

UK Power Networks

Business plan (2015 to 2023)

Core narrative

March 2014

A reliable... an innovative...
and the lowest price electricity
distribution group. 



Foreword



I am delighted to present a high level summary of our final 2015 to 2023 Business Plan for RIIO-ED1 which aims to maintain UK Power Networks as a reliable, innovative and the lowest price network group in Great Britain. We have consulted widely with our stakeholders and customers and incorporated their feedback in the development of these plans.

The detailed comments we have received from stakeholders, together with our own internal work, have allowed us to develop our RIIO-ED1 business plans which will deliver value for money for our customers and stakeholders over the long term. Our final business plans will allow us to achieve upper third performance amongst the 14 distribution networks in Great Britain in the areas of safety, network reliability and quality, customer service, cost efficiency and employee engagement.

Since our formation as UK Power Networks more than three years ago, I am pleased that we have delivered a step change in performance. We have done this whilst innovating to ensure the optimal solutions on our networks and at the same time being socially responsible to take account of the needs of vulnerable customers. Customer interruptions and customer minutes lost improved by 30% and 42% over the last three years. We are ahead of plan on network investment as measured by load and health indices, customer service is improving, we are making cost savings that we will pass on to customers, and most importantly the safety of our network continues to improve. We have also made significant improvements in connections customer service, and in facilitating competition in connections services provision. Our stakeholders have told us there is still more to do in customer service and connections, so we will build on these improvements through our transformation project, which is focused on modernising our processes and systems to be in line with best practice. This project is fully funded by our shareholders, and will deliver sustainable future improvements including service enhancements and cost savings for customers.

Innovation is at the core of our culture of continuous improvement, and our plan fully embraces the transition to a smart grid over the next two price control periods. We already use many 'smart' techniques as evidenced by the high asset utilisation, relatively low cost of our services, and high network reliability. Our RIIO-ED1 plan incorporates significant savings from smart network operations. We have proved our ability to deliver on difficult assignments as evidenced by faultless electricity distribution during the London 2012 Olympic and Paralympic games and a number of other world events that have taken place in London and other parts of our region.

We are planning to spend £6.6 billion during RIIO-ED1 to deliver our outputs. This is an increase of 3% on an equivalent DPCR5 period (8 years) as a result of new activity (smart metering) and an ageing asset base. In today's tough economic climate, demands on customers are increasing and we are very conscious that whilst electricity distribution costs represent only around 16% of the electricity bill, we have our part to play in making electricity affordable. Therefore, I am pleased that our final plan offers upfront price decreases in 2015 of 9% in real terms on average across our three networks, with average prices during RIIO-ED1 2% below the end of DPCR5. We expect that this will maintain UK Power Networks' average prices as the lowest of the network groups in Great Britain.

A handwritten signature in black ink, appearing to read 'Basil Scarsella'.

Basil Scarsella
Chief Executive



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This narrative document has been updated to reflect UK Power Networks' March 2014 business plan. We have a tracked change version for the purpose of informing Ofgem of revisions to the July 2013 business plan, should this be required.

1

Introduction

1.1 The objective of our business plan

UK Power Networks' RIIO-ED1 (2015-2023) business plan has been created to meet the following objectives:

- To deliver a “well-justified plan”, through a robust process (Section 8), including comprehensive stakeholder engagement (Chapter 9)
- To deliver the outputs that our customers, stakeholders and regulator expect from us (Chapter 4)
- To ensure that our proposed expenditure is efficient and prudent (Chapter 5), and reflects savings from innovation (Chapter 10)
- To ensure that our financing proposals and our revenues reflect the market and are efficient, (Section 5) and that our prices are reasonable (Chapter 7)
- Propose a balanced approach to deal with uncertainty and risk (Chapter 11)

We look forward to discussing our plan with our regulator, Ofgem, and our customers and stakeholders. .

1.2 Purpose of this document

This core narrative describes the April 2015 to March 2023 (RIIO-ED1) final business plans of UK Power Networks' licence holding companies, Eastern Power Networks (EPN), London Power Networks (LPN) and South Eastern Power Networks (SPN) (collectively referred to as the Networks). Our final business plans set out what we plan to deliver for customers, how we have engaged with stakeholders to produce the plans, and what the plans will cost.

This core narrative describes the key aspects of the final business plans, and guides the reader to further sources of information provided in other parts of the business plan package of documents, discussed below.

This document is structured as follows:

Table 1 Structure of document

Section	Title	Contents
1	Introduction	A guide to this document and the package of documents that make up our business plan
2	Who we are and what we do	An introduction to UK Power Networks and our role as an electricity distributor
3	Our track record	Our achievements since our creation in 2010, and the benefits that we have delivered to customers and stakeholders
4	Our 77 output commitments	What we will deliver for customers and other stakeholders
5	Cost of delivery	Our expenditure plans
6	Financing our plan	Our assumptions regarding the revenues we will need to finance our plan
7	Impact on customers' bills	Forecast average bills for key customer types
8	Business plan development	Our strategy and how we have developed our plan
9	Stakeholder engagement	The engagement we have undertaken with stakeholders and how it has influenced our plan
10	Innovation	Our innovation strategy and the benefits to customers
11	Risk, uncertainty and incentives	How we will mitigate risk and uncertainty

1.3 The package of business plan documents

This document is one part of a suite of integrated documents that provide varying degrees of detail on our plans to meet the various requirements and interests of different readers. Figure 1 below illustrates the package of documents. These documents are accessible on our web site at: www.ukpowernetworks.co.uk/internet/en/have-your-say/business-plan-2015

The One Page Summary and Executive Summary documents provide shorter summaries of the business plan. Readers seeking more detailed information may wish to consult the supporting documents including:

- The Process Overview
- The Innovation Strategy
- Annex Documents

Figure 1 The suite of business plan documents

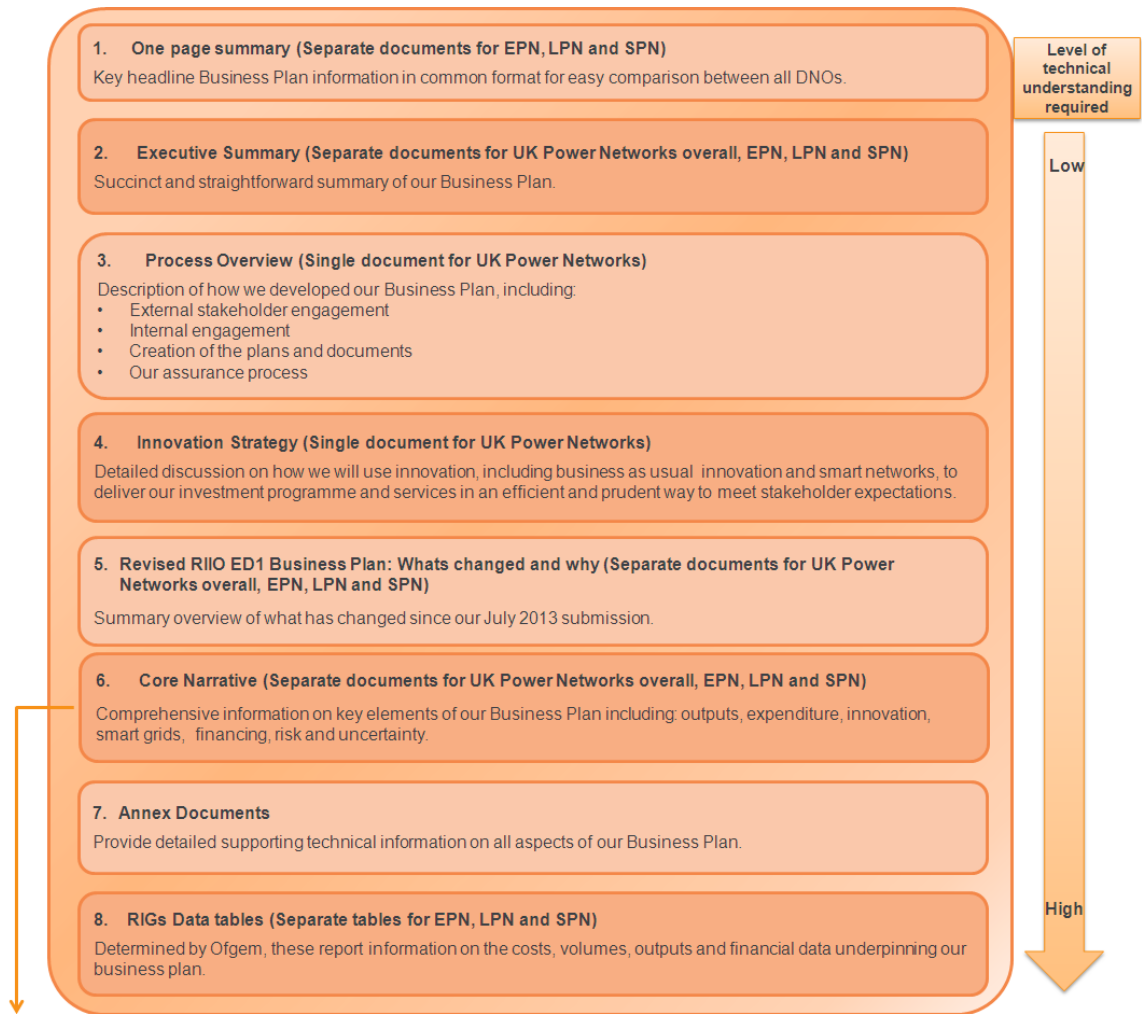
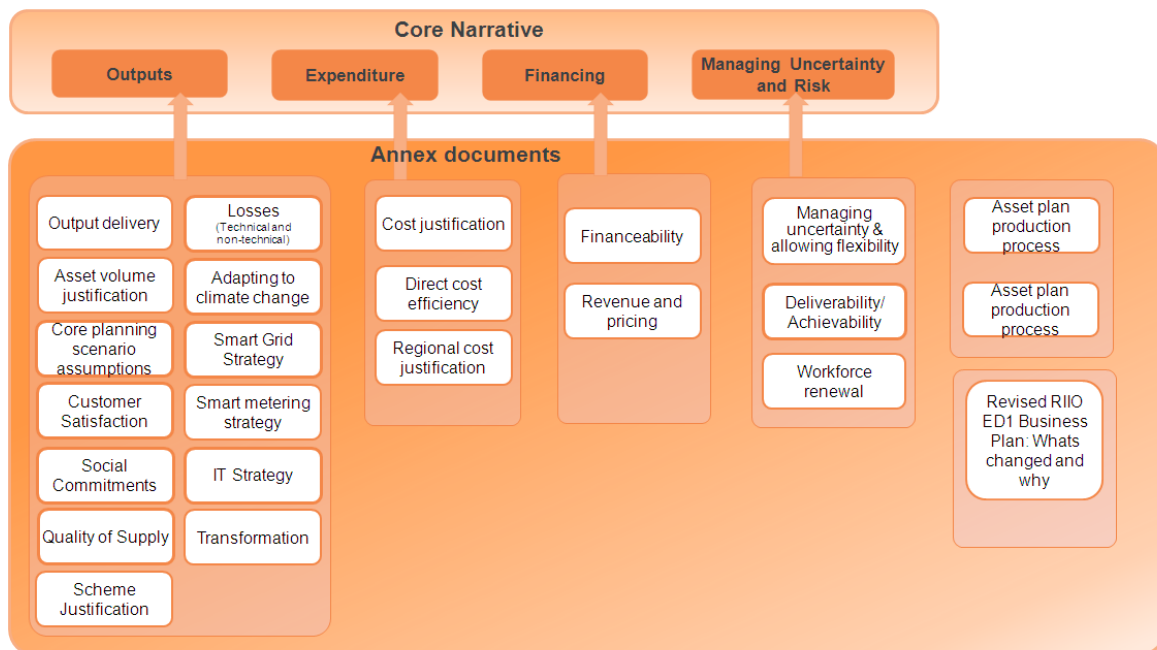


Figure 2 Interdependencies between core narrative and annexes



2 Who we are and what we do

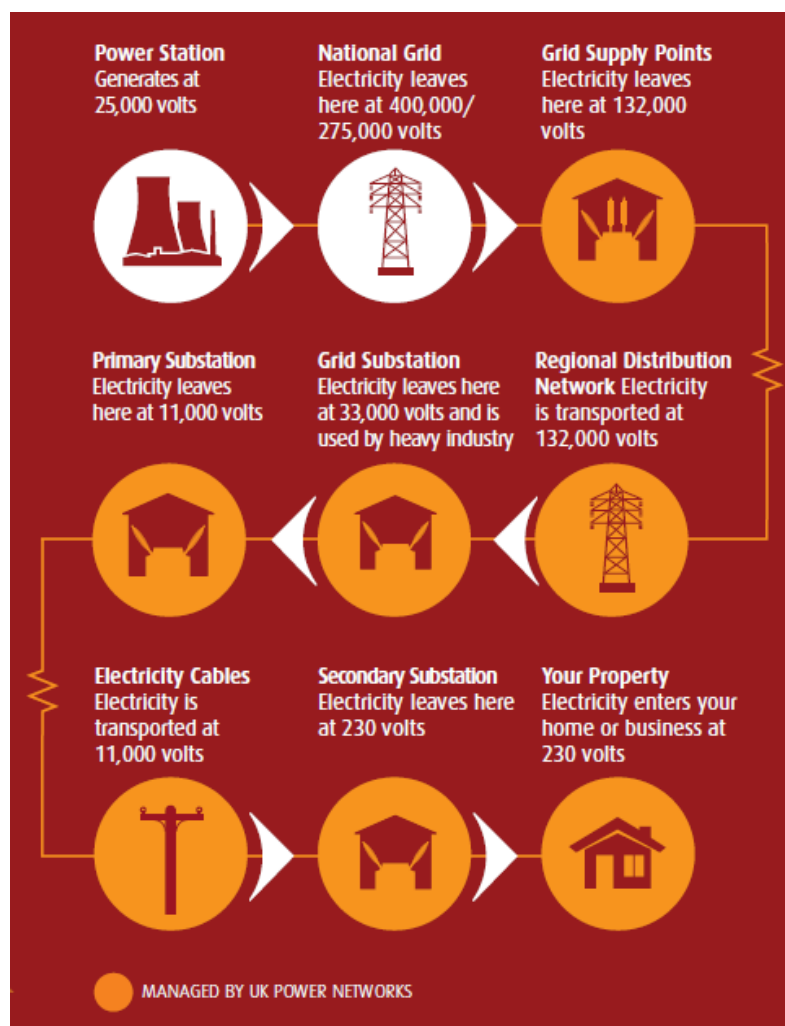
2.1 Business overview

UK Power Networks owns, operates and manages three of the fourteen electricity distribution networks (DNOs) in Great Britain:

- London Power Networks (LPN)
- Eastern Power Networks (EPN)
- South Eastern Power Networks (SPN)

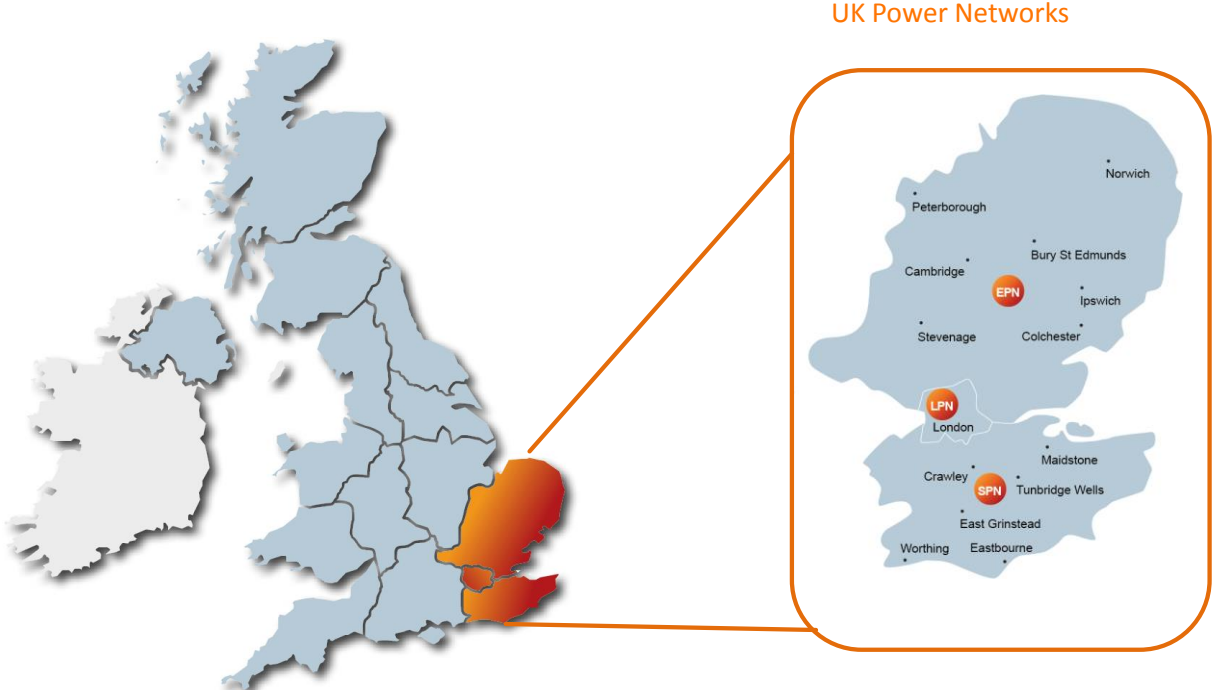
We are a pure network operator, we do not generate or buy electricity nor do we sell it to end customers. The picture below illustrates the various stages in the electricity supply chain and highlights those which involve UK Power Networks. Figure 3 illustrates what we do and our role in the supply chain.

Figure 3 What we do



In the UK, electricity distribution charges make up around 16% of the end customer bill. Collectively, we are the largest electricity distribution group in the UK in terms of customer numbers and energy delivered and we cover an area of approximately 30,000 km². This extends from the Wash in the east, through London, to Littlehampton on the Sussex coast. Our networks operate in the most challenging, fastest growing, and highest cost part of the country. Figure 4 shows where we operate:

Figure 4 Where we operate



Our key responsibility is to 'keep the lights on' and:

- Maintain the safety and reliability of our electricity networks
- Efficiently connect new customers, including generators, to our electricity networks
- Restore supply to customers who experience an interruption as quickly as possible
- Use innovation appropriately to continually improve efficiency and the services we provide to our customers
- Facilitate a low-carbon environment by investing in assets, processes and initiatives that minimise the effect that our network has on the environment
- Extend and upgrade the network to meet our customers' future needs

As our networks are natural monopolies and we only face competition in limited areas such as connections, our outputs, costs and prices are regulated by Ofgem, the economic regulator for the UK electricity and gas utility sector. Each of our three networks has a separate distribution licence from Ofgem. Table 2 shows the key features of our networks.

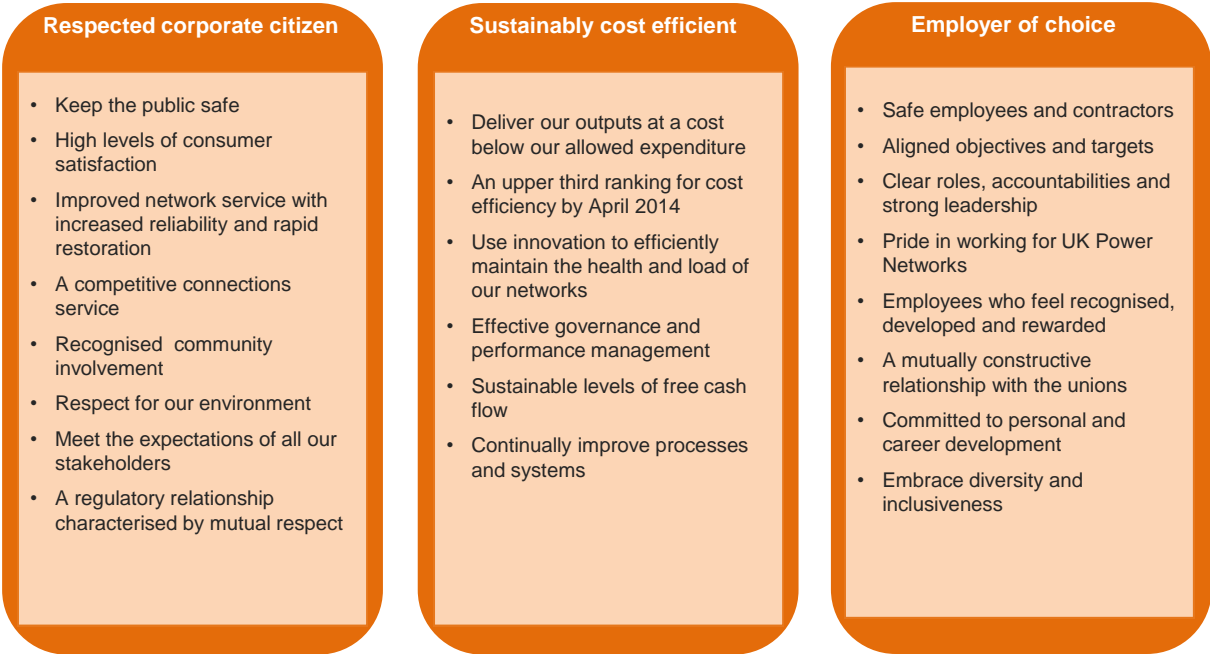
Table 2 Features of UK Power Networks' distribution system

Features	Figures			
	EPN	LPN	SPN	UKPN
Land area (km ²)	20,300	650	8,300	29,250
Number of customers (million)	3.56	2.28	2.26	8.09
Kilometres of underground cable	62,000	37,000	40,000	139,000
Kilometres of overhead lines	34,000	n/a	12,500	46,500
Number of poles	497,230	n/a	206,225	703,455
Number of transformers	69,000	15,700	35,000	119,700
Maximum system demand (MW)	6,408	5,167	4,107	n/a
Electricity delivered (GWh)	35,109	28,723	20,993	84,825
Load density (MW per km ²)	0.32	7.95	0.49	n/a
Number of new connections per annum (metered)	14,570	12,900	9,150	36,620
Number of new connections per annum (un-metered)	7,750	3,250	7,230	18,230

2.2 Our vision and values

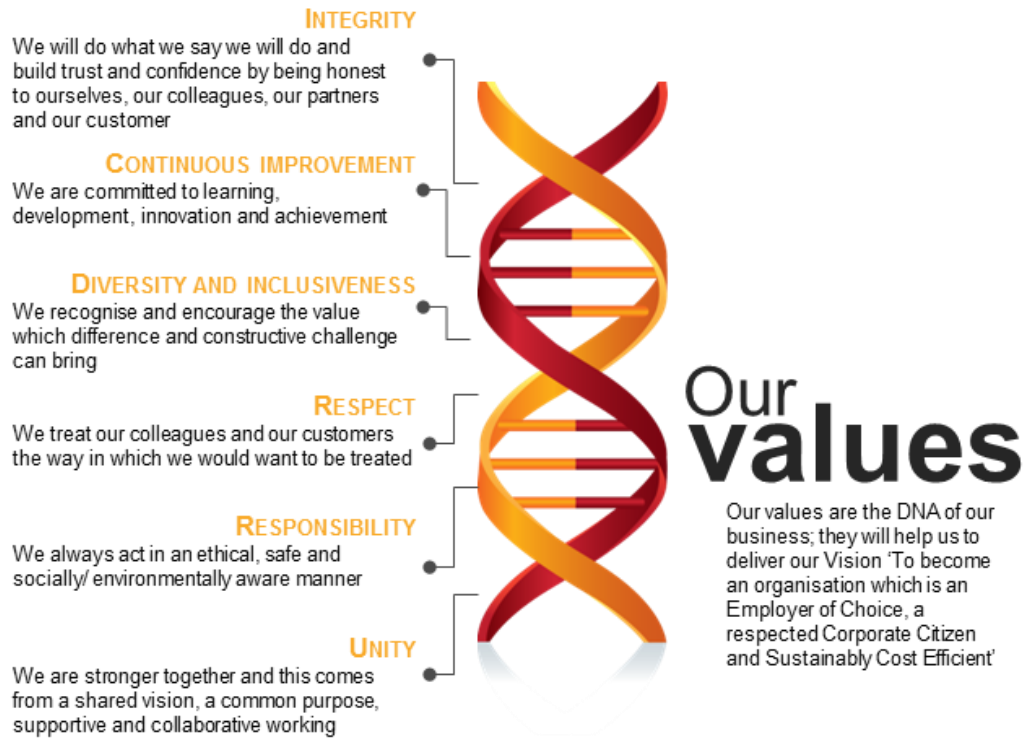
Our vision is to deliver top-third performance on average for our three networks amongst the fourteen GB electricity distribution networks in the area of safety, network reliability, customer service, cost efficiency and employee engagement. This vision is summarised under three key headings as shown in Figure 5 below:

Figure 5 Our vision



Our values form the basis of who we want to be. They set out what we expect from ourselves and those who work with us. This is further illustrated in Figure 6.

Figure 6 Our values

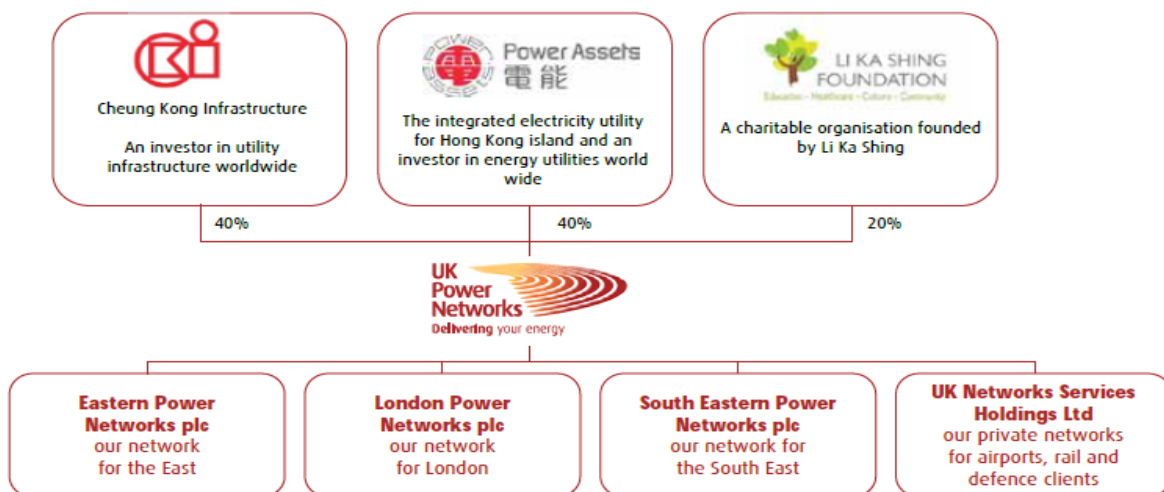


2.3 Our ownership structure

UK Power Networks was created in October 2010 from the sale of EDF Energy's three electricity networks in London, the South East and east of England. We are owned by a consortium of Hong Kong based investors controlled by the Cheung Kong Group (CKG), who are long term investors in utility infrastructure worldwide.

CKG is headquartered in Hong Kong and is a robust, well-capitalised shareholder group which has significant global experience in the long-term ownership and operation of utility and infrastructure businesses. In the UK, CKG is active in electricity distribution via UK Power Networks, in gas distribution via Northern Gas Networks and Wales & West Utilities, and in water and wastewater utilities via the Northumbrian Water Group. CKG also has investments in electricity distribution networks in Australia and New Zealand, and in gas distribution networks, renewable energy power transmission and water businesses in Australia. In Hong Kong, CKG has interests in Hongkong Electric, the sole electricity supplier for over 560,000 customers on Hong Kong Island and Lamma Island. Our ownership structure is shown in Figure 7 below:

Figure 7 Ownership structure



3 Our track record

3.1 Transforming our performance

When UK Power Networks was created in October 2010, we inherited a business that was underperforming in most key areas. We introduced a simple and clear strategy to address this underperformance based on achieving upper third performance relative to other UK DNOs under three key headings by 2014:

- Respected corporate citizen (reliability, customer service, social responsibility)
- Sustainably cost efficient (delivering our outputs at lower cost and facilitating transition to a low carbon economy)
- Employer of choice (safety and employee engagement)

We concentrated on separating from EDF Energy, on setting targets and accountabilities for employees, and on resetting our business performance. Some of the key changes we made include:

- Establishing a dedicated customer services directorate, and separating asset management from capital delivery
- Introducing an element of performance related pay for all our employees, linked to our progress against our 'upper third vision'
- Focusing the business on improved reliability, 'getting the lights back on' more quickly through changing our working patterns and roles, daily operational calls focused on long duration interruptions, clearing backlogs of maintenance, increased use of generation, and investment in automation
- Reducing our 'indirect cost' workforce by around 600 people, or 25%, via a voluntary severance scheme, to make our overhead costs efficient
- Focusing our network investment on delivering health and load outputs, and only reinforcing or replacing assets where there is a clear customer benefit rather than simply following the investment plan originally approved by the regulator
- Insourcing work from contractors where this is proven to improve cost efficiency and customer service
- Investing in cultural change programmes for management (to promote focus, accountability and visibility), for customer service, and for safety culture for all employees
- Launching a shareholder-funded business transformation programme to deliver best-in-class business processes and systems.

We are pleased that executing our strategy has transformed our performance, with significant benefits for customers. This track record of improvement is second to no other network group, particularly considering that we operate in the most challenging, fastest growing, and highest cost parts of the country, including London.

Since October 2010 we have also delivered an exemplary performance distributing electricity for some of the highest profile events in the world such as the London 2012 Olympic and Paralympic Games, the Royal Wedding and the Diamond Jubilee together with numerous major events in London. LPN had 556 major events, as defined by the police and emergency services, during 2012. This compares to 62 in EPN and 61 in SPN.

3.2 Delivering amongst the best network reliability performance in Great Britain

Our operational focus has delivered a step change in Customer Interruptions (CIs) (EPN 35%, LPN 12% and SPN 31% better than 2009/10, the last full year before we became UK Power Networks) and Customer Minutes Lost (CMLs) (EPN 44%, LPN 29% and SPN 48% better than 2009/10). Our average CML performance across our three networks is one of the best in Great Britain, meaning that on average, a UK Power Networks customer enjoys better electricity reliability than the customers of other networks.

Table 3 2012/13 industry average CML

Group	Average customer minutes lost 2012/13	Rank
UKPN	43.5	2
WPD	37.8	1
SP	44.3	3
ENWL	49	4
NPGL	67.5	5
SSE	68.2	6

Figure 8 to Figure 9 show how we have reduced average CIs and CMLs for our three networks.

Figure 8 Average CIs for UK Power Networks

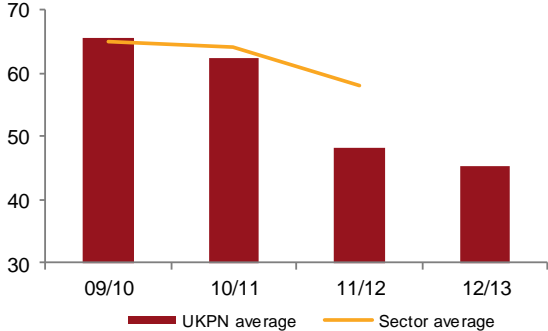
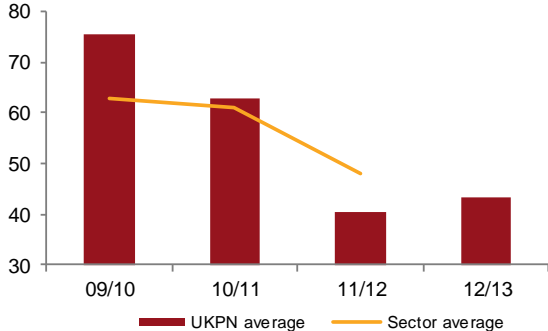


Figure 9 Average CMLs for UK Power Networks



A lot of the reliability improvement has come from our focus on eliminating long duration interruptions, which are now at a fraction of the levels prior to UK Power Networks' creation. The number of interruptions longer than 18 hours has reduced by 97%, and the number of eight hour interruptions have reduced by 77% over the period 2010 to 2013. This is shown in Figure 10 through to Figure 13.

Note: The 2012/13 performance was adversely affected by the wetter than average year, leading to higher underground fault volumes.

Figure 10 UKPN 8, 12 and 18 hour interruptions

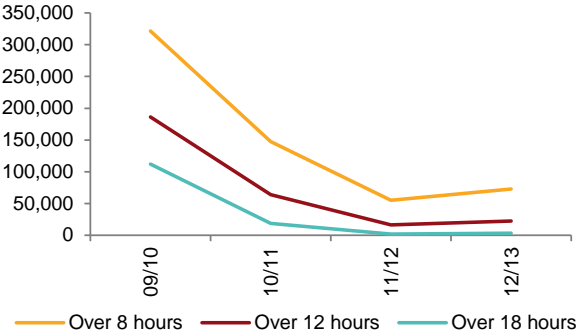


Figure 11 EPN 8, 12 and 18 hour interruptions

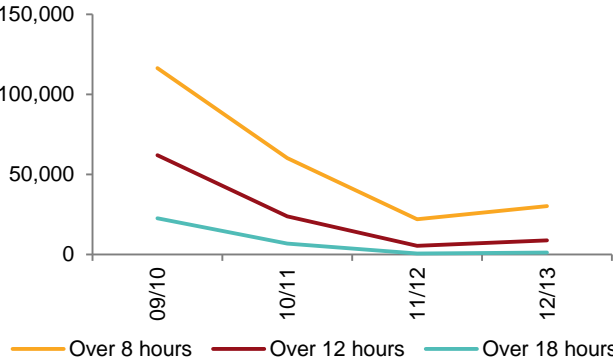


Figure 12 LPN 8, 12 and 18 hour interruptions

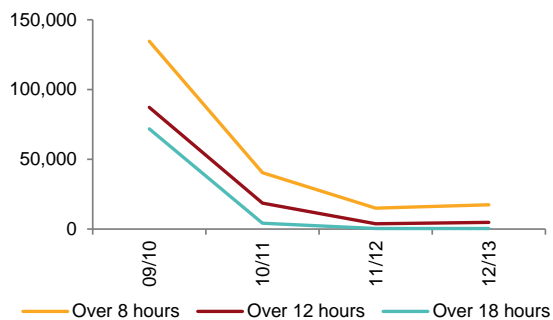
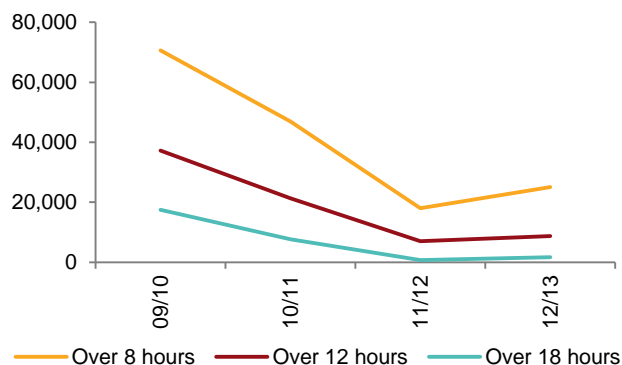


Figure 13 SPN 8, 12 and 18 hour interruptions



For further information see [Annex 1: Historic outputs](#).

3.3 Exceeding our network investment targets

We are focused on maintaining our networks for the long term. After the first three years of the current price control period, our investment programme has exceeded the agreed targets for network health as measured by Ofgem’s Health Indices (EPN 93%, LPN 60% and SPN 82% delivered after only 60% of the period).

The impact of the global economic crisis has resulted in electricity demand growing less quickly than we originally forecast. Rather than automatically executing the investment plans approved by Ofgem we continuously consider the changing economic conditions and update the plan accordingly. This ensures we only perform work that is necessary, and for the benefit of customers.

This has allowed us to optimise our network reinforcement programme by deferring some schemes, allowing us to both exceed capacity targets and reduce expenditure to achieve cost savings which will be shared with customers. We track the level of capacity utilisation of our networks through assigning each primary or grid substation a load index number from 1 to 5, with 5 representing a fully loaded asset and 1 an almost empty asset.

Our forecasts for the number of heavily loaded substation sites in 2015 are as follows:

- EPN, 25 compared to an original target of 56
- LPN, 17 compared to an original target of 21
- SPN, 25 compared to an original target of 40

Table 4 Number of heavily loaded substation sites

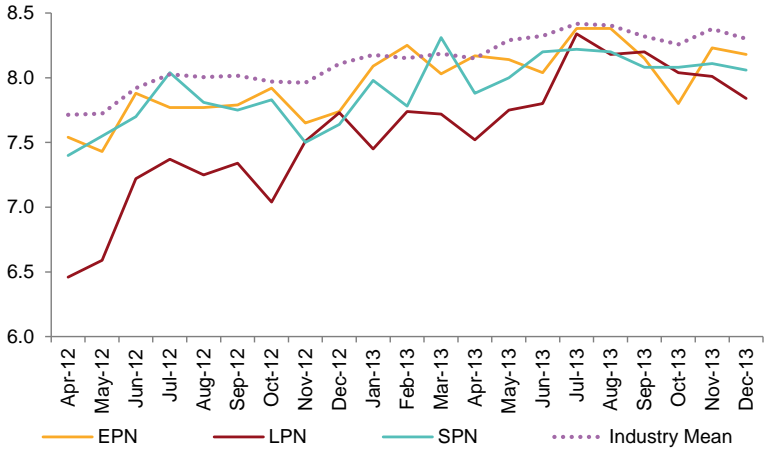
UK Power Networks number of LI 4&5 sites	Initial LI performance at commencement of DPCR5	Target LI performance at end of DPCR5	Forecast LI performance at end of DPCR5	Forecast LI performance at end of RIIO-ED1
EPN	87	56	25	18
LPN	28	21	17	12
SPN	59	40	25	14

For further information see Section 4.3 and [Annex 22: Asset plan production process](#).

3.4 Improving our customer service

Improving our customer service has been a major focus for UK Power Networks. Over the year to March 2013, we have improved our average customer satisfaction score for faults, connections and general enquiries from 7.13 to 8.06. EPN and SPN now consistently rank mid-table amongst the performance of the GB networks. Our London network has shown significant improvements in scores but still typically ranks near the bottom of the table, which we believe is partly due to the increased proportion of low voltage underground faults with their associated longer lead times to find and fix. However, we recognise that our customer service performance still requires further improvement to reach our target of upper third performance against our peers. We believe that our outdated and non-customer friendly systems are holding us back from achieving this goal, and we have launched a business transformation programme at considerable expense to our shareholders to modernise our processes and systems to allow us to realise these gains.

Figure 14 UK Power Networks' Broad Measure of Customer Service performance



To us, customer service also means making sure we help customers to have a choice of service provider in the competitive connections market. We have worked intensively with independent connections providers over the last three years to remove any barriers to entry. Of the nine market segments open to competition, we have successfully passed Ofgem's "Competition Test" in five connection market segments in our three networks, and have applied for regulation to be lifted in a further two segments. We are working hard to facilitate competition in the remaining market segment (low voltage demand connections), and will apply for de-regulation as soon as we believe competition has reached a reasonable level.

For further information see [Annex 4: Customer satisfaction](#) and [Annex 12: Business Transformation](#).

3.5 The most innovative electricity distribution group

We are the most innovative electricity distribution group. Our London network already utilises many 'smart grid' techniques on a business-as-usual basis, including meshed networks, high levels of automation and control, and contracted demand side reduction. This allows us to run the network with higher levels of capacity utilisation, which in turn keeps prices lower. We remain the largest portfolio of major innovation projects of any electricity distribution group. Table 5 below shows the total tier 2 funding awarded up until the end of 2013.

Table 5 LCNF innovation funding

Group	LCNF innovation funding	
	Expenditure £m	Rank
UKPN	59	1
WPD	39	2
SSE	37	3
ENWL	28	4
NPGL	27	5
SP	11	6

This includes our flagship projects - Low Carbon London (a comprehensive smart grid test), Vulnerable Customers and Energy Efficiency, Flexible Plug & Play (interruptible connections and smart technologies to connect generation more cheaply) and Smarter Network Storage (using electricity storage as an alternative to traditional network reinforcement). Table 6 below shows the smart solutions already applied.

Table 6 UK Power Networks – current application of smart solutions

Smart solution	Projects	Business-as-usual
DSR contracts	Low Carbon London	LPN
Storage	Hemsby, Smarter Network Storage	-
Real time thermal ratings	Flexible Plug and Play	-
Domestic ToU tariffs	Low Carbon London	-
Meshed networks	Flexible Urban Networks - Low Voltage	LPN
Intelligent EV charging	Low Carbon London	-
Fault current limiters	Low Carbon Network Fund Tier 1 projects	-
Network Losses strategy	Joint project with Western Power Network	LPN
Extensive network automation	Flexible Urban Networks - Low Voltage	EPN, LPN, SPN

For further information see Section 5.5 and [Annex 9: Smart grid strategy](#).

3.6 Delivering at an efficient cost

We have delivered all our output commitments and significantly improved our operational performance over the current period, whilst spending less than the total expenditure allowance (totex) set by Ofgem. We expect to spend around £2.3 billion over the 2010 to 2013 period, which is £0.2 billion or 7% below Ofgem's approved 2010 to 2013 allowance of £2.5 billion. This efficient level of expenditure benefits customers, as on average 55% of any savings are passed on to customers.

Table 7 shows our actual expenditure over the first three years of the current control period at a building block level compared to the regulatory allowance set by Ofgem.

Table 7 2010 to 2013 actual versus allowed expenditure

£m (in 2012/13 prices excluding pensions)	DPCR5 – 2010 2013 regulatory allowance	DPCR5 UKPN 2010-2013 actual expenditure	Difference: (£m)	Difference (%)
Load related capex	493	247	-246	-50
Non-load related capex	700	618	-82	-12
Network operating costs	466	545	79	17
Indirect costs	718	729	11	2
Non-operational capex	94	118	24	26
Total	2471	2257.0	-214	-9

The key drivers of expenditure by building block over the current period are summarised below:

- **Load related capex (asset reinforcement)**

We have underspent our regulatory allowance on load related capex by around 50% or £246million whilst over-delivering on our outputs. We achieved this by only doing work that is necessary for customers as well as because of lower than forecast growth in demand resulting from the 2008 financial crisis and a greater than anticipated uptake of energy efficient appliances. Customers will receive the benefit of 55% of our underspend.

