



**Scottish Hydro Electric Power Distribution**

**RIIO-ED1 Business Plan**

**Regional Factors Supporting Paper**

## References

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## ABBREVIATIONS LIST

Abbreviation	Definition
ARC	Alarm Receiving Centre
CI	Customer Interruption
CML	Customer Minute Lost
DNO	Distribution Network Operator
DPCR5	Distribution Price Control Review 5
EHV	Extra High Voltage
HSE	Health and Safety Executive
HV	High Voltage
OFGEM	Office for Gas and Electricity Markets
RIIO-ED1	Revenue = Incentives + Innovation + Outputs, Electricity Distribution 1
SEPD	Southern Electric Power Distribution
SHEPD	Scottish Hydro Electric Power Distribution

SSEPD Documents

**MA-PS-001**



<u>Document Type</u>	<u>Business Area</u>	<u>Number Sequencing</u>
MA – Manual	PS – Power Systems	001
PO – Policy	PS – Power Systems	001
PR – Procedure	PS – Power Systems	001
TG – Technical Guidance	PS – Power Systems	001
WI – Work Instruction	PS – Power Systems	001
RS – Risk Standard	SHE – Safety, Health & Environment	001

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# 1 Overview and Conclusion

- 1.1.1 Scottish Hydro Electric Power Distribution (SHEPD) licensed area is 25% of the Great Britain (GB) landmass, and includes both the Highlands of Scotland and also all the islands on the west and north coasts. SHEPD has just 2.5% of the GB customer base and with the majority of these on the east coast; the west and north has a customer density some 20 times less than other parts of GB. The total number of customers in SHEPD's DSA is 750,000 and approximately 7% of these are island based.
- 1.1.2 The very low density of SHEPD's customers in the Highlands and Islands means that the average length of network per customer is five times that of the GB average. To service these networks from a rural road network with multiple ferry crossings brings significant extra costs in the areas of depots, travel, accommodation and manpower.
- 1.1.3 **Environment** - The west and north coasts of Scotland are very exposed to Atlantic storms and the islands are typically a maximum of 10 or 20 kilometres wide, and are therefore exposed not only to the wind but also to salt pollution. During winter storms it is not unusual to have winds of hurricane force, even at low altitude levels.
- 1.1.4 This exposure to both wind and corrosion has a detrimental effect on overhead lines, ground mounted plant and buildings resulting in both a reduction in life expectancy and also a significant increase in conductor and component failure. A typical example is an 11 kV line in the Western Isles that was rebuilt in the early 1990's to a high, weather performance standard and after 20 years is now showing significant component failure and consequential impact on customer service.
- 1.1.5 **History** - The rural electrification programme for the Highlands and Islands in the 1950's and 1960's aimed to supply the maximum number of customers at the minimum cost. This resulted in lines with small cross sectional area including steel conductors, light poles and long spans which are prone to clashing and conductor breakages in gales and especially when line icing is also present. The very low customer density meant that the circuits were often built as radial circuits with no back feeds and in many areas the customers are supplied from pole mounted 33 kV transformers.
- 1.1.6 **Submarine cables** - SHEPD operate the vast majority of the UK's network of submarine cables, with 438km of submarine cable in total covering 108 separate circuits on 60 islands.
- 1.1.7 This paper looks at the costs that SHEPD incurs in serving these customers that companies in other parts of Great Britain do not incur. The costs associated with these factors require to be removed when undertaking any benchmarking or comparative analysis with other DNO's.
- 1.1.8 **SHEPD believe that adjustments totalling £4.8M pa require to be made to the underlying cost base for normalisation purposes before any comparative analysis between DNO's is undertaken. These costs are embedded within SHEPD fault costs and other indirect cost categories. In addition there are 2 specific cost categories ((Island Diesel Generation costs and Submarine cable costs) where SHEPD incurs costs that no other DNO has on any material basis. These costs must also be removed for the purposes of benchmarking.**

## **2 DPCR5 Position and ED1 Impact**

### **2.1 Current rules applied for DPCR5**

2.1.1 During the DPCR5 process in 2009 SHEPD submitted a paper and discussed with Ofgem the factors that impacted on operating in the North of Scotland that are unique to SHEPD. This paper highlighted a number of areas where additional or unique expenditure was incurred and attempted to quantify the impact. This paper was discussed with Ofgem at a number of bilateral sessions during the process and the principle was accepted by Ofgem as being a distinguishing and unique factor affecting SHEPD. As a result of this there was a normalisation adjustment made within the benchmarking analysis for the purposes of setting DPCR5 allowances. This was confirmed within the DPCR5 final proposals (Para 1.41 of DPCR5 Final Proposals – Ref 146a/09).

