

Summary

Electricity distribution networks provide the electricity to homes and businesses, enabling individuals and businesses to carry out everyday tasks without having to give much thought to what happens when you flick a switch. For Scottish and Southern Energy Power Distribution (SSEPD), ensuring this happens is the cornerstone of everything we do.

Distribution networks have historically been designed and developed for the long term, using assets with a long-term life expectancy and experience developed over decades of operation to carefully balance investment to meet customers' requirements, today and tomorrow.

This paper is intended to provide the reader with background information on SSEPD and what we do, within the context of the electricity industry in Great Britain. It also sets out the external factors that impact on the plans and decisions we make as we develop, operate and maintain the networks that we own.

Regulatory policy

In March 2013, Ofgem published its strategy decision¹ for the RIIO-ED1 period.

In its decision Ofgem recognised the key challenges and uncertainties faced by electricity distribution network operators (DNOs). In particular Ofgem highlighted the impact of the transition to a low carbon economy, pressures from the wider economy (not least on customers' ability to pay their energy bills), tightening of the planning and environmental framework and changing customer behaviour and expectations. All of these, and many others, are factors that must be taken into account by DNOs when preparing their Business Plans for the RIIO-ED1 period.

Our best view of the uncertainties we face over the next decade (and beyond) underpins our Business Plan. Most parts of our Business Plan include a consideration of the main risks and uncertainties, and specific views are set out in, for example:

- [Efficiently managing risk](#), where our approach to risk management is described.
- [Our Innovation Strategy](#) which explains how we intend to use new technologies and new ways of working to meet our customers' expectations.
- [Be efficient](#), where we explain our long-standing view that responding to change can save time and money.

In this paper we consider the 'big picture'; that is the national scale, structural changes to the legislative framework within which we operate and the population scale changes to the way people and businesses use electricity.

Where defined, the proposals described in this paper are aligned with the regulatory policy.

An explanation of how our proposals meet regulatory policy requirements is provided in the Appendix - Regulatory policy.

¹ Ofgem, 'Strategy decision for the RIIO-ED1 electricity distribution price control', March 2013, available at www.ofgem.gov.uk/NETWORKS/ELECDIST/PRICECENTRLS/RIIO-ED1/Pages/index.aspx

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Introduction

The electricity distribution networks are part of this country's critical infrastructure, enabling electricity to be distributed to homes and customers. Providing a stable, continuous service is an essential function of Distribution Network Operators (DNOs) to ensure lights stay on and homes and businesses are able to function without needing to think about what happens when you press the switch.

As with other critical infrastructure sectors, DNOs invest in assets that have a long life-expectancy, ensuring continuous supply of electricity with minimal disruption to replace old equipment. As such, many distribution assets are manufactured to last in excess of twenty-five years.

This approach has served GB well as we have seen many years where our approach to generating electricity and the demands we make on it have remained relatively stable. However, we are now starting to see major changes to these patterns as individuals and businesses start to generate their own electricity, at the same time as new patterns for using electricity start to emerge. These changes, combined with other developments in Government policy and the economy, mean we need to be more flexible in how we operate, maintain and invest in our networks to ensure that they continue to allow us to meet customers' expectations.

As we develop our plans for the next ten years and beyond, we have assessed these factors and what they might mean for our networks. This document puts our plans for the period 1 April 2015 to 31 March 2023 (the RIIO-ED1 period) into context; in particular looks at the large scale factors we have taken into account when establishing our plans for the ongoing safe and efficient operation of our electricity distribution networks.

This document sets out our views on the large scale exogenous factors that will influence the efficient development of our networks over the RIIO-ED1 period and beyond, and hence how we will deliver value for money while providing a consistently high service.

- The first part of the document describes who SSEPD is, our owners and our values.
- The second part of the document explains the structure and workings of the GB electricity industry. It also explains what electricity distribution networks do, the role of economic regulation and what a price control is.
- The third part of the document is concerned with how things might change in the future. We start by considering the main factors that influence our activities, and then explore how these factors might change during the RIIO-ED1 period.

Part 1

About us

Who we are and our owners

Southern Electric Power Distribution plc (SEPD) and Scottish Hydro Electric Power Distribution plc (SHEPD) are distribution network operators (DNOs) which mean they each have a licence to own and operate electricity distribution networks. Electricity distribution networks are the system of overhead lines and underground cables that distribute electricity to homes and businesses.

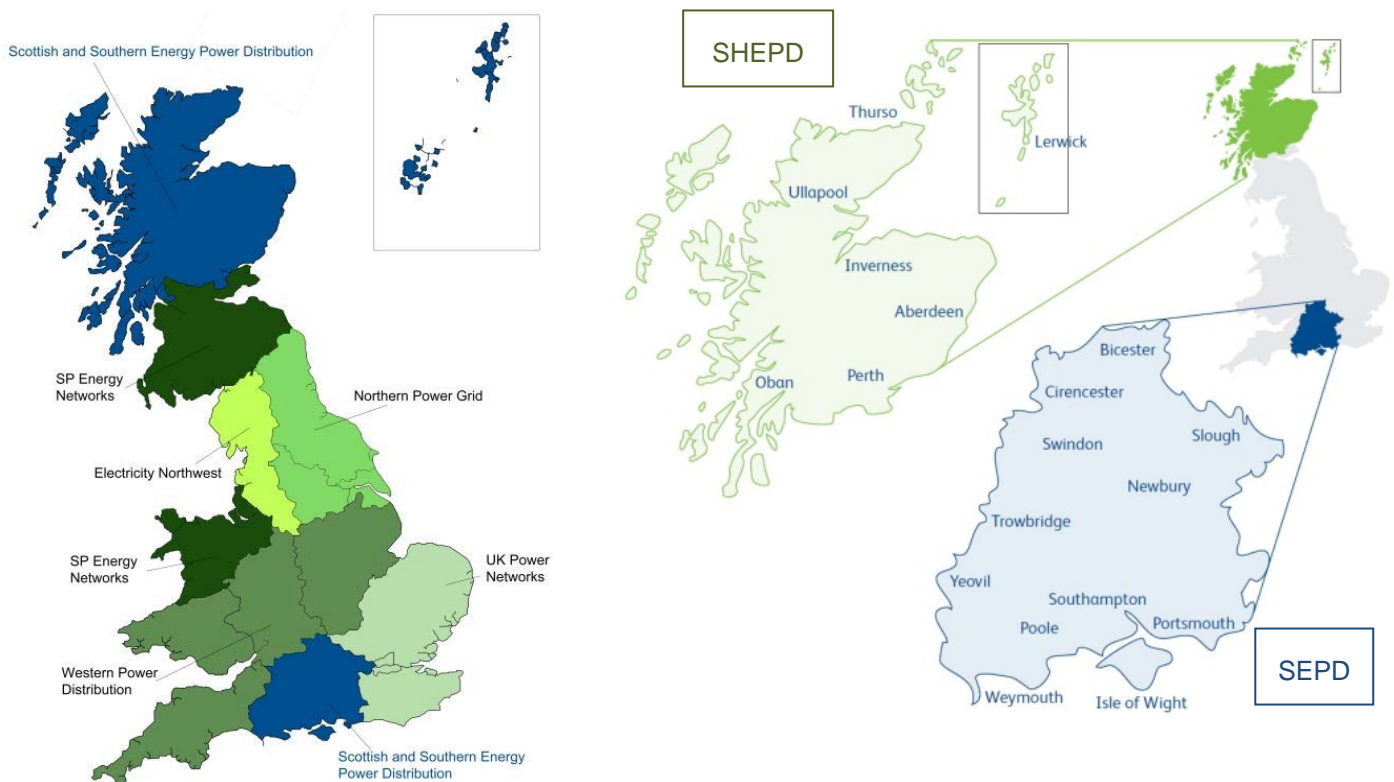
There are 14 main electricity distribution network areas in Great Britain corresponding with the areas of the former Public Electricity Supply (PES) companies that existed prior to industry privatisation. These areas, shown in **Figure 1** below, are regions of Great Britain where one licensed DNO is primarily responsible for the distribution network in that area. Other licensed DNOs can own networks and operate within these areas, but over 99% of the distribution network is owned by the 14 main DNOs.

