4.42 This approach is being followed in GD17, as the UR's bottom-up analysis of operating costs examines all the various disaggregated categories of GDN expenditure. A separate bottom-up analysis has been used to set allowances for GD17, while this benchmarking exercise provides an overall 'sense-check' of business plan efficiency levels through triangulation.
- 4.43 In addition to examining total opex the Utility Regulator has examined specific categories of costs, modelling direct costs and business support costs separately using our econometric models. For our disaggregated econometric analysis, we have used Model 5 for assessing direct costs and have used Model 3 for business support.
- 4.44 For the final determination, we have also completed our analysis of unit cost comparisons between the GDNs in Northern Ireland and the GDNs in Great Britain.
- 4.45 In Appendix B we show some of our graphs, illustrating the unit costs of PNGL and FE, as well as the industry average in Great Britain. The Utility Regulator's internal analysis of unit costs, used to inform our final determination is more comprehensive, comparing equivalent costs to the eight GB GDNs individually and collectively. This has been useful as a sense check of the Utility Regulator's bottom-up results. Due to the nature of the data we have not been able to show this more detailed unit cost information publically.
- 4.46 Unit costs are not in themselves a measure of efficiency. Costs may vary because of differences in operating conditions that are outside a company's control. Unit costs worked out for future years should be viewed with caution as they are based on forecast business plan estimates for both operating costs and denominator used (i.e. customer numbers, throughput of gas volumes and network length).
- 4.47 We have also undertaken some simple ratio analyses of direct and indirect costs. According to our findings, PNGL spend proportionally speaking, significantly more on business support costs than the GB GDNs and that this has been forecasted by the company to continue during GD17.
- 4.48 We calculate that FE in their business plan forecasts are estimating their business support costs will fall as a percentage of opex during GD17 and make up a comparable proportion of costs to the GB GDNs by 2022.

## 5 Interpretation of Results

- 5.1 For final determination the Utility Regulator has re-estimated the models used at draft determination stage following some updates to the data and subsequent adjustments. We have interpreted the results and have set out our main findings below.

### Findings from the total modelled opex models

---

- 5.2 We regard Models 3 and 5 to be the best models in terms of both economic theory and statistical performance, so have used the results from these models to estimate the efficiency of both current costs (using 2014 year) and forecasted costs (in GD17 period of 2017 to 2022).
- 5.3 The Utility Regulator considers Model 3 as being a very conservative approach given that it does not take into account the reduced workload levels in Northern Ireland associated with its more modern network. We regard the above efficiency estimates from Model 3 as being underestimates of what could be achieved by the companies.
- 5.4 We recognise there are some advantages and disadvantages to both models. For example, while Model 3 may suffer from omitted variable bias by not taking into account network age, the iron mains variable in Model 5 is not conclusive in terms of coefficient significance. Model 5 results are plausible however, given that it can be reasonably assumed that having a substantial proportion of iron mains in a network will lead to higher costs within a number of opex categories. Additional data in the remaining years of Ofgem's RIIO-GD1 may ensure that Model 5 estimates with a greater degree of certainty in future modelling exercises.
- 5.5 As outlined in Chapter 4 above, in terms of catch-up efficiency the results show that PNGL's catch-up efficiency estimates (relative to the third most efficient GDN) for 2014 range from 5.2% (Model 3) to 21.6% (Model 5). For FE, the results show that PNGL's catch-up efficiency estimates (relative to the third most efficient GDN) for 2014 range from 10.8% (Model 3) and 26.6% (Model 5).
- 5.6 In addition to examining historic opex performance we have used model results to forecast efficient opex levels for PNGL and FE up to 2022.
- 5.7 As was the case in our draft determination, within our forecasts we have held the time-trend variable constant at 2015, for years 2017 to 2022. This ensures that we do not 'double count' a continuation of a time-trend effect, which may include a continuing productivity assumption in these future years. Continuing productivity is taken into account separately within our frontier shift analysis (detailed in Annex 6 of the final determination).<sup>46</sup>
- 5.8 According to the results, we consider PNGL's forecast costs within their business plan as being less efficient than their current levels, with levels of opex higher than those estimated by the two models. As shown in Table 5 below, our results indicate that there is scope to reduce PNGL's business plan opex costs by up to 24.4% to reach what has been assessed as efficient operational costs.

---

<sup>46</sup> These top-down model estimates have not been used for setting the GD17 final determination allowances, with the Utility Regulator relying on the separate bottom-up approach instead. The top-down benchmarking analysis provides a valuable sense-check however.

