SGN
Your gas. Our network.

Long Term Development Statement 2018

Network Capacity

Contents

Foreword

Welcome to our Long Term Development Statement for 2018

Our Long Term Development Statement (LTDS) is produced by our Network capacity team along with input from across our business. It is the product of a yearly cycle of data gathering, analysis and consultations with our stakeholders, which allows us to understand how our business may develop over the next 10 years and to a lesser extent beyond.

This work informs our operational strategy as well as our investment and business decisions and in turn, allows our customers to identify and evaluate opportunities for entry and exit gas connections.

Each year we update our demand forecasts with learning from the previous year. This ensures we are in the best position to deliver a reliable gas supply for our customers whatever challenges the future may hold.

In late February/early March 2018, the 'beast from the east' weather event arrived and the UK gas industry experienced the highest demands we have seen for some years.

The accuracy of our demand forecasts, together with the excellent work of colleagues across our entire business, meant we were able to keep the gas flowing without interruption for our 5.9m customers.

This year, we have built on the changes we made in 2017 which resulted in an easier to read, more accessible publication.

We are in a rapidly changing energy industry and want to ensure our LTDS remains a valuable decision-making tool for our stakeholders by tailoring the information we supply to meet our customers' requirements.

To do this we need your feedback, so we have introduced a very short survey available through our website.

We hope you will spend a few minutes completing the survey. If for any reason you are unable to do so but would still like to have a voice in shaping our LTDS, please contact the team with your thoughts at: **network.capacity@sgn.co.uk**

Paul Denniff
Network and Safety Director

LTDS annual cycle

February

We provide pre-forecast information to National Grid Gas UK Transmission (NGG UKT)

February / March

We and NGG UKT meet to discuss pre-forecast data

April

We provide our initial forecasts to NGG UKT

May

NGG UKT supplies final forecast information to us

June

We meet NGG UKT to discuss final forecasts

July

NGG UKT provides calorific value (CV)

October

We publish our LTDS

The research we carry out to inform our LTDS is completed by the end of May each year

The next 10 years

By 2028 we expect to have seen a net reduction in annual gas demand of 8.79% and Peak day demand of 4% across our three local distribution zones (LDZs).

Manufacturing

Increases in output in 2016 continued throughout 2017

GDP

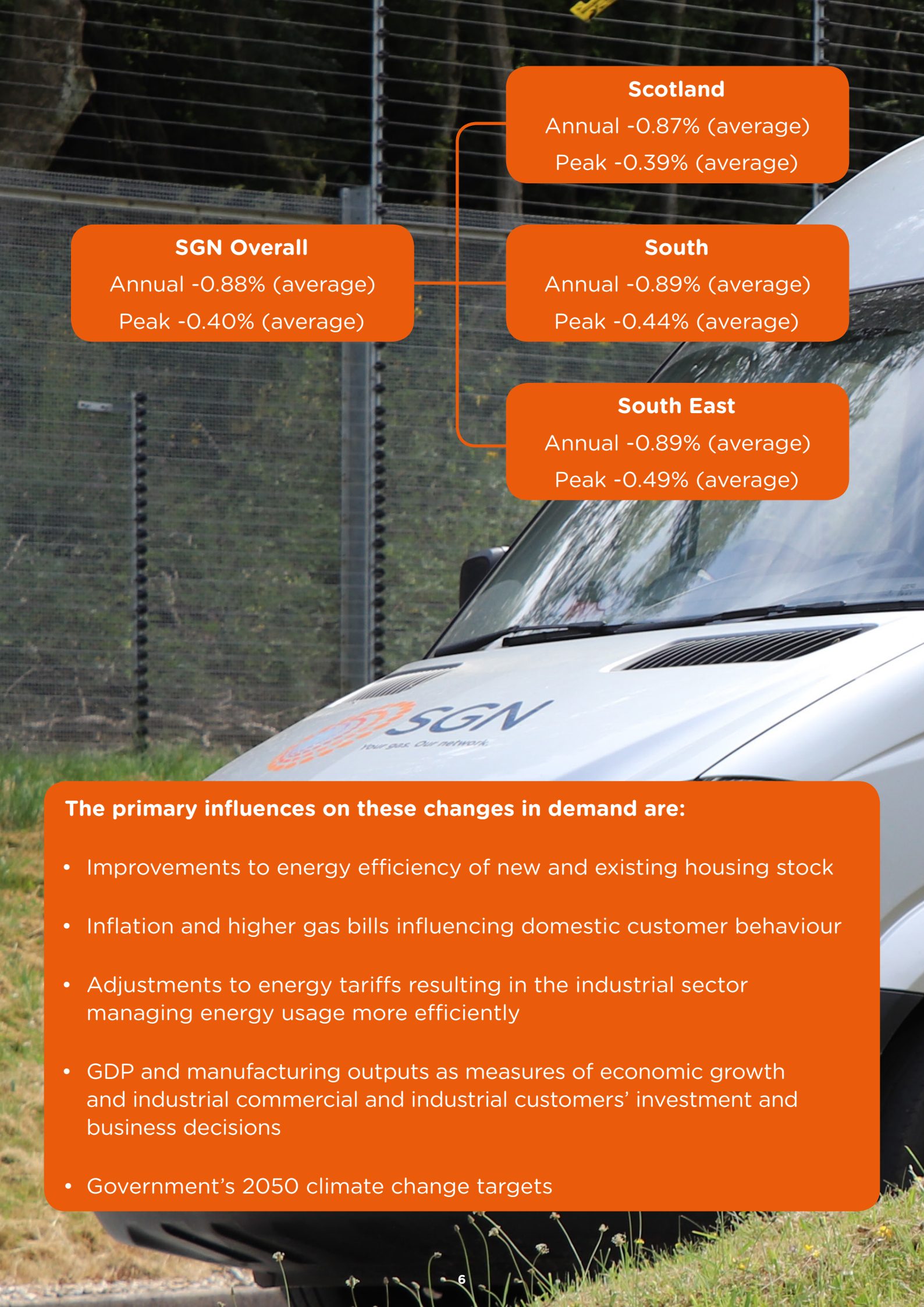
We saw growth in 2017 as forecast, albeit slightly less than expected at around 1.8%.

The forecast for 2018 is a continued level of growth at around 1.4% to 1.6%

Inflation

The forecast for 2018 is between 2.0% and 2.4%.

The forecast for 2019 is a higher level of inflation of 2.2% compared to the forecast of 2.0% for 2017



Scotland

Annual -0.87% (average)

Peak -0.39% (average)

SGN Overall

Annual -0.88% (average)

Peak -0.40% (average)

South

Annual -0.89% (average)

Peak -0.44% (average)

South East

Annual -0.89% (average)

Peak -0.49% (average)

The primary influences on these changes in demand are:

- Improvements to energy efficiency of new and existing housing stock
- Inflation and higher gas bills influencing domestic customer behaviour
- Adjustments to energy tariffs resulting in the industrial sector managing energy usage more efficiently
- GDP and manufacturing outputs as measures of economic growth and industrial commercial and industrial customers' investment and business decisions
- Government's 2050 climate change targets

Our customers

Our customer numbers continue to grow year-on-year despite a reduction in Peak day and annual gas demand.

We believe the UK's gas networks are key to delivering the least cost, lowest impact future energy solution for our customers, while helping the UK to meet its 2050 carbon reduction targets.

Our customers tell us they would like us to increase the amount of green gas in our networks and see us push ahead with innovative ways of delivering an affordable low carbon source of energy.

We are increasingly doing more to inform our customers of the benefits of a low carbon gas network as well as explain the impact of the alternative options.

Our customers' views and opinions are already helping us positively shape our forecasts and business strategy.

2013
5.87m

2014
5.88m

2015
5.91m

2016
5.92m

2017
5.93m

2028
6.1m

Our potential customer numbers at the current rate of increase

The factors we see influencing our forecasts in future are:

Embedded power

We saw an extremely high number of requests for these connections during 2016/17 and we expected many more would progress to completion than actually did.

This year we have seen reports which indicate this customer group is likely to grow faster than previously believed as a result of the hot weather and an increasing desire to cool our homes. These peak demand energy sources are seen as key to filling the gap when renewables are not available due to low wind levels and insufficient solar capacity.

If the reports prove accurate this will impact on how we manage our networks.

This is yet another example of the evolving challenges the industry faces when it comes to supplying this group of customers.

We anticipate during 2018/19 and into 2020 an increasing number of requests for these connections progressing to completion.

Because of this, we are looking at how we may better include this emerging customer base within our forecasts and network management strategy.

Efficiency improvements

We know modern boilers and intelligent control systems are having an impact on gas demand and our challenge is to understand what this will be.

This is a complex issue due to how technology, comfort levels and gas prices come together to influence customer behaviour and at present there is a lack of data which we can use within our forecasts.

You will be able to read more elsewhere in this publication on how we are working with our colleagues in the other three gas distribution companies as well as industry experts to better understand this area.

Smart metering

The eventual impact and benefits of smart metering is one of the many unknowns we have been monitoring to determine when there may be a sufficient change in customer behaviour and then data available to influence our forecasts.

The roll-out of smart meters continues to be a popular topic for debate during our stakeholder events.

Last October the Government re-affirmed its commitment to the technology with the release of the Smart Meters Bill.

The target for completion remains the end of 2020 despite delays due to technological issues.

Of note is the proliferation of home energy management systems, with enhanced functionality, which may result in customer interest being diverted away from smart metering as the preferred way of reducing bills.

This year, as last year, we continue to monitor this emerging technology and await the data required to influence our forecasts.

Hydrogen

The presence of hydrogen in our gas networks is not new as it made up to around 50% of the town gas we used up until the 1970s.

As an industry, we are again looking to see how this now potentially green energy source may be used to the benefit of our customers.

There are a number of challenges to overcome first but along with our colleagues throughout the UK gas industry, we are committed to exploring and overcoming these. We believe both blended and 100% hydrogen gas networks could be a key element of the energy mix which allows the UK to meet its 2050 carbon targets.

Renewables

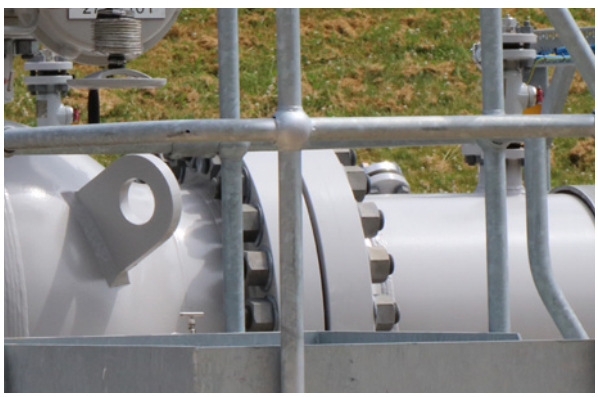
There are a number of renewable technologies emerging which may ultimately influence our forecasts.

- Air source heat pumps
- Ground source heat pumps
- Solar heat
- Thermal stores

2017 saw an increase to the renewable heat incentive (RHI) tariffs for domestic air source heat pumps, ground source heat pumps, and biomass boilers and stoves.

The current tariff changes suggest there is growing recognition for a need to support renewables, with the previous decline in support for biomass being reversed, air source heat pumps increasing significantly and minor increases for solar thermal and ground source heat pumps.

The uptake for these technologies following the tariff changes will be monitored during the next planning period to see how they may impact our long-term thinking.



Transport

Along with our partners, we are promoting the use and benefits of natural gas and LNG as a renewable source of energy for transport. Electric vehicles are also projected to reach around one million by early 2020 with as many as nine million by 2030.

The impact this may have on our gas networks is dependent upon several issues. These include customer choice, how electricity is generated and how Government policy influences change and innovation.

Housing

Last year we explained how Government policy relating to the standards for carbon neutrality of housing changed in 2016.

As part of our work with our colleagues within the other DN's we are looking at the evidence to discover how improvements or alterations to new and existing housing might inform our forecasts.

Heat

Up until 2013 electricity was seen as the best way to heat our homes in the future. However, many subsequent reports have shown this option to be too expensive and prompted a Government review in 2013.

The Government is currently reassessing the best value options to de-carbonise heat and a revised policy is expected to be published in the early 2020s. This should allow a better understanding of the role the UK's gas networks will play in the overall energy mix, which we will then accommodate within our forecasts and business plans.

We are addressing these factors by working with our colleagues in Wales & West Utilities (WWU), Cadent and Northern Gas Networks to better understand how emerging technologies and a changing energy market may impact on demand forecasting and network management.

The initial data from this project will be available to all partners in late 2018 for consideration during next year's planning cycle; this will also be shared with National Grid to help inform it's long term strategy.

RIIO GD2

We have been working with our stakeholders to understand the role they see the gas networks playing in the future.

From this and other research, we believe gas will play an important part in both the short and long-term future energy mix.

Our stakeholders have told us if we are able to decarbonise the gas flowing to people's homes and businesses it will minimise disruption and save the need for them to convert to more expensive forms of low carbon heat. Importantly, they also recognised this would help to meet the UK's carbon reduction targets.

As the start of the next price control period RIIO-GD2 approaches in April 2021, we and the other gas network companies are working with Ofgem on a future proof regulatory environment to support the decarbonisation of our networks, but also one which continues to meet the growing expectations of our customers.

In the meantime, we continue to invest in our networks to provide a safe low-cost, highly reliable energy transportation system on behalf of our growing number of customers.

With peak heat demand at least four times higher than peak electricity demand, we believe low carbon solutions, which utilise our existing gas network infrastructure, will allow for the decarbonisation of heat at the lowest cost and least disruption to customers...

In the short-term

Facilitating green gas solutions such as biomethane and bioSNG into the gas network, making the network smarter by widening the range of gases permitted into the network and developing a new billing methodology that meets current and future needs.

In the medium-term

Adding hydrogen to that blend.

In the longer-term

Evidencing the potential to move towards 100% hydrogen networks.

Our point of contact for RIIO-GD2 related matters is Danny Symes, RIIO-GD2 Project Manager.
danny.symes@sgn.co.uk

Innovation

With an eye to the future, we use our innovation strategy to help understand how we may further support our customers' needs.

Innovation across SGN is used to develop new solutions to problems which exist now or which we anticipate we may face in the future.

In April 2018 alongside our colleagues at WWU, Cadent, Northern Gas Networks, National Grid Gas Transmission and the Energy Networks Association (ENA), we launched a joint gas networks innovation strategy.

