NIAUR – OPEX EVALUATION

EFFICIENCY ASSESSMENT OF NIE'S OPERATING EXPENDITURE

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FINAL

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CONTENTS

IMPORTANT NOTICE

EXECUTIVE SUMMARY

The Northern Ireland Authority for Utility Regulation (NIAUR) engaged a consortium of Cambridge Economic Policy Associates (CEPA), PKF and Sinclair Knight Merz (SKM) to provide advice on various aspects of the Northern Ireland Electricity Transmission & Distribution (NIE) price control review. This report, prepared by CEPA, provides an econometric top down efficiency assessment of NIE's operating expenditure (opex).

We have reviewed NIE's operating cost efficiency study submitted to NIAUR and have provided a short critique in this report. In sum, we consider that methodology used to develop its estimates was relatively robust, however, there were a number of areas where adjustments were made that favoured NIE.

Following discussion with NIAUR, it was concluded that the GB DNOs should be used as comparators as we consider the geographical proximity and similar operating environments make those DNOs the appropriate comparators. We used a similar methodology to the NIE study, namely ordinary least squares. We have, however, differed from the NIE models in that we have also used a composite scale variable (CSV) cost driver in line with that used by Ofgem for DPCR5 based on modern equivalent asset values (MEAV) in addition to a CSV based on network length, number of customers, and GWh distributed (CSV(DPCR4)). An additional difference to the NIE study is that we based our model on 2007/08 and 2008/09 data as the 2009/10 data available for the GB DNOs was for allowed revenue rather than actual expenditure.

As part of the study we have modelled two different cost aggregations, NIE's indirect costs and an aggregation of controllable indirect and direct costs, but which excludes some costs which are not comparable with Ofgem's definitions, we henceforth refer to this aggregation as 'total opex' for simplicity. We have not separately modelled NIE's repairs and maintenance (R&M) expenditure as we do not consider the cost drivers we have available for NIE are good indicators of the volume of work undertaken, e.g. spans of trees cut is not available. In turn, this means that less reliance can be place on the results from the total opex model. We do, however, consider that the two CSVs for indirect costs are good cost drivers; this is supported by high goodness-of-fit estimates.

We have made a number of adjustments to NIE's reported operating costs in order to make the modelled cost consistent with the data available for GB DNO's: this included an adjustment for regional wages. We consider that the available evidence (e.g. ONS data) indicates that Northern Ireland has, on average, lower wages than the GB average. We made a regional wage adjustment to all the comparators in the model using ONS' Annual Survey of Household Expenditure.

The results indicate that NIE ranks comparatively well against the GB DNOs in relation to total opex costs (6^{th} or 8^{th} out of 15, based on CSV(MEAV) and CSV(DPCR4) respectively). NIE's rankings in relation to indirect costs are not as high, rank 8^{th} or 9^{th}, indicating that for this area of costs it is not as good a performer.

As we have noted above, we consider that the cost drivers we have available may not be good indicators for the actual volume of R&M work conducted by the network operators. As such we have not made an estimate as to whether NIE is inefficient or efficient in relation to R&M

work.. We do however consider that the indirect cost model provides a good estimate of NIE's indirect opex efficiency. Based on NIE's distance to the upper quartile, we estimate that NIE's indirect costs would need to be 13% to 16% lower for it to be an upper quartile performer.

1. INTRODUCTION

The Northern Ireland Authority for Utility Regulation (NIAUR) engaged a consortium of Cambridge Economic Policy Associates (CEPA), PKF and Sinclair Knight Merz (SKM) to provide advice on various aspects of the Northern Ireland Electricity Transmission & Distribution (NIE) price control review. This report, prepared by CEPA, provides an econometric top down efficiency assessment of NIE's operating expenditure (opex). This work forms one area of the opex review that NIAUR requested advice on from CEPA and PKF.

Econometric benchmarking is viewed as best practise when assessing a regulated company's relative efficiency. NIAUR used econometric benchmarking as part of its NI Water price control and Ofgem (the Great Britain regulator) has used it in both its most recent electricity distribution and gas distribution price control reviews.

NIAUR proposed in its terms of reference that a top down benchmarking exercise, comparing NIE to the GB DNOs, should be carried out on distribution costs using a composite scale variable (CSV). We consider that a top down benchmarking approach comparing to GB DNOs, using some form of CSV is appropriate for analysing NIE's efficiency.

In this report, we detail our comparative analysis of NIE's efficiency performance based on a top down model of its controllable operating expenditure (with some cost items excluded to ensure consistency with Ofgem's definitions) and, at a more disaggregated level, a model for NIE's indirect costs.

To meet the ToRs set out by NIAUR this note continues as follows:

- Section 2 provides a review of the opex benchmarking results provided to us as part of NIE's BPQ response .
- Section 3 sets out the methodology that we used to benchmarking NIE's opex performance.
- Section 4 provides the results of our benchmarking.
- Section 5 presents our conclusions.

The note is supported by:

- Annex A sets out our calculation for NIE's operating expenditure.
- Annex B sets out our mapping of NIE's assets to Ofgem's asset categories.

2. REVIEW OF NIE'S BENCHMARKING SUBMISSION

NIE provided to NIAUR various reports showing the results of economic benchmarking on its electricity network. We have reviewed these reports and the accompanying models, and below we provide a summary and critique.

The reports estimated that NIE ranked ***fourth*** for indirect costs against GB DNOs, and ***first*** for repairs and maintenance (R&M) costs. The R&M model was based on a panel dataset covering three years from 2007/08 to 2009/10, while the indirect cost model was based only on data from the 2009/10 year.