- **Non-load related capex (asset replacement and refurbishment)**

We have underspent our regulatory allowance on non-load related capex by around 12% or £82million. Key drivers of this expenditure include refurbishment of overhead lines, catching up on our faults backlog, and ensuring compliance with ESQCR regulations.

- **Network operating costs**

Our current period network operating costs expenditure is around 17% or £79million above the approved allowance set by Ofgem. We have spent efficiently and prudently in accordance with need. Whilst we have underspent our tree cutting allowance, we have spent more than our allowance on faults and inspections and maintenance in order to deliver a step change in reliability and address our maintenance backlog respectively.

- **Indirect costs**

Our current period indirect costs expenditure is generally in line with the regulatory allowance set by Ofgem, with an overspend of around 2% or £11million. We have achieved cost savings by removing 600 people from our business through our Indirect Cost Efficiency (ICE) project in 2011, and by focusing on efficient expenditure. We anticipate that this will result in an underspend in indirect costs by the end of the period.

- **Non-operational capex**

We have overspent our regulatory allowance for non-operational capex by around 26% or £24million. This expenditure has been driven by the establishment of new standalone processes and systems, and by upgrading our IT systems following our separation from EDF Energy.

We are now moving into a period of spending in line with our overall allowances. As discussed, we have delivered all our output commitments and significantly improved our performance within the overall approved allowance set by Ofgem.

For further information see Section 5 and [Annex 13: Cost justification](#).

3.7 The lowest price electricity distribution group

Based on our average domestic revenues per customer for DPCR5, UK Power Networks is the lowest price electricity distribution group. Our revenues for the current period clearly pre-date our recent performance improvements. However they do reflect our higher than average capacity utilisation, which constitutes an efficient use of our assets. Other factors such as the relatively higher population density in our network areas are also contributory factors to our low prices.

Table 8 Average revenues per domestic customer

Group	Average revenues per domestic customer as at Oct 2013 (£ per annum)	Rank
UKPN	82	1
NPGL	92	2
WPD	105	3
ENWL	108	4
SP	111	5
SSE	124	6

For 2012/13 UK Power Networks is ranked first for average revenues per domestic customer.

3.8 A good corporate citizen

We pride ourselves on being a good corporate citizen, and we are committed to ensuring that our actions and investment support our standing as a responsible corporate citizen in the wider general community. Over the current period we have undertaken the following:

- **Public safety**
Our Public Safety Team has been developing and implementing a broader, more proactive public safety strategy, and we are working with local communities, councils, businesses and schools to improve safety awareness and understanding, and are developing a number of short safety films to assist in this process.
- **Community engagement**
We have focused on strengthening our relationships with local economies and communities through investment. We have recently established a community grant programme that provides funding (from shareholder returns) for community based projects relating to low carbon projects, vulnerable customers and communities.
- **Vulnerable customers**
Consistent with feedback from our stakeholders, we have established a project specifically focused on identifying how we can better assist vulnerable customers. We have also continued to expand our register of vulnerable customers through contact with support agencies and MPs.
- **Environmental performance**
In order to reduce the environmental impacts of our electricity network over the current period, we have significantly increased expenditure on innovation investment related to low carbon initiatives as well as monitoring and reporting on a number of environmental indicators including oil leakage, noise reduction and recycling of waste from streetworks.

We are committed to building on our achievements in these areas during the RIIO-ED1 period.

For further information see Sections 4.6, 4.7 and [Annex 5: Social commitments](#).

3.9 We deliver on the most difficult assignments

Over the last three years, we have been tested to deliver exemplary electricity distribution for events attracting world-wide focus such as the Royal Wedding, the London 2012 Olympic and Paralympic Games, and the Diamond Jubilee. No other electricity distribution group faces the responsibilities and risks associated with these major events, nor our scale of potential reputational exposure on a daily basis in the event of a major power outage. Our contribution to the success has been widely recognised:

UK Power Networks staff, whether they were directly supporting the Games at the various Olympic venues or were ensuring that the lights stayed on for the millions of households in the region, have played a key role and can proudly share in the success of the 2012 Olympic and Paralympic Games.

Boris Johnson, Mayor of London

Over the Games period, enhanced reporting kept us informed about what was happening, and provided re-assurance across government that energy supplies were being managed efficiently and effectively.

Edward Davey, Secretary of State for Energy and Climate Change

We are proposing investment in RIIO-ED1 which will ensure that we can continue to provide this level of service to our customers.

4 Our 77 output commitments

4.1 Summary of our outputs for the 2015 to 2023 planning period

This section provides an overview of the outputs that we propose to deliver for customers and stakeholders in RIIO-ED1. Our targets are specific, measurable, and time-bounded. This makes them easy for us and our stakeholders to assess, and means that our delivery performance against these targets in the future will be straightforward to measure.

Each year during RIIO-ED1 we propose to publish a report for stakeholders setting out our progress against these output commitments.

We have consulted extensively with our customers and other stakeholders on the outputs in the 2015 to 2023 planning period. In summary stakeholders supported:

- The six output categories defined in Ofgem's RIIO-ED1 Draft Strategy Decision
- The primary outputs under each of the six output categories (but they requested more detail in some areas)
- The proposed secondary deliverables, albeit some suggestions for additional secondary deliverables were made. In particular they requested that the secondary deliverables supporting the environmental output should distinguish between UK Power Networks' response to the low carbon economy and its services or activities, over which it has direct control (i.e. services which involve the use of fluid filled cables), which impact negatively on the environment.

We are planning to spend £7.4 billion of total expenditure (including pensions) in RIIO-ED1, and we forecast a further £1.2 billion of customer contributions. Figure 15 illustrates how our forecast RIIO-ED1 expenditure maps to our commitments in the six key output areas. The majority of our forecast expenditure relates to maintaining the reliability and availability of our networks, followed by connections and customer service.

Figure 15 Proportion of forecast totex associated with our output commitments (£bn real 2012/13)

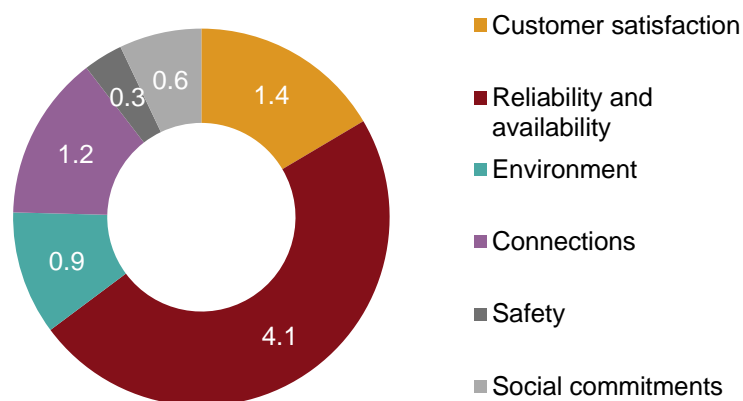


Table 9 summarises the key output measures against which we will target and measure our performance delivery in the 2015 to 2023 planning period. These are grouped into the six output categories identified by Ofgem.

Table 9 UK Power Networks' proposed output measures

Output category	2015-23 Performance Commitments
Customer satisfaction	<ol style="list-style-type: none"> 1. Improve performance of all UK Power Networks' DNOs in all components of the customer satisfaction survey, achieving an average overall performance of 8.3 for EPN and SPN and 8.1 for LPN over RIIO-ED1 2. On average, answer calls from customers in less than 5 seconds 3. Resolve 70% of all customer complaints within 1 day and 95% within 31 days 4. Contact 100% customers within 24 hours to ensure any work they have requested has been completed to their satisfaction 5. Get the lights back on for 90% of HV power cuts within 2 hours 6. Provide multiple ways for customers to stay regularly updated on the estimated time for supply restoration and of any changes to the estimated time. As a minimum this will include phone, SMS text, twitter and online 7. Proactively contact 100% of registered vulnerable customers to offer support if they are without power 8. Continue with our three critical friends panels per DNO per annum 9. Publish and review a UK Power Networks' business plan update every year 10. Publish an annual strategic development statement for Central London 11. Review our economic assumptions with our critical friends panels each year 12. Appoint an independent chairperson to our critical friends panels 13. Hold a Distributed Generation forum annually 14. Continue to use our stakeholder feedback to improve our customer-facing business processes
Reliability and availability	<ol style="list-style-type: none"> 15. Maintain LPN's position as having the lowest level of customer interruptions and customer minutes lost in the UK targeting 23 CIs (7% improvement) and 30 CMLs (8% improvement) for unplanned interruptions 16. Reduce EPN and SPN customer interruptions by more than 12% targeting 51 CI in EPN and 49 CI in SPN for unplanned interruptions 17. Reduce EPN and SPN customer minutes lost by more than 19% targeting 35 CML in EPN and 35 CML in SPN for unplanned interruptions 18. Maintain the health of the network during RIIO-ED1 as measured by the health index, at least at the end of DPCR5 levels 19. Continue to improve the load index of the networks by reducing the number of highly rated sites to 18 in EPN, 14 in SPN and 12 in LPN by the end of RIIO-ED1 20. Protect 78 substation sites from the risk of flooding 21. Reduce the number of 12 hour failures by more than 30% 22. Reduce worst served customers to less than 10,000 in either EPN or SPN
Environment	<ol style="list-style-type: none"> 23. Reduce our business carbon footprint by 2% per annum 24. Continue to recycle 70% of office and depot waste and 98% of streetworks spoil 25. Maintain sulphur hexafluoride (SF₆) leakage at less than 0.2% as a proportion of SF₆ in service 26. Reduce cable fluid leakage of 207,000 litres by 2% per annum 27. Undergrounding the equivalent of 80km of HV overhead line in SPN and 96km of HV overhead line in EPN in Areas of Outstanding Natural Beauty and National Parks 28. Innovation expenditure of 0.5% of allowed revenues and win largest market share of the NIC competition 29. Investigate all noise issues and address all non-compliant sites
Connections	<ol style="list-style-type: none"> 30. Achieve an average time to quote from the time of enquiry of 8.2 days for low voltage single services and 11.7 days for low voltage multiple services 31. Achieve an average time to connect of 42 days for low voltage single services and 53 days for low voltage multiple services

Output category	2015-23 Performance Commitments
	<p>32. Achieve in excess of 99% compliance with our Guaranteed Standards of Performance (GSoP) targets</p> <p>33. From Q3 2014, commence the introduction of new online services for customers requiring new or altered metered services and all customers requiring unmetered connections. These services will include;</p> <ul style="list-style-type: none"> a. Online submission of service requests b. Online quotations and estimates c. Service request and job delivery tracking d. Online payment e. Appointment booking <p>34. Integrate Flexible Plug and Play connection offers (as per our Low Carbon Network Fund Project) into business-as-usual by Q2 2015</p> <p>Meet our improvement commitments to major connections customers</p> <p>35. Engage regularly with other connections stakeholders on a frequency agreed with them</p> <p>36. From 2014, agree and publish a service development plan with associated key performance indicators</p> <p>37. Publish quarterly updates to communicate progress against the service development plan</p> <p>38. Review and revise the plan annually in agreement with stakeholders</p> <p>39. Publish an annual progress update to Ofgem and stakeholders</p> <p>40. Complete an annual independent audit of our achievements against the agreed service development plan</p> <p>41. Work with Connections stakeholders to develop our products and services through 'user groups' 3 times per annum with common interest customer groups (highway services, distributed generation, metered customers) to gain insight into their needs and requirements and shape innovation and development within UK Power Networks.</p> <p>42. Offer account management to any business/commercial customer who requests this service</p> <p>Develop more 'pre-application' support for customers to enable them to make informed decisions on their schemes</p> <p>43. Extend our "Ask the Expert" service to include phone, web chat and face-to-face options</p> <p>44. Publish 'heat maps' to provide an overview of current network capacities by location</p> <p>45. Provide access via a web portal to cable diagrams allowing customer access to up to date information</p> <p>46. Extend the online price illustrator to include all market segments and provide indicative timescales in addition to cost illustrations.</p> <p>47. Extend our current DG surgery sessions to other customer groups to allow customers to discuss their connection proposals informally prior to application.</p> <p>Increase the choice and flexibility of connections services available to customers</p> <p>48. Introduce longer office hours for our contact centre</p> <ul style="list-style-type: none"> a. 08.00 to 20.00 weekdays b. 09.00 to 16.00 Saturdays <p>49. Offer two hour time banded appointments for site visits</p> <p>50. Schedule work delivery across a wider working window to include evenings and weekends</p> <p>51. Extend the convertible quotes concept so that quotations offered in a competitive market segment can be fully or partly accepted dependent on the customers preference</p> <p>Continue to support and promote competition in the connections marketplace through innovative change</p> <p>52. Self-determination of the Point of Connection for an increasing range of connections</p> <p>53. HV jointing to existing networks to include all associated planning and operational activities</p> <p>54. Extend live LV jointing to the LPN interconnected area</p>

Output category	2015-23 Performance Commitments
Safety	<ul style="list-style-type: none"> 55. No formal notices or prosecutions by the HSE under applicable legislation 56. Deliver the high safety criticality element of the asset health/risk index (deliver all asset improvements with a high safety criticality score (4) in the asset risk index) 57. Reduce the Total Recordable Injuries rate (accident rate per 100,000 hours worked) by 10% per annum to less than 0.5 58. Reduce the Lost Time Recordable Injuries rate (accident rate per 100,000 hours worked) by 10% per annum to less than 0.05 59. Achieve at least one year with no RIDDOR reportable lost time incidents for employees and contractors by the end of the period 60. At least one year with no RIDDOR reportable public harm resulting from our activities 61. Engage with two million children and members of the public, either through face-to-face or via online interaction, on public safety issues over RIIO-ED1
Social	<p>Continue to improve the service provided to vulnerable customers:</p> <ul style="list-style-type: none"> 62. Double the number of customers on our priority service register 63. Proactively contact all registered vulnerable customers to offer support if they are without power 64. Extend our local authority joint response pilot across our geographical footprint and standardise triggers 65. Provide every vulnerable customer an alternative high priority dedicated number 66. Distribute welcome packs to all new priority service register customers <p>Maintain community engagement during RIIO-ED1</p> <ul style="list-style-type: none"> 67. Host two subject-specific priority issue focus groups on vulnerable customers and fuel poverty every year 68. Maintain our community fund investing £300,000 per annum <p>Work proactively with third parties to reduce the level of fuel poverty in our three networks</p> <ul style="list-style-type: none"> 69. Work with National Energy Action (NEA) to map and profile fuel poor customers within our footprint 70. Publish information to targeted customers on how energy efficiency and demand- side activity can be used to manage energy consumption 71. Deliver a series of targeted consumer surgeries for vulnerable residents designed to raise awareness of energy efficiency and how to manage energy bills 72. Publish a strategy to explain how smart meters can be used to reduce fuel poverty 73. Create a group of UK Power Networks local community energy champions 74. Develop a project with NEA to educate young carers about energy efficiency 75. Organise and deliver school activity days to encourage safe, efficient use of energy <p>Be an employer of choice</p> <ul style="list-style-type: none"> 76. Measure ourselves against other companies and seek inter and intra sector recognition/accreditation by participating in external benchmarking such as achieving membership of the Sunday Times Top 100 Best Companies 77. Recruit and train over 1,000 staff as well as up-skill and develop existing employees to ensure that we maintain a suitably skilled and motivated workforce

For further information see [Annex 2: Forecast outputs](#)

4.2 Customer service

We are committed to being a customer-driven business. We are committed to monitoring and improving the service we deliver to achieve a high level of customer satisfaction in everything that we do.

2015-23 Performance Commitments

1. Improve performance of all UK Power Networks' DNOs in all components of the customer satisfaction survey, achieving an average overall performance of 8.3 for EPN and SPN and 8.1 for LPN over RIIO-ED1
2. On average, answer calls from customers in less than 5 seconds
3. Resolve 70% of all customer complaints within 1 day and 95% within 31 days
4. Contact 100% customers within 24 hours to ensure any work they have requested has been completed to their satisfaction
5. Get the lights back on for 90% of HV power cuts within 2 hours
6. Provide multiple ways for customers to stay regularly updated on the estimated time for supply restoration and of any changes to the estimated time. As a minimum this will include phone, SMS text, twitter and online
7. Proactively contact 100% of registered vulnerable customers to offer support if they are without power
8. Continue with our three critical friends panels per DNO per annum
9. Publish and review a UK Power Networks' business plan update every year
10. Publish an annual strategic development statement for Central London
11. Review our economic assumptions with our critical friends panels each year
12. Appoint an independent chairperson to our critical friends panels
13. Hold a Distributed Generation forum annually
14. Continue to use our stakeholder feedback to improve our customer facing business processes

We are also concerned with ensuring effective stakeholder engagement across a range of services and activities which directly impact our customers. We have proposed that customer satisfaction targets are set as fixed targets based on the UK service industry upper quartile performance. To enable us to exceed these challenging targets we have the following planned improvements:

- We have recruited a further 50 call centre staff
- We have implemented a business-wide customer service training and development programme to support all employees, so that they understand the standards expected of them, but also have the competencies to deliver service which satisfies our customers
- We are building on our multi-channel strategy by continuing to monitor closely developments in communications technology to ensure that our customers can continue to engage with us using the channels that are most convenient for them. We have already introduced updates via Twitter and the channels we will provide for customer information and contact will as a minimum include:
Phone, text, Twitter and online
- We are working to improve our telephony systems so that, in conjunction with the additional call centre staff, we can ensure that call wait times are reduced to less than five seconds on average over the RIIO-ED1 period
- In addition to our network CI and CML performance targets which relate to average performance and our 12 hour restoration targets which relate to long duration interruptions, we have set ourselves a target of restoring 90% of customers affected by high voltage faults in two hours. This target is appropriate as high voltage faults cause the majority of customer interruptions and can often be restored quickly by switching on the network
- Where we carry out work on a customer's behalf, for example shrouding an overhead service so work can be carried out safely on their premises - we will contact the customer within 24 hours of the work being completed to ensure the work has been completed to their satisfaction
- We will proactively make contact with all registered vulnerable customers to offer support if they are without power

Customer satisfaction

Customer satisfaction performance is measured through the broad measure of customer satisfaction (BMoCS), which is intended to replicate the types of measures typically used by customer-facing businesses in competitive markets. The BMoCS comprises the following three components:

- Customer satisfaction survey
- Complaints metric
- Stakeholder engagement

We have proposed that customer satisfaction targets are set as fixed targets based on the UK service industry upper quartile performance and have set our targets accordingly. Table 10 shows our customer satisfaction survey scores for 2012/13 and our forecast average performance for RIIO-ED1. Our BMoCS targets for the next period highlight our commitment to significantly improve our performance, particularly in the area of connections and for LPN, general enquiries.

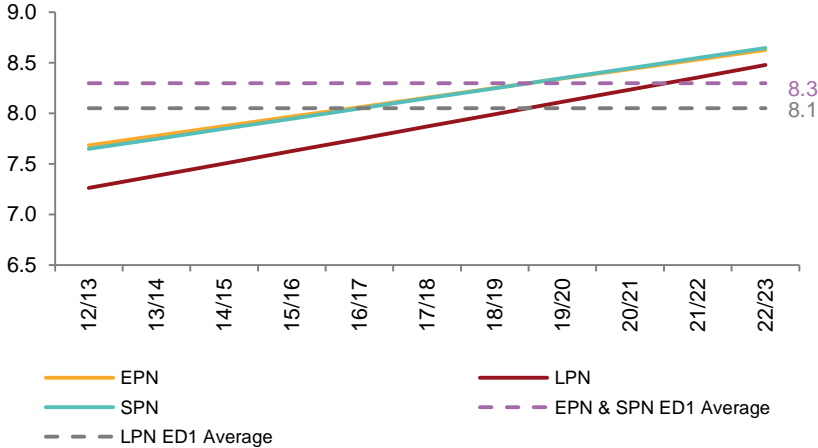
Table 10 UK Power Networks' overall customer satisfaction survey scores

DNO	BMoCS component	DPCR5 (2012/13 Regulatory Year)	UKPN's forecast average performance for RIIO-ED1
EPN	Interruptions	8.1	8.6
	Connections (minor)	7.2	8.1
	General Enquiries	8.2	8.4
	Overall	7.7	8.3
LPN	Interruptions	7.6	8.1
	Connections (minor)	7.2	8.1
	General Enquiries	6.9	8.0
	Overall	7.3	8.1
SPN	Interruptions	7.9	8.6
	Connections (minor)	7.3	8.1
	General Enquiries	8.1	8.4
	Overall	7.7	8.3

In 2012/13, SPN and EPN's general enquiries performance improved providing confidence that the measures implemented will enable them to meet the challenging 2015 to 2023 targets.

We have set a glide path approach to achieving the RIIO-ED1 targets which will involve setting increasingly higher targets for the remainder of the planning period to incentivise continual improvement in its performance.

Figure 16 Overall customer satisfaction survey target scores to 2023



Complaints

Resolving customer complaints is important to us. We are committed to getting the job right first time, every time which is reflected in our commitment to resolve 70% of complaints in one day, eliminate repeat complaints and complaints awarded to the ombudsman in the 2015 to 2023 planning period as shown in Table 11 below.

Table 11 Complaints metric

	DPCR5 Average - EPN	DPCR5 Average - LPN	DPCR5 Average- SPN	UKPN's forecast performance for RIIO-ED1
Complaints not resolved within 1 day (%)	67	69	62	30
Complaints not resolved within 31 days (%)	9	9	9	5
Repeat complaints (%)	12	13	12	0
Ombudsman complaints awarded to the customer (%)	0	1	1	0
Overall complaints metric score (%)	15	16	15	5

Engaging with our customers

We recognise that our business plan and business process, particularly the customer facing services, have benefited significantly from our enhanced stakeholder engagement processes during 2011 and 2012. We have therefore made the following RIIO-ED1 commitments:

- To continue with our critical friends stakeholder panels during RIIO-ED1 holding three sessions in each DNO every year
- To hold an annual DG forum for distributed generation customers every year
- To present an updated review of our business plan for discussion at one of these panels annually
- To review our economic assumptions at one of these panels annually
- To appoint an independent chairperson to the critical friend panels
- To continue to use stakeholder feedback in our review, implement and challenge cycle of process improvements
- To present our Business Transformation outputs during the 2013 critical friends panels

For further information see [Annex 4: Customer satisfaction](#).

4.3 Network reliability and availability

We are committed to ensuring the long term condition and resilience of our networks to ensure that the number and duration of customer supply interruptions are minimised.

2015-23 Performance Commitments

15. Maintain LPN's position as having the lowest level of customer interruptions and customer minutes lost in the UK targeting 23 CIs (7% improvement) and 30 CMLs (8% improvement) for unplanned interruptions
16. Reduce EPN and SPN customer interruptions by more than 12% targeting 51 CI in EPN and 49 CI in SPN for unplanned interruptions
17. Reduce EPN and SPN customer minutes lost by more than 19% targeting 35 CML in EPN and 35 CML in SPN for unplanned interruptions
18. Maintain the health of the network during RIIO-ED1 as measured by the health index, at least at the end of DPCR5 levels
19. Continue to improve the load index of the networks by reducing the number of highly rated sites to 18 in EPN, 14 in SPN and 12 in LPN by the end of RIIO-ED1
20. Protect 78 substation sites from the risk of flooding
21. Reduce the number of 12 hour failures by more than 30%
22. Reduce worst served customers to less than 10,000 in either EPN or SPN

Customer Interruptions (CI) and Customer Minutes Lost (CML)

Table 12 below summarises our actual performance over the current period (2010/11 and 2011/12) and target performance for the RIIO-ED1 period which commit us to deliver further improvements in relation to CIs and which refer to the number of customers whose supplies have been interrupted per 100 customers each year and CMLs, which refer to the duration of unplanned interruptions to supply each year, measured by average customer minutes lost per customer where an interruption of supply to the customer lasts three minutes or longer.

This commitment is underpinned by our [Quality of supply strategy](#) which is focused on achieving greater network automation and remote control to increase our ability to remotely restore loss of supply and improvements to inspections and faults processes across the networks including through changes to working patterns that better align with the volume and timing of fault calls.

Table 12 Unplanned interruptions performance - current period performance and RIIO-ED1 targets

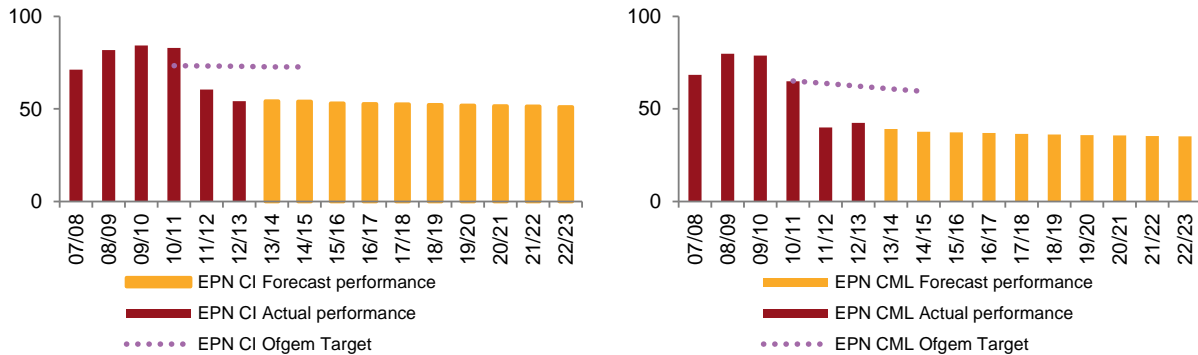
DNO	CI and CML's	DPCR5 average performance	UKPN 2015-23 average performance	% reduction from DPCR5 average	UKPN 2023 target performance
EPN	CIs	61.2	52.1	15%	51.1
	CMLs	44.8	36.5	19%	35.2
LPN	CIs	24.6	22.7	7%	22.5
	CMLs	32.9	30.3	8%	29.6
SPN	CIs	56.5	49.7	12%	49.0
	CMLs	44.2	35.9	19%	34.9

The improvements in EPN's, LPN's and SPN's CI and CML performance during the current period are shown in Figure 17 to Figure 19. In particular, they show that the networks are expected to outperform the CI and CML targets set by Ofgem for the current period, thereby delivering a more reliable service to customers. This improvement has largely been driven by recent investment and operational performance improvements which have focused on the efficient and innovative use of the existing network assets.

This performance improvement has enabled UK Power Networks as a whole to achieve the best CML performance of all six electricity distribution groups, making us the most reliable electricity distribution group in Great Britain.

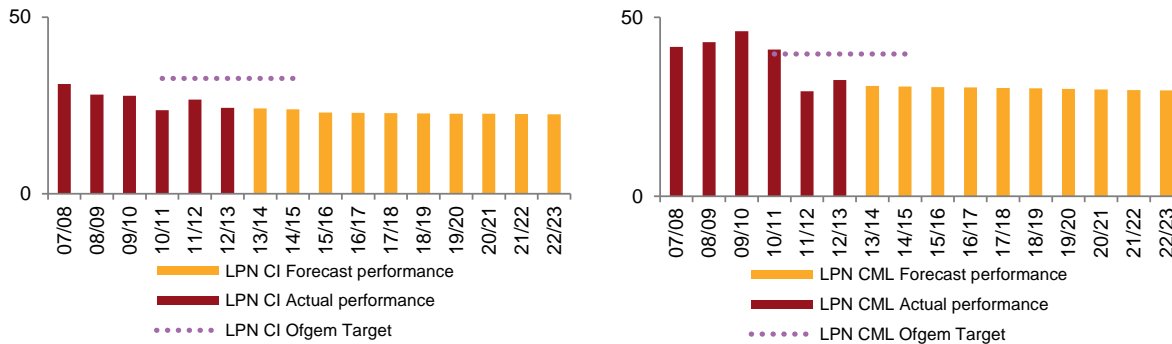
EPN has the fourth lowest average restoration time of all 14 UK DNOs reflecting the significant improvements in restoration performance over the current period. EPN's average restoration time per customer improved by 26 minutes between 2008/09 and 2011/12 (reducing from an average of 101 to 75 minutes). This has contributed to the improvement in performance shown in Figure 17.

Figure 17 EPN's unplanned interruption and restoration performance



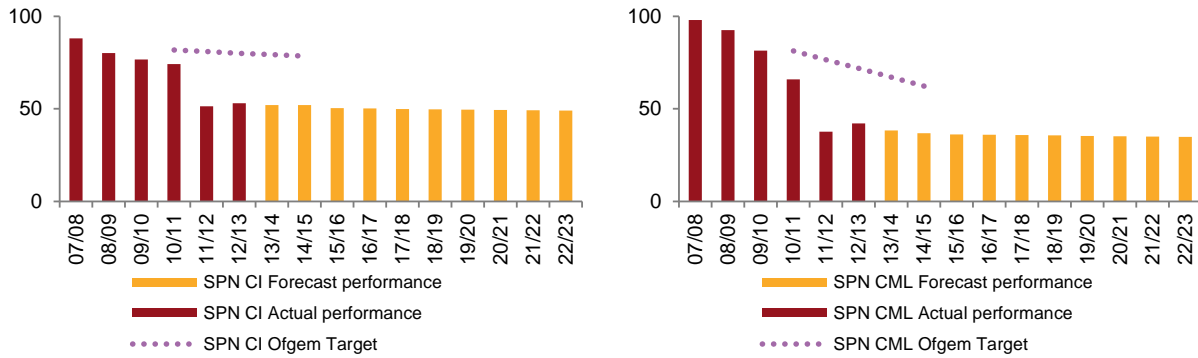
LPN is the most reliable DNO in Great Britain. Figure 18 shows that LPN has consistently delivered high levels of network reliability as reflected in its CI and CML targets set by Ofgem for the current period. LPN has outperformed these targets with outperformance being most pronounced in 2011 and 2012 due to the mild weather. We believe that the expectations of stakeholders regarding operational network performance are higher in central London than in our other network distribution areas. This has been further reinforced through our experience gained during the London 2012 Olympic and Paralympic Games and recent operational incidents in London (e.g. Carnaby Street and Victoria) and the high level of media attention they have attracted. We have included a further £11.2million of on-going expenditure in RIIO-ED1 (see Section 5) to deliver improved operational performance and we expect this to reduce our CI and CML performance by a further 0.2 CI and 0.3 CML. However the CI and CML performance for our central London customers will improve by around 30%.

Figure 18 LPN's unplanned interruption and restoration performance



SPN has the fifth lowest average restoration time of all 14 GB DNOs reflecting the significant improvements in restoration performance over the current period. SPN's average restoration time per customer has improved by 34 minutes between 2008/09 and 2011/12 (reducing from an average of 114 to 80 minutes). An improvement in restoration and times and the elimination of over 3 minute interruptions has contributed to the improvement in overall customer interruptions as shown in Figure 19.

Figure 19 SPN's unplanned interruption and restoration performance



For further information on CI and CML see [Annex 2: Forecast outputs](#).

Network health index (HI)

We track the health of our network by assigning each of our assets an index value based on the following five categories:

- HI1: new or as new
- HI2: good or serviceable condition
- HI3: deterioration requires assessment and monitoring
- HI4: material deterioration, intervention requires consideration
- HI5: end of serviceable life, intervention required

In the absence of interventions by us, the health indices of our assets deteriorate over time due to age and wear and tear. We can then track the outputs of our asset replacement, refurbishment and maintenance interventions by their impact on our overall health index scores.

We have been reporting against HIs since 2010. At the end of the 2012/13, we were ahead of our agreed HI output delivery targets for all three of our Networks. This is highlighted in Figure 20 to Figure 25, which shows EPN's, LPN's and SPN's progress against HI output scores monitored by Ofgem over the current period and the forecast performance HI targets for RIIO-ED1. This delivery outperformance has been achieved in combination with around 14% underspend in asset replacement expenditure against allowances over the three years to March 2013, demonstrating our track record as an efficient operator and resulting in savings for customers.

We will maintain the profile of our asset health risk for each network broadly consistent over RIIO-ED1. This will involve maintaining the number of assets in each index category broadly consistent.

Figure 20 EPN's performance against Ofgem's DPCR5 HI scores **Figure 21 % change in EPN's HI scores over ED1**

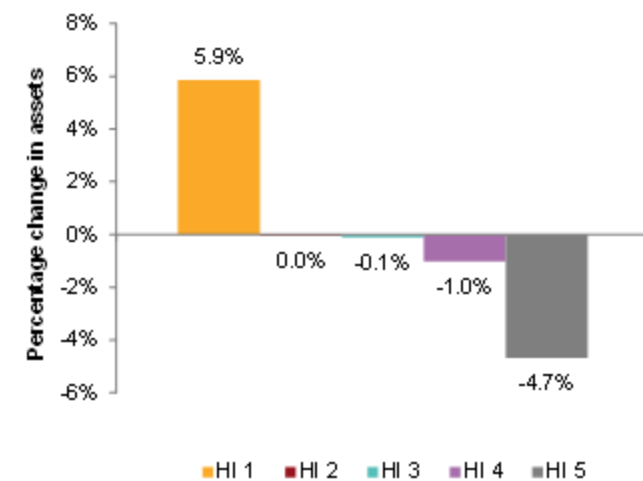
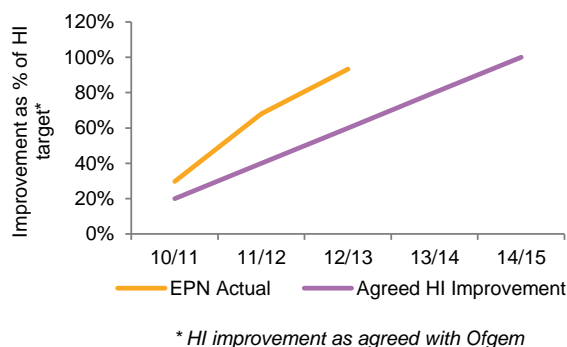


Figure 22 LPN's performance against Ofgem's DPCR5 HI scores

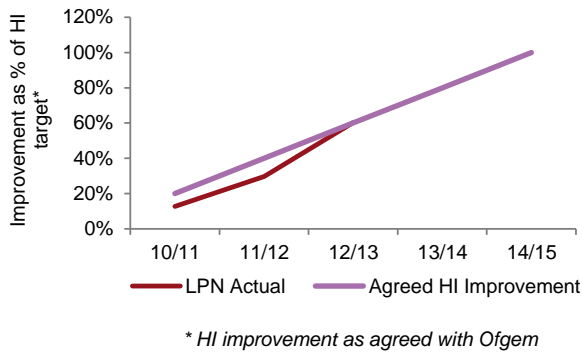


Figure 23 % change in LPN's HI scores over ED1

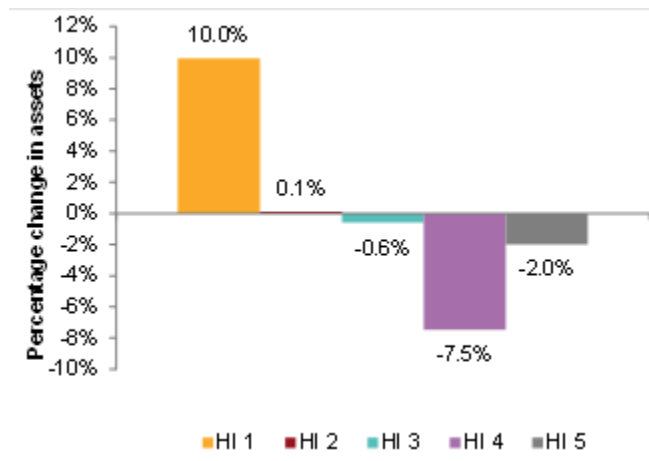


Figure 24 SPN's performance against Ofgem's DPCR5 HI scores

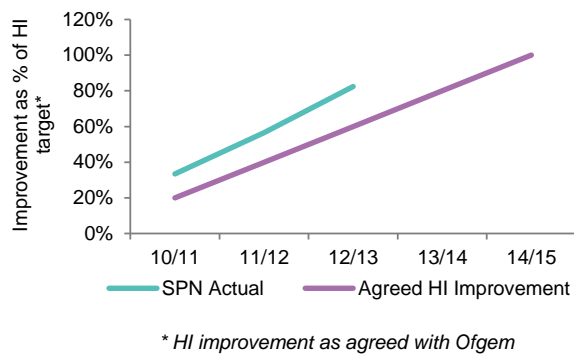
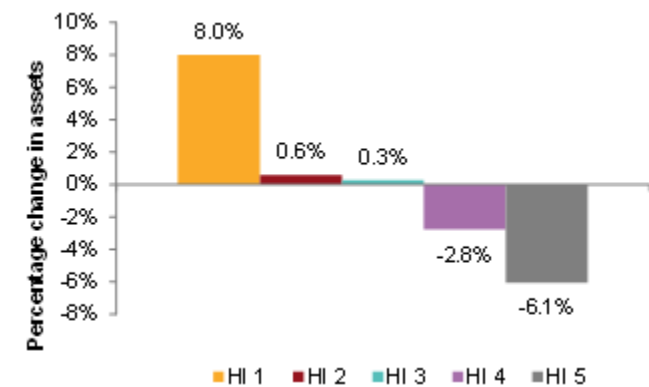


Figure 25 % change in SPN's HI scores over ED1



In RIIO-ED1 an additional measure of criticality will cover the impact of failure of an asset in terms of network performance, safety, the environment and the financial consequences of repair. Combined with asset health this provides a measure of asset risk. Criticality is banded against the average criticality for the asset type; C1 representing low criticality and C4 representing very high criticality (more than double the average criticality). Our plans for the RIIO-ED1 period maintain the health of the most critical assets (C3 and C4) as shown in Figure 26 to Figure 28 below. The higher proportions of more critical assets in LPN reflect the higher customer density which drives higher network performance consequences.

Figure 26 EPN Asset Criticality: % Assets by Criticality

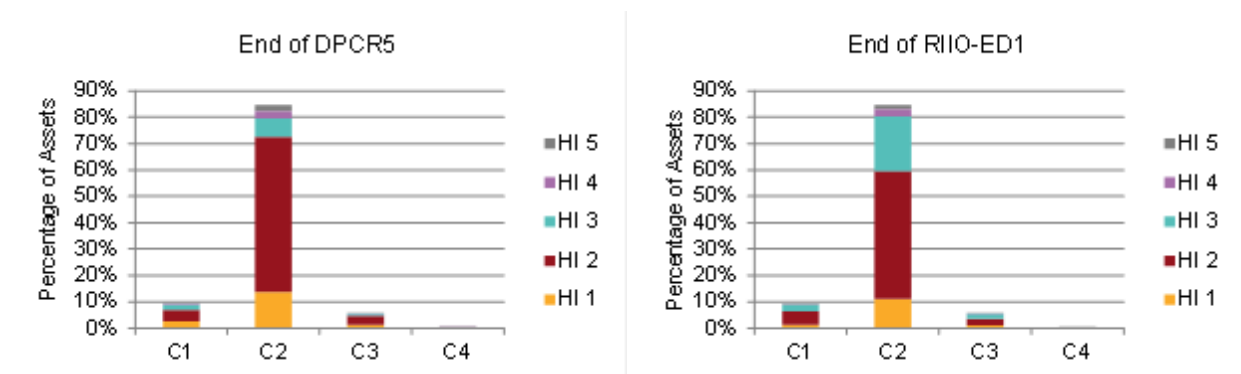


Figure 27 LPN Asset Criticality: % Assets by Criticality

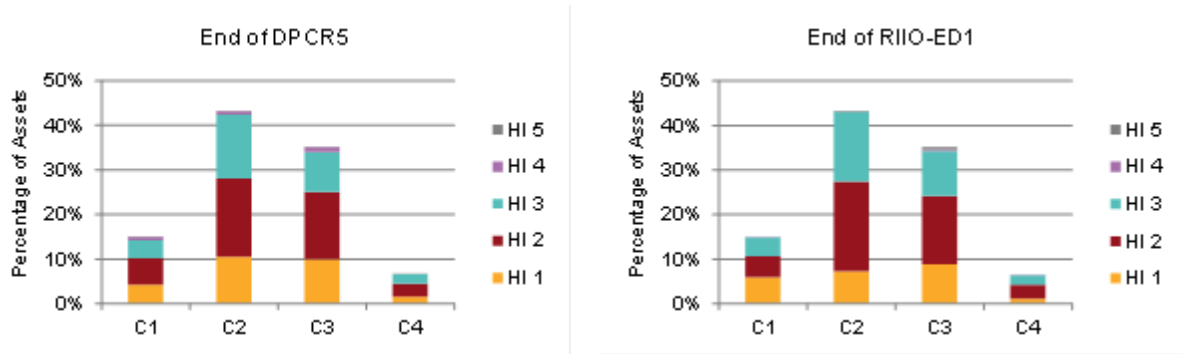
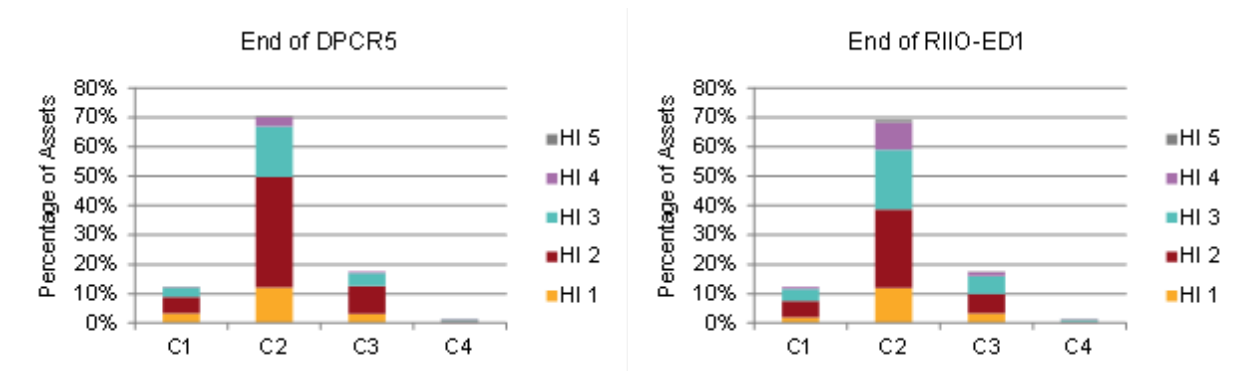


Figure 28 SPN Asset Criticality: % Assets by Criticality



For further information on HI and criticality see [Annex 2: Forecast outputs](#).

