

Operational Expenditure Business Plan Justification Paper





RIIO-T2 Operational Expenditure

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RIIO-T2 Operational Expenditure**1. Executive Summary for Direct and Indirect Operations**

Our direct and indirect operations cover an array of activity required to fulfil our regulatory and statutory obligations while delivering our overall Business Plan strategy including our 5 Goals. The direct operating costs focuses primarily on operation and maintenance of our electricity transmission system. The indirect operating costs relate specifically to our expenditure for facilitating our network operations and capital delivery activities including system planning, commercial management and customer connections, and stakeholder engagement. The indirect operating activities also includes corporate related activities such as finance, human resources, legal, procurement and IT costs. These are referred to as our Closely Associated Indirect costs (CAI) and our Business Support Costs (BSC) respectively. In estimating and justifying our operating expenditure we have considered a number of elements including:

1. **Benchmarking of our T1 and current operating expenditure** to test for efficiency compared to UK and European peers;
2. Consideration of **Real Price Effects (RPEs)** and **Ongoing Efficiency** or productivity¹;
3. **Justification** of activity and related expenditure required during RIIO-T2 compared to RIIO-T1 based on or network requirements; and,
4. **Benchmarking of our T2 operating expenditure** to test for efficiency compared to UK and European peers

As part of the steps above, we have used independent and third-party benchmarking information² and analysis as well as undertaking our own evaluation. A summary of our overall costs and activities for direct and indirect operating costs is summarised in Table 1. This includes a summary of actual and forecast RIIO-T1 and RIIO-T2 costs.

What has changed since Draft Business Plan?

Our Direct Operational costs have been reduced by £8.5m from £95.8m to £87.3m over RIIO-T2. This change is due to a review of our expenditure plans compared to our operational plans and identification of cost reductions. For our Indirect Operational costs, we have not made any material changes in our expenditure plans.

¹ Ongoing efficiency is often referred to as productivity or frontier shift and it based on a range of economic analysis of different comparator industries to electricity network activities. Consideration of initiatives, activities or investments, such as IT investment is required to avoid any double counting of productivity improvements (Ofgem Business Plan Guidance, para 3.14 and 2.63). We have considered the impact on reducing Business as Usual (BAU) costs or mitigating cost increases related to increases in the quality of service and outputs in our assessment.

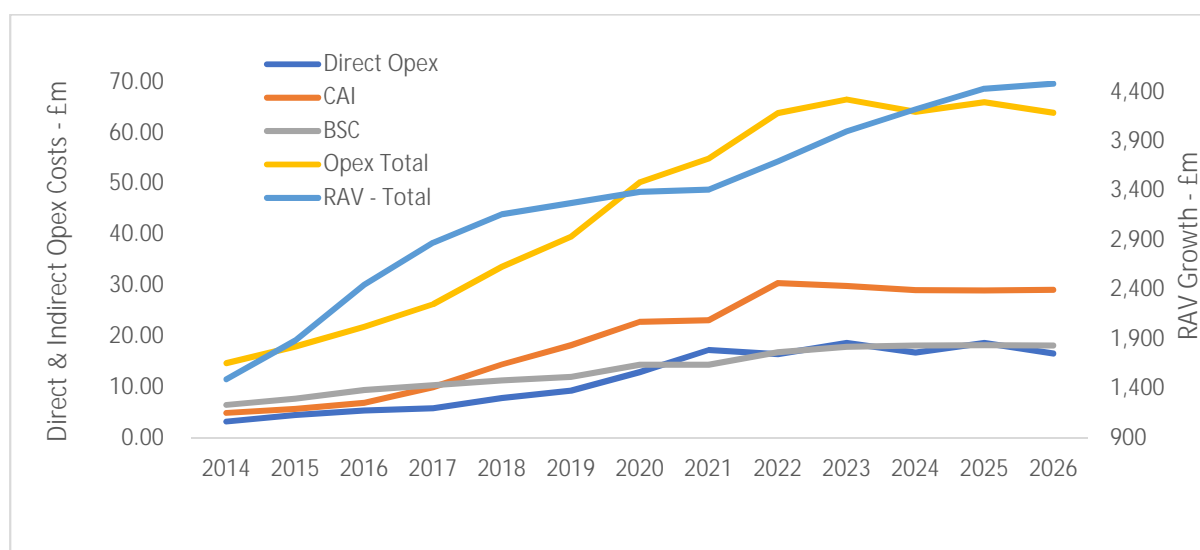
² Oxera, (Dec 2019), Cost Assessment for SHE-T

RIIO-T2 Operational Expenditure
Table 1 – Direct and Indirect Operating Expenditure Summary in T1 and T2

(£m)	T1		T2	
	Average all years*	Total (8 years)	Average all years*	Total (5 years)
Direct Operations				
Inspection, Maintenance and Other costs (inc civils)	6.6	53.2	14.3	71.4
Fault repairs	0.8	6.4	1.2	6.2
Vegetation management	0.9	7.1	1.9	9.7
Indirect Operations				
Closely Associated Indirects (net of capitalisation)	13.3	106.3	29.5	147.7
Business Support Costs (net of capitalisation)	10.8	86.4	17.9	89.5
Total	32.4	259.3	64.9	324.5

* Rounding differences

Total operational expenditure has increased over the T1 and T2 period, mainly driven by the growth in the network which is illustrated when comparing the total operating expenditure to the RAV growth (Figure 1) as a proxy for the increasing size, complexity and scale of our network. For Direct and Indirect Operations, these have been summarised below with reference to detailed supplementary supporting information.

Figure 1 – Total Operating Expenditure compared to RAV Growth over T1 and T2


RIIO-T2 Operational Expenditure

We have set out in this document the basis of our operating expenditure and demonstrate that our direct and indirect operating plans deliver the following:

- **Our RIIO-T1 and current operating expenditure benchmarks as 100% efficiency** across European and GB peers under a range of cost drivers which informs our T2 cost base.
- **Our RIIO-T2 operating expenditure will support our transition towards our ambitious goals** including aiming for 100% reliability where efficient to do so and enabling the move to NetZero.
- **Our RIIO-T2 expenditure benchmarks efficiently across our GB peers** and on initial assessment appears to continue to benchmark at 100% efficiency compared to our European peers.
- **We have contained the impact of operating cost pressures** from RPEs through a series of efficiency initiatives in line with our efficiency and operating strategy.

Overall we believe we have an ambitious and efficient direct and indirect operating plan and related expenditure compared to our peers across the UK and Europe and deliver value for consumers and stakeholders.

RIIO-T2 Operational Expenditure**2. Direct Operating Expenditure****2.1. Direct Operating Expenditure**

Our Operations and Maintenance Team perform a pivotal role in ensuring that the transmission system is operated and maintained effectively and efficiently, thus ensuring a safe, reliable and available system. Operations and maintenance are part of the wider Transmission Operations department which forms an integral part of operating under license for the transmission of electricity in the North of Scotland. We own and maintain the high voltage network electricity transmission network in our license area. Our network comprises of underground cables, overhead conductor, wooden and composite poles, steel towers and all plant and ancillary equipment within substations. This extends over a quarter of the UK land mass across some of its most challenging terrain.

We have developed our Direct Operating expenditure forecasts to ensure safe, efficient and sustainable operations and maintenance of our high voltage network and HVDC system. This ensures our expenditure plans align with our Safe and Secure Network Operation strategy. This will ensure all regulatory and statutory requirements are met along with compliance to our policy and procedures. We have a license obligation to develop and maintain an efficient, co-ordinated and economical system of electricity transmission and we believe our operating strategy aligns with those obligations.