2.1. NIE's submission: methodology

The reports provided by NIE benchmarked NIE's performance against that of the GB DNOs' performances using data published by Ofgem. GB DNOs were chosen given their geographical proximity, and similarities in operating environment and electricity usage profiles. The reports considered that the data available was reliable and regulatory guidelines ensured that the data was well documented.

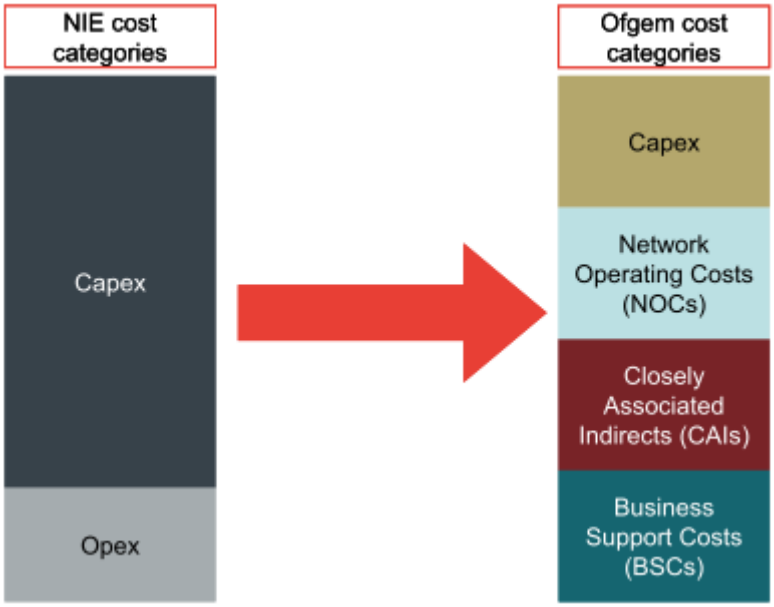
The reports set out analysis on two categories of cost: (i) indirect costs; and (ii) R&M costs. It noted three key challenges of benchmarking NIE's performance against GB DNOs for these cost categories:

- mapping NIE's reported costs to the GB DNO's reported costs;
- NIE Powerteam (hereafter referred to as 'Powerteam') reporting and hourly charging methodology; and
- removing 275kV transmission expenditure.

Mapping NIE's costs to GB DNO's cost categories

The main difference between Ofgem's requirements for reporting regulatory opex data for setting DPCR5 and NIAUR's business plan questionnaire, is that Ofgem required the DNOs to reported expenditure by activity type. Figure 2.1 below illustrates this challenge.

Figure 2.1 – Allocating NIE's costs to Ofgem's cost categories



Source: NIE submission

NIE's submitted reports map NIE's costs to Ofgem's definitions. This mapping was restricted to Powerteam cost categories as NIE T&D's reported costs are limited to indirect opex costs. The mapping process involved assessing each of Powerteam's cost items and allocating that item to Ofgem's definitions.

NIE Powerteam

NIE operates a business model whereby a sister company, Powerteam, carries out the technical engineering services and most of the business as usual services (BAU) for NIE T&D. Powerteam was established in RP2 as the technical engineering service provider to the T&D business. The Powerteam business falls outside the review but the way in which its services are accounted for in T&D is subject to review and a separate business plan questionnaire (BPQ) is submitted covering its business.[1] The services provided by Powerteam are charged to NIE T&D via an hourly rate. The hourly rate includes both indirect and direct costs, and these were separated via the cost mapping exercise.

2.2. Critique

NIE's submission provided NIAUR with the spreadsheet models created for the benchmarking process and separate spreadsheets showing the cost mapping conducted. We have reviewed these spreadsheets in conjunction with the benchmarking report submission and consider that overall the benchmarking approach appears to be robust and the cost mapping has been done in a consistent manner to separate indirect and direct costs. We have, however, not reviewed the underlying raw data from which Powerteam's cost items were generated.

While the mapping and benchmarking methodology appear robust there are a few areas where we consider that a different approach may be valid. These include:

[1] The arrangements for NIE Powerteam are discussed further in the report submitted for Work Area 1.

- **Profit margin.** We understand that the profit margin charged to NIE has been excluded from its estimates of NIE's opex. We consider that 50% of the profit margin should be included in the model as an operating cost as it is a cost faced by NIE.
- **Including Ofgem's workforce renewal allowance for GB DNOs.** As a result of GB DNOs' actual 2009/10 cost being unavailable, NIE's submission included the allowance Ofgem made for workforce renewals costs for GB DNOs in 2009/10, on the basis that NIE faced similar costs in 2009/10. After reviewing NIE costs for 2009/10 we do not consider that there is evidence that NIE workforce renewals costs included a significant uplift over its historical spend in this area.
- **The inclusion of some Dt costs.** NIE's submission included some of Dt costs in the indirect costs it modelled, however we consider that there may be some other Dt costs that should be included to match Ofgem's data.
- **The use of 2009/10 GB DNOs' allowances.** Only the allowance set by Ofgem for the 2009/10 DNO's operating expenditure rather than actual expenditure data is publicly available. We note that GB DNO's actual expenditure in 2009/10 may be quite different from their Ofgem determined allowance, which would impact on the benchmarks.
- **A regional wage adjustment.** While NIE's submitted reports noted that Ofgem made adjustments for labour and contractor rates, they made no adjustment for regional wage differences. We understand that this was on the basis that EDFE LPN was the only DNO whose costs were significantly affected. While we agree that Ofgem's regional wage adjustments resulted in small changes, either up or down, for the DNO's costs, aside from LPN, there is very strong evidence that NI's wages are consistently well below the average in GB.[2]

In addition to the points above, we also have a broader concern around the cost driver used to model R&M costs. We discuss this in our methodology section below.