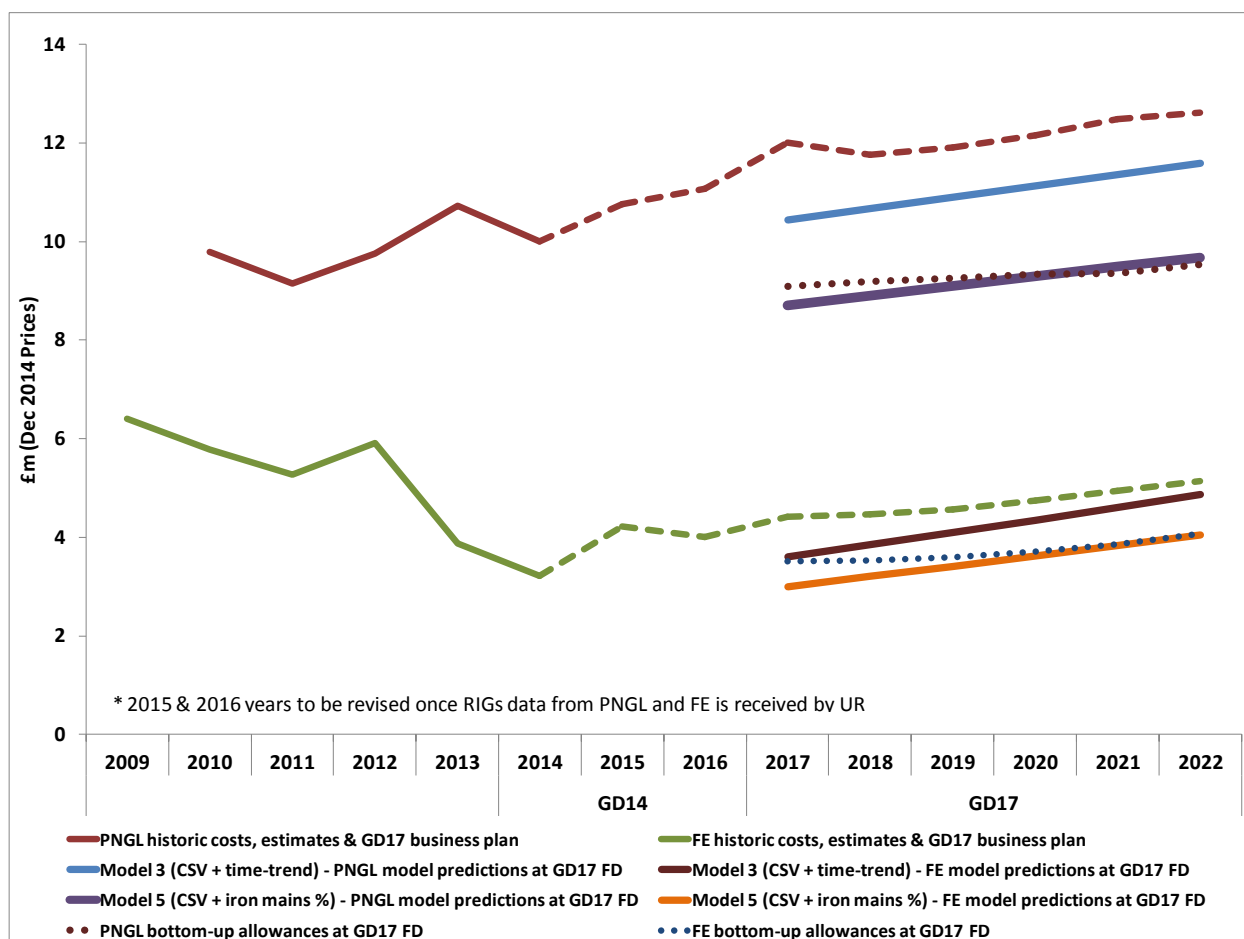
**Table 5: Estimated scope of business plan reduction at final determination**

| GDN  | Model | Specification    | GD17<br>(2017 – 2022) |
|------|-------|------------------|-----------------------|
| PNGL | 3     | CSV + time_trend | 9.4%                  |
|      | 5     | CSV + iron_pct   | 24.4%                 |
| FE   | 3     | CSV + time_trend | 10.2%                 |
|      | 5     | CSV + iron_pct   | 25.3%                 |