The total cost for the T2 period is **£87.3m** covering the existing asset base and new investments required under the certain view (this therefore excludes the impact of any Uncertainty Mechanisms as set out). Our Direct Operating expenditure covers inspection, maintenance and spares for OHL cable and substations including HVDC, Fault Repairs, Vegetation Management, Civils and other operating activities. Direct Operating expenditure increased across the T1 period by **442%** which follows the RAV growth of **192%** in T1. Across T2 RAV growth continues to increase by **46%** while Direct Operating expenditure is planned to remain relatively flat despite this network growth.

Direct Operating activities are undertaken to time-based schedules that follow the manufacturers recommendations and industry best practice. Looking forward beyond 2026 as our risk-based approach is developed we expect new technologies to change our inspection and maintenance model which we plan to develop over RIIO-T2.

The Direct Operating expenditure has increased over the course of RIIO-T1 as the scale, complexity and size of our electricity network has grown. The number of assets and complexity of the electricity transmission network is a key cost driver of our expenditure levels. Figure 2 shows the main cost drivers underpinning the increase in direct operating expenditure from T1 to T2 where we have compared the final year of T1 to the final year of T2.

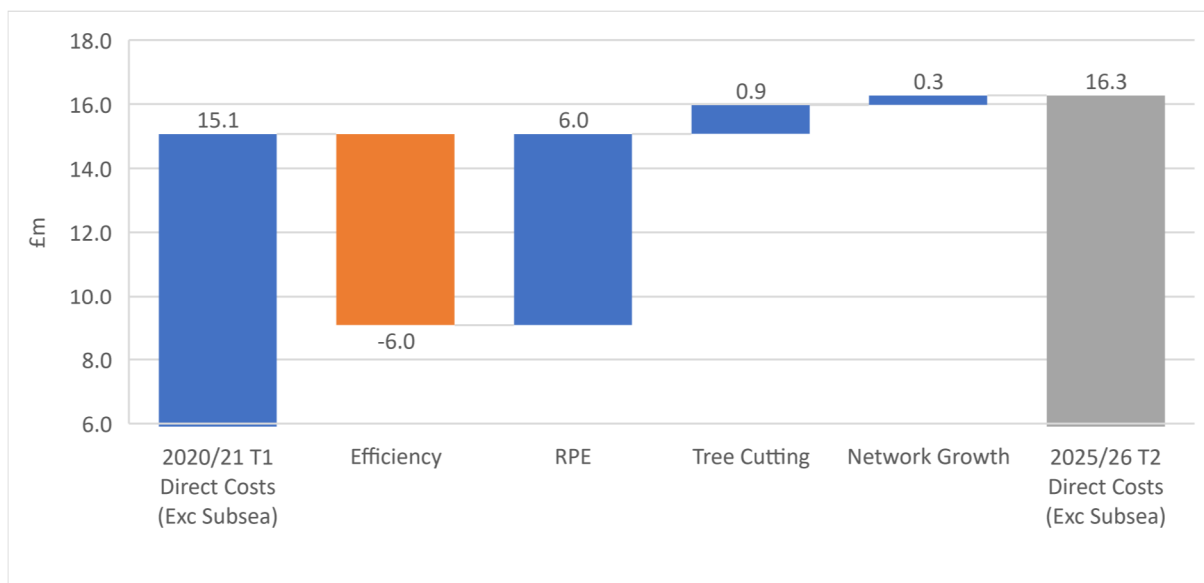
The key drivers in the cost for Direct Operating (O&M) activities for the RIIO-T2 period are as follows:

- Increased volumes of key assets (see Table 3)

RIIO-T2 Operational Expenditure

- Increased inspection criteria, driving proactive maintenance activity and condition monitoring.
- Increased use of new technology to drive better life cycle interventions which includes the use of drones, LiDAR and the use of helicopters to gather data on corona discharge and thermal hotspots.
- Subsea cable inspection and maintenance costs
- Additional Civils infrastructure costs
- HVDC maintenance and inspection

Figure 2 – Direct Operating Expenditure Analysis from T1 to T2³



The increase in costs of £1.2m between the closing year of RIIO-T1 (£15.1m) to the final year of RIIO-T2 (£16.3m) is mainly driven by a requirement to increase activity and expenditure on tree cutting. In relation to the impact of Ongoing Efficiency and RPEs these have been estimated the impact of these based on an evaluation of cost pressures and productivity. RPEs relates specifically to input price pressure on labour costs which have been offset by expected efficiency savings from a range of interventions including IT, general productivity and other related savings. As a result, we are aiming to contain cost increases with efficiency measures during the period as we transition to risk-based operations alongside other efficiency initiatives.

³ This analysis excludes subsea cable related expenditure which is infrequent and bespoke in nature as set out in the below sections. The graph therefore summarises the expenditure analysis between T1 and T2 on a BAU basis.

RIIO-T2 Operational Expenditure

2.2. Our Electricity Transmission System

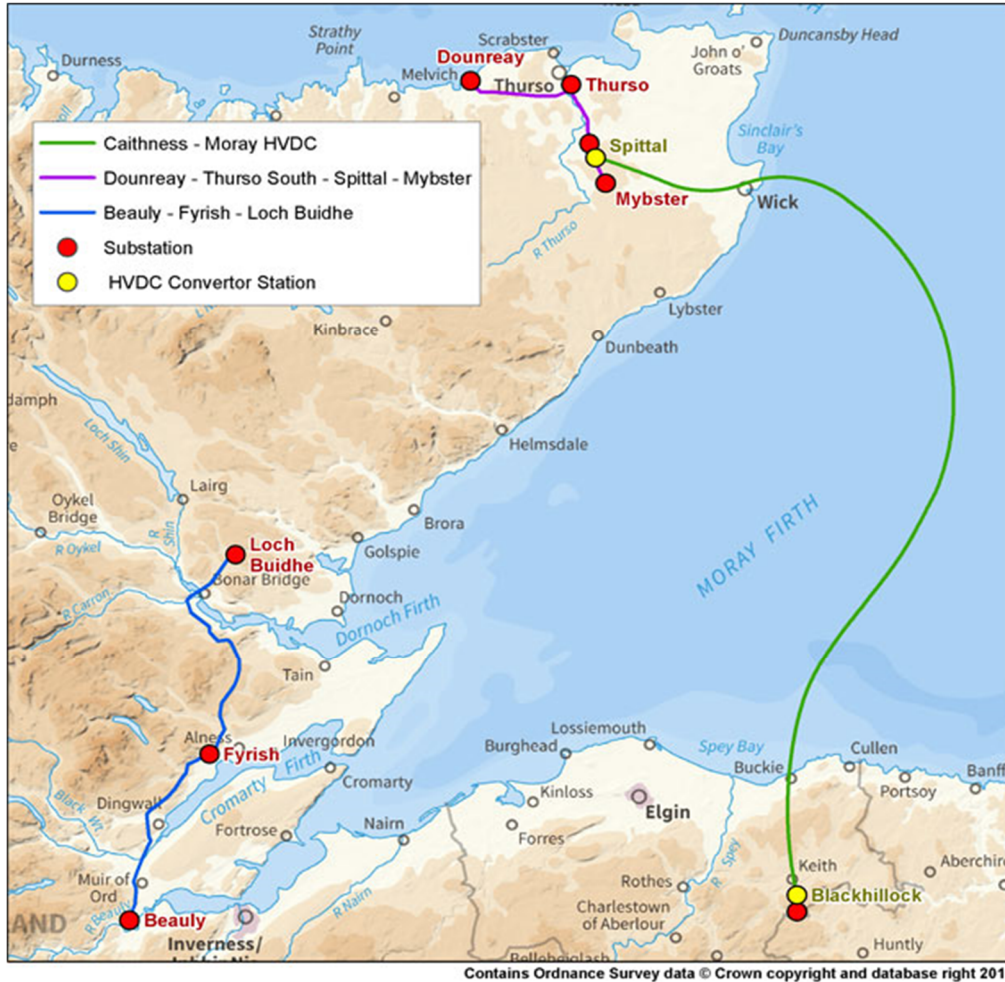
Our operating area is home to vast renewable energy resource which is being harnessed through wind, hydro and marine generation. We transport this energy, alongside that generated by more traditional methods over long distances to areas of demand both within our operating area and beyond through our transmission network to areas of demand around our towns and cities, as well as exporting energy to the rest of the UK. The growth in renewable energy has been the catalyst for the significant expansion of our network including the new HVDC link between Caithness and Moray which was commissioned in 2018. This connection has embraced innovative technology and working practices. Our priority is to provide a safe and reliable supply of electricity to our communities