### **2.2 Proposed changes for RIIO-ED1**

2.2.1 The regional factors that impacted SHEPD in DPCR5 continue to exist but are constantly evolving, especially as renewable energy is developed on the north and west coasts of Scotland, resulting in more work being carried out in rural and island areas compared to populated areas on the east coast of our territory. As the same factors exist SHEPD believe a normalisation adjustment is required to be made for the purposes of benchmarking to set ED1 allowances. This paper highlights the expenditure involved and updates our estimates of current and future expenditure.

2.2.3 As well as the adjustments proposed in this paper to reflect the scarcity issues in the benchmarking analysis, a number of other costs where SHEPD incur a material amount of expenditure will require to be taken into consideration as part of the assessment of DNO business plans and in all of the different methods of benchmarking undertaken as part of the ED1 process.

2.2.4 The vast majority of DNOs do not face similar costs and whilst a small number of DNOs may incur a minimal level of costs in these specific areas they do not incur costs to the material extent as those incurred by SHEPD. These costs include the cost of operating the six remote diesel power stations (fuel and O&M) that are required for network back up purposes and costs associated with submarine cable faults.

2.2.5 This paper highlights and quantifies the impact of these costs incurred during DPCR5 and recommends adjustments that require to be made in the benchmarking analysis to be used for ED1.

### 3 Regional Factor Cost - Estimates for DPCR5

3.1.1 The unique costs that SHEPD predicted to incur during DPCR5 and formed part of the justification paper submitted in 2009 were –

Cost Category	Differential costs (£ m)	Summary Description
Weather/Climate	0.100	Costs for imported staff/contractors during storms
Travel man hours costs	0.152	Additional travel cost due to traffic network
Travel fuel costs	0.140	Fuel differential due to higher mileage / cost
Island Flights and Ferries	0.170	Island staff and management
Terrain - helicopters	0.083	Faults and storm conditions
Depots	0.155	Main and sub offices
Depots out posted staff costs	0.810	Out posted, island and retained staff
Telecoms & IT	0.050	Operations and visits
Islands Diesel Generation	0.200	Operating Cost of Stations
Islands Diesel Generation Legislation	0.166	Flue gas analysis, cooling towers, interceptors and stand by generation
Private Mobile Radio (PMR) System	0.998	Operational voice system in Highlands & Islands of Scotland
<b>Additional Costs</b>	<b>3.024</b>	

3.1.2 These costs were annual costs and were forecast in 2007/08 prices. These did not include the fuel costs for island diesel generation or the costs of maintaining and refurbishing a subsea cable network. These costs were separately assessed for the purposes of setting DPCR5 allowances.



## 4 Regional Factor Costs - Actuals in DPCR5

- 4.1.1 SHEPD has reviewed the costs incurred during the first 3 years of the DPCR5 period and these actual costs are detailed in Table 1 below. A number of the forecasts included in the November 2009 paper have been exceeded and additional costs have been incurred. This has been due to a number of factors including an underestimate of costs included in the 2009 paper, particularly in relation the cost of out posted staff in remote and island depots, Island Diesel O&M costs and PMR costs. The actual additional costs associated with operating in SHEPD are approx £6M pa.
- 4.1.2 Also included in the analysis is the costs of purchasing fuel on our Remote Island Diesel Generation sites, which have been running at an average cost of £5.8m annually during DPCR5, the level of submarine cable replacement, including faults, which have been running at an average cost of £4.9m annually during DPCR5 and the costs of the 3 exceptional severe weather events that we have experienced in 2011/12 & 2012/13.
- 4.1.3 For the purposes of any comparative analysis or benchmarking undertaken across DNOs based on these 3 years of actual figures we believe that these costs need to be excluded. To include these figures would give SHEPD a severe disadvantage in the assessment of relative efficiency between DNOs.