Load Index (LI)

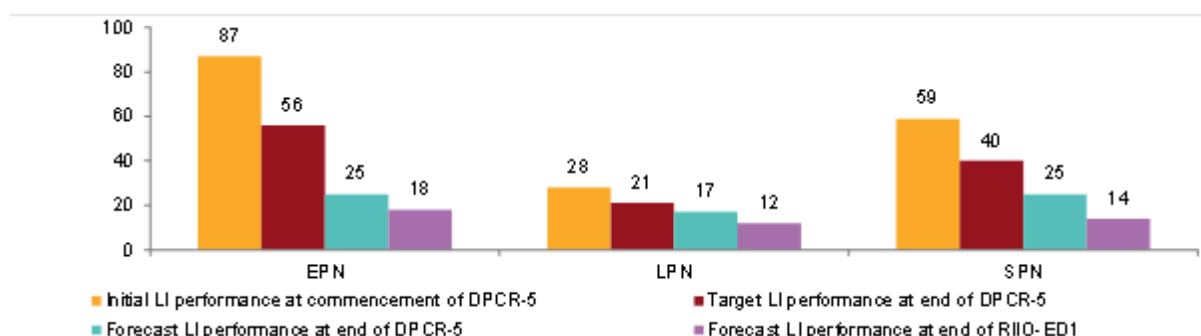
We track the level of capacity utilisation of our networks through assigning each primary or grid substation a load index number from 1 to 5, with 5 representing a fully loaded asset and 1 an almost empty asset. A high or rising level of load indices could mean that a network is too heavily loaded. However, low or falling load indices could indicate an inefficient investment programme that is adding unnecessary capacity. As with network health, we can track the impact of our network reinforcement programme through its impact on load indices. However, there is an additional variable: the level of demand for our assets which changes over time and which we do not control.

The table and charts below shows the historic and forecast number of heavily loaded LI 4 and 5 sites for our networks over DPCR5 and RIIO-ED1. At the start of DPCR5 our networks had considerably more heavily loaded sites than other DNOs. Table 13 shows that over the current period the networks have outperformed the target number of LI4 and LI5, meaning that there are fewer assets in these categories than forecast at the start of the current period. This means that overall, assets have more headroom capacity (or less loading). Figure 29 shows that our 2015 to 2023 load related investment plans will continue to reduce the number of heavily loaded sites in LPN and allow a small increase in EPN and SPN over the period, bringing our load index profile more in line with other DNOs whilst maintaining efficient utilisation of the installed capacity. This will be achieved through a combination of traditional reinforcement and investment in smart network solutions and is supported by the assumptions relating to the growth in forecast demand over the upcoming planning period.

Table 13 UK Power Networks' LI performance and forecast future performance

UKPN number of LI 4&5 sites	Initial LI performance at commencement of DPCR5	Target LI performance at end of DPCR5	Forecast LI performance at end of DPCR5	Forecast LI performance at end of RIIO-ED1
EPN	87	56	25	18
LPN	28	21	17	12
SPN	59	40	25	14

Figure 29 EPN, LPN and SPN performance (number of LI 4&5s)



For further information on LI see [Annex 2: Forecast outputs](#).

Resilience

Resilience is the ability of the distribution system to continue to supply electricity during a disruptive event (such as flooding or severe storms) and the speed of recovery to resume normal operations after the event. We apply a proactive approach to improving our network resilience and in RIIO-ED1 will undertake:

- Flooding resilience for a further 36 substations in EPN, 18 substations in LPN and 24 substations in SPN
- Black start resilience by ensuring all our sites meet the 72 hour resilience standards within the RIIO-ED1 period

We compare our risks to those faced by electricity distribution networks in other major world cities such as New York. Whilst we believe that the risk of a major natural disaster in our network areas such as superstorm Sandy which hit New York in October 2012 is remote, it is important to note that our proposed resilience expenditure does not include the cost of hardening our networks against such an event.

We are committed to maintaining average fault rates on overhead lines in RIIO-ED1 at the current period average rate.

Worst served customers

The Ofgem definition for worst served customers has changed in RIIO-ED1 to customers that have 12 high voltage interruptions in any continuous thirty-six month period. This has changed from 15 interruptions in DPCR5. We support investment to improve service quality to the worst served customers, and have undertaken investment in the current period where it is funded to do so under the regulatory arrangements. During DPCR5 to date, we have identified opportunities that meet the incentive criteria to address service to 727 worst served customers in EPN and 1634 customers in SPN under the DPCR5 incentive.

We will continue to make such investments in the next planning period.

Table 14 UK Power Networks' worst served customers

DNO	2011/2012		2012/2013	
	DPCR5 Definition	ED1 Definition	DPCR5 Definition	ED1 Definition
EPN	3,234	9,951	3,747	11,750
LPN	0	0	0	0
SPN	1,644	3,842	2,249	11,258

Our intention is to make use of this incentive to ensure that the number of worst served customers does not exceed 10,000 by the end of the RIIO-ED1 period in either EPN or SPN.

For further information see [Annex 5: Social commitments](#).

Guaranteed standards of performance

Where customers experience an electricity supply interruption lasting more than 18 hours, they are entitled to a compensation payment under the Electricity (Standards of Performance) Regulations 2010. Domestic customers are entitled to £54 and non-domestic customers to £108, and both to a further £27 payment for every additional 12 hours off supply. We have voluntarily increased the payments we make to domestic customers to £100. The standards under the Regulations will become more challenging in the 2015 to 2023 period. Customers will be entitled to compensation following 12 hour supply interruptions and compensation payments will increase to £75 for domestic customers and £150 for non-domestic customers, with a further £35 payment for every additional £12 hours off supply.

Our commitment in RIIO-ED1 is to pay double the prescribe amount. We proactively contact customers when we believe we may have failed any of the service standards. We will take every opportunity to promote guaranteed standards entitlement to customers.

Table 15 below shows the significant improvement we have made in reducing long duration interruptions. We welcome the change in the guaranteed standard and will focus on ensuring that the networks outperform the new restoration standard to minimise the number of these incidents, so that long duration outages become increasingly rare for all customers. In particular, we will aim to restore all customers in under 12 hours with a commitment to reduce over 12 hour failures by 30%.

Table 15 UK Power Networks' 12 hour restoration performance

UK Power Networks 12 hour restoration	09/10	10/11	11/12	12/13	RIIO-ED1 Target
EPN	62,067	23,895	5,360	8,854	5,000
LPN	87,151	18,642	3,815	4,822	3,000
SPN	37,241	21,361	6,992	8,727	5,500
UKPN	186,459	63,898	16,167	22,403	13,500

4.4 Environmental

2015-23 Performance Commitments

23. Reduce our business carbon footprint by 2% per annum
24. Continue to recycle 70% of office and depot waste and 98% of streetworks spoil
25. Maintain sulphur hexafluoride (SF₆) leakage at less than 0.2% as a proportion of SF₆ in service
26. Reduce cable fluid leakage of 207,000 litres by 2% per annum
27. Undergrounding the equivalent of 80km of HV overhead line in SPN and 96km of HV overhead line in EPN in Areas of Outstanding Natural Beauty and National Parks
28. Innovation expenditure of 0.5% of allowed revenues and win largest market share of the NIC competition
29. Investigate all noise issues and address all non-compliant sites

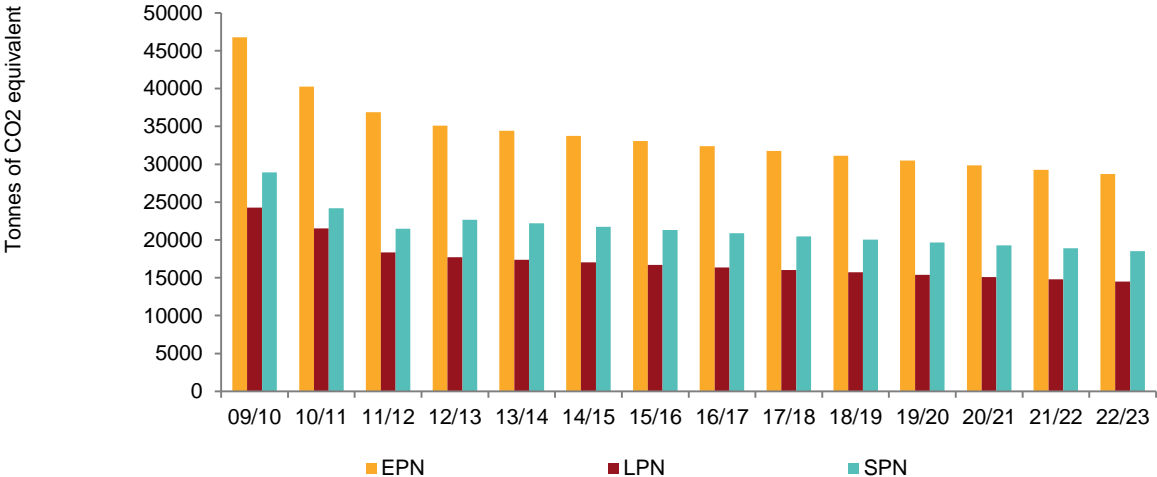
Business carbon footprint

We are committed to the low carbon transition. In addition to playing a key role in facilitating a low carbon economy through the connection of low carbon generation, we are also concerned with reducing our own CO₂ emissions. Over the current period we have reduced our business footprint by 25%. We are committed to achieving further reductions including by reviewing the operational areas of our business that create CO₂ emissions. To achieve upper third performance we are targeting a 2% year on year improvement.

Table 16 UK Power Networks actual and forecast BCF performance (excluding electricity line losses)

	DPCR5 Average - EPN	DPCR5 Average - LPN	DPCR5 Average - SPN	DPCR5 Average - UKPN	UKPN's RIIO-ED1 average forecast performance
BCF	36,076	18,401	22,451	76,927	66,271

Figure 30 UKPN Business carbon footprint



The largest contributors to our BCF arise from our transport and fuel usage. Some activities such as use of temporary generation to restore customers can directly increase our carbon footprint. Our current forecast BCF performance in the next planning period is based on the average performance over the current period. We are signing up to the global reporting initiative and are committed to achieve upper third performance amongst comparable industries.

Waste

We currently divert 70% of our office and depot waste from landfill. Further reductions are challenging and our target is to continue to meet this level through the RIIO-ED1 period.

We recycle 98% of the streetworks spoil under our groundworks term contracts. The remaining 2% of contaminated material is not readily recyclable. We will continue to meet this level and aim to meet the same level in our large projects construction materials waste.

Undergrounding in Areas of Outstanding Natural Beauty and National Parks

Undergrounding in areas of outstanding natural beauty and national parks is an incentive to allow companies to support investment to improve visual amenity of overhead lines in sensitive locations.

We have already identified more opportunities for undergrounding of overhead lines than the DPCR5 allowance caters for. Deliverability issues mean that some schemes that have already been identified have been scheduled for the RIIO-ED1 period. We are therefore confident that we will be able make full use of the allowance to underground overhead lines over the longer 8 year period (£10.5million in SPN and £9.7million in EPN) to underground the equivalent of 80km of HV overhead line in SPN and 96km of HV overhead line in EPN. The exact works will be selected in conjunction with stakeholders.

SF₆

Sulphur Hexafluoride is an important gas that has replaced oil as an electrical insulator in modern equipment. It makes equipment cheaper, safer and smaller, and is essential in 132kV and EHV equipment on sites where space is limited. We will therefore increase the amount in service as oil filled switchgear is replaced. However it is an exceptionally strong greenhouse gas so we aim to use it where appropriate and manage the leakage of gas from equipment. Over the RIIO-ED1 period we will aim to manage leakage at current levels which at 0.2% are much lower than industry standards allow (0.5%).

Table 17 SF₆ gas capacity

	Current Gas Capacity on network (kg)	Gas Capacity on network 2023 (kg)	Increase Gas Capacity of Installed SF ₆ (kg) over RIIO-ED1	Increase as %
EPN	30,926	38,671	7,745	25%
LPN	41,174	44,549	3,375	8%
SPN	18,670	26,757	8,087	43%

IEC 62271-1 is the international standard that specifies the maximum allowable leakage rate on SF₆ switchgear. The current 2008 edition allows either 0.5% or 1% pa. The earlier version of the IEC allowed 1% or 3% which explains why some of the older equipment in service inherently leaks more than newer equipment. The UK industry standard EATS 41-36 which we quote in our specifications require a lower figure of 0.5%. From the leakage rates that we report we are currently running at about 0.2% and we would expect to maintain this despite the increase in mass of SF₆ in service by repairing the worse performing older equipment.

Oil leakage

We operate 2317km (1.7% of cables) of 33kV, 66kV and 132kV cables that are insulated by pressurised oil. This technology dates from before the advent of modern polymeric insulation materials. The majority were installed in the 1960s. If the lead sheath around these cables corrodes, they can leak oil into the environment. The importance of some of these cables means that we must try to keep them in service while we detect and repair leaks. We have introduced new approaches that allow leakages to be detected and repaired more quickly reducing oil leakage significantly and we have a programme to replace those sections that are economic with the aim of reducing leakage over time and we take these out of service as and when the network develops and they become redundant.

Oil leakage is currently less than 4% per annum of the cable oil in service which still represents a significant loss to the environment of over 200,000 litres per annum. Whilst the oil cables are an ageing technology and we expect some degradation of the remaining assets, we are aiming to reduce our oil leakage by 2% per annum over the period from 2015-2023 by replacing cables and through the use of chemical tracers to improve leak location (already in use).

The replacement programme we are proposing in LPN is expected to reduce oil leakage by more than 20%.

Noise reduction

We will respond as required to any complaints we receive about noise associated with our equipment and address any issues in the most practicable way.

Management of network losses

Technical losses are an inevitable consequence of the science of distributing electricity and of transforming from one voltage to another. The main components are:

- 'Variable' or Copper (Cu) losses which are due to electrical resistance of conductors and hence have a quadratic relationship with the current passing through the conductor
- 'Fixed' or Iron (Fe) losses (also known as 'no load' losses) which are incurred as a result of the magnetising forces involved in transforming electricity.

It has long been recognised that managing distribution network technical losses is integral to good distribution engineering practice. However, from a network design perspective (which will naturally assume the optimal day-to-day operation of the network with regard to overall efficiency and security), optimising losses is essentially a trade-off between up-front investment (for example in lower loss equipment and/or additional network capacity) and the longer term cumulative benefits of reduced losses. In pure business terms, the optimum design from a losses perspective is that which delivers the highest NPV of incremental cost benefit in terms of initial investment and longer term revenues arising from reduced losses. However, besides the economic assessment for managing network losses, a very specific driver is our responsible attitude towards environmental sustainability.

We will implement a losses optimisation strategy consisting of the following key areas:

Category of loss	Optimisation strategy
Valuation of losses	Valuing losses fully over the lifetime of the asset and using this on-going value to 'capitalise' losses in our networks' design and investment analyses will tend to give rise to a lower value of specified losses in our plant and equipment technical standards.
Network architecture considerations	Reviewing major asset renewal / reinforcement strategies can reveal opportunities for beneficial circuit reconfiguration in order to both optimally distribute, and reduce the distances, of power flows. This in turn will minimise copper losses as well as improving overall utilisation of plant and equipment and even reliability.
Legacy non-standard network architecture and voltages	The remaining networks operating at the now discontinued voltage levels of 22kV and 6.6kV will gradually be replaced through natural evolution and investment synergies. In general, this will provide losses reduction opportunities due to the (higher) standard voltages now employed.
Voltage, power factor, and power quality management	Maintaining voltage at the highest permissible level within the statutory limits will also ensure that variable losses (as a percentage of energy supplied) are minimised. The impact of poor (less than unity) power factor is that for a given level of demand (in kW) a higher current will be required. This higher current will then have the effect of increasing variable losses due to the electrical resistance in the supplying circuits and transformers. Power quality management.
Optimising energy usage at operational buildings	Whilst not generally considered in the context of 'pure' technical losses, energy used to operate cooling fans and pumps (i.e. for OFAF transformers) and other auxiliary energy supplies directly associated with electricity distribution (including substation heating, lighting, ABCB air compressors, tunnel cooling systems, etc.) can be considered a further source of losses in the sense that this represents energy used in the distribution of electricity.

For further information see [Annex 7: Losses](#) and [Annex 8: Climate change adaptation](#).

4.5 Connections

We are committed to improving our connections customer service, facilitating competition in the connections market and making it easier for customers seeking connection.

2015-23 Performance Commitments

30. Achieve an average time to quote from the time of enquiry of 8.2 days for low voltage single services and 11.7 days for low voltage multiple services
31. Achieve an average time to connect of 42 days for low voltage single services and 53 days for low voltage multiple services
32. Achieve in excess of 99% compliance with our Guaranteed Standards of Performance (GSoP) targets
33. From Q3 2014, commence the introduction of new online services for customers requiring new or altered metered services and all customers requiring unmetered connections. These services will include;
 - a. Online submission of service requests
 - b. Online quotations and estimates
 - c. Service request and job delivery tracking
 - d. Online payment
 - e. Appointment booking
34. Integrate Flexible Plug and Play connection offers (as per our Low Carbon Network Fund Project) into business-as-usual by Q2 2015

Meet our improvement commitments to major connections customers

35. Engage regularly with other connections stakeholders on a frequency agreed with them
36. From 2014, agree and publish a service development plan with associated key performance indicators
37. Publish quarterly updates to communicate progress against the service development plan
38. Review and revise the plan annually in agreement with stakeholders
39. Publish an annual progress update to Ofgem and stakeholders

2015-23 Performance Commitments

40. Complete an annual independent audit of our achievements against the agreed service development plan
41. Work with connections stakeholders to develop our products and services through 'user groups' 3 times per annum with common interest customer groups (highway services, distributed generation, metered customers) to gain insight into their needs and requirements and shape innovation and development within UK Power Networks.
42. Offer account management to any business/commercial customer who requests this service

Develop more 'pre-application' support for customers to enable them to make informed decisions on their schemes

43. Extend our "Ask the Expert" service to include phone, web chat and face-to-face options
44. Publish 'heat maps' to provide an overview of current network capacities by location
45. Provide access via a web portal to cable diagrams allowing customer access to up to date information
46. Extend the online price illustrator to include all market segments and provide indicative timescales in addition to cost illustrations.
47. Extend our current DG surgery sessions to other customer groups to allow customers to discuss their connection proposals informally prior to application.

Increase the choice and flexibility of connections services available to customers

48. Introduce longer office hours for our contact centre
 - a. 08.00 to 20.00 weekdays
 - b. 09.00 to 16.00 Saturdays
49. Offer two hour time banded appointments for site visits
50. Schedule work delivery across a wider working window to include evenings and weekends
51. Extend the convertible quotes concept so that quotations offered in a competitive market segment can be fully or partly accepted dependent on the customers preference

Continue to support and promote competition in the connections marketplace through innovative change

52. Self-determination of the Point of Connection for an increasing range of connections
53. HV jointing to existing networks to include all associated planning and operational activities
54. Extend live LV jointing to the LPN interconnected area

Listening to our customers

We will work with connections stakeholders to develop our products and services through 'User Groups' three times per annum with common interest customer groups (Highway Services, Distributed Generation, Metered Customers) to gain insight into their needs and requirements and shape innovation and development within our Company.

As a result of these engagements we will publish two action plans, which we will update annually. These will be:

- A major connections service improvement plan setting out what we will do to improve services to customers wanting to or considering making larger, more complex connections to our network
- A competition improvement plan describing what we will do to facilitate competition in connections service provision in our service area

We will publish progress updates against service improvement plans quarterly and publish an annual progress update on the extent of competition in our service areas.

Time to connect

RIIO-ED1 has introduced two measures of performance for low voltage service, the average time to quote and average time to connect.

Our performance targets for the next planning period as shown in Table 18 and Table 19 commit us to delivering even further performance improvements that would enable us to reach top-third performance amongst the 14 GB DNOs.

Table 18 Average time to quote (days)

	DPCR5 Average - EPN	DPCR5 Average - LPN	DPCR5 Average - SPN	UKPN's RIIO-ED1 forecast performance (all networks)
Low voltage single services	9.9	9.4	10.0	8.2
Low voltage multiple services	15.6	15.4	17.6	11.7

Table 19 Average time to connect (days)

	DPCR5 Average - EPN	DPCR5 Average - LPN	DPCR5 Average - SPN	UKPN's RIIO-ED1 forecast performance (all networks)
Low voltage single services	42	49	49	42
Low voltage multiple services	53	70	63	53

Guaranteed standards of performance

Overall performance for connections activities are measured by a number of guaranteed standards of performance. Overall we have achieved better than 99% in all these measures and intend to maintain this performance through RIIO-ED1.

Table 20 Connections overall guaranteed standards of performance

	Overall Connections Guaranteed Standards Performance	2012/13
EPN	All metered standards related to budget estimates and quotations (in aggregate)	99.5%
	The rest of the metered standards (in aggregate)	99.9%
	All unmetered standards (in aggregate)	99.5%
LPN	All metered standards related to budget estimates and quotations (in aggregate)	99.7%
	The rest of the metered standards (in aggregate)	99.9%
	All unmetered standards (in aggregate)	99.5%
SPN	All metered standards related to budget estimates and quotations (in aggregate)	99.6%
	The rest of the metered standards (in aggregate)	99.8%
	All unmetered standards (in aggregate)	99.3%

Improving processes for customers

Customers and other stakeholders have told us that this is an area in which we could improve further. We agree with our stakeholders and are committed to undertaking further improvements over the next planning period. In particular, we are committed to implementing an end-to-end connection project, as part of our business transformation project, which will lead to further improvements.

A key part of these improvements will be the introduction of web-based online service for less complex connections activities. This is likely to cover new or altered metered services and all unmetered services. The range of services online will depend on the complexity of the customer's request. The range of services available online may include:

- Online submission of service requests
- Online quotations and estimates
- Service request and job delivery tracking
- Online payment

- Appointment booking

We will also develop more 'pre-application' support for customers' to enable them to make informed decisions on their schemes including:

- Extending our 'Ask the Expert' service to include phone, web chat and face-to-face options
- Publishing 'heat maps' to provide an overview of current network capacities by location
- Providing access via a web portal to cable diagrams allowing customer access to up to date information
- Extending the online price illustrator to include all market segments and provide indicative timescales in addition to cost illustrations.
- Extending our current DG surgery sessions to other customer groups to allow customers to discuss their connection proposals informally prior to application.

We will also seek to increase the choice and flexibility of connections services available to customers by:

- The introduction of wider office hours for our contact centre
- Offer time banded appointments for site visits
- Schedule work delivery across a wider working window to include evenings and weekends
- Extend the convertible quotes concept so that quotations offered in a competitive market segment can be fully or partly accepted dependent on the customers preference

Implementing learning from the Low Carbon Networks Fund

We have learnt a considerable amount about customers' priorities through our Low Carbon Networks Fund project, Flexible Plug and Play, which explored different commercial arrangements to speed up and reduce the costs of generation connections. The project concludes in December 2014 and we are committing to building in the outcomes into our business-as-usual process by the second quarter of 2015.

Meeting our improvement commitments to major connections customers

We also recognise that our major customers have particular needs:

- Engage regularly with major connections stakeholders on a frequency agreed with them
- Agree and publish a service development plan and any associated Key Performance Indicators
- Publish quarterly updates to communicate progress against the service development plan
- Review and revise plan annually in agreement with stakeholders
- Publish annual progress update to Ofgem and stakeholders
- Complete an annual independent audit of our achievements against the agreed service development plan

In particular we will:

- Offer account management to any business/commercial customer who requests this service

Facilitating competition

We are committed to facilitating competition in the connections market and improving our customer service in the area of customer connections by making it easier for customers seeking connection including by ensuring:

- Customers receive high quality information on the process and cost of connection
- Connections are completed in reasonable timeframes that meet customers' expectations

We recognise that there will be an on-going need to facilitate the competitive provision of connections services in our service area. We will continue to support and promote competition in the connections marketplace through innovative change, for example:

- Self-determination of the point of connection for an increasing range of connections
- HV jointing to existing networks to include all associated planning and operational activities.
- Extend live LV jointing to the LPN interconnected area

For further information see [Annex 4: Customer satisfaction](#).

4.6 Safety

We are committed to ensuring safety and minimising the risks associated with operating our Networks to achieve zero harm to customers, contractors and staff.

2015-23 Performance Commitments	
55.	No formal notices or prosecutions by the HSE under applicable legislation
56.	Deliver the high safety criticality element of the asset health /risk index (deliver all asset improvements with a high safety criticality score (4) in the asset risk index)
57.	Reduce the Total Recordable Injuries rate (accident rate per 100,000 hours worked) by 10% per annum to less than 0.5
58.	Reduce the Lost Time Recordable Injuries rate (accident rate per 100,000 hours worked) by 10% per annum to less than 0.05
59.	Achieve at least one year with no RIDDOR reportable lost time incidents for employees and contractors by the end of the period
60.	At least one year with no RIDDOR reportable public harm resulting from our activities
61.	Engage with two million children and members of the public - either through face-to-face or via online interaction, on public safety issues over RIIO-ED1

Safety relates to the physical, mechanical and electrical safety of network assets. We are bound by the framework and obligations set out in Health and Safety Legislation to ensure our network assets do not present a safety risk to the public or our employees and contractors. This is enforced through the Health and Safety Executive (HSE), the national safety regulator. We aim to have no formal notices or prosecutions by the HSE under applicable legislation.

Zero harm

Our vision is to deliver top third industry performance in the area of safety. Our safety performance is our highest priority – we recognise the potential safety risk associated with electricity assets if they are not appropriately managed. We are committed to identifying ways to eliminate risk to achieve zero harm to customers, contractors and staff.

Lost time injuries (LTI) and total recordable injuries (TRI)

Since we became UK Power Networks we have been on a journey to improve our safety performance. This has resulted in significant improvement in our accident and injury performance. Our accident rates have improved from being one of the highest in the industry to being one of the leading performances in 2011/12 and a good performance in 2012/13.

We have set ourselves the challenge of improving our accident rate performance for both total injuries and lost time injuries by 10% per annum and will aim to achieve a year (rolling 12 months) with no RIDDOR reportable lost time incidents for employees and contractors.

Table 21 UK Power Networks’ actual and forecast safety performance

	2010/11	2011/12	2012/13	UKPN’s DPCR 5 target performance	UKPN’s RIIO-ED1 target performance
LTIFR Lost time injuries per 100,000 hrs worked	0.21	0.12	0.15	0.1	0.05
TRIFR Total Injuries per 100,000 hrs worked	1.72	0.99	1.14	0.9	0.5

Asset health and risk

The overall health and condition of our assets is an important contributor to staff and public safety. We have well developed maintenance, refurbishment and replacement activities and programmes of work which ensure the overall condition of our network assets, the overall health of which is measured through the Health Index (HI).

In RIIO-ED1 we will introduce a criticality component into our management of asset condition. Asset criticality is concerned with the consequence of failure and specifically has regard for safety, reliability and environmental issues. We will ensure that all the improvements associated with a high safety criticality (safety criticality score of 4) are delivered.

The network health index is a secondary deliverable for the network reliability and availability output and is discussed in detail in Section 4.3 of this document.

Public safety

We will continue to actively promote public safety including by:

- Actively managing our network including through rapid resolution of potential safety issues such as low conductors and poor condition street furniture (such as link-boxes and streetlights)
- Managing the security of our substations through passive security features, active monitoring and patrols as well as maintaining a high level of engagement with the police and other authorities. This will also help to mitigate the theft of earthing metalwork which may create safety risks for employees and the public
- Education programmes including at county shows and schools. Our schools programme will include both face-to-face sessions or line interaction via our interactive website 'power-up' and will target 2 million interactions with children and members of the public in RIIO-ED1

Our aim is to have one 12 month period with no RIDDOR Reportable public harm resulting from our activities

Employee wellbeing

Our approach to safety is wider than solely reducing LTIs. We have put significant effort into promoting the health of those who work for us. We have published an Occupational Health and Wellbeing Strategy and have launched Fitness to Work assessments for all of our operational staff. Other preventative measures include a flu vaccination programme that is available to all staff. We have also arranged 'office walk-arounds' by physiotherapists to promote good posture.

In May 2013 we launched our Employee Assistance Programme which is a 24/7, confidential counselling and information service to assist with personal or work-related problems that may be affecting health, wellbeing or performance. This service is provided by a well-respected, professional and independent Employee Assistance provider that supports over 200 organisations in the UK. We will continue to build on these services through RIIO-ED1.

4.7 Social commitments

We understand that electricity is an essential service which is important to our customers. We consider that a basic customer requirement for all our customer groups, especially those that are vulnerable to supply interruptions or in fuel poverty, is an affordable price and dependable electricity service.

2015-23 Performance Commitments

Continue to improve the service provided to vulnerable customers:

62. Double the number of customers on our priority service register
63. Proactively contact all registered vulnerable customers to offer support if they are without power
64. Extend our local authority joint response pilot across our geographical footprint and standardise triggers
65. Provide every vulnerable customer an alternative high priority dedicated number
66. Distribute welcome packs to all new priority service register customers

Maintain community engagement during RIIO-ED1

67. Host two subject-specific priority issue focus groups on vulnerable customers and fuel poverty every year
68. Maintain our community fund investing £300,000 per annum

Work proactively with third parties to reduce the level of fuel poverty in our three networks

69. Work with National Energy Action (NEA) to map and profile fuel poor customers within our footprint
70. Publish information to targeted customers on how energy efficiency and demand-side activity can be used to manage energy consumption
71. Deliver a series of targeted consumer surgeries for vulnerable residents designed to raise awareness of energy efficiency and how to manage energy bills
72. Publish a strategy to explain how smart meters can be used to reduce fuel poverty
73. Create a group of UK Power Networks local community energy champions
74. Develop a project with NEA to educate young carers about energy efficiency
75. Organise and deliver school activity days to encourage safe, efficient use of energy

Be an employer of choice

76. Measure ourselves against other companies and seek inter and intra sector recognition/accreditation by participating in external benchmarking such as achieving membership of the Sunday Times Top 100 Best Companies
77. Recruit and train over 1000 staff as well as up-skill and develop existing employees to ensure that we maintain a suitably skilled and motivated workforce

Vulnerable customers cover a wide range of people and we group them into the following three discrete categories:

- **Category 1:** OAP Normal, Elderly (60+), Disabled, Speech Difficulty, Foreign Language, Learning Difficulty, Restricted Movement, Dementia and Other, Parents with Infants.
- **Category 2:** No Life Support, Mobility Problems, Blind, Partially Sighted, Deaf, OAP Vulnerable, Hearing Impairment, Stair Lift and Bath Hoist.
- **Category 3:** Life Support Equipment, Nebuliser, Heart/Lung Machine, Kidney Dialysis, O2 Concentrator, Ventilator, Apnoea Monitor and Medically Dependent on Electricity.

Fuel poor customers are those who spend more than 10% of their disposable income on their energy consumption.

Priority Services Register (PSR) for vulnerable consumers

We maintain a PSR which captures important information on our vulnerable customers in order to assist us in providing services to these customers. There are currently around 280,000 vulnerable customers on our PSR. As a respected corporate citizen, we are committed to doing everything possible to identify and support vulnerable customers.

In RIIO-ED1 we aim to double the number of vulnerable customers registered in our PSR. Over the current period, we have improved our service offerings to vulnerable customers including by introducing:

- Letters to all Members of Parliament in our network areas requesting lists of vulnerable customers

- A welcome pack including luminous stickers with our contact details and practical advice on preparing for a power cut
- A priority number enabling an immediate point of contact
- Real-time updates offered by way of call backs or SMS messages
- Mobile generators to care homes, critically ill customers and those with a medical dependency
- Hotel and meal allowances in certain circumstances
- Home visits from an engineer before leaving the site

We have also introduced an electronic flagging system, which enables us to easily identify vulnerable customers in our database and fault management system. As we improve the quality of the data this will allow us to ensure we have the correct information to ensure all registered vulnerable customers can be contacted proactively in the event of a power cut.

Over the next planning period, we will continue to build on these recent improvements. In particular, we are committed to, amongst other things:

- Proactively contacting all registered vulnerable customers to offer support if they are without power
- Ensuring vulnerable customers can talk to an advisor without any delays in the telephony system
- Distributing welcome packs to all new PSR customers
- Developing new, and strengthen existing, partnerships with suppliers, local government authorities and community organisations to improve services to vulnerable consumers by extending our pilot across our geographical footprint and developing standardised triggers for notifying relevant authorities.
- Providing vulnerable customers with targeted information on how to improve energy efficiency by including fuel efficiency material in the brochure given to all vulnerable customers when registering on the PSR
- Using all available channels to promote the PSR and clearly and simply explaining our priority service offerings. For instance, we will seek to do this during calls with customers, in SMS correspondence, via its website and via Twitter
- Where practical, enhance our service offerings to:
 - Offer notices in braille, for visually impaired customers
 - Simplify telephone options, so it is simpler and quicker to contact a customer advisor
 - More simply explain to customers our pricing methodology.

Fuel poverty

Fuel poor customers are those who would need to spend 10% of their income on fuel to maintain an adequate level of warmth (21 degrees in the main living area, and 18 degrees for other occupied rooms). It is estimated that approximately five million households in the UK are fuel poor and a large percentage of these customers (around 80%) are also vulnerable.

We are committed to undertaking initiatives to reduce fuel poverty.

In December 2012, we organised a Vulnerable and Fuel Poor focus group in London. A number of stakeholders attended where we discussed the issue of fuel poverty and explored ways that as a DNO we could support our fuel poor customers. We have agreed to become formal sponsors of National Energy Action (a national charity focussed on the eradication of fuel poverty).

Key areas of focus in the next planning period include:

- Work in partnership with National Energy Action to develop a joint project to map and profile vulnerable customers within our geographic footprint. Understanding our customers better will enable us to undertake targeted initiatives such as expand our community surgeries programmes for vulnerable residents more effectively (see below)
- Publish targeted information on how energy efficiency and demand-side activity can be used to manage energy consumption better
- Publish a strategy to explain how smart meters can be used to reduce fuel poverty

- Deliver a series of targeted consumer surgeries for vulnerable residents designed to raise awareness around key topics including energy efficiency in the home and how to manage energy bills, the causes of fuel debt and how to apply to fuel poverty alleviation programmes
- Develop an information booklet that would be used as stand-alone educational tools for distribution. These will act as teaching aids for use by teachers during school activities, giving useful information around safety, fuel efficiency and the support available through us
- Explore the possibility of offering assisted connections to vulnerable customers, understanding what work should be included and what level of discount would be considered meaningful. The first phase will be limited to undertaking market research
- Support the development of local community energy champions among our employees through training such as the City & Guilds Certificate in Delivering Energy Efficiency Projects 6281-40
- Develop a project with NEA that engages young carers through training workshops. These would be targeted specifically to them and their families and focus on basic energy efficiency advice, information on how to deal with a power cut, electrical safety issues and support on where to seek assistance with energy bills
- We will work with a third party to organise and deliver school activity days. These will be a series of one-day activity workshops in local schools across our three licence areas. The aim will be to encourage behavioural change by educating school children to be more thoughtful, efficient and safe in their use of energy. The activities will incorporate a mix of interactive drama and practical discussion around energy efficiency and the safe use of electricity

Community engagement

As an essential service provider, we are committed to helping sustain livelihoods and lifestyles for many people in the East and South East of England and London.

During RIIO-ED1 we will host two subject specific focus groups every year on vulnerable customers and fuel poverty to improve our understanding of the impact we are having and continue to improve our initiatives in these areas.

We strengthen local economies and communities through infrastructure investment, as well as through everyday actions including supporting:

- The British Red Cross assistance for vulnerable customers
- Wildlife trusts in our distributions area
- Public safety education in schools and county shows
- Charity aid foundations

Community fund and staff volunteering

In addition to our existing commitments, we have recently established a community grant programme that provides funding (from shareholder returns) for community based projects relating to low carbon projects, vulnerable customers and communities. Quarterly grants of £1,000 to £10,000 are available under the scheme depending on the project's size and merit with a total of £100,000 available for each network in the first year of the scheme. The grant programme is about bringing ideas to life and the possibilities are endless.

Successful projects might include:

- Renewable and low carbon energy installations for community buildings, e.g. heat source pumps; heat exchangers; solar heating; and solar energy
- Community projects that reduce energy costs for the community and/or disadvantaged groups
- Initiatives that address social concerns, e.g. fuel poverty, poor housing and unemployment

We have a well-established employee volunteering programme under which staff are encouraged to take two days a year to help the community. Successful community fund projects will be encouraged to take advantage of this.

Our workforce – being an employer of choice

The technically skilled workforce of UK Power Networks totals approximately 5,150 employees, made up of 3,220 UK Power Networks staff and 1,930 Tier 1 contractors working on our network. We have been working with EU skills to develop a model to forecast workforce recruitment requirements. This model takes into account work volume changes in RIIO-ED1, expected retirement profile, expected natural wastage and productivity. During RIIO-ED1 we expect 19% of our workforce to retire and for this to rise further to 27% in RIIO-ED2. To address the need to maintain our skilled and motivated workforce we will:

- Recruit a further 236 adult, school leavers and 36 smart metering apprentices in RIIO-ED1
- Up-skill 146 trainees in RIIO-ED1 through our Engineering Development Programme
- Recruit 120 graduate trainees
- Recruit a further 403 unskilled staff through the marketplace
- Recruit a further 106 skilled staff through the marketplace

For further information see [Annex 5: Social commitments](#).

5 Cost of delivery

5.1 Summary forecast expenditure tables

This section sets out our forecast expenditure in RIIO-ED1 funded by charges to existing customers (i.e. DUoS) to deliver the output commitments discussed in Section 4. Our forecast total expenditure (totex) is £7.2 billion in real terms, a 1% increase from our forecast expenditure of £7.1 billion in the current DPCR5 period. The increases are focused on capital expenditure associated with increased forecast work volumes. Unit costs and direct operating costs are lower in RIIO-ED1, whilst indirect overhead costs are broadly flat, notwithstanding that we will be doing more work.

Table 22 compares our RIIO-ED1 forecast expenditure with our regulatory allowances and our actual/forecast expenditure over DPCR5. DPCR5 figures are grossed up to an eight-year basis to be comparable with RIIO-ED1:

Table 22 Actual compared to forecast 2015 to 2023 expenditure

£billion Real 2012/13 prices	DPCR5- Regulatory allowance (8yr equivalent)	DPCR5 UKPN actual expenditure (8yr equivalent)	% difference	UKPN RIIO- ED1 forecast	% difference between DPCR5 actual expenditure and ED1 forecast
Load related capex	1.22	0.79	-35%	1.05	33%
Non-load related capex	1.89	1.86	-1%	2.02	8%
Network operating costs	1.27	1.45	14%	1.17	-19%
Indirect costs	1.87	1.78	-5%	1.64	-8%
Non-operational capex	0.25	0.29	15%	0.23	-22%
Pension contributions	0.24	0.26	7%	0.27	5%
RPEs	-	-	-	0.27	-
Total	6.74	6.43	-5%	6.65	3%
Pensions deficit	0.49	0.71	44%	0.58	-18%
Total incl pensions deficit	7.23	7.14	-1%	7.23	1%

- Load related capital expenditure in DPCR5** (investment in reinforcing our network to cater for growth in electricity demand) is below the regulatory allowance by approximately 35% due to a number of factors. These include a lower than forecast growth in demand resulting from the 2008 financial crisis and a greater than anticipated impact from domestic energy efficiency, and a delay in certain major tunnelling works projects due to planning issues. Expenditure in RIIO-ED1 is forecast to increase by 33% in order to meet the capacity requirements for forecast load growth, including the impact of low carbon technologies, offset by reduced unit costs and savings from smart technologies. The £1.05 billion forecast includes 50% of forecast costs for smart metering.

- **Non-load related capital expenditure in DPCR5** (investment in replacing or refurbishing assets because of deteriorating condition) is generally in line with the regulatory allowance set by Ofgem, with an underspend of around 1% driven by improved cost efficiency and lower average unit costs. Expenditure in RIIO-ED1 is forecast to increase by 8% as our detailed asset modelling forecasts an increase in the amount of asset replacement required as a consequence of our ageing asset base. This increase is partially offset by reduced unit costs. The £2.02 billion forecast includes 50% of forecast costs for smart metering.
- **Network operating costs** (tree cutting, faults and inspection & maintenance) in DPCR5 are overall above the allowance set by Ofgem by 14%. We have overspent on faults as we have focused on improving the quality of supply and out-performed on tree-cutting and inspection & maintenance. Expenditure in RIIO-ED1 is forecast to decrease by nearly 19%, due to the impact of reduced unit costs
- **Indirect costs expenditure in DPCR5** (support costs closely associated with our 'direct' capex and opex, and general business support costs) are below the allowance set by Ofgem by 5%. While we overspent our allowance at the beginning of the price control period, expenditure has significantly decreased since we reduced our headcount by around 600 people through a voluntary severance programme in 2011. Expenditure in RIIO-ED1 will be maintained as further efficiency savings offset the impact of increased work volumes
- **Non-operational capital expenditure** (expenditure on new and replacement assets which are not system assets, such as IT and property) in DPCR5 is above the Ofgem allowance, largely due to expenditure on IT separation from EDF Energy and on the Business Transformation project. Expenditure in RIIO-ED1 is forecast to decrease by 22% as a result of the introduction of new business information systems to support the rollout of smart metering and smart networks.

EPN's total proposed expenditure for the next planning period is £2.9 billion. This is in line with the current 2010 to 2015 period expenditure, adjusting for the difference in the length of the planning period. The increase is primarily driven by distributed generation infrastructure investment, increased work volumes and smart meter readiness including interventions (including interventions, offset by falling unit costs).

LPN's total proposed expenditure for the next planning period is £2.2 billion. This is an increase of £0.15 billion or 7% compared to the current 2010 to 2015 period expenditure, adjusting for the difference in the length of the planning period. The increase is primarily driven by the London Infrastructure Plan, increased work volumes and smart meter readiness including interventions (including interventions, offset by falling unit costs).

SPN's total proposed expenditure for the next planning period is £2.1 billion. This is a decrease of £0.05 billion or 2% compared to the current 2010 to 2015 period expenditure, adjusting for the difference in the length of the planning period. The decrease is primarily driven by increased work volumes and smart meter readiness (including interventions, offset by falling unit costs).