Figure 3 – Existing Transmission System



RIIO-T2 Operational Expenditure

Figure 4 – Caithness Moray HVDC line and related infrastructure



Increased reliance on digital technologies is also having a significant impact on the system, moving what was a passive system in many respects, to a system with a dynamic profile introducing additional complexity in operation and maintenance activities.

Our policy and procedures have continually been reviewed and modernised to ensure operations and maintenance activities are carried out in line with regulatory and statutory requirements. Fundamental to this is ensuring compliance with the Electricity Safety Quality and Continuity Regulations 2002 -ESQCR (as amended).

The impact of climate change and the consequential increase in weather events (such as Quoich landslip, as identified in the main business plan), is another contributing factor affecting the network. Traditionally the system has been highly resilient providing a secure and reliable system. However, we must be able to respond in an adaptable and flexible manner to any event to ensure power supplies are maintained or restored quickly. The fault comparison table below shows the historic 6-year trend to date and the improvement to the reliability of the network.



RIIO-T2 Operational Expenditure

Table 2 - Year Fault History

	2014	2015	2016	2017	2018	2019
Faults Main Assets	153	182	92	98	79	102
Failures Main Assets	1	-	2	-	-	-
Sub-Cardinal Asset Faults	2	17	12	11	6	6
Sub-Cardinal Asset Failures	-	2	-	-	-	-

Source: Table C5 Faults and Failures

The Direct Operating proposals sets out our strategy for operating and maintaining the assets on our high voltage network and HVDC system, setting out the following:

- Total current Asset volumes.
- Forecast of future volumes resulting from all workstream proposals.
- Costs and volume tables for the current T1 period and future T2 period.
- Summary of costs associated with this proposal.
- Associated asset management policy, maintenance frequencies, statutory requirements – TG-NET-OPS-500

We operate and maintain all assets using systems that fulfill the requirements of ISO 55001:2014. Compliance with the Electricity, Safety, Quality, and Continuity Regulations 2002 – ESQCR (as amended) is ensured whilst also ensuring that legislative and regulatory requirements are met.

RIO-T2 Operational Expenditure
2.3. Key Asset Volumes

At present within our asset base consists of the following main asset volumes, these have seen a significant increase in the period to date of the current T1 price control. This is set out in detail in Table 3 below.

Table 3 – Asset Volumes Analysis

Assets		T1 (2014)	T1 (2021)	T2 (2026)
Substations	Count	114	149	159
Transformers	Count	193	249	258
Reactors	Count	12	17	17
Circuit Breakers	Count	482	735	838
HVDC Convertor Stations	Count	-	2	2
400/275/132kV Towers, Poles and Composite Poles	Count	10,992	11,914	12,228
400/275/132kV Conductor	Km	4,829	4,956	5,004
Land AC Cable	Km	99	210	267
Subsea AC Cable	Km	0	82	82
Land HVDC Cable	Km	0	48	48
Subsea HVDC Cable	Km	0	115	115

Note: T2 Asset Volumes as listed above are from the A7 Asset Movements Tables.

Core operational activities aligned to these assets are as follows:

- Inspection
- Maintenance – Time based and intervention dependant on condition information for both electrical plant and civil infrastructure
- Vegetation management for OHL and substations
- Defect and Fault repair
- Civil activities

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2.4. Current O&M Activities Model and Associated Costs Overview

Our existing model places and emphasis on the delivery of activities based on a well-established time-based methodology, where by inference all activities are carried out according to timeline determined by asset management timescales, as defined in our internal guidance document TG-NET-OPS-500.

These activities are based on industry best practice along with manufacturers recommendations. This has provided a basis for ensuring that the requirements of statutory, regulatory and internal policy and procedure are met.

We also undertake periodic interventions on our assets to allow us to assess and maintain their condition to ensure and achieve the anticipated asset life. Failure to complete this work may have an adverse effect on the life of the asset and increase the likelihood of failure.

The current time-based model in the period to date has seen the costs as detailed in **Table 4** which are inclusive of all direct operating costs. Based on the RIIO-T1 base line, projections have been made to the end of the T2 period.

Table 4 – Direct Operating Cost Breakdown

	2019	2020	2021	2022	2023	2024	2025	2026
	£'m	£'m	£'m	£'m	£'m	£'m	£'m	£'m
Base from RIIO-T1	5.6	5.1	5.0	5.1	5.2	5.2	5.3	5.3
HVDC service agreement & retainers	1.3	3.8	4.7	4.7	4.7	4.7	4.7	4.7
Thermal & Corona Inspections	-	-	-	0.6	0.6	0.6	-	-
Vegetation Management	1.0	1.1	1.2	1.8	1.9	1.9	2.0	2.1
Civils (incl. substn water and elec)	1.5	2.7	4.2	3.9	3.9	4.0	4.0	4.2
Sub-total (land)	9.4	12.7	15.1	16.1	16.3	16.4	16.0	16.3
Sub-sea	-	0.2	2.3	0.4	2.4	0.4	2.6	0.4
Total	9.4	12.9	17.4	16.5	18.7	16.8	18.6	16.7

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2.5. Operations and Maintenance Costs

Inspection and Maintenance costs for the period to the end of the T1 period along with the forecasted T2 costs are detailed in **Table 5** below.

Table 5 – T1 & T2 Operating and Maintenance Expenditure Summary

(£m)	T1		T2	
	Average all years*	Total (8 years)	Average all years*	Total (5 years)
Direct Operations				
Inspection, Maintenance and other costs (inc civils)	6.6	53.2	14.3	71.4
Fault repairs	0.8	6.4	1.2	6.2
Vegetation management	0.9	7.1	1.9	9.7
Total Direct Operations	8.3	66.7	17.5	87.3

*rounding differences

2.6. Overhead Lines

Inspection costs for overhead lines will increase due to the implementation of an innovative data gathering technology and helicopter flights to gather data on Corona discharge and thermal hot spots on the network. This provides transparency and quantification with regards to the volume of defects and condition of our overhead line assets. Capturing asset condition allows informed investment decisions to be taken as result of this activity. Additional benefits include that the inspection data allows remedial works to be prioritised ensuring that identified ESQCR defects are dealt with promptly and efficiently.