Southern Electric Power Distribution (SEPD) is the largest of our two distribution networks and safely delivers electricity supplies to over 2.8 million customers across central southern England. Our operational region ranges from rural communities in Dorset, Wiltshire, Gloucestershire and Oxfordshire to towns and cities including Bournemouth, Oxford, Portsmouth, Reading, Southampton, Slough, Swindon and in parts of west London. We also distribute electricity to and across the Isle of Wight.

Scottish Hydro Electric Power Distribution (SHEPD) safely delivers electricity to some 740,000 customers in the north of Scotland. Our SHEPD operating region covers a quarter of the UK landmass which attracts unique challenges both in terms of distance and location. As well as the major towns and cities of Aberdeen, Dundee, Inverness and Perth, we connect to most Scottish islands with over 100 subsea cable links, including the Inner and Outer Hebrides, Arran and the

Orkney Islands. We also serve the Shetland Islands, where we presently run a separate electrical system without a connection to the mainland.

Figure 1 GB electricity distribution networks

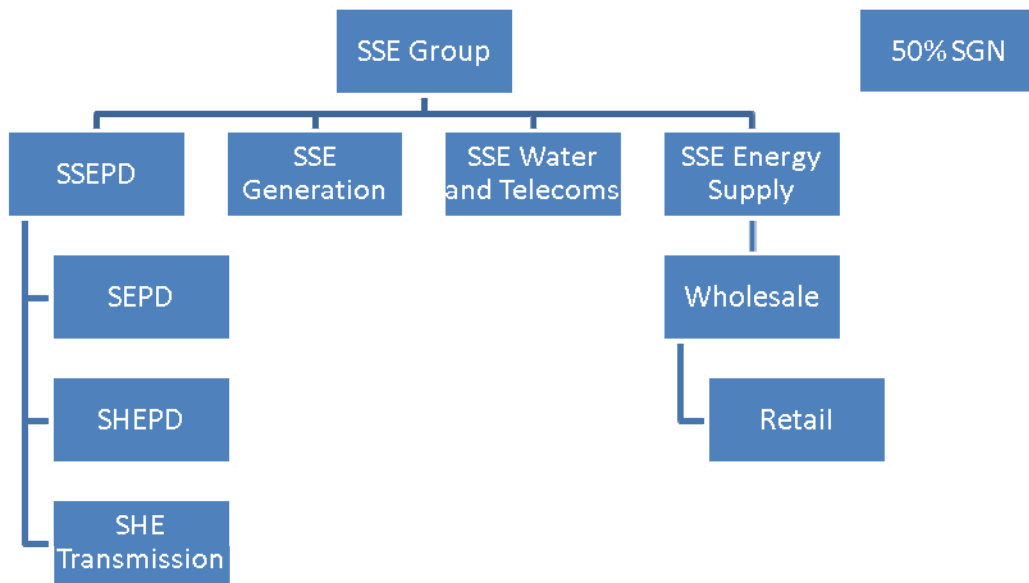


We operate SEPD and SHEPD jointly under the banner of **Scottish and Southern Energy Power Distribution (SSEPD)** (Figure 2). SSEPD is an electricity networks business with three wholly-owned subsidiaries; SEPD, SHEPD and Scottish Hydro Electric Transmission plc (SHE Transmission).

SHE Transmission is a licensed electricity transmission system owner. Electricity transmission systems are the “motorways” of the GB network that transmit power at high voltages from generating stations to the local distribution networks. SHE Transmission is one of three onshore transmission companies across Great Britain who own the transmission system. SHE Transmission plc is responsible for the North of Scotland and comprises of 5,000km of high voltage underground cables and overhead lines.

The purpose of SSEPD is to provide a safe and reliable supply of electricity to the communities we serve in Scotland and England.

Figure 2 Overview of main components of SSE Group



The owner of SSEPD, and hence SEPD and SHEPD, is SSE plc.

SSE is a FTSE 100 company and one of the largest energy companies in Great Britain. As well as being involved in electricity networks, SSE has interests in generation, supply, energy trading, energy services, gas storage, the distribution and supply of gas, electrical and utility contracting, and telecoms. The management and operation of SSEPD is ‘ring fenced’ from SSE’s energy market businesses through a robust set of business separation arrangements overseen by the energy industry regulator, Ofgem.

These business separation arrangements ensure that all parties in the electricity industry that wish to use our networks are able to do so on an equal basis, and contribute to facilitating competition in the supply and generation of electricity in GB.

SSE has a 50% share in Scotia Gas Networks (SGN) which operates two of Great Britain's largest gas networks through 74,000 km of gas mains and services. Scotland is served by Scotland Gas Networks and Southern Gas Networks encompasses the south and south-east of England. SGN provides a safe supply of natural gas to 5.8 million customers and are the second largest gas distribution company in Great Britain.

Our values

SSE, its businesses and all the people employed in them, are guided by the SSE SET of core values.

Safety	We believe all accidents are preventable, so we do everything safely and responsibly or not at all.
Service	We give our customers service we are proud of and make commitments that we deliver.
Efficiency	We keep things simple, do the work that adds value and avoid wasting money, materials, energy or time.
Sustainability	Our decision and actions are ethical, responsible and balanced, helping to achieve environmental, social and economic wellbeing for current and future generations.
Excellence	We strive to get better, smarter and more innovative and be the best in everything we do.
Teamwork	We support and value our colleagues and enjoy working together as a team in an open and honest way.

The SSE core values are important to us as they underpin everything we do. Regardless of changes in industry, our values will remain the same, although we expect the things we do may evolve over time.

Throughout the day to day operations of SSEPD, we always bear in mind four key behaviours that complement the key values – this is the way we do things. They are safety, service, efficiency and innovation.

Safety is our number one value in that the safety of our customers, the public, our contractors and

staff is our number one priority.

We strive to have zero accidents.

We believe good safety is good business and companies that are good at safety will also be good at business. Leading world companies have proved this for many years and we aspire to develop and deliver world class safety performance for our wide family of stakeholders. This is seen in everything we do, so is a vital part of our overall strategy.

Service is also important to us, as we strive to deliver a consistently high level of customer service.

This covers every aspect of SSEPD from our contact centres and local operatives to our environment policies. No matter what aspect of business is considered, a high level of customer service will always be delivered.

Efficiency is something which is implicit in our decision making.

Every time we make any decision, whether big or small, we always consider how efficient it is, in order to avoid wasted time and resources. We strive to be as efficient as possible while delivering outputs and increasing performance.

Innovation has become increasingly important to us in that, in order to increase efficiency, service and remain safe, it is vital to use modern, innovative solutions.

This behaviour moves away from conventional decisions and towards creating a network of the future. Without innovation, we will not be able to achieve our goals.

Part 2

About the electricity industry

Who's who in the electricity industry

Figure 3 illustrates the components of the GB electricity industry. Together these parts work together safely and efficiently to produce and supply electricity to meet the demand of commercial and domestic customers.

Generators are responsible for producing electricity from various fuel sources, be it renewable or fossil fuels. Historically, electricity has tended to be generated by large power stations. Drax Power Station in Yorkshire, for example, started generating electricity in 1974 and these days can generate almost 4,000MW which is enough to power over 1.3 million kettles. By contrast, homes and businesses are increasingly looking to generate some of their own electricity using technology like solar panels.