**Table 1: Summary of Regional Factor Additional Costs incurred during DPCR5**

<b>DPCR5 SHEPD Regional Factors</b>	<b>10/11 £m</b>	<b>11/12 £m</b>	<b>12/13 £m</b>
Additional Vehicle costs	0.17	0.18	0.18
Additional Fuel Costs	0.07	0.07	0.07
Ferries, Helicopters, Accommodation	0.28	0.30	0.30
Additional Depot / Buildings	0.16	0.17	0.17
Additional Staff Islands, Retained, out posted	2.65	2.76	2.76
Private Mobile Radio	1.34	1.35	1.35
<b>Additional Costs (before Fuel, Sub Cables &amp; Severe Weather)</b>	<b>4.67</b>	<b>4.83</b>	<b>4.83</b>
Island Diesel Gen Costs - O&M	1.35	1.55	1.75
Island Diesel Gen Costs - Fuel	5.12	3.52	3.65
Submarine Cables - asset replacement	4.00	5.78	7.78
1-in-20 events	0.00	11.79	8.50

## 5 Regional Factors – Forecast Expenditure in ED1

5.1.1 The type of costs incurred during the ED1 period will be very similar in nature to those incurred during DPCR5; however, we believe that the quantum will be greater. In addition when assessing the additional cost of staff required to operate in our remote locations we have performed a more detailed analysis than in 2009. We have examined a number of options for quantifying the costs and considered how best to weight the factors to arrive at the total cost of operating in these areas.

Included within this section is the justification of the regional factor costs and additional annual costs that we forecast will be incurred by SHEPD during the ED1 period. The costs shown in Table 2 are the areas where costs are embedded within specific cost categories and where we believe SHEPD incur costs that a typical DNO would not. These items should be excluded from comparative analysis work undertaken by Ofgem as part of RIIO ED1.

**Table 2: Summary of Regional Factor Additional Costs Forecast RIIO-ED1**

<b>Cost Category</b>	<b>Differential costs (£ m)</b>	<b>Summary Description</b>
Weather/Climate	0.10	Costs for imported staff / contractors as contingency for storms. Included within ongoing fault costs.
Travel - Additional vehicle / fuel costs	0.25	Additional travel cost due to distance, higher mileage, single track roads and increased fuel cost in the North of Scotland. Included within EMCS costs.
Travel - Island Flights, accommodation and Ferries	0.13	Transport for island staff, specialist staff and management. Included within EMCS costs.
Travel – Terrain/Helicopters	0.12	Faults and storm conditions. Included within fault costs.
Remote Depots - Property Costs	0.13	Main and sub offices in remote locations. Included within Property & Office Costs
Depot Staff – Out posted staff costs	2.76	Out posted, island and retained staff. Included within EMCS costs.
Private Mobile Radio (PMR) System – IT & Telecoms	1.35	Operational voice system in Highlands & Islands of Scotland. Included within IT & Telecoms Costs in Business Support costs.
<b>TOTAL Additional Costs</b>	<b>4.84</b>	

Excluded from this table are the costs associated with Island Diesel Generation and submarine cable repairs and replacement. These costs are separately identified within the cost and volumes tables within NOC Others (Table C26) for Island Diesel and Submarine cables (Tables CV3 & CV15a). It is our belief that as these particular costs is only material for SHEPD and no other DNO. These costs need to be excluded from any comparative analysis and benchmarking work (See Para 5.2.7 & 5.2.8 below). A separate allowance for these costs needs to be arrived at separate to the benchmarking process.

We have considered each of the categories of expenditure below:

### 5.2.2 Weather / Environment / Climate

Snow, line icing and gales all contribute to the high fault levels recorded in the north of Scotland. A further issue is the lack of trees on the islands so that crows build nests on SHEPD poles and despite regular patrols to remove them; they are often rebuilt the following day using such materials as fencing wire.

During winter storms low level wind speeds of over 100 MPH are regularly recorded. Some overhead lines are at heights of over 600 metres and at these altitudes can be exposed to wind speeds of up to 150 MPH. These conditions were encountered during a number of the severe weather events SHEPD experienced in 2011/12.

