SGN
Your gas. Our network.

October 2016

Demand Forecasting Document 2016

Network Capacity

Disclaimer

This document is produced for the purpose of and in accordance with Scotland Gas Network plc's and Southern Gas Networks plc's, collectively known as SGN, obligations.

These are Standard Condition 25 and Standard Special Condition D3 of their respective Gas Transporter Licence and Section O 4.1 of the Transportation Principal Document in the Uniform Network Code in accordance with information supplied pursuant to Section O of the Transportation Principal Document in the Uniform Network Code. Section O 1.3 of the Transportation Principal Document in the Uniform Network Code applies to any estimate, forecast or other information contained in this document. This document is not intended to have any legal force or to imply any legal obligations as regards capacity planning, future investment and the resulting capacity.

This document is intended to be read in conjunction with the SGN Long Term Development Statement 2016.

Contents

Foreword

Paul Denniff,
Network Director

This 2016 Demand Forecasting Document (DFD) is the fourth produced by SGN in accordance with Standard Condition 25 and Standard Special Condition D3 of our Gas Transporter Licences.

This requires that an annual statement is published of demand forecast and system developments. While we have produced this for 12 years now, we took the decision in 2013 to produce two documents.

We have again chosen to present the information in two documents, which can be read in conjunction.

The first document is the DFD. This includes the tables and graphs representing the actual year-on-year predicted load growth of annual and daily demands. In addition, it explains the background and methodology in the development of the forecasts.

The other document is the Long Term Development Statement (LTDS). This contains essential information on the planned major reinforcement projects and associated investment, significant completed projects and other developments in Scotland or Southern England.

I hope you will find both our 2016 DFD and LTDS informative, and if you have any enquiries, please contact me at **network.capacity@sgn.co.uk**, **paul.denniff@sgn.co.uk** or on 01293 818 365.

Paul Denniff
Network Director, SGN

1. Introduction

1.1 Context

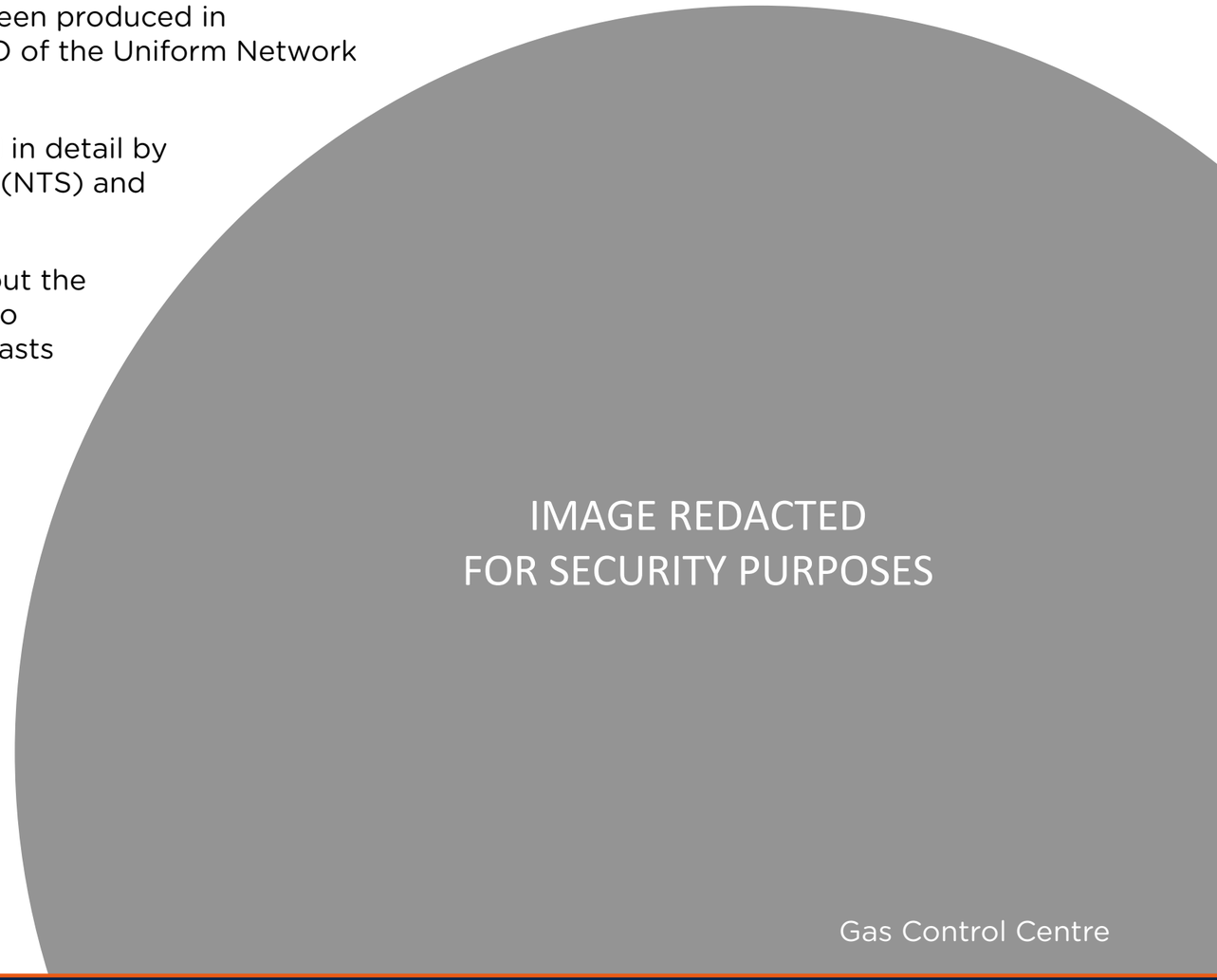
This document provides an overview of our ten-year forecast of annual and peak day demands. Development of the SGN transportation networks is primarily demand driven.

The DFD is developed to be read in conjunction with our LTDS. They have been produced in accordance with the obligations in our gas transporter licence and Section O of the Uniform Network Code (UNC); Transportation Principal Document (TPD).

The overall UK supply position and security of supply assessment is covered in detail by National Grid in its Ten Year Statement for the national transmission system (NTS) and in its associated publications.

The Uniform Network Code; Offtake Arrangements Document (OAD), sets out the framework for exchanging the necessary information to assist transporters to generate long-term demand forecasts. The publication of our demand forecasts forms part of this process.

The timescales for the development of the Annual and Peak Demand Forecasts are included in section 2.



Gas Control Centre

2. Summary and Document Scope

[1]www.energynetworks.org/assets/files/gas/futures/KPMG%20Future%20of%20Gas%20Main%20report%20plus%20appendices%20FINAL.pdf

2.1 Summary

We are forecasting a small decrease in annual and peak day demands over the 10-year period 2016-26. In the period 2017-25, demand is expected to decrease due to increases in energy efficiency and increased uptake of renewable energy.

The percentage demand changes are shown in table 1 and demonstrate the overall change in demand over the next 10 years.

	Scotland	Southern
Annual Demand	-8.29%	-10.30%
Peak Day Demand	-5.46%	-6.56%

Table 1: Overall change in demands

2.2 Overview of the Demand Forecasting Process

The publication of the DFD and LTDS is the output of the planning process for the current annual cycle.

The key input to the planning process is the demand forecasts, which are produced using data obtained from recognised industry sources and through consultation with our stakeholders. We use these demand forecasts to analyse the performance of the local transmission systems (LTS) (>7Barg) to predict flows, pressures, offtake capacity and in-day storage requirements. From this data appropriate investment decisions are made.

The Uniform Network Code provides for consultation between the distribution networks and National Grid Gas UK Transmission in the demand forecasting process within the gas year, which is shown in the timeline in figure 2 on page 7.

Development of our transportation network is primarily demand driven. The overall UK supply position and security of supply assessment is covered in detail by National Grid's Ten-Year Statement for the NTS and in its annual publication UK Future Energy Scenarios document. Separate to this the Energy Networks Association (ENA) has also commissioned a long term future report from KPMG[1]. These two documents examine a number of scenarios for change in gas demand. These can range from minimal change in behaviour or consumption to one of high levels of substitution of gas as a component in the energy mix.

Our view is that we see the evolution of gas demand as one of slow progression in demand, in line with UK Future Scenarios. This approximates most closely to ENA's "Evolution of Gas Network" scenario. However this outlook is only valid based on information available. Should evidence of major changes become apparent our demand outlook evolves to include new evidence.

2. Summary and Document Scope continued

2.3 Structure of Document

The document has been structured such that the main body of the document, sections 3 to 5, provides an assessment of the previous year's forecasting performance and sets out the key drivers and uncertainties affecting demand.

- Section 3 shows a local distribution zone (LDZ)-specific outlook for the key factors that influence demand growth.
- Section 4 describes the forecasting methodology used.
- Section 5 provides details of the annual and peak demand forecasts.

The appendices provide details of the figures used for the forecasts, the actual flows encountered last year and general information useful for understanding the document.

2015	November	National Grid provides Specification
	December	
2016	January	
	February	We provide pre-forecast information to National Grid
	March	
	April	We provide forecast data to NGT
	May	National Grid provides final forecast information
	June	Meeting to discuss NGT forecasts
	July	National Grid provide CV data
	August	
	September	
	October	We publish Demand forecasting document

Figure 2: Timescale of forecasting methodology

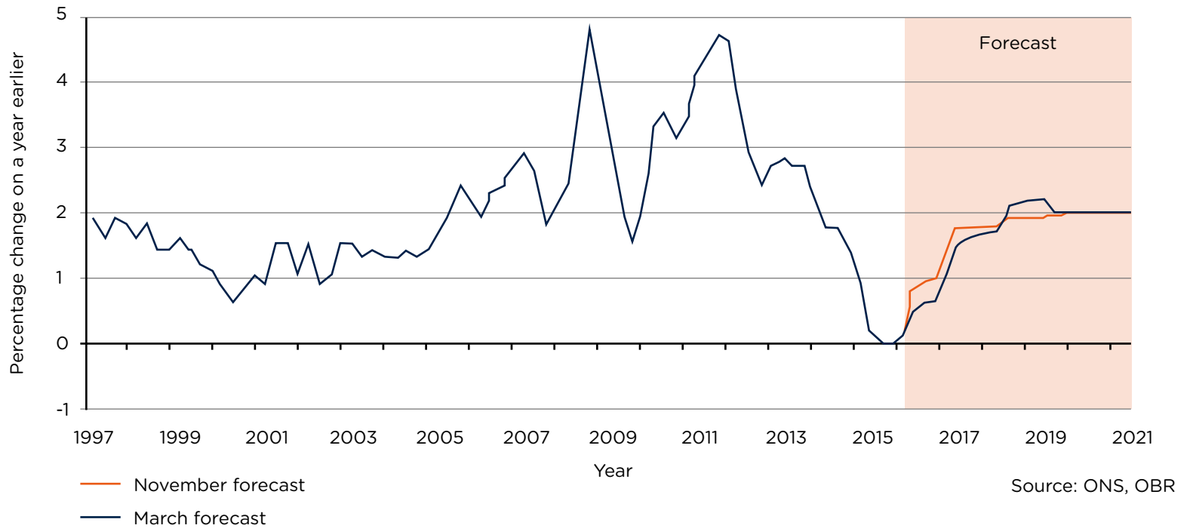
3. Outlook for 2016 Demand

3.1 Medium to Long-Term LDZ Economic Outlook

This section provides a general overview of the UK economy to give some context to the regional data provided in this document. It also outlines some of the key econometric assumptions used to develop the forecasts. Critically, all assumptions were generated before the UK vote on staying or leaving the EU.