Policy for overhead line inspections and maintenance requires that every overhead circuit is foot patrolled on a 4-yearly cycle with increased frequency periods for ESQCR high risk sites. Top inspection activities are carried out on a 12-year cycle.

It is expected that once the data analysis is completed from these new technologies that frequencies can change to a more risk-based approach. Adopting this approach should in the long term lower overall Totex costs through better understanding of our assets along with improved intervention strategies

2.7. Cables

Cables are now more becoming common place on the our transmission system, including subsea cables connected as part of the Caithness – Moray HVDC, and Kintyre – Hunterston link. This brings increased costs associated with operating and maintaining these links due to subsea cable monitoring.

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These increased costs being realised in terms of subsea cable monitoring via geographical survey, marine survey or simple survey and remotely operated subsea vehicles (ROV). We have a license obligation from Marine Scotland to carry out these subsea surveys to ensure the cable is maintained as per its construction and avoids any further risks to other users. The ultrasonic surveys will be completed annually with a 4-yearly cycle for the ROV inspection. The inspection frequency will be risk assessed on an ongoing basis to determine any future efficiency savings in extending the inspection periodicity. Note: Subsea cable faults and associated costs are not included within the scope of this paper and will feature as part of a re-opening mechanism.

Policy for land cable inspections is to carry out visual inspection of cable sealing ends and associated components on a 3-monthly basis with 4 yearly maintenance activities. These activities ensure all statutory obligations are met along with collation of asset condition information.

2.8. Substations

Substation plant and auxiliary equipment are maintained ensuring that all statutory obligations are met and that they comply with our policy documents. The implementation of an innovative electronic platform similar to that adopted for our overhead line activities has provided the same transparency and quantification with regards to the volume of defects and condition. Additionally, condition assessment information is gathered using the same platform.

The policy is that 3 monthly inspections take place. This inspection regime is increased for ESOCR high risk sites and sites classified as of being strategic high risk and in the national interest.

These inspections include thermal imaging of electrical equipment and security of site, civil and ground conditions (including flora and fauna) found at site. These activities ensure all statutory obligations are met along with collation of asset condition information with any change of local circumstances that may influence the site security recorded for review.

With the installation of remote monitoring, we will improve our asset data collection and analysis. This initial investment is expected to reduce costs by the end of the RIIO T2 period as we will be able to adopt a more risk-based approach to asset management.

HVDC

The construction and commissioning of the Caithness – Moray link, has seen it necessary to put service agreements in place with the original equipment manufacturer to support operations and maintenance activities thus providing the most cost-effective method of the delivery of these activities in the short to medium term which is currently projected for five years from 2019. The benefits of this option include;

- Access to the HVDC Supplier's technical & intellectual property
- Technical support is provided within specified timeframes



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- De-bugging is carried out by specialists specifically trained by the HVDC Supplier
- The asset will be maintained in line with the manufacturer's recommendations (construction contract provisions)
- The HVDC Supplier has the resources available (with the correct skills & competencies) to maintain the asset (preventative maintenance, scheduled & unscheduled maintenance). Furthermore, the HVDC Supplier can provide additional trained resources as necessary for planned outage works.
- An asset management system is provided, which ensures the specific requirements of HVDC maintenance is delivered along with inventory and condition checking of spares.
- Outage periods are minimised
- Warranty obligations, which are in place for 5 years under the construction contract, are unlikely to be breached
- Performance guarantees will be monitored & measured

Due to the economies of scale and with the limited amount of HVDC equipment currently on our network, these arrangements will endure for the T2 period. However, this will be reviewed if future developments of HVDC equipment is installed to our network during the T2 period.

At present, daily, weekly, monthly and 3 monthly inspection activities take place due the technology being in early adoption within our annual maintenance activities taking place on the installed HVDC system at present.

We own and operate the national HVDC Centre, the ongoing running costs of this replica system is included with the Closely Associated Indirects (CAI) budget as this asset is not included within the live network and is used for modelling purposes only. This asset was funded through Network Innovation Competition allowances.

2.9. Vegetation and Biodiversity Management

For overhead lines, activities required to inspect and maintain require compliance with ENATS 43-8 with network resilience being achieved via a program based on ETR 132. These activities cover all asset voltages. As we improve our data gathering and analysis over the next few years, we anticipate a move towards a more risk-based approach to these activities by the end of T2. We intend to expand the use of LiDAR (3D laser surveying and mapping of overhead lines) to further assure our overhead lines against our obligations for safety, clearance infringements and tree and vegetation management. In the short to medium term it will increase cost but in longer term it is expected to drive efficiencies in the next price control period.

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Inspection and maintenance policy activities are based on a 4-yearly cycle for OHL maintenance work and resilience works with regular substation weedkilling. These activities ensure all statutory obligations are met.

A Biodiversity Net Gain Survey will be completed 5, 10 & 15 years after operational handover of all new Substations, OHL and Cables. These surveys are part of enduring sustainability objective which is a key element of the RIIO-T2 business plan.

2.10. Original Equipment Manufacturer Support

Due to the adoption of voltage sourced convertor (VSC) technology on the Caithness – Moray HVDC link, and the adoption of additional Flexible Alternating Current Transmission System (FACTS) equipment, agreements have been entered into with the original equipment manufacturer to support operations and maintenance activities. This is also being extended to technologies such as Gas Insulated Switchgear (GIS). This support providing the most cost-effective method of the delivery of these activities in the short to medium term currently projected five years from 2019. It is currently envisaged that these arrangements will remain in place beyond the current T1 period and into the T2 price control period.

2.11. Civils

The civil asset volume base has seen significant growth in line with the increased electrical infrastructure and in addition, we also have an ageing number of substations from our existing network which now require more proactive interventions to maintain their operability.

Construction designs such as the use of Gas Insulated Switchgear that are stored indoors and adherence to current specifications has seen increased costs associated with the inspection and maintenance of these assets. This infrastructure has the further challenges which is dependent upon of their location and the environmental conditions in which they are located. An example of this is Stronelairg windfarm substation which is over 2000 feet above sea level.

The civils inspection and maintenance activities are in line with current substation and overhead line timescales. Additionally, condition information is gathered through inspection and maintenance activities allowing informed investment decisions and pro-active intervention when required, to ensure asset integrity.

Example activities are as follows to ensure compliance with statutory obligations:

- Asbestos Surveys
- Drainage Inspections
- Noise Surveys where required
- Flood Plans including subsidence



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- Fire Plans
- Building inspections including roofs

2.12. Direct Operational Expenditure Conclusion

This section highlights the expanding network and the technological advances and sets out the need for the Direct Opex expenditure for Operations and Maintenance in alignment with our strategy to maintain and enhance our network resilience in line with our licensed requirement over the RIIO-T2 period and beyond.

This ensures that our current and future assets are maintained to ensure efficient operations with the adoption of new technologies and innovations, to meet our goal to aim for 100% transmission network reliability for homes and businesses whilst providing a cost-effective service in line with our stakeholders needs and expectations.

