National Grid Gas Distribution

Long Term Development Plan

October 2012

Disclaimer

This Statement is produced for the purpose of and in accordance with National Grid Gas' obligations in Standard Special Condition D3 of its DN Gas Transporter Licence and Section O 4.1 of its Network Code in reliance on information supplied pursuant to Section O of its Network Code. Section O 1.3 of its Network Code applies to any estimate, forecast or other information contained in this Statement.

National Grid Gas UK Distribution's Long Term Development Plan is not intended to have any legal force or to imply any legal obligations as regards capacity planning, future investment and the resulting capacity.

Foreword

Under the backdrop of unrivalled economic uncertainty, we continue to strive to deliver a gas distribution system that meets the needs and expectations of our customers in an efficient and safe manner.

With the UK Energy Industry predicted to undergo significant change in the coming decades, it is even more important that our business planning be both robust and flexible enough to adapt to the inevitable changes that lie ahead. It is with this in mind that we are currently working with Ofgem and our stakeholders to set our allowances and incentives from 2013/14 to 2020/21 under Ofgem's new regulatory model RIIO, (Revenue = Incentives + Innovation + Outputs). This work is set conclude in December 2012 as such the detailed content is based on the information that we provided in our April 2012 Business plan submission and our response to RIIO-GD1 Initial Proposal consultation.

During this next period, the intention is to deliver a low-carbon sustainable energy sector, with incentives to reward innovation, fulfil outputs for customers, and enhance engagement with key stakeholders. It is a new regime to support investment to renew ageing infrastructure.

Through the Climate Change Act (2008) the UK is the first country in the world to have a legally binding, long-term framework to cut Green House Gas emissions. We have looked at the changing energy landscape out to 2050 in light of the different pathways to the Government's 2050 scenarios and undertaken significant work to look at different pathways.

It is clear in the majority of the 2050 Pathways scenarios that gas usage will decline, but there is no change to the number of customers connected and the requirement to ensure our continued safe, reliable and economic pipeline connectivity, and the distribution of gas over the long term.

Studies propose changing the way we generate electricity in the future. They suggest that we need to maximise energy efficiency where practicable, reducing appliance power consumption, insulating buildings and improving the efficiency of our transport fleet.

In the longer term, the studies indicate that we will need to integrate low carbon electricity and biofuels into road and rail transportation. They also show that electricity (via heatpumps technology) and district heating will play a greater role in providing heat.

In addition, the analysis shows that injection of renewable gas resources into the networks can play an important role in supporting delivery of the 2020 renewable targets as well as supporting the long term role of gas.

It is clear from the studies carried out that new technology is pivotal in achieving the ambition of a low carbon economy. It is also clear that the route to a low carbon economy remains uncertain, with technologies yet to be proven, peak demand and supply relationships yet to be quantified, the economics yet to be fully understood and the practicalities of building and deployment of infrastructure unresolved.

If we are to achieve our environmental ambitions we will need to address the key areas of research and development, prepare our national resource skill's base and deploy electricity, gas and telecommunications infrastructure to support market and technological changes.

In determining the role of new technologies and infrastructure we must also ensure that our decisions have considered the balance between environmental benefits, cost, diversity and security of energy supplies, and not least the impact on the competitiveness of the UK economy.

With this in mind, we need to ensure that the development framework does not preclude any option and we continue to explore all potential solutions until such uncertainties are resolved.

Against this background we believe that natural gas continues to play a major role, both in making a low Carbon economy a successful reality, and in contributing on an enduring basis into the future.

Natural gas is the greenest of all fossil fuels and has the potential of becoming “greener”.

It is possible to substitute natural gas with renewable gas derived from biological materials and/or waste and use it within existing appliances, thus decarbonising the gas network. The first renewable gas plants have successfully connected to the gas network and many more are in development.

In addition the efficiency of the appliance population is expected to continue to improve, through technologies such as hybrid (gas/electric heat pumps) and gas heat pumps and buildings will become more energy efficient and this will reduce the environmental impact of using gas as a fuel.