The remoteness of SHEPD's customers, and in particular its island-based customers, increase the costs incurred in restoring supplies. During severe weather, it is common for ferry services to be cancelled, causeways to be closed to all traffic and both fixed wing aircrafts and helicopters to be grounded. This requires SHEPD to transfer additional manpower to the islands prior to forecast storm events to ensure that there are sufficient resources to deal with potential faults. On average there have been two forecast events per year where staff has been deployed, but the event has not materialised. These numbers have been higher in the last few years, with 5 such events during 2011/12 and 6 during 2012/13. We estimate this cost at £100 k per annum based at least 2 events per annum. This cost has been included within SHEPD's fault costs.

### 5.2.3 Travel and Accommodation

**By Road** - Travel times to remote rural locations increase the overall cost of SHEPD's business as usual functions. Many west coast and island roads are "B" class with passing places, which prolong routine travel and also fault restoration times. In a recent case a landslide closed a road at Stromferry on the west coast and the shortest diversion was a route of over 100 miles. Waiting times for ferries, which are weather and tidal dependent, also contribute to higher fault costs. Overhead line maintenance and primary and secondary substation maintenance is made more difficult and costly through increased travel times. This extends the working hours of the staff undertaking this type of work, often resulting in the need for overnight accommodation increasing the cost of maintaining the network. Our calculations show that this gives an estimated man hours / time differential of £150 k pa.

In addition, SHEPD has to bear the higher travel costs associated with servicing its multiple island networks and despite the five pence per litre island fuel subsidy, fuel costs are significantly higher on the Scottish islands compared with mainland prices. At the end of March 2013, diesel in Shetland (Lerwick) was £1.55 per litre compared to an average cost of £1.42 on the mainland, making fuel prices on the islands £0.13 per litre more expensive. On average, a SHEPD vehicle will travel 13 miles more than a SEPD vehicle carrying out equivalent tasks. We have calculated the additional fuel cost to be approx £100 k pa for our activities in the Highlands and Islands.

**By Ferry** - SHEPD ferry costs are based on travel from the mainland ports to Shetland, Orkney, Western Isles and travel both to the larger islands off Argyll and West Highland (Tiree, Mull, Islay, Arran and Bute) and between the smaller islands off Argyll, the Inner Hebrides, Western Isles, Orkney and Shetland.

Specialist staff has to visit island locations to carry out work which it is not appropriate for local staff to be trained to carry out. This work would include protection testing, cable fault location, high voltage jointing, subsea cable work, etc. To accommodate ferry sailing times two days would typically be required to carry out one day or a part day work with the remainder of the time being spent in travelling, waiting for ferry and in many cases an overnight stay.

Where specialist plant is required e.g. mobile 11kV generation, the local ferry may be unable to take items of this size and weight and a landing craft type of vessel is hired for this journey.

There is also a requirement for both local and company management staff to visit these remote islands and these visits are subject to the same costs and time issues.

**By Air** - Air travel to the islands is also required as well as inter island flights. Flights can be more efficient than ferries on certain routes, particularly where travel time is critical. There are also occasions where ferries cannot run on some routes at certain times owing to low tides and then an aircraft flight or helicopter journey is the only option. We do not believe that any other DNO incurs any material expense in air fares in servicing its authorised areas to the extent that it is required to be incurred by SHEPD.

The actual cost for flights and ferries to and from island locations in 2012/13 was £60k pa.

**Accommodation** - Owing to the fragmented nature of the west and north coast with many islands, overnight accommodation is frequently required, both for routine and fault work. Where an island has an air service there are typically only one or two services per day. Where a ferry journey is required there are also limited services and hence an overnight stay is often required even for a short duration task on the island. Some of the smaller islands, e.g. Jura only have four ferry services per week so that any visit requires a minimum stay of 2 nights. The costs of the additional annual cost of overnight stays in remote locations is £75 k pa.

**By Helicopter** - In addition, SHEPD retains the services of a number of helicopter companies which allow our remote networks to be assessed from the air following a storm to identify points of damage. The helicopters are also utilised to transport staff and materials to inaccessible fault locations. This reduces the time spent in identifying where faults are located and associated repair times. The helicopters are charged on a daily basis with an average charge from helicopter contractors charging approx £2,000 per day per machine. These helicopters are used for both routine fault repairs and also storm fault repairs. The forecasted cost for helicopter use in 2013/14 is £120 k pa.