RIIO-T2 Operational Expenditure**3. Indirect Operating Expenditure****3.1 Indirect Operations Expenditure and our Structure**

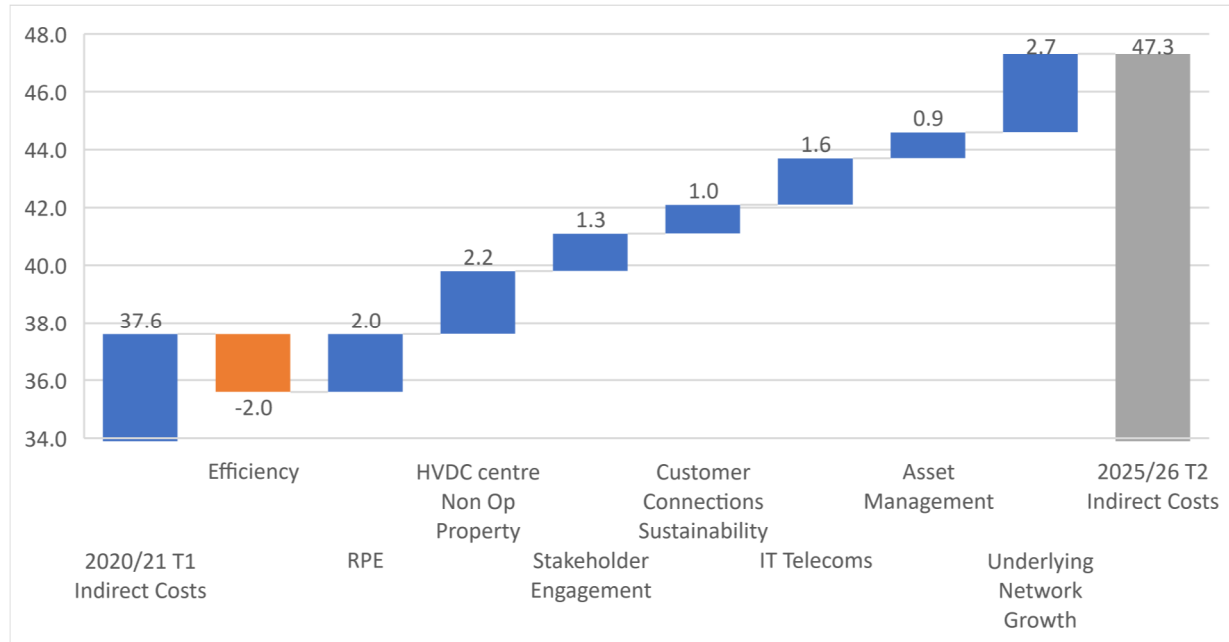
We have developed our Closely Associated Indirect (CAI) costs forecast based on the staff and related expenditure for Regulatory reporting; Stakeholder engagement; Sustainability and Environmental management; Capital delivery; Customer Connections; and Operational training. The total net cost for the T2 period is £147.7m. CAI expenditure increased across the T1 period by 368% which follows the RAV growth of 128% in T1. Across T2 RAV growth continues at 21% while CAI costs remain flat. CAI costs are covered in more detail below.

As we are part of a wider Group of Companies (SSE plc) our structure enables us to utilise an operating model which employs a range of corporate services provided by central Group functions which provides an economies of scale benefit and access to expertise as and when required at a reduced cost. This is referred to as Business Support Cost (BSC) activities and cover the following functions: Finance; Risk, Audit and Assurance; Legal; Regulation; HR; IT; Corporate Affairs; Telecoms; IT. We also receive property management and telecoms services. This operating model has not changed materially during T1 except for an increase in support required to the back-office infrastructure required to support the growing size and scale of the electricity transmission network in RIIO-T1 and expected growth in T2. The total net cost for the T2 period is £89.5m. BSC expenditure increased across the T1 period by 121% which follows the RAV growth of 128% in T1. Across T2 RAV growth continues at 21% while BSC costs increase by 8%. BSC are covered in more detail below.

The total net Indirect Operations cost for the T2 period is £237.2m and Figure 6 below shows the main cost drivers underpinning the increase in operating expenditure from T1 to T2 when considering the final year of T1 and the final year of expenditure in T2.

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Figure 5 – Net Indirect Operating Expenditure Analysis from T1 to T2⁴



The increase in net costs of £9.7m between the closing year of RIIO-T1 (£37.6m) to the final year of RIIO-T2 (£47.3m) is mainly driven by the growth of the network and delivery of our Business Plan⁵ including the 5 Goals. This has created a requirement for additional stores facilities, enhanced stakeholder engagement, improved customer connections experience, IT and telecoms upgrades along with underlying growth in resources required to deliver the T2 capital programme. RPE's have been absorbed by efficiency savings, these are discussed in more detail in the section below.

3.2 Closely Associated Indirects (CAI's) Costs

CAI's have been calculated by using the current 2019 base charge and adding to it out 2020 budget position. Thereafter the incremental cost is mainly based upon headcount growth associated with the activities and planned new policies for T2 along with other externally costed activities as noted.

The net CAI's are rising from £5m at the start of T1 2014 to £23.2m at the end of T1 in 2021. The costs rise to £30.5m in 2022 and drop back to £29m in 2026.

The growth during the T1 period is primarily driven by increased headcount mainly associated with delivering over £2bn of strategic capital investments such as Beaulieu Denny 400kv OHL and substations, Caithness Moray HVDC link and associated onshore AC works, Kintyre Hunterston 220kv subsea cable and associated substations. The overall capex programme during T1 (including TIRG) is £4bn (£3.5bn excluding Island's), which is circa £500m year. Even though capex delivery per year is falling to under

⁴ Explanation of the expenditure activities including justification of costs is set out in Business Plan Data Tables Narrative. The graph therefore summarises the expenditure analysis between T1 and T2 on a BAU basis.

⁵ This includes expenditure required to deliver the minimum standards set out by Ofgem in their Business Plan Guidance (31 October 2019).

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£400m per year, these projects still require a significant amount of resources to deliver and operate a larger network than at the start of T1.

The growth in the annual T2 net cost base of £5.8m, from £23.2m in 2021 to £29m in 2026, is driven by;

- 1) £0.8m this is a p.a. increase for the national HVDC centre which was funded via network innovation competition and is now part of our underlying cost base for T2 as agreed with Ofgem
- 2) £1.3m increase per year relating to stakeholder engagement which includes +7 WTE.
- 3) £0.6m per year relating to sustainability policies which includes +5 WTE and £300k per year external costs for assurance and accreditation including SBTI
- 4) £0.4m per year relating to an enhanced customer connections experience +7 WTE
- 5) £0.7m per year for operating our 2 new strategic storage facilities (+4 WTE North area +4 WTE South area) along with site non staff costs such as haulage and other store costs
- 6) £0.9m per year for additional asset management related staff
- 7) £0.6m operational training increase to for new trainees and existing operational staff training requirements
- 8) £0.6m increased transport and travel due to increased headcount
- 9) £3.7m relating to headcount for across all teams to support the network growth in the T2 period (such as PM's, Engineering, Environmental staff etc
- 10) We expect a reduction in annual costs of £1.3m per year due to non-repeating "Competition" work which we are not forecasting for the later years of T2.
- 11) We expect staff attrition and turnover to amount to 46 heads per annum, worth £2.5m, this has not been allocated to a specific team or function.

Our T2 forecast does not include any expenditure for unapproved SWW projects, potential volume driver mechanisms, future VISTA projects, Brexit related issue's or other uncertainties which still need to be agreed with Ofgem. This ensures consumers are protected from not having to pay unnecessary costs but also protects from costs outside of its control.