- 5.9 We have used the model results to forecast efficient opex levels for FE up to 2022. According to the results, we consider that FE's forecast costs within their business plan are slightly less efficient than their 2014 levels during the earlier years of GD17, but relative performance does improve somewhat by 2022 according to the model. As shown in Table 5 above, our results indicate that there is scope to reduce FE's business plan opex costs by up to 25.3%, to reach what has been assessed as efficient operational costs.
- 5.10 As FE is a clear outlier in terms of scale compared to PNGL and the GB GDNs, the top-down benchmarking results for FE at GD17 final determination should be used for indicative purposes only.
- 5.11 As a result of changes to our methodology following consultation responses, our findings for both models identify slightly lower efficiency opportunities than estimated at the draft determination stage. Notwithstanding, the Utility Regulator considers that at final determination it is likely that opportunities for opex efficiency in PNGL and FE's business plan forecasts lie within an approximate 10% to 25% range. This is a slightly lower and narrower scope for efficiencies than the 12% to 30% range estimated at draft determination.
- 5.12 Given that Model 3 is a very conservative approach, we consider that the likely scope for efficiency reductions would be closer to the results for Model 5, than Model 3 - i.e. towards to upper end of the range. The results from Model 5 correspond well with the findings of the bottom-up approach. As we have not taken an asymmetric approach to efficiency by applying results from our disaggregated opex analysis, there is a potential for even higher efficiency gains than the range estimated above.
- 5.13 The Utility Regulator has forecast each GDN's annual opex using the resulting coefficients of both models. This is illustrated in the chart below in Figure 6. It should be noted that both the historic and the estimated opex costs illustrated in the graph correspond to our definition of modelled costs (i.e. they exclude metering, network rates, advertising & marketing etc). This means for this GD17 top-down analysis we effectively apply our scope for reductions to the same categories of costs which were included and assessed in the models (but without the regional wage adjustment).<sup>47</sup>
- 5.14 The graph also shows how our econometric estimates compare to the GD17 allowances, which were based on the Utility Regulator's bottom-up approach. To ensure the figures are as comparable as possible, we only show the GD17 allowance total which corresponds to our definition of opex modelled costs (i.e. excludes metering, network rates, advertising & marketing etc). Opex figures for 2015 and 2016 are estimates taken from company business plans. These will be revised once RIGs data from PNGL and FE is received by Utility Regulator.

<sup>47</sup> It is arguably more common for a regulator to apply efficiency results to a wider spectrum of company costs than the categories used for modelling.

**Figure 6: Range of forecasted modelled opex (£m) at final determination<sup>48</sup>**



- 5.15 The graph above shows that the GD17 opex bottom-up allowances for FE are largely in line with actuals for the 2014 year for cost categories included within modelled opex. The GD17 opex bottom-up allowances for PNGL are somewhat below 2014 actuals – however, this is largely due to PNGL’s relatively high business support costs and allocating staff associated with the connection incentive into its cost base.
- 5.16 When we compare Utility Regulator allowances for GD17 across all categories of opex costs (i.e. also including metering, advertising and market development etc), it is the case that the bottom-up approach has led to allowances which are well within the range estimated by the top-down method for modelled opex.
- 5.17 For PNGL, the Utility Regulator has allowed £86.2m of total opex (post-efficiency) for the six years of GD17 out of a business plan forecast of £106.9m, meaning final determination allowances are around 19% below the business plan.<sup>49</sup> This is well within the Utility Regulator’s top-down efficiency range of 9.4% to 24.4% for PNGL.
- 5.18 For FE, the Utility Regulator has allowed £40.1m of total opex (post-efficiency) out of a GD17 business plan forecast of £47.9m, meaning allowances are around 16% below the business plan. This is well within our top-down efficiency range of 10.2% to 25.3% for FE.

<sup>48</sup> Modelled opex excludes metering, network rates, advertising & market development etc.

<sup>49</sup> Note that post-efficiency figures are inclusive of frontier shift. Figures also include network rates.

## Findings from disaggregated approach

---

- 5.19 Although our disaggregated analysis has not been as extensively examined and tested as the top-down aggregated benchmarking, it does provide intelligence on the specific cost areas where the NI GDNs can improve.
- 5.20 Of the total modelled opex costs, it appears that PNGL performs better on its direct costs (work management and work execution) than on its business support costs. These findings hold for both historic and forecast opex costs. These results align with the findings of the bottom-up approach which has identified scope for savings on forecast business support costs set out by PNGL in their business plan for GD17.
- 5.21 The findings for PNGL also correspond well with the results from the opex unit cost analysis undertaken by the Utility Regulator. This analysis indicates that PNGL can make opex improvements during GD17 on their business support costs. The analysis also shows business support costs for PNGL make up a higher proportion of modelled opex than is typically the case in GB.
- 5.22 For FE, on the top-down approach, as forecast business support opex costs are held relatively constant in real terms as the business grows further during GD17, this improves their relative efficiency over time on the business support category. This relationship corresponds with our business support model which shows that economies of scale are more evident in this category than the direct category.
- 5.23 Although FE in 2022 will still be a smaller company than PNGL, the company project in their business plan a lower percentage share of business support costs, towards proportions typical of the GB GDNs.
- 5.24 Overall however, our findings identify efficiency opportunities for FE in both main opex categories (direct and business support) during GD17, from FE's business plan forecast.
- 5.25 For the final determination, we have taken a holistic approach to total modelled opex for the 'top-down' benchmarking analysis. Any company that is relatively efficient in one cost area can offset this to some extent against cost areas where they are less efficient. An alternative approach, where the Utility Regulator specifically targets areas of inefficient opex on a top-down disaggregated basis<sup>50</sup> would likely increase the scope for further efficiencies, compared to our final determination position.
- 5.26 For future benchmarking exercises, it may be prudent to explore the merits of having two separate models for both direct opex and indirect opex, rather than a total modelled opex approach. It could be argued for example, that the iron mains variable may be more applicable to direct costs than to the total modelled opex dependent variable.<sup>51</sup> The merits of any alternative econometric approaches can be explored further in subsequent modelling exercises.