#### 5.2.4 Remote Depots – Property Costs

SHEPD has 4 mainland depots compared to 9 depots in Southern Electric Power Distribution (SEPD) area. However, SHEPD has 3 main island depots (Orkney, Shetland and Western Isles). The mainland Argyll depot also services the island of the west coast of Scotland. In total SHEPD have 34 properties across its area including a number of small, remote sub-depots. This compares against 24 properties in total across our SEPD area.

This factor results in SHEPD incurring higher property related costs as there is an increased number of properties required to be utilised to support the network and customers. For example, whilst the main office for Highlands and Islands is in Inverness, which is the administrative centre for public services for the north of Scotland, there are sub depots both on the mainland and also on the islands. A typical example is the Western Isles where the main depot building is located in Stornoway. Stornoway has a further level of sub depots in both Uist and Barra and these require either ferry journeys or flights to travel between them.

On a per customer basis, there is 1 depot per 190,000 customers in SHEPD's area versus 1 depot per 320,000 customers in SEPD's area. We consider SEPD to be more indicative of a typical DNO. The higher number of depots per customer in the north reflects both the remoteness of the customers and the sparsity of the network. If the number of depot locations was reduced, quality of service would suffer considerably and customers and staff would be even more remote from each other than they already are, resulting in higher property costs.

A remote depot, such as Barra, would only normally have two members of staff but would require to be equipped with a full range of spares and equipment to ensure all activities can be undertaken. Also, when the island is stormbound, often for several days at a time, and no outside assistance in the way of staff, materials or plant can be utilised to rectify network problems.

We have calculated the additional cost of maintaining and running depots in SHEPD's area to be £130 k per annum.

#### 5.2.5 Depot Staff – Out posted staff costs

There are additional staff costs incurred by SHEPD compared with a typical DNO due to the remote location, geography, terrain and network being maintained and operated. In order to quantify the additional annual costs incurred we have examined a number of different metrics and comparators.

These metrics and comparators include comparing the number of staff per customer numbers within SHEPD compared to a typical DNO. We have also examined the total length of line (both overhead & underground) per number of staff. A third metric is to examine the number of staff covered by the length of line being maintained and operated divided by the land area in km<sup>2</sup> covered by the DNO.

In looking at this analysis we have compared each individual depot within SHEPD's area and compared this with SEPD. Whilst SEPD is one of the larger DNO in terms of size and scale it could be regarded as being a typical UK DNO.

In addition we have taken the largest depot within SHEPD's area as a benchmark. The North East depot is fairly representative of a typical UK depot area as it has with a mixture of both urban and rural network and customers. This depot services Aberdeen, Scotland's third largest city.

Our analysis shows that based on the comparison with both SEPD and with our largest SHEPD depot on all 3 of the different metrics examined there are clearly additional staff costs incurred in operating the SHEPD network.

Based on the analysis we believe that the additional annual staff costs incurred by SHEPD compared to other DNO's is a minimum of £2.8M. This equates to an additional 74 staff at an average salary of £37.5k pa. This is using our North East depot as direct comparator for a typical UK depot and using a weighted average of the 3 metrics considered. This comparison is the lowest cost of the various scenarios and comparisons we undertook.

The detailed analysis is shown below.

**Table 2: Ratio of customers to staff**

<b>SHEPD Depot</b>	<b>Customers</b>	<b>Staff</b>	<b>Customers : Staff ratio</b>
Western Isles	17,434	33	528
Orkney	12,737	20	637
Shetland	13,381	16	836
Argyll	73,020	68	1,074
Highland	114,551	94	1,219
Tayside and Central	233,695	101	2,314
North East	285,628	100	2,856
<b>TOTAL</b>	<b>750,446</b>	<b>432</b>	<b>1,737</b>

  

<b>TOTAL SEPD Depots</b>	<b>2,967,585</b>	<b>637</b>	<b>4,661</b>
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As can be seen from Table 2 above, the ratio of customers per staff member in SHEPD is far lower on the Islands and in the Highland area of Scotland. Even our second lowest ratio depot of Tayside and Central region, incorporating Perth and Dundee but also a large area of rural Perthshire, has only half the amount of customers per staff member as SEPD. The headline figure of 432 staff servicing 750k customers compared with 637 staff servicing almost 3 million customers in SEPD highlights the fact that even though we have the same business model in both of our areas, there are large difference in the number of staff required, and therefore additional costs, across all of our SHEPD depots.