3.1.1 Inflation

After a period of relative instability during the period 2009 to 2015, the Consumer Price Index (CPI) had started to stabilise as shown in figure 3. The latest forecast for the whole of 2016 as provided by the Office of Budget Responsibility (OBR) in March 2016 is around 0.7%, but is expected to rise to 1.6% in 2017, reaching a figure of 2% by 2018.



Source: ONS, OBR

Figure 3: UK CPI 1997 to 2021

3.1.2 UK Gross Value Added (GVA) and Gross Domestic Product (GDP)

GVA measures the contribution to the economy of each individual producer, industry or sector in the United Kingdom. GVA is used in the estimation of Gross Domestic Product (GDP). GDP is a key indicator of the state of the entire economy and equates to GVA plus taxes on products minus subsidies on products. A significant decline in GDP occurred during 2008/9 set against a long period of growth from 1992. However, there has been some recovery in GDP since that time. Figure 4 shows the variation in GDP over the last 12 years but attention should be paid to the generally positive trend of the last five years. Growth is expected into the future.

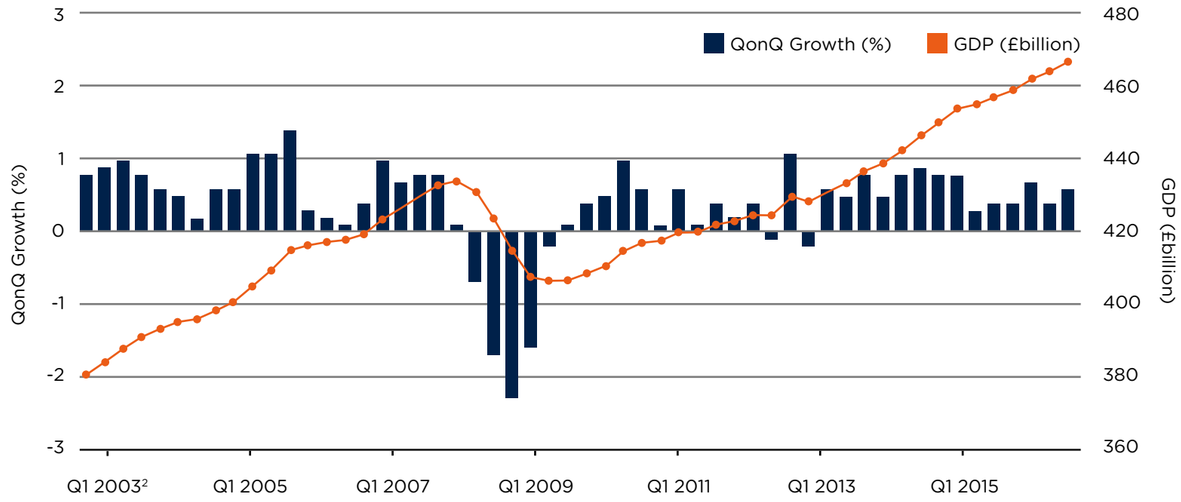
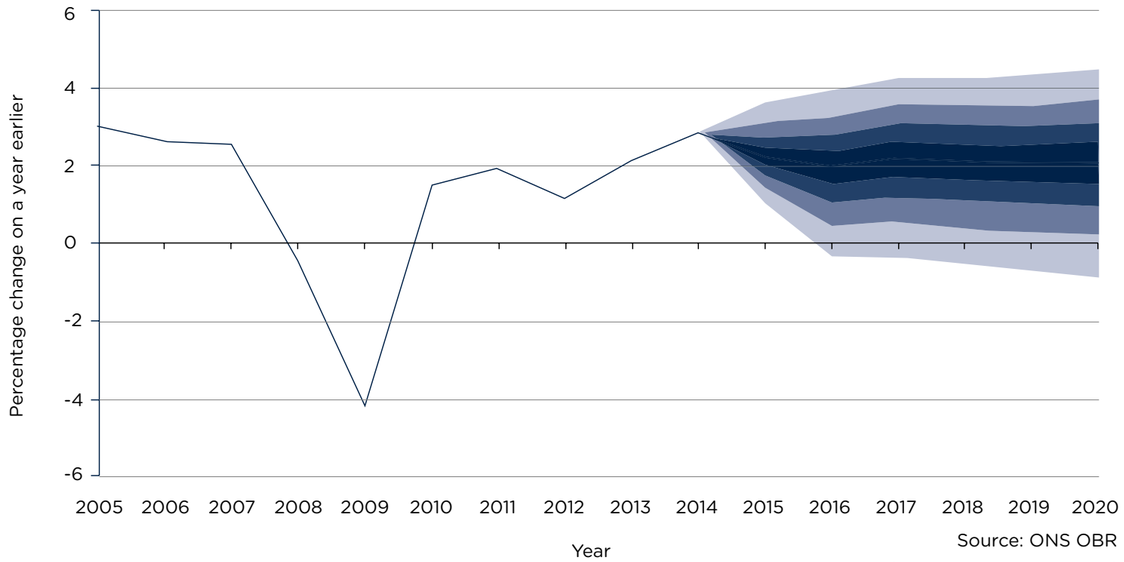


Figure 4: UK GDP and quarterly growth

3. Outlook for 2016 Demand continued

The latest economic figures included in figure 5 taken from the Office of National Statistics (ONS) show a sustained recovery in the economy during 2015 of 2.2%. The Office for Budget Responsibility (OBR) is forecasting growth of 2% for 2016. Independent external forecasters are forecasting on average 2.2% for 2016[2]. It should be noted that these were published prior to the EU Referendum result.



Source: ONS OBR

Figure 5: GDP trend

3.1.3 Gross Disposable Household Income (GDHI)

This can be used as an indicator of householders' ability to absorb potential rising energy prices and provides a reasonable indication of how affluent households are in a particular area. The source of this information is the ONS. There were reports of a decline in GDHI in real terms. In fact GDHI was stronger in London and Scotland in 2014 than in 2011[3].

[2]cdn.budgetresponsibility.org.uk/March2016EFO.pdf

[2]www.ons.gov.uk/economy/regionalaccounts/grossdisposablehouseholdincome/bulletins/regionalgrossdisposablehouseholdincomegdhi/2014#main-points

3. Outlook for 2016 Demand continued

3.1.4 Manufacturing Output

Manufacturing output trends provide an assessment of how this type of industry is performing. There was a significant downturn in manufacturing during 2009, followed by periods of decline and recovery since then. This is demonstrated in figures for the Manufacturing Index from the ONS (see figure 6, where 100 is the level of manufacturing in 2011).

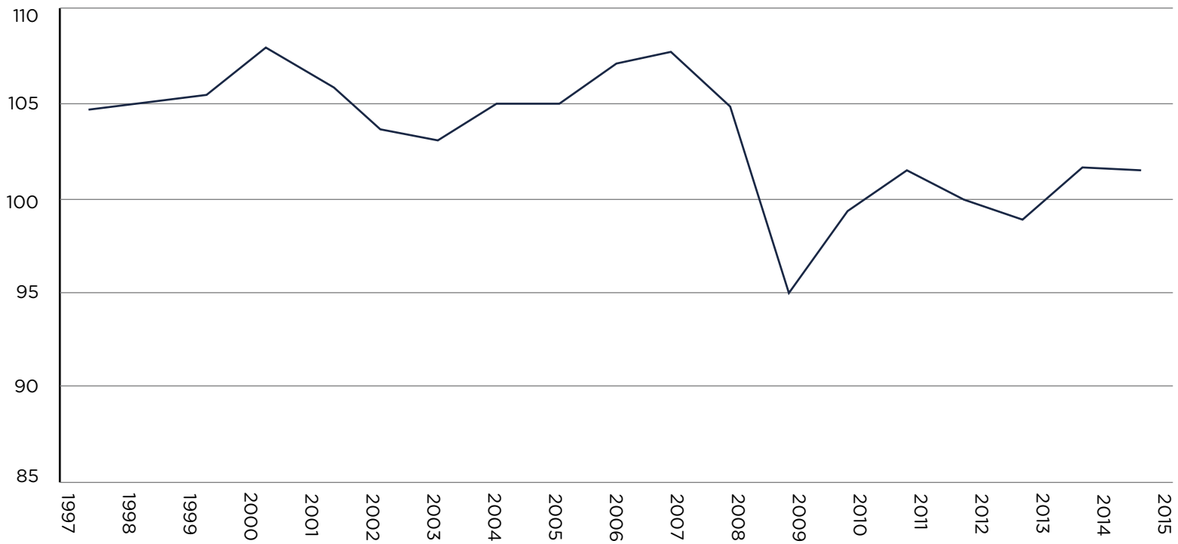


Figure 6: Manufacturing Index

3.1.5 Household Numbers

Household numbers are based on the Department for Communities and Local Government (DCLG) website reported data (mid-year) adjusted to year end. This data is consistent with historical data provided previously. We have adjusted the figures to reflect the current level of housing growth, where this differs.

3.1.6 Employment

After a steady rise in employment for nearly 20 years there has been a steady decline in the number of workforce jobs between 2007 and 2009, with a series of dips and recoveries since then. In 2015, 550,000 jobs were created of which 440,000 were employee jobs as opposed to self-employed. This pattern is mirrored in the commercial and services sector with 600,000 jobs created. Manufacturing has seen a steady decline since 1998 after a period of small growth from 1992 to 1998. The figures for 2012 to 2014 have, however, seen a rise of around 200,000 jobs, followed by a decline in 2015 of 70,000.

Regarding the future employment levels in the commercial and service sectors, we expect that the rise in the number of jobs created in 2015 will not be sustained. In manufacturing, it is expected that the long-term decline since 2007 will continue.

3. Outlook for 2016 Demand continued

3.1.7 Gas and Fuel Price

Prices in all markets have shown significant increases from 2002 for households and from 1999 in the non-domestic market. This has been driven by the rise in wholesale gas prices. However, this pattern has reversed over the last year with the decline in oil price. This is in turn has been brought about by a number of factors including the entry of shale oil in North America, a decline in worldwide consumption and the refusal of OPEC to reduce production, partially because of the return of Iran as an exporter. While it is probable that oil prices will increase at some point, there is no guarantee they will return to the high levels experienced previously.