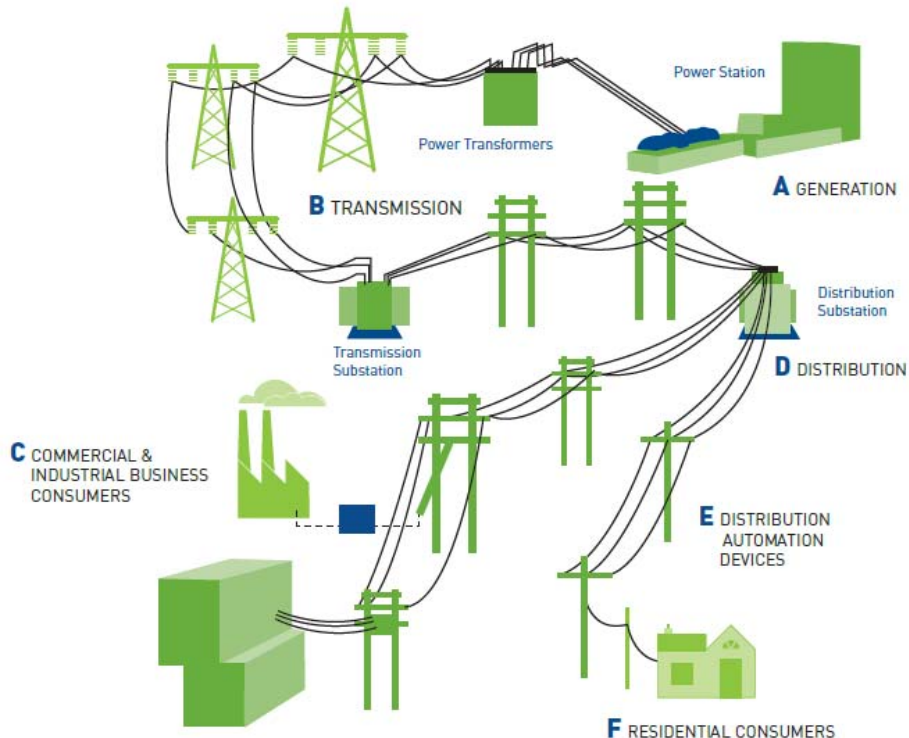
Once generated, the electricity travels along the networks to the point of use by customers. The largest generators are connected to the **transmission system** which is, in effect, the “motorway” of the GB electricity network. Large overhead pylons and cables transmit electricity at very high voltage over long distances to the low voltage distribution systems and directly serve large commercial and industrial customers. The transmission network is owned by a number of licensees, including SHE Transmission, and operated as a single system by National Grid.

After transformation to lower voltages, the **distribution systems** deliver electricity to the majority of customers across the country. Smaller generation, often renewable generation, can be connected directly to the distribution network. If the transmission system is the motorway, then the distribution system is the “A-class” and “B-class” road network that takes electricity to homes and businesses. There are 14 main licensed electricity distribution network operators in GB (**Figure 1**). SEPD and SHEPD are DNOs.

All electricity entering or leaving the network system must pass through a **meter**. The metering business is a competitive market which involves the supply, installation, maintenance and meter readings in the household, commercial, industrial and generation sectors.

Although the networks deliver electricity to the meter, and hence the customer, it is the **energy supplier** that has the commercial relationship with the customer. The supply market is competitive meaning customers can choose who they buy this electricity from. It is the responsibility of the supply companies to ensure they secure enough energy to meet their customers' needs, provide customers with energy and arrange customer billing. There are many companies that supply electricity including EdF, E.ON, NPower, Scottish Power and SSE (sometimes referred to as 'the Big Six'), as well as smaller or more specialist providers. A full list of those companies licensed to supply electricity can be found on Ofgem's website².

Figure 3 Components of GB electricity industry



² www.ofgem.gov.uk/Licensing/Work/Documents1/external_electricity_list.pdf

How our industry is regulated

When the electricity industry was privatised, a regulatory framework was established to protect the interests of customers. The economic regulator of the electricity and gas sector is the Gas and Electricity Markets Authority (GEMA), which is supported by the Office of Gas and Electricity Markets (Ofgem).

Statutory provisions

The primary rules about who can generate, transmit, distribute and supply electricity are governed by law and set out, primarily, in the Electricity Act 1989. This Act sets out the statutory duties on parties active in the electricity sector to ensure that electricity is generated, transmitted, distributed and supplied safely and provides the framework for the privatised sector. Not all of the rules that govern the industry sit in the Act and it makes provision for licences and industry codes to govern more specific aspects of what parties may and may not do. These all combine to form a hierarchy of rules, from Act to licence to industry codes, that must be complied with.

Most of components which make up the industry, excluding metering, require a licence which is granted by Ofgem. A licence is a document detailing conditions which the holder must follow; the consequences of non-compliance are set out in the Electricity Act 1989.

Licences will typically include duties to not discriminate; provisions governing service quality; customer protection; and reporting obligations to allow Ofgem to monitor that licence holders are acting in accordance with their licence.

Licences can be modified if required, following consultation. Network licences such as distribution and transmission are significantly modified after the price control review where the new settlement requires a change to the licence in order to allow the licensee to operate in the way prescribed by the price control.

The licences require signing-up to and complying with industry codes. These codes detail the rules for the day-to-day operation of the industry. The main electricity codes are:

- Grid Code and Connection and Use of System Agreement which cover the technical and commercial arrangements for using the transmission system.
- Balancing and Settlement Code which covers how National Grid ensures generation and demand stays balanced and the commercial arrangements between different parties.

- Distribution Code which covers the technical aspects of the connection and use of the distribution licensee's distribution network.
- Distribution and Connection Use of System Agreement (DCUSA) which covers commercial arrangements between DNOs and those who use the distribution networks.

Codes can be modified after consultation, where some codes need a party to the code to request the modification.

These instruments allow the operation of networks. How different customers are charged is a key element of this. There are specific processes in place for electricity distribution charging that are set out in the DCUSA. Collectively as DNOs, we have implemented a common charging approach. This sets out the costs in a standardised way, so customers can more easily see what we are charging and how much, so as to provide a better service to customers.

Ofgem's role

The Electricity Act 1989 describes Ofgem's principal objective to "*promote the interests of existing and future consumers of electricity..., wherever appropriate by promoting effective competition*". In addition, Ofgem must have regard to "*the need to secure that all reasonable demands for electricity are met, the need to secure that licence holders are able to finance their operations which are subject to obligations under [the Act and other legislation], and the need to contribute to the achievement of sustainable development.*" Ofgem is independent of the government, although works closely with government, the energy industry and other stakeholders.

Amongst other things, Ofgem sets service standards and monitors companies' performance. Ofgem regulates networks because there is no natural competition, that is, regulation is a proxy for competition. In particular, Ofgem restricts the amount of revenue the energy network companies can recover from generators and suppliers through the price control process (see [About price control reviews](#)). At price control, the levels of investment and income are reviewed and agreed for the forthcoming period. As part of this, network distribution companies, such as SSEPD, must submit a business plan which is what this suite of documents constitutes.

Ofgem also monitors the competitive elements of the industry, such as generation and supply, to ensure new entrants are able to participate in the market and to promote the interests of

consumers. More information about these other aspects of Ofgem's activity can be found on its [website](#).

About price control reviews

Since 1990, Ofgem has administered a price control on network licensees around every five years. The aim of the price control is to protect the interests of consumers, including future consumers, while encouraging DNOs to be efficient and deliver outputs through various ways such as innovation. Price controls are a method of setting the amount of money that can be earned by the network company over the length of the price control period, and specifying the outputs that are required for an agreed expenditure.