Expenditure in RIIO-ED1 by output category

Table 23 shows how expenditure building blocks map to output commitments (including customer contributions of £1.2 billion in connections).

Table 23 Nature of investment in each building block and linkage to outputs

£ billion Real 2012/13 prices Gross	EPN RIIO-ED1 expenditure forecast	LPN RIIO-ED1 expenditure forecast	SPN RIIO-ED1 expenditure forecast	UKPN RIIO-ED1 expenditure forecast
Customer Service	0.6	0.4	0.4	1.4
Reliability and Availability	1.7	1.3	1.1	4.1
Environmental	0.4	0.2	0.3	0.9
Connections	0.5	0.4	0.3	1.2
Safety	0.1	0.1	0.1	0.3
Social Commitments	0.1	0.3	0.2	0.6
Total	3.4	2.7	2.4	8.5

5.2 Detailed expenditure forecast tables

Table 24 sets out the detailed expenditure building blocks for total UK Power Networks.

Table 24 Detailed expenditure forecast

UKPN RIIO-ED1 total expenditure forecast (£m real 2012/13 prices)											
Item	DPCR5 average	RIIO-ED1 average	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	RIIO-ED1 total
Load related expenditure	98.8	127.8	135.4	140.2	145.6	127.3	124.6	118.8	121.4	109.3	1,022.6
Non-load related expenditure	232.7	248.7	271.8	275.0	256.7	250.7	254.2	241.0	224.6	215.4	1,989.4
Faults	108.4	78.0	79.9	79.0	77.9	77.5	76.4	76.9	77.7	78.5	623.8
Inspections & maintenance	42.3	34.6	36.3	35.7	35.4	35.2	34.7	34.6	32.7	31.9	276.5
Tree-cutting	23.1	24.0	23.9	24.0	24.3	24.2	24.3	24.0	23.7	23.4	191.8
Other including electricity purchased	7.9	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	78.4
Closely associated indirect costs	142.3	138.0	151.5	145.3	140.3	139.2	135.9	131.2	131.3	129.1	1,103.8
Business support costs	79.9	67.3	69.9	69.7	68.0	67.5	67.0	66.3	65.6	64.3	538.3
Smart metering	0.5	7.1	4.7	8.1	10.3	11.2	11.1	8.1	1.8	1.8	57.1
IT (non-op capex)	19.8	14.4	10.7	24.6	15.9	15.9	15.3	12.9	10.6	8.9	114.8
Other non-op capex	16.5	13.9	14.5	16.4	10.8	14.5	15.0	10.7	16.4	13.1	111.4
Pension contributions	32.4	34.1	39.3	38.3	37.0	35.6	33.9	31.9	29.3	27.1	272.4
RPEs	-	33.5	5.2	14.4	22.5	30.5	38.9	45.6	52.5	58.2	267.8
Total core costs	804.6	831.0	852.9	880.5	854.5	839.1	841.1	811.8	797.4	770.8	6,648.1
Pensions deficit repair	88.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4	579.2
Total core costs pensions deficit	893.0	903.4	925.3	952.9	926.9	911.5	913.5	884.2	869.8	843.2	7,227.3
Business rates	73.5	77.3	77.3	77.3	77.3	77.3	77.3	77.3	77.3	77.3	618.4
National Grid charges	61.2	101.1	75.5	84.3	89.9	97.5	107.9	116.1	117.6	119.9	808.7
Other	22.8	8.6	14.3	9.9	8.9	9.5	7.7	9.8	4.3	4.3	68.7
Connections outside RAV	1.4	-5.0	-6.8	-5.8	-5.0	-5.0	-4.5	-4.1	-4.2	-4.2	-39.6
Total	1,051.9	1,085.4	1,085.6	1,118.6	1,098.0	1,090.8	1,101.9	1,083.3	1,064.8	1,040.8	8,683.5

5.3 Load related expenditure

Table 25 Load related expenditure

UKPN RIIO-ED1 total expenditure forecast (£m real 2012/13 prices excluding pensions and smart metering)											
Item	DPCR5 average	RIIO-ED1 average	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	RIIO-ED1 total
Load related expenditure	98.8	127.8	135.4	140.2	145.6	127.3	124.6	118.8	121.4	109.3	1,022.6

Our load related expenditure forecast is based on the work volumes that we estimate are necessary to deliver our reliability and availability output targets, including our load index objectives. We use a number of models to inform the volume and nature of work that needs to be undertaken to maintain our LI targets including:

- Planning Load Estimator (PLE) – this assesses site specific investment requirements at HV and EHV substations to meet our statutory requirements
- Imperial College London (ICL) Load Related model – this assesses investment requirements at a whole of system level, rather than at a site specific level
- Smart Grid Forum Work Stream 3 (WS3) ‘Transform’ model – this provides an indication of the nature and scope of smart grid investment that could be adopted based on a generic network

Taken together, these models provide a robust view of the nature and volume of work that must be undertaken to deliver our overall output commitments to customers. The work programme identified by the models is further tested and assessed by expert engineers who take into account, amongst other things, the following factors to ensure that it is prudent and efficient:

- The opportunities for synergies between work programmes, such that the replacement schedule can coincide with other major works including National Grid’s investment plans
- The underlying reasons for any step change in average historic volumes
- Whether there is scope to trade off or substitute load related capex for other categories of capex including non-load related or quality of supply or opex
- Whether there are other feasible and efficient alternative investment options that could achieve the same outcomes including non-network solutions or innovative investments
- The cost-benefit of alternative solutions having regard for network risk
- The impact on quality of supply if investment is deferred or not undertaken

Planning scenarios

One of our key challenges in the 2015 to 2023 planning period is the need to adapt to the requirements of a low carbon environment. The UK Government has committed to reducing carbon emissions by 80% by 2050 with medium term goals set for 2020.

There is significant uncertainty about the rate of consumer uptake of low carbon technologies (LCT), such as electric vehicles (EV), solar panels (PV) and heat pumps, to support the Government’s objective of reducing greenhouse gases. We are also expecting growth in a range of distributed generation technologies, including onshore wind farms, to impact our networks. Depending on the rate of uptake, these LCT could significantly impact our future network capacity requirements, and therefore investment requirements.

The Department of Energy and Climate Change (DECC) developed a set of scenarios for the uptake of heat pumps, EV and PV at the Great Britain level. For each technology, DECC has developed three scenarios – low, medium and high uptake.

We developed our own ‘best view’ of the most likely planning scenarios for our networks over 2015 to 2023, having regard for DECC’s scenarios, stakeholder feedback, historical trends and government projections, and expert input from Element Energy including the outputs from their model.

Table 26 sets out the five scenarios that we have developed and consulted on. These scenarios were considered in terms of low, medium and high impact/uptake of the:

- Rate of economic growth including population growth
- Deployment of LCT including heat pumps and EV
- Changes in electricity market mechanisms such as the increase in demand-side response, rollout of smart meters and the introduction of time of use tariffs

Table 26 Planning scenarios 2015 to 2023

Scenario	Rate of economic growth	Impact of low carbon technologies	Impact of electricity market reform
Economic Concern	Low	Low	High
Engaged Green Society	High	High	High
Green Stimulus	Low	High	High
Green Technology Revolution	High	High	Low
Business-as-usual	High	Low	Low

Drawing on the above, we developed a 'hybrid' scenario model which has been updated to reflect several rounds of stakeholder feedback, amendments to Element Energy's modelling approach, and the latest available information and forecasts on key inputs including:

- Forecast household growth
- The domestic uptake rate of heat pumps
- The uptake rate of electric vehicles
- Commercial heat pumps
- Domestic lighting and appliances

The input assumptions included in the planning scenario underpinning our business plan are set out in Table 27 below.

Table 27 Final planning inputs and assumptions (as at March 2023)

	Forecasts for 2023		
	LPN	EPN	SPN
Heat pumps – Domestic (000's)	37	222	84
Heat pumps – Non domestic (MW)	62	155	82
Electric vehicles (000's)	41	129	111
FIT eligible generation (000's)	67	195	113
Onshore wind (MW)	10	625	145
Offshore wind (MW)	Not applicable	Beyond 2015 assumed to connect to offshore grid	Beyond 2015 assumed to connect to offshore grid

Development of the load forecast planning assumptions

During 2011, we held three load planning scenario workshops with key strategic stakeholders including local authorities, government representatives and strategic stakeholders, who agreed that we are about to face a tactical planning issue with regard to the take up of low carbon technologies. Some challenged the idea that we will be independent of gas as a power source by 2050. Others believed that we should be doing more to decrease peak load demand through innovative solutions such as controlling domestic electrical appliances. Figure 31 illustrates the range of GDP growth that is expected in RIIO-ED1. This range of uncertainty is higher in UK Power Networks' three regions by approximately 0.5% of GDP. UK Power Networks has a strong track record in managing this uncertainty in its regions to the benefit of customers.

We share the views of our stakeholders that through innovation, we can utilise the challenges of a low carbon transition to deliver better service and reduced environmental impact. Our best view of the planning scenarios will ensure that network investment driven by our view of planning scenarios, including reinforcement, is efficient and prudent, and therefore will not over invest in our network at the expense of customers.

Figure 31 Current GDP forecast scenarios

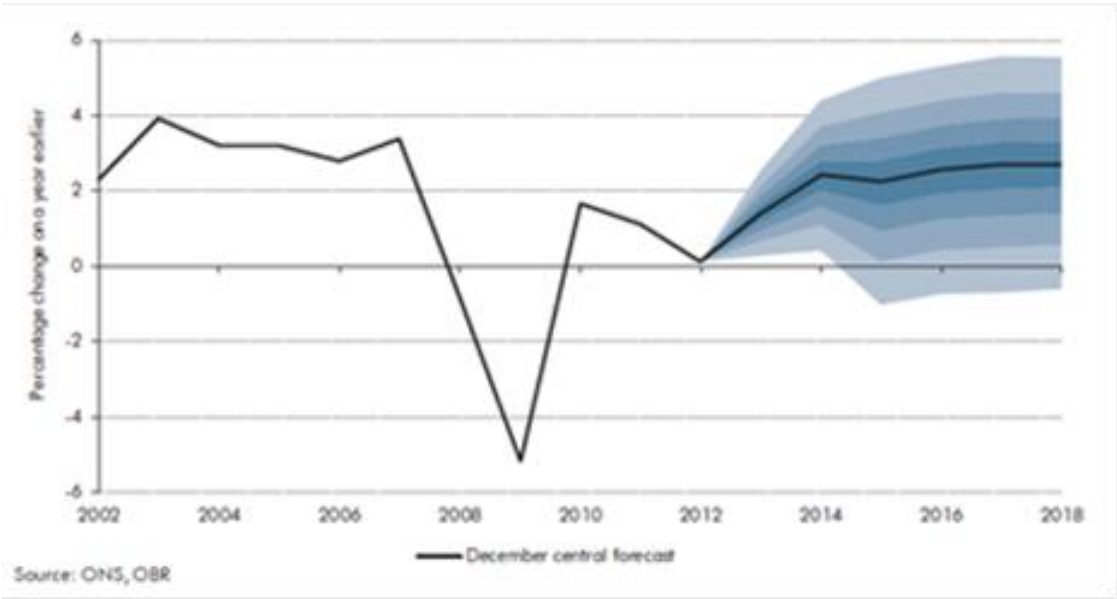
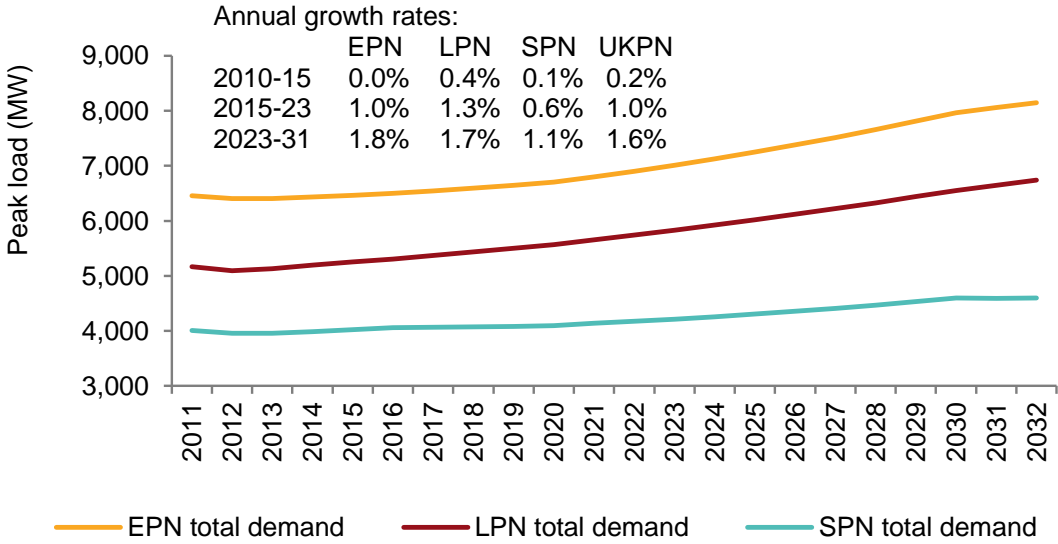


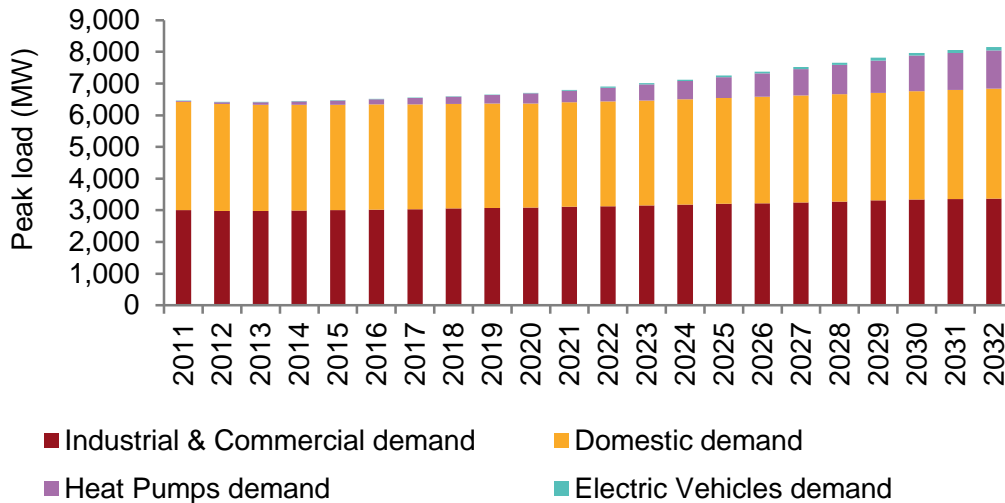
Figure 32 shows the peak load growth in DPCR5 and forecast for RIIO-ED1. It is expected that it will accelerate through ED1 and then increase further in RIIO-ED2.

Figure 32 Forecast peak load growth in UK Power Networks (regulatory years ending in given year)



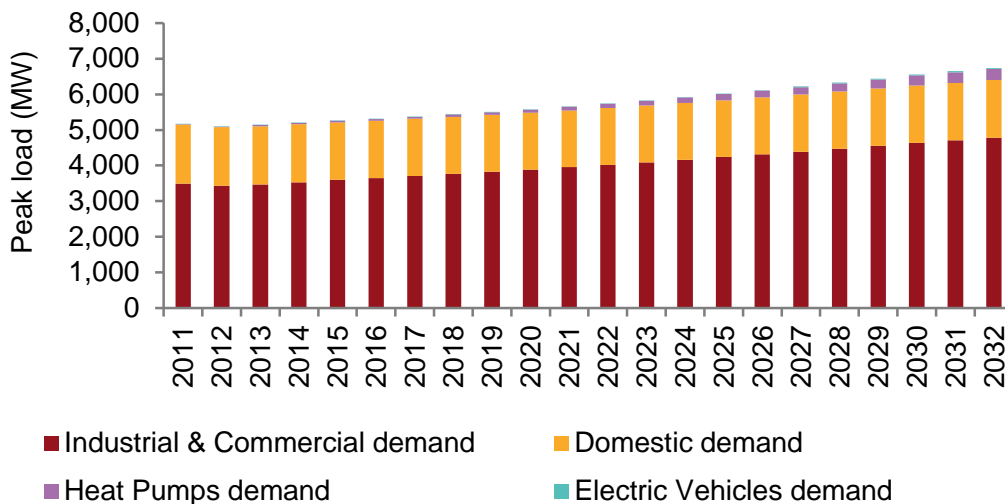
The results of our core planning scenario show that EPN peak demand is evenly split between domestic and industrial/commercial demand, with the latter rising after 2023. Peak demand in EPN is expected to remain relatively level over the course of the period from 2015 to 2023. It is however expected to climb as heat pumps and electric vehicles are more widely adopted towards the end of the period into the mid to late 2020s and the economic conditions return towards pre-crisis levels.

Figure 33 Forecast peak load growth in EPN



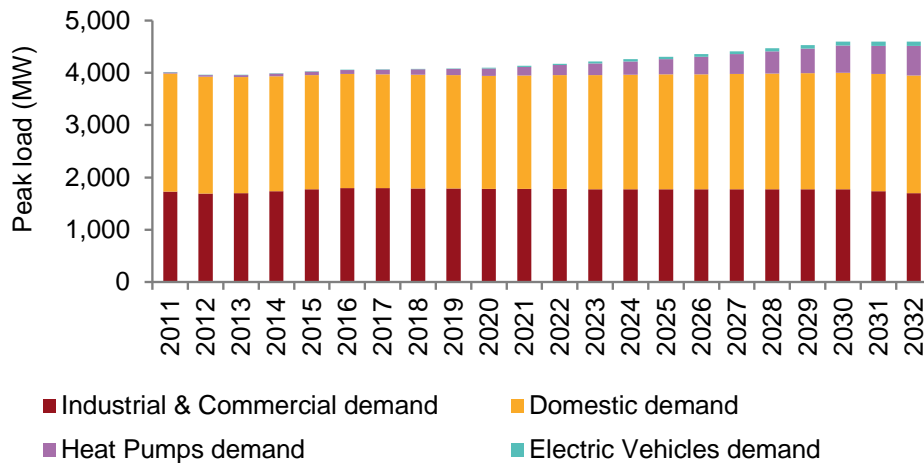
LPN is largely dominated by industrial and commercial demand, reflecting the make-up of inner London. This is expected to rise over the period between 2015 and 2023 and beyond. Electric vehicle take-up is expected to be modest in LPN with heat pumps only being adopted in significant numbers later in the 2020s.

Figure 34 Forecast peak load growth in LPN



SPN peak demand is expected to remain relatively consistent over the next two decades with some take-up of electric vehicles and heat pumps, with overall growth aligned to the long-term trend, with low-carbon technologies being a significant driver of growth beyond the mid-2020s.

Figure 35 Forecast peak load growth in SPN



Dealing with uncertainty in low carbon forecasts

To better understand the scale of the uncertainty in the low carbon forecasts, we have modelled both the DECC scenarios and our own core scenarios in our own load related modelling tool and the Smart Grid Forum’s Transform model.

The different scenarios from our internal load related model are illustrated in Figure 36 to Figure 38. These show the total load related expenditure forecasts in £m (real 2012/13 prices). The scenarios illustrate that there is little variation in RIIO-ED1 except in the extreme low scenarios. In RIIO-ED2 the potential electrification of heat and transport cause major uncertainty. (The core scenario does not reconcile exactly with our load related capex shown in Table 24, because it is raw model output.)

Figure 36 EPN scenarios forecast ED1 and ED2 (£m)

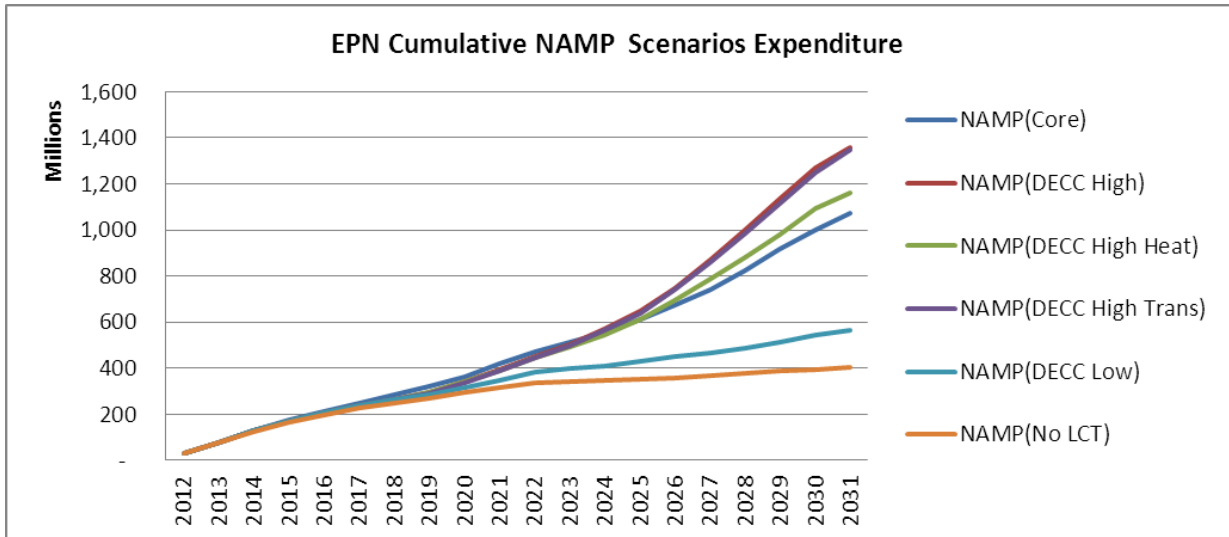


Figure 37 LPN scenarios forecast ED1 and ED2 (£m)

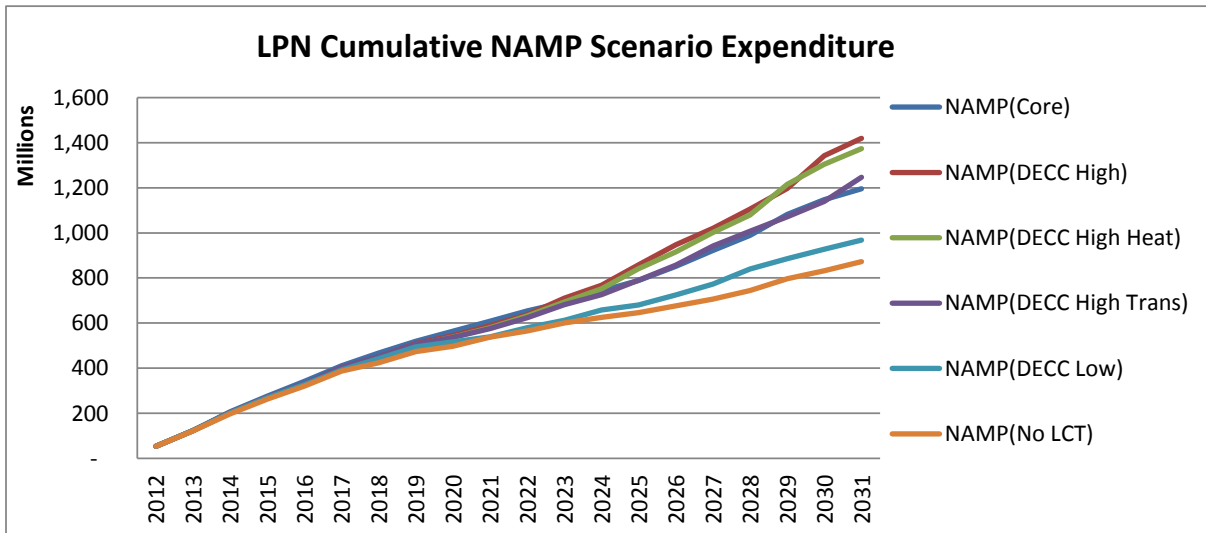


Figure 38 SPN scenarios forecast ED1 and ED2 (£m)

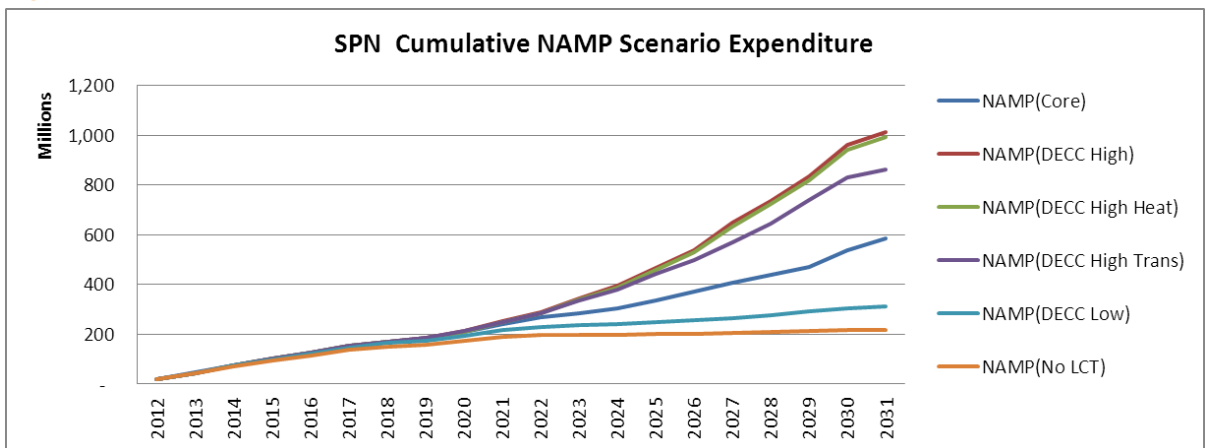


Table 28 below compares the expenditure forecasts for each of our core planning scenarios against the extremes of the DECC scenarios. It should be noted that the underlying economic assumptions in both models are not the same.

Table 28 Scenario comparison

Scenario (to 2023)	UKPN Model	Transform Model
UKPN scenario	100%	100%
DECC high	103%	130%
DECC low	88%	105%

The output of the Transform model look counter intuitive, as it implies expenditure in the UK Power Networks scenario which is lower than the DECC low scenario, despite the economic assumptions being between DECC high and low. Our view is that the complexity of the LPN network makes it difficult for it to be approximated in the Transform model, and hence the results are less representative. This shows that the UK Power Networks view and the DECC view start to diverge through the ED2 period. The principal reason for this is that under the DECC assumptions, the penetration of heat pumps in particular, ramps up significantly post 2020, whereas the UK Power Networks scenario assumes a much more even take-up.

A key issue that is not immediately evident is the change in HV and LV circuit investment requirements from ED1 to ED2. This main form of reinforcement is likely to be the installation of new underground cables, particularly at LV. Figure 28 sets out the scale of peak circuit reinforcement implied under each of the scenarios during ED1 and ED2.

Table 29 Peak annual HV and LV circuit reinforcement during ED1 and ED2

Scenario (to 2023)	ED1	ED2
UKPN core	73km	162km
DECC high	130km	363km
DECC low	68km	111km

As Table 29 shows, if the DECC high scenario occurs, we will face a ramp up in the volume of circuit reinforcement between ED1 and ED2. Large scale replacement of LV cables in particular, presents significant challenges with respect to being able to physically undertake the work due to the level of disruption it would cause to the general public.

Using our load related modelling we have been able to run different scenarios of load growth including and excluding the projected increases in low carbon technologies during ED1 and ED2. In our core business scenario it is forecast that 33.7% of the peak load forecast increase in EPN (195 MW) in ED1 is as a result of the increase in low carbon technologies. The corresponding increases are 30.5% (70 MW) in SPN and 13.2% (84 MW) in LPN. The lower increase in LPN is as a result of higher economic growth and the lower penetration of heat pumps due to the lack of suitable private open space.

Given the level of uncertainty of the proposed take up of low carbon technologies and the low divergence of investment requirements across the different planning assumptions in ED1, UK Power Networks believes that the level of risk of significant changes to the levels of reinforcement is acceptable to customers and shareholders given the proposed uncertainty mechanisms.

Reinforcement in the East of England because of the impact of distributed generation

Our EPN network has seen high levels of distributed generation project connections, in particular in the north of the East, where demand is relatively low. Consequently, we have identified a need to invest to address existing network constraints such as voltage and fault levels, and thereby ensure the quality and reliability of supply and network safety standards.

We are therefore proposing to undertake four network reinforcement investments, forecast to cost around £15.4million, which will increase network capacity by 187MVA. We have robustly tested this investment to ensure that it is prudent and efficient, and will deliver outputs and outcomes that are in the long term interests of our customers through:

- WTP studies – There was clear support from customers for network investment to provide additional infrastructure to support the network against LCT growth. Customers indicated that they were willing to pay an additional £116million across our three networks, and for EPN alone, they were prepared to pay an additional £52million over the 2015 to 2023 planning period
- Cost-benefit / options analysis – UK Power Networks undertook an internal cost-benefit assessment of the 16 different investment options considered. This involved comparing the costs of each project in a single year with the benefits which include amongst other things, including a reduction in carbon emissions over a period of 16 to 24 years
- Stakeholder engagement at two UK Power Networks' DG forums
- Technical expert review – this was undertaken by SKM and focused on the four proposed projects

This project represents best value for money, and would result in a positive return using the DECC non-traded carbon values.

For further information see [Annex 3: Core planning scenario](#).

Reinforcement in London to maintain capacity and resilience

The London Central Business District (CBD) has a significant commercial and political impact on the UK economy. Customers served by our London network include the many internationally significant businesses in the City of London, the West End and Canary Wharf, and the many strategic government and royal sites around Parliament Square, Whitehall and Green Park. It is therefore important that the London network, and particularly the CBD, has capacity and resilience that is comparable with other world cities. To this end, we have incorporated c.£100million of strategic reinforcement expenditure on new substations and on increased automation in our 2015 to 2023 business plan. This is included as part of the £1.02 billion of total load related reinforcement UK Power Networks is proposing to spend during RIIO-ED1.

We will develop four new primary substations at Vauxhall Nine Elms, White City, West End and Calshot Street (near King’s Cross). We have already started developing Calshot Street in the current price control. In total, this will add just under 260MVA of firm capacity. We have reviewed a further three sites at West Ferry Road, City of London and Earls Court where there is insufficient certainty of load growth to comply with the current regulatory network investment requirements. Stakeholders have expressed their concern that the current regulatory framework does not provide sufficient flexibility to enable the development of the network in anticipation of future load growth. UK Power Networks has agreed to facilitate the development of specific network investments through public consultation to establish future connections requirements. We will work with our London stakeholders on this consultation once an initial request to connect is received in one of the three network areas identified above.

UK Power Networks is also investing a further £40million to increase network automation and remote control to improve the resilience of the networks. This will be achieved by the provision of remote control facilities on 1 in 3 remote terminal units (RTU’s) & Air Circuit Breakers and five (one funded in DPCR5) interconnected network groups converted to ‘Unit’ protection.

We have tested this investment to ensure that it is prudent and efficient, and will deliver outputs and outcomes that are in the long term interests of our customers through:

- WTP studies – this highlighted strong support for this investment given its importance of this investment for the economic growth and prosperity of the wider UK economy over the long term
- Network options analysis – we engaged an independent engineering consultant, Sinclair Knight Merz (SKM), to assist us to undertake robust investment options and cost-benefit analysis
- Stakeholder engagement – we have extensively engaged with our stakeholders, including through the London Infrastructure Forum who indicated strong support for strategic investment in London capacity (and indeed would like to see more expenditure than we are proposing)
- Detailed discussions with Ofgem, including reassurances by us that the capacity investment can be justified based on projected general load growth and does not constitute investment ahead of need for new connections

The London Infrastructure Plan project satisfies all the above investment tests, and has therefore been incorporated into our 2015 to 2023 expenditure forecast.

Diversions and wayleaves

There are two primary drivers to diversion and wayleaves expenditure, customer requests to move UK Power Networks infrastructure and the volume of capital investment. UK Power Networks has used the historic level of expenditure and revenue to forecast customer driven diversions. The majority of these costs are charged directly back to customers who incur the work.

5.4 Non-load related expenditure

Table 30 Non-load related expenditure

UKPN RIIO-ED1 total expenditure forecast (£m real 2012/13 prices excluding pensions and smart metering)											
Item	DPCR5 average	RIIO-ED1 average	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	RIIO-ED1 total
Non-load related expenditure	232.7	248.7	271.8	275.0	256.7	250.7	254.2	241.0	224.6	215.4	1,989.4

We are committed to maintaining the health and condition of the network, including health index targets, in line with current levels over the RIIO-ED1 period, and we are committed to further improving our CI and CML performance.

We use a number of models to inform the volume and nature of work that needs to be undertaken to maintain our HI targets including:

- Asset Risk Prioritisation (ARP) – this assigns a numeric representation of condition of individual asset classes in terms of the HI scores (HI1 to HI10), by drawing on a range of inputs including age, location, and inspection data

- Asset health (Civil) – this assigns a numeric representation of condition of individual asset classes in terms of the HI scores (HI1 to HI4)
- Criticality ARP – this provides a relative comparison of the consequences of failure within the HI categories by assigning a criticality score
- Criticality (ESQCR) – this assigns a severity score indicating the deadline within which issues need to be resolved

Taken together, these models provide a robust view of the current health of the network, by assets and the number of interventions (volume of work) required to maintain the health at the current overall level. The outputs from the criticality ARP are important to informing how work programmes should be prioritised, having regard for the consequences of failure.

The work programme identified by the models is further tested and assessed by expert engineers to ensure that it is prudent and efficient. The same tests described in Section 5.3 on load related expenditure are applied.

The majority of our assets were installed in the late 1950s to early 1970s, and asset replacement activity is increasing as these assets approach the end of their useful lives.

Table 31 sets out the forecast replacement volumes by major asset category in RIIO-ED1, and with DPCR5 for comparison. The table shows that our business plan for RIIO-ED1 delivers significantly greater volumes of asset replacement.

Table 31 Volumes of assets to be replaced in RIIO-ED1

Asset Type	EPN		LPN		SPN	
	DPCR5 Total	ED1 Total	DPCR5 Total	ED1 Total	DPCR5 Total	ED1 Total
132kV and EHV switchgear	511	528	31	155	123	185
132kV, 66kV and 33kV underground cables	110	50	23	132	68	61
132kV, 66kV and 33kV transformers	35	65	10	44	34	47
Distribution Transformers	493	920	587	680	386	752
High voltage underground cables	69	48	57	40	66	32
HV ground mounted switchgear	1,844	4,431	2,233	1,859	4,400	6,519
HV Pole mounted switchgear	1,238	352	0	0	275	144
Low voltage switchgear	36,170	22,351	14,124	15,596	21,719	16,174
Low voltage underground cable	26	32	49	16	17	32
Overhead line conductor (all voltages)	525	3,638	-	12	271	2,523
Overhead Low voltage services	15,191	17,500	0	0	3,694	10,400
Poles (all voltages)	12,110	23,776	0	0	8,993	14,120
Towers	1	22	-	-	13	16
Underground Low Voltage services	2,544	6,072	561	350	1,606	3,855
Grand Total	70,867	79,785	17,675	18,884	41,666	54,859

Assets are considered for refurbishment rather than replacement when technically possible and practicable, and where the life extension following refurbishment is sufficient to justify the expenditure over replacement. The decision to refurbish or replace is based on the analysis of the condition data of the specific assets in question.

For example, grid and primary transformers are considered for refurbishment where external factors, such as a significant oil leak, can be rectified and the dissolved gas analysis (DGA) results indicate that the internal condition of the transformer is good. For switchgear, the two main refurbishment options considered are the replacement of the “withdrawable” breaker and refurbishment of the associated fixed portion, or the refurbishment of 132kV air blast circuit breakers which involves the replacement of various internal components under the recommendation of the manufacturer.

Fluid filled cables are also considered on a case by case basis for joint refurbishment, although refurbishment is usually only viable where the cable is constructed with an aluminium sheath and the issue with the circuit is significant oil leaks at the joint positions. Refurbishment of overhead lines is regarded as the replacement of necessary fittings and insulators located on a route as opposed to replacement of conductor. This is driven on a case by case basis depending on the condition of the individual components and whether any associated defects recorded makes replacement of the asset more commercially viable than refurbishment.

Defects on an asset are given a priority for rectification based on a weighting system developed with the relevant asset expert. Some defects will drive an immediate intervention, and others will not until the next maintenance activity.

London operational performance

The expectations of stakeholders regarding to operational network performance are higher in central London than our other network distribution areas. This has been further reinforced through our experience gained during the London 2012 Olympic and Paralympic Games and recent operational incidents in London (i.e. Carnaby Street and Victoria), and the high level of media attention they have attracted. We are proposing to improve the level of services received by customers served by the central London network through:

- The establishment of two central London operational depots
- 24-hour manned fault response
- Removal of technical constraints
- Removal of service constraints

We propose to achieve improved outcomes through our replacement, refurbishment and maintenance, and inspections programmes relating to amongst other things, link boxes, cable pits, radialisation and automation.

We have included a further £11million of on-going expenditure in RIIO-ED1 to deliver this improved operational performance. Further, we expect our CI and CML performance to improve by a further 0.2 CI and 0.3 CML. This represents an improvement of about 30% in our CML performance for our central London customers.

Climate change adaption

We recognise that certain aspects of our network infrastructure and assets may be vulnerable to some elements of climate change such as hotter, drier summers; warmer, wetter winters; rising sea levels and increased flooding; rapid vegetation growth due to warmer, wetter conditions; and increased lightning.

These weather patterns and associated vegetation changes will impact the resilience of our network through, amongst other things:

- Reduced asset capacity
- Deterioration in equipment ratings
- Mechanical damage
- Increased network faults associated with:
 - Flash flooding and increased rain affecting substations
 - Vegetation interference on overhead lines
 - Summer drought conditions affecting earthing and transformer ratings
 - Increased lightning activity affecting overhead lines
 - Increased vegetation growth

We have assessed the short and long term impacts of climate change on our network to develop an investment programme for the RIIO-ED1 period that will bring long term resilience benefits, and ensure that our network can effectively and cost-efficiently adapt to the consequences of climate change. Our investment programme includes, amongst other things, deployment of predictive cooling on major transformers in LPN, flood-proofing of substation sites. We are also currently assessing the benefits of using alternative overhead line insulators.

Importantly, we are committed to continually reviewing our investment requirements to ensure that they remain relevant, efficient and prudent, and incorporate innovative solutions. We have established on-going monitoring and assessment models, such as on-going assessment of equipment ratings, to assist with this.

5.5 Smart grid savings

Smart grid solutions have the potential to deliver significant benefits during the RIIO-ED1 period:

- Reduce the cost of reinforcement on the network in response to increasing demand
- Provide a greater range of options and allow us to hold back on making certain investment decisions until the load uptake is clearer
- Provide flexibility in the event that low-carbon uptake or demand uptake is faster than anticipated
- Reduce the cost and/or speed with which generation in particular can connect to our network
- Improve the reliability of our network performance
- Reduce the cost associated with asset replacement, whilst not affecting the performance of the assets

Since its introduction at the end of 2009, the UK Power Networks Future Network Development Plan has established a structured, qualitative assessment of the maturity of smart grid solutions and their importance in addressing the challenges that UK Power Networks faces.

Two significant tools have allowed us to take this qualitative analysis further and to carry out quantitative analysis: the Transform model developed by the UK DNOs under the auspices of the Smart Grid Forum Workstream 3, and a Load-Related Expenditure (LRE) model developed for us by Imperial College. As an example, these tools have allowed us to model the potential impact that an increasing number of Electric Vehicles (EVs), micro-generation and heat pumps connected at the domestic level may have on the performance of our Low Voltage (LV) networks.

Table 32 Smart grid savings in our UK Power Networks' business plan

Smart Grid solution	UKPN £m
Benefit from existing smart grid network designs and practices	30
Savings in LV reinforcement compared to forecast volumes	35
Saving from demand side response schemes	43
Savings in overhead line reinforcements	9
Savings from dynamic transformer ratings	15
Savings from partial discharge monitoring of switchgear	9
Sum of savings	141

Table 32 shows the benefits from our smart grid investment and we have forecast total savings across our networks of around £141million in RIIO-ED1:

- £132million relates to avoidance (reduction) of traditional network reinforcement investment
- £9million relates to reduction in non-load related expenditure.

This is in line with our implied share of the total £500million of savings for Great Britain estimated by the Department of Energy and Climate Change (DECC) and Ofgem's Smart Grid Forum.

For further information see [Annex 9: Smart grid strategy](#).

5.6 Improving quality of supply

We have set an overall business objective to improve continuity of supply in all three licence areas so that our CI and CML performance for RIIO-ED1 is in the top third compared to other DNOs, and to eliminate over 18 hour and significantly reduce 12 hour restoration failures. Delivering this objective will reduce fault costs, improve customer service, and increase rewards under the regulatory incentive scheme.

Moving into RIIO-ED1, focus will continue on operational improvements to speed up restoration and reduce frequency of interruption, as well as optimising the Network Asset Management Plan (NAMP) programmes to mitigate faults and customers affected. This will require the CI and CML benefits and impacts from asset programmes to be understood, quantified and managed. Monitoring and identification opportunities for automation of the LV network, particularly in London, will be introduced, and improvements will be made to the central London distribution systems.

These improvements will be enabled through better asset and network knowledge, as well as planning and analysis tools. The rollout of smart meters coupled to enhanced distribution substation monitoring provides the opportunity to improve the visibility of network loading and voltage profiles. Further vector capture of network records in our network maps will facilitate accurate network modelling, speeding connection designs and pre-emptive reinforcement, and also enable improved condition and performance analysis of circuits. Improved communications will be necessary to carry the increased data flows and overcome intermittency and obsolescence issues, and improve the effectiveness of secondary control systems.

We have included an additional £21million of shareholder funded quality of supply expenditure during RIIO-ED1. It is expected that this will reduce CI and CML by 12% and 19% in SPN, 12% and 19% in EPN, and 7% and 8% in LPN. We have confirmed this requirement through our willingness to pay studies and completed cost-benefit analysis to ensure that both customers and shareholders receive a return on their investment. The CBA is positive across all three networks.

For further information see [Annex 6: Quality of supply](#).