[2] ONS, Annual survey of household expenditure (ASHE). Also see, NIAUR, PC10 Final Decision, 2010.

3. METHODOLOGY

In this section we set out the methodology used to benchmark NIE's performance against that of the GB DNOs. Our benchmarking analysis has been done on both NIE's indirect costs and an aggregation of controllable indirect and direct costs but which excludes some costs which are not comparable with Ofgem's definitions, hereafter we refer to this aggregation as 'total opex' for simplicity. We have chosen not to benchmark NIE's performance for R&M costs separately as we consider that the cost drivers available do not fully explain the volume of work (e.g. volume of spans of trees cut) conducted by NIE. Ofgem noted this issue and for DPCR5 used output based drivers for R&M opex benchmarking.[3]

3.1. Comparators

NIAUR indicated in the terms of reference that the benchmarking should be undertaken against the 14 GB DNOs. Given the similarities, geographical aspects and robust data available, we agree with NIAUR that the GB DNOs are appropriate comparators.

3.2. Total operating expenditure

As mentioned in Section 2.1, one of the key issues with comparing NIE to the GB DNOs is ensuring that the costs used in the benchmarking process are comparable across the network operators.

3.2.1. Great Britain DNOs' operating expenditure

Ofgem made available the financial information for the GB DNOs via its published financial model.[4] The financial model splits expenditure into a number of categories, of which the following provide estimates for the benchmarking:

- Network operating costs – broken into 'inspections and maintenance', 'faults', 'trees', and 'other';[5] and
- Indirects and non-operational capex – broken into 'indirects closely associated with directs', 'business support costs', and non-operational capex.

The total opex estimates we calculated included: 'inspections and maintenance', 'faults', 'trees', 'indirects closely associated with directs', and 'business support costs'. We excluded 'other' network operating costs and non-operational capex as these costs were atypical and we did not consider these costs reflect the CSVs. These costs can be excluded from NIE reported costs.

3.2.2. NIE's opex

NIE's reported costs combine NIE's indirect costs and all charges from Powerteam which are deemed to be opex under NIE's definitions. Complicating factors in order to get comparable opex costs to Ofgem's reporting requirements are that NIE's capitalisation policy includes, for

[3] Ofgem, 2009a, p.69.
[4] Ofgem, 2009b.
[5] 'Other' refers to dismantlement and remote location generation.

example, capitalising its five-year repairs and maintenance programme, and NIAUR's reporting requirements do not identify NIE's costs by activity type. The former results in a number of NIE's costs that Ofgem would request reported as opex being included in NIE's capex BPQ. In other words, in comparison to Ofgem's reporting requirements NIE understates its opex and overstates capex.

To calculate comparable opex costs a mapping exercise based on activities, such as provided by NIE in its BPQ submission, is required. We have reviewed the mapping exercise in NIE's submission for Powerteam's 2009/10 indirect costs and Powerteams 2007-2010 R&M costs and consider it, based on the available information, to be robust. Therefore, we have used NIE's submission's estimates to determine NIE's total opex for the years 2007/08, 2008/09 and 2009/10. NIE's submission did not map indirect costs for the years 2007/08 and 2008/09. We consider that the cost profiles for 2007/ 08 and 2008/09 are sufficiently similar to 2009/10 to pro rata the indirect costs based on the 2009/10 ratio of indirect costs to total opex.

We have used 2008/09 as our base year and have excluded 2009/10 from our panel. We have done this as we only have available information on the 2009/10 'allowance' provided by Ofgem to GB DNOs rather than actual expenditure. GB DNO's actual expenditure in 2009/10 may be quite different from their Ofgem determined allowance, which would impact on the benchmarks.

In addition to using 2008/09 as the base year we have made a number of adjustments to NIE's reported opex which are set out below:

- **275kV transmission adjustment.** As we noted earlier in this report, NIE undertakes both distribution and transmission network operations whilst GB DNOs, by definition, only distribution operations. However, distribution operations in GB include 132kV assets, while in NI assets related to 110kV and over are considered as part of the transmission network. NIE's submission estimated that approximately 7.5% of opex relates to the 275kV transmission network. We have considered this against estimates for capex carried out at 275kV and believe that this estimate is relatively robust, and as such have used the 7.5% adjustment to remove 275kV work from the opex estimate.[6]

- **Powerteam profit margin.** Powerteam is allowed to charge a margin to NIE on the work it undertakes. This margin is shared evenly with customers. We therefore consider that 50% of the margin should be included in the operating costs as it is a cost faced by NIE.

- **Connections.** Ofgem requires that DNOs report indirect costs associated with connections separately, so directs costs can be identified separately through the activity mapping process. As Powerteam carries out connections activities this costs needs to be excluded from total opex. NIE's submission estimated that approximately 20% of indirect costs can be attributable to connections. We do not have information from GB DNOs in relation to connections indirect costs and have therefore used this proportion

[6] We have checked this against NIE's capex spend during RP4 and we consider that this is appropriate. This is discussed further in Section 3.4.

in our base case analysis. We have, however, undertaken sensitivity analysis on this by modelling connections indirect costs at 15% and 25%.