In November 2008, Ofgem launched a major review of its approach to price controls that lasted for almost two years. In one of Ofgem's initial papers, it was acknowledged that operating efficiency has increased, quality of service has improved, and companies continue to have incentives to reduce costs³. In 2010, the review concluded, acknowledging that the general framework has *“served consumers well, delivering lower prices, better quality of service and more than £35bn in network investment since privatisation.”*⁴ However, it also identified that some changes to the framework were required to meet the future challenges of network regulation and introduced a revised framework, called RIIO.

The next electricity distribution price control for the period 1 April 2015 to 31 March 2023, called RIIO-ED1, is slightly different from previous price controls. It is an eight year period instead of five, and the approach and style is different.

This price control will be conducted under the RIIO framework, whereby the Revenue that network companies can earn is strongly linked to Incentives, Innovation and Outputs. In other words, Ofgem will seek to reward behaviours that customers want, will support the use of innovation to consider how networks meet the challenges of tomorrow, and will require the companies to commit to the outputs that they will deliver and ensure that these are achieved.

A core element of this framework is the increased opportunity for stakeholders to contribute, both to Ofgem's thinking and to the plans developed by the DNOs. As such, we have developed a

³ Ofgem, 'Regulating energy networks for the future: RPI-X@20 Principles, Process and Issues', February 2009, available at: www.ofgem.gov.uk/Networks/rpix20/ConsultDocs/Documents1/Principles%20Processes%20and%20Issues%20con%20doc_final%20-%20270209.pdf

⁴ Ofgem, 'RIIO: A new way to regulate energy networks, Final Decision', October 2010, available at: www.ofgem.gov.uk/Networks/rpix20/ConsultDocs/Documents1/Decision%20doc.pdf

detailed business plan, based on feedback to date from those interested in and affected by our activities, and welcome further dialogue with our customers and wider stakeholders to ensure we are reflecting your concerns and priorities in our thinking.

The process is also slightly different in that all parties must submit a business plan, and there is the option of being 'fast tracked' through the process. Companies which submit a well justified business plan of sufficient quality for Ofgem to be able to conclude their price control early, have the potential to be fast tracked. The benefits of being fast tracked include having the price control finalised around nine months early where the DNO will be no worse off if they are not fast-tracked. Therefore, there's a strong incentive to provide quality data and strive to be a frontier performer.

More information about the RIIO-ED1 price control, including Ofgem's consultations on its strategy, can be found on its [website](#).

Part 3

The changing environment in which we operate

Our statutory duties and our core purpose

In thinking about the future of our networks, and the things we need to be planning for, it is important to have a clear understanding of the requirements on our business.

Our duties

As a licensed electricity distribution operator, we have statutory duties which are set out in the Electricity Act 1989. Our general duties are:

- to develop and maintain an efficient, co-ordinated and economical system of electricity distribution; and,
- to facilitate competition in the supply and generation of electricity.

These duties – supported by the further obligations we have under the Act, including the duty to connect, and under our licence and the industry codes – are fundamental how we operate our business and are fundamental to what we plan to deliver during the RII0-ED1 period.

Our purpose

As well as being bound by statutory duties,

Our values relate to a core purpose which describes what we do every day. This core purpose is to deliver a safe, reliable supply of electricity to our customers.

In order to fulfil our purpose, we need to consider what is required to deliver a safe, reliable supply of electricity to our customers. This means that we need to ensure that our network is built and operated in a way that meets the needs of our customers.

Our customers' needs

Our network is built based on what our customers' needs have been in the past and what we expect those needs to be in the future. To ensure that we continue to deliver a safe, reliable supply of electricity to our customers, we need to consider how our customers' needs may change in the future and how we might adapt to those changing needs.

There are two key areas where we expect to see a change to our customers' needs in the future:

- How and when our customers are using electricity; and,
- How much electricity our customers use.

In turn, there are a number of large scale factors which influence those two areas, including:

- The economy;
- Government policy;
- Environment and climate change; and
- Technology.

Some of these factors directly influence how we operate our business, but don't directly influence our customers' needs. For example, the possible implementation of new legislation restricting the use of creosote as a wood preservative would require us to find new ways of protecting our wood poles, or to find an alternative to wood poles. This does not affect our customers' needs but does affect the way we meet those needs.

This section sets out our thinking on how our customers' needs will change in the future and how we have captured those changing needs in our Business Plan for the RIIO-ED1 period.

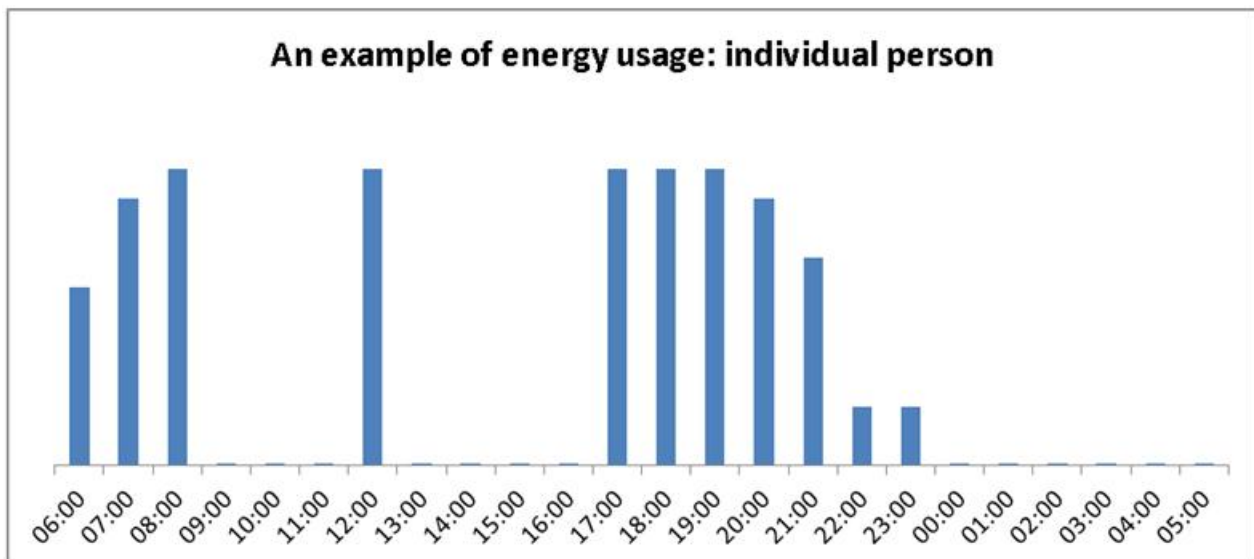
Patterns of electricity consumption

The way our customers use electricity is a key factor which influences how we build and operate our network.

There are overall patterns in our customers' electricity usage over a range of timescales. On a longer timescale, usage is affected by the time of year. For example, average usage is normally higher in winter than in summer. On a shorter timescale, electricity usage is affected by the weather and temperature, the time of day, and even what's on television.

Electricity consumption can vary by household to household. For example, **Figure 4** demonstrates how electricity usage can change in a domestic property over the course of a day⁵. The peaks between 06:00 and 08:00, at 12:00, and between 17:00 and 20:00, typically correspond to the electricity requirements for heating, lighting, washing, cooking or watching television. Outside of these periods, less electricity is needed to be delivered to the property, with electrical appliances in standby mode for example. The timing of these peaks will vary between days, or between households.