This document set out how we could provide continuing benefits to our customers from our innovation projects. It shows the key themes which all parties align their innovation projects against and demonstrates how a collaborative approach ensures consistency and cost savings across the UK's gas industry.

If you would like to explore this publication further you can access it at: **www.sgn.co.uk/Publications/Innovation/**

We, along with our colleagues in the wider gas industry, believe innovation is key to....

- The continued operation of a safe, reliable and affordable gas network which customers need, and
- Develop solutions for a cost effective low carbon economy

We publish annually a summary of our innovation activities.

You can access this information at **www.sgn.co.uk/Publications/Innovation/**

Current innovation projects specifically related to our long-term demand strategy are our **Real Time Networks project** and our **H100 100% hydrogen project**.

REAL-TIME NETWORKS

Our commitment to these projects show how we believe the UK's gas networks are key to delivering the least cost, low impact future energy solution for customers.

Customers looking to explore innovative opportunities with us should please get in touch with our Director of Energy Futures, Gus McIntosh. **angus.mcintosh@sgn.co.uk**

Network strategy

SGN has been at the forefront of the development of the biomethane industry since the first commercial site was connected at Poundbury in Dorset in 2012.

Biomethane in our networks is key to our delivering a safe, secure and low carbon energy source for homes and businesses, while helping to alleviate fuel poverty. Utilising our licence obligations to enable biomethane entry connections helps us realise the full potential of our networks and contributes towards the UK meeting its carbon reduction obligations. In 2017 our networks transported half of all the UK's biomethane.

We aim to provide a fast and efficient service to our customers in the biomethane industry, going over and above our licence obligations relating to entry connections to develop strategic sites which allow biomethane producers, without the required facilities, to inject their product into our network.

Our response to a customer's request is focused on assisting them in choosing the best locations to maximise the injection of biomethane into our networks, enabling them to secure the optimum financial returns.

The current model for connecting biomethane facilities to our networks encompasses a minimum connection model. The quality of the biomethane gas is monitored, including energy content, to ensure both legislative and regulatory standards are maintained. Once connected, we continue to work with the biomethane producers to ensure we can maximise gas injection rates while maintaining security of supply.

As with all the gas in our networks, we don't own the gas produced by biomethane plants. Biomethane producers sell their green gas to licensed gas shippers and suppliers who in turn contract with domestic and business customers.

Details of all gas shippers and suppliers are available on Ofgem's website – a link to this site is available within our glossary. Some of which may focus their supply contracts on green forms of energy such as biomethane.

The total energy input into both networks per year is circa 3,550,000 Mwh which has the potential to supply 284,176 domestic customers.

We currently have 15 biomethane facilities connected to our network in Scotland and 14 connected to our Southern networks. We are working with our customers to facilitate the connection of a further 14 sites prior to the Renewable Heat Incentive (RHI) target commissioning date of January 2020.

If you would like to know more about Biomethane and Natural Gas Vehicles, please get in touch with our Network Strategy Manager, Joel Martin. **joel.martin@sgn.co.uk**

We are members of the Natural Gas Vehicle Network (NGVN). This body is central to the promotion of natural gas usage as an important part of the overall plan to reduce the carbon emissions from vehicles in the UK.

With other partners, we are working closely with them to better understand how our gas network infrastructure may provide capacity at the required geographical locations.

NGV NETWORK

<7bar distribution system

Our gas distribution system is designed and managed to meet a peak six-minute demand level that could be experienced under 1:20 weather conditions, or in other words, the highest demand that can be statistically expected to occur once every 20 years. We continue to invest in our networks to facilitate new connections, taking into consideration future growth. This ensures we maintain security of supply for all our customers.

When planning our activities, we engage with our customers to reduce the impact on them of our works.

Both of the southern major projects in Wavendon and Allington described as 'under construction' in last year's LTDS were successfully completed on time, allowing our customers to complete their connections as per their agreed schedules. Details of current projects under consideration of construction and completion can be found in Appendix 2 on pages 43-44.

Strategic planning reviews

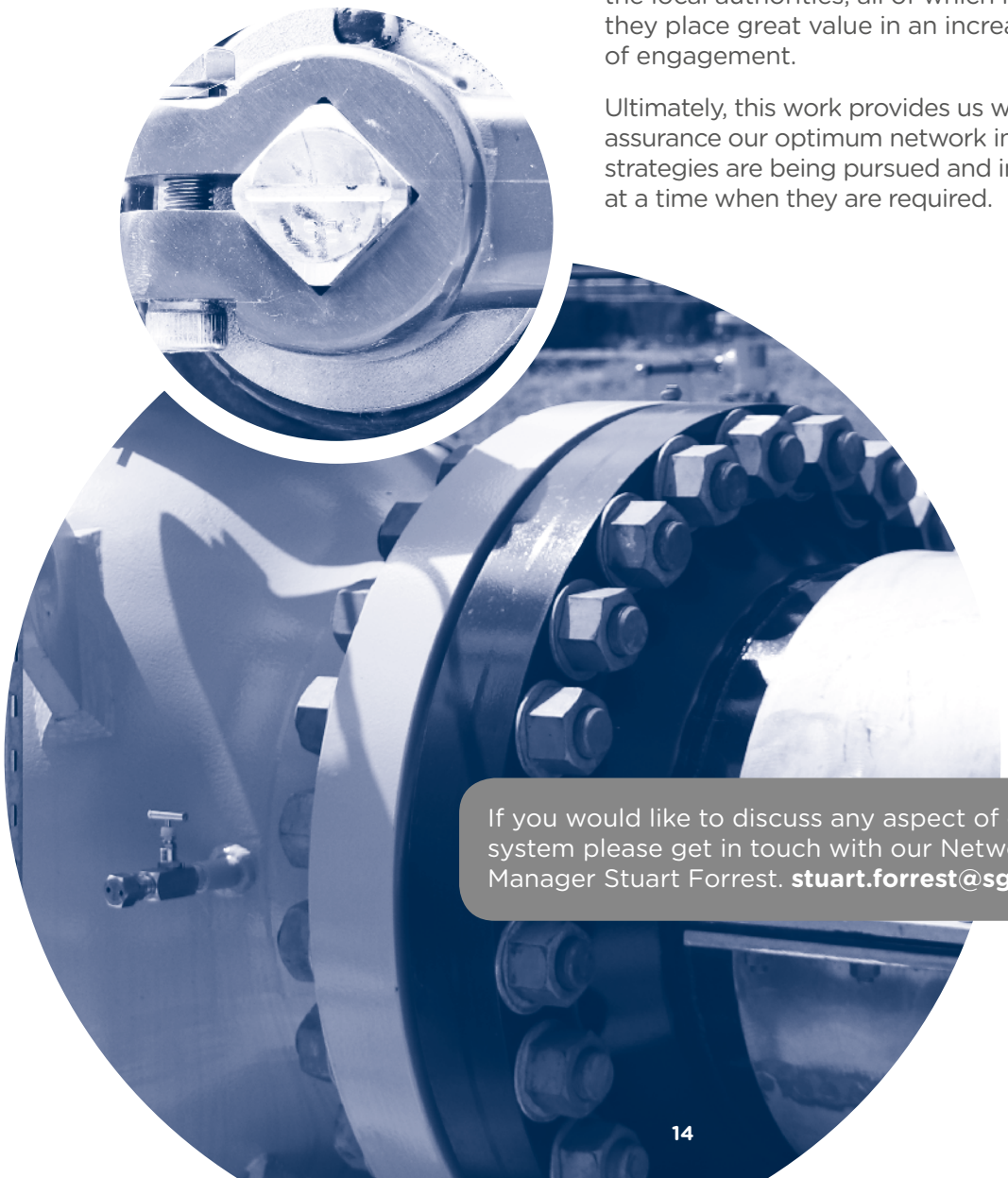
In order to establish a fully informed and independently sourced picture of the forecast demand growth within our networks, we have initiated an extensive programme of stakeholder engagement, working closely with local authorities both in Scotland and the south of England.

The objective of these reviews is to ensure we continue to deliver gas safely, reliably and effectively to all our customers, both now and in the future, by establishing a clear picture of long-term system requirements.

We see this detailed understanding as critical to ensuring larger scale projects in particular may be delivered in a timely manner, while avoiding capacity constraints, which can in turn become a blocker to planned developments.

This approach has been well received by the local authorities, all of which indicated they place great value in an increased level of engagement.

Ultimately, this work provides us with assurance our optimum network investment strategies are being pursued and implemented at a time when they are required.



If you would like to discuss any aspect of our distribution system please get in touch with our Network Planning Manager Stuart Forrest. **stuart.forrest@sgn.co.uk**

Third party connections

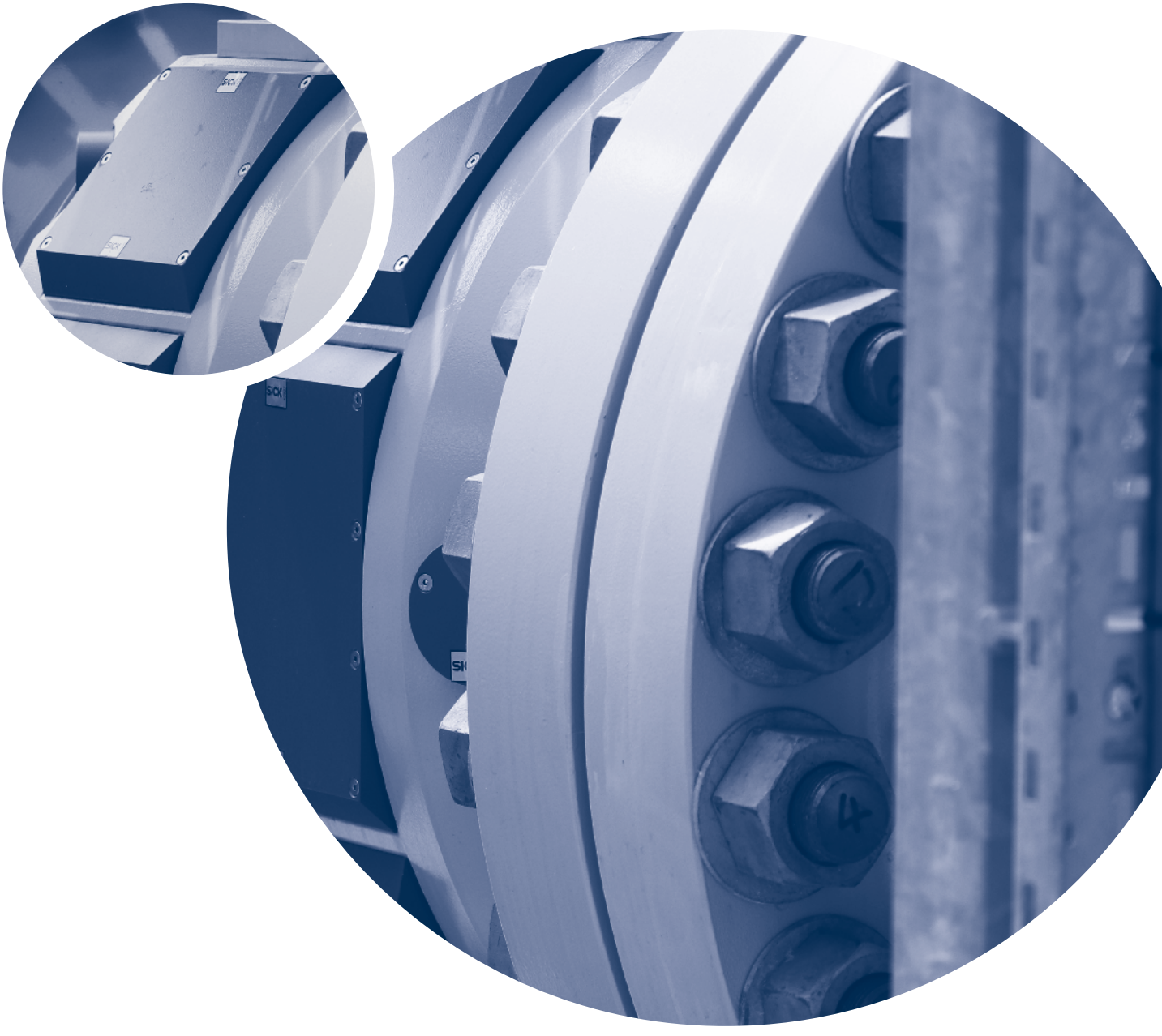
Our Third party connections team is our primary point of contact for Independent Gas Transporters (iGTs) or Utility Infrastructure Providers (UIPs) accredited under the Gas Industry Registration Scheme (GIRS) looking to make connections to our networks.

iGTs and UIPs with connection queries can contact our Third Party connections team: **soe_gtuip_sgn@sgn.co.uk**.

Connections for embedded power generation sites intended to satisfy National Grid electricity reserve will be subject to an additional Network Exit Agreement (NExA) and possibly, upon application to National Grid Gas UK Transmission (NGG UKT), a Planning and Advanced Reservation of Capacity Agreement (PARCA).

Capacity within our networks is made available on a 'first come first served basis' as per SGN Connections Charging Methodology and Standard Condition 4B Statement, Appendix B and the Uniform Network Code therefore quotations may be issued as interactive along with other customers' requests.

In the event of an interactive quotation being accepted, we will advise our other customers of the acceptance and requirement to issue a requote for their request.



Regulation

As a Distribution Network Operator (DNO), our activities are regulated by Ofgem through our gas transportation licence. These activities are supported by a suite of industry codes which further define our responsibilities and also set out how we will engage and transact with our industry colleagues. These are then delivered by our systems, processes and colleagues, with a continuous focus upon compliance, efficiency and best practice.

Network efficiency and flexibility

In last year's Long Term Development Statement we highlighted several mechanisms within the Uniform Network Code (UNC) which allow us to work with our customers, to manage their capacity and create flexible solutions to help meet their requirements.

We have continued our focus on engagement in this area and have recently undertaken our annual supply point offtake review. This assists users in understanding variations between their reserved and utilised capacity.

We also continue to encourage our customers to make use of interruption contracts and/or summer capacity contracts.

These help ensure the network is used as efficiently as possible, creating potential cost savings to customers.