5.7 Network losses

Network losses are expected to increase as a result of the higher utilisation of networks as load grows and the UK economy decarbonises. Our RIIO-ED1 network losses strategy is to factor in appropriate loss mitigation measures to all categories of existing network investment. This approach, which we describe as ‘opportunistic’, will give rise to greater and more cost-effective opportunities for losses mitigation since the consideration will be largely a matter of incremental cost over that required to meet a given investment driver. For example, the incremental cost of installing a higher rated cable to serve a new development might be small compared with the value of the reduced losses benefit, whereas overlaying an existing adequately rated cable for no other reason than to reduce losses would be unlikely to be cost-effective. The approach to cost-benefit analysis will therefore primarily be based on incremental cost benefit, comparing the NPV of intervention options and factoring in the discounted value of losses (and any other on-going costs and benefits) in the overall investment appraisal.

The strategy recognises that pressures to cost-effectively accommodate new low carbon technologies will result in networks being driven harder. Under DECC’s ‘central’ generation scenario and 4th Carbon Budget demand scenarios, distribution networks will need, by 2030, to accommodate up to 20GW of solar photovoltaic generation, and distribute up to 66TWh of additional electrical energy (a 19% increase over today) due to electric vehicle charging and heat pumps. It follows that in MWh terms, losses will inevitably increase as a direct consequence of the increased power flows. Moreover, the unmitigated usage of low carbon technologies (i.e. in terms of time of day of usage) is likely to give rise to network peak demands increasing disproportionately to the underlying increase in electrical energy distributed. This in turn would have a further disproportionate impact on circuit losses which vary with the square of the electrical current passing through the conductors.

Taking all these factors into account, a challenging target would be to maintain losses as a percentage of energy distributed at current levels. However, there is some uncertainty over the current level of technical losses. The ED1 outturn ambition is shown below, along with our estimate of the level of ED1 unmitigated outturn losses that we would anticipate due to forecast load growth over the RIIO-ED1 period in the absence of this strategy.

Table 33 Final planning inputs and assumptions

Network	2012/13 Measured Performance (%)	Anticipated Unmitigated ED1 Outturn (%)	EDI Outturn Ambition (%)
EPN	6.70	6.78	6.65
LPN	5.90	6.09	5.93
SPN	6.35	6.43	6.29

A consequence of our opportunistic approach is that we attribute no costs to implementing this strategy and hence no expenditure in our business plan is categorised as ‘losses management’. Through this strategy, we anticipate delivering, at potentially no additional cost to consumers, savings in losses with a cumulative present value benefit of £46.9million over the RIIO-ED1 period. Along with the environmental benefits of reduced CO₂ emissions, these benefits should flow through to consumers in terms of lower energy prices.

For further information see [Annex 7: Losses](#).

5.8 Network operating costs

Table 34 Network Operating costs

UKPN RIIO-ED1 total expenditure forecast (£m real 2012/13 prices excluding pensions)											
Item	DPCR5 average	RIIO-ED1 average	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	RIIO-ED1 total
Fault repair	108.4	78.0	79.9	79.0	77.9	77.5	76.4	76.9	77.7	78.5	623.8
Inspections & maintenance	42.3	34.6	36.3	35.7	35.4	35.2	34.7	34.6	32.7	31.9	276.5
Tree maintenance	23.1	24.0	23.9	24.0	24.3	24.2	24.3	24.0	23.7	23.4	191.8
Other including Electricity purchased	7.9	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	78.4
Total Network Operating costs	181.7	146.3	149.9	148.5	147.4	146.7	145.2	145.3	143.9	143.6	1170.5

Network operating costs fall into three broad categories of activity that are required to operate the network on an on-going short term basis. These activities are the restoration of electricity supply as a result of network electrical faults, inspection and maintenance of our assets and tree maintenance. We will optimise the amount of work carried out in these activities through a combination of historic trend analysis, asset health records, intervention scheduling optimisation and required frequency of visits.

Fault repair

Fault repairs arise from both network failures and interruptions to power as a result of third party activities (e.g. cable strikes). The historic failure rate of our network has been relatively stable over the last five years and our network investment programme has been constructed to ensure that the number of interruptions does not increase over time. Therefore we have used the historic 5-year average to forecast the number of expected network failures. Although there is more variability in the number of interruptions as a result of third party activities, it is not expected that the long term trend will change significantly over time and therefore the long run average has again been assumed. The overall reduction in the costs of the fault repair expenditure in RIIO-ED1 is as a result of the forecast improvement in the unit costs of our activities as our direct cost efficiency and business transformation programmes take effect over 2013-2015.

Inspections and maintenance

UK Power Networks inspects and maintains its network to minimise the expected whole life cost of an asset. UK Power Networks has developed an inspection and maintenance policy based upon a combination of real time information and studies of asset condition. Inspection and maintenance is used to ensure that the life of an asset is maximised by identifying and fixing asset problems before they occur.

Broadly our inspection and maintenance volumes in RIIO-ED1 are expected to remain flat when compared to DPCR5. We have also moved to the overall upper quartile unit cost target in RIIO-ED1. There is a £0.6million per annum increase in LPN as a result of the implementation of the London operational strategy. There is also an increase in inspection expenditure in the last two years of DPCR5 as UK Power Networks has committed to the Health & Safety Executive to inspect and where required replace, all cable pits and underground link boxes.

Tree maintenance

Tree maintenance is used to ensure that the amount of network damage as a result of tree growth or network damage during high winds from falling trees is kept to a minimum. UK Power Networks operates a 4-year rolling tree management programme in both SPN and EPN. There are no overhead lines in LPN that require tree-cutting. Expenditure in RIIO-ED1 is expected to stay at a constant level when compared to DPCR5.

Other costs including electricity purchased

There are a number of other small costs that are treated as network operating costs. The most significant (accounting for more than 80% of this category) is the purchase of electricity to run the network. UK Power Networks has implemented significant cost cutting programmes during DPCR5 through the implementation of demand reduction (reduced heating, the use of light timer switches in substations) and the total costs (above inflation and real price effects) are not expected to increase further in RIIO-ED1.

5.9 Closely associated indirect costs

Table 35 Closely associated indirect costs

UKPN RIIO-ED1 total closely associated indirect cost forecast (£m real 2012/13 prices excluding pensions)											
Item	DPCR5 average	RIIO-ED1 average	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	RIIO-ED1 total
Closely associated indirect costs	142.3	138.0	151.5	145.3	140.3	139.2	135.9	131.2	131.3	129.1	1,103.8

Closely associated indirect costs are activities that are required to support the operational activities (capital investment and network operating costs) of UK Power Networks. UK Power Networks has seen a significant reduction in these costs during DPCR5 and they are expected to remain constant in RIIO-ED1 except where there is a forecast increase in the volume of direct activities and new activities (smart metering) are undertaken. The costs of the main activities are shown in Table 36

Table 36 Closely associated indirect detailed cost breakdown

UKPN RIIO-ED1 closely associated indirect cost forecast (£m real 2012/13 prices excluding pensions)											
Item	DPCR5 average	RIIO-ED1 average	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	RIIO-ED1 total
Call centre costs	6.8	5.8	7.7	5.6	5.5	5.5	5.5	5.5	5.5	5.5	46.3
Control centre	11.9	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	94.1
Network design & engineering	15.6	14.0	16.0	15.2	14.7	14.2	13.8	13.1	12.8	12.4	112.2
Project management	15.2	13.3	14.8	14.4	13.9	13.5	13.2	12.5	12.2	11.9	106.4
Engineering mgt & clerical support	57.2	55.1	60.3	58.8	57.4	56.2	54.7	52.4	51.3	50.0	441.1
System mapping - Cartographical	3.3	3.1	3.1	3.1	3.1	3.1	3.1	3.0	3.0	3.0	24.6
Stores	4.7	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	36.8
Operational training	1.9	1.9	2.1	2.4	1.2	2.0	2.3	1.2	2.0	2.4	15.6
Workforce renewal	10.4	10.1	12.8	11.0	9.7	9.9	8.6	9.0	10.0	9.4	80.4
Vehicles, transport & property	15.3	16.6	16.8	16.7	16.7	16.7	16.6	16.5	16.5	16.5	133.0
Network policy (part of closely associated for RIIO-ED1)	n/a	1.6	1.6	1.6	1.6	1.7	1.7	1.6	1.6	1.6	13.2
Total closely associated indirect costs	142.3	138.0	151.6	145.3	140.3	139.2	135.8	131.2	131.3	129.0	1103.8

Call centre

UK Power Networks has a single 24-hour response call centre in Ipswich covering the entire customer facing activities for all three of our network areas:

- Answering power loss calls
- Facilitating the reporting of distribution network faults and safety hazards and complaints about the quality and reliability of supply
- Responding to queries, for example from retailers, customers, builders and contractors, on new connections, disconnections and reconnections
- Responding to general queries
- Responding to initial queries on metering
- Resolving customer complaints

The centre is co-located with the control centre to ensure close lines of communication when there are significant levels of customer interruptions during storms or other emergency events. UK Power Networks is not forecasting to increase call centre costs in RIIO-ED1 despite committing to significant improvements in customer service and satisfaction.

Control centre

The control centre operates, manages and controls the network on a real time basis. UK Power Networks is the only DNO to operate a full low voltage control system which enables UK Power Networks to interactively operate its network in real time reduces overall fault restoration times. The control centre includes the following activities:

- The short term and long term outage planning and management that is carried within the Control Centre prior to the undertaking of planned incidents
- Real time network control, monitoring and recording
- The dispatching of resources in response to customer supply interruptions (both supply-related and safety related incidents)
- Major incidents and emergency planning with national and regional emergency planning committees in respect of network operations, security of supply, civil contingency and business recovery

There is no expected increase in costs during RIIO-ED1.

Network design and engineering

This cost category includes all processes and tasks involved in the strategic planning of the distribution network at all voltages, and detailed engineering design of extensions and changes to the distribution network at all voltages.

Strategic planning of the distribution network relates to the tasks associated with the distribution network in totality rather than individual projects. It includes:

- Maintenance of network design data models
- Development of long-term development statements
- Capital planning for business plans and budgets
- Network wide demand forecasting
- Network modelling associated with determination of use of system charges

Detailed engineering design covers the tasks associated with general and fault level reinforcement projects, demand connections projects & enquiries, distributed generation connection projects & enquiries. The main activities are

- Load forecasting
- Network modelling
- Provision of connection charge quotations
- Approval of network designs undertaken by other parties
- Network performance monitoring and evaluation of impact of salient policies
- Planning and the authorisation of new projects

The network design and engineering costs vary with the volume of projects. This is expected to increase slightly from DPCR5 to RIIO-ED1.

Project management

Project management of significant projects or key programmes of work is important to ensure that projects are delivered to time, quality and cost requirements. The main activities in this area are:

- Overall responsibility for major project delivery
- Determining resource requirements
- Planning and requisitioning materials and equipment
- Work and resource programming
- Risk assessments of the overall project content
- Preparation of work instructions
- Issue work to own staff and contractors
- On-site supervision and technical guidance
- Quality checks on work undertaken
- Organising network access and co-ordinating outages
- Organising and supervising (where appropriate) the undertaking of commissioning tests
- Arranging energisation of assets
- Cost control

The project management costs vary with the volume of projects. This is expected to increase slightly from DPCR5 to RIIO-ED1.

Engineering management and clerical support

The office-based activities of engineering and clerical support staff (i.e. depot clerical staff, managers, work planners, etc) managing or assisting employees undertaking direct activities and wayleave administration. It covers the following activities:

- Clerical support for staff undertaking street lighting, including answering verbal and written enquiries regarding street lighting faults, dealing with instructions from lighting authorities, liaising with contractors and lighting authorities and providing statistics to local authorities
- Identification and implementation of improvement initiatives
- Work planning, budgeting, allocation and control
- Line management of staff undertaking direct activity work
- Mobile generation management
- Operational performance management
- Providing safety advice to persons working in proximity to network assets
- Health and safety
- Wayleave payments are annual payments made in advance to the owner and/or occupier to cover the financial impact of having equipment on their land

The engineering management and clerical support costs vary with the volume of projects. This is expected to increase slightly from DPCR5 to RIIO-ED1 in line with forecast in the volume of direct activities and new activities (smart metering).

System mapping

System mapping is the activity of geographical and system mapping of the network and operational premises. It is primarily about updating the geographical system maps with asset and location information following the installation, removal or repositioning of system assets.

These costs are forecast to be constant between DPCR5 and RIIO-ED1.

Stores

Is the activity of managing and operating stores including the delivery costs of materials or stock to stores and the labour and transport costs for the delivery of materials or stock from a centralised store to a satellite store.

Operational training and workforce renewal

Our workforce renewal strategy sets out the average growth in our workforce that will be required over the RIIO-ED1 period to deliver our investment and output commitments to our customers and other stakeholders.

The UK Power Networks technically skilled workforce totals 5,150 employees, made up of 3,220 UK Power Networks' staff and 1,930 Tier 1 contractors working on our network (we also have c. 2,500 employees not working directly on the network). UK Power Networks has been working with EU Skills to develop a model to forecast workforce recruitment requirements. This model takes into account work volume changes in RIIO-ED1, expected retirement profile, expected natural wastage and productivity improvements. During RIIO-ED1 UK Power Networks expects 19% of our workforce to retire and for this to rise further to 27% in RIIO-ED2. UK Power Networks will use six recruitment and training pathways to manage this potential workforce shortfall:

- UK Power Networks' apprentice programmes (skill level 3) – we recruited 73 adult and school leaver apprentices between 2010 and 2013, have up-skilled 37 staff to level 3 craftsmen in 2011 and 2012, we will recruit a further 108 general and 36 smart metering apprentices between 2014 and 2015 and we will recruit a further 236 general and 36 smart metering apprentices in RIIO-ED1
- Engineering development programme (skill level 4-5) – we up-skilled 38 trainees between 2010 and 2013, we will up-skill 47 trainees between 2014 and 2015, and we will up-skill 146 trainees in RIIO-ED1
- Graduate recruitment (skill level 5-7) – we recruited 28 trainees between 2010 and 2013, we will recruit 40 trainees between 2014 and 2015, and we will recruit 120 trainees in RIIO-ED1
- Market place recruitment (skill level 1–8) – we recruited 302 skilled direct staff between 2009 and 2013, we will recruit a further 343 staff between 2014 and 2015, and we will recruit a further 509 in ED1
- Contractor delivery – UK Power Networks uses contractors for the delivery of additional work programmes, specialist work and to manage peak workloads. This strategy will continue in ED1 with the contractor to direct staff ratio forecast to fall from 28%/72% in 2015/16 to 21%/79% in 2022/23

For further information see [Annex 16: Workforce renewal](#).

Vehicles, transport and property

Vehicle and property expenditure is expected to increase on average from £15.3million per annum in DPCR5 to £16.6million per annum in RIIO-ED1. This is as a result of the better utilisation of property space offset by an increase in the number of company vehicles. There is a slight increase in the level of expenditure in site security in recognition of the increase in metal theft. UK Power Networks has worked with an external company, IPD to benchmark its property costs against other utilities and similar companies operating in the same geographical area. The final report from IPD shows that for the geographical regions we are operating in UK Power Networks' forecast costs are better than benchmarked.

Network policy

Network policy is the development and review of environmental, technical and engineering policies, including all research and development. It includes the evaluation of the impact of changes in relevant legislation and the development, regular review and updating of engineering policies, such as those for:

- Asset inspection
- Asset maintenance
- Asset replacement
- Asset risk management
- Technical standards and specifications
- Plant, equipment and component specifications
- Vegetation management
- These costs are forecast to be constant between DPCR5 and RIIO-ED1.

5.10 Business support costs

Table 37 Business support costs

UKPN RIIO-ED1 Business Support cost forecast (£m real 2012/13 prices excluding pensions)											
Item	DPCR average	RIIO-ED1 average	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	RIIO-ED1 total
HR & Non-operational Training	5.7	5.0	5.1	5.1	5.1	5.0	5.0	4.9	4.9	4.8	39.8
Finance & Regulation	24.6	22.4	23.2	23.1	22.8	22.6	22.3	22.1	21.8	21.4	179.3
CEO	5.9	5.5	5.6	5.7	5.6	5.6	5.5	5.5	5.4	5.3	44.1
IT & Telecoms	26.5	22.6	23.6	23.8	22.6	22.6	22.5	22.3	22.0	21.6	181.0
Property Management	15.6	11.7	12.5	12.0	11.9	11.8	11.7	11.6	11.4	11.2	94.0
Total business support costs (includes Network for DPCR5)	79.9	67.3	69.9	69.7	68.0	67.5	67.0	66.3	65.6	64.3	538.3

Business support costs are associated with corporate functions of a DNO. The main activities are:

- HR and Non-Operational Training
- Finance & Regulation
- CEO
- IT & Telecoms (see Section 5.13)
- Property Management

UK Power Networks has worked with PA Consulting to benchmark our business support cost base and identify where future cost reductions are required. This has resulted in total business support costs which are reduced by an average of £7.9million per annum in RIIO-ED1 when compared to DPCR5.

5.11 Pensions

Table 38 On-going pension contributions

UKPN RIIO-ED1 Pension forecast (£m real 2012/13 prices)											
Item	DPCR5 average	RIIO-ED1 average	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	RIIO-ED1 total
On-going pension costs	32.4	34.1	39.3	38.3	37.0	35.6	33.9	31.9	29.3	27.1	272.4
Pensions Deficit	88.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4	579.2
Total	120.7	106.5	111.7	110.7	109.4	108.0	106.3	104.3	101.7	99.5	851.6

UK Power Networks inherited a closed (but active) pension scheme that still contains a significant number of employees. The benefits under this pension scheme are protected under primary legislation that was introduced at the time of privatisation of the electricity industry in 1990. Under the last price control Ofgem established five pension principles to ensure that customers and shareholders appropriately shared the risks of a deficit arising in the scheme. UK Power Networks has not altered these assumptions for its RIIO-ED1 business plan submission. The costs will be reviewed as part of the tri-annual efficiency evaluation. The next evaluation is expected to be completed in 2014.

5.12 Smart metering

The Government's decision to mandate the rollout of smart meters to all domestic and non-domestic customers by the end of 2020 (reflecting the one year delay in the rollout programme) is a major national change programme introduced to support its commitment to transitioning to a low carbon economy and meet its long-term challenges including providing an affordable, secure and sustainable energy supply.

Table 39 Smart metering expenditure in RIIO-ED1

UKPN RIIO-ED1 SPN Smart metering forecast (£m in real 2012/13 prices excluding pensions)									
Item	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	RIIO-ED1 total
Smart metering	4.7	8.1	10.3	11.2	11.1	8.1	1.8	1.8	57.1

Smart meters, which are an enabling technology, will replace the existing meters and will empower consumers to better manage their energy consumption and their energy bill by providing real-time information on energy usage. They will also facilitate more sophisticated energy management techniques and should bring an end to estimated billing – consumers will only be billed for the energy actually used.

Smart meters will also deliver direct benefits to UK Power Networks and other network operators, including real-time data on customers interrupted in a fault situation giving us the ability to improve customer service and restore supplies more quickly, and information on load and voltage, enabling us to better target network reinforcement. We will also have the ability to improve services to vulnerable and fuel poor customers.

While suppliers are responsible for rolling out smart meters, the installation of these meters presents significant dependencies (services, activities and costs) for us during RIIO-ED1:

- DNO Interventions
These are new service offerings including the ability to identify and fix technical problems with our service equipment uncovered during smart meter installations. We are expecting to undertake an additional 20,000+ interventions per year during the rollout.
- Security and privacy

We are required to treat the increased data collected by smart meters in accordance with stringent security requirements

- Industry interface and income management

We will need to modify our systems and processes to accommodate the new data collected by the smart meters. This will involve modifications to our billing systems

- DCC costs

We will incur a fixed fee per meter associated.

We have assessed the costs and sought ways to optimise expenditure associated with smart meters in line with our key principles. UK Power Networks has considered whether the existing business model is best placed to support the challenge and opportunity of smart metering, or whether changes are required. The following approach has been adopted.

- We have based our interventions approach on Ofgem's estimate of a 2% intervention rate. For the London Power Networks region we have applied the rate to the number of services, reflecting the significant number of multi-storey properties in London. There are therefore less interventions but of greater rating and complexity in London, partially reflecting a much higher cost per intervention.
- We will take benefits of smart data early, particularly in the use of energisation checks to avoid unnecessary site visits where the problem is on the customer's assets.
- We will significantly improve the customer experience during fault situations.
- We will commence a move of our customer service operations from 'inbound reactive' to 'outbound proactive'.
- There will be limited changes to the asset management business model during ED1. We will focus during this period on accumulating smart data to drive our greater understanding of the network. Towards the end of mass rollout, we will acquire sophisticated modelling tools and establish a small team to assess and optimise the use of the data.

The main cost drivers in RIIO-ED1 are summarised in Table 40. This includes the costs shown in Table 39.

Table 40 Smart metering investment requirements (£m real 2012/13)

Area	DPCR5	ED1	Comment
Interventions	£1.8m	£48.8m	Establish a workforce and carry out additional smart meter call outs and interventions
Indirects (inc. training)	£1.0m	£6.2m	Associated work management and for additional Smart Meter Interventions.
Industry interface and income management	£0.2m	£0.6m	Support additional data queries and the Smart Energy Code (SEC)
Call centre	-	£0.4m	Additional agents to manage the Smart Meter call outs.
Network Condition and Planning	-	-	
DCC Fixed charge	£1.9m	£12.3m	Based on 7.7m meters, rising from 12p to 20p per meter per year
DCC transaction costs	-	£1.9m	Energisation checks and asset data
IT Costs	£6.3m	£22.3m	Mandated change and building a platform to support smarter networks
Total	£11.2m	£92.5m	

We have applied a rigorous approach to identifying and quantifying potential benefits. We reviewed the benefits in DECC's Impact Assessment (IA) - this forecast benefits of £107million and the ENA's paper 'Analysis of Network Benefits from Smart Meter Message Flows Interim Review (Phasing and Categorisation)' - this forecast benefits of £67million. However, this was based on a programme start date of 2014. We forecast total benefits of £33.4million for all parties between the DECC and ENA scenarios, and direct savings across all three Networks over RIIO-ED1 of £16.3million. These benefits have been factored into the unit costs for fault management and network non-load reinforcement.

Table 41 UK Power Networks' smart metering benefits (£m real 2012/13)

Area	DPCR5 total (£m)	ED1 total (£m)	Comment
Investment decisions	nil	1.5	Current projected low levels of reinforcement mean that the comparable DECC/ENA benefit cannot be fully realised
Energisation status	Nil	11.1	We estimate that we will avoid around 11,000 unnecessary visits a year by the ability to test the meter status
Reduced fault opex	Nil	3.7	Improved fault information and incremental change to our process
Total	Nil	16.3	

In addition to these financial benefits, we believe we can deliver substantial qualitative benefits to consumers, in particular proactive targeted messaging in fault situations. We can also position the business to address the opportunities of the network of the future at the start of RIIO-ED2.

For further information see [Annex 10: Smart metering](#).

5.13 IT expenditure

Table 42 Summary of our planned expenditure

£m real 2012/13 prices	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	ED1 Total
IT & Telecoms Capital Expenditure (Non-load capex)	12.0	14.0	16.6	16.1	16.8	17.5	18.3	18.0	129.2
IT Non Operational Capital Expenditure (Non-operational capex)	10.7	24.5	15.9	15.9	15.2	12.8	10.6	8.9	114.7
IT & Telecoms Operational Expenditure (Business support)	23.6	23.8	22.6	22.6	22.5	22.3	22.0	21.6	181.0
Total	46.3	62.4	55.2	54.6	54.5	52.6	50.9	48.6	425.0

Our IT platform is critical to assisting us to meet the opportunities and challenges that we face in delivering our output commitments over the RIIO-ED1 period. This includes amongst other things, the use of smart interventions and the transition to a smart grid, the rollout of smart meters, improved data quality, improved customer service, and more sophisticated use of large scale data in asset management.

Managing our IT systems by maintaining, replacing and refreshing them in an efficient and effective way to ensure that they remain reliable, resilient and secure, will deliver benefits and value for money over the RIIO-ED1 period. We have developed a comprehensive IT strategy which will provide a key capability to support the delivery of our output commitments, while providing value for money. The overall objectives of our RIIO-ED1 IT strategy are to adopt a different investment strategy compared to DPCR5 by:

- Creating a simpler platform that is easier to manage

- Rationalising and integrating IT applications
- Mitigating risk through refresh

Investment themes

We have grouped our IT capital investment into sixteen themes, as shown in Table 43. Table 43 Investment themes

Theme	Description
Customer	Projects and initiatives associated with driving improvements to customer service
Workforce	Projects and programmes associated with delivering change in work management, field processes and mobile technology
Mapping Geospatial	On-going investment in the delivery of change related to geospatial technology including digitisation of records
Industry Management	Investments aimed at enhancing the interfaces with and management of the industry bodies, including Income Management and Billing
Asset Information Modelling	Initiatives focussed on the management of information associated with our electricity distribution assets, and the use of information within the wider business for modelling
Smarter Network Control	Investment in the electricity control systems and associated operational technologies which deliver an improved network function, including those linked to smart grid
Support Services	Projects and programmes which address the needs of back office support functions
Reporting	On-going investment in the improvement of our reporting capabilities in order to meet new demands, e.g. regulatory reporting changes, or streamline the reporting process
Collaboration	Investment in our tools and process which support the interaction and collaboration of our users
Telecoms	Investment in enhancing the telecommunications infrastructure and applications used by the business users and in customer interaction
IT Security	Initiatives and investments in ensuring the IT estate remains secure from attack and in accordance with CPNI guidelines
IT Infrastructure	On-going investment in ensuring that the technology components in the IT estate are periodically refreshed to minimise risk and provide a robust platform for the provision of business services
Legal/Regulatory	Investments aimed at ensuring on-going compliance with license conditions and other legislation.
IT Maintenance IMACs	Provision for installs, moves and changes and the delivery of small change as requested by the business users
Application Upgrades & Refresh	Investment in the refresh of core application services and platforms which form the application infrastructure for the provision of business services
IS & IT Contract Renewals	Investment which enables the re-tendering and migration of managed service contracts

Future strategy

Our future strategy is summarised as follows:

- We have embarked on a shareholder-funded Business Transformation Programme which will deliver a more streamlined and efficient IT estate by the beginning of ED1. This will include the decommissioning of ageing legacy systems and investment in a wider SAP-based architecture
- Post-Transformation, the investment in SAP to support core business operations will be extended through additional ERP development or niche integration tools to maximise the initial investment, and to minimise the legacy systems in the estate
- Our investment in the digitisation of the current raster GIS records will continue to enable additional benefits and capabilities to be leveraged.

- Greater focus on embedding and using the additional information gained from Smart Meters and network instrumentation in network modelling, design and asset information
- Advanced asset maintenance capabilities will be introduced in order to provide a more mature approach that ensures maintenance, reliability, effectiveness and value for money
- Decommissioning of systems will be required in order to ensure that operating costs are minimised
- Throughout the period, applications will be refreshed in order to mitigate technical risk, enable business capabilities through functional enhancements, and reduce opex through intelligent and innovative use of on-premise rather than cloud-based applications
- Continual investment in ensuring that the IT estate remains secure and robust through the renewal of infrastructure and investment in IT security enhancements
- Recognition and inclusion of alternative service delivery models and solution architectures such as cloud, software as a service, and open source options

IT costs

Under guidance from ImprovIT, our third party benchmarking organisation, we have undertaken a benchmarking exercise to ensure UK Power Networks provides a cost efficient IT function. This analysis has looked at the underlying core drivers to IT costs as every organisation has a different approach to discretionary investment. The Information Systems (IS) directorate provides support across UK Power Networks. In order to meet the output targets defined within our ED1 submission, we will require a total expenditure of £425million.

In return for this level of expenditure, we are committed to delivering the following – further details of which are provided within this business plan:

- Delivery of efficiencies against non-operational IT expenditure totalling 3.4% over the ED1 period, driven through contract renewals, continuous improvements and business transformation
- Discretionary capex investment is targeted at yielding 1% p.a efficiencies (1.25% per annum in London) towards UK Power Networks' efficiency targets
- Contribution and enablement of the business to realise their outputs whilst also ensuring the delivery of cross business direct and indirect efficiencies
- Rationalise and simplify the IT estate supporting the business, leveraging the platforms put in place through Business Transformation
- Delivery of IT investment programmes which will see a robust and reliable service provided to the business within the technology infrastructure and IT platforms
- Convergence of managed service providers to increase service levels in a more cost-effective way

A key element of our IT strategy will be delivered by the Business Transformation project, which is shareholder funded at a cost of £50million.

Our costs associated with running the IT estate and providing a stable and reliable service to the business is included within the IT&T operating expenditure. The operational expenditure through the ED1 period is to reduce from an average of £26.4million in DPCR5 to an average of £22.9million per annum in RIIO-ED1.

For further information see [Annex 11: IT strategy](#).

5.14 Business rates and National Grid costs

Table 44 Business rates and national grid cost forecasts

UKPN RIIO-ED1 total expenditure forecast (£m real 2012/13 prices excluding pensions)											
Item	DPCR5 average	RIIO-ED1 average	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	RIIO-ED1 total
Business rates	73.5	77.3	77.3	77.3	77.3	77.3	77.3	77.3	77.3	77.3	618.4
National Grid charges	61.2	101.1	75.5	84.3	89.9	97.5	107.9	116.1	117.6	119.9	808.7

UKPN RIIO-ED1 total expenditure forecast (£m real 2012/13 prices excluding pensions)											
Item	DPCR5 average	RIIO-ED1 average	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	RIIO-ED1 total
Total	134.7	178.4	152.8	161.6	167.2	174.8	185.2	193.4	194.9	197.2	1,427.1

Business rates

UK Power Networks is able to pass through costs that it is charged by central and local government for the rates payable by the licensee in respect of any land and heritages. These are forecast to increase by £3.8million per annum in RIIO-ED1.

National Grid costs

National Grid charges are payable by UK Power Networks for charges that are levied by National Grid as connection charges by direct reference to the number or nature of connections between UK Power Networks and the National Grid. They include any associated Transmission Use of System Charges and any remote Transmission Asset Rentals payable by the licensee. National Grid are subject to a separate price control and these costs are forecast to increase by £40 million per annum in RIIO-ED1.

5.15 Other costs

Other costs included below are non-operational and capex (other than for IT), innovation, Ofgem licence fee and other pass through items.

Table 45 Non-operational capex and other costs

UKPN RIIO-ED1 total expenditure forecast (£m real 2012/13 prices excluding pensions)											
Item	DPCR5 average	RIIO-ED1 average	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	RIIO-ED1 total
Non-operational capex property	5.1	4.8	6.7	5.3	2.7	4.2	6.1	2.4	6.0	4.9	38.3
Non-operational capex – other	11.4	9.2	7.9	11.1	8.1	10.3	8.9	8.2	10.4	8.2	73.3
Ofgem licence fee	4.1	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	34.9
Innovation	16.7	1.0	4.5	2.7	0.6	-	-	-	-	-	7.8
Metering pass through	1.6	3.2	5.4	2.9	3.9	5.0	3.3	5.3	-	-	26.0
Total Other	39.0	22.5	28.8	26.4	19.7	24.0	22.7	20.4	20.8	17.5	180.2

Innovation expenditure covers remaining LCNF income from DPCR5 projects.

Note: IT non-capex is included in Table 42.

5.16 Well-justified regional cost assumptions

The costs of operating electricity distribution networks vary across Great Britain, including within our three network areas. Our SPN and especially our LPN network faces higher costs than our EPN network, principally due to a more challenging urban operating environment and higher labour costs in London and the South East.

We have adjusted the unit costs underpinning LPN and SPN's 2015 to 2023 expenditure forecasts to reflect the regional cost differences associated with undertaking the investment required to deliver our output commitments to customers served by these networks. These regional cost adjustments are included in the cost tables in sections.

These regional differences are costs incurred by our networks that are not consistent with costs incurred by our own EPN network or other DNOs and therefore must be recognised when drawing comparisons within the industry. Key areas of cost differences are set out in Table 46 below, together with estimates of their impact on UK Power Networks.

Table 46 Regional cost factors (£m real 2012/13)

London Factor	Description of unique cost to LPN	LPN average cost (£m p.a.)	SPN average cost (£m p.a.)
Labour and contractor costs	Higher labour and contractor costs due to higher cost of living	7.0	3.5
Central London Network strategy	Additional costs of providing the enhanced service demanded by customers in Central London	11.2	0
Transport & Travelling	Congestion charging, exceptional parking and servicing costs and the cost of moving plant overnight to avoid heavy traffic.	0.6	0
Excavation	Exceptional lane rental, permitting and traffic management costs in London.	2.6	1.0
Operations	The extra cost of maintaining and repairing assets in the London environment; including primary and secondary substations and LV, HV and EHV cable systems.	8.4	5.5
Security	Network preparations and unplanned demobilisations associated with major events.	1.8	0.5
Properties	Increased insurance premiums incurred due to LPN's terrorism risk and indirect premiums incurred as a result of the higher cost of operation.	0.5	0.2
Tunnels	Inspection, maintenance and defect repair and charges for accessing tunnels owned by local authorities.	2.2	0
TOTAL		33.3	10.7

Unquantifiable items

The following items can also lead to higher expenditure, but have not been quantified:

- Delays to jobs due to environmental restrictions by local authorities i.e. noise, dust, vibration, exhaust fumes, water etc.
- Delays to jobs due to the discovery of archaeological artefacts in City of London etc.

Mitigations and innovation

We have identified the following innovation initiatives and other methods that can mitigate the increased expenditure:

- New technology adopted for oil filled cable fault location: PFT training equipment
- Developing alternative technology to cable freezing but using non-intrusive cable heating technology
- Engaging PCN to challenge all parking fines
- Major event planner to chart all major events in all regions that may affect supplies or our reputation
- Adopt shift working to carry out streetworks outside "normal" working hours to offset the high charges imposed by Lane Rental charges.
- Introduction of 24/7 shift working to improve the customer service in the inner enhanced interconnected area of Westminster and The City of London

Our regional costs adjustments

In order to reflect all the above factors into our cost allowances, we have applied the same top down approach applied by Ofgem in its recent gas distribution determination. This results in the regional cost differences as shown Table 47 below. This approach was chosen as it provides a straightforward, robust and transparent approach for calculating regional cost differences.

Table 47 Regional cost differences reflected in LPN's and SPN's 2015 to 2023 expenditure forecasts

£m real 2012/13	LPN - £m per annum	% of annual expenditure	SPN - £m per annum	% of annual expenditure
Replacement	6.7	22	3.5	10
Reinforcement	3.1	10	1.2	5
Civils	1.1	3	0.3	5
Operational IT&T	0.9	3	0	0
Faults	6.1	20	2.5	11
ONIs	0.3	1	0	0
I&M	4.0	13	0.8	9
Indirect costs	8.3	27	2.2	4
Total costs	30.2		10.5	

EPN's expenditure forecasts has not been adjusted for regional cost differences because the lower contract and labour costs in the East of England offset costs arising from the dense urban environment which characterises the south of EPN's distribution area.

For further information see [Annex 13a: Regional cost justification](#).

5.17 Efficient unit costs

Our 2015 to 2023 expenditure forecasts are based on the latest unit cost benchmarking and actual performance information. Extensive assessment was involved in ensuring efficiency of our unit costs including a top-down assessment of the efficient industry costs for network activities, as reported annually by DNOs and a detailed 'should cost' review of all cost components (i.e. a bottom-up cost build-up) for 22 network services and activities, which represent around 80% of UK Power Networks' total expenditure for the next planning period. This involved assessing and comparing the costs incurred across the networks for these activities as well as average industry costs.

Our review highlighted that the top-down approach resulted in a lower cost outcome. The unit costs underpinning our 2015 to 2023 expenditure are set out in Table 48 below and represent efficient industry targets. They have been adjusted for regional cost impacts (which apply only to LPN and SPN) discussed in Section 5.16 the total effect of which is reflected in the differential targets below.

Table 48 Unit costs underpinning our 2015 to 2023 expenditure forecasts

	EPN	LPN	SPN
Asset replacement and reinforcement	Ofgem DPCR5 target less 10%	Ofgem DPCR5 target	Ofgem DPCR5 target less 10%
Inspections and maintenance	2011/12 median less 20%	2011/12 median plus 8.2%	2011/12 median less 17.5%
Trees	2011/12 median less 10%	N/A	2011/12 median less 10%
Faults	2011/12 median less 17.7%	2011/12 median plus 18% (regional factors)	2011/12 median less 4.5%

Our 'should costs' process

Currently, we track cost performance on unit costs across different NAMP (network asset management plan) lines which are at a more detailed task-based level than RIGs unit costs. In order to create a meaningful bottom up build we then roll up our costs and map them up to RIGs level using the same mapping to monitor current NAMP performance to RIGs. Our task during DPCR5 has been to reflect how we should be performing if processes were optimal providing a baseline view of 'good performance'. These unit costs have been labelled our 'should' unit costs recognising that this is the performance that the business should be achieving. They are the average costs of delivering a standard job and make no allowance for any unproductive time. Developing 'should costs' will identify areas where more cost is being incurred, and also where achievement may not be recorded correctly.

A structured process is used to establish 'should costs', starting with Unit Cost Indices (UCIs) data gathering from across the business, e.g. Finance, Strategy and Regulation etc.

Table 49 'Should costs' process steps

Process Step	Details
Step 1: Check data availability and gather data	<p>Before the development of 'should costs', all the UCI data available in the business is collated. This helps us understand:</p> <ul style="list-style-type: none"> • Our current UCI performance and existing targets (e.g. budget UCIs) • The industry's UCI performance • Our relative position compared to our peers
Step 2: Prioritise focus UCIs for Should Cost creation	<p>The RIGs tables contain 171 reportable lines for which UCIs could be developed. However, only a small number of reporting lines cover the majority of the expenditure reported in these tables. In order to maintain focus and optimise team effort, RIGs lines are prioritised based on a percentage of expenditure reported. For tree cutting, 'should costs' are considered on a total cost per span managed/inspected in line with current contracts. For capex, focus is applied to 85% of distribution capex where year-on-year cost should be repeatable, and project-specific factors present in major construction projects have less impact.</p>
Step 3: Analyse current UCIs	<p>Summary of analysis:</p> <ul style="list-style-type: none"> • Current performance (across UK Power Networks' DNOs): Comparison of YTD performance across UK Power Networks' DNOs • Current performance (within LPN): Comparison of YTD performance across areas of LPN • Regulatory target versus financial budget: Comparison of RIGs targets and budget by DNO (LBE) NAMPs aggregated at RIGs level to allow comparison • Performance versus financial budget: Comparison of YTD performance against budget • Performance versus regulatory target: Comparison of YTD performance against targets
Step 4: Develop cost hypothesis diagrams	<p>In order to understand the key cost drivers for each UCI cost component (Labour, Contractor, Generators, and Material), hypothesis trees are developed. These are used to ensure exhaustive Should Cost models are created, and that suitable challenge is provided.</p>
Step 5: Develop bottom-up 'should costs'	<p>For each CV table, a series of workshops are held to develop the relevant 'should costs'. These include a range of operational business representatives from each region, thus ensuring that 'should costs' are credible and based on empirical experience.</p> <p>During the workshops, individual NAMP-level 'should costs' models are developed in Excel, bottom-up by region and cost element (LMCGO): labour, materials, contractors, generators and other. Each tab in Excel represents a NAMP line, ensuring that the overall model is transparent, given the level of granularity, and fully flexible.</p> <p>The models created are fully dynamic and therefore enable, during the workshops, rigorous testing against historical and current performance, next year's budget and rolled-up median RIGs targets.</p> <p>A central dashboard is created to roll-up the NAMP lines for each of the selected RIGs and clearly show the variance between 'should costs', current performance and industry targets. Suitable challenge are provided over perceived high 'should costs' or variances between the regions. Any reasons and/or assumptions driving exceptions are captured in the model to best explain these variances.</p> <p>Following the workshops, completed Should Cost models undergo final review, comment and sign-off.</p>

Process Step	Details
Step 6: Identify savings opportunities/constraints	<p>Throughout the workshops and subsequent review sessions with the business, opportunities and constraints to achieving the industry targets are captured at both RIGs and NAMP level. Opportunities focus on the following:</p> <ul style="list-style-type: none"> • Achieving 'should costs'. For example: <ul style="list-style-type: none"> – Improve data accuracy (e.g. achievement recording, cost allocation, capitalisation) – Improve productivity – Improve management of contractor charges – Improve material costs through reviewing specifications / supplier contracts – Improve use of generators • Delivering the industry median target: through creating plans to improve upon current operations and 'should costs', for example: <ul style="list-style-type: none"> – Different resourcing model – Lower contractor rates – Optimal in house vs. outsourcing mix <p>These opportunities are particularly important where 'should costs' are higher than the industry median. Where 'should costs' developed are significantly below observed industry costs, further consideration of scope of work should be given in subsequent reviews.</p>
Step 7: Develop roll-out plan and strategy	<p>These opportunities are cascaded to Area and Regional Managers for review, and as input for their area level plans. They are accountable for:</p> <ul style="list-style-type: none"> • Delivering UCI performance against the UK Power Networks' target • Comparing poor current NAMP performance with 'should costs' to identify improvement opportunities • Developing with Finance, roll-out plans and strategies, at area level, to achieve targets

Having established our 'should costs' we have benchmarked against RIGS target levels.

The analysis of 'should costs' highlighted the following:

- Contractor and labour costs make up the bulk of the unit costs
- There are significant regional factors:
 - On average, contractor rates in London are expensive
 - Lane rental, streetworks and permitting costs are expensive in London
 - Work tends to be technically complex in London; more confined spaces, ground conditions require more excavation, larger sites and transformers, blend of 4-way to 2-way link boxes etc.

Key unit cost improvement opportunities

Table 50 summarises possible key opportunities to improve unit cost performance. This is not an exhaustive list, and all opportunities will require full investigation before they are applied to the business.