With the discovery of huge deposits of natural gas within shale strata in the United States and in the North West of England, it is probable that natural gas will be a plentiful and relatively cheap fuel for many decades. It can therefore play a vital role in helping to meet carbon reduction targets economically and reliably. Our analysis suggests that gas can play an enduring role as part of an integrated energy system in particular providing an economic solution to seasonal and peak heat demand.

Natural gas gives policy makers confidence that whatever the path we follow to a low carbon economy and whatever happens along the way, the gas system will be there as an option to support electricity generation, heating demand and the transport sector.

It is clear that the natural gas Network needs to see continued investment and ongoing maintenance of the asset base into the future.

This Long Term Development Plan is published by National Grid Gas UK Distribution, and is produced in accordance with Standard Special Condition D3 of National Grid Gas’s DN Gas Transporter Licence. It contains essential information on the process for planning the development of the system, including demand forecasts, system reinforcement projects and associated investment as well as actual demands for the previous year. The main body of the document provides an overview of the key issues, with further information provided in the appendices.

The Plan includes information about how customers may enter gas, e.g. renewable gas, into our Distribution Network. This can be found in Chapter Six, Gas Entry.

I hope you find the Plan both interesting and informative. We would welcome any comments on the style and content via the Feedback Form, which is available on the National Grid website.

I look forward to receiving your views on the Plan, including suggestions as to how it might be improved.

Jeremy Bending
Director, Gas Distribution
Gas Distribution
National Grid

Contents

Chapter One

1. Executive Summary

The purpose of this document is to set out our assessment of the future demand position for National Grid Gas Distribution, our supply from the NTS (National Transmission System), and the consequences for investment in the National Grid Gas Distribution network.

National Grid Gas UK Distribution manages the development, operation and maintenance of the High Pressure and below 7barg Distribution Networks. These Networks extend from the Inlet Valves of the Pressure Regulating Installations at the National Transmission System interface to the outlet of the consumers' Emergency Control Valves in the North West (NW), East Midlands (EM), West Midlands (WM), East Anglia (EA) and North London (NL) LDZs.

1.1 Context

The Long Term Development Plan has been developed using demand scenarios produced by UK Gas Transmission, supported by feedback from their industry-wide consultation process – Transporting Britain's Energy (TBE).

1.2 Demand Outlook

The latest demand forecast is on average 3% higher than our Peak Demand over a ten year period than our 2011/12 demand forecast.

All forecasts are based on annual demands, which are then converted into peak demands via relationships established through analysis of historical behaviour. The relationship has been updated for this years forecast, as previous forecasts have been consistently under estimated in colder weather conditions, predominantly due to changes in domestic heating behaviour.

The relationship between annual gas demand and the 1 in 20 peak day gas demand forecast continues to be based on historic relationships and observed behaviour. However, the relationship between annual and peak demands has changed slightly, with cold weather periods in the last few highlighting a change.

The winters of 2009/10 and 2010/11 included two periods of sustained cold weather which were unlike those experienced in the last thirty. These occurrences have allowed us to validate and correct our profile of gas demand, which is predominantly due to changes in the domestic sector. This has had a consequential effect on the annual to peak relationship and therefore peak demand has been adjusted to reflect the very latest data from the last two winter periods.

1.3 Investment Implications

Following our in depth investment strategy review, undertaken as part of our RIIO-GD1 submissions, the indicative total investment will be £70.3m per year over the next six years (this average falls to £67.2m for the period out until 2020/21). This average yearly spend is in line with our RIIO-GD1 proposals and does not account for any potential changes during the ongoing challenge and review process with Ofgem. This figure is in 09/10 constant prices, as per our RIIO submissions, and also does not allow for replacement-related expenditure.

Some investment to add exit capacity is required even with overall demand reducing. Constraints can arise within the networks due to Local Authority Strategic Development proposals enabling new developments, and the dynamics of existing loads, industries and customers migrating and changing within our networks.

It is possible that in the future, significant investment will be required to facilitate the connection of new sources of gas, including renewable gas. However, our current plan does not include this investment.