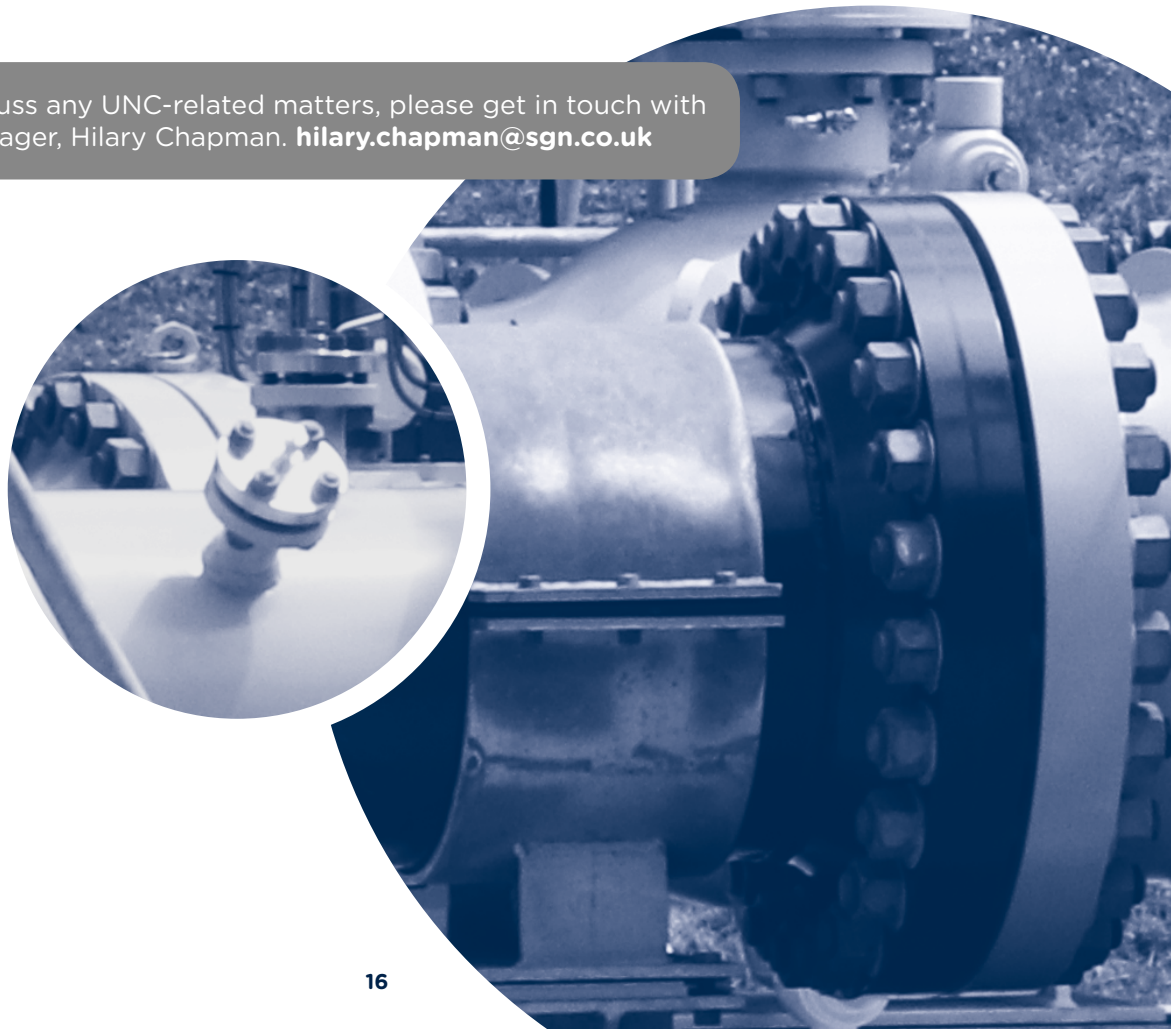
UNC modifications to improve customer experience

Customer experience is at the heart of our business and we have taken a leading role looking at industry processes. This is to ensure we meet the needs of not only ours, but all customers across the UK. These changes are referred to as a 'modification' and are made to the industry codes mentioned earlier.

This year we implemented a change to enhance the validation of meter and address information which takes place before a site visit occurs. This has the benefit of increasing the accuracy of industry data and leading to lower customer disruption, as a result of site visits. This modification is Uniform Network Code Modification 0518 – Verification of Meter and Address Details.

The above modification is just one example of where we work with other GDN's and suppliers to improve cross-party processes, for the benefit of customers. Similarly, we regularly engage directly with end-use customers to support their understanding and follow industry processes. This provides further opportunities to understand requirements from their perspective and seek to raise the appropriate changes to the relevant industry codes. We welcome such valuable engagement from our stakeholders and will continue this in the future.

If you would like to discuss any UNC-related matters, please get in touch with our Industry Codes Manager, Hilary Chapman. **hilary.chapman@sgn.co.uk**



More detail

This section, along with Appendices 1 and 2, provide a more in-depth view of the information and econometric assumptions used to develop our forecasts. Please do get in touch if you would like to discuss the forecasting process further or feel we have not covered everything here. See contact details on page 48.

Regulatory obligations
We produce our LTDS in accordance with our Gas Transporter Licence and Section 'O' of the Uniform Network Code Transportation Principal Document obligations. In addition, the Uniform Network Code Offtake Arrangements document sets out the framework for exchanging the necessary information to assist transporters to generate long-term demand forecasts. The publication of our LTDS forms part of this process.

The publication of our LTDS provides our customers with an overview of our 10-year forecast of the annual and Peak day demands which we use in the management of our gas networks.

These forecasts' primary function is to ensure we maintain our 1 in 20 licence obligations, ensuring our domestic customers can benefit from an affordable and reliable supply of energy.

Forecasting process
We work with expert industry partners to develop the forecasts each year. The starting point is the actual demand data from the previous year, which is analysed along with information procured from recognised industry sources. The results are tested against the previous year's forecast to improve the accuracy year-on-year. This gives us greater confidence when planning work on our networks and the suitability of investment decisions we make on behalf of our customers.

Over time, this forecast methodology has proven very reliable in ensuring we are able to keep gas flowing even during the more challenging times, such as late February/early March 2018, during periods of unusually adverse weather.

Validating our 1:20 Peak day
Our 1:20 Peak day demand is determined year on year using historical demand and weather data. The extremely low temperatures in early 2018 allowed us the opportunity to validate our current forecast regime against an actual extreme weather event. The resulting analysis showed our 2017 1:20 Peak day for SGN overall was accurate to within 0.25%.

Improving the process
We recognise while our forecasting regime has served us and our customers extremely well, the UK's energy infrastructure will be undergoing changes to facilitate a low carbon future and this requires us to understand the role we will be playing within the energy mix.

As a result, our planning process now requires two separate viewpoints. The immediate one, which is covered by our 10-year statement whereby we maintain current operating requirements and continue to invest in our networks to maintain a reliable supply of gas for our customers and a more long-term view of what might develop.

To add to the mix of variables, our current price control RIIO-GD1 comes to an end in 2021. This means we must look beyond 2021 for our more immediate planning considerations to ensure we maximise the value of our investment decisions.

Looking ahead we will be connecting more with our stakeholders, including our colleagues in the other three GDNs, sharing best practice and looking for ways to engage with new areas of the energy industry.

Over time, this additional information will help inform and improve the accuracy of our analysis. It's early days however, and a lot of the changes we might see in the energy industry are yet to develop sufficiently, so at present there's very little additional data we can use to improve the accuracy of our forecast in this ten-year planning horizon.

Development of our transportation networks is primarily demand driven although in recent years biomethane injection has had an impact on our approach to demand management. As discussed earlier, the connection of embedded power stations is likely to require a major change in how we manage demand.

UK view
Readers looking for an understanding of the UK's overall energy supply position and security of supply assessment, can refer to National Grid for its 10-year statement for the National Transmission System (NTS) and other publications and consultations including the Future Energy Scenario process (FES). **www.nationalgrid.com/uk/publications/gas-ten-year-statement-gtys**

Demand forecasting performance

Here we show how our 2017 forecast performed and what we have done this year to improve the accuracy of our 2018 forecast.

As you read this information, please be aware when we talk about a particular year's forecast, it relates to that year's Long Term Development Statement 10-year forecast. Also, when we refer to our networks we generally only talk about Scotland and Southern although for the purpose of regulatory reporting we are uniquely required to discuss each of our local distribution networks (LDZs) individually, so you will also see Scotland and for England, South East and South shown separately.

0 to 73 MWh - Domestic
Scotland LDZ - we saw a rise in the level of gas demand in this sector (3.9%), when compared to last year. Our analysis shows the upturn in demand is a result of a lower gas price than expected.

South East LDZ - there has been no overall change in gas demand in this sector, compared to a decline in demand last year of 3.7%.

South LDZ - has seen a small increase in the level of gas demand in the last two years of 0.5%.

73 to 732 & >732 MWh – Commercial / Industrial
There has been sustained growth in the economy since 2016 despite the referendum vote on 23 June 2016 to leave the EU, with all four quarters showing quarter-on-quarter growth. This seem to have had an impact on the level of demand, with all three LDZs showing growth in this sector, continuing the trend from last year.

The data on customer numbers for this load band showed a fall in the number between 2015 and 2016 for all LDZs, compared to a rise in the previous years.

This whole sector has seen some unexpected results where there are pockets of growth and decline, some counter to previous years behaviour. This volatility is not particularly surprising in a period where the future stability of the economy is uncertain after the EU referendum, but gas prices are still falling, driven by the decline in oil prices.

It is assumed the main factors influencing gas demand remain the economy and the gas price. Gas prices for medium to very large loads fell again last year.

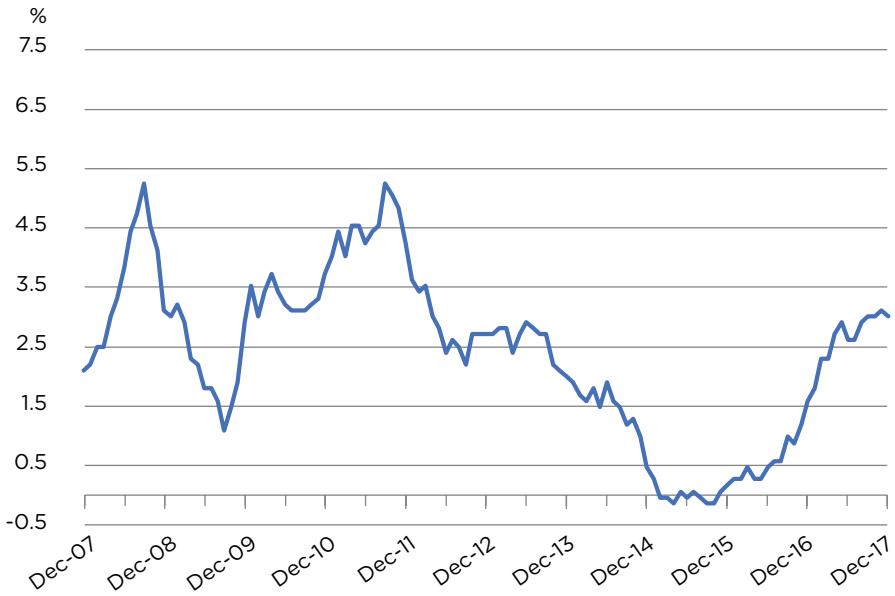
UK outlook

This section provides a general overview of the UK economy to give some context to the regional data that is provided in this report. It also outlines some of the key econometric assumptions used to develop the forecasts.

Inflation

During the years 2009 to 2012 the Consumer Price Index (CPI) was fluctuating significantly but had started to stabilise in the 2% to 3% range in 2013 and had fallen steadily to end up hovering around zero towards the end of 2015. Inflation was rising steadily in 2016 but levelled off towards the end of 2017, finishing in December at 3.0%.

The latest forecasts of CPI for the end of 2018 vary depending on the source but are in the range 2% to 2.4%. The forecast for 2019 is around 2.2%.



CPI 12 month rates for the last 10 years: December 2017 to December 2017, UK

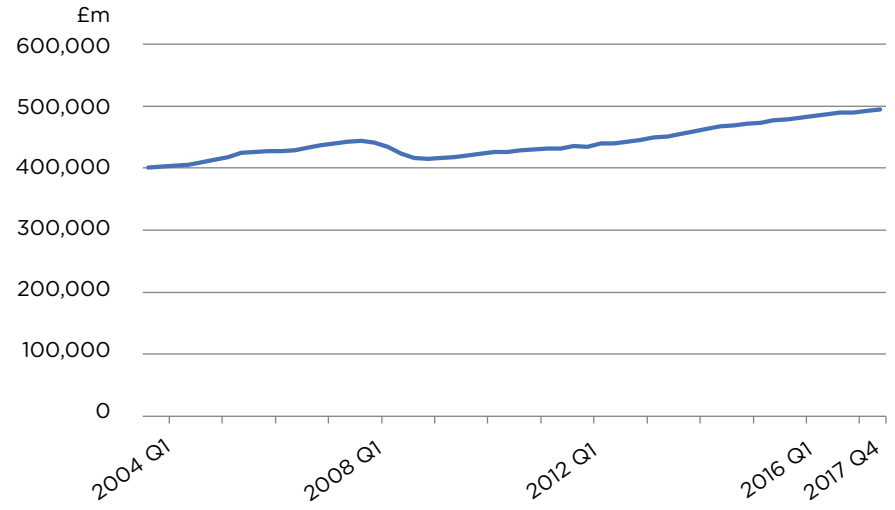
Source, Office of National Statistics (ONS)

Figure 1: Change in rate of CPI

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

GDP is a key indicator of the state of the whole economy and equates to GVA plus taxes on products minus subsidies on products. GVA measures the contribution to the economy of each individual producer, industry or sector in the United Kingdom. Following the economic crisis in 2008 there was a significant decline in GDP during 2008/9 set against a long period of growth from 1992. There has been a steady and sustained recovery in GDP since that time.

The latest economic figures produced by the Office of National Statistics (ONS) show a sustained growth in the economy during 2017 (see graph). This is despite the June 2016 EU referendum result and major ongoing uncertainty over future trading relationships. The preliminary figures from the ONS show annual GDP growth for 2017 is 1.8%. This is a small decline from the figure for 2016 of 1.9%.



Gross Domestic Product chained volume measures: Seasonally adjusted £m

Source, Office of National Statistics (ONS)

Figure 2: Change in GDP

The level of growth is expected to continue to decline in 2018 at around 1.4% in the central case, rising to 1.6% by 2022. The Office for Budget Responsibility (OBR) published its central forecast in November 2017 which is shown in fig 3.