3.3 Business Support Costs (BSC's)

BSC consist of charges for corporate services, provided by the SSE Services Group company, and Telecoms services provided by SSE Telecoms, a 50% owned SSE joint venture. Business Support Costs for T2 are £89.5m (net of capitalisation) and is fairly constant through T2 between £16.9m and £18.2m

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per year. This is a £3.8m increase from our 2021 cost and is associated with having a larger and more complex network. BSC are covered in detail below.

The following corporate services are provided by SSE Services:

- 1) Provision of corporate services including Risk, Audit and Insurance, Legal, Corporate Affairs, Finance, HR, Training, Regulation, IT, Corporate Business Services and Other (consisting of Procurement, Investor Relations and Company Secretary, Facilities Management, Health and Safety, Other Corporate Services and Group Management cost).
- 2) Rental charge for occupation of head office and depot premises owned by SSE Services and utilised by SHE Transmission.

Each of these corporate services are explained in more detail below.

Provision of Corporate Services (relating to BSC only)

The costs of corporate services are allocated on the following basis: a charge is calculated via the SSE Corporate Recharge model and based on a combination of factors such as entity specific cost centers, individual managerial assessment of services provided by each corporate area to each licensee, headcount, number of staff occupying corporate properties and a general rule calculation based on operating profit, headcount, net assets & turnover within each operating division. There is no margin charged. All corporate costs are charged at cost. The methodology used to charge costs to each licensee is on the same basis as the charge to other Group Companies.

The General allocation rules and the specific allocation method adopted for each corporate area are:

SSE General Rule calculation - For several Corporate Cost centres, the general rule calculation is used. This is where it is not possible to identify a specific allocation methodology. This is a detailed calculation that takes a weighted average of 4 factors for each operating division and the legal entities within the division (Turnover, Operating profit, Net Assets and number of employees) and applies the derived percentage for each division to the appropriate corporate cost centre.

Networks General Rule Calculation - The charge from each Corporate Service identifies the total costs to be allocated to each Division (i.e. total charge to Networks Division). These charges require to be allocated between the 3 licenced entities within the division (i.e. SHEPD, SEPD and SHE Transmission). Where no specific logical allocation basis (i.e. headcount) can be identified a Network's general rule is applied to the total divisional charge. This general rule uses the same principles as the SSE General rule. A weighed average of 4 factors (Turnover, Operating profit, Net Assets and number of employees) for each individual Network entity is used to arrive at the percentage split to allocate the Networks cost to each entity.

Finance – Different finance cost centres are allocated on different bases. Group Finance, Accounts Payable, Corporate Finance, Treasury and Systems Finance are allocated on the SSE general rule basis. Accounts Payable department use the general rule. Business Finance teams such as Networks, Retail

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and Wholesale are separately ring fenced and are allocated to individual entities within each business area based on the assessment of the relevant business Director of Finance. Group Tax is allocated to each business area based on the assessment of case load by the Head of Tax. Costs associated with bank transactions and bank management are allocated on the number of bank accounts per entity.

Human Resources – Corporate HR cost centres, including payroll, recruitment, employee relations and central service centre are allocated to entities based on headcount. The cost centres for graduates, apprentices and trainees are allocated based on the number of those staff working with each business area. Corporate training cost centres are allocated based on an assessment by the Training department of the business area for which courses and training was undertaken. Pensions Department costs are allocated based on the number of pension members within each operating entity. Group Security is allocated using the assessment of the Security manager of the business units for whom he has worked and incurred costs on behalf of in the year.

Information Technology – IT recharges fall into 4 separate groupings. Firstly, there are a number of business specific teams which are charged directly to their business unit and split by legal entity based on annual activity levels. Secondly software contracts and depreciation costs are allocated to business units where software items are used by a single business unit, with remaining shared software allocated based on total IT user numbers. Corporate IT costs are charged to business units based on the weighted average of the attribution of costs in HR, Finance and Procurement. Lastly, costs not on the directly aligned segments (such as hardware maintenance, desktop support, service management) are split based on number of queries completed per directorate.

Corporate Business Services – Consists of charges for regulation, large capital project support and assurance activities. Regulation has a business specific team who are charged directly to Networks. The cost centre's costs are charged into Networks individual entities based on an assessment of workload per headcount. The cost incurred in the delivery of Large Capital projects within SHE Transmission (i.e. Project Management, design, etc) sits within the legal entity that is constructing the assets (i.e. Transmission). A central team that manages the development and monitoring of the common procedures and methodologies across all major project units sits within SSE Services. LCP support and the management and clerical cost centres are recharged to the relevant entities (Transmission, Thermal & Renewables and Generation) based on their relative value of capex spend in the year.

Legal and Compliance – Both areas have a business specific team who are charged directly to Networks. The corporate teams for litigation and claims are charged based on the number of claims by entity. Networks legal services and compliance Costs are charged into Network specific costs centres and are recharged out using the Networks General rule. Overarching costs associated with the director of the functions and more general corporate activities are recharges across the various business units using the general rule.

Risk, Audit and Insurance – There is a separate recharge mechanism for insurance costs in relation to Business interruption/property damage, for which premiums are priced by site. Therefore, the

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recharge is based on the site by site cost according to legal entity ownership. All other audit, risk teams and insurance costs are allocating according to the SSE general rule.

Corporate Affairs – This area is split into business specific cost centres. There is a separate cost centre for staff that carry out work on behalf of the 3 licensed network entities. The costs of this cost centre are allocated between the 3 network businesses based on the Networks general rule. All internal communications have been allocated based on headcount, whilst a number of other cost centres such as Public Policy and External Relations have been allocated based on the SSE general rule basis.

Procurement and Logistics – Procurement is split into business facing teams (one for Transmission, one for Distribution combined) which are allocated directly to each business unit. Other procurement functions, including IT, Corporate procurement and Supplier relationship management costs are allocated according to the SSE general rule. Logistic costs are recharged through SSE Stock.

Other Corporate Services – Group Directors cost centres are split based on the SSE general rule. A small number of other costs centres such as corporate other and Group Travel desk are allocated using the general rule basis. These methods are consistent with previous year's recharges.

Investor Relations and Company Secretary - The Company Secretarial department and Investor Relations are allocated out based on the SSE general rule.

Group Change – consists of cost centres for travel desk, innovation, change and efficiency programmes. These are allocated using the group general rule.

Rental Charge for Occupation of Head Office and Depot Premises

The terms of the rental charge for occupation of head office and depot premises are: a rental charge based on external rental values for each geographic location and property type taken from the published Valuation Office Agency (SEPD) / Scottish Ratings Assessor (SHEPD and SHE Transmission) publicly available rental value charges. Where properties are occupied by different operating entities the charge for each property is split based on area of the premises occupied by each entity.

The following telecoms services are provided to us by SSE Telecoms of which SSE plc has retained a 50% holding of the SSE Telecoms company since March 2019:

- 1) Data network and full telephony services

The terms of supply are: SSE Telecoms operates a telecoms costs incurred on behalf of SSE Group companies and allocates specific cost categories between operating divisions based on a range of factors such as divisional headcount, actual telephony usage, specific divisional cost allocation and a general allocation rule. This service has not been formally benchmarked against third party service providers since the time of business separation in 2001. However regular comparisons are made with charges made by SSE Telecoms to external customers to ensure that the charges made to other Group

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Companies are reasonable. All contracts placed with suppliers of goods and services to SSE Telecoms are subject to SSE plc procurement policy and therefore subject to formal competitive tendering processes. A margin is charged on these services. This margin is based on a similar level of margin that SSE Telecoms use to charge 3rd Party customers.