Chapter Two

2. Document Scope

2.1 Overview of Process

The production of the Long Term Development Plan is essentially the conclusion to the planning process for the current planning cycle 2012. The Plan is based on UK Transmission demand scenario data, which is formulated from the 2012 Transporting Britain's Energy (TBE) consultation.

The proposed programme for next year's plan is as follows:

- Publish 2012 Long Term Development Plan – October 2012
- Produce outline investment proposals - October 2012
- Seek feedback via feedback form– November 2012 to April 2013
- Receive 2013 Demand Scenario Data - May 2013
- Produce initial strategy proposals – July 2013
- Publish 2013 Long Term Development Plan – October 2013

2.2 Structure of Document

Chapter 3 provides an overview of our latest demand scenarios; Chapter 4 outlines our plans for investment in National Grid Gas UK Distribution; Chapter 5 covers the latest commercial developments affecting our Distribution systems and Chapter 6 addresses the requirements in respect of Network Entry.

The Appendices provide details of the methodologies used to produce the demand and supply forecasts, the latest demand and supply scenarios, actual gas flow data, system maps, connection and specifications including gas quality. The final sections of the document contain a glossary and conversion matrix.

The demand and supply data shown in this year's document is also available on an Excel spreadsheet file, from our website.

The Feedback Form may be accessed via the internet. We would be pleased to hear your views about this publication.

Chapter Three

3. Demand

3.1 Overview

This Chapter describes the forecast for demand ten years ahead for each LDZ within National Grid Gas UK Distribution. It also includes discussion on how current scenarios relate to previously published forecasts. An overview of these scenarios is provided in Section 3.3. Further information is provided in Appendix 2.

3.2 Scenarios

Our demand scenarios are based upon an extensive range of planning assumptions and from our own market observations. This section provides an outline of our latest gas demand scenarios and the key underlying assumptions.

The demand scenarios take into account trends of reducing our carbon emissions which is critical if we are to meet government targets in 2050. They also include planning assumptions derived from market observations the view of specialist consultancies and data collected from UK Transmission's TBE consultation process. The consultation involves a broad cross section of market participants including consumers and consumer groups. It provides important feedback on the impact of market developments and data relating to the consumption of new and existing loads.

3.2.1 Forecast Demands

This section provides an overview of our latest gas demand scenarios through to 2020/21. A more detailed view can be found in Appendix 2, which includes our view for both annual and peak demand on a year-by-year basis. During the next ten years, annual gas demand is forecast to remain flat due to a number of new assumptions within the 2012 demand scenarios.

As part of the demand forecast update for the 2012/13 winter, a range of demand scenarios were developed. Due to the scenario changes described in section 1.2 Demand Outlook additional sensitivity scenarios were created to understand the changes within this year's scenarios. As in previous years we have worked with our service provider (UK Transmission) to develop these scenarios, as summarised below.

Slow Progression - 'Bottom-up' scenario reflecting existing or soon to be implemented energy policies and market factors.

Gone Green - 'Top-down' scenario that represents a potential energy background which meets the environmental targets in 2020 and maintains progress towards the UK's 2050 carbon emissions reductions target.

Accelerated Growth – As per Gone Green but a more aggressive response to environmental elements of the scenario.

Sensitivity (S3) – This scenario is our 2011 forecast updated with a revised Peak and Annual Relationship. The relationship between annual and peak has been updated in this year's forecast correcting an error that resulted in an under forecast last year.

Sensitivity Scenario (S8) - which is the adopted forecast for 2012 broadly, represents a mid case between the upper, Slow Progression 2012 scenario and the lower, Gone Green 2012 scenario. This forecast balances the risk of security of supply and customer impact and gives the opportunity to validate a number of the new assumptions.