Figure 4 Individual consumption of electricity

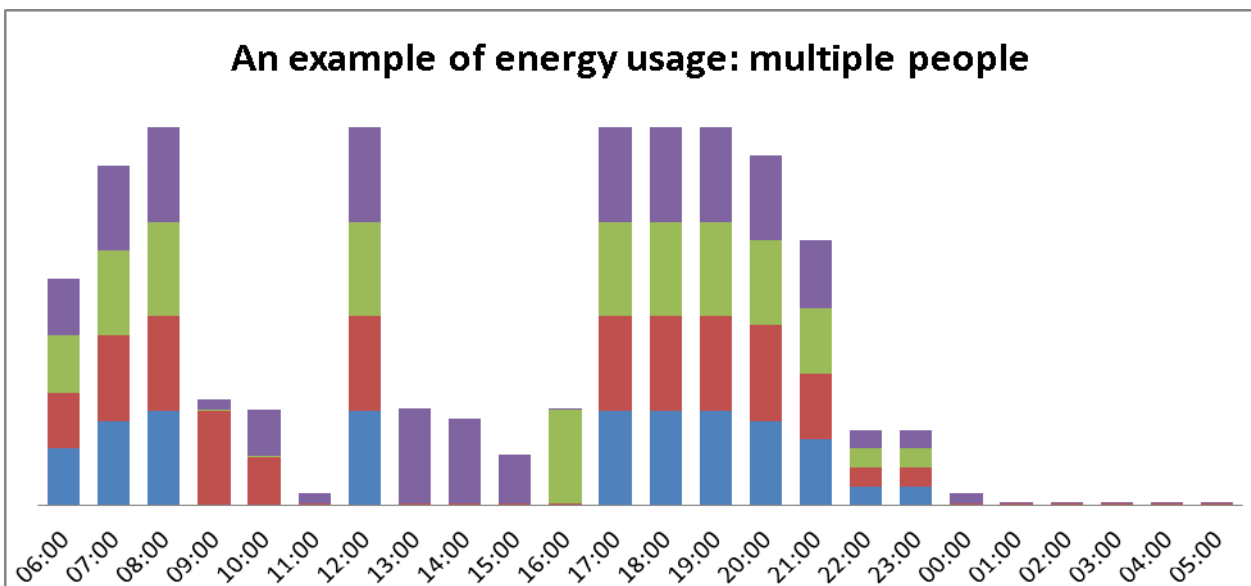


⁵ This graph is indicative and intended to provide an illustration of how one customer's demand may look. It is based on our experience of different profiles and does not reflect a single customer.

Our network must be able to deliver the electricity which people want when they want it, whichever pattern of usage is prevailing on our network. In particular, the network must be able to cope at times when our customers are using the most electricity, i.e. it must be able to meet the ‘peak demand’. This requirement is a particularly important consideration in how we build and operate our network.

When there are lots of customers and households with similar usage patterns, the electricity requirements stack up (Figure 5)⁶. This means our network must be able to cope with not only one customer’s usage, but lots of different customers’ usage, many of whom might have different lifestyles and different electricity requirements. We must be able to provide the peak quantity of electricity, even though the actual peak might only occur once a day, or even once a year.

Figure 5 Cumulative consumption of electricity



In addition to our domestic customers, we also have a significant number of industrial and commercial customers whose usage must also be met. These customers typically require a more

⁶ This graph is also indicative only.

stable and less fluctuating electricity supply as the demand is likely to be required for machines and lighting which tend to be required to run all day.

We currently forecast what the requirements of our customers will be based on historic patterns, and adjust them to reflect how we think customers' requirements might change in the near future. In order to predict customers' requirements during the RII0-ED1 period, we need to consider broader factors than in our shorter-term forecasts.

If customers' requirements grow but we do not match that growth with a strengthening of our network where necessary, we will not be able to deliver a safe, reliable supply of electricity. Similarly, if we work only from a historic pattern which tells us that domestic customers use most electricity at breakfast time and again at teatime, and then that pattern changes in the future, we may not be able to deliver the electricity that our customers need at the right time.

Our predominate concern in network planning, however, is the forecasting the peak demand. It is the size of the peak demand that determines the size of the network. So long as the network is of sufficient size to accommodate the peak then changes in electricity consumption at other times can be accommodated.

The following sections explain the large scale factors we have taken into account in forecasting our customers' future peak use of electricity.

Peak use of electricity

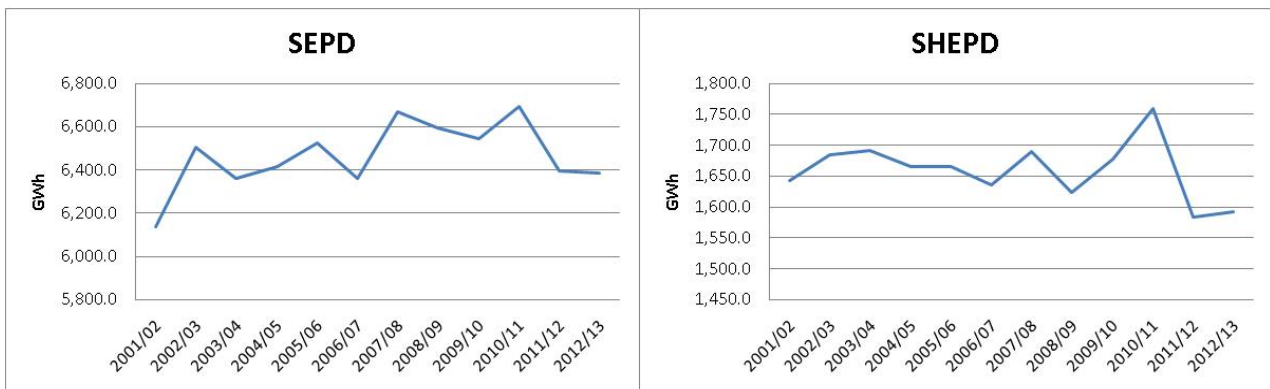
In the section above, we discussed the patterns in how and when our customers use electricity. When planning the network, one of the most important considerations is how much electricity our customers use overall and, in particular, where, when and what the highest demand is. We currently have around 3.7 million customers connected to our networks in the north of Scotland and the south of England.

Peak demand is the term we use to describe the highest demand seen on one of our networks in any given year and is shown in **Figure 6**. Typically, peak demand occurs in the winter when there is a greater requirement for electricity for lighting, cooking, and heating, as well as other uses such as domestic appliances, computers, office equipment and industrial processes.

Different factors affect the peak demand we observe on our networks, reflecting the differences in the communities we serve. In many areas of Scotland, for example, electricity is the primary fuel for heating but the widespread uptake of storage heating means that this demand for electricity often falls at times when other demands are lower, effectively smoothing the profile.

Figure 6 shows how this peak demand varies from one year to the next. Some of this variation can be accounted for with regard to the weather but other factors, like the economic challenges seen in recent years, can also influence the demand we record.

Figure 6: Electricity consumption: (a) SEPD, and (b) SHEPD



There are other factors which influence this overall requirement for electricity, such as the impact of energy efficiency measures and how customers' choose to manage their own overall requirements. Our record of peak demand also excludes the effect of small-scale distributed generation, like solar panels and small wind turbines. The electricity generated by these installations is meets demand in its immediate vicinity and, as such, 'disguises' this demand. At present, this effect is negligible but we anticipate this will increase further over coming years and are continue to monitor to ensure we understand the effect that this distributed generation is having on our recorded peak demand.

Forecasting future peak demand

As set out above, there are four main external factors which are likely to influence our customers' electricity usage and, hence, impact on our network. Namely:

- The economy
- Government policy
- Consumer behaviour
- Technology

All four factors influence, at a national scale, how much electricity our customers will use and when they expect to use it. This section will consider why this is, what we have seen so far and what we think we'll see in the future, as well as considering how we have accounted for these factors in our plans.