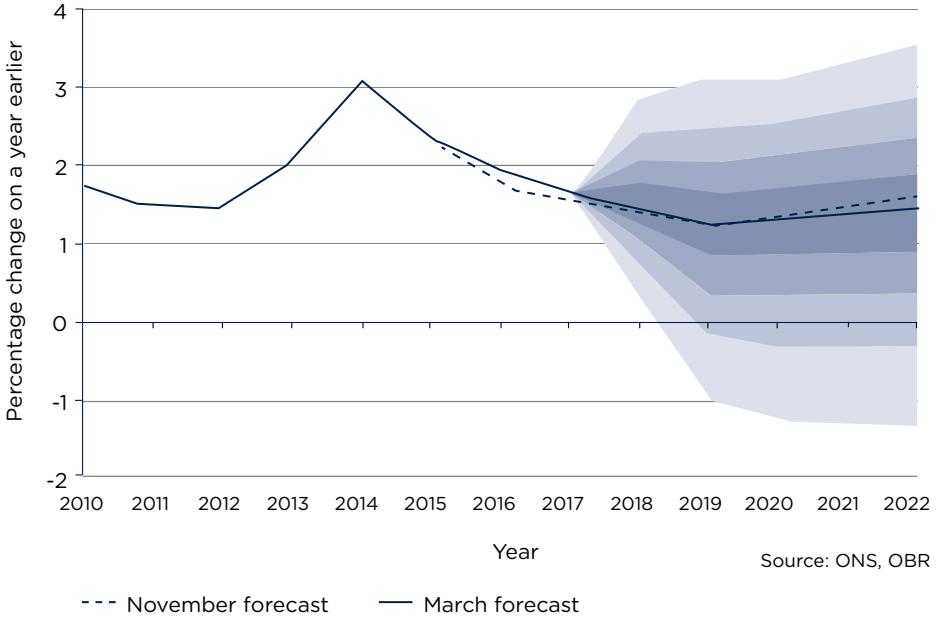


Figure 3: Forecast inflation rate

Gross Disposable Household Income (GDHI)

This can be used as an indicator of householders' ability to absorb rising energy prices and provides a reasonable indication of how affluent households are in a particular area.

The latest published figures produced by the ONS are for 2016 and show London has the highest GDHI per head of population followed by the south east. Scotland is ranked fifth of all the UK regions just below the UK average.

Manufacturing Output Index

The Index of Manufacturing Output provides one measure of how our manufacturing industry is performing. Following the economic crisis in 2008 there was a significant downturn in manufacturing during 2009. It has been showing some recovery since then, with periods of slight decline in 2012 and 2013, recovery in 2014, then decline again in 2015, another rise in 2016 and finally a rise over the first three quarters of 2017. This can be seen in the quarterly figures for the Manufacturing Index from the ONS (see fig 4). There has also been growth in October and November 2017 with the index at 105.3 in November 2017.

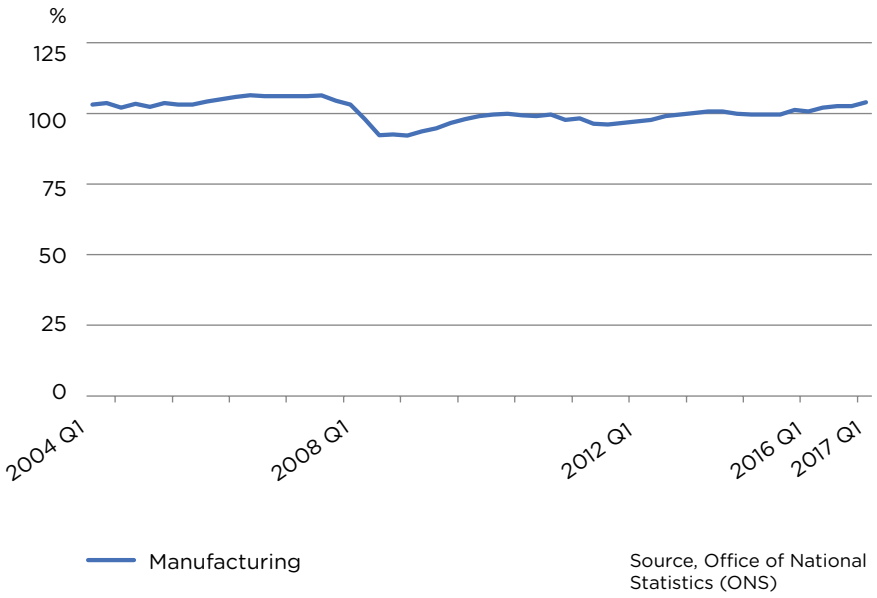


Figure 4: Change in rate of manufacturing output

Household numbers

The historical data used as the basis for our analysis is taken from the Department for Communities and Local Government (DCLG) website reported data (mid-year) adjusted to year end and is entirely consistent with historical data provided by our service provider last year. The DCLG has updated its original historical figures again, therefore it's been necessary to update our data used in last year's assumptions.

Employment

UK employment levels have been rising steadily for nearly 20 years with only small reductions in 2009 and 2011. In 2017 the commercial/services sector created 305,000 jobs. In addition there were 12,000 jobs in construction, 1,000 in agriculture, 9,000 in mining and 27,000 jobs that were unclassified. These increases were countered by a loss of 86,000 in manufacturing, resulting in a total number of 268,000 jobs being created, the majority of which were employee jobs, as opposed to self-employed.

Future employment levels are unpredictable as a result of uncertainty over the EU exit negotiations but we are assuming future employment levels in the commercial/service sector will continue to follow the pattern that has been seen over the last 10 years.

Regarding future employment levels in manufacturing, it's expected there will be a continued long-term pattern of decline, again similar to the last 10 years.

Gas/fuel price

The price of gas in all markets has shown, until very recently, significant rises from 2002 for households and effectively from 1999 in the non-domestic market. This has been as a direct result of the pass-through of wholesale gas price rises influenced by rising oil prices.

However, this trend turned around significantly in 2015 and 2016 driven, in part, by the entry of US shale oil into the market, a decline in worldwide consumption and OPEC's delayed decision to cut back production and introduce output limits.

Instability in eastern Europe and the fluctuating value of the pound against the dollar has also introduced uncertainty regarding the sustainability of any recovery in oil prices.

Historically the price of oil has been the major influence on wholesale gas prices and this will continue. However, increasingly there are other factors which may result in wholesale gas purchases becoming delinked from the price of oil.

The European Third Package, with its legally binding guidelines and Network Codes, has as its primary objective promotion of cross-border trade in the European gas market. The aim is to promote liquidity and improve integration of the gas markets and drive more efficient use of gas interconnectors to ensure the flow of gas follows price signals in the various markets. An increase in interconnectivity has the potential to create greater shocks in gas prices as a result of supply losses and weather extremes.

In addition, further gas price volatility may be seen as a result of decommissioning the Rough storage facility within the North Sea and from suppliers passing on to customers short term price increases due to extreme cold weather conditions similar to those experienced in early 2018.

Efficiency improvements

Gas demand, when corrected to seasonal normal weather conditions, has been declining in recent years, although there are instances of regional growth in some sectors which may be driven by an improving economy. There is also evidence average consumption per customer is falling steadily. It's 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. This is further complicated by the impact of the penetration of renewables into households which were using gas as a primary source of heating and now have renewable alternatives (when available) and use gas heating as a top-up. There remains, therefore, the possibility gas demand at peak could be the same as previously seen at these properties, before the installation of renewable heat sources.

It's a fact there's been a steady and substantial programme of gas fired domestic boiler replacement for a very long period now and the high levels of efficiency achieved with these new boilers is a significant contributory factor in the decline in gas demand.

Energy Bill 2011 (Updated 2018)
There was a range of provisions in the original 2011 bill to encourage energy efficiency and to remove barriers to investment in energy efficiency.

Private rented sector
Powers established for the Secretary of State will, in the event of continued poor energy efficiency performance in the private rented sector, prevent private residential landlords from refusing a tenants' reasonable request for energy efficiency improvements where a finance package is available.

They will also require private landlords in the domestic and non-domestic sector to improve some of the least energy efficient properties where finance is available. With effect from 1 April 2016, tenants were able to request consent from their landlords to carry out energy efficiency improvements to privately rented properties. The landlord is not able to unreasonably refuse consent. It will, however, be the responsibility of the tenant to ensure the works are funded and the intention is that no up-front costs should fall on the landlord, unless the landlord agrees to contribute. There are separate regulations requiring properties to be brought-up to an 'E' rating on an Energy Performance Certificate (EPC) which became effective from 1 April 2018.

Energy Company Obligation (ECO)
This is the Government's domestic energy efficiency programme which replaced its CERT and CESP programmes, both of which ended at the end of 2012. ECO works alongside the Green Deal to provide additional support for packages of energy efficiency measures. It also provides insulation and heating packages to low income and vulnerable households and insulation measures to low income communities.

ECO creates a legal obligation on energy suppliers to improve the energy efficiency of households and is administered by Ofgem.

In 2017 there were 202,000 efficiency related installations under ECO, compared to 360,000 for 2016. To date a large proportion of these installations were for loft and cavity wall insulation (24% and 35% respectively). Boiler replacement accounted for 22% and solid wall insulation 7%.

Further measures to improve energy efficiency

- 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
- Powers established 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 and cavity wall and loft insulation benefitted from the Green Deal, but higher cost solutions like renewable heat or solid wall insulation would need to allow protracted payback periods (approaching 50 years or more) to be viable, unless a significant subsidy is obtained.

In summary, it would appear 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.

Smart meters

The revised Smart Meters Bill published in October 2017 states the Government is committed to ensuring all homes and small businesses are offered smart meters by the end of 2020. The Bill contained two measures:

The first extends by five years the ability for Government to make changes to regulations for smart meters until 1 November 2023, to make sure the roll-out is delivered on time, that benefits are maximised and customers are protected during the roll-out and in the years beyond.

The second measure introduced a special administration regime to ensure continuity of smart meter services for customers in the unlikely event the company responsible for the national data and communications service becomes insolvent. Similar regimes are already in place for the energy network companies and energy suppliers.

During the Commons Committee stage, a third measure was added to the bill by means of a Government amendment. This measure allows Ofgem to deliver market-wide half-hourly settlement more swiftly and smoothly than currently without it having to rely on industry-led processes to the same extent. Half-hourly settlement is a central aspect of the Government's Smart Systems & Flexibility Plan. It could deliver benefits to customers by encouraging them to use energy when it is cheaper, reduce the costs of the future energy system and make it more resilient as the UK moves towards an increasingly low carbon generation mix. This would help ensure the benefits to customers of new tariffs, products and services enabled by smart metering and half-hourly settlement, to become available sooner.

There are problems with the current smart meters being installed (SMETS1), as they are not compatible with the legacy systems, resulting in customers losing their smart services if they switch supplier. A solution to this is being worked on, with plans to replace the SMETS1 devices with the latest version SMETS2.

With regards to the availability of useful data for the GDNs, there are currently many home energy management alternatives on the market which, in theory, could supply better data, potentially making smart meters redundant for this application.

Carbon neutral housing

The previous Government policy on carbon neutral new housing made it clear that although being carbon neutral is an objective for new housing, the proposed standards published in November 2009 were aimed at reducing energy consumption as much as possible, through utilising renewable sources. This was planned to come into force in 2016, but the current Government axed this policy in 2015. As many parties have been involved in trying to achieve carbon neutrality there could still be many new housing sites that will be developed as if the policy was still in place. We have not made a specific adjustment for this initiative during our assessment of household demand within this forecast, but will continue to review this each year.

Renewable Heat Incentive Scheme (RHI)

In March 2011 the Government announced the introduction of the Renewable Heat Incentive Scheme (RHI). The original RHI documentation is still considered to be a primary source of information for any study on renewables until analysis has been carried out on the effectiveness of RHI and the level of adoption of renewable energy.

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. Initially, in the first phase, long-term tariff support was targeted at the big emitters 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 majority of the renewable heat needed to meet the targets and represents the most cost-effective way of increasing the level of renewable heat.

Under the revised domestic RHI scheme introduced in April 2014, there is financial support for renewable heat, targeted at, but not limited to, off gas grid households. The support is paid at a set rate per unit of renewable heat produced (kWh), for seven years, to the owner of the heating system.

The scheme is administered by Ofgem and in order to control the costs of the policy a system of degression was introduced, which is reductions in tariffs over time as threshold spend figures (known as triggers) are reached. The latest tariffs April to June 2018 show the decline in support for biomass has been reversed, air source heat pumps have increased significantly and there are minor increases in ground source heat pumps and solar thermal, and here there was no degression during this period.

Regional economy

In this section we look at the specific LDZ econometric assumptions which influenced our forecasts.

Scotland

Scotland possesses a strong commercial and services sector base, accounting for around 80% of the Scottish economy. Financial and insurance services growth underpinned by the presence in Edinburgh and Glasgow of many leading financial institutions is the fifth largest in GVA terms in the UK behind London, the South East, North West and Eastern. A better indicator however is the GVA per head of population. The current figure is £24,876 which places Scotland third behind London and the South East. The overall figure for the UK is £26,584.

The growth in the different sectors has been quite variable over the last few years. The greatest fluctuation was seen in the construction sector, with exceptional growth in 2014 and 2015 followed by a downturn in 2016 and 2017. The services sector, the largest by far, is still growing steadily.

The earlier economic downturn did have a negative effect as banks consolidated offices and functions. This could have been exacerbated if Scotland was devolved from the UK as some banks were rumoured to be looking to relocate away from Scotland. This is currently less likely given the rejection of devolution, but the EU referendum result could trigger another Scottish referendum, although this is currently not being actively pursued. This may depend on how the negotiations for the UK's exit from the EU develop. The Scottish Government is keen to emphasise the impact its economy has on UK GDP, as illustrated by the significant contribution Scotland makes to the extra-regional elements of UK GDP. Scottish GDP growth has, however, fallen significantly behind the UK overall.

South East

In our 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 ongoing and steady economic growth. This will be especially significant should confidence in London as a banking stronghold be adversely affected by any fallout from the various inquiries into the banking sector, changes in regulation and the impact of the UK leaving the EU. Some banks indicated their desire to move to another country within the EU, but speculation of widespread moves seems to be unlikely given that London is still ranked as the highest financial centre in the world, followed closely followed by New York. The next ranked European city is Zurich at no.16, but the next ranked within the EU are Frankfurt, Luxemburg and Paris at no.20, 21 and 24 respectively.