FIGURE 3.2A – North West LDZ Historical and Forecast Annual Gas Demand – EP2 SNCWV

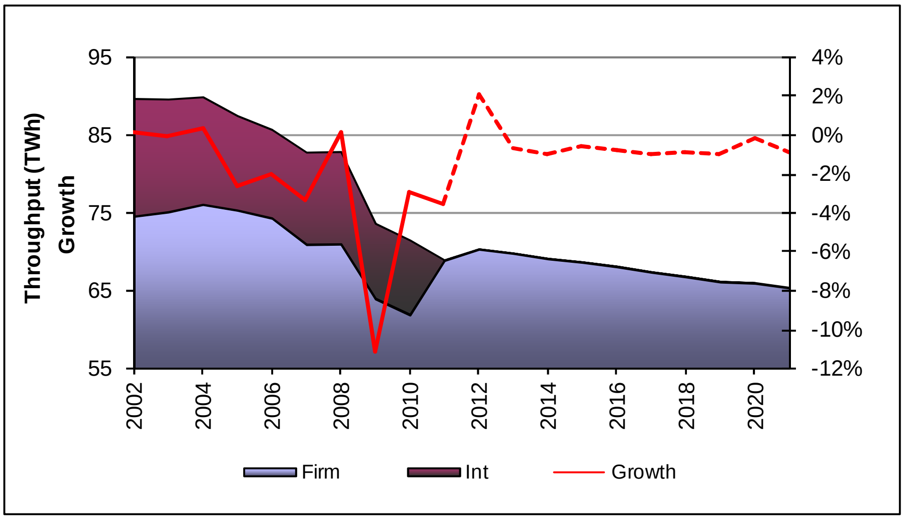


FIGURE 3.2B – East Midlands LDZ Historical and Forecast Annual Gas Demand– EP2 SNCWV

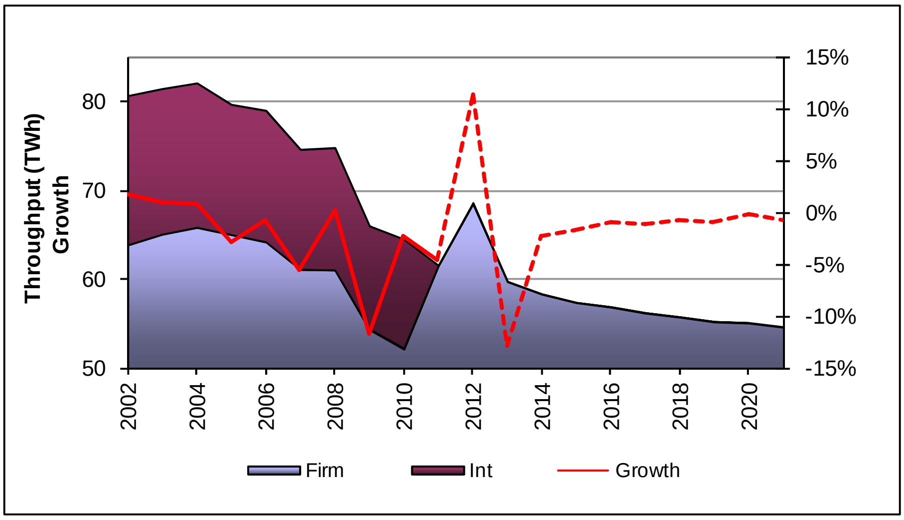


FIGURE 3.2C – West Midlands LDZ Historical and Forecast Annual Gas Demand – EP2 SNCWV