The economy

Economic conditions in the UK can have important indirect impacts on our network. In particular, there is a recognised link between overall energy consumption and economic growth, resulting in increased or decreased demand on our network. For example, stakeholders such as industrial electricity customers or property developers may expand or reduce their activity in response to the prevailing economic conditions. If a property developer chooses not to proceed with a new development, for example, this would reduce the number of new connections which we are required to provide and, subsequently, the volume of energy supplied.

The state of the UK economy and wider global economic factors can also directly impact on our business and network since we are a major employer and purchaser of goods and service. For example, the level of global demand for raw materials such as copper and iron ore affects the prices of those materials. This feeds through into the price of carrying out different tasks that we do, whether it is a single new connection or more substantial network expenditure. As a further example, we are affected by trends in the UK workforce such as the availability of skilled employees, e.g. engineers.

Where are we now?

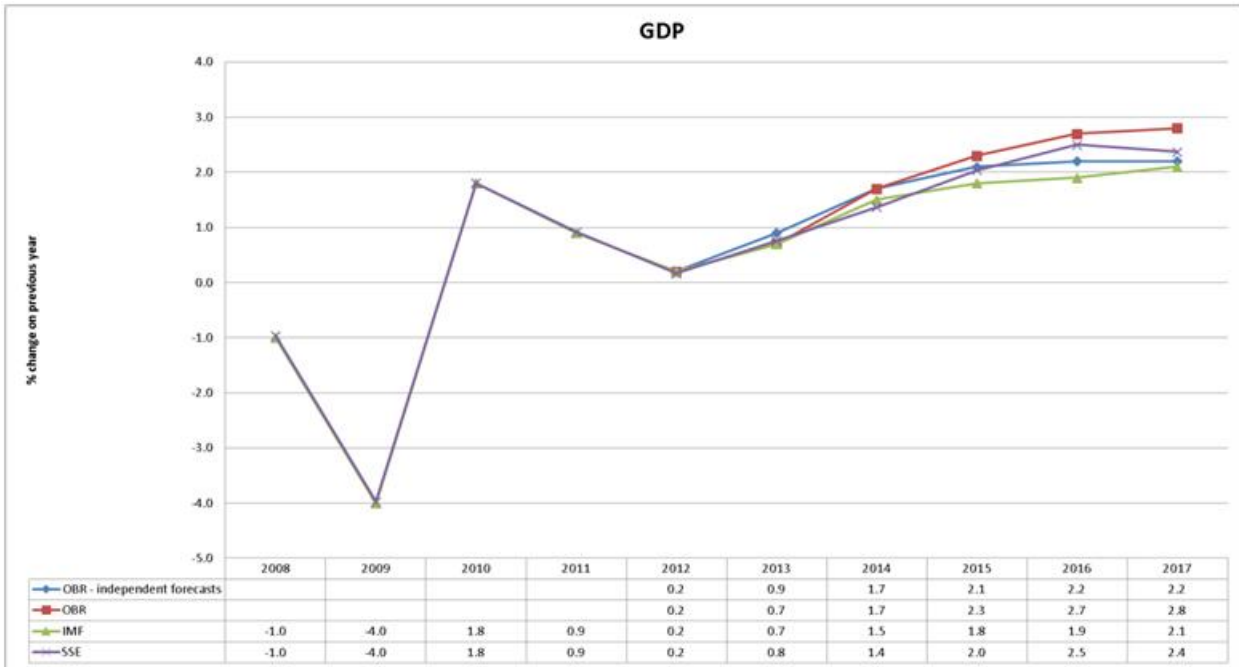
The UK economy has demonstrated weakness since the financial crisis of 2008, characterised by shrinking gross domestic product (GDP)⁷. Looking forward, the Office for Budget Responsibility's (OBR) most recent forecasts are positive, but the pace of recovery is constrained by factors including slow growth in productivity and real incomes, and external developments relating to the outlook for the global economy.

Our view of the future

Figure 7 illustrates the year-on-year % changes in UK GDP which have been measured up to 2012 and forecasted for the period from 2013 to 2023. The chart shows the Government's view as provided by the Office of Budget Responsibility (OBR), as well as projections from the International Monetary Fund (IMF). It also shows our view, of growth in the UK economy from 2012 up to 2016.

Figure 7 UK Gross Domestic Product

⁷ Gross domestic product is a widely used measure of overall economic output. It corresponds to the monetary value of all the finished goods and services produced within a country, usually on an annual basis.



The forecasted economic growth will lead to:

- Increased consumer spending and, hence, consumption.
- Increase in new connections.
- Impact on inflation and raw materials cost as greater demand and competition for resources drives prices up. You can read more about this in our paper entitled, [Be efficient](#).

Government policy

Government policy includes policies and legislation enacted by the European Union as well as the UK and Scottish Governments. The respective influences of these bodies on how and when our customers use electricity are interlinked; for example, the impact of EU legislation can be direct or indirect via ‘trickle-down’ in UK and Scottish government legislation.

Government policy has a wide range of impacts on our network, which can include:

- Affecting how we can design and build our network. For example, EU legislation could restrict the use of certain types of gas as an insulator in our network. We have considered this further in [Managing our environmental impact](#). A further example is the mandated roll-out of smart meters across GB by the end of 2020. The changes brought about by the smart metering programme and the related policy objectives will require significant changes to be made to our business processes and practices, as well as the allocation of significant additional resources. You can read more about this in our paper, [Smart meters](#).
- Affecting customer energy usage patterns by stimulating the uptake of certain technologies, for example through the UK Government’s Carbon Plan which is discussed in the next section.
- Affecting customer energy usage patterns by incentivising certain types of behaviour, relating to energy usage or energy generation. For example, the structure of government subsidies for renewable energy generation can have a significant impact of the type, location and overall amount of this type of generation. Likewise, the Green Deal has the potential to reduce overall consumption.

Where are we now? European Union

To date, EU policy has focussed on achieving a low-consumption economy based on a more secure, competitive and sustainable energy sector. This has included ensuring the smooth functioning of the European electricity market as well as reducing in greenhouse gas emissions across a number of sectors including electricity.

Within the sphere of the EU we have seen a number of pieces of influential energy legislation over the past few years. The 2009 Electricity Directive brought about unbundling of transmission companies and three week switching directions for suppliers. They have introduced the EU Emissions Trading Scheme (EUETS), which implements a cap on the level of carbon dioxide (CO₂) emitted by businesses and creates a market and price for carbon allowances which can be bought and sold.

During the current price control period, the EU has also implemented a Directive⁸ which establishes a common framework for the production and promotion of energy from renewable sources. This framework consists of a set of targets for each member state of the EU which is consistent with the share of energy from renewable sources in its final consumption for 2020. These policies feed through to the UK Government and to business within each member state, as they must comply with EU regulation.

Along with influential energy legislation, the EU is also responsible for environmental legislation which has an impact on our networks. For example, a recent piece of European legislation which comes into effect in May 2013 restricts the use of creosote as a wood preservative. On the surface, legislation like that does not suggest an immediate link with our network business. However, as our network business has traditionally used creosote to preserve wood poles, we are now required to consider what alternatives we are able to use and what the cost impact on our customers will be.

In addition, the Agency for the Cooperation of Energy Regulators (ACER)⁹ is developing a number of Network Codes to provide harmonized rules for cross-border exchanges of electricity. These rules are intended to improve the integration of the European market for electricity and will also impact on how we operate our network.

⁸ Directive of the European Parliament [Online]
http://europa.eu/legislation_summaries/energy/renewable_energy/en0009_en.htm

⁹ ACER is the European Union body created to further progress on the completion of the internal energy market and seeks to foster cooperation among European energy regulators.