---

<sup>50</sup> Can be termed 'middle-up' benchmarking

<sup>51</sup> Although there may be "overhead" costs associated with work relating to iron mains.



## 6 Next Steps for Benchmarking

- 6.1 This top-down analysis marks the first comprehensive econometric and unit cost analysis undertaken into the gas distribution industry in Northern Ireland. The Utility Regulator considers undertaking benchmarking analysis as in keeping with good regulatory practice.
- 6.2 The analysis has proved useful in understanding and interrogating the proposed opex costs of the NI GDNs for GD17, and has formed a good foundation from which to further develop and refine the modelling, as additional data becomes available in future years.

### Annual reporting during GD17

---

- 6.3 The Utility Regulator's recent introduction of RIGs reporting of annual cost data has facilitated benchmarking, as it assists comparability with GB GDNs due to the categorisations used.
- 6.4 Going forward, the Utility Regulator intends to publish an annual Cost and Performance Report (CPR) covering the outturn performance of the GDNs in Northern Ireland during the GD17 period and beyond. This report will be similar to the Utility Regulator's annual CPR for Northern Ireland Water,<sup>52</sup> as well as Ofgem's RIIO-GD1 Annual Reports which cover the performance of the eight GDNs in Great Britain.<sup>53</sup>
- 6.5 As each GB GDN will release their Regulatory Reporting Pack (RRP) data for each year of RIIO-GD1 (2013-14 to 2020-21), the Utility Regulator proposes to assess opex unit costs within the CPR in a similar way going forward as illustrated in Appendix B. As this data is publically available, this is something which GDNs in Northern Ireland will be able to undertake themselves each year in parallel to the Utility Regulator, thus better understanding their relative costs. The first year of GD17 data (i.e. for 2017 calendar year) will be available for analysis in 2018.
- 6.6 Once SGN NI become fully operational during the GD17 period, their costs can also be examined and included in future analyses. This will be a positive development for NI benchmarking as they can form another local comparator with which to compare the existing NI GDNs of PNGL and FE. This will especially be the case for benchmarking FE, as both FE and SGN NI should have relatively similar network characteristics. Any benchmarking in GD23 should therefore have a higher degree of certainty.<sup>54</sup>
- 6.7 In addition to unit cost analysis, the Utility Regulator will also undertake econometric benchmarking of the GDNs in Northern Ireland within the CPR, likely using models adopted in this GD17 final determination, but updated for latest GDN data. The underlying data behind the econometric analysis may not become publically available since it requires a number of particular adjustments and cost exclusions.
- 6.8 We expect meetings and ongoing correspondence between the Northern Ireland GDNs and the Utility Regulator on the nature of the CPR and its likely contents in due course.

---

<sup>52</sup> [http://www.uregni.gov.uk/publications/ni\\_water\\_2013-2015\\_cost\\_and\\_performance\\_report](http://www.uregni.gov.uk/publications/ni_water_2013-2015_cost_and_performance_report)

<sup>53</sup> <https://www.ofgem.gov.uk/publications-and-updates/riio-gd1-annual-report-2014-15>

<sup>54</sup> In addition, by GD23 the Utility Regulator will have a longer dataset of actuals with which to examine long-run trends and fluctuations. There should be greater network utilisation for PNGL and FE as customers continue to connect to gas, which will enhance comparability with GB GDNs.

## Benchmarking in GD23

---

- 6.9 Benchmarking the NI GDNs may be used in conjunction with bottom-up analysis to assess the business plan forecasts in the next gas distribution price control of GD23.
- 6.10 As the GB GDNs continue their current repex programme during RII0-GD1, the proportion of iron mains in their network will reduce further.<sup>55</sup> This will enhance the comparability of gas distribution operations between Great Britain and Northern Ireland, thus making any future benchmarking more robust.
- 6.11 In addition, as NI GDNs continue to grow during GD17, the differences in company size/scale and network utilisation between companies in Northern Ireland and Great Britain should gradually reduce. This will help improve comparability in future benchmarking.

---

<sup>55</sup> Around 4,000km of iron mains were removed each year from the GB GDNs' gas mains network from 2007 to 2014.  
<http://www.hse.gov.uk/pipelines/annual-report13-14.pdf>

# APPENDIX A: DETAILED RESULTS

A1.1 Provided below are the detailed model and statistical test results from our two preferred opex econometric models, namely Model 3 and Model 5.