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%, with reasonable levels of growth in recent years albeit a very small decline occurring in 2014. It remains the lowest manufacturing base outside London. The impact on this sector of the level of economic activity could still be significant, assuming there is to be continued growth, but the uncertainty created by the UK leaving the EU could depress any economic growth. The sector of the economy that has generally performed the best appears to be the wholesale and retail sectors (12.6% of South East GVA), which were only marginally affected by the recession, and in 2016 showed further growth on top of growth between 2009 and 2015. It is unclear how sustainable this position could be, especially if the UK, EU and World economies continue to be adversely affected by the ongoing economic uncertainty or slowdown in some countries. The impact of the result of the EU referendum will be unknown until the negotiations have been finalised.

Strong expansion of tourism, both internal and international, provides opportunities for the South East region, given London's attraction as a tourist centre and the lower value of the pound following the EU referendum.

Housing development is still forecast to grow in the South East. There are physical signs of this growth with the Greenwich Peninsula developments, which are part of the Thames Gateway regeneration project, where there are plans to build riverside and parkside homes on the peninsula over the next 20 years. There are also commercial developments and various cultural developments that form part of the scheme.

South

In our 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 downturn in other areas. The latest worldwide sales figures for the Oxford built Mini show a rise of 3.2% during 2017 compared to 6.5% in 2016, to a record high of 372,000. This is as a result of the strong growth in sales of new models lead by the Mini Countryman which saw growth in 2017 of 30%. The largest growth market for BMW is Asia. Further new models are being released in 2018.

Cuts by the Ministry of Defence to sites in this area will have some effect on the local economies near these facilities. This is despite the continued commitment by UK Government to meet the NATO target of spending 2% of GDP on defence. Another review of defence is under way, which is aimed at a modernisation programme. The impact of the potential further cuts in public sector employment is not clear at this stage, but it is anticipated 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 where people are living in the Thames Valley London commuter belt.

A recent report called the UK Powerhouse Tracker, produced by Irwin Mitchell and the Centre for Economics and Business Research, provides an estimate of GVA growth and job creation within 45 of the UK's largest cities. Published in Spring 2018, the study revealed while each of the south coast's biggest cities had steady GVA growth in the third quarter of 2017, each are expected to enjoy a strong showing across 2018. Southampton and Brighton are expected to have the sixth fastest-growing economies in the UK in 2018, with a year-on-year growth rate of 1.6%, Portsmouth and Bournemouth (1.4%) also taking positions within the top ten for the year ahead. Cambridge, Oxford and Milton Keynes take up the top three places.

In addition, the study also found Bournemouth enjoyed the fastest-growing employment rate in the UK across Q4 2017, with its workforce increasing by 1.4% to reach 95,600 during the period.

Housing development is forecast to grow by government, which will be boosted by money raised from the right-to-buy scheme for council houses will be used to build replacement houses. It's not clear how this will impact the number of new homes, given the substantial discounts being offered to potential buyers will reduce 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 will reduce the housing stock available for low income families which may result in pressure on government and local authorities to build more homes. The Government has stated it is committed to building 1.5 million new homes between 2015 and 2022, which would require at least a doubling of the current level of house building. The latest set of statistics show that 215,000 homes were built in this area between 2016/17 but only 19% of these were affordable homes.

Embedded power

Over the last year this group of customers has continued to grow becoming more important a consideration within all three LDZs. The expectation is this will continue with a number of previous enquiries progressing to completion.

Forecast methodology

General assumptions

The starting point for production of the full set of demand forecasts is the annual seasonal normal 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
- Historic annual demand data is provided to our service provider on the same basis, and daily demand data is available broken down by load band
- The historic data was corrected by our service provider using reconciliation data we provided
- SIU demand and Borders (supplied by NGN) was not incorporated into the Scotland LDZ numbers
- Shrinkage was forecast on a fixed daily basis irrespective of demand levels, to be consistent with the UNC
- It should be noted that Xoserve has started providing Unaccounted for Gas data (LDUG) as part of the throughput data from June 2017. This data was examined to assess any impact on the actuals and forecasts with adjustments made as required
- Retail gas price forecasts that are used as part of the demand modelling process continue to be developed by our service provider
- Load band 0-73 MWh is assumed to consist predominantly of households, therefore behaviour patterns are based on typical household demand
- Load band 73 to 732 MWh is considered to be predominantly small commercial/retail premises with some small industrial. Although there are some households within this band it is assumed that the behaviour patterns will be linked to predominantly commercial/retail behaviour
- The load bands >732 MWh and Interruptibles will be predominantly industrial and commercial premises and therefore exhibit behaviour related to these types of load
- Interruptible loads are no longer included as a separate forecast

General methodology

The forecasting models for the different load bands have been refined over a number of years. The underlying principle is 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 affecting recent demand levels has been the decline in the price of gas in 2015, 2016 and 2017, which has resulted in growth in some demands historically, but this is anticipated to shift to a rise in gas prices during 2018 as a result of the impact of rising oil prices in 2017. Many customers may have begun to take further action with regard to energy saving, including a switch to renewable energy sources, as a result of the anticipated price rise.

The latest economic figures from the Office of National Statistics (ONS) show a sustained growth in the economy during 2017 despite the EU referendum result on 23 June 2016 to leave the EU and ongoing uncertainty over future trading relationships with the EU. The preliminary figures from the ONS show annual GDP growth for 2017 was 1.8%. This was a small decline from the figure for 2016 of 1.9%.

This level of growth is expected to continue to decline in 2018 at around 1.4% in the central case, but increasing again to 1.6% by 2022.

With regard to energy efficiency, we believe ongoing analysis is needed to develop a view on the impact in different sectors. Efficiency savings are already occurring but the extent is masked by the impact of gas price on demand. This is further complicated by the potential effects of fluctuating energy prices as increased or decreased comfort levels are used in households, and in industry the decision to vary production as energy prices change. All these aspects were considered when developing a view on energy efficiency.

A further factor influencing annual demand is the gradual introduction of renewable sources of energy but the true extent of this is yet to fully develop at this stage.

0 to 73.2 MWh – Domestic

The primary driver in this sector is still believed to be the behaviour of households although it includes a number of small commercials. Annual demand growth has traditionally been driven by the number of houses built and the number that subsequently on completion are occupied and of that population, how many of these 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. In last year's analysis the best fit was a relationship between average consumption per gas customer and the current retail gas price; this remained the case this year.

Average customer gas bills fell in 2015, 2016 and 2017, but are expected to rise in 2018. The UK gas market remains well supplied with gas having major over-capacity of import infrastructure. Also, there could be additional UKCS gas delivered into the UK, following the announcement that a major gas processing plant has been built on Shetland to take gas from the West of Shetland offshore fields. Drilling for shale gas could also be a possibility but requires political direction.

Variables reviewed include:

- Total households
- Average household consumption
- Average consumption per customer
- Current and real retail gas prices
- Household disposable income
- Efficiency improvements
- GDP

As with last year, models were tailored to each LDZ, as customer behaviour proved to be materially different in each.

Our service provider has developed a current retail gas price forecast specifically for the purposes of this project each year. This was repeated this year.

The impact of efficiency gains were not incorporated separately in this year's model, as these are assumed to be driven by gas price.

Consideration will need to be taken when analysing Scotland LDZ in future years of the Scottish Government's changing strategy on renewable heat targets. It had previously stated that 80% of households should be heated using low carbon technologies by 2032. The latest 2030 renewable energy targets appear to say that there should be 50% renewable energy for electricity generation, heat and transport. But it also states 20% of non-electric heat demand will be renewable.

73.2 to 732 MWh - Commercial

It has traditionally been assumed this sector is generally influenced by energy prices and economic drivers. As a result of detailed evaluation of alternative econometric models as part of last year's analysis, the best fit was achieved by using a multi-variable model that related annual gas consumption to a combination of UK GDP and current retail gas price for this sector.

We repeated the analysis this year, re-examining the following drivers:

- 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

>732 MWh – Large industrial

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.

Peak demand forecasting

General 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.

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

- 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 allowance will be made in calculating the base case 1 in 20 Peak day for the differences between the calculated peak demand and the SOQ booked by shippers for larger loads
- 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 ourselves and our customers

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.

Methodology

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

$$\text{Peak demand} = \frac{(\text{annual demand}/365)}{\text{load factor}}$$

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 0 to 73.2 MWh
- NDM 73.2 to 732 MWh
- NDM >732 MWh
- DM consumption

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

Demand forecasts

The next section provides an overview of our latest annual and Peak day gas demand forecasts through to 2027/28. These forecasts have been developed around the UNC load band categories and relate only to gas that is transported through our systems.

A more detailed view can be found on pages 33-40 in Appendix 2, which includes the forecasts for both annual and Peak day demand on a year-by-year and LDZ basis.

Annual demand

These figures show historical gas demand and the forecast going forward. Note specifically the sudden demand reduction in 2009 followed by a minor recovery in 2010 and then a further decline between 2011 and 2014.

Note also that interruption ceased to exist in 2011 as a standard type of load – this is shown in orange within the graphs.

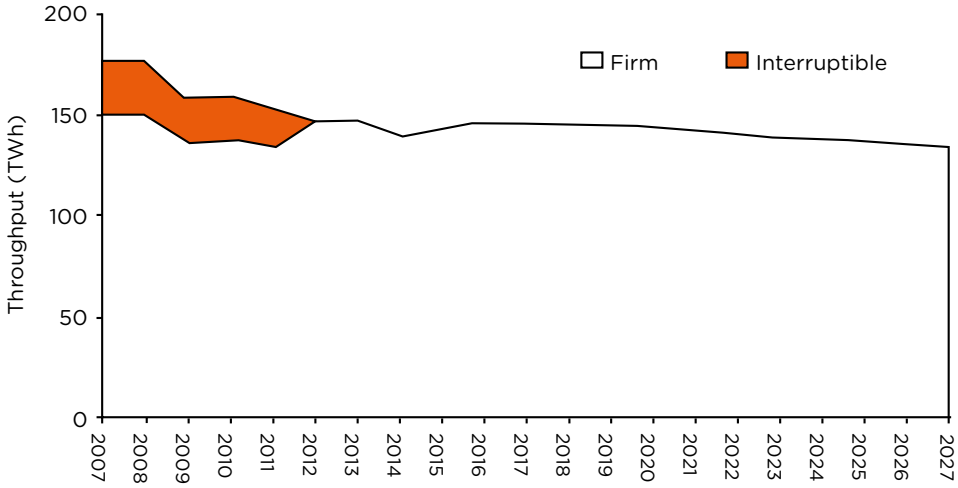


Figure 6: Change in historic and future annual demand - SGN overall

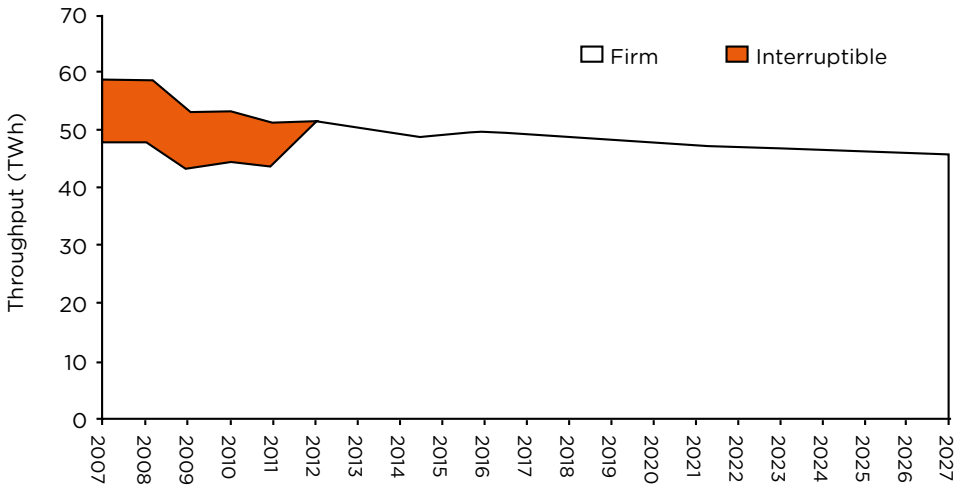


Figure 7: Change in historic and future annual demand - Scotland

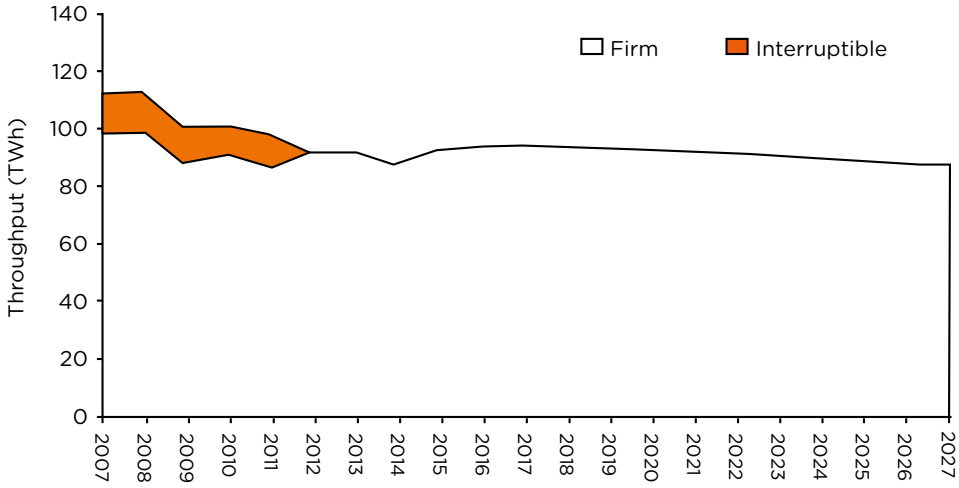


Figure 8: Change in historic and future annual demand - Southern

Change in forecast annual growth (2018–27)			
SGN	SGN	Scotland	Southern
Annual demand growth	-0.92%	-0.9%	-0.92%

Table 1: Change in forecast annual growth (2018–27)

Peak demand

The following graphs show the equivalent view for peak demand, the key driver for investment in SGN.

Note also that interruption ceased to exist in 2011 as a standard type of load – this is shown in orange within the graphs.