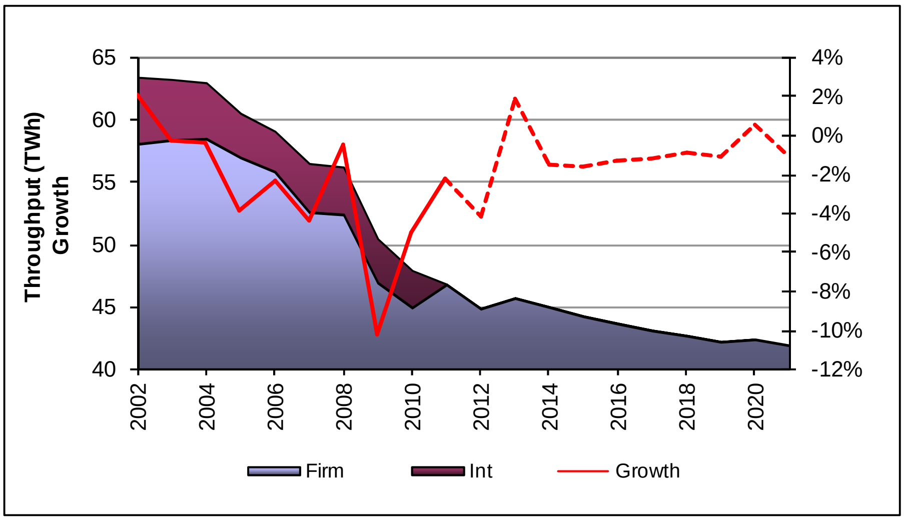


FIGURE 3.2D – East Anglia LDZ Historical and Forecast Annual Gas Demand – EP2 SNCWV