Where are we now? UK Government

The Carbon Plan published by the UK Government in 2011 includes a range of policy measures designed to deliver substantial emissions reductions in the UK in the period up to 2050, including major electrification in heating, transport and industrial processes, which could lead to a rise of between 30% and 60% in average UK electricity demand.¹⁰ The Carbon Plan also states the expectation that the UK's electricity supply will be almost completely decarbonised by 2050, which will require us to use smarter ways of managing energy demand and balancing it against the electricity supply. The Carbon Plan is underpinned by a legally binding target in the Climate Change Act 2008 to reduce the UK's greenhouse gas emissions by at least 80% below base year levels by 2050.

The UK Government is also undertaking major reform of the electricity market in the UK, with the overarching objective of ensuring that the UK can meet its requirements for secure and flexible supplies of electricity at affordable prices. This reform will have direct and indirect impacts on our network and our business.

The UK Government focuses on incentive mechanisms in order to deliver the targets agreed with the EU. These incentives include the Feed-in-Tariff, Renewable Heat Incentive and Renewable Heat Premium Payment for example.

The Feed-in-Tariff is a policy mechanism designed to accelerate investment in renewable energy technologies. It achieves this by offering long-term contracts to renewable energy producers based largely on the cost of generation of each technology. It has had an effect on the amount of renewable generation such as photo voltaic cells being installed. The number of quotations provided for these types of connections which accommodate this type of generation, increased from approximately 1,000 to just over 6,000 between 2010/11 and 2011/12. The number of acceptances increased from approximately 200 to over 1,800 over the same period. This trend is expected to continue.

Where are we now? Scottish Government

¹⁰ HM Government, 2011, *The Carbon Plan: Delivering our low carbon future*
www.gov.uk/government/uploads/system/uploads/attachment_data/file/47613/3702-the-carbon-plan-delivering-our-low-carbon-future.pdf

The main policy objectives of the Scottish Government are to increase renewable generation and its impact, increase related activity so as to maximise energy exports and retention of wealth, and develop skills, intellectual property rights and manufactured products.

The Scottish Government has a 2020 Roadmap setting out future renewable energy aspirations and aims to become a “*global leader in developing solutions to the challenge of climate change*”.

The Climate Change (Scotland) Act also sets out the Scottish Government’s aims to reduce total final energy consumption in Scotland by 12% by 2020.

The Scottish Government provide support through the Carbon Trust and Energy Savings Trust. These organisations offer advice and information on specific topics. The Scottish Government also provides direct financial support through loans to certain businesses who wish to improve energy efficiency. These loans, depending on what it’s used for, can be between 0 and 5% interest rate. This encourages businesses to invest in reducing carbon emissions and become more energy efficient. This will lead to a reduction in the amount of energy a customer uses which means they will demand less quantity of energy from our network.

Where are we now? Non-energy specific legislation

In addition to carbon reduction, other pieces of legislation affect our business. As we are a business which employs staff, operates equipment and machinery, and are part of a wider industry, we are exposed to a wide range of legislative influences. Should new legislation come into effect which changes something which we do, it will affect our business.

An example of such a change is the Road Transport (Working Time) Regulations 2005. When these were introduced they affected our business by ensuring that we operated within the regulations. The Road Transport Regulations 2005 contain a list of requirements from the times and amounts of breaks to the amount of time an employee can drive at night time. Once regulations like this are introduced they must be complied with, which has a large affect on the way we operate.

Other regulations and legislation which have affected how we operate include Working Time Regulations 1998 which detail factors like rest days and the maximum number of hours worked in one shift. As we employ staff in many different capacities, these regulations affect our whole business from the policies we put in place to processes we have such as scheduling of shift patterns.

Our view of the future

Whilst it is clear that there are overarching policy objectives to increase energy efficiency and reduction carbon production, the specifics of these objectives will be delivered by each legislative body is hard to predict in detail.

Whilst we have a high level view of what EU policy developments are in progress, it is difficult to be certain about what might be the scope and breadth of legislative developments from Europe in the future. However such legislative change tends to be lengthy in gestation and development, and implementation will typically recognise the time and cost impacts on member states.

Likewise, in Westminster and Holyrood, while the broad framework of policy that will impact our business is known the detail of implementation is not. Further it is subject to change with changing in administrations and administrative priorities. There is the additional uncertainty associated with the Scottish Independence Referendum in 2014.

Active participation in the policy development stage in Brussels and with the UK and Scottish Governments is essential to managing the risks and uncertainties associated with new EU legislation. SSE has policy teams in Brussels, London and Scotland to participate in this process; we also contribute through the Electricity Networks Association (ENA).

As a result, our plans for RIIO-ED1 are based on the high-level policy objectives that we currently see, including an expected increase in renewable generation connection to our network and increased demand for energy efficiency measures.

As for less certain policy developments, we will stay flexible and adaptable throughout the RIIO-ED1 period to ensure that we can respond to the will of government and consumers. As we explain in [Efficiently managing risk](#), through the combination of our risk management procedures, the mechanisms in the price control settlement and a pragmatic approach to implementing new legislation from governments and Ofgem, we believe that we can accommodate most legislative change within the period.

Consumer behaviour

Consumer behaviour determines how much energy a customer uses from our network over time.

Where are we now?

Consumer behaviour can be affected by many factors. At a macro level, the economy and Government policy are key drivers. The overall economic health will determine national pay inflation and the amount of money households and businesses have to spend on electricity. A family who makes use of a Government child care voucher scheme will be affected if this scheme is scrapped. It may mean the parents lifestyle change, where they then may have to stay at home. Energy usage in the family home will increase as the family is at home more often, so consumer behaviour changes.

Within homes and businesses, energy intensity will vary with the use of technologies. The rate of technological change in the recent past has been staggering. Almost all types of domestic and end-user technology have experienced expansive growth in the UK.

- The TV Licensing department recognised that the number of households with a TV has grown from 16.7 million in 1967 to 24.9 million in 2010.
- The number of households with internet access has grown by 7.1 million between 2006 and 2012, according to the Office of National Statistics¹¹.
- The telecoms regulator, Ofcom¹², note that the take up of smartphone technology has increased from 1.5 million sales per year in 2005 to around 11.4 million sales in 2010.

All of these technological advances and expansions require electricity and demand patterns and overall consumption has changed over the past 30 years.

For example, the adoption of technologies to improve the efficiency of energy consumption can reduce the overall level of demand on our network (although the net effect on overall demand can be uncertain due to the phenomenon of "energy rebound", in which greater energy efficiency through new technology or behaviour triggers additional energy use). Key examples of technologies which can improve the efficiency of energy consumption include lighting, heating, domestic white goods and industrial equipment such as electric motors.

¹¹ ONS study: www.ons.gov.uk/ons/rel/rdit2/internet-access---households-and-individuals/2012/stb-internet-access--households-and-individuals--2012.html

¹² Ofcom's report on the growth of smartphones in the UK: <http://stakeholders.ofcom.org.uk/market-data-research/market-data/communications-market-reports/cmr11/telecoms-networks/5.20>

The impacts of wider uptake of technology, alongside more efficient appliances, all feed into the variations in peak demand that can be seen in **Figure 6**. As more devices and appliances increase demand, efficiency savings, particularly in traditional domestic appliances and electric motors, counter this and reduce the overall impact.

Our view of the future

We need to establish what we expect our customers' overall requirement for electricity will be between 2015 to 2023 in order to assess how best to build and operate our network. If we don't consider these requirements we may not be able to deliver a reliable supply of electricity to our customers.