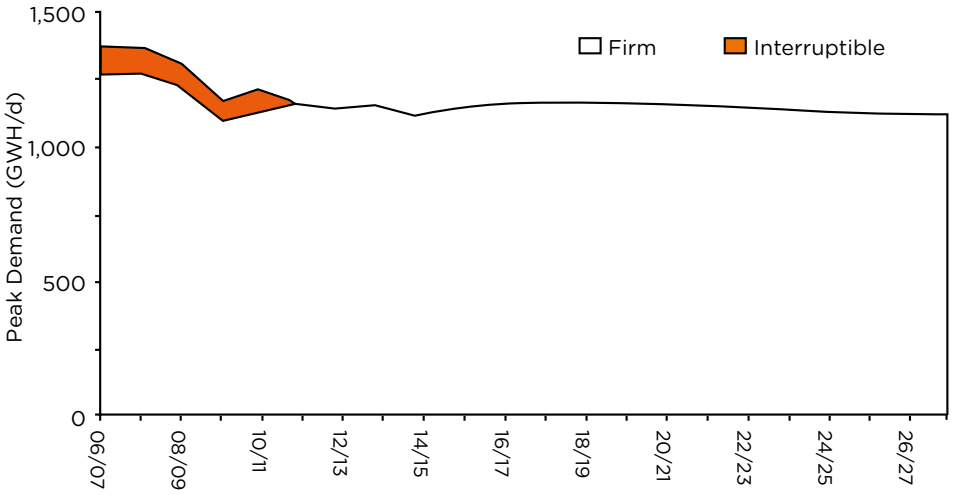


Figure 9: Change in historic and future peak gas demand - SGN overall

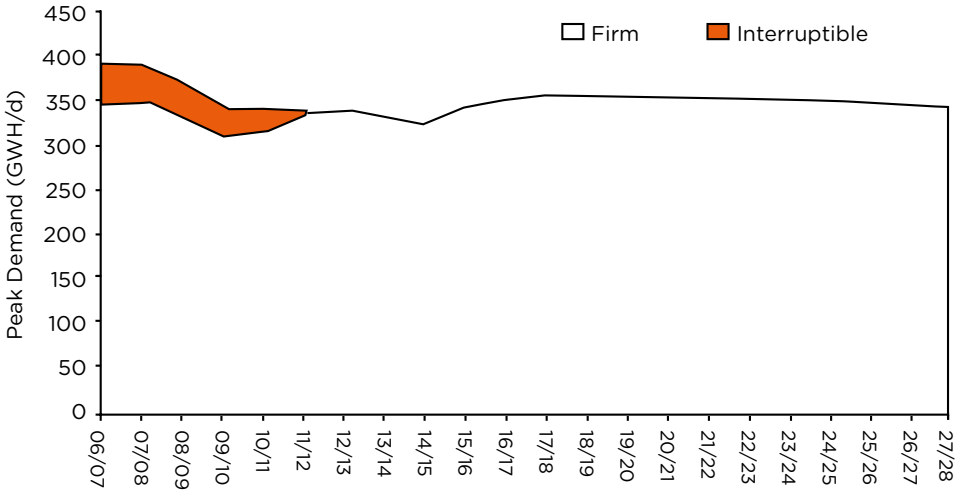


Figure 10: Change in historic and future peak gas demand - Scotland

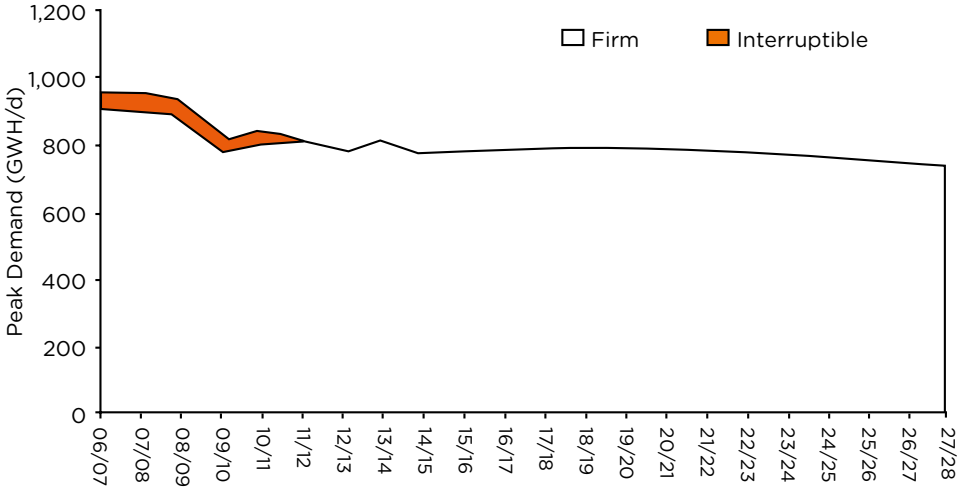


Figure 11: Change in historic and future peak gas demand - Southern

Change in forecast annual growth (2018-27)			
	SGN	Scotland	Southern
Peak demand growth	-0.4%	-0.32%	-0.44%

Table 2: Change in Peak day demand (2018–27)

Forecast comparisons

Figures 12 to 14 provide a comparison of the current forecasts with those produced in 2017.

The latest annual demand forecast for Scotland is marginally lower and the South and SGN in total are higher over the period of the plan than last year's. The driver for the difference in the forecasts is partly due to the 2018 forecasts taking account of the difference between the forecast for 2017 and the actual demand in 2017. The forward price assumptions also have a different profile to last year, as a result of a different forecast profile for the wholesale gas price.

There are marginally higher demands in the domestic and small commercial sector in South East and South due to the impact of lower relative retail gas price assumptions. This sector in Scotland is essentially the same as last year. In the larger industrial/commercial sectors, Scotland demand is lower, reflecting the decline in this sector over the last year compared to the forecast. South East is higher as a result of greater demand at Shoreham Power Station and in Southern there's no significant change to last year. There's forecast a modest decline in demand throughout the forthcoming forecast period.

One significant factor that may influence future gas demand, the impact of which remains uncertain, is the decision taken by the UK to leave the EU. There has been only minor impact on the economy at this stage but the final negotiations on the terms of the exit are still ongoing.

Another major influence on gas demand in the future will be the Government's strategy to deal with the environmental targets. The previous European Directive known as the '20 - 20 - 20 Targets' was 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 by 20% by improving energy efficiency. Performance against the 20% renewable target has been variable amongst the member states, with the UK until recently being well below its renewable source target. New targets have been agreed within the EU for 2030 which will require 27% of total energy from renewables and efficiency savings of 27%. This may require increases in renewable subsidies if this is to be met, assuming the UK continues to abide by these targets after leaving the EU.

Greater customer awareness on environmental issues and their 'carbon footprint' may also have an effect on the annual gas demands during the forecast period.

Sustained higher gas prices would also encourage efficiency improvements and maybe even switching to renewable energy. The potential for shale gas development within the UK, currently supported by the UK Government but not the Scottish Government, could also have a major influencing factor on gas price.

Any of the above could have a substantial impact on consumption year-on-year or may not materialise in the near or possibly even mid-term future, depending on Government policy and the decisions of UK and Scottish Governments.

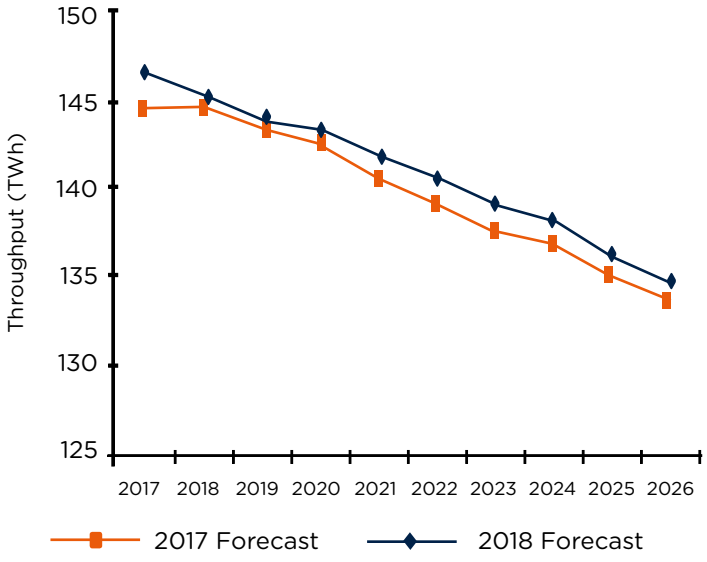


Figure 12: Comparison of total annual demand forecasts – SGN overall

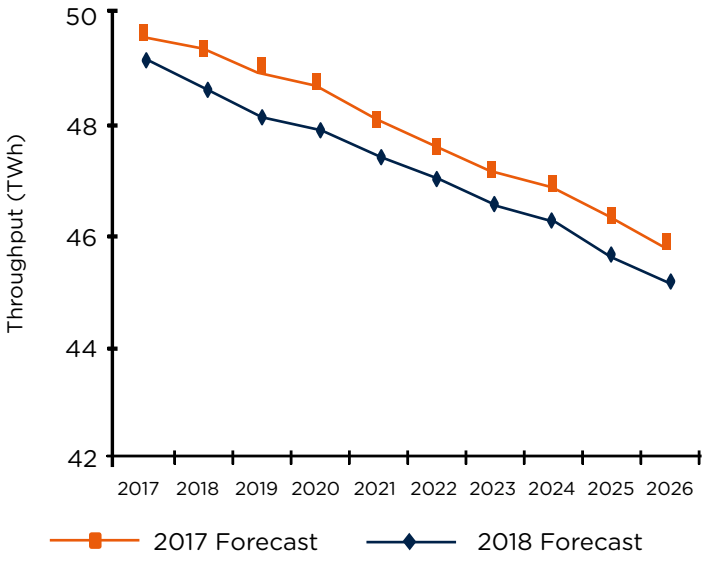


Figure 13: Comparison of annual demand forecasts – Scotland

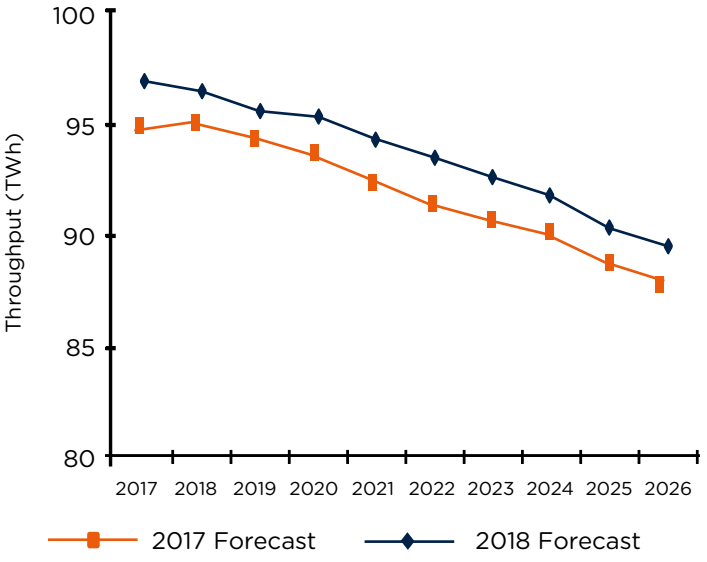


Figure 14: Comparison of annual demand forecasts – Southern

National Grid Future Energy Scenarios (FES)
National Grid (NG) has developed four scenarios influenced by its analysis of the impact of different assumptions regarding the uptake of renewable energy sources and the reduction in carbon based fuels. This is known as the Future Energy Scenarios (FES) publication which is published and updated every July.

The analysis supporting the publication is based on data gathered through meetings and workshops from within the industry and webinars with stakeholders. The aim being to inform NG's network planning process but also to drive debate throughout the industry.

The document aims to outline a range of pathways for the future of energy out to 2050 by discussing the possible sources of and demands for gas and electricity in the future and the implications for the energy industry.

Comparison between NG and SGN scenarios
NG develop their scenarios starting with an assumption regarding the end point in 2050; they then further develop the different scenarios to achieve the desired end point. This results in some anomalies, for example, the actual demand starting point for each scenario develops differently.

Our approach differs as our scenarios are built from a base-case which uses historical trends as a predictor of the future. This is then modelled forwards to determine the likely impact of various 'unknowns' including renewable energy sources.

The selected scenario which we use to plan network development includes an assumption the reduction in demand, as a result of new renewable energy sources replacing gas, is different for annuals and peaks. These renewable assumptions are currently related to progress against the 2020 targets and from 2019, will relate to the 2030 targets. We don't make an assessment of the impact of the 2050 targets as it's assumed performance against the shorter-term is more appropriate to the accuracy of the forecast.

It's difficult to draw clear comparisons between the results of the two forecasts as the FES scenarios have changed year-on-year, either in terms of the way the scenarios are developed or the emphasis on the key variables used within the scenarios.

Importantly, the FES scenarios are not the primary driver for NG's National Development Plan (NDP) and no one FES scenario is considered key to determining network investment. Instead the range of demand (and supply) scenarios that could happen are used, to quote NG, 'to influence their NDP'. Whereas, our forecasting regime allows us a clear starting point to determine suitable investment and development of our networks.