Table 50 Key Improvement opportunities

Key Opportunity	Description	Scope
Provide guidance to manage costs and volumes reporting	<ul style="list-style-type: none"> • Communicate basic and consistent ground rules around cost allocation • Briefings and training for existing staff • Creation of materials for future new joiners 	<ul style="list-style-type: none"> • Faults • I&M • Capex • Trees
	<ul style="list-style-type: none"> • Allocate items of plant in substations to appropriate service orders • Follow up with strategy and regulation for a consistent approach to booking consequential assets to jobs 	<ul style="list-style-type: none"> • Capex
	<ul style="list-style-type: none"> • Book costs (eg tree planting, compensation, and permission forms) to correct outage planning line. Ensure a consistent approach 	<ul style="list-style-type: none"> • Trees
Improve achievement recording	<ul style="list-style-type: none"> • Ensure all volumes are recorded in the systems • Ensure processes enable activities to have achievement appropriately captured in preferred system 	<ul style="list-style-type: none"> • Faults • I&M • Capex • Trees
	<ul style="list-style-type: none"> • Investigate how to best record customer driven achievement 	<ul style="list-style-type: none"> • Trees
Reduce labour costs	<ul style="list-style-type: none"> • Improve dispatch tasking to ensure efficient number of staff on jobs • Ensure staff have a full day's work (improved productivity) • Ensure non-productive time is booked correctly and is visible. • Plan to ensure the job goes ahead. If it doesn't the costs should go to unproductive time to improve visibility of productivity • Optimise UK Power Networks' policies to avoid unnecessary work • Standardise scope across regions 	<ul style="list-style-type: none"> • Faults • I&M • Capex
	<ul style="list-style-type: none"> • Introduce faults technicians to provide increased supervision, coaching and improved productivity to faults jointers 	<ul style="list-style-type: none"> • Faults
Reduce contractor costs	<ul style="list-style-type: none"> • Review strategy for groundworks • Assess resourcing strategy to enable us to bring work in-house in medium/long term (following the successful in-sourcing of groundworks in SPN) • Improve management and itemisation of extras in contracts (Contract Management and local areas) • Improve audit activities on bill of quantities per job • Ensure invoices and price estimates for work can be matched to contractor rates (Contract Management activity) 	<ul style="list-style-type: none"> • Faults • I&M • Capex
	<ul style="list-style-type: none"> • Align contractor schedule of rates to RIGs reporting (inspection and cut) 	<ul style="list-style-type: none"> • Trees
	<ul style="list-style-type: none"> • Review and optimise own staff and contractor resourcing 	<ul style="list-style-type: none"> • Capex
Reduce material costs	<ul style="list-style-type: none"> • Review and allocate materials and consumables booked to jobs correctly • Review material specifications 	<ul style="list-style-type: none"> • Faults • I&M • Capex
Reduce generator costs	<ul style="list-style-type: none"> • Improve utilisation of owned generators • Purchase generators to reduce reliance on contractors 	<ul style="list-style-type: none"> • Faults • I&M • Capex

To ensure cost targets are achieved and 'should costs' refined, the actions outlined in Table 51 below will be implemented.

Table 51 Actions implemented

Action	Details
On-going management of Should Cost models	<ul style="list-style-type: none"> • Finance will be custodians for the models which are now available to the business on an intranet page. • The 'should costs' are living documents that will continually be managed to be kept relevant and up to date as LMCO costs change. • A formal process has been designed and put in place to ensure that these 'should costs' are reviewed at least every six to twelve months. They will be regularly tested and validated against latest current performance and budget.
Delivering on the UCI targets	<ul style="list-style-type: none"> • UCI targets cascaded down to Area Managers and embedded in their performance targets. • Finance will coordinate a monthly process with Area Managers to drive the correct focus on UCIs through the business <ul style="list-style-type: none"> – Make unit cost performance gaps visible to Area Managers and Field Staff Supervisors through monthly reports produced showing actual performance against targets and 'should costs' – Hold monthly meetings to undertake a detailed UCI review including: <ul style="list-style-type: none"> Jobs with no achievement but with costs Jobs with costs but with no achievements UCIs that are higher than should be costs Analysing the highest UCIs to ensure mis-postings are corrected and an understanding of variations is agreed Area P&L – Develop and review strategies and initiatives to reduce the UCIs • Clear cost and volume guidelines rolled-out to all staff to improve cost allocation and data quality

For further information see [Annex 13b: Direct cost efficiency](#).

5.18 Real price effects and efficiencies

Key elements of our cost base for the next planning period will increase at a greater rate than the retail price index (RPI), which measures general prices in the economy, due to the specialist labour and materials required to operate our networks. UK Power Networks engaged NERA Economic Consulting (NERA) to independently estimate the real price effects (RPEs), being the real price movements, relative to RPI for the next planning period for: labour, materials, plant and equipment.

NERA's analysis (methodology and data sources) is consistent with the approach applied by Ofgem in the recent RIIO electricity transmission and gas distribution price reviews. NERA developed a range of scenarios: midpoint and upper and lower bounds. Separate RPEs were calculated for network investment expenditure and operational expenditure reflecting the different composition of inputs required to undertake activities relating to this expenditure.

We have adopted NERA's mid-point RPE estimates as shown Table 53 below. These RPEs have been reflected in our capital and operating expenditure forecasts, which are separately detailed in Section 5 The RPE impact is offset, in part, by efficiency savings also independently calculated by NERA. The RPEs applied by UK Power Networks are lower than those applied by Ofgem in its RIIO electricity and gas transmission decision (on a consistent weighting of activity). The RPE impact is offset, in part, by efficiency savings also independently calculated by NERA. These RPEs are lower than those applied by Ofgem in its recent decision on electricity transmission.

Table 52 RPEs for the 2015 to 2023 planning period

	Operational activities (%)	Network investment (%)
RPE	1.2	1.0
Efficiency savings	1.0 (1.25% in LPN)	0.7
Net effect	0.2 (-0.05% in LPN)	0.3

NERA has also reviewed the potential on-going annual productivity improvements during RIIO-ED1.

Table 53 NERA productivity estimates per annum

NERA's on-going efficiency estimate	Operational activities (%)	Network investment (%)
Mid point	0.7	0.6
Upper bound	1.1	0.8
Lower bound	0.4	0.4
RIIO-ED1 Transmission/ gas decisions	1.0	0.7

UK Power Networks has included an on-going productivity estimate of 1.0% per annum for operational expenditure (including total indirect costs) and 0.7% for network investment. In recognition of the slightly higher potential for on-going efficiency in London due to the inclusion of regional cost factors we have increased the on-going operational annual productivity improvement for LPN to 1.25%. The net impact of RPE's on UK Power Networks' March 2014 business plan is £19million or an annual increase of 0.04% p.a.

5.19 Detailed cost benchmarking

This section provides evidence that the unit costs underpinning our expenditure forecasts are efficient and deliver value for money for customers over the long term. Each of these is discussed below.

We support the use of benchmarking as a tool, within the overall toolkit of cost assessment methods and models, to assess our relative efficiency amongst the GB DNOs given the outputs we are required to deliver. However, we acknowledge the inherent limitations of benchmarking and of the comparability of data and note that benchmarking needs to be tailored to meet specific regulatory applications.

We have further developed the cost assessment model which Ofgem used for its fast-track assessment, and applied additional benchmarking tools to assess the efficiency of our RIIO-ED1 expenditure forecasts:

- Ofgem Totex model (macro-CSV)
This is a regression-based statistical model that considers total expenditure (capex and opex) in the context of a number of service characteristics, such as number of customers and units distributed.
- Ofgem Totex model ('bottom-up')
This is a regression-based statistical model that considers total expenditure (capex and opex) in the context of a number of the key activity cost drivers, such as numbers of faults and network scale
- Ofgem disaggregated model
This is a detailed assessment of each cost category utilising an appropriate cost driver for each
- Bottom up cost analysis
Using cross utility data, UK Power Networks has developed detailed unit cost targets for its main activities. For indirect costs we have either set the benchmark at industry average or used independent specialist advisors to assess appropriate cost levels
- Project specific assessment
Due to the unique nature of some project and programmes of work UK Power Networks has developed specific project justifications
- Cost-benefit analysis (CBA)
UK Power Networks has used cost-benefit analysis to justify projects against Ofgem agreed criteria and assess our proposals against the condition based plans of the industry.
- External benchmark review
External consultants were appointed to review and assess the efficiency of IT and property costs

In the July 2013 version of the annex, we included a set of efficiency scores calculated for DPCR5, and summarised in table 54 below. This shows that, over DPCR5, UK Power Networks has steadily improved its cost efficiency. UK Power Networks has employed specialist consultants to review our delivery model and resulting costs in areas where they appear inefficient. This was primarily focused on direct costs and business support.

It is noted that, although UK Power Networks has used consistent cost allocation methodologies and benchmarking drivers EPN consistently performs worse in the bottom up analysis. UK Power Networks during 2011 worked with Professor Andrew Chesher, Professor of Economics at University College London to review these outcomes. He observed that EPN’s network had two very diverse and distinct geographical and urban areas, a dense rural area in the north of London and a sparse rural area in East Anglia, and concluded that this would result in difficulties in finding individual benchmarking drivers that reflect the overall nature of EPNs network. UK Power Networks shared these results with Ofgem and has included his final report ([EPN Benchmarking: Potential implications of scale effects](#)) as part of the business plan submission.

Table 54 Efficiency of our actual and forecast expenditure in DPCR5

Cost category	Efficiency score based on 5 years DPCR5 actuals and forecasts (2010/11 and 2014/15) (less than 100% is better than assessed frontier)		
	EPN	LPN	SPN
TOTEX model	96%	97%	95%
Capex core (e.g. replacement)	104%	106%	98%
Capex non-core (e.g. environment)	Project specific benchmark or CBA	Project specific benchmark or CBA	Project specific benchmark or CBA
Civils	Bottom up analysis	Bottom up analysis	Bottom up analysis
Network operating costs (NOC)	113%	105%	94%
Closely associated indirects (CAI)	104%	108%	102%
Business support	120%	108%	97%
IT and Property	External Benchmark	External Benchmark	External Benchmark

(Note: this table has been colour-coded on the following basis – Green: <100%, Amber: >100% and <105%, Red: >105%)

We have applied the Ofgem assessment model, suitably modified, to estimate efficiency scores for RIIO-ED1 and these are shown in Table 55 below.

In respect of Ofgem’s combined assessment which brings together the outcomes of the three models, UK Power Networks’ three DNOs are ranked as follows, out of 14 DNOs:

- EPN – 5th
- LPN – 9th
- SPN – 3rd

On a group basis, UK Power Networks ranks 2nd out of the 6 ownership groups.

Overall, on a totex basis, all three networks benchmark as efficient and improve efficiency during RIIO-ED1. Within each individual category UK Power Networks is able to demonstrate an overall improvement in cost efficiency in RIIO-ED1. However, certain spend categories benchmark as “amber” or “red” for individual networks. We believe that this reflects inevitable simplifying assumptions used in the benchmarking process which are averaged out at the overall totex benchmark level.

Table 55 Efficiency of our forecast expenditure in RIIO-ED1.

Cost category	Expenditure change required to meet efficiency frontier (a positive value denotes a forecast which already benchmarks as efficient)		
	EPN	LPN	SPN
Combined assessment	-2%	-6%	-1%
Totex (macro)	+2%	+4%	0%
Totex (bottom-up)	-1%	-9%	-3%
Totex (sum of below categories)	-1%	-6%	+1%
Load-related capex	+11%	+9%	+12%
Non-load related capex	-12%	-31%	-9%
Other network capex	-19%	-15%	+5%
Network operating costs (NOC)	+2%	-1%	+5%
Closely associated indirects (CAI) and Smart Metering	+5%	-4%	+2%
Business support, Op IT&T and non-op capex	-5%	-7%	-5%

NB Business Support benchmarks as efficient, supported by external review

The values stated in Table 55 show the overall change in expenditure required to hit the efficiency frontier, which could be positive or negative. For example, the submitted Network Operating Costs in LPN need to be reduced by 1% to be considered efficient, whereas in EPN, the submitted costs are already 2% better than the benchmark costs.

Further benchmarking studies have been conducted and are on our website:

http://library.ukpowernetworks.co.uk/library/en/RIIO/Cost_Justification_and_Assurance_Documents/

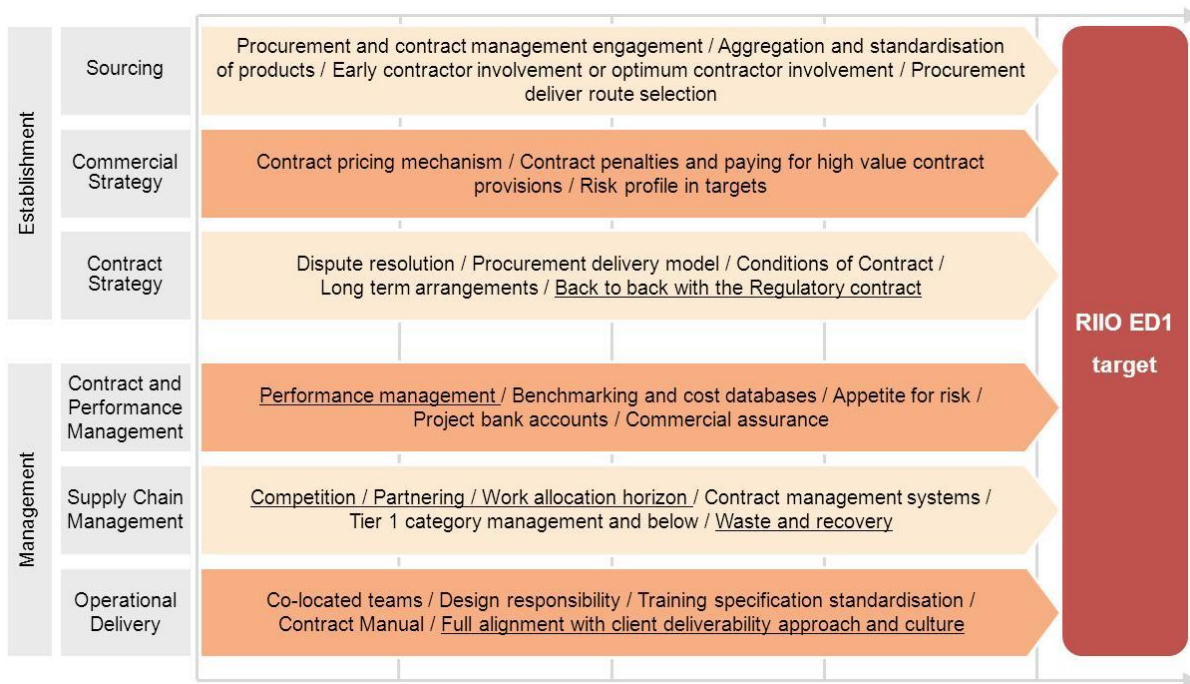
<http://www.ukpowernetworks.co.uk/internet/en/have-your-say/business-plan-2015>

5.20 Market testing and deliverability

UK Power Networks has been working with Turner and Townsend to confirm the required delivery strategy for RIIO-ED1. This strategy will enable UK Power Networks to deliver the required network investment and achieve the required cost efficiency reduction for direct capex of 10%. The programme of work has:

- Provided the supply chain a forward visibility of work (rolling 18 months)
- Engaged the supply chain early and over the longer term
- Identified the critical resources that are required to deliver the programme, including senior authorising engineers and commissioning engineers
- Identified the schemes where consents will be on the critical path of delivery
- Enabled the supply chain capacity to flex in the event of a significant increase in demand (e.g. connections work; take up of electric vehicles etc)
- Identified the necessary outages
- This strategy is summarised in Figure 39.

Figure 39 UK Power Networks' RIIO-ED1 delivery programme



We considered a number of delivery models, contracting and commercial approaches in determining our deliverability strategy for the next price control period. We also had regard for:

- The nature of work that we will undertake in RIIO-ED1. This has been grouped into the following workstreams:
 - Major substations
 - Major underground circuits, 32kV and 33 kV
 - Major overhead circuits
 - Distribution underground systems, 11kV and LV
 - Distribution overhead systems
 - Major tunnelling and civil projects
 - Low carbon projects
 - National Grid connections
- Our current delivery structure - currently each DNO delivers its own capital programme based on an End-to-End Investment Delivery Model which maps out how the capital programmes are developed, designed, delivered and handed to UK Power Networks.
- Our supply chain members – currently we source our supply chain by workstream (listed above). Our supply chain comprises the following three levels:
 - main general contractors who would be responsible for the sourcing and management of small to medium contractors who undertake specific work packages
 - contractors who deliver specific work packages e.g. civils
 - companies who provide labour, plant and material to Level 1 and 2 suppliers
- Contract and commercial models

Our deliverability strategy also sets out how we will proactively manage our supply chain through:

- Contractual and commercial arrangements
- Continual performance improvement
- Identifying and implementing innovation

Our deliverability strategy confirms that we have efficient, flexible and scalable procurement arrangements in place to ensure that we can deliver our proposed expenditure programme and output commitments in the next regulatory control period.

For further information see [Annex 15: Network plan deliverability](#).

5.21 Extensive cost-benefit analysis of our investments

We have undertaken cost-benefit assessments to demonstrate the efficiency and prudence of our investment programme, provide investment justification and demonstrate value for money of our:

- Asset replacement and refurbishment programmes that underpin our NAMP
- Reinforcement
- Large investment projects including DG infrastructure investment
- Flooding
- ESQCR investments
- BT21 mitigation
- Our proposed Central London investments
- Smart Grid intervention initiatives

To address the comments made by Ofgem on our original submission and address the revised guidance that arose from their assessments of all the DNOs submissions we have comprehensively updated our approach as shown in Table 56:

Table 56 CBA outcomes table

Ofgem Guidance	UKPN Approach
Options need to be realistic and appropriate. 'Do nothing' or 'run to failure scenarios' are not appropriate to compare investment options.	Our Asset Management engineers have reviewed and developed credible scenarios to assess. 'Do nothing' scenarios only exist where this is a real and possible option.
DNOs should consider a range of possible options, rather than limit to a baseline and one other option.	Most CBAs contain at least 3 or 4 options to compare
Benefits need to be realistic and justifiable, with transparent calculations and engineering feasibility.	Benefits are based on a mechanistic approach, using similar methodologies between assets and using established CBRM assumptions where possible, reflecting engineering judgement that is calibrated to historic performance. Calculations have been provided within each CBA model.
Costs and volumes should be easily identifiable and be able to be traced to their relevant RIGs tables.	Each CBA states which RIGs line the costs are taken from, and this document details the exact amount assigned to each line.
The baseline scenario should represent a realistic business scenario. In most cases, this is considered to be current DPCR5 levels of expenditure.	The baseline scenario we have used is the current DPCR5 levels of intervention for most CBAs. In many cases, this option is not considered by UK Power Networks to be a viable long-term approach, but has been used to adhere to Ofgem Guidance. Where this is the optimum approach, we have selected the least negative option.

UK Power Networks has assessed its investments against a DPCR5 equivalent reference case as requested by Ofgem. We do not believe that historic volumes of activity are a good indicator of future investment where condition based asset management is used to make best use of assets and extend their lives by making the most appropriate interventions at the most appropriate time. To illustrate the efficiency of our plans we have tested our investments against two alternative scenarios which we have developed to represent equivalent industry average condition based volumes and fast track equivalent condition based volumes.

We have subjected 65% of our capex to CBA assessment as shown in Table 57 below.

Table 57 Expenditure covered by CBAs

	EPN	LPN	SPN	UKPN Total
Total Expenditure Covered by CBAs	£855m	£982m	£526m	£2,063m
% of Capex covered by CBAs	66%	67%	62%	65%
% of Load Related Expenditure covered by CBAs	100%	100%	100%	100%
% of Non-Load Related Expenditure covered by CBAs	45%	46%	45%	46%
% of Asset Replacement/Refurbishment Expenditure covered by CBAs	60%	71%	67%	65%
% Increased expenditure for improved Central London performance	100%	100%	100%	100%

For further information see [Annex 13c: Overall cost-benefit analysis.](#)

5.22 Cost benefit analysis conclusions

Asset Replacement

We have carried out assessments based on identifiable projects covering

- Fluid filled cables
- 132kV, 66kV and 33kV transformers
- 132kV, 66kV, 33kV and 11kV Primary switchgear,
- OHL Steel Towers

We have also carried out CBAs on our Distribution Switchgear and Link Box replacement programmes.

We have demonstrated that our condition based intervention strategies produce robust investment plans which provide positive benefits for customers and maintain the condition of the distribution networks. We have compared our investment plan to alternative strategies which give intervention volumes comparable to the other UK DNOs condition based programmes of work and the results show our plans to be favourable.

Load-Related Reinforcement

We have populated a sample of 30 of our reinforcement projects for RIIO ED1 through the Ofgem CBA model showing supporting the scheme papers we have proved. The scheme papers giving technical options and solution choice have been provided separately for primary substation and EHV/132kV circuit reinforcement projects.

In EPN we have had a significant increase in requests to connect new low carbon generation which has not been seen in LPN and SPN. This is largely due to the availability of land for solar generation projects. We have included CBA to justify investment in EPN of £15.4million of reinforcement which will increase network capacity for generation connections by 187MVA.

High Value Projects

We have included CBAs for key high value projects providing additional support to the detailed justification documentation supplied separately.

We have demonstrated that the replacement of gas filled cables between Sydenham and Eltham in south east London should be carried out in RIIO-ED1 rather than being deferred until RIIO-ED2

Flood Mitigation

Our proposals to protect at-risk sites from surface water flooding have been tested through CBA to ensure we are providing the most optimal solution.

BT21CN

A CBA has been carried out to show that our proposed solution for BT21CN is the least-cost solution for customers.

ESQCR

Our approach to dealing with the safety issues of presented by overhead lines where there is a high risk of contact by the public has been scrutinised to prove the mix of work we are proposing is optimal for customers.

Loss reduction

We have used CBA to value the impact of our loss reduction initiative and identify the tipping point for investing in low loss transformers ahead of any limits being imposed by EU directives.

Smart grid solutions

We have used CBA to test the parameters we have used to assess the implementation smart technologies will have on our investment plans. These support using:

- Demand-side response to defer investment. Separate parameters have been define around 2MVA in deferring reinforcement for at least 3 years in EPN and SPN and 5MVA of DSR deferring reinforcement for 4 years in LPN.
- Partial discharge testing provides benefits in deferring switchgear replacement
- Smart adaptation of overhead line ratings will allow reinforcement to be managed more effectively
- Equipment to allow real time transformer rating provides benefits in allowing capacity increases to be deferred.

These technologies will allow our investment plans to be better optimised and uncertainties better managed.

5.23 Summary CBA outcomes

In order to show how our plans compare to the other DNOs we have presented how our investment plans compare to our industry average condition based replacement volumes in Table 58. We have presented the outcomes for RIIO-ED1 as an eight year equivalent to the whole life costs and benefits (45years) from the CBA assessments.

Table 58 CBA outcomes compared to the DPCR5 baseline

CBA £m in ED1	kV	EPN	LPN	SPN
Fluid Filled Cable Intervention	132	2.7	5.1	10.1
	66		10.6	
	33	0.7	1.0	3.1
EHV Transformer Intervention	132	5.9	-0.05	2.2
	66		3.9	
	33	25.5	45.5	8.3
Switchgear Intervention	132	0.8	2.1	1.9
	66		0.1	
	33	4.3	3.3	5.0
	11	12.7	7.3	5.8
Link Boxes		0.1	2.2	0.3
Distribution Switchgear		29.7	4.7	11.0
Steel Towers		0.0		0.0
Asset Replacement and Refurbishment		82.3	85.7	47.8
Load Related Expenditure		10.9	4.6	2.6
High Value Projects		2.0	12.6	3.2
Flood Mitigation		8.1	3.2	4.3

CBA £m in ED1	kV	EPN	LPN	SPN
ESQCR		2.5		0.6
BT21CN		1.3		1.3
Central London Plan			6.5	
Low Carbon generation		2.7	0.0	0.0
Losses		17.4	17.4	17.4
Smart Grid Strategy		0.0	0.0	0.0
QoS		4.0	0.4	2.5
Total		131.4	130.3	79.6

Table 59 below shows the summary outcomes against the industry benchmark scaled to reflect our total capex and the overall UK Power Networks position.

Table 59 CBA Results against equivalent industry condition based replacement

£m Total in ED1	kV	UKPN	EPN	LPN	SPN
FFC	132	17.9	2.7	5.1	10.1
	66	10.6	0.0	10.6	0.0
	33	4.8	0.7	1.0	3.1
Transformers	132	8.1	5.9	0.0	2.2
	66	3.9	0.0	3.9	0.0
	33	79.3	25.5	45.5	8.3
Switchgear	132	4.8	0.8	2.1	1.9
	66	0.1	0.0	0.1	0.0
	33	12.6	4.3	3.3	5.0
	11	25.8	12.7	7.3	5.8
Link boxes		2.5	0.1	2.2	0.3
Distribution switchgear		45.4	29.7	4.7	11.0
Steel towers		0.0	0.0	0.0	0.0
Total		215.7	82.3	85.7	47.8
scaling		65%	65%	65%	67%
Scaled total		329.0	137.1	120.6	71.3

Table 60 shows the summary outcomes against our equivalent WPD condition based benchmark.

Table 60 CBA Results against equivalent WPD condition based replacement

£m Total in ED1	kV	UKPN	EPN	LPN	SPN
Transformers	132	9.6	4.6	1.2	3.8
	66	-0.2	0.0	-0.2	0.0
	33	20.4	8.4	9.0	3.1
Switchgear	132	-1.5	-2.7	0.3	0.9
	66	-2.0	0.0	-2.0	0.0
	33	3.9	0.9	0.9	2.1
	11	4.6	1.3	2.0	1.4
Total		34.9	12.5	11.1	11.3
scaling		32%	32%	32%	27%
Scaled total		112.1	34.6	36.3	41.3

In aggregate for non-load expenditure, UK Power Networks is £216million more efficient on volumes than the industry benchmark (£329million when scaled assuming the results are representative of all expenditure) and £35million more efficient on volumes than the fast track benchmark (£112million if scaled). This represents a significant benefit to customers from our asset management approach that was not taken into account in the fast track assessment.

For further information see [Annex 13c: Overall cost-benefit analysis.](#)

6 Financing our plan

6.1 Cost of capital and financial requirements

Our final business plan has substantial associated financing requirements. Over RIIO-ED1, our regulatory asset value (RAV) is projected to grow by £2.1 billion after inflation. This requires £1.6 billion of additional debt which after including existing debt maturing during the period, implies a debt financing requirement of £2.9 billion. Shareholders' equity committed to the business grows by £0.6 billion. Therefore, it is critical that our business plan includes acceptable financing assumptions. Our acceptance is conditional on Ofgem accepting our overall business plan package, including our proposed totex and financeability proposals, and therefore on the outcome of our discussions with Ofgem and the Draft Determinations.

Table 61 summarises these (with DPCR5 for comparison) and the paragraphs below comment on the key parameters.

Our acceptance is conditional on Ofgem accepting our overall business plan package, including our proposed totex and financeability proposals, and therefore on the outcome of our discussions with Ofgem and the Draft Determinations.

Table 61 Financing parameters

Parameter	Current period (DPCR5)	2015 to 2023 planning period
Cost of equity	6.7%	6.0%
Notional gearing	65.0%	65.0%
Cost of debt	3.6%	Rolling 10 year average (2.6% to 1.7%)
Vanilla WACC	4.69%	3.79% to 3.21% (estimated)
Totex split (fast / slow)	15/85 (business support + non-operational capital expenditure 100% fast)	32/68 on all expenditure categories
RAV depreciation	20 years	Single period transition to 45 years
Ofgem target dividend yield	5% on regulated equity	5% on regulated equity

Cost of equity

We have amended our proposed cost of equity to 6.0% from 6.7%. This aligns with Ofgem's revised central estimate. We do not agree with the estimate of 6.0% but we believe we will be penalised through the IQI mechanism if we do not accept it.

Since our business plan submission there has been considerable debate on the methodology for estimating to cost of equity. Historically, the key components of the cost of equity had been derived by regulators using long run historic averages. However, in its draft determination for Northern Ireland Electricity (NIE) the Competition Commission (CC) placed more weight on short run data. The consequence of using this approach is a lower estimate of the cost of equity. However, both the Competition Commission, and more recently OFWAT, considered all of the components of the Cost Capital when coming to their draft positions on the appropriate cost of capital. Both regulators adopted an ex- ante approach to the cost of debt, compared to the use of a long run trailing average, as set out by Ofgem in its RIIO strategy document. We acknowledge that Ofgem have accepted the recommendation of Wright and Smithers to continue to use long run data to calculate the total equity market return. However, it is not clear how Ofgem have derived their 6.0% cost of equity.

We have set the dividend in all years and for all three networks at 5% of equity RAV, in line with DPCR5. The GB electricity distribution networks are seen by the investing communities as stable cash-generative businesses which, without under-performance, should be able to support a steady dividend in real terms. A 5% dividend yield is in line with a peer group of GB utilities, and below the average among a European peer group.

Cost of debt

Ofgem has determined that the rolling cost of debt index will apply in RIIO-ED1. In our view, an index is a better mitigant to interest rate risk than a fixed cost of debt reset each price control. However, we believe that there are a number of issues with the proposed index which by now are well publicised:

- It implicitly assumes all debt is issued in index-linked format. This is neither possible (because market capacity for index-linked debt is small, and inflation swaps introduce unacceptable levels of cost plus cash flow and P&L volatility) nor desirable as high levels of index-linked debt introduce volatility into interest cover ratios which could impact credit ratings
- The short term 10 year trailing average together with the relatively short tenor of bonds in the index and the lack of allowance for fees or new issue premia combine to incentivise networks to issue short term debt of maturity c.10 years. Over time, this will introduce more financing risk into these businesses and because utility bonds make up half the index, this effect will intensify over time via a positive feedback loop

We have maintained the use of the 10 year trailing average for calculating the cost of debt in line with the decision in Ofgem’s March 2013 strategy document. However, it should be noted that our actual cost of debt will exceed our forecast of the cost of debt allowance by 0.55%, on average, over the ED1 period.

Table 62 details our forecast for the value of this trailing average index for each year of RIIO-ED1 together with our actual cost of debt forecast. This profile has been used throughout our financial analysis.

Table 62 RIIO-ED1 cost of debt forecast

	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23
Cost of debt allowance (iBoxx)	2.6%	2.5%	2.4%	2.3%	2.1%	1.9%	1.8%	1.7%
UK Power Networks’ cost of debt fo	2.6%	2.6%	2.6%	2.7%	2.7%	2.9%	2.8%	2.8%

Forecast allowance

The forecast cost of debt allowance has been calculated using the methodology described below.

Historic data has been derived from a combination of Ofgem’s indexation model, the Bank of England’s website and Bloomberg. Forward swap rates have been derived from internal models maintained by one of our key UK relationship banks and are based on observable market swap rates.

- The average maturity of the two indices is:
 - iBoxx ‘BBB’ index – currently approximately 17 years; and
 - iBoxx ‘A’ index – currently approximately 22 years
- For modelling purposes, forecast future underlying interest rates are based on a single maturity swap, (namely 20 years). Swap market rates are used to imply forward 20-year swap rates at the beginning and end of each calendar year. The average for the year is taken as a simple average of the two valuations.

- A credit spread is added to the average swap rate to derive a forecast average iBoxx index yield for each calendar year. In 2012, the average of the iBoxx 'A' index was 1.55% above the 20year swap rate. In 2012, the average of the iBoxx 'BBB' index was 1.83% above the 20-year swap rate. This implies an average credit spread over swaps of 1.69%, which is assumed as constant
- The nominal forecast average iBoxx yield is deflated by the forecast breakeven inflation for the corresponding year to derive a projected real index value for the year. The differential between historic 10-year breakevens (difference between 10-year nominal gilts and 10-year real gilts) and 10-year zero coupon inflation swaps averaged 0.28% over the period January 2005 to December 2012. Projected breakevens are therefore derived by implying forward inflation swap rates from swap markets and adjusting downwards for the assumed 0.28% differential. A simple average of opening and closing rates for each year is used as the deflating rate

Forecast cost of debt performance

As can be seen from Table 62 we are forecasting to meet the cost of debt allowance in the first year of the price control and then move to a position of underperformance for the rest of the price control.

We have taken a close look at our future debt issuance and derivatives strategy and have tailored this to reduce cost of debt as far as possible for the RIIO-ED1 price control and beyond. The benefits of this strategy have been overlaid in the forecasts above and include actions such as:

- Raising new debt with shorter tenor, and in smaller amounts to allow more frequent visits to debt capital markets
- Avoiding very large maturities in any one particular year
- Using derivatives to manage interest rate maturity

Having modelled these actions in the forecasts we are forecasting to be in a position of underperformance in the second half of RIIO-ED1. The main driver for this is that we will enter the start of the price control with a significant amount of fixed debt and embedded derivatives which are in existence today, and cannot be restructured without incurring significant cost.

We believe this underperformance coupled with Ofgem's position on the cost of equity raises financeability issues for our licensees in ED1.

Target gearing

We do not believe that ratings agencies or debt capital markets have materially changed their assessment of the DNOs since the last price control. Accordingly, we propose the same target gearing as for DPCR5, i.e. 65% debt to RAV. It is important to note that the ratings agencies factor other debt like liabilities, such as pension deficits, into their estimates of gearing ratios, and therefore 65% debt to RAV on an Ofgem basis typically translates to closer to 70% debt to RAV on a ratings agency basis. This level of gearing is in line with a BBB+/Baa1 rating, which in our view, is the minimum acceptable long term target rating.

6.2 Financeability assumptions

The values set for depreciation of our assets with the RAV and the split of fast and slow money act together to determine the revenue profile resulting from a given set of costs, and therefore determine the credit profile and hence financeability, of the business plan.

Ofgem has determined that RAV depreciation on new assets from 2015 onwards will move from 20 years to 45 years, bringing it more in line with the technical life of our assets. We propose to transition from 20 years to 45 years over one price control. We propose a fast and slow money split of 32%/68%. This is consistent both with the split of how we expense and capitalise assets on a statutory basis, and with the fast/slow split in DPCR5 when one considers the overall split taking into account 100% fast money for business support costs and non-operational capex, and 15/85 fast/slow for all other costs.

Table 63 Financeability assumptions

Fast/slow split	Average statutory capitalisation (07/08 – 11/12)	Average regulatory capitalisation (07/08 – 11/12)	Proposed regulatory capitalisation over RIIO-ED1
EPN	25/75	32/68	32/68

Fast/slow split	Average statutory capitalisation (07/08 – 11/12)	Average regulatory capitalisation (07/08 – 11/12)	Proposed regulatory capitalisation over RIIO-ED1
LPN	26/74	36/64	32/68
SPN	23/77	32/68	32/68

We believe that our combined depreciation and fast/slow money proposals produce the minimum acceptable level of forecast credit ratios over RIIO-ED1. We are rated by all three of the major ratings agencies, and the table below summarises their ratio thresholds for BBB+/Baa1, and our forecast average ratios based on our business plan. Not all ratios in all years are above the thresholds, but on balance, we believe our business plan is consistent with our target rating.

Table 64 Forecast credit ratios

Financial ratios (average DNO)	Ratio threshold for BBB+/Baa1	Average ratio in RIIO-ED1	Minimum ratio in RIIO-ED1
Moody's			
Net Debt / RAV	>60% - 75%; Baa	71.3%	72.3%
Adjusted ICR	>1.4 - 2.0x; Baa	1.6x	1.5x
Fitch			
PMICR (excluding swap accretion)	> 1.4x	1.1x	0.9x
Adjusted Net Debt / RAV (Y/E)	<73%	67.9%	69.1%

6.3 Forecast revenue requirement

Our expenditure plans, plus the financing assumptions discussed above, generate forecast revenues under Ofgem's 'building block' methodology. We have then profiled the revenues on an NPV neutral basis in order to provide revenue growth during RIIO-ED1 in line with the growth in our RAV, in order to generate stable interest cover ratios. We are pleased that this profiling results in real terms revenue reductions of 5% (EPN), 12% (LPN) and 13% (SPN) at the start of RIIO-ED1 which will translate into price reductions for customers. Figures 47 - 50 show both the profiled revenues in our plan for each of our three networks.

Figure 40 UKPN's annual revenue requirement

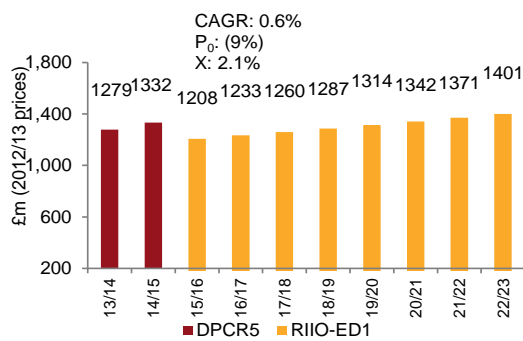


Figure 41 EPN's annual revenue requirement

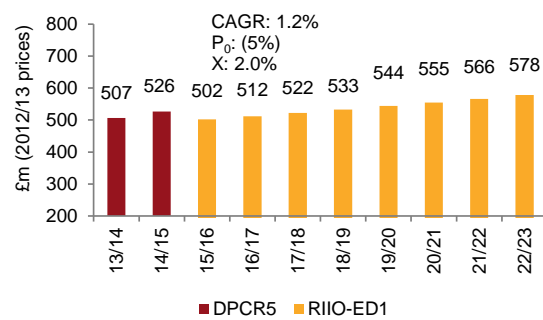


Figure 42 LPN's annual revenue requirement

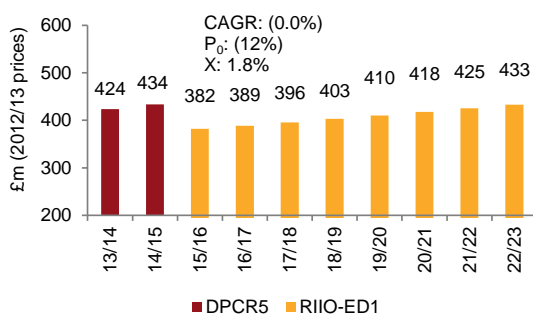
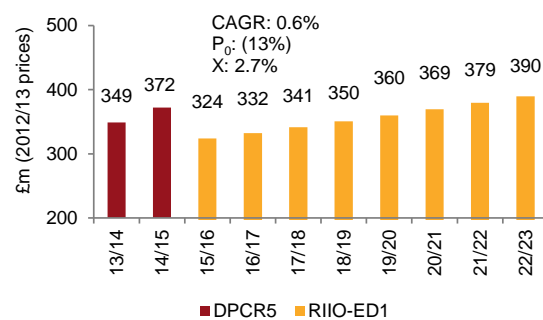


Figure 43 SPN's annual revenue requirement



The proposed revenue profiles will result in revenues in 2023, at the end of RIIO-ED1, equal to revenues at the end of DPCR5 for LPN. For SPN, at the end of RIIO-ED1 revenues, will be 5% higher and for EPN, at the end of RIIO-ED1, revenues will be 10% higher by 2023 compared to 2015.

For further information see [Annex 17: Financeability](#).

7

Impact on customers' bills

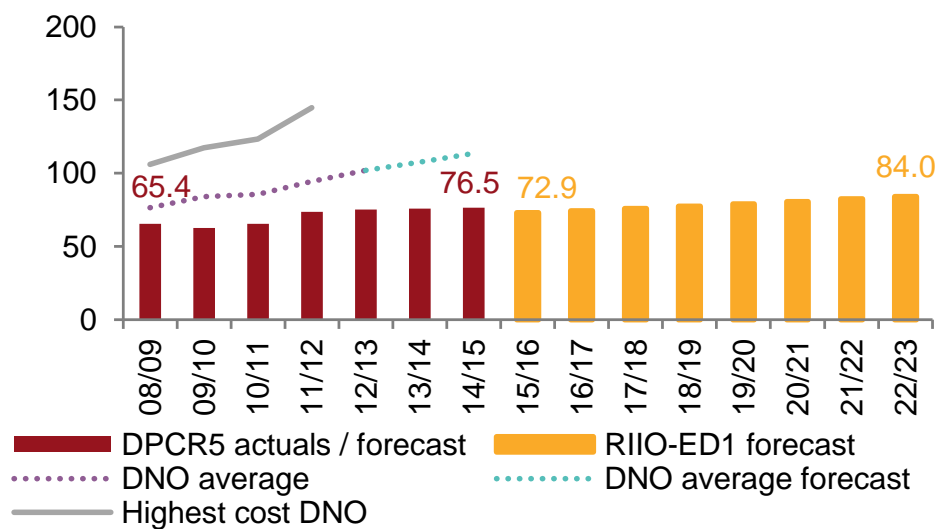
7.1 Forecast bills in RIIO-ED1

We have estimated the impact on prices for domestic and non-domestic customers by applying the percentage change in forecast revenue required to finance our plans in the next planning period to the current charges.

In DPCR5 UK Power Networks' average prices were the lowest of any electricity distribution group. We do not know what others will charge in RIIO-ED1, but based on the price cuts we are proposing we hope that our 2015 to 2023 business plan should see us remain the lowest cost electricity distribution group.