3.1.8 Wholesale Price

There has been fluctuation in the wholesale gas price (as represented by the UK NBP price) over time but the general trend has been upwards. Following the steep decline in oil prices in 2015, the wholesale price also fell in 2015. The forecast provided is based on forecasts that are used by DECC for their energy demand forecasts. The forward prices published by Heren are significantly lower than these, but the average wholesale price of gas is made up of a combination of this forward gas and other contracts both short and long term.

- 3.1.8.1 Domestic Retail Price

There has been a dip in the real price of domestic gas prices this year as a result of the impact of the wholesale price drop which has an impact on a proportion of the costs incurred by domestic suppliers. In addition competition from smaller suppliers is increasing and there is increasing pressure from within the Government to make switching supplier easier and quicker. Beyond 2015 forecast, wholesale prices are due to remain fairly stable initially and then rise slowly. It is assumed that the major suppliers will, as a minimum, control prices using the full wholesale price plus a 2% premium for the ongoing costs associated with smart metering and the development of smart grids.

- 3.1.8.2 Non-Domestic Retail Price

There has been a steady rise in the real price of industrial gas for many years but with significant fluctuations in line with the change in wholesale prices. This fluctuation is particularly felt by customers with large annual consumptions as the wholesale price will be a much greater proportion of their charges from their supplier. In 2015 there was a drop in gas price, driven by the fall in price of oil.

Ongoing current price rises are anticipated at this level in line with the trend in rising wholesale prices. In addition, a premium of 1% or 2% is added to the current price in the short term to accommodate the development of smart grids, smart metering and other green initiatives. The lower premium level is anticipated as non-domestic customers will see greater benefits from this technology compared to domestic customers and hence be early adopters of some form of smart or advanced metering or will have embraced such technology already.

3. Outlook for 2016 Demand continued

3.1.9 Efficiency Improvements

Gas demand has been declining in recent years, although there are some instances of growth in some sectors in some parts of the country, possibly driven by falling gas prices and the improving economy. But it is difficult to separate the impact of efficiency improvements from the impact of variations in gas prices and the effects of variations in the number of supply points.

It is a fact that there has been a steady programme of gas fired domestic boiler replacement for several years now and the high levels of efficiency achieved with these new boilers is a significant contributory factor in the decline in gas demand. However the increases in efficiency may in some circumstances have been used to provide higher comfort levels, especially in winter. There has also been a sustained effort by gas suppliers and other parties to encourage the use of loft and cavity wall insulation. This has been extensively used to reduce household consumption. The major suppliers are, in many instances, refusing to offer top-up loft insulation as the benefits are not sufficient to cover the cost.

The DECC pathways analysis has much commentary on different types of insulation and anticipates high levels of take up of previously underutilised insulation categories e.g. solid wall insulation. It is expected that cavity wall and loft insulation (being relatively cheap) will be increased to the point of saturation in a relatively short space of time but solid wall insulation requires substantial investment and disruption to install and doesn't currently provide an economic solution (without large subsidies) to those households that pay their own energy bills and could benefit from savings made.

There are examples, however, of local authorities funding this investment either wholly or in part to meet their own green agendas, although there are some where it does seem that the payback periods are very long. With ever increasing pressure on local authority budgets it is possible that this may not be sustainable, especially as the council tenant sees the benefit in reduced energy costs and not the councils.

3. Outlook for 2016 Demand continued

3.1.10 Energy Act 2011 (updated 2016)

There is a range of provisions in the Act to encourage energy efficiency and to remove barriers to investment in energy efficiency measures.

- Green Deal. This was intended to be a new financing framework which is funded by a charge on energy bills that avoids the need for consumers to pay upfront costs. The UK Government announced in July 2015 that no further funding would be available, effectively bringing the scheme to an end while a number of vouchers are still being signed off.

- Energy Company Obligation (ECO). This is the Government's domestic energy efficiency programme which replaced previous programmes from 2013. It will run until March 2017 and has three distinct targets:

  - The Carbon Emissions Reduction Obligation (20.9 million lifetime tonnes of carbon dioxide). Focusing measures for "hard to treat" situations.

  - The Carbon Saving Community Obligation (6.8 million lifetime tonnes of carbon dioxide). Focusing on the provision of insulation measures and connections to district heating systems to domestic energy users that live within an area of low-income.

  - The Home Heating Cost Reduction Obligation (£4.2 billion of lifetime cost savings). Requiring energy suppliers to provide measures which improve the ability of low-income and vulnerable households (the 'Affordable Warmth Group') to affordably heat their homes.

Further measures to improve energy efficiency include:

- Amendment of the smart meters powers in the Energy Act 2008 to allow Government to direct the approach to the roll-out of smart meters until 2018.

- Amendment of the Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007 to enable the removal of unnecessary restrictions on access to data.

- Establish powers for the Secretary of State to require energy companies to provide information on the cheapest tariff on energy bills.

As high level principles the provisions cannot be seen as providing the only solution to cut carbon emissions to the target levels. Relatively low cost measures to improve efficiency like boiler replacement, cavity wall and loft insulation benefitted from the Green Deal. However, higher cost solutions like renewable heat or solid wall insulation would need to allow for protracted payback periods (approaching 50 years or more) to be viable, unless a significant subsidy is obtained.

In summary, it would appear that there are still some barriers to major investment in efficiency savings, although recent incentive developments have reduced these. The key driver, at least in the short term, will be the price of gas when compared to the cost of installing new energy efficient appliances or means of reducing heat loss from premises.

3. Outlook for 2016 Demand continued

3.1.12 Smart Meters

It was observed by Ofgem in their December 2010 report for the Energy Demand Research Project (EDRP) that smart meters can be a vehicle for effective action to reduce domestic energy demand. However, there was no distinction between gas and electricity meters.

At present, the roll-out programme has been delayed until beyond mid-2016 from the original date of summer 2014. The target date for full roll-out stays at the end of 2020. However, some suppliers are already installing meters in advance of the official roll-out. At the end of March 2016, there were 1.2 million gas meters installed.

The public profile of this programme has been raised by TV and social media campaigns advertising to promote and inform on the programme. One final observation is the advent of home energy management systems. This will make the overall impact of Smart Metering difficult to quantify in isolation as these devices may be more effective in changing consumer behaviour and have not provided evidence of impact on gas demand.

3.1.13 Carbon Neutral Housing

The UK Government policy on carbon neutral new housing, more commonly referred to as “zero carbon homes”, has been interpreted by some as being taken literally from the headline title. In fact the actual policy makes it clear that although carbon neutral is an objective for new housing, the proposed standards published in November 2009 are aimed at reducing energy consumption as much as possible and using renewable sources where appropriate.

The commitment to make new homes zero carbon was dropped by the UK Government in July 2015. Given this decision and the fact that gas consumption has already fallen significantly amongst the much larger existing housing market, it should not be necessary to make any specific adjustments to forecasts of household demand, but to keep this area under review for future forecasts.

3. Outlook for 2016 Demand continued

3.1.14 Renewable Assumptions and Impacts

In March 2011 the UK Government announced that they would introduce a Renewable Heat Incentive Scheme (RHI)[4].

The RHI was aimed at helping to accelerate deployment of renewable heat sources by providing a financial incentive to install renewable heating in place of fossil fuels.

The non-domestic scheme was launched in November 2011 offering long-term tariff support for renewable heat installations in the non-domestic sector. This sector, which covers everything from large-scale industrial heating to small business and community heating projects, was anticipated to provide the vast majority of the renewable heat needed to meet the targets and represents the most cost-effective way of increasing the level of renewable heat.

To ensure the success of the non-domestic scheme, a cost control regime called degression was introduced in 2013 to ensure the RHI scheme stays within budget. The scheme was also expanded to support new technologies. As of July 2016 this resulted in a reduction of 10-15% on biomass and biomethane tariffs.

The domestic RHI scheme opened for applications in spring 2014. Under the scheme, there is financial support to encourage the uptake of renewable heating among domestic consumers. It is targeted at, but not limited to, off gas grid households. The impact on gas demand is likely to be small as the scheme is likely to be more attractive to households who rely on more expensive heating fuels such as oil, electricity or LPG. UK Government is committed to providing 12% of heat from renewable sources by 2020. The total figure quoted by them is 73TWh, a reduction of 15TWh from the original target of 88TWh.[5] In January 2016 it was reported that progress on the 73TWh target from a mixture of schemes was at 38%.[6]

[4]DECC Renewable Heat Incentive – March 2011

[5]www.gov.uk/government/uploads/system/uploads/attachment_data/file/48041/1387-renewable-heat-incentive.pdf

[6]Third Progress Report on the Promotion and Use of Energy from Renewable Sources for the United Kingdom

3. Outlook for 2016 Demand continued

3.2 Regional Economy

3.2.1 Scotland

Scotland LDZ possesses a strong commercial and services sector base, accounting for around 78% of the Scottish economy, just below the UK figure of 81%. Financial and business services growth underpinned by the presence in Edinburgh and Glasgow of many leading financial institutions is the third largest in GVA terms in the UK behind London and the south east. The recent economic downturn did have a negative effect as banks have consolidated offices and functions. The Scottish Government is keen to emphasise the impact that their economy has on UK GDP as illustrated by the significant contribution that Scotland makes to the extra-regional elements of UK GDP. The effect is demonstrated in figure 7 below.

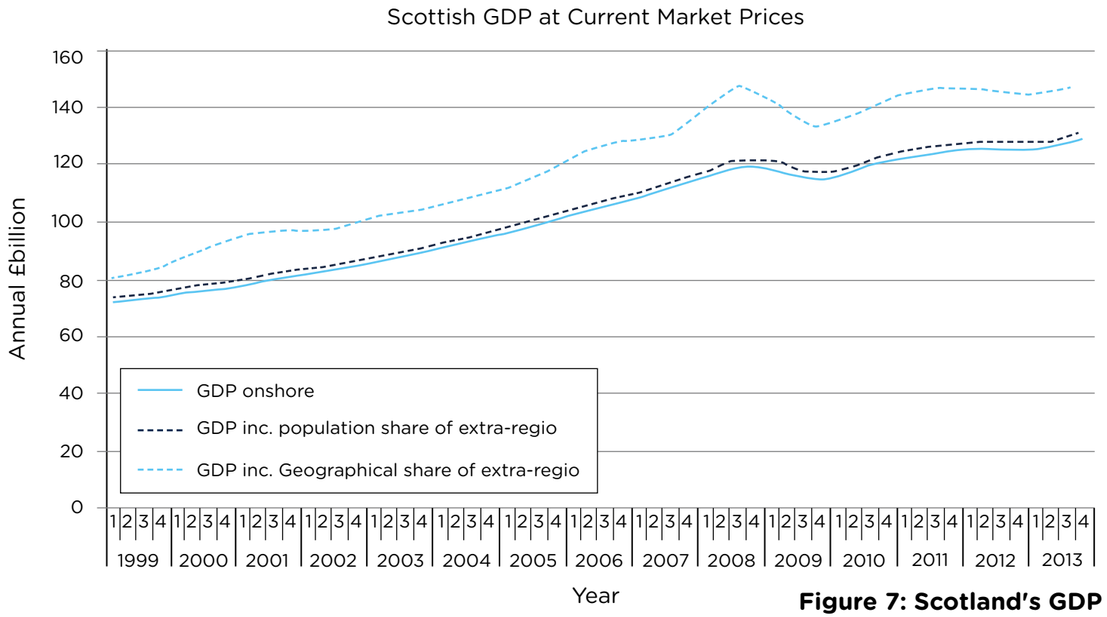


Figure 7: Scotland's GDP

The Scottish manufacturing base is strong, delivering 11.5% of Scotland's GVA, higher than the UK figure of 10.5%. The sector has, however, performed well showing a reasonable increase in 2013 and 2014 compared to a small decline in 2012 in line with the rest of the UK. Scottish international exports have grown since 2013, after a decline in 2012 in line with the figures that relate to exports to the rest of the UK.