Provision of professional services over and above base telecoms services. These services consist of support for ongoing specialised support required after the initial element of project specific work. All contracts placed with suppliers of goods and services to SSE Telecoms are subject to SSE plc procurement policy and therefore subject to formal competitive tendering processes. These are booked directly to the relevant company.

Provision of Network specific project support, such as BT 21st Century works and fibre works as part of wider Network work. All contracts placed with suppliers of goods and services to SSE Telecoms are subject to SSE plc procurement policy and therefore subject to formal competitive tendering processes. These are booked directly to the relevant company.

The Gross business support costs are set out in BPDT D4.6 BS and show the costs rising from £8.1m at the start of T1 2013/14 to £17.5m at the end of T1 in 2020/21. The costs rise to £20.0m in 2021/22 and rise further to £21.3m at the end of T2 period 2025/26.

The growth in the gross cost base of £3.8m, from £17.5m to £21.3m, is driven by;

- 1) £0.7m increase per year in property management costs following the completion of two new store facilities, a new control room, National HVDC centre and additional office space to accommodate our increased staff base.
- 2) £1.6m increase per year in IT & Telecoms charges due to the expanding data network requirements as the physical network grows and increased data and telephony charges as the headcount increases to support the network growth
- 3) £0.7m increase per year in HR costs to support stakeholder engagement and non-operational staff training and to provide support as the headcount increases and the workforce continues to age
- 4) £0.8m increase in other back office support functions as insurance, finance, regulation and procurement costs are increased to support the network growth and the increased regulatory & compliance reporting and efficiency drives

Our T2 forecast does not include any expenditure for unapproved SWW projects, potential volume driver mechanisms, future VISTA projects, Brexit related issue's or other uncertainties which still need to be agreed with Ofgem. This ensures both consumers are protected from not having to pay unnecessary costs but also ensures costs outside of our control are mitigated.

RIIO-T2 Operational Expenditure**4. Cost Benchmarking and Efficiency Assessment****4.1 Independent Efficiency and Benchmarking of Operating Expenditure**

As part of evaluating our direct and indirect operating expenditure we assessed our operating expenditure against a range of domestic and international comparators. This has allowed us to measure our relative efficiency for our Direct and Indirect Operating Expenditure for European Comparators and UK Peers. This is to ensure we are delivering our outputs and fulfilling our regulatory and statutory obligations efficiently⁶.

We participated in the Transmission Cost Benchmarking project commencing in 2018 where data was collated across European Transmission System Operators (TSOs) by Sumicsid and the Council of European energy regulators (CEER). We undertook our own analysis of our UK peers as well as undertaking a separate study with Oxera⁷ to review the CEER benchmarking of European TSOs.

Oxera analysed Sumicsid's benchmarking models for total operating expenditure to 31 March 2018 and concluded that when comparing to the Totex models, SHE Transmission's operating expenditure is estimated at 100% efficient using Sumicsid's definitions. Although Oxera note that there are limitations with the CEER study, they undertook a range of sensitivities to test the robustness of the analysis and concluded that SHE-T's total operating expenditure was still evaluated as 100% efficient. This is compared to 17 European peers including our UK peers, whereby in order for our total operating expenditure to be considered inefficient on this historical basis our total operating expenditure would need to increase by 25% to be below the 100% efficiency assessment. In considering the cost drivers such as length of network, scale of Totex, or other factors, Oxera conclusions remain unchanged.

They also note that our total, direct and indirect operating expenditure either collectively or individually is significantly below our UK peers when considering the length of our network as of 2017/18. Oxera also concluded that when benchmarking Business Support Costs and Closely Associated Indirects with our UK peers, we are significantly lower in cost. This illustrates our total operating expenditure is efficient relative to UK and European peers for T1 and this expenditure level informed our assessment of our T2 proposed operating expenditure levels.

⁶ Ofgem's Business Plan Guidance (31 Oct 2019) requires an assessment of RPEs (para 2.61), Ongoing Efficiency (para 2.62) and also efficiency assessment (para 3.14) using historical, UK and international comparators.

⁷ Oxera (Dec 2019), Cost Assessment for SHE-T

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4.2 Internal Benchmarking GB TOs Direct Operating Expenditure

To support this cost base and to provide evidence of our relative efficiency in the T1 period we have compared the published annual reports of Scottish Power & National Grid (published 30th Sept 2019) and have detailed out the Direct Opex, CAI's, BSC's and Total Opex below expressed as a ratio to Totex and then against RAV. The RAV details have been extracted from the PCFM models published on Ofgem's website as well as our TOs RIIO-T2 Business Plans as of July 2019. The results are below:

Table 6 – Direct Opex in T1 as a % of Totex

DO as a % of Totex	2014	2015	2016	2017	2018	2019	2020	2021	Total
SHE Transmission	1.7%	1.4%	1.2%	1.2%	1.3%	1.5%	1.7%	2.0%	2.0%
SP	3.4%	3.3%	2.9%	2.7%	2.8%	3.0%	3.6%	4.0%	4.0%
NGET	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%

Table 7 – CAI's in T1 as a % of Totex

CAI's as a % of Totex	2014	2015	2016	2017	2018	2019	2020	2021	Total
SHE Transmission	2.5%	1.5%	1.2%	2.0%	3.3%	5.3%	5.5%	5.1%	3.2%
SP	2.3%	1.8%	1.9%	2.2%	2.4%	4.0%	4.0%	3.5%	2.6%
NGET	5.7%	7.2%	6.5%	7.4%	6.8%	8.5%	6.7%	5.5%	6.7%

Table 8 – BSC's in T1 as a % of Totex

BSC's as a % of Totex	2014	2015	2016	2017	2018	2019	2020	2021	Total
SHE Transmission	3.3%	2.1%	1.7%	2.0%	2.4%	3.3%	3.3%	3.1%	2.5%
SP	4.2%	3.9%	4.2%	5.0%	6.0%	10.2%	6.5%	6.2%	5.5%
NGET	5.1%	7.6%	7.2%	7.5%	9.2%	9.1%	7.2%	5.9%	7.2%

Table 9 – Total Opex in T1 as a % of Totex

Opex as a % of Totex	2014	2015	2016	2017	2018	2019	2020	2021	Total
SHE Transmission	7.5%	4.8%	3.8%	5.2%	7.5%	11.3%	11.9%	11.9%	7.8%
SP	9.8%	8.8%	8.3%	10.0%	12.0%	19.6%	18.5%	16.7%	12.3%
NGET	17.1%	24.9%	23.6%	23.1%	25.9%	28.7%	22.6%	18.5%	22.6%

As can be seen in the ratio's above, our cost base is relatively lower than our peers consistent with Oxera's analysis as well as that of our RIIO-T2 analysis.

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Within CAIs we have the cost of some senior engineers and managers who do carry our direct duties (touch the assets) but it has been agreed with Ofgem to leave these within CAI's rather than allocate back to Direct Opex. Below is the detailed ratios expressed as a percentage of RAV.