- **Regional wage adjustment.** It is well established that NI wages are below the GB average and we consider that it is appropriate to make an adjustment to reflect NIE's lower cost of labour. We have based this adjustment on official estimates released as part of the Annual Survey of Household Expenditure (ASHE). We weighted together surveyed wages over 2006-2010 for 'professional occupations' and 'skilled trades occupations' (67% and 33% weightings respectively)[7] and benchmarked the NI estimate against GB's. We chose these two categories as we considered that they best reflected the make-up of NIE's workforce, however the findings are relatively consistent over all the occupations reported. Taking the ratio of NI's wages to those of the UK we estimate that NI's wages have been on average 10% lower over the last five years.[8] While there are a number of different approaches for making adjustments for regional wage difference, we consider that this adjustment is consistent with the approach taken by NIAUR in setting the price control for NI Water (PC10).[9] For PC10 NIAUR determined that 12.2% was an appropriate wage adjustment for NI Water to benchmark against GB water companies. We have adjusted GB DNO's costs on the same basis in order to ensure consistency. We have used the published weights from Ofgem's real price effects as the estimate for proportion of opex which is attributable to wages.

Figure 3.1 below shows the allocation of NIE's costs to match Ofgem's definitions. A proportion of Powerteam's costs that are charged to NIE are related to capital projects and direct costs related to connections can be identified separately. The estimate for the proportion of opex on the 275kV transmission network is 7.5% and 20% of indirect costs are estimated to relate to connections, both of these costs are excluded from the opex calculations in order to match Ofgem's definitions.

We disagree with NIE's submission's inclusion of the workforce renewal allowance which Ofgem provided DNOs from 2009/10 onwards. This allowance is over and above a DNOs 'normal' expenditure on recruitment and development and after analysing NIE's BPQ we see no evidence that its expenditure in this area had increased significantly in 2009/10. However, as our model excludes 2009/10 data this issue does not impact on the modelling.

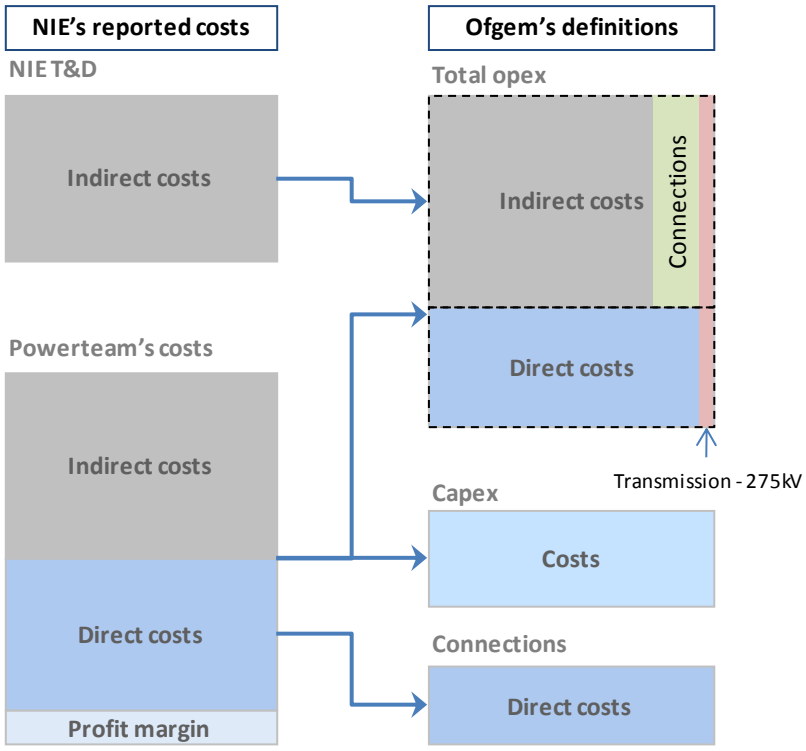
We have excluded licence fees and NIE's business rates from the operating costs as these are considered to be outside of management control. Ideally we would only exclude NIE's network rates as some business rates are controllable, however we do not have this information as a separate NIE cost item. We would prefer to exclude wayleaves as well, however the data we have from Ofgem does not separate these out on an annual basis.

[7] These weightings were based on Ofgem's RPE weightings.

[8] The ratio would preferably include GB's average wage rather than the UK's, however this information was not available. Using the UK average instead includes NI and would result in a small underestimation of the difference as NI's wages would bring the UK average down slightly.

[9] We note that Ofgem made adjustments for all DNOs, however EDFE LPN was the only DNO to receive a significant change to its opex. Ofwat appear to only make adjustments in its opex benchmarking for regions operating in areas below the England and Wales average (Ofwat, 2009, p. 16).

Figure 3.1 – Allocating NIE's costs to Ofgem's definitions



Source: CEPA

Table 3.2 below shows the total opex costs for the NIE reflecting the adjustments outlined above.

Table 3.2: Total opex

Network operator	Total operating expenditure – including NI regional wage adjustment (£m, 2009/10 prices)		
	2007/08	2008/09	2009/10
NIE	49.5	53.0	52.7

Source: CEPA, Ofgem, NIE Submission

Annex A sets out our calculation of NIE's total opex.

3.3. Indirect costs

The cost allocation approach we have taken allows for the identification of NIE's indirect costs (including Powerteam's indirect costs). As we discuss below in Section 3.4, we consider that the drivers we have available are appropriate for benchmarking indirect costs and as such we have model this category of costs as well. Table 3.3 below provides the costs modelled for each of the comparators.

Table 3.3: Indirect costs

Network operator	Indirect costs – including NI regional wage adjustment (£m)		
	2007/08	2008/09	2009/10
NIE	38.0	38.8	39.4

Source: CEPA, Ofgem, NIE Submission

3.4. Drivers

For DPCR5, unlike previous price controls, Ofgem took a more disaggregated approach to benchmarking and used a number of primary and secondary drivers for each of the cost areas. Table 3.4 below shows the different cost groups and drivers that were used in Ofgem's operating cost analysis.