Heavy reliance on public services (21% of employment in 2015, down from 21.4% in 2014) may also be problematic as the UK Government continues to cut its spending plans in order to meet borrowing targets and reduce the budget deficit. Employment levels across the whole of Scotland have risen by 0.8% in the last year. However, employment levels in the public sector have continued to fall with a 0.1% drop in employees during 2015. This does mean that there is some steady growth in other sectors outside which is counteracting the losses in the public sector. But it will still leave the Scottish Economy heavily reliant on public services in the near future. Scottish Parliament reports have highlighted that the Scottish economy is probably over reliant on a small number of overseas markets and would be well advised to exploit opportunities in other emerging markets.

In the medium term the Scottish economy will have development opportunities in renewable technology with the Scottish Parliament targeting a potential 16,000 to 70,000 new job opportunities in these emerging areas of employment. The UK Government states that 12,700[7] jobs already exist in low carbon employment in Scotland and studies estimate that this figure could rise to 28,000 by 2020[8]. These numbers are very dependent on the influence of Government incentive measures which are under review at the time of writing.

[7] **www.gov.uk/government/uploads/system/uploads/attachment_data/file/416240/bis-15-206-size-and-performance-of-uk-low-carbon-economy.pdf**

[8] **www.scotland.gov.uk/Publications/2011/09/13091128/5**

3. Outlook for 2016 Demand continued

3.2.2 South East

In the south east LDZ, the strong representation in financial and business services and transport and communications - the best-performing sectors of the national economy, are further encouraged by favourable demographics. This should be boosted by the steady economic recovery following the downturn, but the trickle of recent banking industry scandals is a real threat to that industry. This will be especially significant should confidence in London as a financial hub be adversely affected by the various enquiries into the banking sector, changes in regulation and the impact of the UK leaving the EU.

The pattern of growth and development remains unbalanced, with economic hot and cold spots in the region. Manufacturing is still a significant element of the south east economy at 8.8%, but there was some decline in 2011, and it remains the lowest manufacturing base outside London. The impact of the level of economic recovery on this sector could still be significant assuming there is to be continued recovery. The sector of the economy that has generally weathered the economic downturn the best, appears to be the wholesale and retail sector (13% of south east GVA), which was only marginally affected by the recession in 2012 and in 2014 showed further sustained growth on top of that in 2013. It is unclear how sustainable this position will be, especially if the UK, EU and global economies continue to be adversely affected by the prevailing economic uncertainty or slowdown in some countries. The impact of the result of the referendum on UK membership of the EU will be unknown until the negotiations have developed.

Strong expansion of tourism, both internal and international provides opportunities for the south east region, given London's attraction as a tourist destination. This could actually expand should the pound weaken on the international market. This will drive internal and external tourism in general and make London a more attractive destination.

There are however, opportunities in the agriculture industry with incentives to "buy local" produce encouraging supermarkets to source high value fruit and vegetables in the UK. This in turn encourages an increase in commercial greenhouses, which in turn generates gas demand. This also creates biomethane opportunities. Of particular note for gas demand forecasting is a number of companies, primarily brickworks, which supply the construction sector that are operating different shift patterns to minimise costs while retaining capacity. With the construction sector now showing some recovery the demand for bricks is increasing. This has lead, in turn, to some companies having moved to care and maintenance, now restarting full scale production[9].

The Government continues to forecast that housing development will grow in the south east. A prime driver for this is the increase in population in London and the south east. There are signs of growth with the Greenwich Peninsula developments, which was part of the Thames Gateway regeneration project. In addition to these existing projects, we have been involved in initial studies for the Thames Estuary 2050 Growth Commission which was announced in the March 2016 Budget[10].

[9] www.architectsjournal.co.uk/news/brick-manufacturers-ramp-up-production/8687537.article

[10] https://www.gov.uk/government/consultations/thames-estuary-2050-growth-commission-call-for-ideas

3. Outlook for 2016 Demand continued

3.2.3 South

In the south LDZ, the rail, sea and airport links provide a favourable environment for investment opportunities and employment growth. This combined with a reasonably broad mix of commerce, industry, housing and tourism should create the ideal opportunity for sustained economic growth. The south coast and rural areas of south LDZ continue to attract visitors, boosting the local economies at a time when there has been some turndown in other areas.

Further changes by the Ministry of Defence will have some effect on the local economies due to the vicinity of several bases in the south LDZ. This can take the form of job cuts, but can also result in increases of employment due to consolidation of bases and upgrading of living quarters. The recent commitment by the UK Government to spend 2% of GDP is expected to provide some clarity and allow longer term planning. The impact of the cuts in public sector employment is not clear at this stage, but it is anticipated that it will have an impact on the south LDZ economy. Further job losses for London-based public sector employees will have a knock on effect within south LDZ where people living in the Thames Valley are within commuting distance of London.

Although the region has many pockets of thriving economic growth, there are some threats to certain areas as a result of changes in other parts of the country. Other factors that may constrain growth are the fact that there are many pockets within the area that are protected from development; witness the lack of onshore wind farms in the area. In addition the road infrastructure has already reached its capacity limits, particularly the M4.

Housing development is forecast to grow by Government, which will be boosted by the fact that money raised from the Right to Buy scheme for council houses will be used to build replacement houses. It is not clear how this will impact the number of new homes given that the discounts being offered to potential buyers will reduce the revenue. Also, constraints on development and infrastructure could further dilute the growth in new housing. A new development that may impact housing in the area is the inclusion of housing association tenants in the Right to Buy schemes. This may reduce the housing stock available for low-income families which may result in pressure on Government and local authorities to build more homes.

4 Forecasting Methodology

4.1 Annual Demand Assumptions

The starting point for production of the full set of demand forecasts is the annual average demand. The following general assumptions were used to assist in the development of the annual forecasts;

- All forecasts are seasonal normal demands calculated using the latest Seasonal Normal Composite Weather Variable basis [known as EP2].
- Historic annual demand data is provided on the same basis and daily demand data is available broken down by load band.
- SIU demand is not incorporated into the Scotland LDZ numbers.
- Shrinkage was forecast on a fixed daily basis irrespective of demand levels to be consistent with UNC.
- Retail gas price forecasts that are used as part of the demand modelling process.
- Load band 0-73 MWh is assumed to consist predominantly of households and that the behaviour patterns are linked to household behaviour.
- Load band 73 to 732 MWh is considered to be predominantly small commercial/retail premises with some small industrial.
- The load bands >732 MWh and Interruptible will be predominantly industrial and commercial premises and therefore exhibit behaviour related to these types of load.

4 Forecasting Methodology continued

4.2 General Methodology

We have refined the forecasting models for the different load bands over a number of years. The underlying principle is that the models make specific linkages between the load bands and traditional market categories like households and industrial and commercial customers. These models are tailored specifically to each LDZ although the underlying approach is the same across the whole of our networks.

An important factor that has been affecting recent demand levels has been the decline in the price of gas over most of the last year, which has resulted in growth in some demands. Many consumers may have already taken action with regard to energy saving, including a switch to renewable energy sources, as a result of sustained price rises in earlier years. However, as a result of lower prices there may be some consumers that are retaining their comfort levels. There is a reversal in all LDZs of the steady loss of non-domestic customer numbers which would be expected to result in increased demand. There are pockets where growth is being seen. This may be partially a result of holding off investment in efficiency measures due to uncertainty about the economy or the fact that energy prices have been falling for some time.

The latest economic figures included in figure 9, taken from ONS, show a sustained, but slow recovery in the economy during 2014 and 2015 with the latest figures showing an average growth in national GDP of 2%.

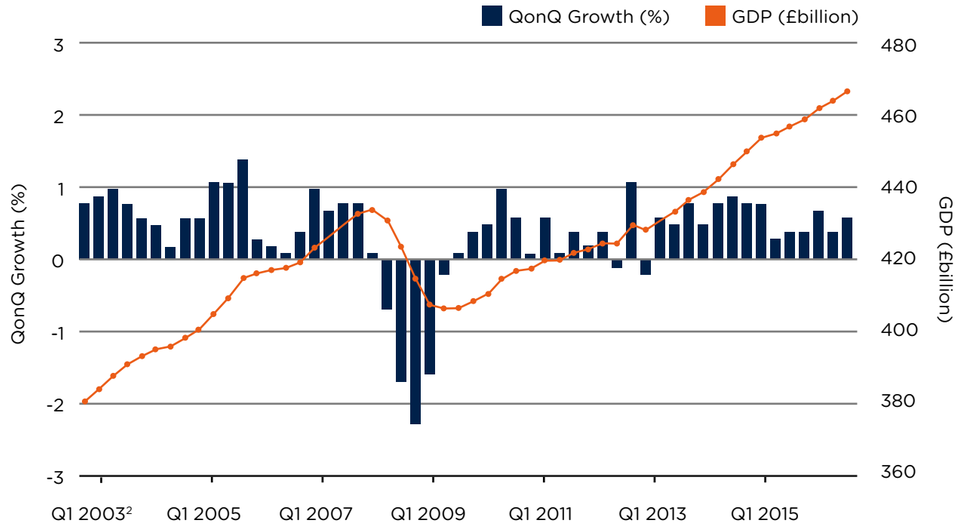


Figure 9: Change in UK GDP growth rate

There is still a little way to go to get to pre-recession levels but on the basis of the current trend it would be expected that the economy should continue to grow in 2016 and beyond.

4 Forecasting Methodology continued

4.2.1 0 to 73MWh Annual Demand

The primary driver in this sector is still believed to be the behaviour of households. Annual demand growth has traditionally been driven by the number of houses that are being built and completed, the number that subsequently on completion are occupied, and of that population how many of these occupied properties will be using gas.

Data was collected on all aspects of the housing market and regression analysis was carried out to establish if there is any need to amend the models from last year.

