REGIONAL WAGE ADJUSTMENT
THE NORTHERN IRELAND UTILITY REGULATOR (UR)

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FINAL REPORT

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CONTENTS

1. INTRODUCTION

Cambridge Economic Policy Associates (CEPA) has been engaged by the Utility Regulator (UR) to develop a regional wage adjustment (RWA) to apply to GB and Northern Ireland electricity distribution networks operators (DNOs).

As part of its next price control (RP6), the UR would like to introduce a RWA to estimated costs for the Northern Ireland Electricity Networks (NIE Networks). Applying a RWA helps ensure the comparability of the data used in benchmarking analysis. In line with other UK regulators we use the Office of National Statistics (ONS) Annual Survey of Hours and Earnings (ASHE) dataset and the equivalent ASHE dataset from the Department for the Economy in Northern Ireland to derive the RWA.

This approach is in line with the UR's previous decisions and with the Competition Commission's (CC) determination in relation to NIE Networks for RP5. Further, it is also in line with good regulatory practices in other jurisdictions.

The report sets out our approach and recommendations and is structured as follows:

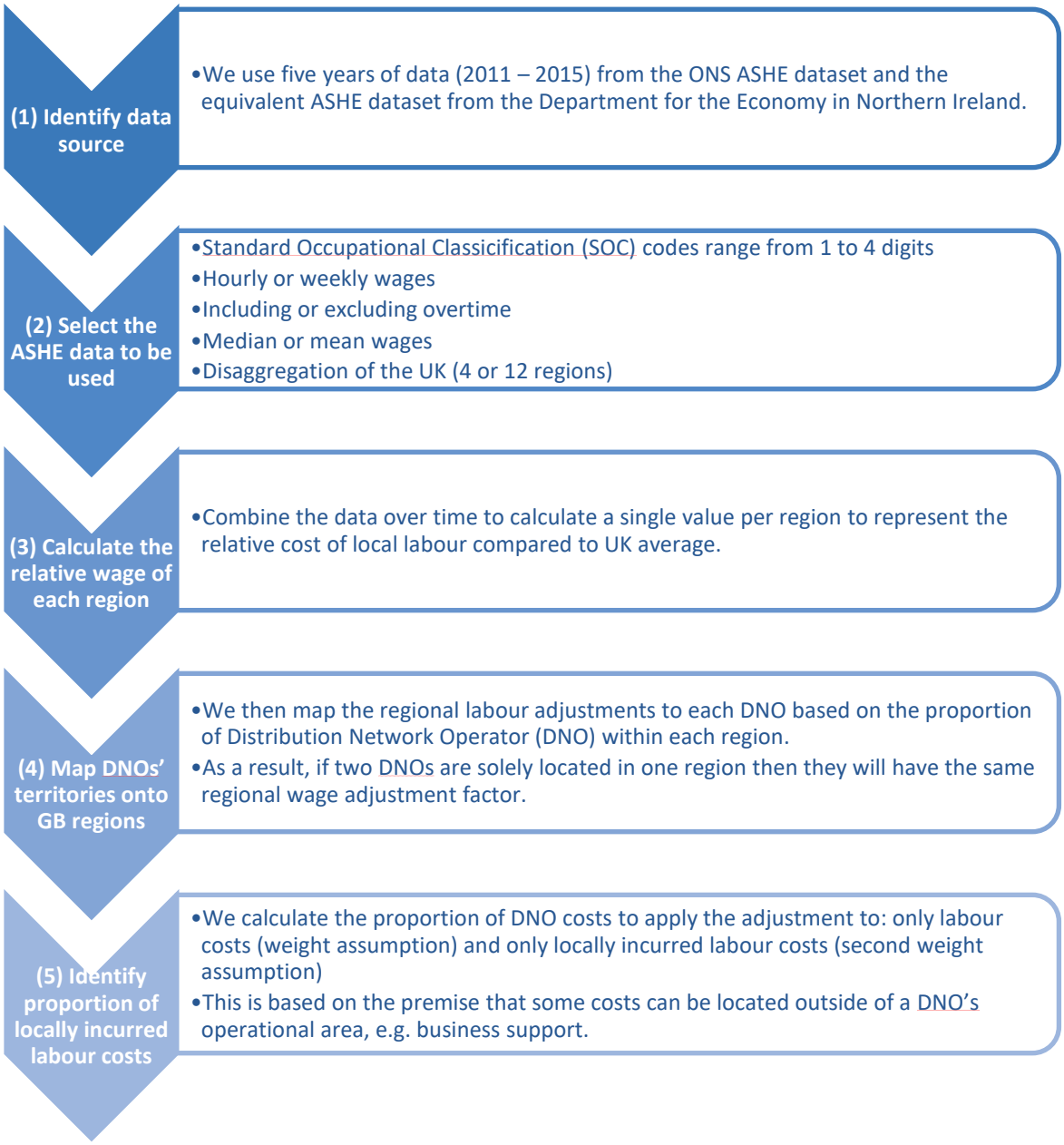
- Section 2 sets out our methodology and key parameters considered in the analysis.
- Section 3 sets out the sensitivity testing undertaken with regards to the key parameters identified in Section 2.
- Section 4 summarises our results and proposed adjustments.
- Section 5 compares our approach to previous regulatory determinations.

2. REGIONAL WAGE ADJUSTMENT - METHODOLOGY

2.1. Relative differences

The RWA is made to account for relative differences in labour costs across DNOs that are driven by regional factors, outside of DNO control. In this sense, the RWA should not just be viewed as how NIE Networks wages compare to the UK average but how all the DNOs (the 14 GB DNOs and NIE Networks) compare to each other, which is an important concept when conducting comparative benchmarking. We propose that adjustments should be applied prior to benchmarking modelling to account for those differences and to increase the comparability of the data. Our approach to calculating the regional differences and applying the adjustment is summarised in the flow charts below.

Figure 2.1: Calculating and applying the adjustment



2.2. Point estimate

There are a few options for coming to a point estimate (Steps 2 and 3). For example, we could:

- Choose a set of assumptions as a central case.
- Run various combinations of assumptions (based on the choices in Step 2) and use a point within the range or a subset of the range. The merit of this approach is that it avoids having to take a strong stance on individual assumptions and allows the UR to argue that it has considered a number of angles. There are, however, potential issues if the distribution is skewed by a few outlier observations. There are different ways to arrive at a point in the range:
    - Average of the sensitivities or an average of a subset of sensitivities.
    - Take the median of the range of different combinations.
    - Take the mid-point of the minimum and maximum of the range.