Table 3.4: Ofgem's opex benchmarking driver split

Regression cost group		Primary driver	Secondary driver
LV & HV Underground Faults		LV & HV Underground faults	Length of cable replaced
LV and HV Overhead Faults		Lv & HV Overhead faults	
Inspection & maintenance		Asset Hours Work driver for Inspection & Maintenance	
Tree Cutting		Spans Cut	Spans affected
Group 1	Network Design, Project Management, System Mapping	Load & Non-Load costs	MEAV
Group 2	Engineering Management & Clerical Support, Control Centre, Customer Call centre, Stores, Health & safety	Total Direct Costs (less non-operational capex £m)	MEAV
Group 3	Network Policy, HR & Non-operational Training, Finance & Regulation, CEO, IT & property	MEAV	Total Direct Costs (less non-operational capex £m)
Single Group	As for Groups but amalgamating the three groups of costs into a single regression	Total Direct Costs (less non-operational capex £m)	MEAV
Top Down	Single regression of all the above costs.	MEAV	Load & Non-Load costs

Source: Ofgem[10]

As we have noted above, we are benchmarking the total opex costs (i.e. Ofgem's top down) and indirect costs (i.e. Ofgem's single group). Given the different reporting requirements between NI and GB, we do not have comparable data available for each of the drivers (or cost groups) listed in Table 3.4 above. However, we have been able to map NIE's assets volumes (reported as part of NIE's BPQ) to those asset classes captured by Ofgem. Using this information and unit costs provided by Ofgem we have been able to create a modern equivalent asset valuation (MEAV) total for NIE that is equivalent to those developed by Ofgem for use in is benchmarking analysis.[11] NIE's transmission assets at 275kV were excluded to maintain comparability with the GB DNOs. Further details of this asset mapping exercise are set out in Annex C. Given the relatively stable nature of asset volumes, Ofgem only requested asset volumes for the 2009/10 year, thus the same MEAV was used for each year in the panel regressions.

[10] (Ofgem, 2009, p. 73)

[11] The unit costs effectively act as weights allowing comparable volume indices to be created for each of the network operators.

We have replicated Ofgem's approach of weighting together each network's MEAVs with their load and non-load capex (LDNL) to create the cost driver. As with opex, we have separated out 275kV transmission capex through the 7.5% adjustment. We have verified this adjustment against NIE's reported capex for RP4.

We have used the same weights as Ofgem calculated, 63% for MEAV and 37% for LDNL. Equation 1 below shows the calculation for the DPCR5 composite scale variable (hereafter referred to as CSV(MEAV)).

Equation 1:

While we believe we undertaken the mapping process in a robust manner, we have some concerns around the mapping of NIE's assets to Ofgem's definitions given that this information was not collected by NIAUR with this intended purpose. We also have, albeit to a lesser degree, some concerns over the correct allocation of transmission load and non-load capex to 110kV and 275kV.

Given our concerns noted above, we also undertook benchmarking analysis using a CSV which is based on the CSV Ofgem used for its DPCR4 opex benchmarking (hereafter known as CSV(DPCR4)).[12] Ofgem's DPCR4 CSV was calculated using DNO's network length, number of customers, and GWh distributed. Ofgem's used weighting for the DPCR4 CSV of 50% for network length and 25% for customer numbers and GWh distributed. Equation 2 below shows the CSV(DPCR4) calculation.

Equation 2:

We do not consider that either CSV(MEAV) or CSV(DPCR4) are sufficiently robust drivers for R&M costs, given that R&M costs included event driven costs (e.g. faults), and as such we have not modelled these costs separately. We can see from Table 3.4 that Ofgem used a number of volume drivers for R&M related costs. Table 3.5 below shows the CSVs for the DNOs.

Table 3.5: CSV data

Network operator	CSV(MEAV)			CSV(DPCR4)		
	2007/08	2008/09	2009/10	2007/08	2008/09	2009/10
NIE	721	751	734	10.7	10.8	10.9

Source: CEPA, Ofgem, NIE Submission

3.5. Estimation technique

There are a number of different estimation techniques that can be used for efficiency analysis, including:

- Ordinary least squares (OLS);
- Stochastic frontier analysis (SFA);
- Data envelopment analysis (DEA); and

[12] This is the same CSV methodology in NIE submission.

- Total factor productivity analysis.

We have chosen to use a standard OLS model. OLS is a type of average response model. Such models estimate a line of 'best fit' to observed data points by minimising the sum of the squared deviations of the observations from the fitted line. An average response model therefore simply determines the expected or mean relationship between costs and a given level of outputs/ cost drivers. Therefore, using the model we can estimate NIE's performance against that of a theoretical average firm's performance (given it output/ cost driver). As we have multiple years of data available we have made use of panel data regression with fixed effects. Fixed effects allow for specific year-on-year differences that may shift costs up or down.

3.6. Summary of approach

A summary of the benchmarking approach we have taken is provided in Table 3.6 below.

Table 3.6: Summary of approach

Dimension	Decision
Sample	NIE and GB DNOs, years 2007/08 - 2008/09
Dependent variable(s)	Total opex, Indirect costs
Main driver	CSV(MEAV)
Alternative driver	CSV(DPCR4)
Technique	OLS

Source: CEPA

4. BENCHMARKING RESULTS

In this section we set out the results of our benchmarking models and the sensitivity analysis we have conducted around these. A key point to note is that while we have data available for the 2009/10 year, the data from Ofgem are not actual costs they are instead the allowance set by Ofgem for the first year of DPCR5. We consider that Ofgem's 2009/10 allowance contain adjustments to the DNOs' opex as a result of the price control review that the DNOs may not be able to implement in the first year of DPCR5. Therefore, after careful consideration we have decided to exclude 2009/10 data and present the results for NIE based on the 2008/09 year. NIE relatively unchanged performance over the 2007/08 – 2009/10, its ratio of total operating costs to CSV(MEAV) is 0.064, 0.066 and 0.067 (£m/CSV), supports the use of 2008/09 actuals. In other words, there is no indication that NIE would be adversely affected, in relation to its own measured performance, by the use of the 2008/09 actuals.