Appendix 1

Demand forecasts tables

Annual demand forecast by load category – SGN overall											
Calendar year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
0 - 73.2 MWh	89.5	89.3	89.2	89.6	89.1	88.7	88.1	88.0	87.1	86.7	86.3
73.2 - 732 MWh	13.6	13.7	13.5	13.4	13.3	13.3	13.2	13.1	12.8	12.7	12.6
732 – 2,196 MWh	6.4	6.2	6.1	6.0	5.8	5.7	5.6	5.5	5.3	5.2	5.1
2,196 – 5,860 MWh	3.9	3.8	3.7	3.7	3.6	3.5	3.4	3.3	3.3	3.2	3.1
Total small user	113.4	113.1	112.5	112.6	111.8	111.1	110.3	109.8	108.5	107.8	107.1
>5,860 MWh	7.3	7.1	6.9	6.7	6.6	6.4	6.3	6.2	6.0	5.9	5.7
DM consumption	24.9	24.3	23.7	23.2	22.7	22.2	21.7	21.3	20.8	20.3	19.9
Total large user	32.2	31.4	30.6	30.0	29.2	28.6	28.0	27.5	26.8	26.2	25.6
Total LDZ	145.6	144.4	143.1	142.6	141.0	139.7	138.3	137.3	135.3	134.0	132.8
Shrinkage	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Total throughput	146.3	145.1	143.8	143.3	141.7	140.4	138.9	138.0	136.0	134.7	133.5

Gas supply year	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**
Total throughput	145.4	144.2	143.6	142.0	140.8	139.4	138.4	136.4	135.1	133.8	133.1

Table 3: Forecast annual demand - SGN load categories (TWh)

Annual demand forecast by load category – Scotland LDZ											
Calendar year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
0 - 73.2 MWh	29.2	29.1	29.1	29.3	29.2	29.1	29.0	29.0	28.8	28.7	28.7
73.2 - 732 MWh	4.6	4.7	4.6	4.6	4.6	4.5	4.5	4.5	4.4	4.4	4.4
732 – 2,196 MWh	2.6	2.5	2.4	2.4	2.3	2.2	2.2	2.1	2.1	2.0	2.0
2,196 – 5,860 MWh	1.7	1.7	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.3
Total small user	38.1	37.9	37.8	37.8	37.5	37.4	37.1	37.1	36.7	36.5	36.3
>5,860 MWh	3.2	3.1	3.0	3.0	2.9	2.8	2.8	2.7	2.6	2.6	2.5
DM consumption	7.6	7.3	7.1	7.0	6.8	6.6	6.5	6.3	6.2	6.0	5.9
Total large user	10.8	10.5	10.2	9.9	9.7	9.5	9.2	9.0	8.8	8.6	8.4
Total LDZ	49.0	48.4	47.9	47.8	47.2	46.8	46.4	46.1	45.5	45.1	44.7
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	49.2	48.6	48.1	47.9	47.4	47.0	46.5	46.3	45.7	45.3	44.9

Gas supply year	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**
Total throughput	48.7	48.2	48.1	47.5	47.1	46.7	46.4	45.8	45.4	45.0	44.8

Table 4: Forecast annual demand - Scotland LDZ (TWh)

Annual demand forecast by load category – South East LDZ											
Calendar year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
0 - 73.2 MWh	36.4	36.5	36.4	36.6	36.4	36.2	35.9	35.8	35.4	35.1	34.9
73.2 - 732 MWh	5.2	5.2	5.0	5.0	4.9	4.9	4.8	4.7	4.6	4.5	4.5
732 – 2,196 MWh	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.7
2,196 – 5,860 MWh	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.0	1.0
Total small user	44.9	44.8	44.6	44.7	44.3	44.1	43.6	43.4	42.7	42.4	42.0
>5,860 MWh	1.8	1.8	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5
DM consumption	11.1	10.8	10.6	10.4	10.2	10.0	9.8	9.7	9.5	9.3	9.1
Total large user	12.9	12.6	12.4	12.2	11.9	11.7	11.5	11.3	11.0	10.8	10.6
Total LDZ	57.8	57.4	57.0	56.8	56.2	55.7	55.1	54.7	53.8	53.2	52.6
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	58.1	57.7	57.3	57.1	56.5	56.0	55.4	54.9	54.1	53.5	52.9

Gas supply year	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**
Total throughput	57.9	57.4	57.3	56.7	56.2	55.6	55.1	54.3	53.7	53.1	52.7

Table 5: Forecast annual demand - South East LDZ (TWh)

Annual demand forecast by load category – South LDZ											
Calendar year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
0 - 73.2 MWh	23.8	23.7	23.6	23.7	23.5	23.4	23.2	23.2	23.0	22.9	22.8
73.2 - 732 MWh	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.8	3.8	3.8
732 – 2,196 MWh	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.4
2,196 – 5,860 MWh	1.0	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8
Total small user	30.4	30.3	30.1	30.1	29.9	29.7	29.5	29.4	29.1	28.9	28.8
>5,860 MWh	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.7
DM consumption	6.3	6.2	6.0	5.8	5.7	5.5	5.4	5.3	5.2	5.0	4.9
Total large user	8.5	8.3	8.0	7.9	7.7	7.5	7.3	7.2	7.0	6.8	6.6
Total LDZ	38.9	38.6	38.2	38.0	37.6	37.2	36.8	36.6	36.1	35.7	35.4
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	39.1	38.8	38.4	38.2	37.8	37.4	37.0	36.8	36.3	35.9	35.6

Gas supply year	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**
Total throughput	38.8	38.5	38.3	37.9	37.5	37.1	36.9	36.4	36.0	35.7	35.6

Table 6: Forecast annual demand - South LDZ (TWh)

1 in 20 Peak day firm demand forecast – At a glance											
Calendar year	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**
Scotland	356.1	353.8	352.9	352.2	351.5	349.8	348.0	346.3	344.6	343.2	342.1
South East	466.6	466.8	465.1	464.5	463.7	461.3	457.6	453.7	450.0	446.7	443.9
South	330.0	328.8	327.4	326.5	325.7	323.8	321.7	319.8	318.0	316.5	315.3
SGN overall	1,152.7	1,149.5	1,145.4	1,143.3	1,140.9	1,135.0	1,127.3	1,119.7	1,112.6	1,106.4	1,101.3

Table 7: Forecast 1 in 20 Peak day firm demand forecast - At a glance (GWh)

1 in 20 Peak day firm demand forecast – SGN overall by load categories											
Calendar year	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**
0 - 73.2 MWh	815.5	814.5	817.3	818.4	819.8	816.9	813.3	809.9	806.6	804.2	802.5
73.2 - 732 MWh	123.0	125.5	122.3	122.7	122.6	122.9	122.0	121.1	120.4	119.8	119.4
732 – 2,196 MWh	44.3	43.1	42.1	41.1	40.1	39.2	38.4	37.5	36.6	35.8	35.0
2,196 – 5,860 MWh	27.1	26.3	25.7	25.1	24.5	24.0	23.4	22.9	22.4	21.9	21.4
>5,860 MWh	50.3	48.8	47.7	46.6	45.4	44.5	43.5	42.5	41.5	40.6	39.6
Total NDM consumption	1,060.1	1,058.3	1,055.1	1,053.9	1,052.4	1,047.5	1,040.6	1,033.9	1,027.6	1,022.2	1,017.9
DM firm consumption	90.6	89.4	88.4	87.5	86.6	85.7	84.8	84.0	83.1	82.3	81.5
Total firm consumption	1,150.8	1,147.6	1,143.5	1,141.4	1,139.0	1,133.1	1,125.4	1,117.9	1,110.7	1,104.6	1,099.4
Total shrinkage	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Total LDZ	1,152.7	1,149.5	1,145.4	1,143.3	1,140.9	1,135.0	1,127.3	1,119.7	1,112.6	1,106.4	1,101.3

Table 8: Forecast 1 in 20 Peak day firm demand forecast - SGN by load categories (GWh)

1 in 20 Peak day firm demand forecast – Scotland LDZ by load categories											
Calendar year	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**
0 - 73.2 MWh	241.8	241.3	242.5	243.1	243.8	243.2	242.8	242.5	242.2	242.1	242.2
73.2 - 732 MWh	38.3	39.0	38.2	38.3	38.3	38.4	38.2	38.0	37.9	37.8	37.7
732 – 2,196 MWh	16.9	16.3	15.9	15.5	15.2	14.9	14.5	14.2	13.9	13.6	13.3
2,196 – 5,860 MWh	11.3	10.9	10.7	10.4	10.2	10.0	9.8	9.5	9.3	9.1	8.9
>5,860 MWh	21.2	20.4	20.0	19.5	19.1	18.7	18.3	17.9	17.5	17.1	16.7
Total NDM consumption	329.5	327.9	327.3	326.9	326.5	325.2	323.6	322.1	320.8	319.7	318.8
DM firm consumption	26.1	25.4	25.1	24.8	24.5	24.2	23.9	23.6	23.3	23.0	22.8
Total firm consumption	355.6	353.3	352.4	351.7	351.0	349.3	347.5	345.7	344.1	342.7	341.6
Total shrinkage	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total LDZ	356.1	353.8	352.9	352.2	351.5	349.8	348.0	346.3	344.6	343.2	342.1

Table 9: Forecast 1 in 20 Peak day firm demand forecast - Scotland LDZ by load categories (GWh)

1 in 20 Peak day firm demand forecast – South East LDZ by load categories											
Calendar year	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**
0 - 73.2 MWh	343.1	343.7	344.8	345.4	346.0	344.8	342.7	340.5	338.3	336.5	335.1
73.2 - 732 MWh	46.4	47.3	45.5	45.5	45.2	45.0	44.4	43.7	43.1	42.5	42.1
732 – 2,196 MWh	14.1	13.8	13.5	13.1	12.8	12.5	12.2	12.0	11.7	11.4	11.1
2,196 – 5,860 MWh	8.6	8.4	8.2	8.0	7.8	7.6	7.5	7.3	7.1	7.0	6.8
>5,860 MWh	12.8	12.5	12.2	11.9	11.6	11.4	11.1	10.9	10.6	10.3	10.1
Total NDM consumption	425.2	425.7	424.3	424.0	423.4	421.4	417.9	414.3	410.8	407.7	405.2
DM Firm consumption	40.6	40.3	40.0	39.7	39.4	39.2	38.9	38.6	38.4	38.1	37.9
Total firm consumption	465.7	466.0	464.3	463.7	462.9	460.5	456.8	452.9	449.2	445.9	443.1
Total shrinkage	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Total LDZ	466.6	466.8	465.1	464.5	463.7	461.3	457.6	453.7	450.0	446.7	443.9

Table 10: Forecast 1 in 20 Peak day firm demand forecast - South East LDZ by load categories (GWh)

1 in 20 Peak day firm demand forecast – South LDZ by load categories											
Calendar year	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**	**2027/28**
0 - 73.2 MWh	230.5	229.4	229.9	229.9	230.0	228.8	227.8	226.9	226.1	225.6	225.2
73.2 - 732 MWh	38.2	39.3	38.6	38.9	39.1	39.5	39.4	39.4	39.4	39.5	39.7
732 – 2,196 MWh	13.3	13.0	12.7	12.4	12.1	11.8	11.6	11.3	11.0	10.8	10.6
2,196 – 5,860 MWh	7.2	7.0	6.8	6.7	6.5	6.4	6.2	6.1	5.9	5.8	5.7
>5,860 MWh	16.2	15.9	15.5	15.1	14.8	14.4	14.1	13.8	13.5	13.2	12.9
Total NDM consumption	305.5	304.6	303.5	303.0	302.5	300.9	299.1	297.5	296.0	294.8	293.9
DM firm consumption	24.0	23.6	23.3	23.0	22.7	22.3	22.0	21.7	21.4	21.1	20.9
Total firm consumption	329.4	328.3	326.8	326.0	325.1	323.3	321.1	319.2	317.5	316.0	314.8
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	330.0	328.8	327.4	326.5	325.7	323.8	321.7	319.8	318.0	316.5	315.3

Table 11: Forecast 1 in 20 Peak day firm demand forecast - South LDZ by load categories (GWh)