We have opted for the former approach (choose a set of assumptions). We consider that making specific assumptions that are based on a clear rationale is transparent and logical when it comes to relative regional wages. Averaging or choosing any other arbitrary position within a range risks internal inconsistencies. Regulatory precedent has also shown that such an approach as choosing a set of assumptions is preferred by regulators. As the Northern Powergid (NPg) appeal of RIIO-ED1 showed, the Competition and Markets Authority (CMA) places the onus on companies to prove that the regulator's set of assumptions are wrong (that is, based on an error of fact, wrong in law, or error in the use of discretion). Therefore it is likely to be difficult to oppose where robust arguments can be put forward to support the assumptions.[1] However, we still consider that testing sensitivities is useful to inform decisions.

2.3. Characteristics to be taken into account

We built a flexible model that has allowed us to calculate the RWA factor. We have also incorporated CC precedent (from RP5) and Ofgem precedent (from RIIO-ED1). The model is flexible across a number of parameters:

- mean or median wage rates;
- Standard Occupational Classification (SOC) code weightings;
- all employees or full-time employees;
- with or without overtime;
- hourly or weekly wage rates;

[1] CMA (2015), Northern Powergrid (Northeast) Limited and Northern Powergrid (Yorkshire) plc v the Gas and Electricity Markets Authority Final determination

- number of regions; and
- method of averaging.

Mean vs. median

We have the option to use either the mean or the median wage from the ASHE statistics. Companies are likely to buy labour from a range of job types within a given SOC code, so we consider that, unless there is evidence that wage estimates are being skewed by a particular job type that is not relevant to the company, that the mean will be more representative of labour costs that the median. In this sense, average wages are more relevant when estimating the total costs across a group of staff within the occupational categories used, whereas, median wages are more relevant to an estimate of the wages of a particular employee picked at random from those categories. Therefore, we recommend using mean wages instead of median wages.

In terms of precedent, both Ofgem and the CC have used mean wages in electricity distribution, rather than median. Ofwat also used mean wages at PR14. The only recent precedent using the median is the UR in GD17. While we agree with the UR's statement as part of GD17 that the median can be less influenced (than the mean) by skewness in the distribution in wages, we consider that, except in the presence of outliers, using the mean will better reflect average wages of companies that employ workers from across the whole distribution of wages.

We have tested the impact of both approaches and found the resulting RWA factors using mean and median wages are similar on a relative level between DNOs when using two-digit SOC codes (as will be shown presently in Table 3.2). This suggests that the distribution of wages is not likely being skewed by outliers.

As a result, for RP6, we consider that using the mean is most appropriate given the recent precedent and mixture of labour that DNOs are likely to employ under any given SOC category.

SOC-code level

ASHE is based on a 1% sample of employee jobs taken from HMRC Pay-As-You-Earn (PAYE) records. The ASHE data is broken down into several SOC-code levels with 2-digit codes being broader categories and 4-digit codes being narrow categories. When choosing the SOC codes to be used the UR needs to balance between the capacity to tailor the analysis by choosing those jobs descriptions that are closer to the actual staff in the DNOs (that is, higher-digit codes) and using more robust data by choosing SOC categories where ASHE collects a larger sample of data (that is, lower-digit codes).

This balancing was reflected in the recent CMA determination as part of the referral of the RIIO-ED1 decision. In that decision, the CMA said:

> *"As part of the overall assessment, although we recognise that NPg identified benefits from using three-digit and/or four-digit codes, we also consider that GEMA was reasonable to take account of the risks arising from lower data accuracy and increased data volatility over time that is associated with more granular data from the ASHE data set.[2]"*

The CMA considered the appropriate SOC code level during the NPg referral of RIIO-ED1 and concluded that none of the alternative options proposed by NPg, that involved the use of 4-digit SOC codes, were better than the 2-digit approach put forward by the Gas and Electricity Markets Authority (GEMA).[3] As a result, the CMA determined that NPg had not demonstrated that GEMA's approach was wrong and dismissed NPg's appeal.

Following the CMA, when identifying the appropriate SOC level, this paper considers the effect of moving to a granular SOC code in terms of data accuracy and data volatility, in the context of Northern Ireland.

To evaluate the changes in the robustness of the data when granularity increases, we looked at how the Department for the Economy for Northern Ireland classifies the different mean wage estimates for Northern Ireland over the sample period. Generally speaking, the precision of estimates is measured by the coefficient of variation (CV) of point estimates[4] and classified into one of four categories:

- **Precise**. CV of less than 5%.
- **Reasonably precise**. CV greater than 5%, but less than 10%.
- **Acceptable**. CV greater than 10%, but less than 20%.
- **Unreliable**. CV greater than 20%. Unreliable estimates are not reported.

In addition to these categories, there is a confidentiality criterion in which estimates are classified as 'disclosive'. If the sample size is smaller than three, or one employer is dominant in its contribution to the estimate, then no average wage is published to avoid revealing the source of the data.

Below we show the relative weight put on SOCs falling under each one of the five categories described above under the different labour adjustments that have been considered.

Figure 2.2 shows 2-digit SOC code weightings used by Ofgem.

[2] CMA (2015) NPg vs GEMA Final Determination, p.103

[3] CMA (2015) NPg vs GEMA Final Determination, p.91 – p.110

[4] The Office of National Statistics defines the coefficient of variation as the ratio of the standard error of an estimate to the estimate, expressed as a percentage. Generally, if all other factors are constant, the smaller the CV the higher the quality of the estimate.

Figure 2.2: Share of 2-digit RWA by category of precision

Source: CEPA analysis using Northern Ireland ASHE data

Figure 2.3 shows 3-digit SOC code weightings used by CC at RP5 (WA2 in the CC final determination).

Figure 2.3: Share of 3-digit RWA by category of precision

Source: CEPA analysis using Northern Ireland ASHE data

Figure 2.4 shows 4-digit SOC code weightings used by CC at RP5 (WA1 in the CC final determination). Some categories are no longer reported, in which case we substitute the relevant 3-digit code for which the 4-digit code falls under.