Annex A of this report provides the results of modelling with the 2009/10 data included for completeness.

4.1. Total opex

4.1.1. Base case

Table 4.1 below presents the results for the base case using regional wage adjusted opex. The efficiency score represents the distance NIE is away from the model's predict costs i.e. 100% would indicate that NIE's costs are in line with the models costs. We can see from the model using the CSV(MEAV) driver that NIE has a ranking of 6, however it is very close to the upper quartile (95%). When the CSV(DPCR4) driver is used in the model, NIE's ranks as 7th. NIE's efficiency scores are, respectively for CSV(MEAV) and CSV(DPCR4), approximately 0.2% and 4% away from the upper quartile. These estimates can be taken to reflect the required improvement in performance for NIE to reach the upper quartile.

Table 4.1: Top down opex benchmarking base case results for 2008/09 (with regional wage adjustments)

Network operator	CSV(MEAV)		CSV(DPCR4)	
	Efficiency score	Rank	Efficiency score	Rank
NIE	95%	6	95%	7
Upper Quartile	95%	4.5	92%	4.5

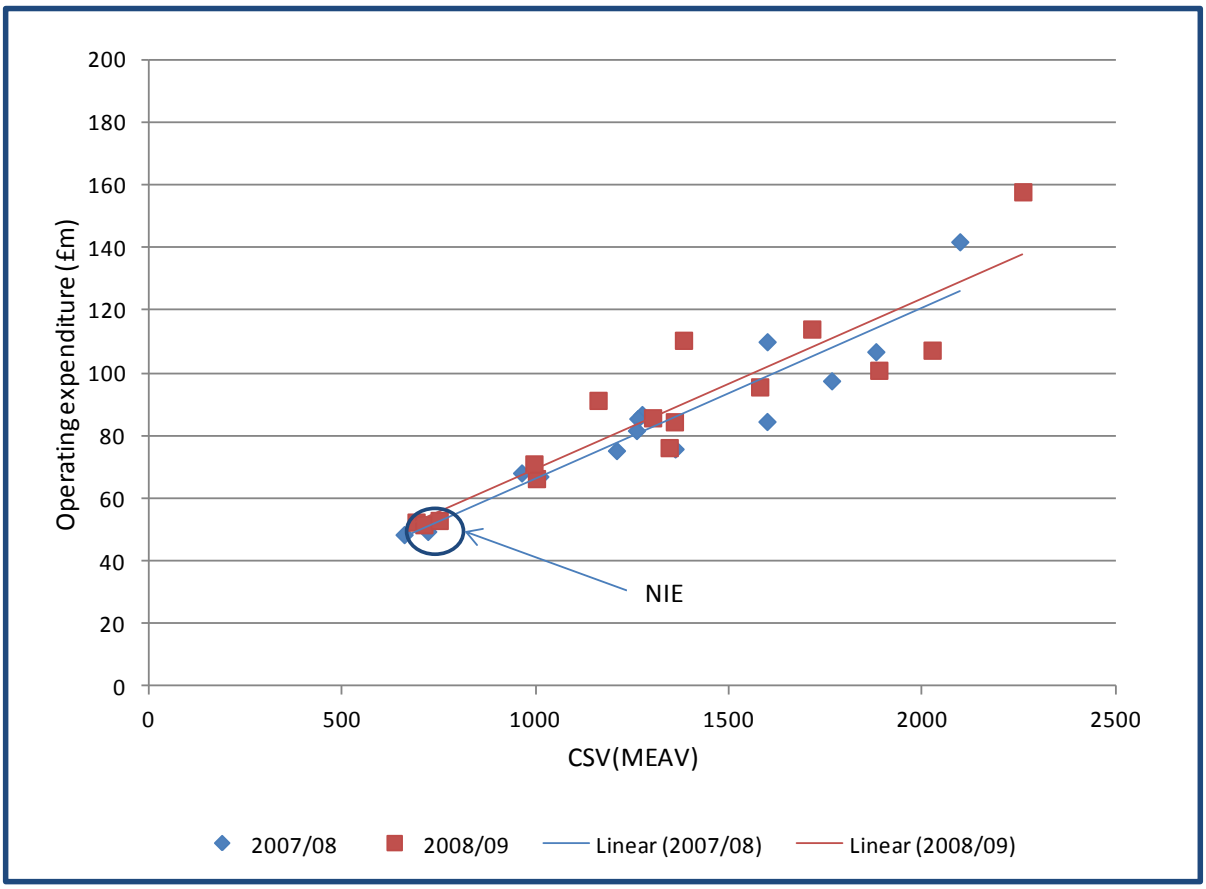
Source: CEPA

Figure 4.1 below plots each DNO's operating expenditure for 2007/08 and 2008/09 against its CSV(MEAV) for those years. The two lines represent simple lines of best fit for the two years. The similarity between the slopes of the lines indicates that the model is relatively stable and coefficient estimate should be robust. Please note that the model's coefficient is based on the panel data set and as such reflects all the data points for 2007/08 and 2008/09.