The lower Customer : Staff ratio for Orkney, Shetland, Western Isles Argyll and Highland is a direct consequence of the lack of economies of scale on individual islands groups and rural areas and the need to ensure sufficient manpower to cover normal operational activities on a 24/7 basis in these extremely remote locations. The staffing ratios are further decreased on the smaller islands; for example in the case of Barra there are two staff for 700 customers. On some on the very small islands there are retained staff who have other employment but who are paid an annual retainer so they are available for basic switching, line patrols and fuse replacement with full time staff travelling from the larger islands as and when required.

**Table 3: Ratio of Length of Line (overhead & underground) km to staff**

<b>SHEPD Depot</b>	<b>Line Length (km)</b>	<b>Staff</b>	<b>Line Length : Staff ratio</b>
Western Isles	1,871	33	57
Orkney	1,689	20	84
Shetland	1,490	16	93
Argyll	7,630	68	112
Highland	9,027	94	96
Tayside and Central	11,373	101	113
North East	14,398	100	144
<b>TOTAL</b>	<b>47,478</b>	<b>432</b>	<b>110</b>

<b>TOTAL SEPD Depots</b>	<b>75,925</b>	<b>637</b>	<b>119</b>
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A further measure of the additional staff requirement that is inherent in the North of Scotland is shown in Table 3 above, where we look at the length of both overhead conductor and underground cable in each of our depots, and the staff employed in each. The effect can be seen most starkly on the Islands and in the Highland Region where we require 1 staff member to service under 100km of line. Using this measure the remaining North depots are on a par with our South area, with over 100 staff per km of line.

**Table 4: Ratio of Length of Line (overhead & underground) as a factor of land mass (km<sup>2</sup>) per staff member**

<b>SHEPD</b>	<b>Line Length (o/h &amp; u/g)</b>	<b>km<sup>2</sup></b>	<b>km Line length / Depot area</b>	<b>Staff</b>	<b>length of line (meters) / km<sup>2</sup> per staff member</b>
Western Isles	1,871	2,963	0.632	33	19
Orkney	1,689	990	1.705	20	85
Shetland	1,490	1,415	1.053	16	66
Argyll	7,630	15,943	0.479	68	7
Highland	9,027	17,715	0.510	94	5
Tayside and Central	11,373	10,342	1.100	101	11
North East	14,398	7,822	1.841	100	18
<b>TOTAL</b>	<b>47,478</b>	<b>57,191</b>		<b>432</b>	

<b>TOTAL SEPD Depots</b>	<b>75,925</b>	<b>17,182</b>	<b>6.784</b>	<b>637</b>	<b>126</b>
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Table 4 above which shows the number of staff SHEPD have per length of line in km's divided by the area of each depot in km<sup>2</sup>, and highlights a further measure of the staff issue that SHEPD face in the North of Scotland. This shows the density of assets per depot and is probably the clearest indication of the problems that SHEPD face with staffing levels, where even our mainland depots of Argyll, Highland and Tayside have less than 10% of the assets per km<sup>2</sup> as our SEPD depots on average as the areas these depots cover is so vast. Even our most populous depot, North East, has six times fewer less assets per equivalent area than a typical SEPD depot, with all of the inherent diseconomies of scale issues that this brings.

### Results of analysis

Based on the 3 comparators outlined above we have calculated the number of additional staff required to operate and service SHEPD depot network and customers. Using an average staff cost of £38.8k pa we have quantified the incremental salary cost to SHEPD. We have also considered a range of weightings to be applied to each of the 3 factors. The analysis is based on comparing SHEPD to both SEPD (a typical UK DNO) and SHEPD's North East depot (a typical UK depot)

We have quantified below the additional staff cost incurred by SHEPD when comparing with both SEPD and comparing it with SHEPD's largest depot (North East). We have also taken a weighted average of all 3 metrics considered.

As can be seen from Table 5i below the additional cost of staffing the depots in SHEPD based on the number of customers serviced in SEPD indicates additional costs of £9,015k, (232 staff) are required. Using line length as the metric indicates an additional cost of £1,314k, (34 staff) is required. Using line length per km<sup>2</sup> as the metric indicates an additional cost of £14,509k (374 staff). Evenly weighting all three metrics would mean that SHEPD has £8,279k (213 staff) of salary costs that we believe would not be incurred given similar factors in SEPD.