Figure 2.4: Share of 4-digit RWA by category of precision

Source: CEPA analysis using Northern Ireland ASHE data

The above figures show that statistical precision decreases as the granularity of the SOC code increases. At the 2-digit SOC level, all of the SOC codes relevant for our analysis are classified as precise. In contrast, at the 4-digit level, there is a large share of the adjustment that is categorised as disclosive in 2012 and 2013, as well as circa 20% classified as unreliable in 2014. Based on this, it appears that the use of 4-digit SOC would require the use of unreliable data. Further, in some cases, the data have been identified as disclosive which seems to indicate that for some of the categories the data sample is either small or heavily influenced by one single company which, as indicated by the CC in its RP5 final determination, is likely to be NIE Networks.[5] As a result, it appears that the use of 4-digit SOC weightings would not provide robust findings.

At the 3-digit SOC level, none of the codes are classified as unreliable or disclosive and are at least 'reasonably precise' (except for one code in one year). However, they are less precise than the 2-digit weightings in which all codes are classified as 'precise'. Therefore, both the 2 and 3-digit weightings could be used depending on the tolerance for the additional imprecision in the 3-digit codes. In practice the RWAs calculated using the 2 and 3-digit weightings are very similar.

In terms of choosing between the 2-digit or 3-digit level of granularity, we consider that Ofgem's use of 2-digit code level during RIIO-ED1 constitutes a precedent to support the choice of this approach. However, it is important to note that the CMA also clearly states that its decision on the NPg appeal does not imply an endorsement of the 2-digit level for future regulatory decisions,[6] but that the decision ultimately depends on the tolerance for the

[5] CMA (2014) Northern Ireland Electricity Limited price determination: Final determination. Paragraph 8.216
[6] However, the CMA also clearly state that their decision on the NPg appeal does not imply an endorsement of the 2-digit level for future regulatory decisions.

additional imprecision. In the context of Northern Ireland, where sample sizes (which are not directly reported) will be relatively smaller than in GB ASHE data, it may be pragmatic to use the more aggregate 2-digit weightings.

Therefore, we recommend that the 2-digit SOC codes be used to make a RWA, making use of the most robust ASHE data, but also run a sensitivity within our benchmarking analysis using 3-digit SOC codes.

All employees versus full-time employees only

ASHE wage data are available for all employees or for full-time employees only. Our analysis thus far has used all employee data, which capture part-time workers as well as full-time workers.

At GD17, the UR chose to use full-time employee data, which is arguably more appropriate given they used weekly wages rather than hourly wages. Since part-time workers are likely to work fewer hours per week, their weekly wage is also likely to be lower, which could skew results.

However, as it will be discussed below, we are recommending using hourly wages. This allows us to control for the effect above as the wage will be independent of the number of hours worked per week. Further, since we would expect that DNOs employ part-time employees to some extent, it appears more appropriate to include this data in the analysis. In addition, excluding it could fail to consider potential difference in wages between full time and part time workers, which could influence our estimates and reduce the sample size.

As a result, we propose to use all employee data. For completeness, we have also shown a sensitivity limited to full-time employees which shows that there is no significant difference in results.

Overtime

The ONS reports wages including or excluding overtime. We consider which of the two is more appropriate to measure the regional price differences across DNOs. It can be argued that overtime is an important part of the market price for labour. For certain job categories this may be true, for example, if a particular job type is typically prone to overtime hours (for example, if critical fault repairs require several hours, overtime may be inevitable). However, workers who are on salaries, rather than paid hourly, may not receive any compensation for overtime work. For an electricity distribution company, there will be a mix of salaried (such as the CEO) and hourly contracts (such as external contractors), so it is difficult to know exactly how important overtime is for a typical company. But the question is not how much overtime DNOs rely on, but why the mix of overtime would differ across DNOs. We consider that the reasons for why the mix of overtime could differ across DNOs are most likely to be within company control – for instance, company policies on overtime pay.

Furthermore, overtime pay may also pick up company inefficiencies in areas such as work planning. For example, companies that do not efficiently scope work in advance could end up paying more overtime. Ideally we would not want to pick up these inefficiencies in the regional adjustment, and so excluding overtime is perhaps more appropriate. In any case, overtime work is work carried out in addition to standard working hours, and in that sense can be seen as not being 'business as usual'.

We therefore recommend using wages that exclude overtime pay. However, we still test the impact of overtime on the results.

Hourly vs. weekly

An issue with the weekly wage measure is that it potentially captures differences in company policies and inefficiency, similar to the overtime issue. This would be the case, for example, if employees in one company worked 35 hours per week and worked 40 hours per week in another company, but were paid equal weekly salaries. The wages being equal would not reflect the regional differences in getting the same amount of work done.

In terms of choosing weekly or hourly wages, regulatory precedent differs. The CC chose weekly wages at the RP5 referral because it felt that it was more representative of the types of salaried occupations that are relevant to the workforce of NIE Networks and NIE Powerteam (NIE Networks argued for hourly). Since RP5 however, Powerteam (now rebranded as Omexom) has been sold to Vinci Energies and is no longer part of the NIE Networks business. In any case, at RP5 the CC found there to be little difference between weekly and hourly RWAs, something which we have also found in our calculations (as will be shown in Table 3.3). Ofgem did not explain its selection of hourly wages. Ofwat also used hourly wages at PR14.

We recommend consistency with Ofgem's latest approach using hourly wages, since weekly wages may capture other elements of company policies, such as differences in working hours both within and between different regions. We note that in practice the difference in the RWA when using weekly wages is quite small, however, we still test weekly as a sensitivity.

Number of regions

The ONS ASHE data is split into regions – 10 regions that encompass England & Wales, one region for Scotland and one for NI. The ASHE data consider Scotland, Wales and Northern Ireland wages on a country basis; that is, provide wage data for Scotland, Wales and Northern Ireland individually, but do not look at regional differences within Scotland, Wales and Northern Ireland as the dataset does for England. However, all three countries have the same level of SOC-code disaggregation as England, which is more important for this analysis. As mentioned above, some 4- and 3-digit SOC codes are not reported at a regional level.

The choice regarding the number of regions in GB for the regional labour adjustment does not impact the adjustment factor for NIE Networks alone, since we propose to split Northern

Ireland out as a separate region. It will only impact the adjustment factors for GB DNOs. As such, even if the NIE Networks adjustment does not change, the cost inputs into the benchmarking models do change and the choice of regions can have an impact on the efficiency results, and in particular on the overall DNO efficiency scores. As a result, the order of DNOs from least efficient to most efficient may change according to the number of regions chosen within the RWA analysis.

We have considered two alternatives:

- twelve separate regions: eleven in GB, consistent with CC at RP5, and Northern Ireland; and
- four regions: three in GB (London, South East and Other), consistent with Ofgem at RIIO- ED1, and Northern Ireland.