Average consumer gas bills are expected to fall in 2016 and indeed the six major of suppliers reduced tariffs in early 2016. To ensure that the methodology from last year is still appropriate, the models were re-examined to test the validity of the current model.

These models were refined for each LDZ, as customer behaviour proved to be materially different between each LDZ. We have developed a current retail gas price forecast specifically for the purposes of this process each year as an input.

4.2.2 73 to 732MWh Annual Demand

It has been assumed that this sector is generally influenced by energy prices and economic drivers. As a result of detailed evaluation of alternative econometric models, the best fit was achieved. We repeated the analysis this year with data from 2014. The following drivers were re-examined as part of this year's analysis:

- Current and real retail gas prices for this type and size of load
- Average non-domestic retail gas price
- GDP indices, actual GDP (seasonally adjusted) and GDP growth, regional GVA
- Manufacturing Output
- Consumption per unit of GDP
- Efficiency improvements
- Impact of renewables

4.2.3 >732MWh Annual Demand

This sector can be significantly affected by the behaviour at a small number of large loads and therefore the forecasts continue to be split into two elements. The Large Loads are forecast individually and separately from the rest of the market sector. The remaining demand is forecast as a whole.

4 Forecasting Methodology continued

4.3 Peak Demand Assumptions

The traditional primary basis for calculating the peak day demand in any market is the relationship between average daily demand and peak day demand, typically known as the load factor, where

Peak Day Demand = Average Daily Demand ÷ Load Factor.

The following assumptions were made when producing the 1 in 20 peak day demand:

- It is assumed that the modelling method results in no additional requirements for demand diversity analysis.
- The use of 1 in 20 CWVs, provided by Xoserve to calculate the 1 in 20 peak day meets the requirements of the licence and UNC with respect to the specified methodology for determining 1 in 20 peak day demand.
- No demand reduction will be allowed associated with demand management products offered by shippers.
- No allowance will be made to take account of any capacity buy-back contracts that may have been negotiated between SGN and its customers.

4.3.1 LDZ Specific Assumptions

All the general assumptions are applied across all the LDZs and there were no specific assumptions that relate to the individual LDZs that were used in this analysis, unless the weather demand analysis suggests that this should be considered.

4.3.2 Methodology

Forecast base case peak day demands were calculated from projections of annual demands using the following relationship:

Peak demand = (Annual demand ÷ 365) ÷ load factor.

The relationship was applied in each of a number of different market sectors, for which the load factor may be assumed to be constant over the forecast period. The following market sectors have been used as the starting point for the production of the base case peak day forecasts:

- NDM Firm 0 to 73.2MWh
- NDM Firm 73.2 to 732MWh
- NDM Firm >732MWh
- DM Firm Consumption

Load factors for each market sector were estimated from historical daily demand and other data sources.

5 Forecasts

5.1 Forecast Demands

This section provides an overview of our latest annual and peak gas demand forecasts through to 2025. A more detailed view can be found in the appendices, which includes the forecasts for both annual and peak demand on a year-by-year and LDZ basis. These forecasts have been developed around the UNC load band categories and relate only to gas that is transported through SGN systems.

5.1.2 Change in annual gas demand forecast (2016–25)

Table 2 below provides the headline view for annual demand over the 10-year period. The differences between Scotland and Southern networks is due to the loss of a number of large customers and demand reduction at others. It is important to realise that while we forecast an overall decrease during the period, this does not infer a year-on-year decrease of the same magnitude. Specifically we actually forecast small increases in demand in 2016-17 driven by economic recovery. This is then followed by a period of annual demand decreasing driven by efficiency measures, renewable technology and UK Government policy.

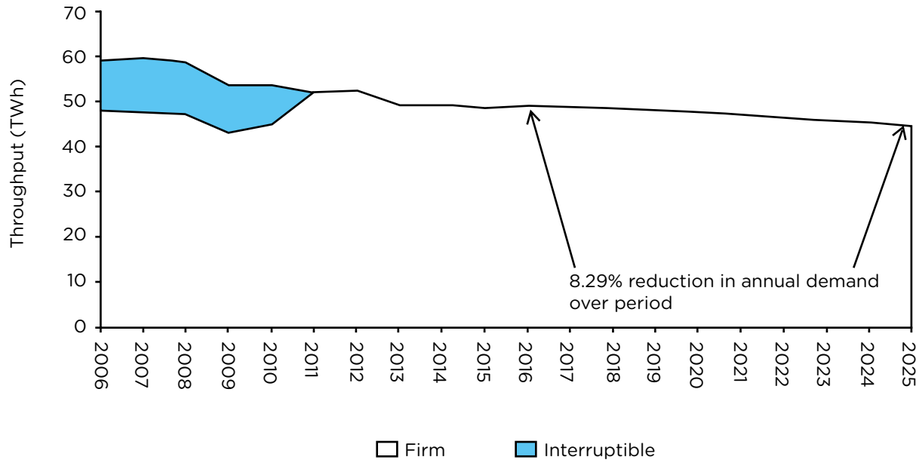
	Scotland	Southern
Demand Growth	-8.29%	-10.30%

Table 2: Change in annual demand

5 Forecasts continued

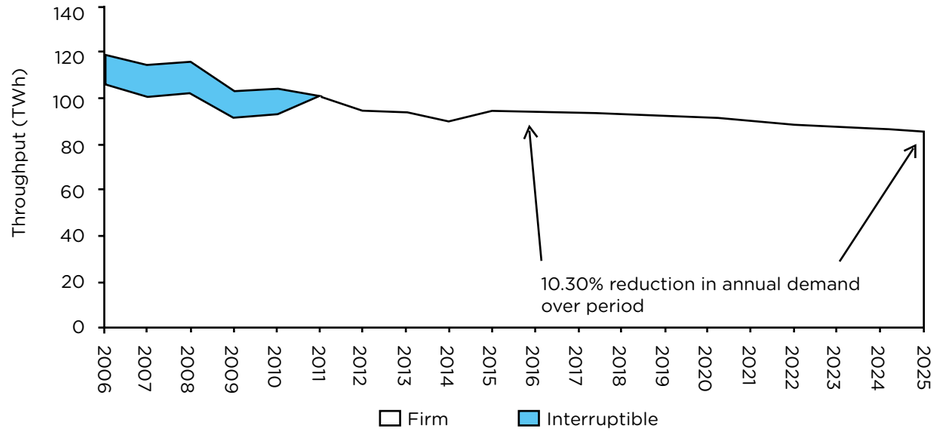
5.1.3 Annual Demand

Graph 5.1.3 shows the variation in historical gas demand and the forecast going forward. Note specifically the demand reduction in historical demand in 2009 followed by a minor recovery in 2010 and then further declines for 2013 onwards.



Graph 5.1.3a – Change in annual gas demand for Scotland Gas Networks

- Left hand scale represents annual throughput
- Note the effect of UNC Mod 90 in 2011 as almost all sites go firm
- Between 2016 and 2025 there is a 8.29% reduction in overall demand



Graph 5.1.3b – Change in annual gas demand for Southern Gas Networks

- Left hand scale represents annual throughput
- Note the effect of UNC Mod 90 in 2011 when all sites went firm
- In 2016-25 there is a 10.30% reduction in overall demand

5 Forecasts continued

5.2 Change in peak demand forecast

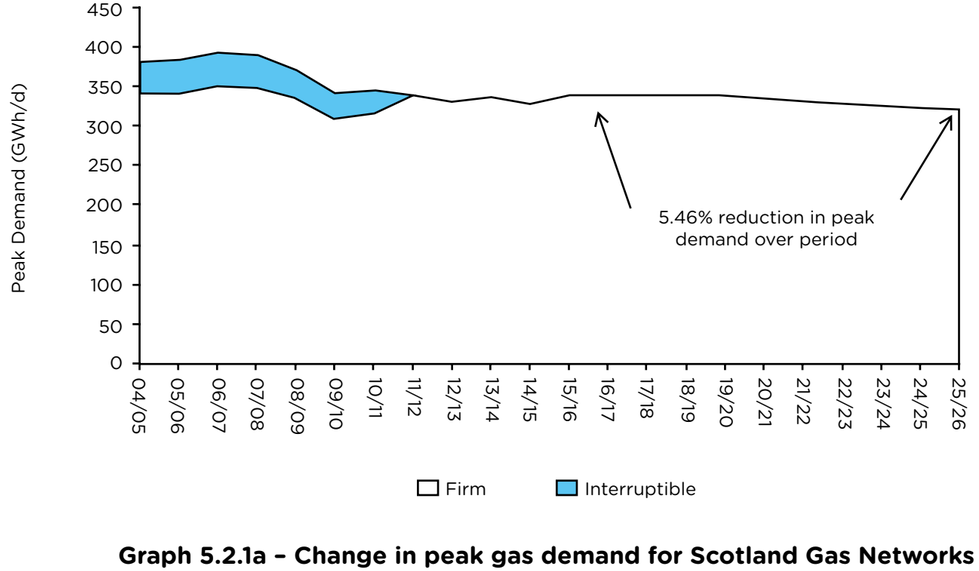
The following graphs show the equivalent view for peak demand, the key driver for investment in SGN. Note specifically the decline in 2009 followed by a minor recovery in 2010 and then further decline from 2011 onwards. However table 3 below provides the headline view that peak demand will fall over the next 10 years.

	Scotland	Southern
Peak Demand Change	-5.46%	-6.56%

Table 3: Change in Peak demand

5.2.1 Peak Demand

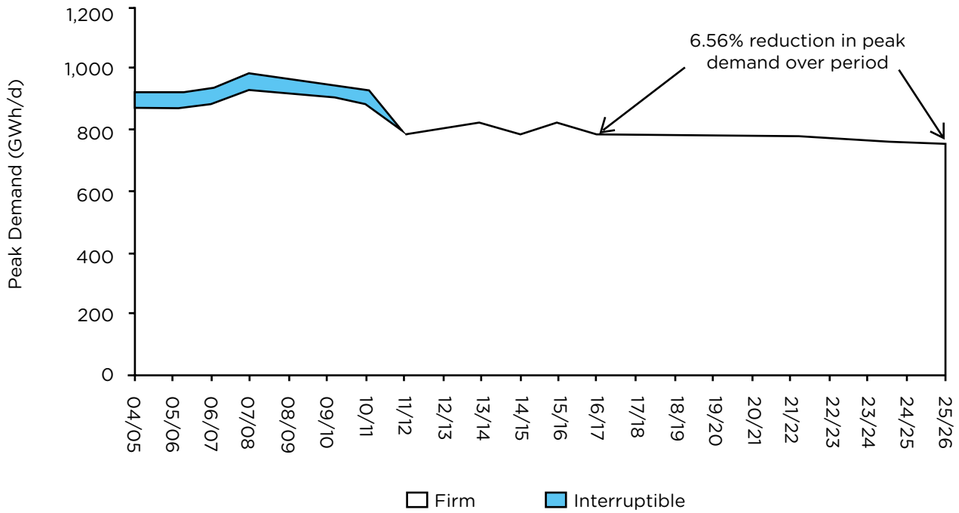
The differences between Scotland and Southern Networks are due to the loss of a number of large customers in the south and reduction of consumption by some other customers. As highlighted previously, it is important to note that there is a distinction between the decrease during the 10-year period and the year-on-year values depicted in graphs 5.2.1a and 5.2.1b. Specifically we assume again a small increase in 2016-17 driven by economic recovery followed by a decrease driven by energy efficiency measures and renewable technology.