## MODEL 3: CSV + YEAR

|                   |               |   |        |
|-------------------|---------------|---|--------|
| Linear regression | Number of obs | = | 56     |
|                   | Replications  | = | 1,000  |
|                   | Wald chi2(2)  | = | 30.25  |
|                   | Prob > chi2   | = | 0.0000 |
|                   | R-squared     | = | 0.7853 |
|                   | Adj R-squared | = | 0.7772 |
|                   | Root MSE      | = | 0.1192 |

(Replications based on 8 clusters in company\_no)

| ln_m_tot_o~x | Observed<br>Coef. | Bootstrap<br>Std. Err. | z     | P> z  | Normal-based<br>[95% Conf. Interval] |          |
|--------------|-------------------|------------------------|-------|-------|--------------------------------------|----------|
| csv          | .7788891          | .142516                | 5.47  | 0.000 | .4995628                             | 1.058215 |
| year         | -.0094255         | .0100617               | -0.94 | 0.349 | -.0291461                            | .010295  |
| _cons        | 12.16725          | 19.741                 | 0.62  | 0.538 | -26.52439                            | 50.85889 |

| Statistical<br>test | p-value/<br>result |
|---------------------|--------------------|
| Normality           | 0.04               |
| Ramsey RESET        | 0.52               |
| Adj R-sq            | 78%                |
| Observations        | 56                 |

## MODEL 5: CSV + IRON\_PCT

|                   |               |   |        |
|-------------------|---------------|---|--------|
| Robust regression | Number of obs | = | 56     |
|                   | Replications  | = | 1,000  |
|                   | Wald chi2(2)  | = | 36.73  |
|                   | Prob > chi2   | = | 0.0000 |
|                   | R-squared     | = | 0.8085 |
|                   | Adj R-squared | = | 0.8013 |
|                   | Root MSE      | = | 0.1092 |

(Replications based on 8 clusters in company\_no)

| ln_m_tot_o~x | Observed<br>Coef. | Bootstrap<br>Std. Err. | z     | P> z  | Normal-based<br>[95% Conf. Interval] |          |
|--------------|-------------------|------------------------|-------|-------|--------------------------------------|----------|
| csv          | .7812895          | .129721                | 6.02  | 0.000 | .527041                              | 1.035538 |
| iron_pct     | .6273163          | .5441014               | 1.15  | 0.249 | -.4391029                            | 1.693735 |
| _cons        | -7.019288         | 1.897366               | -3.70 | 0.000 | -10.73806                            | -3.30052 |

| Statistical<br>test | p-value/<br>result |
|---------------------|--------------------|
| Normality           | 0.05               |
| Ramsey RESET        | 0.64               |
| Adj R-sq            | 80%                |
| Observations        | 56                 |

## APPENDIX B: OPEX UNIT COSTS AT FD

- A1.2 For final determination, the Utility Regulator has completed its unit cost comparison between the GDNs in Northern Ireland and the GDNs in Great Britain. Graphs showing how unit costs compare across the Northern Ireland GDNs and the GB average are shown below. However, a number of considerations should be regarded before interpretation of the differences in unit costs is undertaken.
- A1.3 Unit costs are not in themselves a measure of efficiency. Costs may vary because of differences in operating conditions that are outside company control. Unit costs worked out for future years should be viewed with caution as they are based on forecast business plan estimates for both operating costs and denominator used (i.e. customer numbers, throughput of gas volumes and network length).
- A1.4 Due to data confidentiality, our public facing analyses do not include the various exclusions which would make comparison more like-for-like. GDNs in Great Britain experience substantial operating costs associated with gasholder decommissioning and environmental costs for example, which GDNs in Northern Ireland would not ordinarily face. These costs have not been excluded from the calculations to produce these public facing graphs. Thus, we consider that GB GDNs' unit costs may be somewhat overstated for direct opex, when compared to the NI GDNs.
- A1.5 Due to the different regimes in Northern Ireland and Great Britain, in order to ensure a more like-for-like comparison, costs are not included for metering, advertising & market development, training & apprentices.
- A1.6 Operating costs are taken from each GB GDN's Regulatory Reporting Pack (RRP), which consists of summary data of costs and outputs for the Ofgem RIIO-GD1 period.<sup>56</sup> The denominators are simply the industry total number of customers, volume of gas, length of main relating to gas distribution in Great Britain. Such industry totals are readily available from Ofgem publications.
- A1.7 Each graph shows various information:
- GB average weighted unit costs for 2013/14 and 2014/15, which are in blue;
  - PNGL unit costs are in red. 2014 year is an actual, while 2015 and 2016 are company estimates made at business plan submission stage. Years 2017 to 2022 are business plan proposals by the company expressed in unit cost terms;
  - FE unit costs are in green. 2014 year is an actual, while 2015 and 2016 are company estimates made at business plan submission stage. Years 2017 to 2022 are business plan proposals by the company expressed in unit cost terms;
  - All costs are in December 2014 prices.
  - For reference, the black lines in each graph show the Utility Regulator's allowed costs at GD17 final determination, expressed in unit cost form for comparison.
- A1.8 It should be noted that the costs are expressed in raw terms and have not been adjusted for differences in regional wages. Northern Ireland would be at an advantage as it is in a low cost region with regards to labour operating costs.