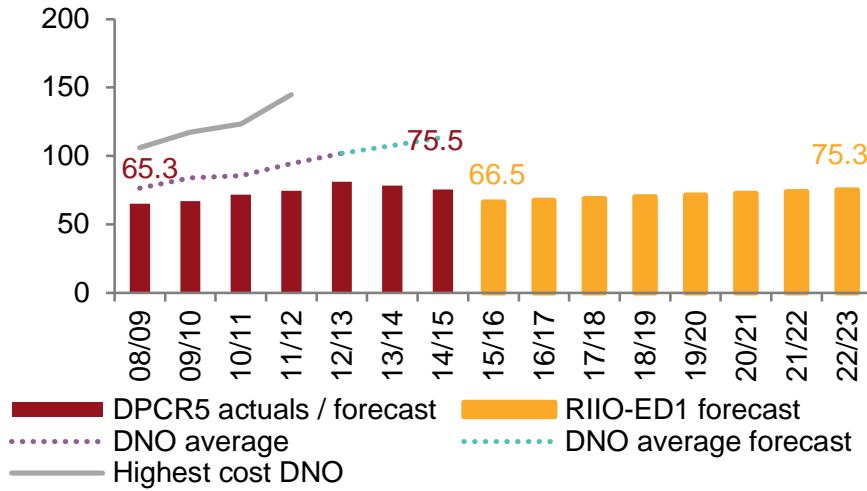
Domestic customers

Figure 44 EPN: projected change in average annual domestic bill (£2012/13)



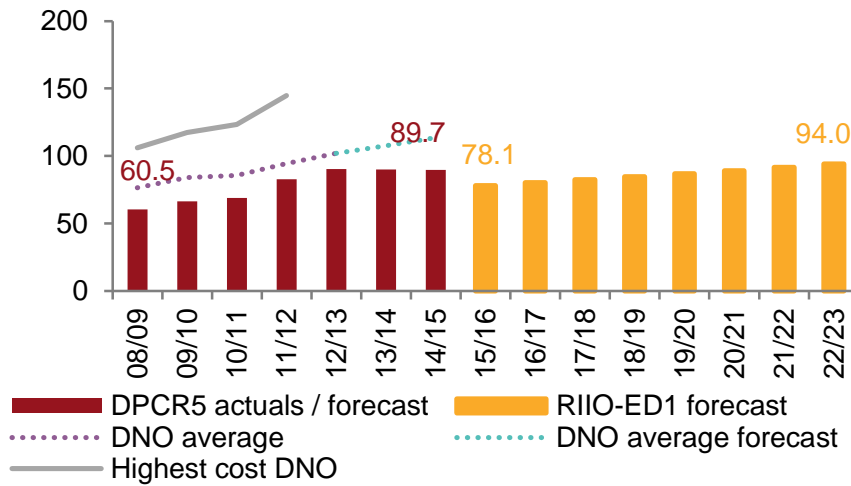
EPN's domestic prices increase slightly between the end of DPCR5 and the end of RIIO-ED1 from £77 to £84. There is an initial cut of 5% or £4 in 2015/16. The average domestic price over the RIIO-ED1 period compared to the end of DPCR5 is 2% higher.

Figure 45 LPN projected change in average annual domestic bill (£2012/13)



LPN's domestic prices are the same at the end of RIIO-ED1 (2022/23) and at the end of DPCR5 (2014/15) at £75 and are lower in between. There is an initial cut of 12% or £9.50 in 2015/16. The average domestic price over the RIIO-ED1 period compared to the end of DPCR5 is 6% lower.

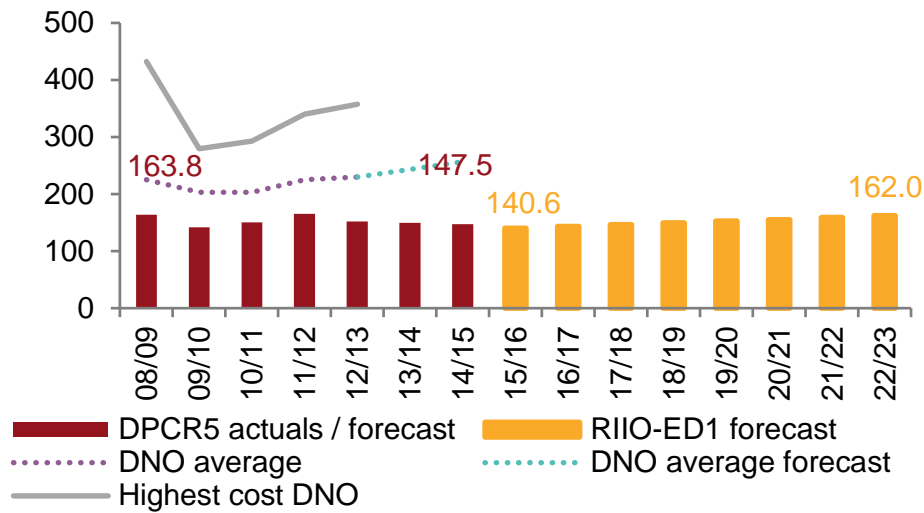
Figure 46 SPN: projected change in average annual domestic bill (£2012/13)



SPN's domestic prices are 5% higher at the end of RIIO-ED1 (2022/23) than at the end of DPCR5 (2014/15) at £94 and are lower in between. There is an initial cut of 13% or £12 in 2015/16. The average domestic price over the RIIO-ED1 period compared to the end of DPCR5 is 4% lower.

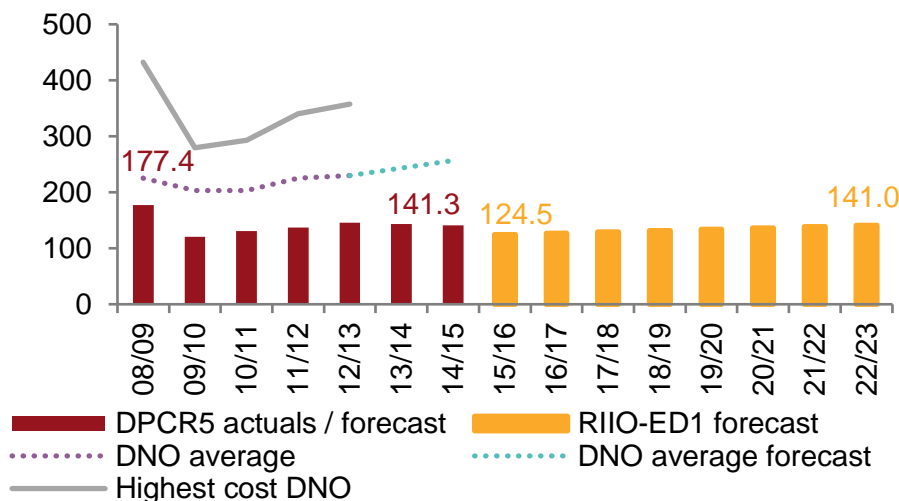
Non-domestic customers

Figure 47 EPN: projected change in average annual non-domestic bill (£2012/13)



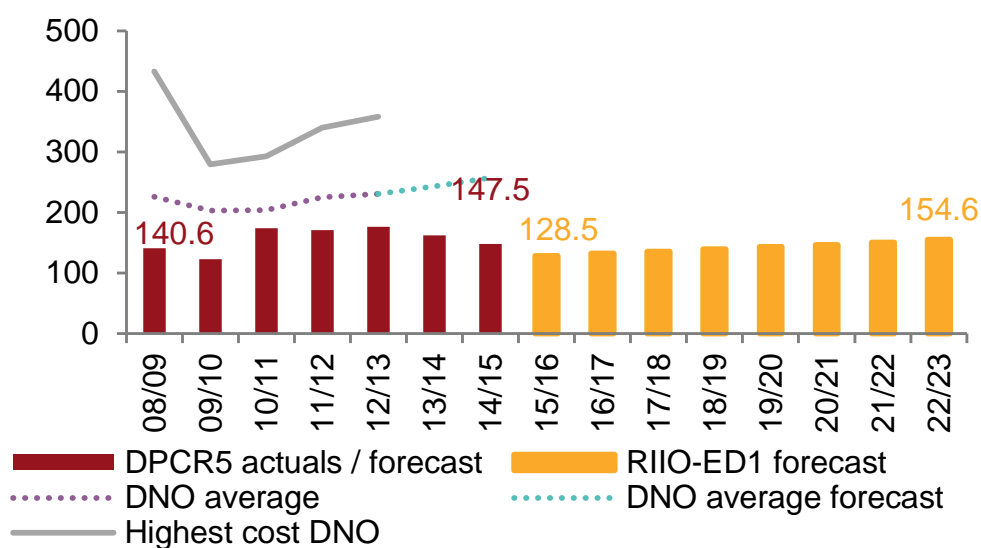
EPN's non-domestic prices increase slightly between the end of DPCR5 and the end of RIIO-ED1 from £148 to £162. There is an initial cut of 5% or £7 in 2015/16. The average non-domestic price over the RIIO-ED1 period compared to the end of DPCR5 is 2% higher.

Figure 48 LPN: projected change in average annual non-domestic bill (£2012/13)



LPN's non-domestic prices are the same at the end of RIIO-ED1 (2022/23) and the end of DPCR5 (2014/15) at £141 and £141 respectively and are lower in between. There is an initial cut of 12% or £17 in 2015/16. The average non-domestic price over the RIIO-ED1 period compared to the end of DPCR5 is 6% lower.

Figure 49 SPN: projected change in average annual non-domestic bill (£2012/13)



SPN's non-domestic prices increase slightly between the end of DPCR5 and the end of RIIO-ED1 at £148 and £155 respectively and are lower in between. There is an initial cut of 13% or £19 in 2015/16. The average non domestic price over the RIIO-ED1 period compared to the end of DPCR5 is 4% lower.

7.2 Summary of impact on customers' bills

Table 65 shows a comparison of the expected annual cost of electricity distribution for an average domestic and average non-domestic customer between 2014/15 (the end of the current price control) and the average bill for RIIO-ED1.

Table 65 RIIO-ED1 price comparisons

Real 2012/13 prices	2014/15	Average RIIO-ED1	% difference between end of DPCR5 and average RIIO-ED1
EPN			
• Domestic	76.5	78.3	+2%
• Non-Domestic	147.5	151.1	+2%
LPN			
• Domestic	75.5	70.8	-6%
• Non-Domestic	141.3	132.6	-6%
SPN			
• Domestic	89.7	85.8	-4%
• Non-Domestic	147.5	141.2	-4%
UKPN			
• Domestic	80.0	78.3	-2%
• Non-Domestic	145.7	143.0	-2%

8

Business plan development

8.1 Comprehensive process and governance

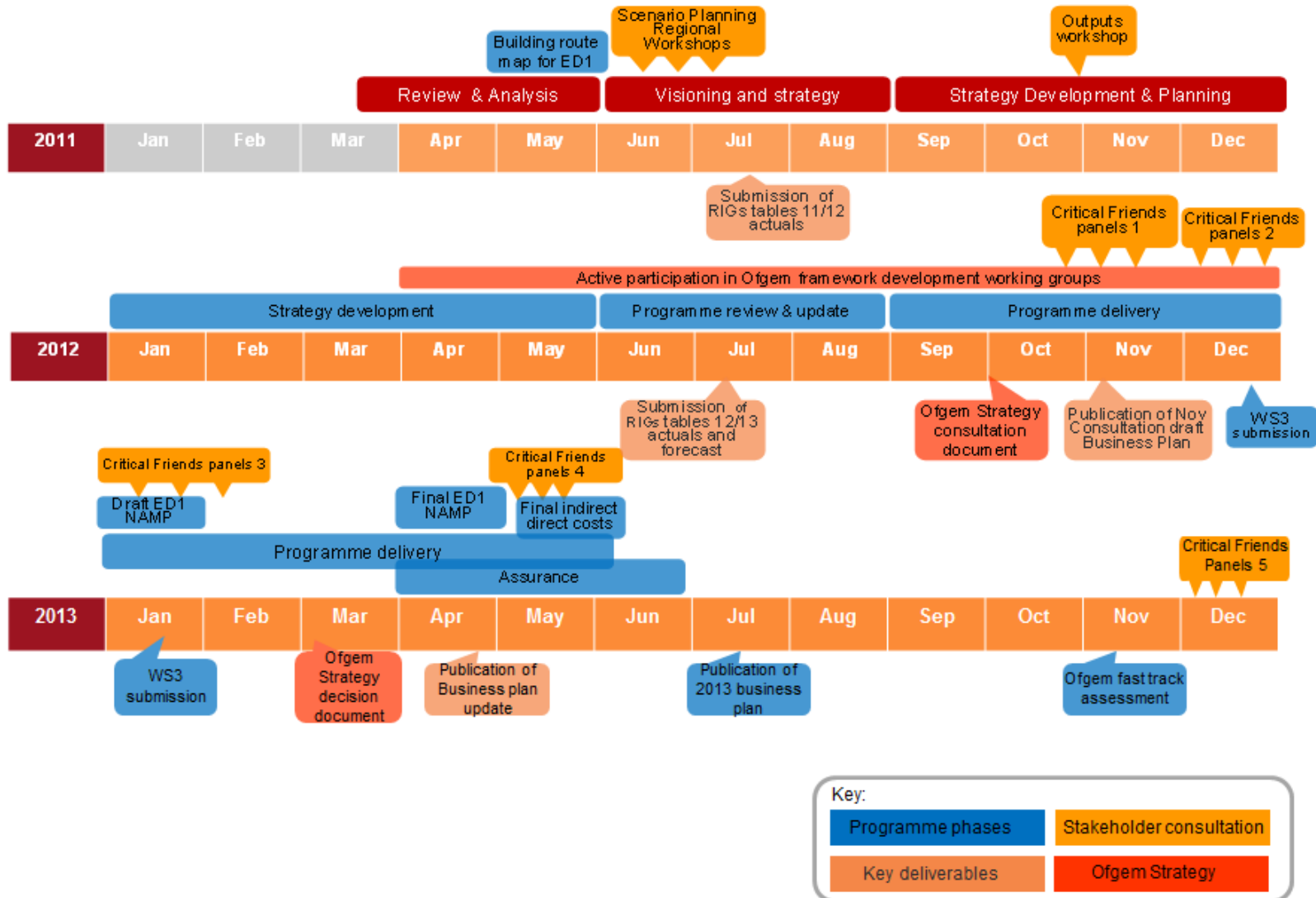
We have taken a whole of business approach to develop our plans for the 2015 to 2023 price control period. The business plan development has been led by UK Power Networks' entire leadership team, coordinated via a RIIO Programme Steering Group comprising senior members of the leadership team, which meets weekly and is chaired by the CEO. The Steering Group has responsibility for making key decisions and periodically updating the Board of Directors. This final business plan was approved by our Board in March 2014. A large number of senior managers and other staff across the business have been involved in producing and confirming our business plan assumptions.

Extensive stakeholder engagement was taken into consideration during the development of our business plan. Since 2011, our Customer Services team have led an extensive consultation process with our stakeholders on all aspects of our business plans to ensure that it meets the expectations of customers and other stakeholders, and delivers value for money over the long term. Where we have not been able to fully deliver on their expectations we have explained why it was not possible. We consulted through a range of consultation pathways including both business-as-usual and business plan specific pathways. Section 9 describes the process of, and outcomes from, our stakeholder engagement in more detail.

Innovation and delivery of smart solutions to support the low-carbon economy is at the heart of our business and part of our everyday business-as-usual activities. Our business plan development process has drawn extensively upon these activities including our own innovation projects and the learnings from other DNO innovation activities. Our plan includes the first stage of a potential journey towards a smart grid by 2030. In terms of the benefits from our smart grid investment, we have forecast total savings across all three Networks of around £141million over RIIO-ED1.

Figure 50 shows the key stages of our business plan process. Intensive work started on the plan in 2011 including stakeholder engagement on our macro-economic and load forecasts. In November 2012 we published a draft business plan including revenues and prices, and in April 2013 we published an update to the plan reflecting stakeholder feedback. We considered that this was a critical step as it provided our stakeholders with a real opportunity to comment on our plans.

Figure 50 Key stages of our business plan development



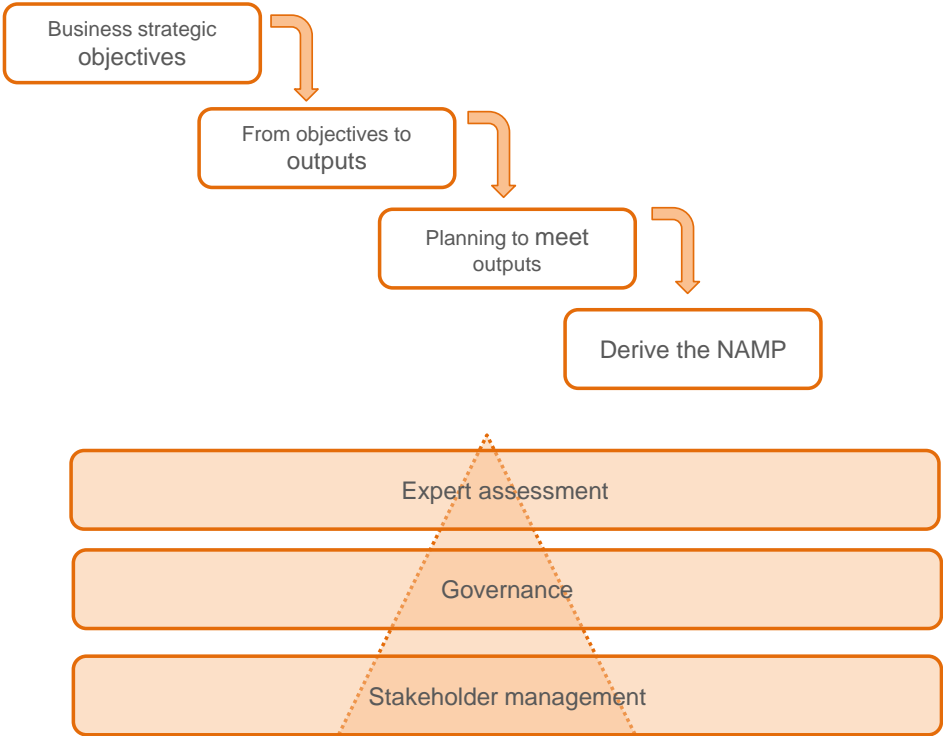
8.2 Volumes of work in the plan

The volumes of work for both capex and opex set out in our business plan are taken from the volumes set out in our 2013 Network Asset Management Plan (NAMP). Production of the NAMP is a business-as-usual process undertaken by our asset management directorate, and provides a rolling 10-year annual forecast of network investment requirements for direct costs.

The NAMP development process as shown in Figure 51 below ensures that our volumes of work, and thereby our expenditure forecasts which are underpinned by volumes, are efficient and are required to deliver our output commitments to customers by meeting demand, ensuring reliability, availability and security of supply, and meeting our regulatory obligations whilst taking account of asset condition and risk. It incorporates a balanced outcomes decision model, and ensures that the forecasts deliver the strategic business objectives being to undertake investment:

- Based on the lowest long-term cost to manage the health and risk of the network
- Based on the lowest long-term cost to support decarbonisation of the economy
- Consistent with operating our network to ensure sustained customer satisfaction
- To achieve long-term improvements in safety
- Consistent with achieving improvements in social outcomes (vulnerable and fuel poor) that our customers and other stakeholders say they want

Figure 51 NAMP development process



The NAMP process for load and non-load expenditure, which are the two largest expenditure categories, is described in further detail in Section 5.

8.3 Extensive assurance of our plan

We have subjected our business plans to proportionate and robust internal and external assurance, challenge and verification to improve them, and to ensure completeness, accuracy and appropriateness of information, data and assumptions.

- **KPMG** – reviewed our business plan data templates

- **PA Consulting** has provided advice, quality assurance and monitoring of the development of the business plan since 2011. They also reviewed the cash-flow risk model and our indirect costs to identify opportunities for greater efficiency, based on benchmarking our business support costs against a range of other utility companies
- A panel of eminent utility executives and regulatory and policy experts (comprised of former CEOs, current regulatory NEDs, a CC member, a former civil servant specialising in consumer policy) organised by **Indepen** has provided an overall critique to challenge and shape the business plan
- **Navigant** and **PwC** reviewed and provided feedback on our November and April business plan consultation documents
- **Dialogue by Design** managed and facilitated early engagement with stakeholders to help our understanding of planning assumptions and potential outputs
- **Element Energy** assisted us with economic modelling and reviewed our assumptions for economic growth in the UK economy, and other drivers for load growth including drivers for decarbonisation of the economy (e.g. electric vehicles)
- **Sinclair Knight Merz** assessed the reasonableness of our asset investment, opex expenditure and output forecasts, and assessed our health index methodology
- **An independent firm** of chartered accountants reviewed our financial model
- **Chiltern Power** assessed the feasibility, availability, suitability and completeness of the smart network solutions being used within our business plan
- **Frontier Economics** assisted with the analytical and economic development of a totex benchmarking model
- **Two Tomorrows** reviewed the business plan stakeholder engagement commentary to ensure it accurately reflects the processes we followed, and the changes to the outcomes as a result of the on-going engagement programme
- **Oxera** and **First Economics** provided advice on the cost of capital and other financial matters (through the Energy Networks Association)
- **NERA** reviewed our internally estimated real price effects (RPEs) and total factor productivity (TFP) for the period 2015 to 2023 to ensure that they are economically justified and robust
- **Investment Property Databank** (IPD) provided cost benchmarking analysis to inform our property related expenditure forecasts, and to measure the efficiency of the estate
- **ImprovIT** provided benchmarking cost analysis to inform our IT related expenditure forecasts and ensure that they are efficient
- **Turner and Townsend** assisted with the development of our deliverability assessment of the capital programme across the RIIO-ED1 timeframe

For further information see [Annex 21: Assurance](#).

9

Stakeholder engagement

9.1 Comprehensive engagement on our business plan

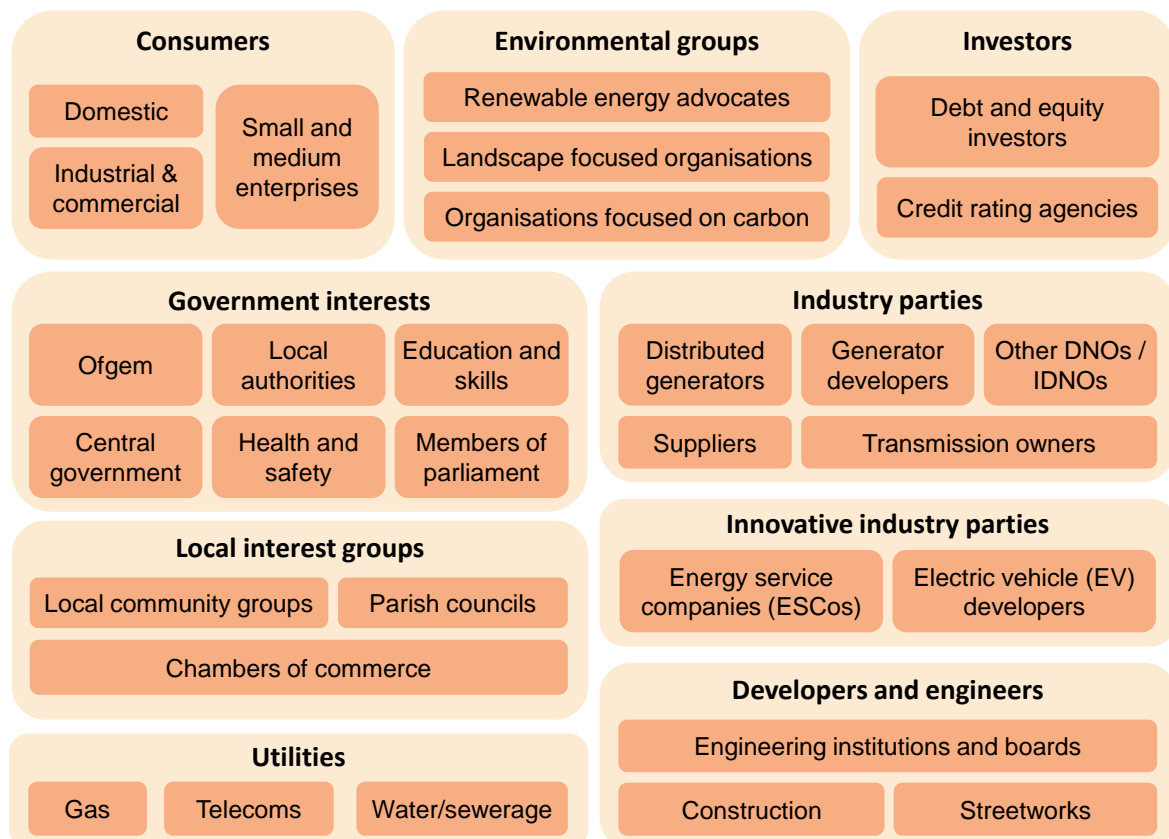
UK Power Networks has an extensive business-as-usual stakeholder engagement programme, managed within the customer services directorate and through our CEO reporting to our Board.

Since 2011, we have incorporated within our business-as-usual engagement - an extensive programme of consultation on all aspects of our 2015 to 2023 business plans to ensure that they meet the expectations of our customers and other stakeholders, and deliver value for money over the long term. We believe that we were one of the earliest groups to start engagement on our business plan, and this early start allowed us to publish a detailed draft business plan including revenue forecasts in November 2012, together with an update to the business plan reflecting stakeholder input in April 2013.

Our stakeholders

We seek to engage widely, and we define our stakeholders as any individuals, groups of individuals or organisations that affect, or could be affected by our activities, services or associated performance. The diverse range of stakeholders that we engage with comprise domestic customers, commercial and industrial customers, local governments, major energy users, customer organisations and those representing the community sector. This is illustrated in Figure 52 below.

Figure 52 UK Power Networks' stakeholders



We manage our stakeholders through a detailed database that records our contact history with stakeholders, as well as a range of other information about our stakeholders including their location and areas of interest. This ensures that all interested individuals, groups and organisations are continually informed about relevant upcoming consultation pathways.

Our stakeholder programme

For our RIIO-ED1 business plan we have undertaken a comprehensive stakeholder programme to ensure that all our stakeholders have the opportunity to put forward their views and get involved in the development of our plans in an efficient and inclusive way:

- Fifteen critical friends panel sessions
- 14 focus groups with domestic customers
- 21 telephony interviews with London business customers to test their willingness to pay (WTP) for certain services
- 1,200 WTP interviews with domestic customers
- 300 WTP interviews with business customers
- 200 WTP interviews with central London business customers
- 22 customer connections stakeholder forums
- Four priority issue topic specific stakeholder panels (vulnerable consumers & fuel poor customers, storm performance, metal theft and street works)
- Two distributed generation customer stakeholder forums and a customer service survey
- Targeted stakeholder feedback
- Bilateral engagement with suppliers and large business customers
- Two rounds of bilateral meetings with energy suppliers
- Multiple meetings with key central London stakeholders, including establishing a working group with key stakeholders including the Mayor of London, the Greater London Authority, Westminster Council, the Corporation of London, and the City and Westminster Property Associations
- Publication of our draft business plan in November 2012
- Online consultation on our November 2012 consultation business plan with 23 responses
- Publication of our business plan Update in April 2013
- Online consultation on our April business plan update

Feedback on management engagement

“Really good mix of management, giving ability to provide immediate and informative answers.”

Critical friends panel 4 - SPN

“Great to see Basil (CEO) at the event.” *Critical friends panel 4 - EPN*

“UKPN are dedicated to improve in the future; will be interesting to see the outcome.”

Critical friends panel 3 - EPN

“Strong high level engagement providing clear messages to stakeholders and actively inviting feedback.” *Critical friends panel 4 - EPN*

Feedback on inclusiveness

“Felt that the issues and challenges we have discussed in past panels are being considered and delivered on.” *Critical friends panel 4 - SPN*

“Would be good to see how continuous improvement, technology deployment etc. talked about is considered in the planning cycle and how this is reflected in the overall benefit for the customers.” *Critical friends panel 2 - SPN*

“Good update on business plan. Nice to see our inputs are being listened to.”
Critical friends panel 4 - EPN

“UKPN are seriously listening to the panels and taking actions.” *Critical friends panel 1 - EPN*

Comments on the way we implement feedback

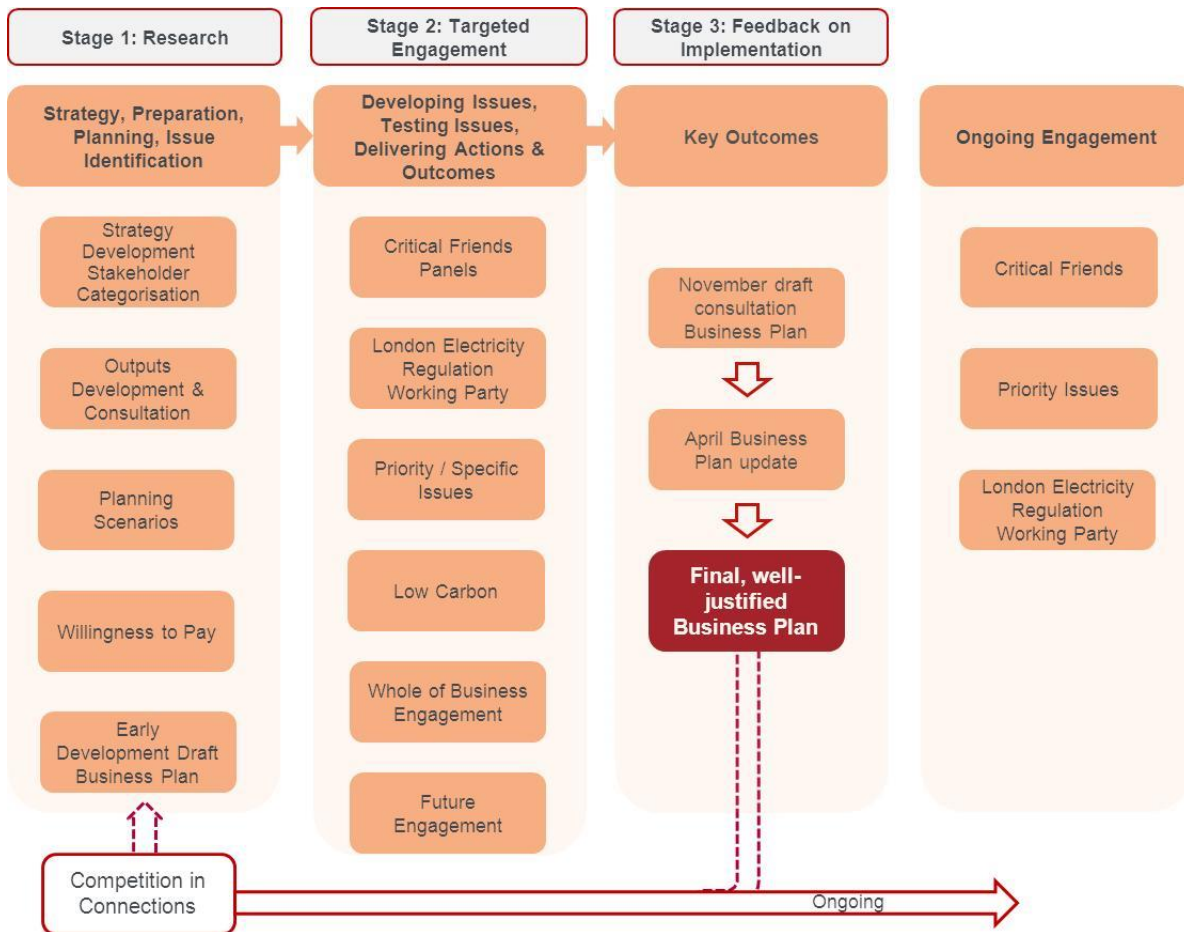
“Very interesting, excellent range of stakeholders. Good stuff!” *Vulnerable and Fuel Poor Customer Focus Group*

“Good mix of cross-industry partners.” *Metal Theft Focus Group*

“The right mix of professionals at the event, which challenged the presenters to respond to most highly political matters.” *Street Works Focus Group*

Our stakeholder engagement programme on the business plan is summarised in Figure 53.

Figure 53 Stakeholder engagement programme



9.2 How stakeholder feedback has influenced our plans

Our engagement has identified a number of key issues that consistently come through as most important to our stakeholders.

- **Increased transparency**
Stakeholders have requested greater transparency around reporting, decisions and business processes particularly in connections. In response, we were the first of the GB DNOs to publish information on our annual revenue requirements and prices for the upcoming planning period.
- **Improved customer service in particular in connections**
Stakeholders would like to see improved customer service and support the development of a contestable customer connections market to foster greater choice in service provider and in improvements in service outcomes. This was also evident from the willingness to pay studies for all three networks. Customers identified a range of services, including longer working windows and specific time-banded appointments. In response, we have already significantly improved our customer connection services by listening to and acting on feedback from customers. We are committed to introducing further improvements as part of our Business Transformation project, including the introduction of a connection customer self-service portal. (See [Annex 12: Transformation](#))

Transition to a smart grid

There is stakeholder support for planning to meet the challenges arising from the transition to a low carbon economy, which will drive changes in the role and responsibilities of distribution networks. In response, we have made clear our commitment to the UK's transition to a low carbon economy and to a possible journey towards a 'smart grid' by 2030 without creating stranded assets. We have reflected investment to support our transition to a smart grid in our business plans, and have also reflected £141million of cost savings from smart interventions. We are taking an incremental smart solution implementation strategy during R10-ED1, continuously monitoring the take up of smart technologies. We have sufficient flexibility in our delivery model to move to a faster implementation strategy if necessary. (See [Annex 9: Smart grid strategy](#)).

Infrastructure development

Some of our stakeholders, in particular in London, have questioned whether our business plan provides sufficient capacity to accommodate future customer connection requests in certain areas of the network and how the cost of network investment, required to accommodate future connections, should be recovered from customers. In response, we have revised our business plans within the constraints imposed by regulations under which we operate to reflect stakeholder feedback, whilst being careful not to propose investment in new capacity ahead of need, which would result in existing customers subsidising the cost of connecting new customers and is prohibited by our regulator.

Vulnerable customers

Stakeholders would like to see even more investment in initiatives to assist vulnerable and fuel poor customers. In response, we have established a project specifically focused on identifying how we can better assist vulnerable customers.

Efficiency of cost delivery

Stakeholders have asked for more comparative information on the relative efficiency of our networks in delivering their outputs compared to other DNOs. In response, our vision, to achieve top third performance in our sector in key areas, is founded on comparative benchmarking and this business plan is full of information comparing our performance with the sector.

Willingness to pay survey

Our stakeholder engagement has included a quantitative willingness to pay survey to assess our customers' priorities and requirements, administered by the consulting firm Accent. The results are summarised in Table 66 below, and the customer priorities identified are consistent with the key issues identified above. It is noticeable however that in absolute terms customers are not prepared to pay significantly more on top of their existing bills for enhanced services and we have taken affordability into account in our business plan and in our proposed revenues which include a real terms price cut for customers. See Section 5 of [Annex 19: Stakeholder Engagement Process](#).

Table 66 Willingness to pay results

WTP by Output category	Domestic Customer (£m)	Business Customer (£m)	All Customers (£m)	Average annual increase in Domestic customer bill (£/annum)	Average annual increase in Business customer bill (£/annum)
Environmental – Facilitation of low carbon economy					
Renewable/distributed generation	134	69	203	2.30	12.60
Low carbon tech e.g. electric vehicles, heating	82	44	126	1.40	8.10
Connections					
Flexibility in delivery	70	26	96	1.20	4.80
Improved quotations service	45	29	74	0.80	5.30
Improved delivery service	85	35	120	1.40	6.30
Network availability and reliability					
Smart metering	79	42	121	1.30	7.70
Quality of supply	63	29	92	1.10	5.20
Customer Services					
Information provision	37	10	47	0.60	1.80
Additional services	18	17	35	0.30	3.20

However, all such schemes should be subject to further investment appraisal to demonstrate true value for money. On this basis we have adjusted our business plan to:

- Incorporate £57.1million (with a further transactional cost of data transfer) into our expenditure forecasts for process and system changes required to accommodate smart meter data
- Incorporate £27million into our expenditure forecasts for targeted quality of supply improvements
- Incorporate £15million into our expenditure forecasts for network reinforcement to provide the additional network capacity required for the connection of renewable generation in EPN

Other changes to our plan as a result of stakeholder engagement

As a result of stakeholder feedback, we have also made a number of other changes to our business plan. We have:

- Introduced additional secondary deliverables to support primary outputs such as commitments to being an employer of choice, community engagement and supporting vulnerable customers. We have also identified programmes of work or activities to support these commitments.
- Refined certain inputs into the planning scenario including forecast household growth and the domestic uptake rate of heat pumps and electric vehicles. We have however, retained the core planning scenario underpinning our consultation draft business plans
- Refined the scope of investment required to respond to the decarbonisation of the UK economy, particularly through the connection of new low carbon technologies
- Refined the scope of the distributed generation (DG) infrastructure required to allow the timely and efficient connection of the increase in medium to large scale generation
- Introduced an enhanced central London operational response team
- Further developed our innovation strategy through expert panel review
- Included shareholder funded greater investment to improve the end-to-end customer connections process to address stakeholder comments on customer service. Further improvements will continue to be delivered as part of the business transformation project over the next planning period

- Further reviewed and revised our procurement, work delivery, training and contractor strategy
- Expanded the initiatives that we will undertake to support community engagement and the services that we will provide to vulnerable and fuel poor customers
- Amended the way that our distribution use of system prices (DUoS) will be set to reduce price volatility

Stakeholder requirements not included in the business plan

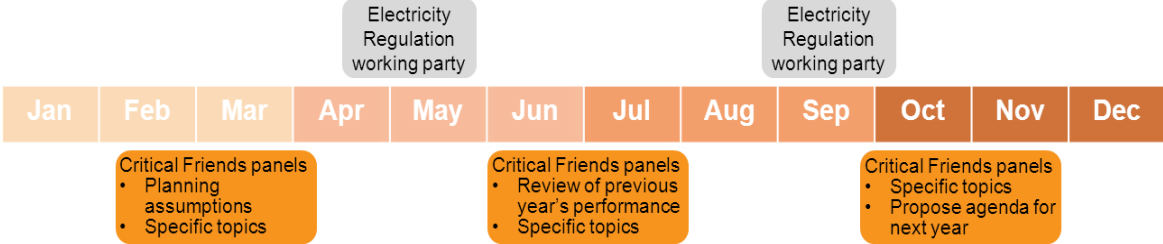
Whilst we have listened to and understood all the feedback we have received, it has not been practical or feasible to incorporate it all into our business plan. Feedback that we have not reflected in our business plans includes:

- The introduction of a seventh output category, and associated targets and incentives relating to the decarbonisation of the UK economy. This was proposed by UK Power Networks during the Ofgem RIIO-ED1 strategy working groups but was rejected.
- Whilst we have undertaken to monitor and report upon short duration interruptions (less than 3 minutes) during RIIO-ED1, Ofgem's Interruptions Incentive Scheme has not been extended to such interruptions, nor has compensation been extended to cover for such an occurrence. However we will continue to discuss with stakeholders how we can improve in this area.
- We have decided not to move to a Distribution System Operator during RIIO-ED1 as we do not believe this is cost effective, but will continue to review our role as the decarbonisation of the economy speeds up and the requirements on a traditional Distribution Network Operator begin to change
- Requests from major London stakeholders for investment in new capacity ahead of need in London to facilitate economic growth through faster connection times and lower connection charges for new major connections. We have not included this investment, which was discussed in our November 2012 draft business plan consultation, because it is clear to us that our regulator Ofgem will not approve the expenditure because it is contrary to the regulatory principles which apply to electricity distribution, namely that connecting customers rather than existing customers should pay for the cost of incremental capacity for new connections, and that this capacity should not be constructed ahead of need. Ofgem has also made its position clear to our stakeholders directly
- We have not included investment ahead of need to facilitate the connection of distributed generation in the East of England. Again, this is because the current regulatory framework does not support the investment requirements.
- We have decided not to create a separate licensed network for the central London district. We now monitor customer interruptions and customer minutes lost performance separately, and provide geographical specific network loading. However, it is not practical due to the interconnection of the London network to try to completely separate the central district from the rest of the London network.
- We have decided not to become a Meter Operator in response to the smart metering roll-out, and will focus on responding effectively to network interventions required by the supply companies and their agents
- It was suggested that we should measure and report on the additional congestion resulting from our streetworks. Whilst this is a worthwhile proposal, it is not clear to us how this can be achieved and hence it has not been included in our plan given the number of variables impacting on traffic congestion
- Moving to a more aggressive programme of removing oil-filled cables to minimise the potential for environmental damage through oil leakage. We will continue to monitor our oil-filled cables carefully and where a suitable investment case exists, (which has considered all externalities including traffic disruption) we will replace them
- It was suggested that we should change our DUoS charging to reflect the distance of the customer from the substation. Whilst understanding the rationale behind this point, we believe that this would be perceived as a 'postcode lottery' by customers and that a 'postage stamp' pricing model is more appropriate to a fundamental service such as provision of electricity

Next steps

We invite stakeholders to comment on our final business plan. Also, we emphasise that our business-as-usual stakeholder engagement will continue after the submission of our business plan to Ofgem. Our future engagement programme will build on the benefits derived from consultation since 2011, and ensure the continued involvement of stakeholders through the critical friends panels, specific issue engagement and a range of other stakeholder engagement pathways.

Figure 54 UK Power Networks' RIIO-ED1 stakeholder engagement annual timetable



Our goal is for our business-as-usual stakeholder engagement to be of a quality and intensity comparable to strongly performing companies that are active in competitive markets. Needless to say, our stakeholder events will continue uninterrupted in 2014 and onwards into RIIO-ED1.

UK Power Networks has also made commitments in its RIIO-ED1 outputs to:

- Continue with three critical friends panels per DNO per annum
- Appoint an independent chairperson to the critical friends panels
- Publish an annual report on the progress against the RIIO-ED1 business plan
- Publish an annual strategic development statement for Central London
- Review progress against the RIIO-ED1 business plan at one of the critical friend panels
- Publish and review our annual planning assumptions through the critical friends panels

For a fully comprehensive description on the stakeholder engagement undertaken, please refer to [Annex 19: stakeholder engagement](#).

10 Innovation

10.1 Innovation is embedded in our business

Innovation is key to our strategy, because our vision of upper third performance in our sector requires continuous improvement in order to maintain that position as other networks also improve.

The major changes we have made to our business since we became UK Power Networks demonstrate a substantial level of commercial innovation. We are now embarking on a £50million shareholder funded Business Transformation project which will accelerate the pace of change in our business and leave us with world class business processes and systems.

Technical innovation in our business and via the Low Carbon Networks Fund is also a major focus for us. We have the leading share of the LCNF and our major projects are already starting to deliver lessons for the DNO community. Our plans incorporate 'smart' interventions on our networks allowing us to build £141million of savings from smart interventions into our business plan.

All of our innovation activities are focused on delivering measurable benefits in the areas of our top third vision: respected corporate citizen, sustainably cost efficient, and employer of choice. We do not make changes for the sake of change.