The impact of the two choices is shown in Table 2.1 below, which presents GB regional price adjustments under our baseline case.[7]

Table 2.1: GB regional price adjustment scenarios (by region)

Region	4 regions	12 regions	Difference
North East	0.96	0.95	-0.01
North West	0.96	0.95	-0.01
Yorkshire & the Humber	0.96	0.94	-0.02
East Midlands	0.96	0.95	-0.01
West Midlands	0.96	0.94	-0.02
East	0.96	0.99	0.03
London	1.18	1.18	0.00
South East	1.04	1.04	0.00
South West	0.96	0.96	0.00
Wales	0.96	0.95	-0.01
Scotland	0.96	1.03	0.07
NIE Networks	0.88	0.88	0

Source: CEPA analysis using ONS ASHE data

The largest difference is seen for Scotland, which would receive a higher adjustment factor under the eleven region approach than the one made by Ofgem in the RIIO-ED1 modelling. As the DNO territories are allocated across these regions, this then translates into relatively large changes in the regional adjustment factors for Scottish DNOs (SSEH and SPD). Other DNOs are less affected and their differences are less than 0.03 (see Table 2.2 below).

[7] Central case is defined as 2-digit SOC codes; mean hourly wages excluding overtime; and applies the SOC code occupation weights to the ASHE data prior to taking the ratio between the region in question and the UK (see section below for details on the latter).

However, as mentioned previously, the relative differences in RWAs between DNOs have the potential to significantly impact on the ordering of DNOs in terms of estimated efficiency in the benchmarking.

Table 2.2: GB DNO regional price adjustment scenarios

DNO	4 regions	12 regions	Difference
ENWL	0.96	0.95	-0.01
NPGN	0.96	0.95	-0.01
NPGY	0.96	0.94	-0.02
WMID	0.97	0.94	-0.03
EMID	0.97	0.95	-0.02
Swales	0.96	0.95	-0.01
SWest	0.96	0.96	0.00
LPN	1.18	1.18	0.00
SPN	1.07	1.07	0.00
EPN	1.01	1.04	0.03
SPD	0.96	1.03	0.07
SPMW	0.96	0.95	-0.01
SSEH	0.96	1.03	0.07
SSES	1.04	1.04	0.00
NIE Networks	0.88	0.88	0.00

Source: CEPA analysis using ONS ASHE data

The ONS does break down the ASHE data further into territories within Scotland, but other sources suggest that the higher wages in Scotland on average are largely driven by significantly higher ones in Aberdeen, Edinburgh and Glasgow, when compared to the rest of Scotland.[8] The Aberdeen premium could capture the high paying jobs of offshore oil, which while applicable to that job category, are not representative of DNO worker wages in Scotland.[9] While insufficient information exists to pin down the drivers of the extremely high Scottish wages, it is clear that Scotland is an outlier and it is worth testing the sensitivity of results to the adjustment applied to Scottish DNOs. We therefore test two versions of the central case – one fully relying on the reported ASHE data for Scotland - and another using the GB average instead of the high wages for Scotland.

[8] Andrew Aiton (2015). Financial Scrutiny Unit Briefing: Earnings in Scotland 2015. http://www.parliament.scot/ResearchBriefingsAndFactsheets/S4/SB_15-82_Earnings_in_Scotland_2015.pdf. There are 31 local authorities in Scotland, and the overall Scotland median wage lies in 7th place. This implies that the average Scotland wage is being driven upwards by a small number of local authorities within Scotland.

[9] It is unclear which SOC code these workers fall but it is possible that they are part of skilled metal, electrical and electric trades SOC code, which gets a 48% weighting and is above the UK average at 1.045.

Under the original twelve region approach, Scotland's RWA factor is 1.03, while under the four region approach (GB average for Scotland), its RWA factor is 0.96. We consider the difference between these two RWA factors; 1.03 (twelve region approach) versus 0.96 (four region approach); is sufficient enough to warrant the use of an individual RWA for Scotland where we fully rely on the reported ASHE data for Scotland. On this basis, our preferred approach uses twelve regions.

Averaging

Once we have selected the relevant wage characteristics, we have to build up the index that represents relative differences between DNOs. To do this we have aggregated the data over time (three or five years), combined the relevant wage estimates from different occupations using appropriate weights and derived a single value of the index for each region.

Within our model we have tested the use of three different methods for calculating RWAs:

1. **Approach 1** takes the ratio of wage estimates between the region in question and the UK, applies the SOC code weights (as per Ofgem's assumptions at RIIO-ED1); and then averages across time. (x/UK; SOC; years).
2. **Approach 2** initially applies the SOC code weights, then takes the ratio of the combined wage estimate between the region in question and the UK, and then averages across time. (SOC; x/UK; years).
3. **Approach 3** (termed 'Method B' by the CC at RP5) averages wages across years first (2011, 2012, 2013, 2014 and 2015), then takes the ratio of the average wage estimates for a particular region to the UK, and finally applies the SOC code weights. (years; x/UK; SOC).

We have considered the rationale behind each of those approaches. Weighting the SOC codes together before taking the ratio between the region and the UK (that is, Approach 2) essentially calculates the average hourly wage for a DNO-type company in each region (in each year) and then compares it to the rest of the UK. This seems logical. The alternative of calculating the ratio for each SOC code before weighting up those ratios (that is Approach 1 and Approach 3) is less intuitive.

Take a simple example in which a company in Region 1 has two workers with the following characteristics:

	Hourly wage		Weight in company labour
	Region 1	UK	
Worker 1	£80	£50	60%
Worker 2	£20	£10	40%

Source: CEPA analysis

Approach 1 would assign Region 1 a relative value of 1.76.[10] Whereas Approach 2 estimates it to be 1.65.[11] In fact, assuming all employees work the same number of hours, the company in Region 1 would pay its workers £56 and whereas the average UK company pays £34. The ratio of these two numbers is 1.65. We therefore consider that the appropriate approach for such analysis is to apply the SOC weightings before taking the ratio (and thus eliminating Approaches 1 and 3). This calculation is carried out for each year, then averaged across years. As we are making a pre-modelling adjustment, we take the average over the relevant historical years to arrive at a single number for each company.

2.4. Applying the RWA

Based on our discussion above, our recommended approach is summarised in Table 2.3 below.