Graph 5.2.1a – Change in peak gas demand for Scotland Gas Networks

- Left hand scale represents throughput on peak day.
- It is assumed that in 2016/17 there is a small increase in demands associated with economic recovery.
- It is assumed that the UK Government will meet its 2020 renewable target hence from the period 2017-24 there is a decrease in demands associated with increased energy efficiency measures and the uptake of renewable technology.
- Note the impact of UNC Mod 90 as most sites became firm in 2011. The small number of remaining sites have minimal impact on the network until they also go firm during 2016.

5 Forecasts continued



Graph 5.2.1b – Change in peak gas demand for Southern Gas Networks

- Left hand scale represents throughput on peak day.
- It is assumed that in 2016/17 there is a small increase in demands associated with economic recovery.
- It is assumed that the UK Government will meet its 2020 renewable target hence from the period 2017-24 there is a decrease in demands associated with increased energy efficiency measures and the uptake of renewable technology.
- Note the impact of UNC Mod 90 In 2011 when all loads went firm.

5.3 Forecast comparisons

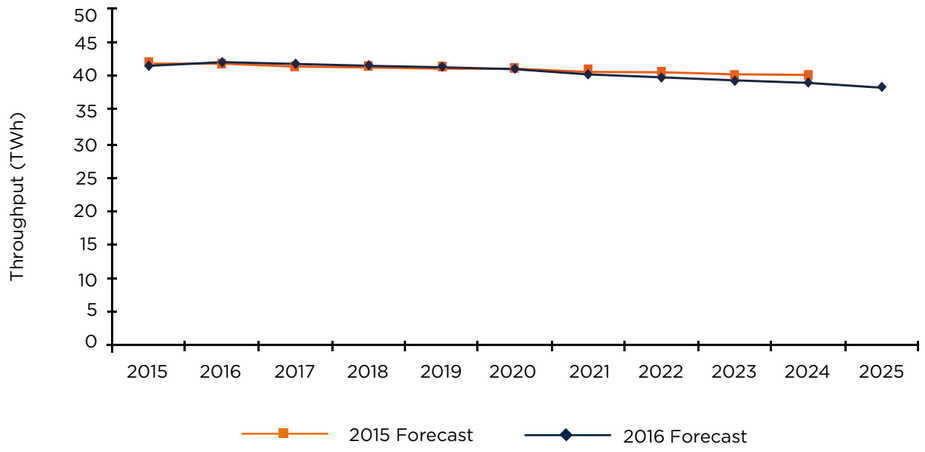
The following graphs provide a comparison of the current forecasts with those that were produced in 2015. The latest annual demand forecasts are higher over the period of the plan than last year's. The difference in the forecasts is primarily due to the fact that the 2016 forecasts have taken account of the difference between the forecast for 2015 and the actual demand in 2015. Scotland forecasts are broadly similar.

There is some increase in the domestic and small commercial sector due to lower retail gas price forecasts, countered slightly by lower economic forecasts. Higher levels of housing growth are forecast in Scotland and the south than the previous year. There is forecast a modest decline in demands throughout the forthcoming forecast period.

Greater consumer awareness on environmental issues and their 'carbon footprint' also has an effect on the annual gas demands during the forecast period. Typical measures for domestic consumers include double glazing, loft insulation, cavity wall insulation and energy efficient boilers. Much of this is taken in account from the results of UK Government programmes such as CERTS. Differences in fuel price will also affect all markets along with national and local government initiatives along with long term policy including UK and EU renewable energy targets such as "20 - 20 - 20 Targets" is important. This European Directive is to reduce the European Union's greenhouse gas emission by 20% below 1990 levels, ensure 20% of energy is generated from renewable sources and reduce primary energy use 20% by improving energy efficiency. These initiatives should have an impact on non-domestic and domestic demand as gas is used more efficiently and have a positive impact as new types of business are created to cope with emerging industrial opportunities.

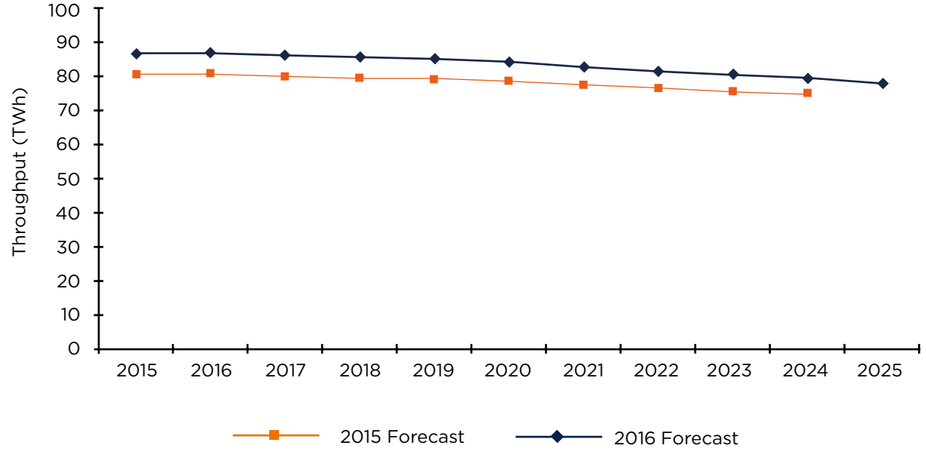
This could have a substantial impact on consumption year to year or may not materialise in the near or possibly even mid-term future.

5 Forecasts continued



Graph 5.3a – Comparison of annual demand forecasts – Scotland Gas Network

- 2015 and 2016 forecast demands are measured on the left hand side.
- On the above example a demand of 39TWh in 2024 on the 2016 forecast compared to 40TWh in 2024 in the 2015 forecast is a decrease of 2.5%.



Graph 5.3b – Comparison of annual demand forecasts – Southern Gas Network

- 2015 and 2016 forecast demands are measured on the left hand side.
- On the above example a demand of 80TWh in 2024 in the 2016 forecast compared to 75TWh in 2024 in the 2015 forecast is an increase of 6.3%.

Appendix A - Annual demands

Table 4 – Forecast annual demand – Scotland Gas Networks load categories (TWh)

Calendar Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
0 - 73.2 MWh	28.1	28.0	28.0	27.8	27.9	27.9	27.9	27.6	27.5	27.3	27.3
73.2 - 732 MWh	4.2	4.4	4.5	4.5	4.5	4.6	4.7	4.7	4.7	4.8	4.8
732 - 2196 MWh	2.6	2.5	2.5	2.5	2.4	2.4	2.3	2.3	2.2	2.2	2.1
2196 - 5860 MWh	1.9	1.8	1.8	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.6
Total Small User	36.8	36.8	36.8	36.5	36.5	36.6	36.6	36.2	36.0	35.8	35.8
> 5860 MWh	3.4	3.3	3.3	3.2	3.2	3.1	3.0	3.0	2.9	2.9	2.8
DM Firm Consumption	8.3	8.2	8.3	8.2	8.1	8.0	7.9	7.8	7.7	7.6	7.5
DM Interruptible Consumption	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Large User	11.9	11.8	11.6	11.4	11.3	11.1	10.9	10.8	10.6	10.5	10.3
Total LDZ	48.6	48.6	48.4	47.9	47.8	47.7	47.5	47.0	46.6	46.3	46.1
Firm Shrinkage	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Interruptible Shrinkage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Shrinkage	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Throughput	48.6	49.0	48.7	48.5	48.0	47.7	46.9	46.3	45.8	45.4	44.6
Gas Supply Year	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Total Throughput	49.0	48.8	48.5	48.2	47.9	47.1	46.5	45.9	45.5	44.8	44.2
Total Firm Demand	48.4	48.8	48.7	48.5	48.0	47.7	46.9	46.3	45.8	45.4	44.6
Total Interruptible Demand	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The information from this table is used to produce graph 5.1.3A.

Note that DM Interruption stops in 2016. This is due to the current contracts ending in September 2016.

Appendix A - Annual demands continued

Table 5a – Forecast annual demand – South Eastern LDZ load categories (TWh)

Calendar Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
0 - 73.2 MWh	36.4	36.8	36.6	36.6	36.5	36.3	35.9	35.6	35.3	35.1	34.7
73.2 - 732 MWh	5.0	5.2	5.1	5.0	5.0	5.0	4.9	4.8	4.7	4.6	4.4
732 - 2196 MWh	2.2	2.2	2.1	2.0	1.9	1.8	1.7	1.6	1.6	1.5	1.4
2196 - 5860 MWh	1.4	1.4	1.4	1.3	1.3	1.2	1.1	1.1	1.0	1.0	0.9
Total Small User	45.0	45.5	45.1	44.9	44.7	44.4	43.6	43.0	42.5	42.1	41.4
Firm >5860 MWh	1.7	1.7	1.7	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.1
DM Firm Consumption	8.5	8.1	8.4	8.2	8.1	8.1	8.0	7.9	7.8	7.7	7.6
DM Interruptible Consumption	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Large User	10.2	9.8	10.0	9.8	9.7	9.5	9.3	9.2	9.0	8.9	8.7
Total LDZ	55.3	55.3	55.2	54.8	54.3	53.9	52.9	52.2	51.5	51.0	50.1
Firm Shrinkage	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Interruptible Shrinkage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Shrinkage	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total Throughput	55.6	55.7	55.5	55.1	54.6	54.2	53.3	52.5	51.8	51.4	50.4
Gas Supply Year	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25
Total Throughput	56.0	55.5	55.2	54.8	54.4	53.5	52.8	52.1	51.6	50.7	50.0
Total Firm Demand	55.6	55.7	55.5	55.1	54.6	54.2	53.3	52.5	51.8	51.4	50.4
Total Interruptible Demand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The information from this table is used to produce graph 5.1.3b.