10.2 Key solutions delivering benefits in the business plan

Our past and present innovation performance has allowed us to achieve a significant reduction in the capital expenditure we require:

- Our work within the Low Carbon London project has given us the confidence to replace 14 traditional reinforcement schemes in our business plan with interim solutions which we expect to fulfil through Demand Side Response (DSR). We expect DSR to play a role in managing complex construction timelines within a further 6 reinforcement schemes. This will provide a saving of £43million compared with the original planned schemes and will minimise disruption to customers
- Our change journey is not yet complete, and in particular we still have improvements to make in customer service and in direct cost efficiency. With these goals in mind, early in 2013 we launched a £50million business transformation project. We will not seek to recover the costs associated with this transformation from our customers. The project is focused on process and systems improvements. In particular, it is concerned with ensuring we have best practice, efficient, integrated, common processes and systems across our core work, asset and customer operations. This will enable:
 - Improved customer relationships through greater provision of information, service channels (web, voice, SMS, social media), improved service and self-service options
 - More sophisticated asset performance measurement, refined asset policies and the production of high quality near term asset plans with reduced manual intervention
 - Improved and simplified data capture and management
 - Better managed work planning and the use of contractors
 - Simplified regulatory reporting and internal planning processes
 - Better control of the delivery of capital programmes
- We have reduced our expenditure forecasts on overhead line upgrades by £9million, in anticipation that we will find simpler upgrade options identified through the use of Light Detection and Ranging (LIDAR) surveys

- Our trials of a number of transformer monitoring solutions for primary and grid transformers over a number of years, and previous work carried out to model thermal cycling of transformers, has given us the confidence to reduce our capital expenditure forecasts for transformer upgrades by £15million. We expect to meet the gap by managing existing transformers using a combination of advanced monitoring, modelling of their thermal effects, and potentially pre-cooling of transformers ahead of system peaks. In addition Demand-Side Response contracts will be considered where viable to relieve load on transformers in a fault event
- We are not requesting the full amount of capital expenditure to carry out all the replacement of low-voltage (LV) cable which is predicted by our models to need replacing due to the uptake in electric vehicles, micro-generation and heat pumps. This results in both a financial saving to our customers and in reduced disruption due to fewer excavations on the street. We are confident that there are a variety of technologies being worked on by ourselves and other DNOs which can help to manage voltage issues at either the distribution substation or at the customer's premises, or indeed at a mid-point along the length of the feeder as well as there being opportunities to control load or automatically re-configure the low-voltage network to resolve some loading issues. We have identified a saving of £35million over the RIIO-ED1 period
- Our ability to consider refurbishment rather than replacement of equipment, while maintaining network reliability, has reduced our capital expenditure forecast over the RIIO-ED1 period. This has its roots in our skilled engineers, but who in turn are informed by and develop our innovation programmes such as the Strategic Technology Programme, a joint research programme in which the GB and Irish DNOs participate
- We have reduced our expenditure forecasts for replacement of switchgear by £9million on the basis that we expect we can manage the condition of the switchgear using real-time partial discharge monitoring. Real-time monitoring gives a picture of the developing nature of faults, and complements the spot-checks which are carried out across all switchgear on a regular inspection cycle
- In the context of supporting new generation and demand connections:
 - We have issued new 'interruptible' offers to a number of renewable generation developers as part of our Flexible Plug and Play (FPP) project. If taken up, these could potentially save significant sums for the developers and reduce their time to break even.
 - We have trialled Active Network Management (ANM) technology as part of both our Low Carbon London and FPP projects, which is the vital technology enabler behind interruptible contracts and some Demand Side Response contracts

10.3 We have a positive return on investment in innovation

Over DPCR4 and DPCR5 we will have received around £101million of customer contributions. These contributions have led to £111million of the total of the £141million (which includes existing smart solutions) of savings in the RIIO-ED1 business plan and further savings will follow in RIIO-ED2. These savings are as much as:

- 25% in the case of our plans to avoid LV cable reinforcement by using smart grid solutions
- 15% in the case of using demand-side response to avoid the need to undertake traditional substation reinforcement

These savings are fully documented in our [Smart Grid Strategy](#) annex, which also contains a more detailed description of our smart grid strategy.

10.4 Our investment in smart metering will realise benefits to customers

The Government's decision to mandate the rollout of smart meters to all domestic and non-domestic customers by the end of 2020 is a major national change programme introduced to support the commitment to transitioning to a low carbon economy and meet long-term challenges including providing an affordable, secure and sustainable energy supply.

Smart meters will replace the existing meters and will empower consumers to better manage their energy consumption and their energy bill by providing real-time information on energy usage. They will also facilitate more sophisticated energy management techniques and should bring an end to estimated billing – consumers will only be billed for the energy actually used.

The smart meter roll-out is the responsibility of the retail suppliers. However, we are innovating to improve our systems and working practices to ensure smart meters will also deliver direct benefits to UK Power Networks and other network operators. These include real-time data on customers interrupted in a fault situation giving us the ability to improve customer service and restore supplies more quickly, and information on load and voltage, enabling us to better target network reinforcement. We will also have the ability to improve services to vulnerable and fuel poor customers.

The table below quantifies the cost savings benefits we are forecasting. Customer service benefits would also arise.

Table 67 Smart metering benefits (£m real 2012/13)

Area	DPCR5 total (£m)	ED1 total (£m)	Comment
Investment decisions	nil	1.5	Current projected low levels of reinforcement mean that the comparable DECC/ENA benefit cannot be fully realised
Energisation status	Nil	11.1	We estimate that we will avoid around 11,000 visits a year by the ability to test the meter status
Reduced fault opex	Nil	3.7	Improved fault information and incremental change to our process
Total	Nil	16.3	

The smart meter rollout will also impose significant costs on UK Power Networks, principally for interventions during installations and for IT.

10.5 Our network innovation funding requests for RIIO-ED1

The RIIO-ED1 framework has two main funding mechanisms to allow DNOs additional revenues for innovation expenditure – the Network Innovation Allowance (NIA) of up to 1% of revenues per annum and the Network Innovation Competition (NIC).

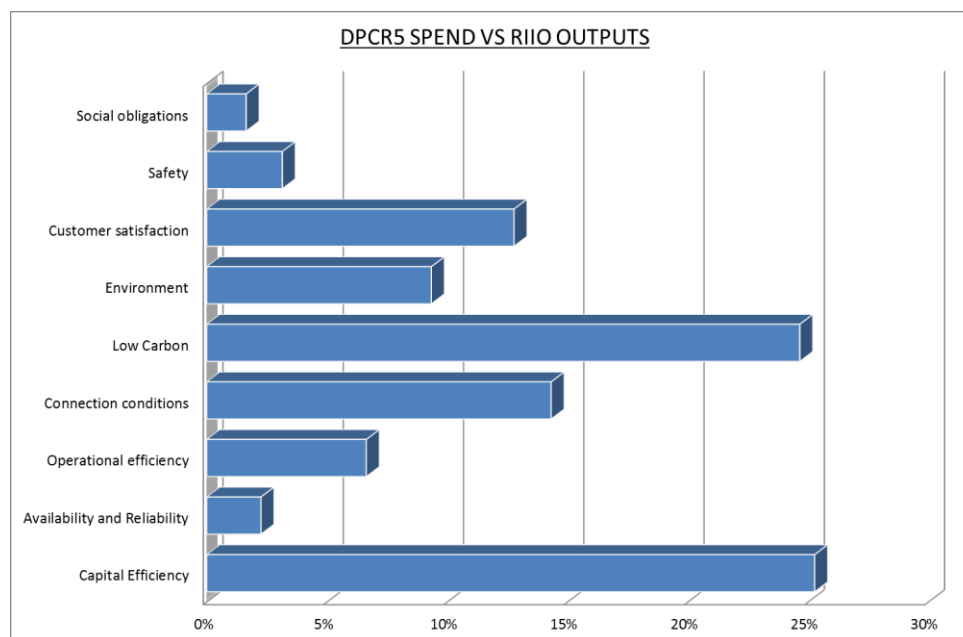
We believe that when practical innovation funding should be subject to the scrutiny of a competitive mechanism to ensure value for money. Therefore, we are requesting an NIA allowance of £5million per annum (0.5% of allowed revenues), only half of the maximum available. We propose to bid for the majority of our funding through the competitive NIC mechanism, just as we do today through the LCNF scheme where UK Power Networks has the largest amount of approved expenditure under the scheme. This provides the best protection to customers that the expenditure will be efficient and targeted at the best innovation projects, as each proposal is assessed on its own merits.

For further information on this section please see our [Innovation strategy](#) and [Annex 9: Smart grid strategy](#).

10.6 Our innovation track record

Since we became part of UK Power Networks in 2010 we have innovated in many areas of our business to support our outputs, cost efficiency and the low carbon transition. Figure 55 provides the breakdown of our total innovation expenditure in DPCR5 split across the key output categories.

Figure 55 Innovation spend by output category



Commercial and customer service (connection and customer service outputs)

- We are reducing the time it takes us to deliver work for our customers in both connections and general enquiries by providing single points of contact for each service
- We have extended the range of communication channels that we use to interact with customers, to include SMS, text, Twitter and online
- Innovation to promote good quality data for decision-making through the introduction of a CAT (Completeness, Accuracy and Timing) scoring methodology

Technical and operational (operational efficiency, availability and reliability outputs)

- Working with Imperial College London, we have developed a new Load Related Expenditure Model
- To improve cost efficiency, we have implemented a new performance management framework
- The introduction of unit cost tracking to enable better performance management and cost forecasting
- Actively using demand side response in the heart of London to mitigate network interruptions
- New technical procedures to increase the capacity of overhead lines (OHLs)
- The introduction of perfluorocarbon tracer oil cable leak location
- We are the only GB network currently to use LV remote control with an LV network control centre

Safety, social and environmental

- We are increasing safety by developing unmanned aerial vehicles for line inspections
- We have reduced our environmental impact from streetworks with more than 97% of waste soil now recycled
- We have carried out trials utilising waste heat
- We have expanded the scope of our vulnerable customer register and have written to all MPs for further contact points

10.7 Commercial Innovation: business transformation

UK Power Networks has made a significant improvement in its performance since the change in ownership in 2010. This has been achieved by introducing clear business objectives which are continuously monitored, focusing on what is important to our stakeholders and introducing innovative business, commercial and technical solutions. We have had three distinct phases of our evolution; separate our operations and systems from the previous owners, reset and improve performance and transform as shown in Figure 56. Two stages of this evolution have been completed.

Figure 56 Key stages of UK Power Networks' evolution



Our change journey is not yet complete, and in particular we still have improvements to make in customer service and in direct cost efficiency. With these goals in mind, early in 2013 we launched a £50million business transformation project, which is funded by our shareholders.

The project is focused on process and systems improvements. In particular, it is concerned with ensuring that we have best practice, efficient, integrated, common processes and systems across our core work, asset and customer operations. This will enable:

- Improved customer relationships through greater provision of information, service channels (web, voice, SMS, social media), improved service and self-service options
- More sophisticated asset performance measurement, refined asset policies and better defined near-term asset plans
- Improved and simplified data capture and management
- Better managed work planning and the use of contractors
- Simplified regulatory reporting and internal planning processes
- Better control of the delivery of capital programmes, reducing costs to customers

The delivery of the business transformation programme outcomes is led by UK Power Networks, working alongside our Transformation Partner (Enzen) and our Client Side Adviser (KPMG). The programme is due to be completed by the second quarter of 2015, delivering the business outcomes that will enable us to achieve upper third performance and to deliver our proposed RIIO outputs.

The targeted outcomes from the project are shown in Figure 57.

Figure 57 Targeted outcomes from business transformation



10.8 Network innovation: enabling the low carbon transition

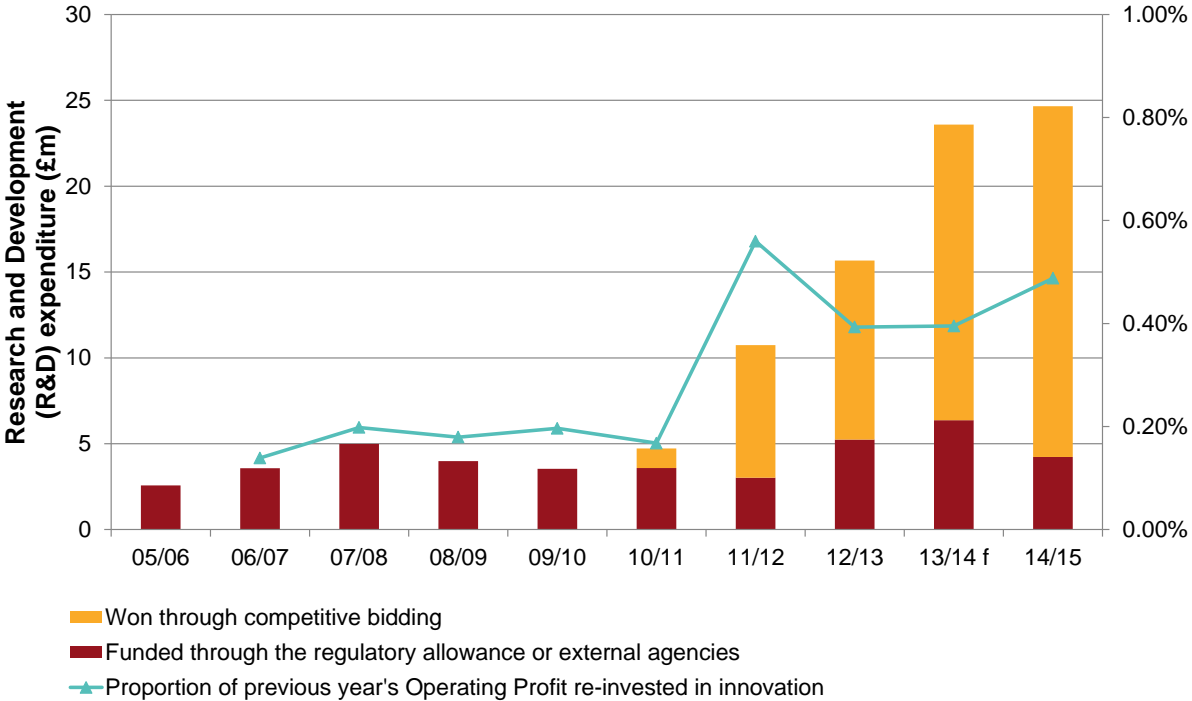
Current Low Carbon Network Fund (LCNF) and Innovation Funding Incentive (IFI) activities

We have established a leadership role in respect of innovation over the current period and we are fully committed to maintain this leadership position in RIIO-ED1. We take this leadership position to best deliver value to our customers and stakeholders, both in terms of innovation activities themselves and embedding the fruits of innovation into core business activities.

Furthermore, we believe that innovation will be crucial to deliver the low carbon economy in a financially sustainable way, as innovation provides us the flexibility to respond better, faster or more cost-efficiently to the potentially changing requirements of our future customers.

Our total innovation expenditure (LCNF tier 1 and 2 and IFI) increased from £3.3million in 2008/09 (or 0.5% of allowed revenue) to £15.8million in 2012/13 (or to 1.2% of allowed revenue). IFI and LCNF Tier 1 expenditure has increased from £3.9million in 2010/11 to £5.4million in 2012/13. The remaining expenditure relates to LCNF Tier 2 and has risen from £1.1million to £10.4million over the same period. The efficiency and value of this expenditure was tested through the LCNF Tier 2 competitive bidding process. This is shown in Figure 58.

Figure 58 Innovation through the Low Carbon Network Fund



Our innovation expenditure has assisted us to deliver our vision, improve customer satisfaction, deliver cost efficiencies, optimise investment and network planning, meet the challenges of the low carbon economy and keep customers' bills down.

Our key innovation projects are starting to deliver benefits to us and the rest of the DNO community by providing detailed information on the scope to use smart techniques in our business-as-usual activities.

Low Carbon London

This was our first flagship project. It is a holistic smart grid trial project concerned with pursuing smart network initiatives which use innovative ways to deliver sustainable electricity to businesses and communities in a low carbon future.

- **Smart meters**
The trial offers flexible time-of-use tariffs to customers. These tariffs help customers explore how they can reduce their electricity consumption at peak times making better use of network capacity.
- **Electric vehicles**
This trial involves EV owners and will determine how flexible they are about when they charge their cars.
- **Decentralised energy**
London businesses are being incentivised to contribute their locally generated power to our network.
- **Energy efficiency**
This trial assesses the impact of energy efficiency measures already in use in smart meter households.

- Demand response
London businesses are being incentivised to alter when they use electricity to help us reduce peak energy demand. Trial phases have to date been successful in enrolling DSR services across four primary substations in LPN with 15.8 MW cumulative DSR made available through seven sites and up to 115 MW of potential DSR available from c.90 prospective participants, including DSR delivered through standby generation output as well as building turn down and up to a maximum of 109.1 MWh of responsive demand utilised per trial phase

Flexible Plug and Play

This was our second flagship project and is concerned with trialling innovative technical and commercial solutions to provide cheaper and faster connections of renewable generation, such as wind power, to the electricity distribution network. The trial area of the Flexible Plug and Play (FPP) project within the EPN distribution network has experienced very significant increases in connection requests from developers of generation projects. This has resulted in network constraints due to thermal, voltage and power flow limits being exceeded, with the consequence that traditional connection offers increasingly include significant network reinforcement costs which make the generation projects uneconomic. FPP is trialling a range of technical innovations such as dynamic line ratings and a quadrature booster to increase available capacity, and the commercial innovation of an interruptible connection offer. This has allowed UK Power Networks to make ‘smart’ connection offers of 40.7 MW which represent in aggregate cost savings of £51.3million for customers.

Smarter Network Storage

This project involves the installation of a larger scale storage plant to solve a network constraint. We plan to install a 6MW/10MWh storage unit to meet peak demand at our Leighton Buzzard primary substation within the EPN network area, as an alternative to the traditional reinforcement option of installing a new transformer and additional high voltage lines. The project is innovative because it proposes to access other areas of the electricity industry value chain such as selling ancillary services to National Grid, and selling spare capacity in order to subsidise the cost of electricity storage as a network reinforcement option.

In general, our portfolio of LCNF and IFI projects provides excellent coverage of the suite of smart research areas being considered by the industry.

Table 68 Mapping of current Tier 2 LCNF projects to areas of interest

Areas of interest	Low Carbon London	Flexible Plug and Play	Smarter Network Storage	Flexible urban LV Networks
Voltage constraint		X		
Thermal constraint		X	X	X
Fault level constraint	X			X
Cost of connection		X		
Customer engagement	X	X		
Commercial models	X	X	X	

10.9 Our long term smart grid strategy

We are one of Great Britain’s leading exponents of smart grids and have already established a baseline of smart network solutions which has provided, and will continue to deliver, significant network investment efficiencies. This includes the £141million of smart savings in our business plan. Our networks are also more highly utilised than average. This means the current asset efficiency is higher than for other DNOs, and also provides us with a strong incentive to use smart interventions to avoid, postpone or complement reinforcement, both now and in the future.

Our smart grid strategy, which we have published as part of the submission, presents how we will deliver this commitment of network reinforcement savings in ED1 based on our innovation portfolio and the technology roadmaps that provide the flexibility around delivery of our plan.

Our two new models, the load related model developed with Imperial College London, and Transform model, developed by the Smart Grid Forum, played an important part in identifying the savings. The models gave us two good views of the volume of savings that could be achieved, and what technologies could be considered. Both sets of information were used by our network planners and innovation team to make the final decision on what smart solutions, on a scheme by scheme basis, could be deployed to give us our savings.

The smart grid solutions that are of particular importance to our network over the RIIO-ED1 period include:

- Demand-side response
- LV smart solutions
- Dynamic ratings of overhead lines
- Dynamic ratings of transformers
- Partial discharge monitoring
- Fault current limiters
- Active network management

Each of our smart grid solutions was tested using one of Ofgem's approved methodologies for assessing cost-benefit. In a number of instances, we favoured the smart grid solution based on the optionality and flexibility that it introduces in the early years. We feel that this is particularly valuable during periods of uncertainty around low carbon technologies.

We will also invest in enabling technologies over the RIIO-ED1 period where these are justified and the stranded asset risk is minimal, to ensure that our smart grid strategy remains optimal over the RIIO-ED2 period when low carbon technologies are expected to have a much greater impact.

Our smart grid strategy has been informed on a solid foundation including through our participation in wider industry developments including:

- The Ofgem / DECC Smart Grid Forum
We fully participated in the Forum's various workstreams which focused on key areas including: future energy scenarios; smart grids; and addressing regulatory and market barriers. We shared the lessons learned and experience gained from our Low Carbon Network Fund projects to ensure that the industry as a whole benefits from our work.
- The development of a parametric model of the GB distribution networks known as 'Transform'
The model provides a high-level assessment of the impact of low carbon technologies, and the relative cost-effectiveness of a range of both conventional and smart network investment options to manage that impact. The model can be used to compare the relative benefits of alternative smart interventions under varying future energy scenarios. Whilst it can provide an indicative level of investment over a given period of time (such as RIIO-ED1) the parametric nature of the model means that it is better utilised in its design context – namely as a means of comparing longer-term investment strategies.
Importantly, recognising the inherent uncertainty in the uptake rate of low carbon technology over the medium term, our smart grid strategy, which is based on our 'best view' of future load growth as discussed in Section 10.9, identifies how we would flex our investment to deal with varying future energy scenarios, and thereby ensure an efficient level of smart grid investment.
Notwithstanding its longer-term horizon, we assessed the outputs of the model in the context of RIIO-ED1 to compare its predicted savings over conventional investment with those of our own smart grid strategy. The analysis shows that the savings were similar under both approaches, albeit that the solutions identified under our smart grid strategy are more appropriate to our networks and the RIIO-ED1 timeframe than those promoted by the model.

In terms of the benefits from our smart grid investment, we have forecast total savings across all three networks of around £141million over RIIO-ED1. Refer to Section 5.5 for a detailed breakdown:

- £132million relates to avoidance (reduction) of traditional network reinforcement investment
- £9million relates to reduction in non-load related expenditure

This is in line with UK Power Networks' implied share of the total £500million of savings for Great Britain estimated by the Department of Energy and Climate Change (DECC) and Ofgem's Smart Grid Forum.

For further information see [Annex 9: Smart grid strategy](#), [Annex 12: Business Transformation](#) and our [Innovation strategy](#).

11

Risk, uncertainty and incentives

The ex-ante nature of price control settlement, whereby Ofgem determines prices and outputs upfront for the eight year price control period, means that UK Power Networks is subject to a range of risks and uncertainties in delivering the agreed outputs within the approved financial settlement. The nature and scope of the uncertainties and risks that we will face over the RIIO-ED1 period are more expansive and complex than those faced over the current price control period due to:

- The significant external risk factors driving uncertainty in network investment arising from the UK Government's commitment to transition to a low carbon economy
- The prospect of significant technical changes to our operations as a result of the smart meter rollout, the introduction of smart interventions and the long term transition to a smart grid
- The extended length of the price control period, which has increased from five to eight years. This has reduced regulatory risk but increased the overall level of operational risk

We have a robust risk management framework which identifies the likely risks and uncertainties we will face over the RIIO-ED1 period, and sets out our financial protection framework and arrangements which will allow us to manage these risks to ensure that we will deliver our output commitments to customers.

We manage risk through a directorate led risk management programme which includes an active risk register which is reported to the Board on a regular basis.

11.1 Likely risks over the RIIO-ED1 period

We maintain an active risk register that is reported to the Board of Directors on a regular basis. The top 10 business risks for the regulated network activities of the UK Power Networks group are shown in Table 69 below together with the key mitigants:

Table 69 The key top 10 business risks

Number	Risk	Ownership Directorate	Mitigation action
1	Very Serious Incident (VSI) - employee or contractor	HSS	Introduction of 'Zero Harm' and 'Stay Safe' behavioural training programmes
2	Failures in the assets results in VSIs to public or employees	Asset Management	Increased expenditure in DPCR5 on asset defect rectification and enhanced inspection and maintenance activities
3	Providing incorrect or misleading information to Ofgem	Strategy & Regulation	Introduction in 2011 of full regulatory submission assurance programme based on risk and impact
4	Inability to deliver against capex plan outputs	Capital Programme	Detailed modelling and monitoring of health and load indices. Introduction of lead indicators into capital programme delivery
5	Inaccurate unit costs impact management of performance and forecasting	Finance	Direct cost efficiency and unit cost projects set up with monthly reporting of cost performance
6	Failure to achieve an acceptable outcome in RIIO-ED1 reset	Strategy & Regulation	Comprehensive business-led RIIO-ED1 project producing well-justified business plan
7	Inadequate response to major events results in a visible perceived failure of UKPN performance	Network Operations	Asset management policies and investment programme. Major incident management procedure and training. Application of lessons learnt from the Olympic Games
8	Changes to Department of Energy and Climate Change (DECC) Legislation	UKPN Services	Continue discussions to apply a working model to comply with the legislation
9	Adverse outcome from Ofgem's finalised decision on DPCR4 losses close out values	Finance	Robust losses methodology and data which has been consistent across DPCR4 and DPCR5
10	Poor outcome to Business Transformation Programme	Strategy & Regulation	EMT sponsorship with focussed governance to maintain, momentum, quality and pace

Risk of an unacceptable RIIO-ED1 outcome

One of the key risks on the register is the failure to obtain an acceptable RIIO-ED1 outcome following submission of this business plan. The main sources of uncertainty and risk underlying this risk include:

- **Revenue risk** – that the revenue collected from customers is less than is required to deliver our output commitments, for example because the financeability arrangements are inappropriate, or because inflation is significantly different from forecast. Inflation risk is mitigated by the inflation indexation mechanism for our revenues and RAV. Financeability risk is mitigated by our detailed modelling of credit and equity metrics as discussed in [Annex 17: Financeability](#)
- **Volume risk** – the risk that the volumes underpinning our expenditure forecasts for the RIIO-ED1 period are lower than the actual volume of work that we are required to undertake to provide our output commitments due to:
 - The impact of the transition to a low carbon economy. In particular, higher than forecast uptake of low carbon technology such as heat pumps or electric vehicles

- Faster than forecast economic growth which would require a significant increase in network reinforcement investment
- Higher than forecast asset replacement arising from the rollout of smart meters
- More rapid asset degradation than forecast in the programme of works designed to maintain the health of our network assets

These risks are mitigated by our sophisticated load related and asset replacement expenditure models, combined with extensive scenario analysis, and are also capped through Ofgem's re-opener for load-related expenditure and volume driver for smart meter costs. These are discussed in Section 5.3.

- **Unit cost risk** – the risk that the unit costs underpinning our RIIO-ED1 expenditure forecasts are less than the actual costs that we will incur to provide our output commitments. This risk is mitigated by the detailed bottom up "should cost" work, detailed cost benchmarking, and our fully developed delivery strategy.

Further information about our unit costs is found in:

- Section 5.15 which sets out our proposed unit costs for RIIO-ED1. Our benchmarking analysis support these as being efficient and prudent
- Section 5.16 which sets out our proposed regional cost differences which recognise that the unit costs required to deliver our output commitments will be higher in London and South East England due to a variety of regional factors such as transport and travel – which are driven in part by changes to streetwork related legislation which has significant financial impact
- Section 5.18 which sets out our proposed RPE estimates which recognise that the cost of labour, materials and plant and equipment required to deliver our outputs will increase at a greater rate than the retail price index (RPI)
- **Indirect cost risk** – the risk that our closely associated or business support indirect cost allowances are insufficient to cover our actual spend. The risk is mitigated by our detailed benchmarking together with analysis confirming the deliverability of implied efficiencies versus historic cost levels. UK Power Networks has reviewed volume changes during RIIO-ED1 and applied these to forecast indirect costs. It is estimated that for every 3% increase in volumes of activity indirect costs increase by 1%. This trend has been observed against history
- **Unrecoverable pension deficit risk** – Any efficiently incurred pension deficit up to 2010 is funded through extra contributions from customers. However, any increase in pension deficit beyond 2010 will be subject to additional efficiency tests before funding is confirmed. This pension costs benchmarking is new to the electricity distribution industry and therefore introduces some uncertainty into future revenues

Impact of Streetworks legislation

A further risk that we face is the impact of rising streetworks costs associated with our operational activities. Streetworks legislation related costs are one of the most significant areas of costs for us over RIIO-ED1. The effects of streetworks legislation impact on costs across our whole business covering maintenance, repair, replacement, new connection and other capital schemes as well as requiring back-office and indirect costs. Hence they have a direct impact on customer bills for using our network.

To increase the understanding of how this legislation affects our activities, we have invested significant time and resource into working very closely with and lobbying bodies such as local authorities, policymakers and the London Mayor's office. Our goal has been to find an approach which balances the need to manage the impact that our works have on road congestion with the desire to minimise customer bills. We have also innovated in our work delivery process to manage the time and impact of our streetworks.

Our business plan includes our forecast of the impact of changes in streetworks legislation, based on the legislation that is currently enacted. However, as was evidenced in DPCR5, local authorities are implementing streetworks legislation at varying rates which could add significant uncertainty to our cost base. We are therefore pleased that Ofgem has retained the streetworks reopener mechanism for the ED1 period, which should significantly mitigate this risk and reduce it to a level comparable to DPCR5.

11.2 Our approach to managing risk and uncertainty

Our approach to managing the risks discussed above is governed by our Risk, Control and Compliance Framework which is described by the Governance and Assurance Cube set out in Figure 59 below.

Figure 59 Governance and Assurance Cube



We have analysed the risks described in Section 11.1 within our Risk, Control and Compliance Framework and on this basis we are not proposing any additional uncertainty mechanisms to those set out in Ofgem's RIIO Strategy Decision documents as set out in Table 70.

Table 70 regulatory uncertainty mechanisms

Regulatory uncertainty mechanism	Risk
Indexation	<ul style="list-style-type: none"> RPI indexation of allowed revenue Indexed allowance for cost of debt
Volume driver	<ul style="list-style-type: none"> Smart meter rollout costs
Passthroughs	<ul style="list-style-type: none"> Business rates Ofgem licence fees DCC fixed costs Transmission connection point charges
Specific re-openers	<ul style="list-style-type: none"> Load related expenditure including relating to general reinforcement, new connections, low carbon devices (i.e. heat pumps, PV cells), fault level reinforcement Streetworks Enhanced physical site security High value projects Innovation rollout mechanism Pension deficit repair
Revenue trigger	<ul style="list-style-type: none"> Tax

11.3 Incentive mechanisms

Further, the incentives under the RIIO regulatory framework provide UK Power Networks with strong financial disciplines both within and across regulatory periods. These are summarised in Table 71.

Table 71 Regulatory incentive mechanisms

Output	Incentive mechanisms
Safety	<ul style="list-style-type: none"> No financial incentives on safety within the Ofgem RIIO framework Safety has a strong reputational incentive and is subject to criminal fines for breaches
Customer service	<ul style="list-style-type: none"> Broad Measure of customer service – (+/- 1.5% base revenues) in total: <ul style="list-style-type: none"> Customer satisfaction survey (+/- 1%) Complaints (-0.5%) Stakeholder engagement (+0.5%)
Network availability and reliability	<ul style="list-style-type: none"> The Interruption Incentive Scheme (IIS) is the primary incentive on interruptions to supply (+/-2.5 % return on regulated equity) The delivery of health indices is also incentivised with a positive incentive to deliver additional work where merited, rather than just a penalty for under delivery (2.5% of value of over or under delivery). Potential penalties for inefficient non delivery of load indices (2.5% of value of under delivery) Guaranteed Standards restoration standard where compensation paid for interruptions that exceed the timescales set (12hrs in normal weather). Worst served customer allowance for set improvements accessible on an as required basis
Connections	<ul style="list-style-type: none"> Time to Connect incentive (+0.4% base revenue) Incentive on Connection Engagement (-0.9% base revenue) Broad Measure of Customer Service for minor connections customers (+/- 0.5% base revenue)
Environmental performance	<ul style="list-style-type: none"> Losses discretionary award up to £32million across all DNOs in 3 tranches Undergrounding allowance for Areas of Outstanding Natural Beauty and National Parks Business Carbon Footprint is a reputational incentive using a league table and baseline Oil leakage and SF₆ are reputational incentives based on reporting
Innovations	<ul style="list-style-type: none"> Network Innovation Allowance (up to 1% of revenue per annum) Network Innovation Competition (£90million per annum for the industry in the first two years of RIIO-ED1. Innovation rollout mechanism

For further information see [Annex 14: Managing uncertainty](#).

A Glossary

A

Asset risk and prioritisation (ARP)

Models for establishing and forecasting the health of network assets. The ARP models use a combination of information relating to an asset's age, environment, duty and specific condition and performance information to derive a health score for each asset, underpinned by proximity to end of life and probability of failure

B

Business carbon footprint (BCF)

The BCF scheme was introduced as a reputational incentive in DPCR5 to encourage DNOs to consider the direct carbon impact of conducting their operations and to be proactive in the reduction of emissions

Broad measure of customer satisfaction (BMoCS)

A composite incentive consisting of a customer satisfaction survey, a complaints metric and stakeholder engagement. It was introduced for DPCR5 and is designed to drive improvements in the quality of the overall customer experience by capturing and measuring customers' experiences of contact with their DNO across the range of services and activities the DNOs provide

C

Capital expenditure (Capex)

Expenditure on investment in long-lived distribution assets, such as underground cables, overhead electricity lines and substations

CDCM

Common Distribution Charging Methodology is a standard used across the industry to set DUoS charges.

Combined heat and power (CHP)

The simultaneous generation of usable heat and electricity in a single process, thereby discarding less wasted heat

Compound annual growth rate (CAGR)

Average annual growth rate over a defined period of time

Customer interruptions (CIs)

The number of customers whose supplies have been interrupted per 100 customers per year over all incidents, where an interruption of supply lasts for three minutes or longer, excluding re-interruptions to the supply of customers previously interrupted during the same incident.

Customer minutes lost (CMLs)

The duration of interruptions to supply per year – average customer minutes lost per customer per year, where an interruption of supply to customer(s) lasts for three minutes or longer

D

DCLG

Department of Communities and Local Government

DCUSA

Distribution Connection and Use of System Agreement

DECC

Department of Energy and Climate Change

DEFRA

Department of Environment, Food and Rural Affairs (DEFRA)

Distributed generation (DG)

Distributed generation (also known as embedded or dispersed generation) refers to an electricity generating plant connected to the distribution network. There are many types and sizes of distributed generation facilities. These include Combined Heat and Power (CHP), wind farms, hydro-electric power or one of the new smaller generation technologies such as photo-voltaic cells

Distribution network operators (DNOs)

A DNO is a company which operates the electricity distribution network which includes all parts of the network from 132kV down to 230V in England and Wales. In Scotland 132kV is considered to be a part of transmission rather than distribution so their operation is not included in the DNOs' activities. There are 14 DNOs in the UK which are owned by six different groups

Distribution price control review 5 (DPCR5)

Distribution price control review 5. This price control runs from 1 April 2010 until 31 March 2015

Distribution system operator (DSO)

As DNOs actively manage the local levels of demand, whilst at the same time accommodating varying amounts of generation onto the network, they will start to behave like system operators (ie locally balancing demand and supply on their networks), known as the DSO

DUoS

Distribution Use of System

E

EA

Environment Agency

EDCM

EHV Distribution Charging Methodology

Eastern Power Networks (EPN)

One of the three distribution network licence areas owned and operated by UK Power Networks. The EPN network covers the East of England

Element Energy (EE)

Element Energy, a strategic energy consultancy, have provided economic analysis to inform the 2013 forecast business plan

Electricity Guaranteed Standards Electric vehicle (EV)

Vehicles that utilise electric motor(s) or traction motor(s) and are powered by either an external power station, on-board electrical generators, or stored electricity

Electricity, safety, quality and continuity regulations 2002 (ESQCR)

The ESQCR specify safety standards, which are aimed at protecting the general public and customers from danger. In addition, the regulations specify power quality and supply continuity requirements to ensure an efficient and economic electricity supply service to customers

Extra high voltage (EHV)

Voltages over 20kV up to, but not including, 132kV

F

Fast money

Fast money is the revenue that is matched to the year of expenditure

Feed in tariff (FIT)

The price per unit of electricity that a utility or supplier has to pay for renewable electricity from private generators. These are used to encourage distributed renewable generation through private generators

Forecast business plan questionnaire (FBPQ)

Questionnaire through which data is submitted to Ofgem to help form Ofgem's initial views on the revenue requirements for price control reviews

G

Gigawatt (GW)

Measure of power equal to one billion watts

Guaranteed standards of performance (GSOPs)

Guaranteed Standards set service levels to be met in each individual case and are established by a Statutory Instrument. If the licence holder fails to provide the level of service required, it must make a payment to the customer affected subject to certain exemptions

H

Health index (HI)

Framework for collating information on the health (or condition) of distribution assets and for tracking changes in their condition over time. The HI will be used by Ofgem to inform an assessment of the efficacy of the DNOs' asset management decisions over the price control period. Health index arrangements were introduced as a part of DPCR5

High voltage (HV)

Voltages over 1kV up to, but not including, 22kV

I

Indirect cost efficiency (ICE)

The ICE programme was launched in 2011 in order to close the gap with the benchmark distribution companies in relation to indirect costs

Information technology (IT)

Technology systems used to manage information. In UK Power Networks this includes our management information systems, asset information systems and operational IT

Inspections and maintenance (I&M)

The activities of both:

Inspections – the visual checking of the external condition of assets

Maintenance – the invasive ('hands on') examination of plant and equipment

Innovation funding incentive (IFI)

The IFI is intended to encourage DNOs to invest in appropriate research and development activities that are designed to enhance the technical development of distribution networks (up to and including 132 kV) and to deliver value (ie financial, supply quality, environmental, safety) to end customers

Interruption incentive scheme (IIS)

The interruption incentive scheme is a symmetric annual rewards and penalties scheme based on each DNO's performance against their targets for the number of customers interrupted per 100 customers (CI) and the number of customer minutes lost (CML)

K

KiloWatt hour revenue driver (kWh)

A revenue allowance based on units distributed (kWh)

L

Load index (LI)

Framework for collating information on the utilisation of individual substations or groups of interconnected substations and for tracking changes in their utilisation over time. The LI will be used by Ofgem to inform an assessment of the efficacy of the DNOs' general reinforcement decisions over the price control period. The Load Index was introduced as a part of DPCR5

Load related expenditure (LRE)

The installation of new assets to accommodate changes in the level or pattern of electricity or gas supply and demand

London Power Networks (LPN)

One of the three distribution network licence areas owned and operated by UK Power Networks. The LPN network covers Greater London

Low Carbon Networks Fund (LCNF)

A mechanism introduced under the fifth distribution price control review to encourage the DNOs to use the forthcoming price control period to prepare for the role they will have to play as GB moves to a low carbon economy. The fund will see up to £500million made available for DNOs and partners to innovate and trial new technologies, commercial arrangements and ways of operating their networks

Low voltage (LV)

This refers to voltages up to, but not including, 1kV

M

Megawatt (MW)

Measure of power equal to one million watts

Megawatt-hour (MWh)

A measure of energy production or consumption equal to one million watts produced or consumed for one hour

N

Non-load related expenditure (NLRE)

The replacement or refurbishment of assets which are either at the end of their useful life due to their age or condition, or need to be replaced on safety or environmental grounds

O

Office of gas and electricity markets (Ofgem)

Responsible for regulating the gas and electricity markets in the UK to ensure consumers' needs are protected, including their interests in the reduction of greenhouse gases and in the security of the supply of gas and electricity. This involves promoting competition, wherever appropriate, and regulating the monopoly companies which run the gas and electricity networks

P

Photovoltaic (PV) connection assessment tool

Planning tool which assesses the impact of concentrations of small scale generation on our networks e.g. solar panels, enabling us to provide a better and faster service to our customers

R

Real price effects (RPE)

Increase in prices over and above increases in the Retail Price Index (RPI). For example, increases in the cost of copper, steel, direct or contract labour over and above increases in RPI.

Regulatory asset value (RAV)

The value ascribed by Ofgem to the capital employed in the licensee's regulated distribution or (as the case may be) transmission business (the 'regulated asset base'). The RAV is calculated by summing an estimate of the initial market value of each licensee's regulated asset base at privatisation and all subsequent allowed additions to it at historical cost, and deducting annual depreciation amounts calculated in accordance with established regulatory methods. These vary between classes of licensee. A deduction is also made in certain cases to reflect the value realised from the disposal of assets comprised in the regulatory asset base. The RAV is indexed to RPI in order to allow for the effects of inflation on the licensee's capital stock. The revenues licensees are allowed to earn under their price controls include allowances for the regulatory depreciation and also for the return investors are estimated to require to provide the capital

RPI-X

The form of price control currently applied to network monopolies. Each company is given a revenue allowance in the first year of each control period. The price control then specifies that in each subsequent year the allowance will move by 'X'% in real terms

Revenue = incentives + innovation + outputs (RIIO)

Ofgem's new regulatory framework, stemming from the conclusions of the RPI-X@20 project, to be implemented in forthcoming price controls. It builds on the success of the previous RPI-X regime, but better meets the investment and innovation challenge by placing much more emphasis on incentives to drive the innovation needed to deliver a sustainable energy network at value for money to existing and future consumers

RIIO electricity distribution 1 (RIIO-ED1)

The first RIIO price control review to be applied to the electricity distribution network operators, following DPCR5. This price control will run from 1 April 2015 to 31 March 2023.

Remote terminal unit (RTU)

Communications device that transmits readings and information about the status of the network back to the control centre.

Renewable heat incentives (RHI)

Financial incentive scheme for renewable heat generation that will help the UK reduce carbon emissions and hit its European Union renewable energy targets

Ring main unit (RMU)

A HV switchgear arrangement for the connection and protection of distribution transformers

S

Slow money

Slow money is where costs are added to the RAV and revenues allow recovery of the costs over time together with the cost of financing this expenditure in the interim

South Eastern Power Networks (SPN)

One of the three distribution network licence areas owned and operated by UK Power Networks. The SPN network covers the South East of England

Site of Special Scientific Interest (SSSI)

Sites of Special Scientific Interest give legal protection to wildlife, geological and physiographical heritage under the Wildlife and Countryside Act 1981. There are over 4000 SSSIs in England, covering around 8% of the country

Sulphur Hexafluoride (SF₆)

One of the most potent greenhouse gases and is widely used in transmission and distribution equipment

System operator (SO)

National Grid Electricity Transmission is the electricity system operator, responsible for managing the operation of the electricity transmission system. They balance supply and demand ensuring the stability and security of the power system and the maintenance of satisfactory voltage and frequency

T

Tonnes of carbon dioxide equivalent (tCO₂e)

Unit of measurement that allows global warming potential of different greenhouse gases to be compared

Total operating and capital expenditure (totex)

Total of capital expenditure (capex) plus operational expenditure (opex)

W

Weighted average cost of capital (WACC)

This is the weighted average of the expected cost of equity and the expected cost of debt