Table 2.3: Recommended approach to RWAs

Characteristic	Recommended approach
Mean vs median	Mean
SOC-code level	2-digit
Overtime	Excluding
All/ full-time employees	All employees
Hourly/ weekly	Hourly
Number of regions	12
Averaging	Approach 2
Notional vs actual weights	Notional

The RWA is applied pre-modelling. Where econometric models are used, it could also be included as a driver in the equation to derive the elasticity of costs with regard to wages in the model. However, some models are likely to be unit cost models and an in-model adjustment cannot be undertaken there. In terms of precedent, Ofgem has used a pre-modelling adjustment, while Ofwat has used an in-model adjustment. Based on the circumstances for RP6, we recommend implementing a *pre-modelling* adjustment.

The next step of the process is to decide how the RWA factor should be applied to the DNO's cost data. Consideration needs to be given to:

- **Calculating the total quantum of labour costs to be adjusted.** There are two options:
    - using actual company labour costs; or
    - using notional weightings applied to cost categories to determine labour costs.

  The notional approach applies constant assumptions across DNOs but these assumptions can, for example, be an average of actuals reported by DNOs. The

[10] (80 / 50) * 60% + (20 / 10) * 40% = 1.76
[11] (80 * 60% + 20 * 40%) / (50 * 60% + 10 * 40%) = 1.65

notional approach abstracts from potential errors or bias in the information submitted by each individual company. Using a notional proportion of labour costs is also consistent with applying the same SOC code weights across regions.

At RIIO-ED1, Ofgem used the latter across all cost categories. For indirect labour costs, the CC also used a constant weighting across companies, which was an average across all DNOs and all years. We recommend using a notional proportion of costs related to labour, rather than actual labour costs, since it has both CC and Ofgem precedent. We therefore recommend using a notional approach.

- **Adjusting for locally incurred labour costs.** Some labour costs do not necessarily have to be sourced locally, i.e. within the region the DNO operates; as the role being performed can be conducted remotely. Examples may include call centres which, in theory, can be located anywhere in the world providing a sufficiently skilled labour force is available. Hence, all else being equal, if we assume DNOs are profit maximising firms all DNOs should locate business support activities in the lowest cost region of the world where a sufficiently skilled labour force is available. As a result, for the proportion of labour costs that do not need to be incurred locally, competitive pressures should eliminate price differentials across companies.

  At RIIO-ED1, Ofgem accounted for this by applying a percentage to the amount of labour costs that needed to be carried out locally. Percentages varied across different cost categories, ranging from 0% to 88% of labour costs. The percentages were informed by submissions from the DNOs regulated by Ofgem. The CC does not appear to have considered this at RP5, but instead appears to have applied the RWA to the entirety of indirect labour costs. At RP6, the decision to introduce Ofgem's local labour adjustment, or an alternative local labour adjustment, is a decision to be considered by the UR. Thus, we have outlined our thoughts on this issue below.

  To ensure that, when possible, our analysis is consistent with Ofgem's approach, we aimed to replicate the work it undertook to develop its data adjustments at RIIO-ED1. However, we were unable to find the exact source of Ofgem's assumptions with regards to its local labour adjustment. As a result, we were unable to duplicate Ofgem's analysis that would have supported us when assessing the suitability of the adjustment for Northern Ireland.

  Overall, we consider that it is difficult to pinpoint the total proportion of labour that can realistically be procured nationally (or internationally) by DNOs as there are many factors to take into account that include:

  - This is likely to be an asymmetric effect. Companies operating in expensive areas would have incentives to acquire these services outside of their area. On the contrary, those operating in cheaper areas (such as Northern Ireland) are less likely to go to a national market where they would face higher costs.

- The decision to relocate certain activities outside of the DNO's operational region will not only be the result of differences in wages but there could be other considerations. Examples of these factors may include: the existence of cheaper regions inside of the area served by the DNO; joint provision of services across DNOs in the same group; political pressure to keep jobs in the area or degree of control required by the company over the provision of these services; and quality of service incentives.

Taking these factors into account, it appears that DNOs could have limited incentives to source labour outside of their operational region, hence reducing the local labour adjustment required.

It is important to note, however, that if a proportion of a DNO's labour costs are not sourced locally, an approach that assumes that all cost are regional would 'over-adjust' the costs of the company. This will mean that for companies operating in a cheap area, the adjustment would also be applied to the costs of services sourced outside of their region. Given that, for these services, the company would be paying the same price as the other DNOs, the costs entering into the benchmarking model would appear to be more expensive after the application of the RWA than they would otherwise.

To illustrate this effect the table below shows a numerical example of how costs would be adjusted for different companies. For simplicity, we assume that Company A operates in an average cost area and it receives no adjustment while Company B operates in a less expensive area and its costs are adjusted by 1.25 before they enter into the econometric analysis.

Table 2.4: Worked example of applying a RWA to non-local costs

	Source of the services	Actual costs	RWA applied only to regional costs	RWA applied to all costs
Company A	Regional	1,000	1,000	1,000
	National	100	100	100
	Total cost	1,100	1,100	1,100
Company B	Regional	800	1,000 (800*1.25)	1,000 (800*1.25)
	National	100	100	125 (100*1.25)
	Total cost	900	1,100	1,125

This shows that when the regulator applies the adjustment to all costs (including those that are being acquired at the same price than Company A), Company B will seem to be less efficient (i.e., relatively higher cost).

Lacking a robust approach for the development of this adjustment, we also considered the possibility of using Ofgem corrections for Northern Ireland. However, given the characteristics of operating in Northern Ireland, it appears reasonable to assume that

NIE Networks would acquire less services in other regions than the GB's DNOs. As a result, we would recommend not to apply this adjustment to NIE Networks costs. However, we have conducted two local labour sensitivities within our benchmarking analysis[12] to evaluate the effect of this modelling decision, at the request of the UR:

1. Apply Ofgem's local labour weights to GB DNOs and NIE Networks.
2. Apply Ofgem's local labour weights to GB DNOs only.

[12] CEPA, 2017. RP6 efficiency advice.

3. SENSITIVITY TESTING

We tested a range of sensitivities which use a combination of hourly or weekly wages; including or excluding overtime; mean or median; and three different methods for calculating the RWA. All the sensitivities are run using 2-digit SOC codes, a twelve region split, and all employee jobs. In total there are 24 different combinations of sensitivities and these are shown in Table 3.1 below. The different sensitivities are explained further below. The outcomes help us place our central estimate in perspective.