There are two large scale factors:

- The number of customers connected. We forecast that in excess of 125,000 projects will deliver new connections for customers to our networks during the next price control period, from 2015 to 2023. This view is based on the economic forecasts described above. This increase in the number of customers connected to our network has the potential to increase the overall amount of electricity we are required to deliver. We consider this further in [Get connected](#).
- Average consumption per customer. Energy use at individual properties will be the net effect of energy efficiency measures and new electricity using devices (we consider the effect of low carbon technologies below).
- The way people use energy has an effect on our network because the amount which they want to draw from our network changes. Our network must not only cope with one person's usage, but lots of different people's usage, who have different lifestyles and approaches to their energy usage. We must be able to provide the peak quantity of energy, even though it's only used at some points of the day.

Technology

The adoption of new technologies has a significant impact on how and when our customers use electricity. This impact is likely to become increasingly important during the RIIO-ED1 period, largely to the anticipated uptake of low carbon technologies (LCTs) by customers. LCTs typically include 'domestic-sized' heat pumps, electric vehicles and small-scale distributed generation,

typically photovoltaic (PV) and small-scale wind installations. Work commissioned by the Smart Grid Forum, chaired by DECC and Ofgem, considered a number of potential uptake scenarios for LCTs, reflecting the uncertainties around when and how they will be adopted¹³.

The adoption of LCTs could fundamentally change the quantity and timing of energy transfer through our network. The new sources of low carbon demand which could drive this change include electric vehicles and electric heat pumps, either in new-build domestic properties or as replacements for existing gas boilers. Historically, distribution networks have not been designed to accommodate the energy flow required to supply these new technologies at a high level of penetration on our network.

New sources of low carbon generation will also influence our network. For example, new domestic generation can cause the voltage on our network to rise beyond the maximum acceptable level, requiring us to take mitigating action. A key challenge for our business during the RIIO-ED1 period will be to enable the connection and use of these new technologies in the most cost-effective way possible. This will often involve the use of innovative or 'smart' solutions instead of installing larger cables and bigger transformers to provide the extra capacity.

Where are we now?

There has been a significant increase in the number of LCTs connected to the network since 2005/06. In our SHEPD network, there has been 593MW of low carbon connections and in our SEPD network, there has been 215MW connected.

We have seen an impressive increase in the number of microgenerators connected to our networks. In just over a single year, between April 2010 and June 2011, the UK saw the installed capacity of microgeneration increase from around 32MW to over 160MW.

To date, our networks have been able to accommodate the rate of adoption of these technologies that we have seen and we have been able to match our investment into our network by reference to predictable growth. However, we are beginning to see changing patterns in adoption, such as clusters of technologies as neighbours follow each other to install PV for example, making it more difficult to predict the location and extent of change that may be required going forward.

¹³ Smart Grid Forum, 'Assessing the Impact of Low Carbon Technologies on GB's Distribution Networks' August 2012, available at www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=47&refer=Networks/SGF/Publications

Our view of the future

The speed and scale of the change to technology is extremely hard to predict between now and 2015, let alone between 2015 and 2023. However, we have taken into account what we have seen in the past few years and based our assumptions for the future on a combination of historical patterns and expected future growth.

Figure 8 below summarises our current view of the volume of low carbon technologies which will connect to our network during each year of the RIIO-ED1 period. This forecast has been produced using the Transform model developed by Work Stream 3 of the Smart Grids Forum – this model is available to all GB DNOs and has also been used to inform [Get connected](#). The evident increasing deployment of LCTs will require us to play an increasingly active role in the operation of our network, managing the flow of electricity and integrating the actions of all users connected to it - generators, consumers and increasingly those that do both.

Figure 8 Best view of LCT growth during the RIIO-ED1 period

		2016	2017	2018	2019	2020	2021	2022	2023
Heat pumps	SEPD	9,996	12,132	14,320	29,170	53,950	58,526	63,294	68,314
	SHEPD	8,199	9,554	10,888	21,063	38,158	40,610	42,930	45,088
Electric vehicles (slow charge)	SEPD	3,698	5,110	6,914	9,197	12,093	15,725	18,878	22,154
	SHEPD	761	1,052	1,427	1,899	2,498	3,252	3,905	4,584
Electric vehicles (fast charge)	SEPD	2,806	4,958	8,476	14,128	23,221	33,661	46,252	63,839
	SHEPD	578	1,021	1,749	2,918	4,797	6,960	9,567	13,210
Photovoltaic installations	SEPD	485,598	544,551	597,395	651,219	705,799	748,438	769,068	783,006
	SHEPD	97,385	114,090	130,852	149,318	171,316	183,514	191,826	198,518

How we have considered the impact of these factors







We have combined our understanding of these external factors and what they may mean for our networks to come to a view of the changes we anticipate will affect our networks over the next ten years. **Figure 9** presents this as a summary of overall impact.

Some of these factors taken on their own would suggest moderate growth in demand. However, we expect overall to see ongoing low growth in demand during the period from 2015 to 2023, as

energy efficiency measures, relatively low and steady economic growth, and increased levels of small scale generation counter demand growth from some of the other factors.

We do expect that there will be significant geographic differences in the impact of some of these factors, particularly changes to consumer behaviour and adoption of low carbon technologies, and this is one of the considerations in developing our [Innovation](#). We also expect more significant change to come during the period from 2023. As such, we will use our increased understanding of the implications from these factors during the next ten years to inform our longer-term plans and thinking beyond 2023.

Figure 9 Overall Impact on Peak Demand from External Factors

External Factor	Change anticipated	Likely impact on Peak Demand
Economy	Steady Growth	
Government policy	Increased drive for low carbon technologies and energy efficiency measures ¹⁴	 
Consumer behaviour	Increased uptake of technologies, offset in part by more energy efficient devices and appliances	
Technology	Increased uptake but likely to develop in 'clusters'	
Overall Impact		

Whilst we have built our plan to allow for the likely impact of the factors detailed above, there is always the possibility that the impact will be greater than or different to that which we expect. An example could be a change in environmental legislation by the Government that we had not foreseen that could lead to us requiring significantly to change the way in which we operate. Our

¹⁴ Reductions in demand from energy efficiency and from netting off of small generation likely to be balanced against increased demand from heat pumps and electric vehicles.

paper entitled [Efficiently managing risk](#) sets out the mechanisms to mitigate the impact of these remaining risks and uncertainties during RIIO-ED1.

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Appendix

Regulatory policy

Process: Has the DNO followed a robust process?

We have engaged with stakeholders to seek their views in order to develop ours. Specifically, we asked our stakeholders about their expectations of the growth of future connections. You can read more about our stakeholders' feedback in [What you said](#) and [What our Stakeholders Think](#).

The paper is split into three clear sections: **About us**, **About the electricity industry** and **The changing environment in which we operate**.

Outputs: Does the plan deliver the required outputs?

There are no specific outputs required from this paper. However, it does demonstrate that we have considered the long term context in developing our plans and taken into account, where possible, factors which are largely outwith our control.

Resources (efficient expenditure): Are the costs of delivering the outputs efficient?

Any expenditure we make is needs-based and delivers maximum value for money for our customers. We have always been at the forefront of efficiency and will continue to be throughout RIIO-ED1. You can read more about the efficiency of our costs in [Be efficient](#).

Resources (efficient financing): Are the proposed financing arrangements efficient?

Our paper entitled [Efficiently financing our plans](#) sets out how we plan to finance our plans for RIIO-ED1.

Uncertainty & Risk: How well does the plan deal with uncertainty and risk?

This paper considers the uncertainty and risk associated with the future environment in which we will operate. It recognises that we will continue to provide a reliable supply of electricity to our customers by considering the potential areas of future change. You can read more about how we specifically mitigate risk in [Efficiently managing risk](#).