Table 10 – Direct Opex in T1 as a % of RAV

DO as a % of RAV	2014	2015	2016	2017	2018	2019	2020	2021
SHE Transmission	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.4%	0.5%
SP	0.6%	0.5%	0.4%	0.4%	0.3%	0.4%	0.8%	0.7%
NGET	0.9%	1.0%	1.0%	0.8%	0.8%	0.9%	0.8%	0.8%

Table 11 – CAI's in T1 as a % of RAV

CAI's as a % of RAV	2014	2015	2016	2017	2018	2019	2020	2021
SHE Transmission	0.3%	0.3%	0.3%	0.3%	0.5%	0.6%	0.7%	0.7%
SP	0.4%	0.3%	0.3%	0.3%	0.2%	0.3%	0.4%	0.4%
NGET	0.8%	0.7%	0.6%	0.7%	0.6%	0.7%	0.6%	0.6%

Table 12 – BSC in T1 as a % of RAV

BSC as a % of RAV	2014	2015	2016	2017	2018	2019	2020	2021
SHE Transmission	0.4%	0.4%	0.4%	0.3%	0.3%	0.3%	0.4%	0.4%
SP	0.7%	0.7%	0.7%	0.8%	0.6%	0.8%	0.6%	0.6%
NGET	0.7%	0.7%	0.7%	0.7%	0.8%	0.7%	0.7%	0.6%

Table 13 – Total Opex in T1 as a % of RAV

Opex as a % of RAV	2014	2015	2016	2017	2018	2019	2020	2021
SHE Transmission	1.0%	1.0%	0.9%	0.9%	1.0%	1.2%	1.5%	1.6%
SP	1.7%	1.5%	1.5%	1.5%	1.2%	1.4%	1.87	1.8%
NGET	2.3%	2.4%	2.4%	2.1%	2.1%	2.2%	2.2%	1.9%

Note the figures above relate to a net CAI position not gross, as we are unable to find data on the capitalisation rates for SP and NGET.

As can be seen in the ratio's above, SHE Transmission fairs favorably against its peers in most Opex categories. Within CAIs we have the cost of some senior engineers and managers who do carry our direct duties (touch the assets) and it has been agreed with Ofgem to leave these within CAI's rather than allocate back to Direct Opex.

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For Opex overall, our costs are lower than both its peers and despite the huge growth during the last 10 years, we have been able keep its operational costs down.

To support this cost base and to provide evidence of our relative efficiency in the T2 period we have compared the published draft business plans of Scottish Power and National Grid and where data was unavailable (for example RAV) assumed values and gross costs. This analysis is expressed below by Direct Opex, CAI and BSC expressed as a ratio to Totex and then against RAV. The results are below:

Table 14 – Direct Opex in T2 as a % of Totex

DO as a % of Totex	2022	2023	2024	2025	2026	Total
SHE Transmission	3.7%	3.2%	3.3%	3.8%	5.0%	3.7%
SP	5.7%	4.5%	4.9%	6.2%	8.8%	5.7%
NGET	6.8%	6.8%	6.8%	6.8%	6.3%	6.7%

Table 15 – CAI's in T2 as a % of Totex

CAI as a % of Totex	2022	2023	2024	2025	2026	Total
SHE Transmission	11.5%	9.0%	10.1%	10.2%	15.4%	10.9%
SP	11.9%	9.2%	10.3%	12.7%	16.5%	11.6%
NGET	4.1%	4.1%	4.1%	4.1%	3.8%	4.0%

Table 16 – BSC in T2 as a % of Totex

BSC as a % of Totex	2022	2023	2024	2025	2026	Total
SHE Transmission	4.4%	3.6%	4.2%	4.3%	6.4%	4.5%
SP	6.8%	5.3%	5.9%	7.3%	9.4%	6.7%
NGET	9.5%	9.5%	9.5%	9.5%	8.9%	9.3%

Table 17 – Total Opex in T2 as a % of Totex

Total Opex as a % of Totex	2022	2023	2024	2025	2026	Total
SHE Transmission	19.6%	15.8%	17.6%	18.4%	26.8%	19.0%
SP	24.5%	19.1%	21.1%	26.2%	34.7%	24.1%
NGET	20.3%	20.3%	20.3%	20.3%	19.0%	20.0%

As can be seen in the ratio's above, our costs are lower relative to our peers in most operating cost categories. We have also assessed our operating costs as a percentage of RAV.

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Table 18 – Direct Opex in T2 as a % of RAV

DO as a % of RAV	2022	2023	2024	2025	2026
SHE Transmission	0.4%	0.5%	0.4%	0.4%	0.4%
SP	0.6%	0.6%	0.5%	0.5%	0.6%
NGET	0.7%	0.7%	0.7%	0.6%	0.6%

Table 19 – CAI in T2 as a % of RAV

CAI as a % of RAV	2022	2023	2024	2025	2026
SHE Transmission	1.4%	1.3%	1.2%	1.1%	1.1%
SP	1.3%	1.2%	1.1%	1.1%	1.1%
NGET	0.4%	0.4%	0.4%	0.4%	0.4%

Table 20 – BSC in T2 as a % of RAV

BSC as a % of RAV	2022	2023	2024	2025	2026
SHE Transmission	0.5%	0.5%	0.5%	0.5%	0.5%
SP	0.8%	0.7%	0.7%	0.6%	0.6%
NGET	1.0%	0.9%	0.9%	0.9%	0.9%

Table 21 – Total Opex in T2 as a % of RAV

Total Opex as a % of RAV	2022	2023	2024	2025	2026
SHE Transmission	2.4%	2.3%	2.1%	2.0%	2.0%
SP	2.7%	2.5%	2.3%	2.3%	2.3%
NGET	2.1%	2.0%	2.0%	1.9%	1.9%

We therefore believe we benchmark efficiently during the RIIO-T2 period based on several factors. Our T1 cost base scoring 100% relative efficiency score in the Sumicsid benchmarking review as assessed by Oxera. Also our own internal review of benchmarking against our peers shows we have a relatively lower operating cost base despite the growth in our network.

Our T2 cost base is efficient on a totex and RAV comparison across our peers with only CAI appearing higher than National Grid which is not an indication of lack of efficiency given nature of our network. For example, Oxera identified the length of network as an appropriate measure for an electricity network with a profile similar to ours.

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4.3 Real Price Effects and Ongoing Efficiency

Real Price Effects (RPEs) is consistent with our RPE policy⁸ whereby we are not advocating an allowance based on an indexation mechanism as set out in that document. We have however, undertaken analysis with Oxera to estimate the impact of RPEs for labour costs which they have quantified as 0.46% of Totex. Applying this to direct and indirect operating expenditure, it amounts to 0.86% p.a. thereby applying a cost increase in T2.

Also, Oxera undertook analysis of ongoing productivity or Total Productivity Factor (TFP) that would apply to Totex as well as split between capital and operating expenditure. In doing so, Oxera identified that it is reasonable to forecast a TFP for operating expenditure of 0.3% to 0.8% per annum during T2. This is detailed in the below table 22 whereby cost increases expected from labour price pressures are expected to be offset by changes in ongoing efficiency:

Table 22 – Summary of Ongoing Efficiency and RPE analysis

	Ongoing efficiency	Real price effect	Net frontier shift
OPEX	0.5-0.9%	0.86%	0%
CAPEX	0.3-0.8%	0.43%	0-0.4%
TOTEX	0.3-0.8%	0.46%	0-0.4%

Source: Oxera Analysis

We have applied a TFP on underlying Business as Usual (BAU) operating expenditure and not additional activities driving further operating expenditure. We estimate a frontier shift for Totex in the range of 0–0.4% p.a. for Totex and Capex and 0% for Opex and we recommend an ex ante labour RPE forecast of 0.46% p.a. for Totex, 0.86% for Opex and 0.43% for Capex. We have included this as part of our expenditure analysis for RIIO-T2 as set out in this document.

⁸ SHE-T Real Price Effects Policy for RIIO-T2 (Dec 2019)