Appendix A - Annual demands continued

Table 5b – Forecast annual demand – South LDZ load categories (TWh)

Calendar Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
0 - 73.2 MWh	23.6	23.5	23.4	23.3	23.3	23.2	22.9	22.7	22.5	22.4	22.1
73.2 - 732 MWh	3.7	3.8	3.7	3.7	3.7	3.7	3.6	3.6	3.5	3.5	3.4
732 - 2196 MWh	1.9	1.9	1.8	1.8	1.7	1.6	1.5	1.5	1.4	1.3	1.3
2196 - 5860 MWh	1.1	1.1	1.1	1.1	1.0	1.0	0.9	0.9	0.9	0.8	0.8
Total Small User	30.3	30.3	30.0	29.9	29.7	29.5	29.0	28.6	28.3	28.0	27.5
Firm >5860 MWh	2.2	2.2	2.1	2.0	2.0	1.9	1.8	1.7	1.6	1.6	1.5
DM Firm Consumption	5.9	6.0	5.9	5.8	5.7	5.6	5.5	5.5	5.4	5.3	5.2
DM Interruptible Consumption	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Large User	8.1	8.1	8.0	7.8	7.6	7.5	7.3	7.2	7.0	6.9	6.7
Total LDZ	38.4	38.4	38.0	37.7	37.3	37.0	36.3	35.8	35.3	34.9	34.3
Firm Shrinkage	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Interruptible Shrinkage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Shrinkage	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Throughput	38.6	38.6	38.2	37.9	37.5	37.2	36.5	36.0	35.5	35.2	34.5
Gas Supply Year	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Total Throughput	38.7	38.2	38.0	37.7	37.4	36.7	36.2	35.6	35.3	34.6	34.1
Total Firm Demand	38.6	38.6	38.2	37.9	37.5	37.2	36.5	36.0	35.5	35.2	34.5
Total Interruptible Demand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The information from this table is used to produce graph 5.1.3b.

Appendix B - Peak Demand

Table 6 – Forecast 1 in 20 peak day demand (GWh per day)

LDZ	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Scotland	343	345	345	344	342	340	336	334	331	328	325
South East	458	461	458	457	456	453	448	444	440	436	432
South	330	330	327	326	324	321	317	314	311	308	304
SGN	1,131	1,136	1,129	1,127	1,122	1,114	1,102	1,092	1,081	1,072	1,061

Table 7 – Forecast 1 in 20 peak day demand Scotland Gas Networks (GWh/day)

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
0 - 73.2 MWh	227.8	228.8	229.4	230.2	230.8	229.8	228.8	227.9	226.8	225.7	224.6
73.2 - 732 MWh	34.5	36.7	37.1	37.2	37.5	37.7	37.3	37.0	36.7	36.4	36.1
732 - 2196 MWh	16.0	15.9	15.6	15.4	15.1	14.8	14.5	14.2	13.9	13.6	13.4
2196 - 5860 MWh	11.8	11.5	11.0	10.5	9.9	9.3	8.7	8.2	7.8	7.3	6.9
> 5860 MWh	19.8	19.9	19.9	19.9	19.9	19.9	19.9	19.8	19.7	19.7	19.6
Total NDM Consumption	291.9	292.5	290.3	290.0	291.2	292.1	291.5	290.5	289.5	288.5	287.6
DM Firm Consumption	32.0	32.0	31.0	29.8	28.6	27.6	26.7	25.9	25.0	24.3	23.5
Total Firm Consumption	323.9	324.6	321.2	319.8	319.8	319.8	318.2	316.3	314.5	312.8	311.1
Firm Shrinkage	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Total Firm Demand	324.5	325.1	321.8	320.3	320.3	320.3	318.7	316.9	315.1	313.3	311.6
DM Interruptible Consumption	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interruptible Shrinkage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Interruptible Demand	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total DM Consumption	32.8	32.0	31.0	29.8	28.6	27.6	26.7	25.9	25.0	24.3	23.5
Total Shrinkage	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Total LDZ Demand	325.0	324.8	322.1	321.0	321.2	321.1	319.7	318.0	316.3	314.6	313.1

The information from this table is used to produce graph 5.2.1a.

Appendix B - Peak Demand continued

Table 8a – Forecast 1 in 20 peak day demand South East LDZ (GWh/day)

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
0 - 73.2 MWh	337.7	339.8	339.7	340.0	340.0	337.7	335.5	333.3	331.1	328.9	326.7
73.2 - 732 MWh	43.5	45.1	43.6	43.7	43.8	44.0	43.2	42.4	41.7	40.9	40.2
732 - 2196 MWh	15.3	15.1	14.9	14.7	14.4	14.1	13.8	13.6	13.3	13.1	12.9
2196 - 5860 MWh	10.0	9.7	9.3	8.7	8.1	7.5	7.0	6.5	6.1	5.6	5.2
> 5860 MWh	12.0	12.1	12.2	12.4	12.6	12.8	12.9	13.0	13.1	13.2	13.3
Total NDM Consumption	406.7	409.2	406.8	404.7	405.3	405.6	403.1	400.0	396.9	393.8	390.8
DM Firm Consumption	38.3	37.9	37.5	37.0	36.4	35.7	35.1	34.6	34.0	33.5	32.9
Total Firm Consumption	445.0	447.2	444.3	441.7	441.7	441.4	438.3	434.6	430.9	427.3	423.8
Firm Shrinkage	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Total Firm Demand	445.9	448.1	445.2	442.6	442.6	442.3	439.1	435.4	431.8	428.2	424.7
DM Interruptible Consumption	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interruptible Shrinkage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Interruptible Demand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total DM Consumption	38.3	37.9	37.5	37.0	36.4	35.7	35.1	34.6	34.0	33.5	32.9
Total Shrinkage	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Total LDZ Demand	450.6	449.0	445.8	443.4	443.4	443.2	440.1	436.5	432.9	429.3	425.9

The information from this table is used to produce graph 5.2.1b.

Appendix B - Peak Demand continued

Table 8b – Forecast 1 in 20 peak day demand South LDZ (GWh/day)

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
0 - 73.2 MWh	228.1	226.4	226.4	226.6	226.7	225.1	223.6	222.0	220.5	218.9	217.4
73.2 - 732 MWh	33.5	34.0	33.2	33.4	33.6	33.9	33.5	33.2	32.8	32.5	32.2
732 - 2196 MWh	13.9	14.0	13.7	13.5	13.1	12.9	12.5	12.3	12.0	11.8	11.5
2196 - 5860 MWh	8.6	8.4	8.0	7.6	7.1	6.6	6.2	5.8	5.5	5.1	4.7
> 5860 MWh	16.2	16.5	16.4	16.4	16.3	16.4	16.2	16.2	16.0	16.0	15.8
Total NDM Consumption	308.0	302.0	300.7	299.3	299.9	300.1	298.1	295.8	293.5	291.3	288.2
DM Firm Consumption	29.4	29.8	28.6	27.8	26.5	25.9	24.9	24.3	23.4	22.9	22.0
Total Firm Consumption	337.3	331.9	329.3	327.1	326.4	325.9	322.9	320.2	316.9	314.2	310.2
Firm Shrinkage	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Total Firm Demand	337.9	332.4	329.9	327.7	327.0	326.5	323.5	320.7	317.5	314.8	310.8
DM Interruptible Consumption	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interruptible Shrinkage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Interruptible Demand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total DM Consumption	29.4	29.8	28.6	27.8	26.5	25.9	24.9	24.3	23.4	22.9	22.0
Total Shrinkage	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Total LDZ Demand	335.7	327.9	325.9	323.7	323.2	322.4	319.8	316.9	314.1	311.3	306.3

The information from this table is used to produce graph 5.2.1b.

Appendix C - Actual Flows

This appendix describes annual flows during the calendar year 2015.

Annual flows

Forecasts of annual demand are based on average weather conditions. Therefore, when comparing actual demand with forecasts, demand must be adjusted to take account of the difference between actual weather conditions and seasonal normal weather. The result of this adjustment is the weather corrected demand.

Recent winters have included some of the warmest of any in the weather data history employed for demand modelling, dating back to 1960-61. Consequently the basis of the average weather condition used for demand forecasting purposes has been adjusted to better reflect these conditions. Anecdotal evidence to the contrary is based on specific days or weeks and not the entire winter period. As a result of this, the 2015 weather corrected annual demands and forecasts are based on the industry's current view based on research in cooperation with the Hadley Centre, which is part of the Met Office.

Tables 9a to 9c provides a comparison of actual and weather corrected demands during the 2015 calendar year with the forecasts presented in the 2015 LTDS. Annual demands are presented in the format of LDZ load bands/ categories, consistent with the basis of system design and operation.

Table 9a – Annual demand for 2015 (TWh) – Scotland LDZ

	Actual Demand	Weather Corrected Demand	2015 LTDS Forecast Demand
0 - 73.2MWh	30.1	28.7	29.6
73 - 5860MWh	9.1	8.8	8.5
>5860MWh Firm	12.7	12.6	12.6
Total LDZs	51.9	50.1	50.7
Shrinkage	0.2	0.2	0.2
Total Throughput	52.1	50.3	50.9

Notes: Figures may not sum exactly due to rounding.

Appendix C - Actual Flows continued

Table 9b – Annual demand for 2015 (TWh) – South East LDZ

	Actual Demand	Weather Corrected Demand	2015 LTDS Forecast Demand
0 - 73.2MWh	38.7	36.7	36.1
73 - 5860MWh	8.8	8.4	8.3
>5860MWh Firm	9.3	9.2	11.5
Total LDZs	56.8	54.4	55.9
Shrinkage	0.4	0.4	0.3
Total Throughput	57.2	54.8	56.2

Notes: Figures may not sum exactly due to rounding.

Table 9c – Annual demand for 2015 (TWh) – South LDZ

	Actual Demand	Weather Corrected Demand	2015 LTDS Forecast Demand
0 - 73.2MWh	24.5	23.2	22.7
73 - 5860MWh	6.8	6.5	6.2
>5860MWh Firm	8.5	8.4	8.7
Total LDZs	39.8	38.0	37.6
Shrinkage	0.2	0.2	0.2
Total Throughput	40.0	38.2	37.8

Notes: Figures may not sum exactly due to rounding.

LDZ Winter Severity Statistics

Table 10 - SGN 6 month Winter Severities per LDZ

LDZ	1 in N
Scotland	1 in 6, warm
South East	1 in 8, warm
South	1 in 19, warm
National	1 in 12, warm

Notes: Sourced from the May 2016 National Grid report on winter severity statistics 2015/2016. The winter of October 2015 to March 2016 was generally in line, or warmer, than 2014/15 with the exception of a significantly warm period in November to December. February 2016 was also warmer than February 2015. This was the second warmest winter on record since 1960/61. These statistics cover the gas industry interpretation of winter lasting from October to March inclusively. By way of explanation a winter can be either warm, cold or average. The 1 in x is a measure of how far away from average it is and if it is either cold or warm. The most severe cold winter is the one that has happened once in the last 56 years. This would be a 1 in 56, cold winter and this occurred in 1962/63.

Appendix C - Actual Flows continued

Maximum and minimum flows

Table 11 – Actual Flows on the Maximum and Minimum Demand Day of Gas Year 2015/16

LDZ	Maximum Day 2015/2016	Minimum Day 2015/16
Scotland	23.43mscmd (16 January 2016)	4.44mscmd (19 July 2016)
South East	28.88mscmd (20 January 2016)	5.57mscmd (23 July 2016)
South	20.90mscmd (20 January 2016)	3.15mscmd (16 July 2016)

The table above indicates the highest and lowest daily demands seen between October 2015 and September 2016 and when they occurred.