Table 3.1: Different combinations of sensitivities

Sensitivity run	Hourly	Weekly	Including overtime	Excluding overtime	Mean	Median	Ratio first	Weighting first	Average across time first
1	✓		✓		✓		✓		
2	✓		✓		✓			✓	
3	✓		✓		✓				✓
4	✓		✓			✓	✓		
5	✓		✓			✓		✓	
6	✓		✓			✓			✓
7	✓			✓	✓		✓		
8	✓			✓	✓			✓	
9	✓			✓	✓				✓
10	✓			✓		✓	✓		
11	✓			✓		✓		✓	
12	✓			✓		✓			✓
13		✓	✓		✓		✓		
14		✓	✓		✓			✓	
15		✓	✓		✓				✓
16		✓	✓			✓	✓		
17		✓	✓			✓		✓	
18		✓	✓			✓			✓
19		✓		✓	✓		✓		
20		✓		✓	✓			✓	
21		✓		✓	✓				✓
22		✓		✓		✓	✓		
23		✓		✓		✓		✓	
24		✓		✓		✓			✓

Mean / median wage rates

While we have set on using mean wages, it is useful to understand how sensitive the results are to this choice. Table 3.2 presents two different ranges: Range 1 which contains all the combinations of sensitivities using mean wages (twelve different combinations, showing the minimum and the maximum); and Range 2 which contains all the combinations of sensitivities using median wages (twelve different combinations).[13]

Table 3.2: Mean versus median wages

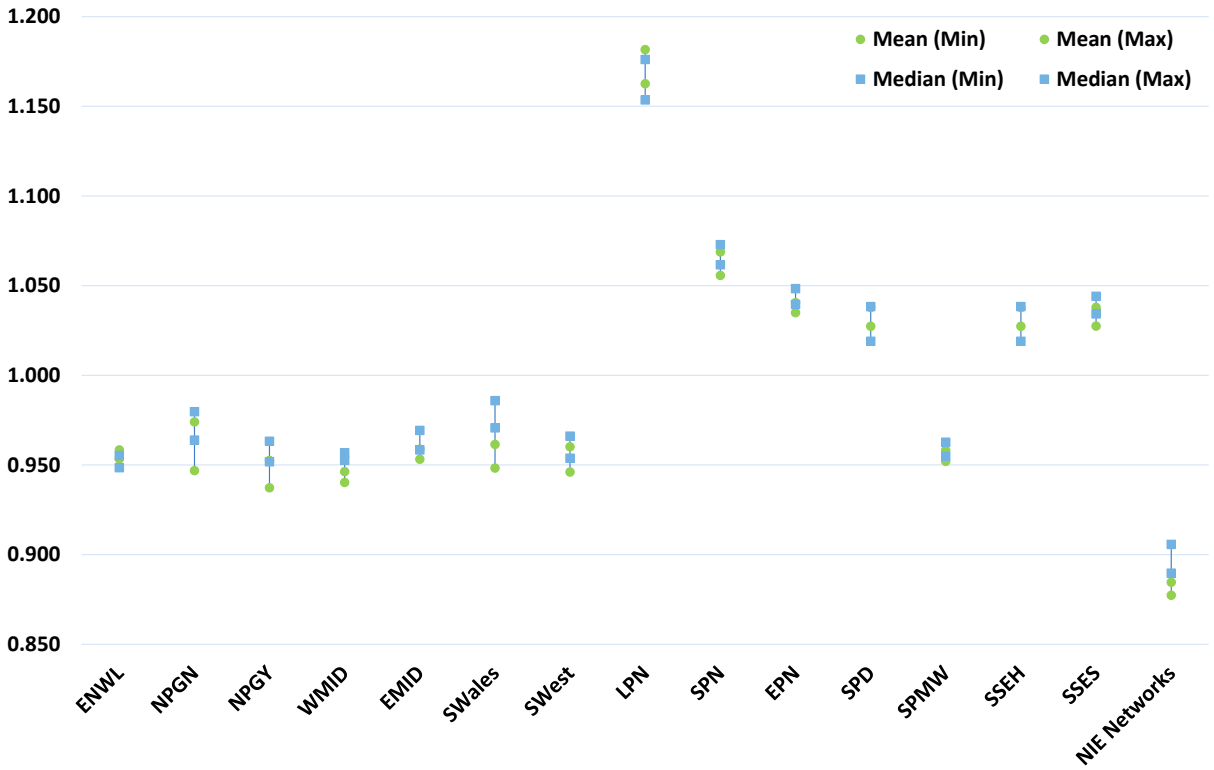
	Range 1: Mean wages		Range 2: Median wages	
	Min	Max	Min	Max
ENWL	0.953	0.958	0.949	0.955
NPGN	0.947	0.974	0.964	0.980
NPGY	0.937	0.953	0.952	0.963
WMID	0.940	0.946	0.953	0.957
EMID	0.953	0.959	0.958	0.969
SWales	0.948	0.961	0.971	0.986
SWest	0.946	0.960	0.954	0.966
LPN	1.163	1.182	1.154	1.176
SPN	1.056	1.069	1.062	1.073
EPN	1.035	1.040	1.040	1.048
SPD	1.027	1.038	1.019	1.038
SPMW	0.952	0.958	0.955	0.963
SSEH	1.027	1.038	1.019	1.038
SSES	1.027	1.038	1.034	1.044
NIE Networks	0.877	0.885	0.890	0.906

Source: CEPA analysis using ONS ASHE data.

The choice between mean and median wages can have an impact on the resulting RWA ranges, with RWAs calculated using median wages being higher than those calculated using mean wages for the majority of DNOs, with the main exception being LPN. This is illustrated in the Figure 3.1 below, where the square markers represent the range using mean wages and circle markers represent the range using median wages. However, while the decision to use mean or median wages has an impact on the resulting RWA ranges in *absolute* terms, in *relative* terms (that is, the distance between RWA factors for each DNO) the differences arising from using mean or median wages are minimal.

[13] See Table 1.2.

Figure 3.1: Using mean versus median wages



Source: CEPA analysis based on ONS ASHE data.

Hourly / weekly wages

The potential issues around inefficiency when using weekly wages has swayed our preference towards using hourly wages when calculating RWAs. However, differences in opinion between regulators means it is still valuable to test whether the choice of using hourly or weekly wages has a significant impact on RWAs.

Table 3.3 present two different ranges: Range 3 which contains all the combinations of sensitivities using hourly wages (twelve different combinations); and Range 4 which contains all the combinations of sensitivities using weekly wages (twelve different combinations).

Table 3.3: Hourly versus weekly wages.