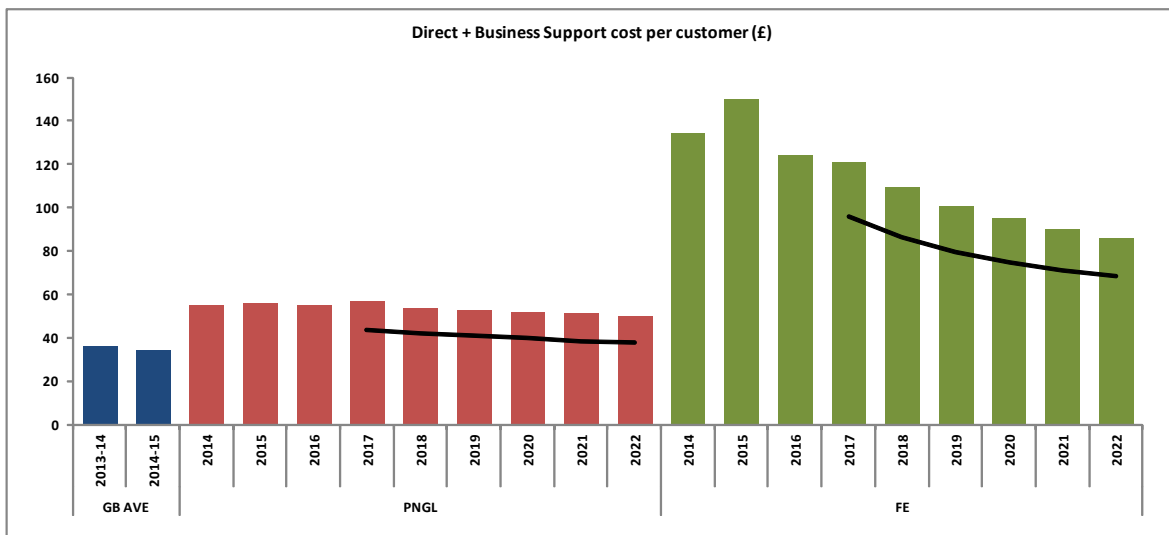
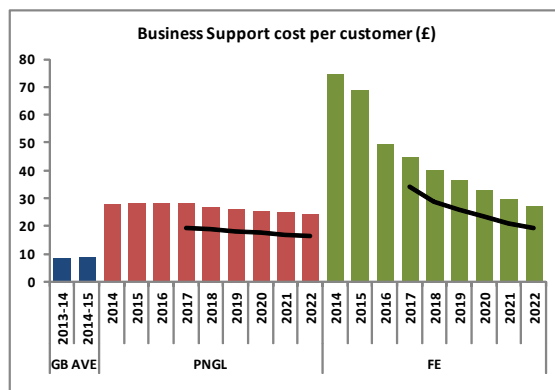
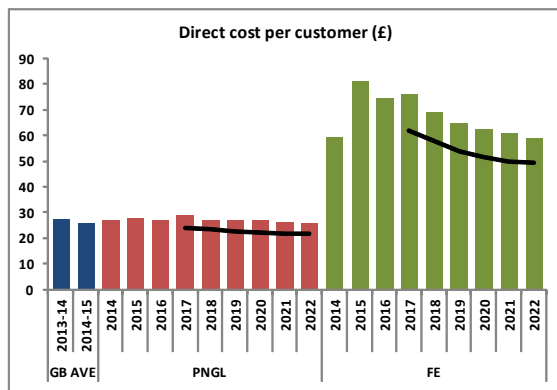
<sup>56</sup> <https://www.ofgem.gov.uk/network-regulation-riio-model/network-performance-under-riio/riio-gd1-performance-data>