We have carried out a standardised residual test to determine whether there are outliers within the data set, and one DNO was highlighted as a possible outlier. We have decided to retain the DNO within the model as we consider that it adds valuable information to the model and its

data is not inconsistent with the opex and CSV's reported for the other related networks, this means that the possibility of measurement error is reduced.[13]

Figure 4.1: Top down opex against CSV(MEAV)



Source: CEPA

4.1.2. Sensitivities

In addition to our base case, we have undertaken sensitivity analysis on a number of the adjustments included. These sensitivities include:

- **Connections.** Increasing and decreasing the share of indirect costs allocated to connections.
- **Transmission 275kV.** Increasing and decreasing the share of opex allocated to 275kV transmission work.
- **Log base case.** Converting the costs and drivers to (natural) logs. This would be done if it was considered that there was a non-linear relationship between the costs and the drivers, i.e. the model's functional form was considered to be incorrect.
- **Regional wage adjustment.** Removing the regional wage adjustment from the modelled opex.

[13] Outliers should only be removed if it is considered that the 'outlier' has resulted from measurement error.

Table 4.2 below shows the results of running these sensitivities. We can see that varying the share of opex allocated to connections or 275kV has significant impact on NIE's rankings with its ranking changing by as much as four. As expected, given the size of the adjustment, removing the regional wage adjustment improves NIE's relative performance.

Table 4.2: Sensitivity analysis – top down opex 2008/09

Sensitivity	CSV(MEAV)			CSV(DPCR4)		
	NIE efficiency score	NIE ranking	Upper quartile	NIE efficiency score	NIE ranking	Upper quartile
Base case	**95%**	**6**	**95%**	**95%**	**8**	**92%**
Connections – 15% allocation	99%	9	95%	99%	9	91%
Connections – 25% allocation	92%	4	93%	92%	5	91%
275 kV – 5% allocation	97%	8	95%	97%	9	91%
275 kV – 10% allocation	93%	4	94%	93%	6	92%
Log base	88%	4	91%	98%	9	92%
Without regional wage adjustment	92%	4	93%	92%	7	90%

Source: CEPA

4.2. Indirect costs

4.2.1. Base case

In addition to our total opex benchmarking we benchmarked NIE's indirect costs. Table 4.3 below presents the results of this benchmarking. In terms of its indirect cost efficiency, NIE performed much worse than in the total opex benchmarking, ranked 9th with the CSV(MEAV) and 8th with the CSV(DPCR4). NIE's efficiency scores are, respectively for CSV(MEAV) and CSV(DPCR4), approximately 13% and 16% away from the upper quartile.[14]

We observe that the results across the two drivers are much closer than when using total opex. This could be taken as further support that the CSV as less appropriate as drivers for the R&M, as we previously indicated, i.e. given that both CSVs are a proxy for the network size we would expect very similar results from the two model. As the results diverge for the total opex model it indicates that for R&M costs the drivers are not as consistent and therefore may not be appropriate explanatory variables for R&M costs.

Table 4.3: Indirect cost benchmarking results for 2008/09 (with regional wage adjustment)

Network operator	CSV(MEAV)		CSV(DPCR4)	
	Efficiency score	Rank	Efficiency score	Rank

[14] The percentage is estimated as the percentage reduction in opex required to reach the upper quartile.

Network operator	CSV(MEAV)		CSV(DPCR4)	
	Efficiency score	Rank	Efficiency score	Rank
NIE	**104%**	**9**	**103%**	**8**
Upper Quartile	**90%**	**4.5**	**87%**	**4.5**

Source: CEPA

4.2.2. Sensitivities

Table 4.4 below shows the results of running the sensitivities detailed in Section 4.1. The results indicative that NIE's rankings are relatively stable across the sensitivities. As with total opex, removing the regional wage adjustment has an impact on NIE's distance to the upper quartile.

Table 4.4: Sensitivity analysis – indirect costs

Sensitivity	CSV(MEAV)			CSV(DPCR4)		
	NIE efficiency score	NIE ranking	Upper quartile	NIE efficiency score	NIE ranking	Upper quartile
Base case	**104%**	**9**	**90%**	**103%**	**8**	**87%**
Connections – 15% allocation	109%	11	90%	108%	10	86%
Connections – 25% allocation	99%	8	91%	98%	8	87%
275 kV – 5% allocation	106%	10	90%	105%	9	86%
275 kV – 10% allocation	102%	8	91%	101%	8	87%
Log base	97%	8	91%	104%	8	86%
Without regional wage adjustment	97%%	8	93%	97%	9	90%

Source: CEPA

5. CONCLUSIONS

While NIE's ranking appear relatively high in terms of total opex efficiency benchmarking (6th or 8th out of 15), when compared with the GB DNOs, when we only model indirect costs NIE ranks 8th or 9th (out of 15).

Based on the results of the total opex and indirect benchmarking, we consider that NIE's total opex performance appears to be enhanced by its relatively low spend on R&M. In other words, as NIE's relative performance increases as we are using the same cost drivers for both indirect costs and total opex we can assume that NIE is spending relatively less on R&M. However, we do not consider that the drivers we have available are suitable for benchmarking R&M costs alone. Without appropriate cost drivers for R&M costs (e.g. spans of trees cut) the total opex benchmarking analysis provides more insight into NIE relative expenditure levels rather than efficiency. We are therefore more confident in the efficiency results produced by the indirect costs' models.

We estimate efficiency scores of 104% and 103%, for CSV(MEAV and CSV(DPCR4) respectively, in relation to indirect costs. Comparing these scores to upper quartiles of 90% and 87% indicates that NIE would need to improve its indirect cost efficiency performance by 13% to 16% to become an upper quartile performer. [15]

[15] The percentage is estimated as the percentage reduction in opex required to reach the upper quartile.