Percentage flows

Table 12 – Maximum and Minimum percentage flows of Gas Year 2015/16

LDZ	Forecast Peak Day for 2015/16 (% of peak)	Maximum Day 2015/2016 as %age	Minimum Day 2015/2016 as %age
Scotland	29.34mscmd	79.9%	15.1%
South East	42.67mscmd	67.7%	13.1%
South	31.51mscmd	66.3%	10.0%

The table above shows the forecast peak day flow. It then converts the maximum and minimum values from table 11 above to percentages of the peak flow. So demand in the South varied from 20.9mscm or 66.3% of peak day down to 3.15mscm or 10% of peak day.

Appendix D - Gas Transportation System

Appendix D consists of diagrams of the general arrangement of the major pipelines and associated assets we operate. Please note that there is not a specific scale in use due to the differences in size between the areas covered by the differing LDZ. However the names of towns and cities are included as a means of reference. In addition we have published larger, more legible versions of the same schematics on our website which are intended to be printed at A3 size.

Should you require further information on the location of our assets please contact our plant control department at **plant.location@sgn.co.uk**

Scotland LDZ Schematic

IMAGE REDACTED - PLEASE REFER TO
https://www.linesearchbeforeudig.co.uk
FOR ANY PLANT LOCATION INFORMATION

Appendix D - Gas Transportation System

continued

South East LDZ Schematic

IMAGE REDACTED - PLEASE REFER TO
https://www.linesearchbeforeudig.co.uk
FOR ANY PLANT LOCATION INFORMATION

Appendix D - Gas Transportation System

continued

South LDZ Schematic

IMAGE REDACTED - PLEASE REFER TO
https://www.linesearchbeforeudig.co.uk
FOR ANY PLANT LOCATION INFORMATION

Appendix E - Glossary

Annual Quantity (AQ)
The AQ of a supply point is its annual consumption over a 365 or 366-day year, under conditions of average weather.

Bar
The unit of pressure that is approximately equal to atmospheric pressure (0.987 standard atmospheres). Where bar is suffixed with the letter g, such as in barg or mbarg, the pressure being referred to is gauge pressure, i.e. relative to atmospheric pressure. One-millibar (mbar) equals 0.001 bar.

BEIS
Department for Business, Energy and Industrial Strategy. UK Goverment department which includes many of the roles of DECC. This includes climate change and energy supplies.

Biomethane
Biogas that has been cleaned in order to meet GSMR requirements.

Bioplant
Plant that will process biogas or gas produced by any alternative methods in biomethane. This can involve removal of sulphur content, reduction in oxygen or any other content which will otherwise make the gas unsuitable for injection into the gas networks owned by us.

BRIC
Brazil, Russia, India and China. Generic term for major emerging economies especially these four countries.

Calorific Value (CV)
The ratio of energy to volume measured in Mega joules per cubic meter (MJ/m^3), which for a gas is measured and expressed under standard conditions of temperature and pressure.

Climate Change Levy (CCL)
Government tax on the use of energy within industry, commerce and the public sector in order to encourage energy efficient schemes and use of renewable energy sources. CCL is part of the UK Government's Climate Change Programme (CCP).

Connected System Exit Point (CSEP)
A connection to a more complex facility than a single supply point. For example a connection to a pipeline system operated by another Gas Transporter.

Cubic Metre (m^3)
The unit of volume, expressed under standard conditions of temperature and pressure, approximately equal to 35.37 cubic feet. One million cubic metres (mcm) are equal to 10^6 cubic metres, one billion cubic metres (bcm) equals 10^9 cubic metres.

Daily Metered Supply Point
A supply point fitted with equipment, for example a data-logger, which enables meter readings to be taken on a daily basis. These are further classified as SDMC, DMA, DMC or VLDMC according to annual consumption. Of these the most relevant is VLDMC which is defined further on.

Distribution Network (DN)
An administrative unit responsible for the operation and maintenance of the local transmission system (LTS) and <7barg distribution network's within a defined geographical boundary, supported by a National Emergency Services organisation.

Distribution System
A network of mains operating at three pressure tiers: intermediate (7 to 2barg), medium (2barg to 75mbarg) and low (less than 75mbarg).

Appendix E - Glossary continued

Diurnal Storage
Gas stored for the purpose of meeting within day variations in demand. Gas can be stored in special installations, such as gasholders, or in the form of linepack within transmission, i.e. >7barg pipeline systems.

DECC
Department of Energy and Climate Change. In 2016 absorbed into Department for Business, Energy and Industrial Strategy.

Embedded Entry Points
Entry point which is not an offtake from NTS. Can be a biomethane or other unconventional source of gas.

Exit Zone
A geographical area within a LDZ that consists of a group of supply points, which on a peak day, receive gas from the same NTS Offtake.

Formula Year
A twelve-month period commencing 1 April predominantly used for regulatory and financial purposes.

Future Energy Scenarios (FES)
National Grid's annual industry-wide consultation process encompassing the Ten Year Statement, targeted questionnaires, individual company and industry meetings, feedback on responses and investment scenarios. Previously called Transporting Britain's Energy.

Gas Transporter (GT)
Formerly Public Gas Transporter (PGT). GTs such as SGN, are licensed by the Gas and Electricity Markets Authority to transport gas to consumers.

Gas Supply Year
A twelve-month period commencing 1 October also referred to as a Gas Year.

Gemini
A computer system which supports Uniform Network Code operations, including energy balancing.

Interconnector
This is a pipeline transporting gas from or to another country.

Interruptible Supply Point
A supply point that offers lower transportation charges where SGN can interrupt the flow of gas to the supply point and that is prepared to be interrupted if the Transporter needs it to.

Kilowatt hour (kWh)
A unit of energy used by the gas industry. Approximately equal to 0.0341 therms. One Megawatt hour (MWh) equals 10^3 kWh, one Gigawatt hour (GWh) equals 10^6 kWh and one Terawatt hour (TWh) equals 10^9 kWh.

Linepack
The usable volume of compressed gas within the National or Local Transmission System at any time.

Liquefied Natural Gas (LNG)
Gas stored in liquid form. Can be firm or constrained (CLNG). Shippers who book a constrained service agree to allow us to use some of their gas to balance the system.

Load Duration Curve (Average)
The average load duration curve is that curve which, in a long series of winters, with connected load held at the levels appropriate to the year in question, the average volume of demand above any given threshold, is represented by the area under the curve and above the threshold.

Appendix E - Glossary continued

Local Distribution Zone (LDZ)
A geographic area supplied by one or more NTS offtakes. Consists of High Pressure (>7barg) and lower pressure distribution system pipelines.

Local Transmission System (LTS)
A pipeline system operating at >7barg, that transports gas from NTS offtakes to distribution systems. Some large users may take their gas direct from the LTS.

National Balancing Point (NBP)
An imaginary point on the UK gas supply system through which all gas passes for accounting and balancing purposes.

Nomenclature of territorial Units for Statistics (NUTS)
Single system classification of spatial units used across the European Union.

National Transmission System (NTS)
A high-pressure system consisting of terminals, compressor stations, pipeline systems and offtakes. Designed to operate at pressures up to 85barg. NTS pipelines transport gas from terminals to NTS offtakes.

National Transmission System Offtake
An installation defining the boundary between NTS and LTS or a very large consumer. The offtake installation includes equipment for metering, pressure regulation, etc.

Non-Daily Metered (NDM)
A meter that is read monthly or at longer intervals. For the purposes of daily balancing, the consumption is apportioned using an agreed formula, and for supply points consuming more than 73.2MWh pa reconciled individually when the meter is read.

Odorisation
The process by which the distinctive odour is added to gas supplies to make it easier to detect leaks. Odorisation is provided at all Network Entry points.

Office of Gas and Electricity Markets (Ofgem)
The regulatory agency responsible for regulating the UK's gas and electricity markets.

Offtake
An installation defining the boundary between NTS and LTS or a very large consumer. The offtake installation includes equipment for metering, pressure regulation, etc.

ONS
Office for National Statistics

Operating Margins
Gas used to maintain system pressures under certain circumstances, including periods immediately after a supply loss or demand forecast change, before other measures become effective and in the event of plant failure, such as pipe breaks and compressor trips.

OPN
Offtake Profile Notice. Method of notifying National Grid of the next day or future demand for gas at offtakes.

Peak Day Demand (1 in 20 Peak Demand)
The 1 in 20 peak day demand is the level of demand that, in a long series of winters, with connected load held at the levels appropriate to the winter in question, would be exceeded in one out of 20 winters, with each winter counted only once.

Appendix E - Glossary continued

Price Control Review
Ofgem's periodic review of Transporter allowed returns. The current period has been called RIIO and will cover April 2013 to March 2021.

PRI
Pressure Regulating Installation. The replacement term for PRS, district governor and all other local terms (such as STRS or TRS) when IGEM standard TD13 was introduced.

PRS
Pressure Regulating Station. An installation which reduces the supply pressure as gas passes between different pressure rated tiers of the LTS or from the LTS to the below 7barg network or between different pressure tiers of the <7barg network.

Seasonal Normal Temperature (SNT)
Seasonal Normal Temperature is the average temperature that might be expected on any particular day, based on historical data.

Shipper or Network Code Registered User (System User)
A company with a Shipper Licence that is able to buy gas from a producer, sell it to a supplier and employ a GT to transport gas to consumers.

Shrinkage
Gas that is input to the system but is not delivered to consumers or injected into storage. It is either Own Use Gas or Unaccounted for Gas.

Supplier
A company with a Supplier's Licence contracts with a shipper to buy gas, which is then sold to consumers. A supplier may also be licensed as a shipper.

Supply Hourly Quantity (SHQ)
The maximum hourly consumption at a supply point.

Supply Offtake Quantity (SOQ)
The maximum daily consumption at a supply point.

Supply Point
A group of one or more meters at a site.

Therm
An imperial unit of energy. Largely replaced by the metric equivalent: the kilowatt hour (kWh). 1 therm equals 29.3071 kWh.

Transporting Britain's Energy (TBE)
National Grid's annual industry-wide consultation process encompassing the Ten Year Statement, targeted questionnaires, individual company and industry meetings, feedback on responses and investment scenarios. In 2013 rebranded as Future Energy Scenarios.

Unaccounted for Gas (UAG)
Gas lost during transportation. Includes leakage, theft and losses due to the method of calculating the Calorific Value.

Uniform Network Code (UNC)
The Uniform Network Code covers the arrangements between National Grid, shippers and the DNs following the selling off of four of the Networks.

UKCS
United Kingdom Continental Shelf.

UK-Link
A suite of computer systems that supports Uniform Network Code operations. Includes Supply Point Administration; Invoicing, and the Sites and Meters database.

VLDMC
Very Large Daily Metered Site. A site which uses greater than 50,000,000 therms per annum.