- A1.9 It should also be noted that for direct costs (especially repairs, maintenance and emergencies), Northern Ireland GDNs would be expected to experience lower workload levels due to the fact that no iron mains are currently used in the province for gas distribution. Northern Ireland has a relatively new and modern gas network, consisting primarily of PE pipe, whereas around 27% of the GB network is iron, which is susceptible to corrosion and subsequent leaks.
- A1.10 In some cases FE may have a higher allowance in unit cost terms, than PNGL. This is partly due to the fact that PNGL is a larger company and can take greater advantage of economies of scale. The econometric analysis would be typically regarded as more sophisticated than simple unit costs since it can take into account economies of scale within its analysis.
- A1.11 Caution should be adopted when comparing unit costs on a volumetric basis. Gas volumes can be affected by mild winters as well as large users exiting the market, for example. Such events may lead to unit costs increasing on this metric, while actual opex has stayed the same or even decreased.
- A1.12 Although Northern Ireland GDNs complete similar cost reporting as in Great Britain, there may be some differences between each of the companies on how exactly costs are categorised.
- A1.13 Some unit cost comparisons are more appropriate than others. For example, for maintenance it may be more suitable to express maintenance costs per network length than per customer as there would be arguably more of a causal relationship between network length and the costs to maintain the network. The Utility Regulator has simply shown the unit costs for all denominators on a factual basis.
- A1.14 There will be a range of unit costs for each of the eight GDNs. For simplicity and for data sensitivity reasons we only show the industry mean (weighted average) for GB, as opposed to the median, upper quartile, or frontier GB company.
- A1.15 Costs are shown for the following opex categories:
- **Direct costs** – encompass the activities of work management and work execution together. Work management includes asset management, operations management, customer management (including the emergency call centre) and system control.<sup>57</sup> Work execution includes emergency, repairs, maintenance and other direct activities costs,<sup>58</sup>
  - **Business support** – comprise of ‘overhead’ type costs for running the business (includes IT, property management, insurance, HR, finance & audit & regulation, procurement, CEO & Group costs, stores and logistics); and
  - **Direct + business support** – simply direct and business support unit costs added together.

<sup>57</sup> For GB GDNs work management includes substantial operational expenditure for gasholder decommissioning, environmental costs and land remediation, which have not been excluded for our public facing unit cost analysis.

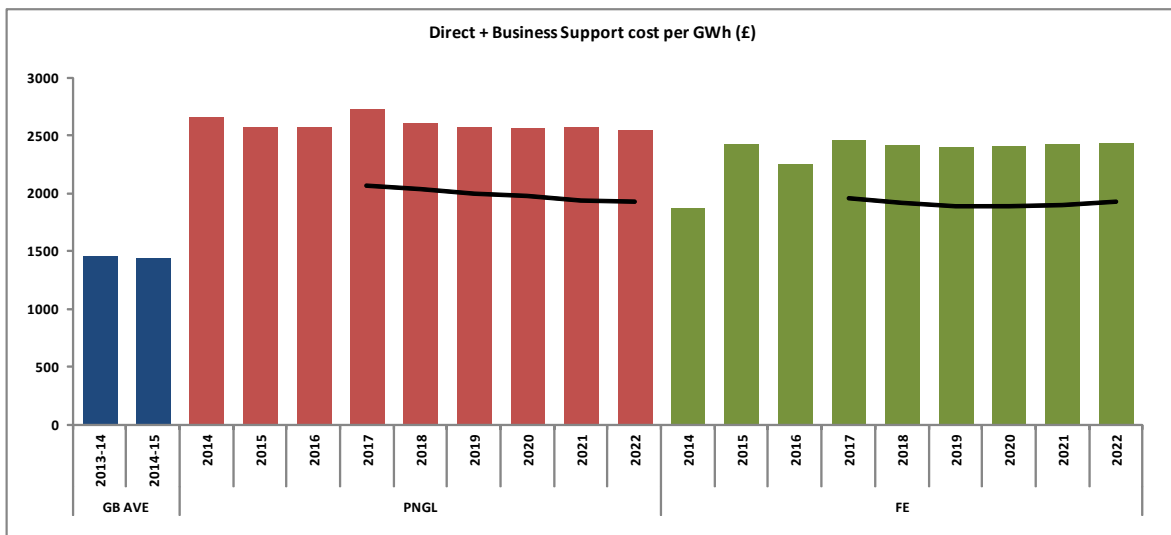
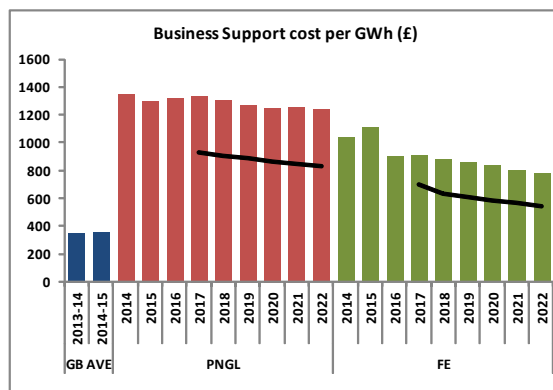
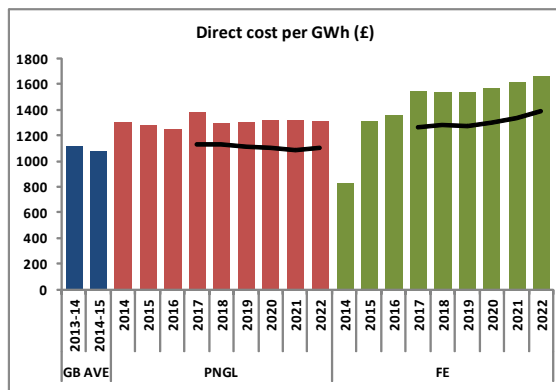
<sup>58</sup> 67% of xoserve is excluded from GB data to improve comparability with Northern Ireland GDNs. Metering costs are not included in NI GDN modelled opex.