**Table 5i: Additional North of Scotland staff costs based on SEPD with equal weighting of metrics (£k)**

<b>Increased staff numbers with SHEPD depots compared to SEPD</b>				
	Customer Numbers	Line Length	Line per Depot Area / km <sup>2</sup>	
Additional Staff numbers	232	34	374	
Additional Cost	£9,015k	£1,314k	£14,508k	£24,838k
Weighting	33%	33%	33%	
	<b>£3,005k</b>	<b>£438k</b>	<b>£4,836k</b>	<b>£8,279k</b>

Even though SHEPD and SEPD are run using the same business model and therefore the increased staff costs experienced within the SHEPD area is caused by the inherent geographic and demographic factors previously mentioned, it could be argued that taking our SEPD area as the comparator is an overly idealistic measure given that SEPD has consistently been assessed as being at the forefront of efficiency. Given that, we have also assessed staff per customer numbers, line length, and density of line length using our North East depot as the comparator for the remaining SHEPD depots. The impact of this on SHEPD staff level and costs are shown in Table 5ii and shows on an evenly weighted basis of the 3 factors that the additional x staff are required at a cost of £3,942k p.a.

**Table 5ii: Additional North of Scotland staff costs based on SHEPD North east depot with equal weighting of metrics (£k)**

<b>Increased staff numbers with SHEPD depots compared to North East</b>				
	Customer Numbers	Line Length	Line per Depot Area / km2	
Additional Staff numbers	169	102	33	
Additional Cost	£6,569k	£3,968k	£1,290k	£11,828k
Weighting	33%	33%	33%	
	<b>£2,189k</b>	<b>£1,322k</b>	<b>£430k</b>	<b>£3,942k</b>

However, given our reservations of customer numbers as the main cost driver during the TOTEX work carried out by Frontier Economics, we feel that a more accurate weighting of the various metrics would be 5% attributable to Customer Numbers, 45% attributable to Length of Line, and 50% to Network Line Density as shown in Table 5iii below. At the 12/13 average salary cost of £38.8k per WTE, this illustrates that SHEPD has **£2.759M** of salary costs (71 staff) that we believe would not be incurred given similar circumstances to the North East depot across the whole SHEPD DNO. We have concluded that this is the normalisation adjustment that should be made to reflect increased staff requirements in SHEPD and we believe should be excluded from the SHEPD cost base during Totex or disaggregated regression analysis.

**Table 5iii: Additional North of Scotland staff costs based on North east depot (£k)**

<b>Increased staff numbers with SHEPD depots compared to North East</b>				
	Customer Numbers	Line Length	Line per Depot Area / km2	
Additional Staff numbers	169	102	33	
Additional Cost	£6,569k	£3,968k	£1,290k	£11,828k
Weighting	5%	45%	50%	
	<b>£328k</b>	<b>£1,785k</b>	<b>£645k</b>	<b>£2,759k</b>

**5.2.6 PMR Costs - Telecoms & IT**

With a very large geographical area which is also very difficult topographically with mountain ranges and deep valleys, there is a lack of coverage in the north and west of Scotland from major telecom companies for both operational control and communication.

Events over many years have shown where SHEPD's network is affected by power outages in storms; the telecom network is also affected as they do not have alternative supplies.

Where geographically available, operational staff utilise General Service Mobile phones (GSM) for day to day use. However, SHEPD operates and maintains its own Private Mobile Radio (PMR) network to ensure safe operation during periods of severe weather and in remote locations. This network was replaced in 2013 and has a significant level of resilience to power failures with 24 hour battery backup and also diesel generation with 7 days running stock maintained at all sites.

SHEPD operates one IT network, with the islands connecting to the main servers on the mainland. Remote PCs are centrally supported, if visits are required, mainland staff need to travel by ferry or plane and also incur accommodation costs.

The operation of our PMR system is expensive on an ongoing basis and we set out below why this system is required within SHEPD and the costs incurred in operating it.

The key reasons for utilising both GSM and PMR technologies are as follows:-

**Coverage area**

The PMR system covers many areas of SHEPD's north operating territory that GSM does not reach i.e. Northern & Western Isles, the West Coast of Scotland especially between towns, & line routes away from inhabited areas.