	Range 3: Hourly wages		Range 4: Weekly wages	
	Min	Max	Min	Max
ENWL	0.950	0.958	0.949	0.958
NPGN	0.948	0.980	0.947	0.974
NPGY	0.937	0.958	0.939	0.963
WMID	0.940	0.953	0.942	0.957
EMID	0.953	0.960	0.958	0.969
SWales	0.948	0.977	0.953	0.986
SWest	0.956	0.966	0.946	0.964

	Range 3: Hourly wages		Range 4: Weekly wages	
	Min	Max	Min	Max
LPN	1.166	1.180	1.154	1.182
SPN	1.061	1.071	1.056	1.073
EPN	1.036	1.044	1.035	1.048
SPD	1.029	1.038	1.019	1.038
SPMW	0.952	0.959	0.953	0.963
SSEH	1.029	1.038	1.019	1.038
SSES	1.035	1.043	1.027	1.044
NIE Networks	0.877	0.906	0.877	0.902

Source: CEPA analysis using ONS ASHE data.

It is clear that the decision on whether to use hourly or weekly wages does not have a significant impact on the resulting RWAs overall. The largest differences are for LPN, SWest, SSEH and SSES although the differences are still not very significant.

Wages excluding and including overtime

Although our preference remains to use wages excluding overtime it is still worthwhile to understand the difference in outcome from using wages excluding or including overtime. These differences are presented in Table 3.4 below, where each range contains twelve different combinations of sensitivities for those using wages including overtime and those using wages excluding overtime. Overall, it appears that the choice between including or excluding overtime makes little difference to the RWA range.

Table 3.4: Wages including overtime versus wages excluding overtime

	Range 5: Including Overtime		Range 6: Excluding Overtime	
	Min	Max	Min	Max
ENWL	0.951	0.958	0.949	0.958
NPGN	0.958	0.98	0.947	0.977
NPGY	0.939	0.963	0.937	0.957
WMID	0.941	0.956	0.94	0.957
EMID	0.953	0.969	0.954	0.963
SWales	0.95	0.986	0.948	0.982
SWest	0.947	0.965	0.946	0.966
LPN	1.154	1.174	1.172	1.182
SPN	1.056	1.07	1.064	1.073
EPN	1.035	1.043	1.039	1.048

	Range 5: Including Overtime		Range 6: Excluding Overtime	
	Min	Max	Min	Max
SPD	1.022	1.038	1.019	1.033
SPMW	0.953	0.963	0.952	0.959
SSEH	1.022	1.038	1.019	1.033
SSES	1.027	1.042	1.035	1.044
NIE Networks	0.88	0.902	0.877	0.906

Source: CEPA analysis using ONS ASHE data.

Averaging

While we consider that Approach 2 is most intuitive, there is not a single method that is correct, so we have tested the impact of using each approach within our set of sensitivities. These are shown in Table 3.5, which provide three different ranges, each containing eight different combinations of sensitivities. Range 7 contains the combination of sensitivities which takes the ratio before weighting; Range 8 contains the combination of sensitivities which applies the SOC weights first; and Range 9 contains the combination of sensitivities which average wages over time first.

Table 3.5: Testing different methods for determining the RWAs

	Range 7: Ratio before weighting		Range 8: Weighting before ratio		Range 9: Average wages across time	
	Min	Max	Min	Max	Min	Max
ENWL	0.952	0.958	0.949	0.955	0.949	0.955
NPGN	0.954	0.980	0.947	0.971	0.947	0.971
NPGY	0.943	0.963	0.937	0.960	0.937	0.960
WMID	0.943	0.956	0.940	0.957	0.940	0.957
EMID	0.956	0.968	0.953	0.969	0.953	0.969
SWales	0.957	0.986	0.948	0.982	0.948	0.982
SWest	0.948	0.966	0.946	0.963	0.946	0.963
LPN	1.157	1.182	1.154	1.180	1.154	1.180
SPN	1.056	1.070	1.059	1.073	1.059	1.073
EPN	1.035	1.047	1.036	1.048	1.036	1.048
SPD	1.023	1.038	1.019	1.036	1.019	1.036
SPMW	0.957	0.963	0.952	0.959	0.952	0.959
SSEH	1.023	1.038	1.019	1.036	1.019	1.036
SSES	1.027	1.042	1.030	1.044	1.030	1.044

	Range 7: Ratio before weighting		Range 8: Weighting before ratio		Range 9: Average wages across time	
	Min	Max	Min	Max	Min	Max
NIE Networks	0.879	0.906	0.877	0.900	0.877	0.900

Source: CEPA analysis using ONS ASHE data.

Range 8 and Range 9 are identical to three decimal places, whereas taking the ratio first generally leads to higher RWAs compared to the other two approaches; although the differences are not very significant.

All employees versus full-time employees only

In

Table 3.6 below we show the impact of using full-time employee wage data instead of using all employee data. This analysis shows that the effect of this is marginal. Therefore, we retain our approach and use all employee wage data in our central case.

Table 3.6: All employees versus Full-time employees only

DNO	Full-time employees	All employees
ENWL	0.955	0.954
NPGN	0.947	0.948
NPGY	0.937	0.937
WMID	0.940	0.940
EMID	0.954	0.954
SWales	0.947	0.948
SWest	0.956	0.956
LPN	1.180	1.180
SPN	1.067	1.067
EPN	1.038	1.039
SPD	1.028	1.030
SPMW	0.952	0.952
SSEH	1.028	1.030
SSES	1.038	1.038
NIE Networks	0.875	0.877

Source: CEPA analysis using ONS ASHE data.