## Opex unit costs per customer <sup>\*</sup>



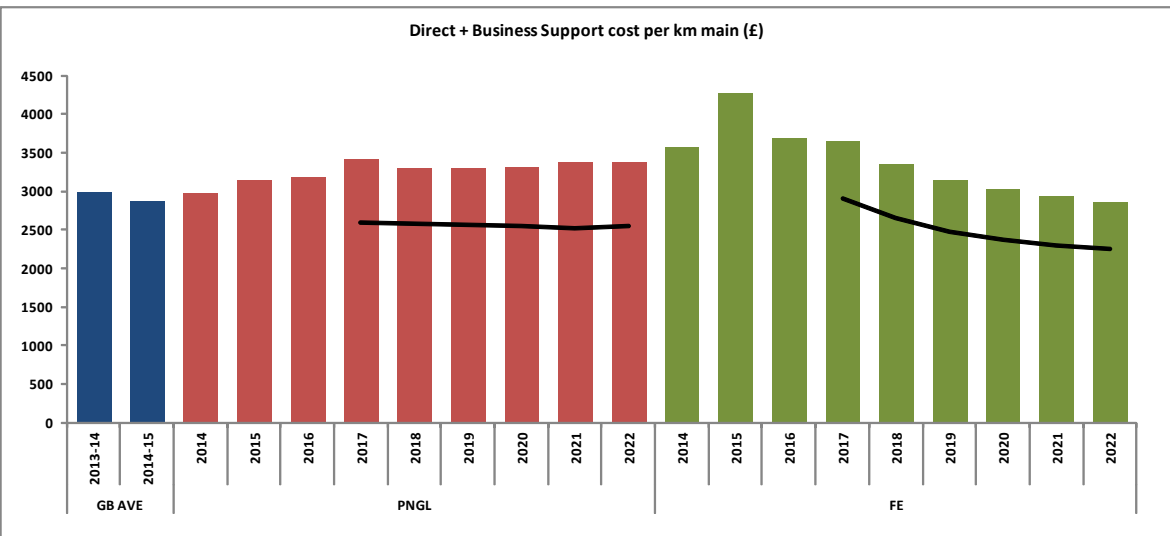
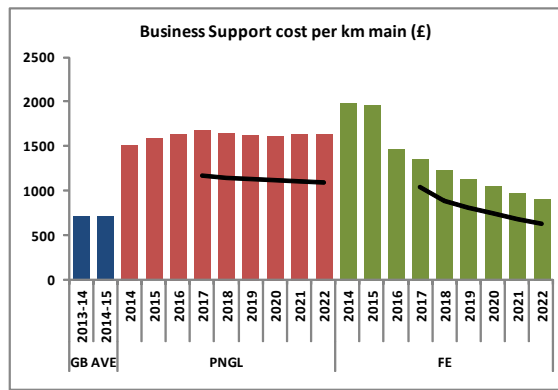
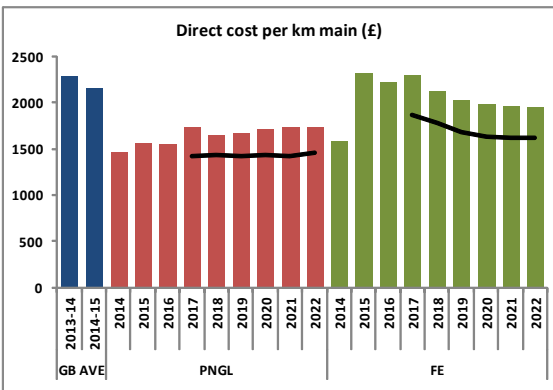
<sup>\*</sup> GB average calculated from publically available Regulatory Reporting Pack opex data from Ofgem and from GB industry totals of customer numbers, network length and gas volumes. All unit costs are in December 2014 prices.

## Opex unit costs per volume of gas <sup>\*</sup>



<sup>\*</sup> GB average calculated from publically available Regulatory Reporting Pack opex data from Ofgem and from GB industry totals of customer numbers, network length and gas volumes. All unit costs are in December 2014 prices.

## Opex unit costs per km main <sup>\*</sup>



<sup>\*</sup> GB average calculated from publically available Regulatory Reporting Pack opex data from Ofgem and from GB industry totals of customer numbers, network length and gas volumes. All unit costs are in December 2014 prices.