### **Reliability**

When the power network suffers a fault it is common for the GSM network in the same area to fail shortly after. The PMR system is supported with independent power supplies capable of maintaining continuous operation for several days, and longer subject to diesel deployment.

### **PMR – PSTN calls**

It is necessary for some operational staff to communicate with customers while out in the field i.e. storms, faults, etc. The PMR system enables communication with mainstream phone lines without the need to move from site.

### **Call prioritisation**

Public use of the GSM network increases during a storm situation which in turn decreases our chances of making a successful call. In addition to this, using PMR dispatchers, the Control Room have the ability to prioritise who to communicate with to aid recovery of major faults.

### **Severe Conditions**

An example of severe weather conditions affecting SHEPD was after the hurricane that affected Skye and the Western Isles in January 2005. On this occasion significant damage was done both to the SHEPD network but also to the mobile phone network and the physical infrastructure e.g. buildings, roads, causeways, etc. Throughout the duration of the emergency (seven days) there was no mobile coverage on the Isle of Skye owing to damage to the infrastructure and the 400 staff who were imported to the island relied on the PMR system for mobile communication.

### **Cost**

The cost incurred annually for the ongoing maintenance and operation of the PMR system is £1,350 k.

## **5.2.7 Fixed Diesel Generation**

The operation of diesel generators has historically been the way of ensuring security of supply on the islands. However, the operating costs associated with diesel generators are additional costs that other DNOs do not incur.

### **1. Shetland Isles**

The electricity network on Shetland is 'islanded', that is it is not connected to the mainland electricity network. Generation on Shetland is provided by Lerwick Power Station (67MW) and supported by BP's Sullom Voe gas turbines (60MW). The excess costs of generating and balancing supply and demand on Shetland are recovered through the Shetland balancing Costs term ( $SA_t$ ) as part of SHEPD's allowed revenue.

### **2. Western Isles**

There are two 33 kV subsea cables supplying the Western Isles, one feeding Lewis and Harris and the other feeding the Uists. There are two diesel generating stations on Lewis and Harris; one at Stornoway, which has 8 engines giving an installed capacity of 23.4 MW and one at Arnish with an installed capacity of 10.3 MW. There are also two diesel generating stations on Uist; one at Loch Carnan with 5 engines, giving an installed capacity of 9.4 MW, and one on the island of Barra, which has three engines and an installed capacity of 2.5 MW.

### **3. Orkney**

Kirkwall Power Station is the main back up to the two 33 kV subsea cables feeding Orkney and with the island demand exceeding the rating of one cable, the diesel power station is necessary to maintain security of supply. The station consists of 4 engines with an installed capacity of 16 MW.

#### 4. Argyll and West Highland

The two fixed diesel generating stations are located on Tiree and on Islay. Tiree has four engines providing a capacity of 2.6 MW, whilst Islay has three engines providing 6.2 MW.

#### 5. Total Costs

The cost of operating and maintaining all of these fixed diesel power stations (excluding Shetland) including materials, labour and external contracts has been between £1.4m and £1.8m pa over the last 3 years (see Table 1). These costs include all of the environmental costs as well as planned and unplanned maintenance required.

The fuel costs for these fixed diesel power stations have also been increasing over the last number of years as diesel costs increase. A significant amount of costs were incurred in diesel costs in 2010/11 (£5.5M) following a number of submarine cable faults that required generation to be utilised to provide back up supplies to the network. Over the past 2 years costs have been at £3.6m and £4.2m pa. We have included an average expenditure of £5.2M p.a. during the ED1 period due to the increased outages associated with our subsea cable replacement programme. We are also forecasting increased running costs during RIIO ED1 associated with Transmission outages, although we have included a lower forecast than the 2010/11 level noted above.

#### 5.2.8 Subsea Cables

Owing to the nature of the north and west of Scotland, an extensive 33kV and 11kV subsea cable network is required to take power to the different islands and also to cross sea lochs. The costs specific to subsea cables to be incurred during ED1 are covered in RIIO ED1 SSE Subsea Cables Justification Paper. However, the costs incurred during DPCR5 and included in the ED1 forecast will also require to be removed from any benchmarking or comparative analysis. We have forecasted spend on asset repair and faults for subsea cables during the ED1 period to be an estimated £59.7m.