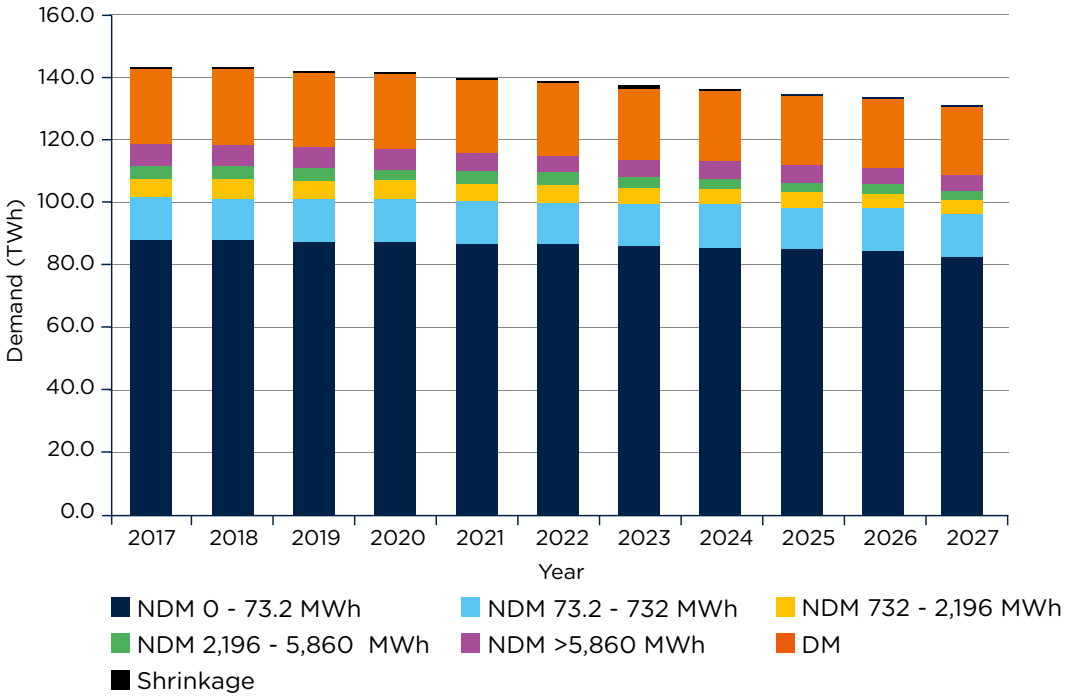


Figure 15: Annual demand forecast - SGN overall

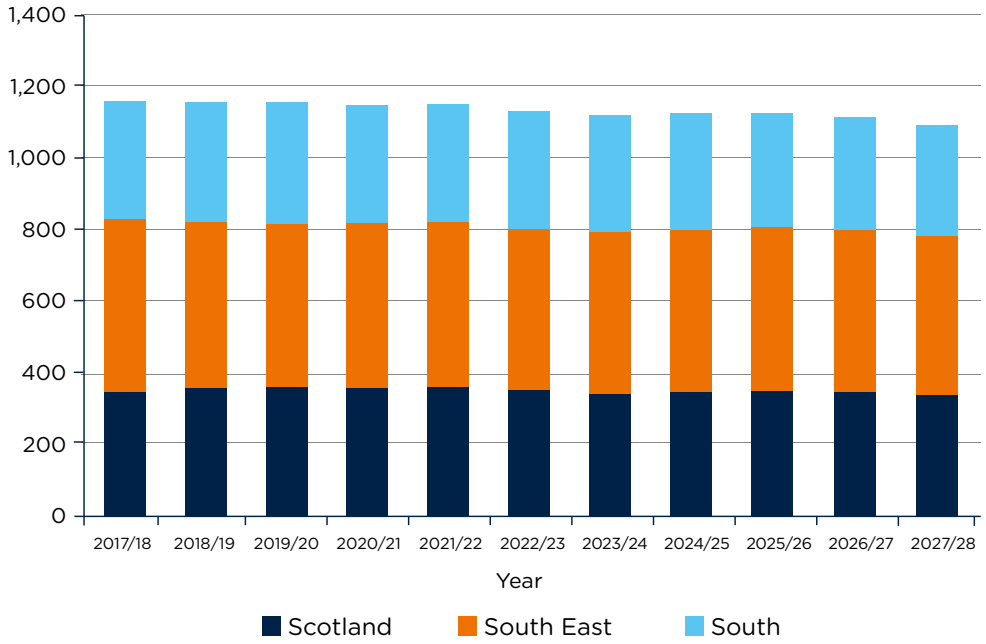


Figure 16: 1 in 20 Peak day demand forecast - SGN overall

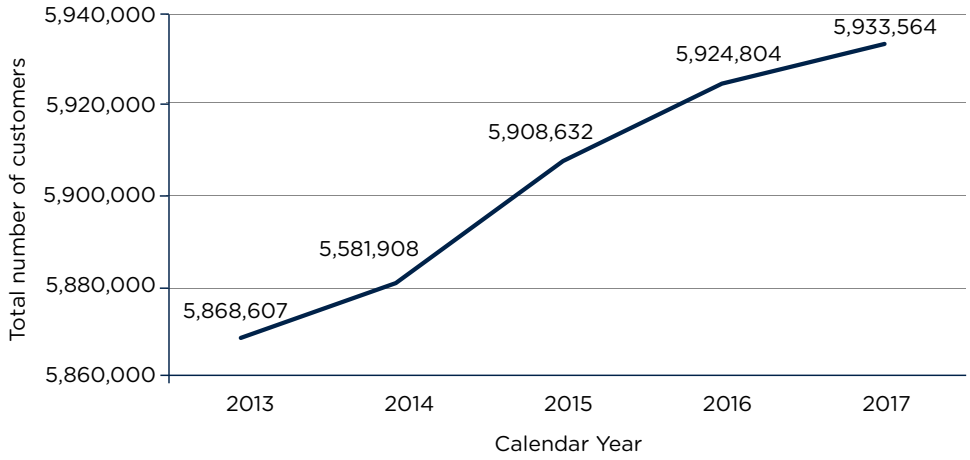


Figure 17: Year-on-year customer numbers - SGN overall

Appendix 2

2017 flows

This appendix describes annual flows during the 2017 calendar year

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, the 2017 weather corrected annual demands and forecasts are based on the industry's current view and research in co-operation with the Hadley Centre, which is part of the Met Office.

Tables 12 to 14 provide a comparison of actual and weather corrected demands during the 2017 calendar year with the forecasts presented in the 2017 LTDS. Annual demands are presented in the format of LDZ load bands/categories, consistent with the basis of system design and operation.

Note: Figures may not sum exactly due to rounding.

Annual demand for 2017 (TWh) - Scotland LDZ			
	Actual demand	Weather corrected demand	2017 LTDS forecast demand
0 - 73.2 MWh	27.9	28.1	29.1
73 – 5,860 MWh	8.7	8.8	9.2
>5,860 MWh firm	10.9	10.9	11.1
Total LDZs	47.5	47.7	49.5
Shrinkage	0.2	0.2	0.2
Total throughput	47.7	47.9	49.7

Table 12 : Annual demand for 2017 (TWh) – Scotland LDZ

Annual demand for 2017 (TWh) - South East LDZ			
	Actual demand	Weather corrected demand	2017 LTDS forecast demand
0 - 73.2 MWh	35.1	35.8	36.3
73 – 5,860 MWh	8.2	8.3	8.6
>5,860 MWh firm	12.9	12.9	11.6
Total LDZs	56.1	57.0	56.5
Shrinkage	0.4	0.4	0.3
Total throughput	56.5	57.4	56.8

Table 13: Annual demand for 2017 (TWh) – South East LDZ

Annual demand for 2017 (TWh) - South LDZ			
	Actual demand	Weather corrected demand	2017 LTDS forecast demand
0 - 73.2 MWh	22.9	23.5	23.7
73 – 5,860 MWh	6.4	6.6	6.6
>5,860 MWh firm	8.4	8.5	7.5
Total LDZs	37.7	38.6	37.8
Shrinkage	0.2	0.2	0.2
Total throughput	37.9	38.8	38.0

Table 14: Annual demand for 2017 (TWh) – South LDZ

LDZ winter severity statistics

Sourced from the May 2018 National Grid Winter Severity Report 2017/18, these statistics cover the gas industry interpretation of winter lasting from October 2017 to March 2018 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.

UK wide the winter of 2017/18 was the eleventh coldest winter recorded in the last 56 years.

1 in 'X' winter severities per LDZ	
LDZ	1 in 'X'
Scotland	1 in 5, Cold
South East	1 in 8, Cold
South	1 in 5, Cold
National	1 in 11, Cold

Table 15: 1 in 'X' winter severities per LDZ

Maximum and minimum flows

Table 16 indicates the highest and lowest daily demands for each LDZ seen between October 2017 and September 2018 and when they occurred. Table 17 shows actual flows for each LDZ on the maximum and minimum demand day of gas year 2017/18.

Actual flows on the maximum and minimum demand day of gas year 2017/18		
LDZ	Maximum day 2017/18	Minimum day 2017/18
Scotland	27.66 mscmd (28 February 2018)	3.97 mscmd (8 July 2018)
South East	38.32 mscmd (1 March 2018)	4.09 mscmd (5 Aug 2018)
South	27.77 mscmd (1 March 2018)	2.66 mscmd (8 July 2018)

Table 16: Actual flows on the maximum and minimum demand day of gas year 2017/18

Maximum and minimum flows of gas year 2017/18 (as a percentage)			
LDZ	Forecast Peak day	Actual maximum Peak day	Actual minimum Peak day 2017/18
Scotland	32.15 mscmd	86.0%	12.3%
South East	43.34 mscmd	88.4%	9.4%
South	31.21 mscmd	88.4%	8.5%

Table 17: Maximum and minimum flows of gas year 2017/18 (as a percentage)

Biomethane sites

Table 18 shows the total number of biomethane sites connected to our networks and the equivalent number of houses this gas might be able to supply.

Portfolio of biomethane sites		
LDZ	**Total**	**Equivalent no of houses**
Scotland	15	128,011
Southern	14	156,165
Total	29	284,176

Table 18: Portfolio of sites as of end August 2018

<7bar distribution projects

Tables 19 to 23 detail the <7bar projects which relate to the planning horizon discussed with this year's LTDS.

When scheduling our major reinforcement projects, we consult with local authorities and developers. This may result in a planned build year change compared with the last year LTDS.

Major projects are works estimated to cost up to and in excess of £500,000.

Projects under construction

<7bar major projects under construction in Scotland		
Project	**Build year**	**Project scope**
Main Street, Glenboig	2018/19	1.2km x 250/355mmPE and a new DG
Bught Road, Inverness	2018/19	1.1km x 315mmPE MP

Table 19: <7bar projects under construction in Scotland

<7bar major projects under construction in southern England		
Project	**Build year**	**Project scope**
MP Mains Extension, Chipping Norton	2018/19	1.0km x 250/315mmPE MP

Table 20: <7bar major projects under construction in southern England

Projects under consideration

<7bar major projects under consideration in Scotland		
Project	**Build year**	**Project scope**
West Mains Road, Edinburgh MP	2019/20	1.0km x 630mmPE MP
Glasgow MP	2019/20	2.0km x 630mmPE/24"ST MP
Dunning - Auchterarder MP	2019/20	1.1km x 315mmPE MP
Inverness IP	2019/20	1.7km x 16"ST IP
Haddington - Dunbar IP	2020/21	1.8km x 315mmPE IP
Bridge of Earn MP	2020/21	2.0km x 250mmPE MP
New Winton to Tranent IP	2020/21	1.1km x 315mmHDPE IP
Hill of Banchory MP	2021/22	1.6km x 250mmPE MP
Haddington - Dunbar IP	2022/23	1.8km x 250mmHDPE IP

Table 21: <7bar major projects under consideration in Scotland

<7bar major projects under consideration in southern England		
Project	**Build year**	**Project scope**
Charlton Park Lane, Woolwich*	2019/20	0.3km x 600ST IP
Galpins Road, Mitcham*	2019/20	0.2km x 24''ST IP
Folkestone DPG	2019/20	New DPG
Tingewick Road, Buckingham	2019/20	1.0km x 355mmPE MP
The Packway (A3028), Durrington	2019/20	2.0km x 250mmPE MP
Bicester MP	2020/21	1.6km x 315mmPE MP
Boundary Road, Newbury	2023/24	0.7km x 355mmPE MP

Table 22: <7bar major projects under consideration in southern England

*Raised as London IP in last year's submission, now split to two separate projects.

<7bar major projects complete in southern England (2017/18)		
Project	**Build year**	**Project scope**
Wavendon MP	2017/18	2.3km x 355mm PE MP
Allington MP	2017/18	2.3km x 400mm PE MP

Table 23: <7bar major projects complete in southern England (2017/18)

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 – Government Department for Business, Energy & Industrial Strategy. BEIS replaced the Department for Business, Innovation and Skills (BIS) and the Department of Energy and Climate Change (DECC) in July 2016.

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

Calorific Value (CV) - The ratio of energy to volume measured in Mega joules per cubic meter (MJ/m3), 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 (m3) - 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 106 cubic metres, one billion cubic metres (bcm) equals 109 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 system - A network of mains operating at three pressure tiers: intermediate (7 to 2barg), medium (2barg to 75mbarg) and low (less than 75mbarg).

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.

Embedded Power Stations – Gas fired power stations designed to provide resilience within a local electricity power grid by generating electricity according to operational and market factors.

Exit Zone - A geographical area within a LDZ, which 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 10 Year Statement, targeted questionnaires, individual company and industry meetings, feedback on responses and investment scenarios. Previously called Transporting Britain's Energy.

Gas Day – Used by gas industry for buying and selling gas on open market. Defined as running from 05:00 on one day to 05:00 on the following day.

Gas Distribution Network (GDN) - An administrative unit responsible for the operation and maintenance of the local transmission system (LTS) and <7barg distribution networks within a defined geographical boundary, supported by a national emergency services organisation.

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 customers.

Gasholder - A vessel used to store gas for the purposes of providing diurnal storage.

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.

H100 100% hydrogen project – Our Hydrogen 100 project has been designed to demonstrate the safe, secure and reliable distribution of hydrogen to reduce carbon output and progress towards the 2050 UK carbon target. More information is available at **www.sgn.co.uk/Hydrogen-100**

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.

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.

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.

Megawatt hour MWh A measure of energy over a period of time. 1 Megawatt hour is equivalent to 1,000,000 watts of power being used or generated for one hour.

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

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.

Network Entry Agreement (NEA) - The Network Entry Agreement sets out the technical and operational conditions for any third party site injecting gas into our networks.

Network entry facility - Sites with the necessary equipment and agreements in place which enable the injection of gas into our networks by a third party.

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.

Planning and Advanced Reservation of Capacity Agreement (PARCA) - A bilateral contract between National Grid and their customer which allows entry and/or exit capacity to be reserved in advance of the completion of a connection

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.

Price Control Review – RIIO - Ofgem's periodic review of transporter allowed returns. The current period has been called RIIO-GD1 and covers April 2013 to March 2021. RIIO-GD2 will commence in 2021 and last five years to 2026.

RIIO stands for:

Revenue = Incentives + Innovation + Outputs.

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 either 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.

Real Time Networks - Our Real-Time Networks project aims to make gas supply's more secure and affordable by demonstrating how a flexible gas network could be more efficient for our evolving energy market and meet changing customer demands. To do this we are capturing representative data of customer gas demand, recording how much gas is needed and when from 1,200 gas meters in the south-east. More information is available on the Real Time Network pages of our website. **www.sgn.co.uk/real-time-networks**

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 customers. 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). One therm equals 29.3071 kWh.

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 Customer. A site which uses greater than 50,000,000 therms per annum.

Appendix 3

Links and contacts

SGN contacts

sgn.co.uk
You can apply for a new gas connection online through our website and learn more about our Help to Heat Scheme for our fuel poor scheme. You can also find further information about our planned and emergency works in your area.

network.capacity@sgn.co.uk
Our dedicated email address for any questions regards our Long Term Development Statement.

leyon.joseph@sgn.co.uk
Network Planning Manager – above 7bar transmission system.

GT1.GT2@sgn.co.uk
Mailbox for requests for increased loads at existing sites where meter capacity may be an issue.

linesearchbeforeudig.co.uk
Safety is our number one priority. Before you dig, always request details of our pipework's location via this online service.

customer@sgn.co.uk
Our 24-hour Customer Service team can be reached by email or by calling 0800 912 1700.
You can also find us on Facebook or follow us on Twitter at @SGNgas.

lets.chat@sgn.co.uk
We are always interested in engaging with our stakeholders This is how we look to improve the way we do things by listening to your feedback.

paul.denniff@sgn.co.uk
Network & Safety Director.

joel.martin@sgn.co.uk
Regulatory Finance Manager – point of contact for storage and biomethane enquiries.

stuart.forrest@sgn.co.uk
Network Planning Manager – below 7bar distribution system.

danny.symes@sgn.co.uk
RIIO GD2 Manager.

hilary.chapman@sgn.co.uk
Industry Codes Manager.

angus.mcintosh@sgn.co.uk
Director of Energy Futures.

soe_gtuip_sgn@sgn.co.uk
Primary contact for iGTs and UIPs.

External contacts

ofgem.gov.uk
Office of Gas and Electricity Markets. Regulating authority for gas industry and markets.

ENA
Energy Networks Association (ENA) represents the 'wires and pipes' transmission and distribution network operators for gas and electricity in the UK.

Joint Office of Gas Transporters
The Joint Office is where the UNC can be found. There are also details of live modifications to the document and the various working bodies relating to the gas industry.

BEIS - Department for Business Energy & Industrial Strategy
BEIS brings together responsibilities for business, industrial strategy, science, innovation, energy and climate change.

www.xoserve.com
One of several service providers supporting the UK gas industry.

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 Licences 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.

If you smell gas or are worried about gas safety you can call the National Gas Emergency Number on 0800 111 999.

Carbon monoxide (CO) can kill.
For more information:
www.co-bealarmed.co.uk

SGN
Your gas. Our network

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