ANNEX A: CALCULATION OF NIE'S OPERATING COSTS

As discussed in Section 3.2 we have had to estimate operating costs for NIE that are consistent with Ofgem's reporting requirements. Table B.1 provides our calculation for estimating the modelled opex.

Table B.1: Calculation of NIE's modelled opex

Cost	Actuals (£m, 2009/10 prices)			Comment
	2007/08	2008/09	2009/10	
T&D controllable opex	£30.9	£31.1	£31.4	From NIE's BPQ (REQ54).
Less Powerteam	-£6.0	-£5.7	-£5.6	Removed to avoid double counting (REQ54).
Less R&M	-£10.3	-£10.5	-£10.0	These are added back in based on NIE's Submission's R&M estimates (REQ54).
Less Innovation schemes	-£0.4	-£0.4	-£0.6	Schemes (Vulnerable customer fund and Sustainable network programme) funded by NIE during RP4.
Plus Capitalisation	£9.3	£9.1	£8.7	Ofgem's reporting requirements are pre-capitalisation.
Plus Wayleaves (less Powerteam Admin)	£3.4	£3.4	£3.5	Included as we do not have information for the GB DNOs that separates this cost out. Unclear the extent of PT admin costs (approx £0.1m for 2009/10 NIE Reconciliation s/s). Based on NIE Submission we have assumed £0.1m for each year.
Less P&L Pensions charge	-£1.6	-£1.3	-£1.1	Ofgem's reporting requirements separate out pensions.
Dt costs				Included to ensure comparability with Ofgem's reporting.
Market opening costs	£1.1	£2.5	£2.5	
Credit Rating Costs	£0.0	£0.1	£0.0	
Powerteam costs				
Plus R&M (including MBIS)	£11.2	£14.4	£13.2	NIE Submission estimates based on Powerteam's recorded activities.
Plus Indirect costs	£21.2	£21.1	£20.5	NIE Submission estimate for 2009/10. 2007/08 and 2008/09 prorated based in 2009/10 ratio (43%).
Plus Profit margin	£1.0	£1.0	£1.0	Cost of providing the service to users.

Cost	Actuals (£m, 2009/10 prices)			Comment
	2007/08	2008/09	2009/10	
Total T&D opex (unadjusted)	£59.9	£63.7	£63.6	Total before connections and 275kV adjustments.
Connection Adjustment				
Connection adjustment	20%			NIE Submission 2009/10 estimate. Estimate used for 2007/08 and 2008/09.
Indirect costs estimate	£48.3	£49.3	£50.0	Total (unadjusted) less R&M.
Adjusted indirect costs	£38.5	£39.3	£39.9	Indirect costs less connection indirect costs.
Total T&D opex less connections	£50.1	£53.7	£53.5	Adjusted indirect costs plus R&M.
Transmission adjustment				
Transmission (275kV) adjustment	7.5%			NIE Submission estimate.
Total distribution opex	£46.3	£49.7	£49.5	T&D opex less connections less transmission adjustment.
Regional adjustment				
NI regional wage adjustment factor	0.91			Based on official Annual Survey of Household Expenditure data for GB and NI.
Regional wage adjustment	£3.2	£3.3	£3.2	Payroll multiplied by adjustment factor. Payroll calculated based on NIE T&D's reported payroll and Powerteam's payroll. Pensions, connection and transmission costs removed from the payroll data. Payroll is approximately two-thirds of total distribution opex.
Total modelled distribution opex	**£49.5**	**£53.0**	**£52.7**	Total distribution opex plus regional wage adjustment.

ANNEX B: MODERN EQUIVALENT ASSET VALUE MAPPING

Unlike DPCR4, Ofgem used MEAV, and load and non-load capex as the drivers for its top-down assessment of operating costs for DPCR5. In order to create a consistent MEAV Ofgem weighted together each DNO's volume of assets using a common unit price. Thereby, in effect creating a comparable volume index across the DNOs. We have mapped NIE's reported asset volumes (BPQ responses DREQ_146 and TREQ_146) to the asset classes that were used by Ofgem. In some cases there were no direct matches between the asset categories, for each of these cases we have allocated the assets to the most applicable category. There were also a number of assets for which a more detailed breakdown was not available, e.g. NIE did not report whether a transformer was pole or ground mounted. Where this occurred we allocated NIE's assets based on the average ratio for the GB DNOs. Table C.1 below provides an illustration of the mapping exercise.

Table C.1: Example of NIE's distribution network assets mapped to Ofgem's categories

NIAUR asset categories	**Mapped to Ofgem's categories**	**RP4**
Linear Assets		**2009/10**
Length in Service (km)		**Actual**
33 kV cable	33kV UG Cable (Non Pressurised)	637.0
33 kV line - wood pole	33kV OHL (Pole Line)	3,110.0
33 kV line - tower line (route length)	33kV OHL (Tower Line)	100.1
33 kV line - tower line		
33 kV comms (integral to circuit)		
33 kV comms (other)		
11 kV & 6.6kV cable	6.6/11kV UG Cable	3,510.0
11 kV & 6.6kV line - wood pole	6.6/11 kV OHL (Open)	20,791.0
11 kV comms (integral to circuit)		
11 kV comms (other)		
6.6 kV cable		
6.6 kV line - wood pole		
6.6 kV comms (integral to circuit)		
6.6 kV comms (other)		
400 V cable	LV Final (UG Consac)	9,332.0
400 V line - wood pole	LV Final (OHL)	5,389.0
400 V comms (integral to circuit)		
400 V comms (other)		
Other (please specify)		
Other (please specify)		

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