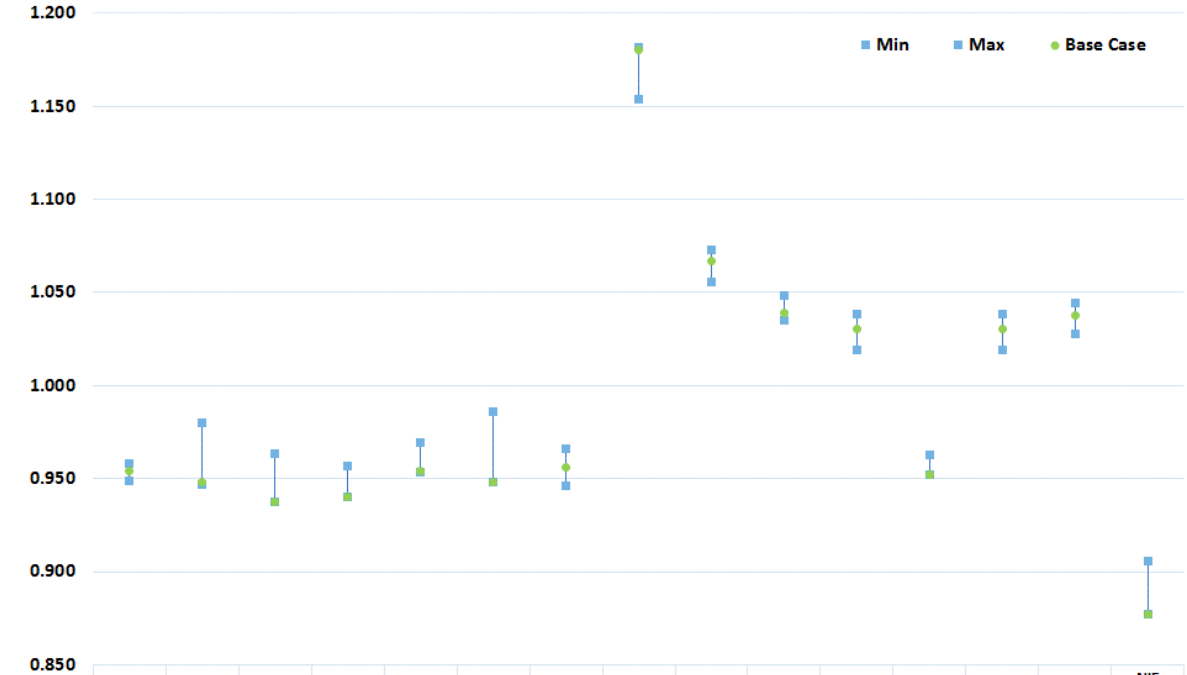
4. RESULTS

In Figure 4.1, we present a range of possible RWAs, which includes our base case scenario and the sensitivities we have run. All sensitivities have been calculated based on a twelve region split and 2-digit SOC codes.

Our base case scenario for each DNO is shown by the green circles, which are calculated under the following assumptions:

- twelve region split;
- 2-digit SOC codes;
- mean hourly wages excluding overtime; and
- the second approach to averaging, which first applies the SOC code weights, then takes the ratio between the region in question and the UK, and then averages across time (SOC; x/UK; years).

Figure 4.1: A range of possible Regional Labour Adjustments (RWAs)



	ENWL	NPGN	NPGY	WMID	EMID	SWales	SWest	LPN	SPN	EPN	SPD	SPMW	SSEH	SSES	NIE Networks
Min	0.949	0.947	0.937	0.940	0.953	0.948	0.946	1.154	1.056	1.035	1.019	0.952	1.019	1.027	0.877
Max	0.958	0.980	0.963	0.957	0.969	0.986	0.966	1.182	1.073	1.048	1.038	0.963	1.038	1.044	0.906
Base Case	0.954	0.948	0.937	0.940	0.954	0.948	0.956	1.180	1.067	1.039	1.030	0.952	1.030	1.038	0.877

Source: CEPA analysis using ONS ASHE data.

Table 4.1 presents different RWA factors for Northern Ireland under different SOC-level assumptions. The RWA factors presented are based on a 5-year average (2011-15). This is consistent with the approach for both RIIO-ED1 and RP5. Our recommended option is shaded in green, which is calculated under our base case scenario assumptions, which are listed above.

Table 4.1: Northern Ireland RWA sensitivities

SOC code weights	Weekly wages		Hourly wages	
	Mean	Median	Mean	Median
Ofgem RIIO-ED1 FD *(2-digit codes)*	0.88	0.90	**0.88**	0.90
CC RP5 – WA2 *(3- digit codes)*	0.89	0.90	0.89	0.91
CC RP5 – WA1 *(4-digit codes)*	0.76	0.72	0.77	0.72

Source: CEPA analysis using ONS ASHE data.

There are a few key messages that we can draw from the results above:

- 2-digit and 3-digit weightings give similar results.
- Ofgem's 2-digit SOC codes are relatively robust to the choice of weekly/ hourly.
- The choice of averaging approach can have a significant impact.
- 4-digit weightings give materially different, consistently lower, results to 2 and 3-digit weightings. This is partly due to some SOC codes being reported as *unreliable* or *disclosive* in the data, and the method we have used to address this. When this occurred in the data, we placed no weight on the observation when calculating the RWA factors. Given the approach we have taken to averaging (SOC; x/UK; years), this is equivalent to replacing missing values with zeros, which pulled the RWA downwards. We recognise that there are other ways in which missing data could be replaced, for example, replacing with a previous year's data or using an alternative averaging approach. However, this does not distract from our rationale for not using the 4-digit SOC approach, which was based on a preference for more reliable data, not on the resulting estimate of the RWA.

Proposed adjustment

The resulting set of RWAs are presented in Table 4.2 below for our base case scenario.

Table 4.2: CEPA proposed RWAs

DNO	CEPA RWAs
ENWL	0.95
NPGN	0.95
NPGY	0.94
WMID	0.94
EMID	0.95
Swales	0.95
SWest	0.96
LPN	1.18
SPN	1.07
EPN	1.04
SPD	1.03
SPMW	0.95
SSEH	1.03
SSES	1.04
NIE Networks	0.88

Source: CEPA analysis using ONS ASHE data.

5. COMPARISON TO PREVIOUS REGULATORY APPROACHES

Table 5.1 below summarises our recommended approach to deriving the RWA.

Table 5.1: Recommended approach to deriving the RWA

Characteristic	CEPA
Mean vs median	Mean
SOC-code level	2-digit
Overtime	Excluding
All/ full-time employees	All employees
Hourly/ weekly	Hourly
Number of regions	12
Averaging	Approach 2
Notional vs actual weights	Notional

For comparison, in Table 5.2 we present a selection of approaches taken recently by regulators. There are various possible permutations, and regulators have differed in what they have implemented.

Table 5.2: Approaches to RWA by other regulators

Characteristic	CC RP5	Ofwat PR14	UR GD17	Ofgem RIIO-ED1
Mean vs median	Mean	Mean	Median	Mean
SOC-code level	3 & 4 digit	2 digit	2 digit	2 digit
Overtime	Excluding	Excluding	Excluding	Including
All/ full-time employees	Not reported	Not reported	Full-time	All employees
Hourly/ weekly	Weekly (hourly tested)	Hourly	Weekly	Hourly
Number of regions	12	12	12	3
Averaging	Approach 2 & 3	N/A	Not discussed	Approach 1
Notional vs actual weights	Notional	N/A	Notional	Notional