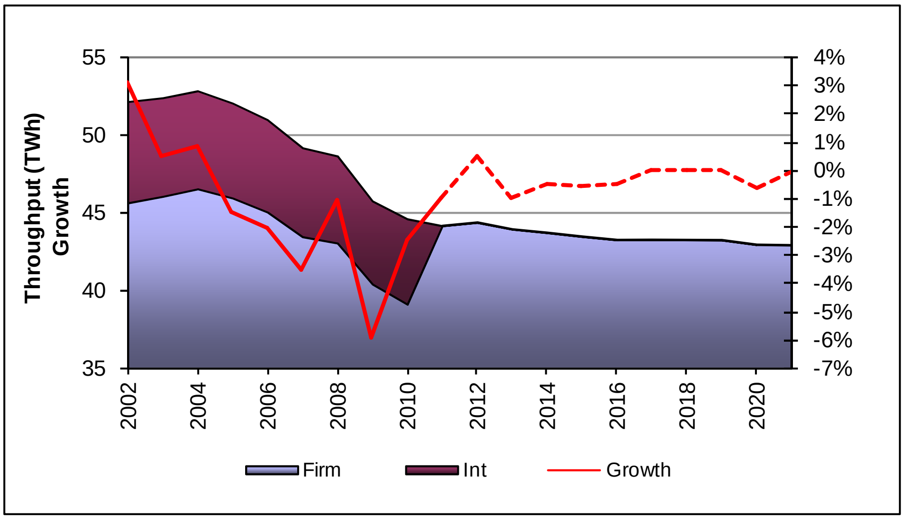


FIGURE 3.2E – London LDZ Historical and Forecast Annual Gas Demand – EP2 SNCWV

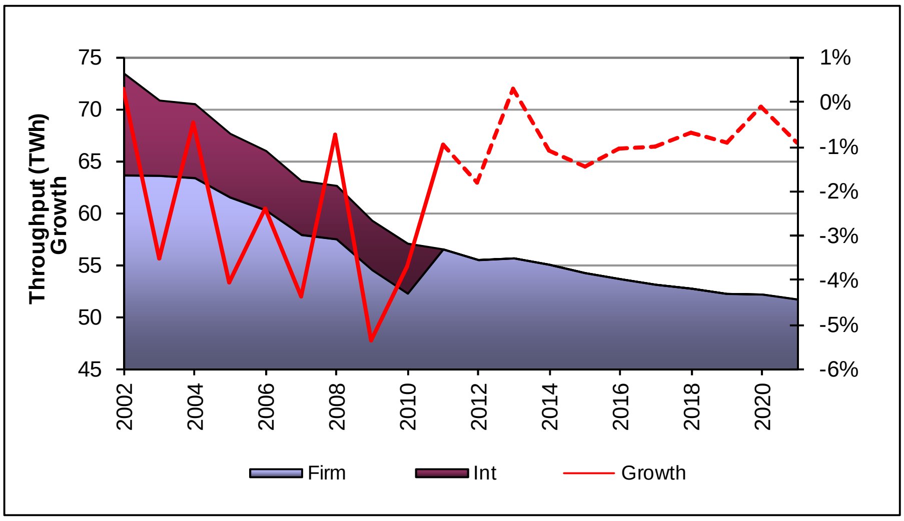
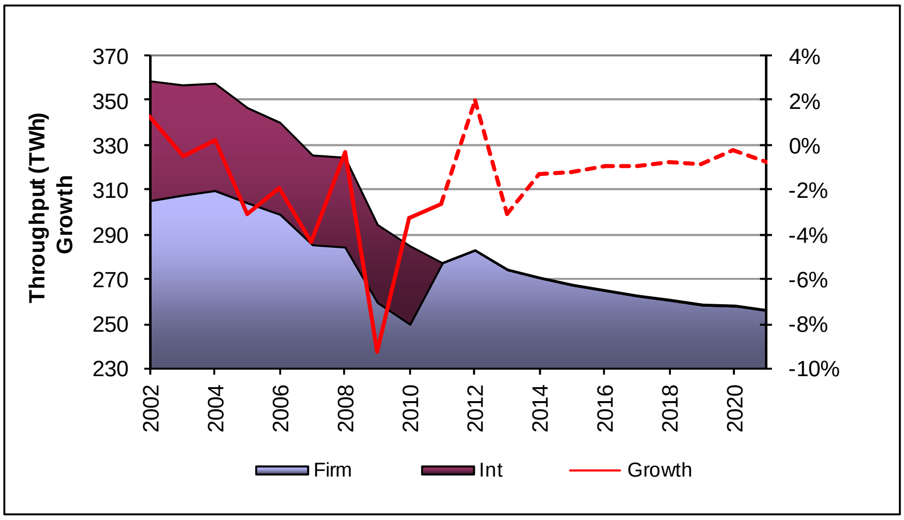
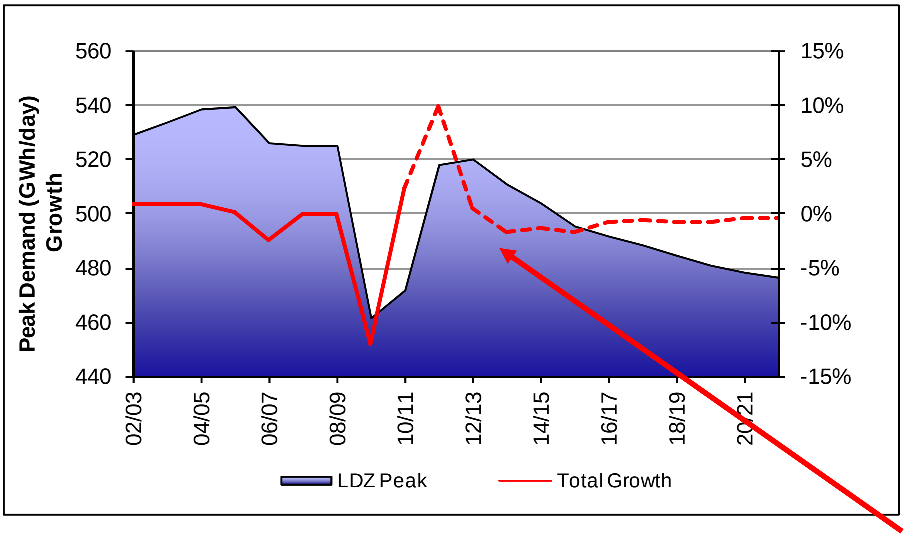


FIGURE 3.2F – Aggregate National Grid Gas LDZ Historical and Forecast Annual Gas Demand – EP2 SNCWV



Figures 3.2G to 3.2L show the equivalent view for peak demand.

FIGURE 3.2G – North West LDZ Historical and Forecast 1 in 20 Peak Gas Demand



The impact of Interruption Reform can be seen from 2011/12 onwards with a step increase in demand. This is shown in all slides from 3.2G to 3.2L.

FIGURE 3.2H – East Midlands LDZ Historical and Forecast 1 in 20 Peak Gas Demand

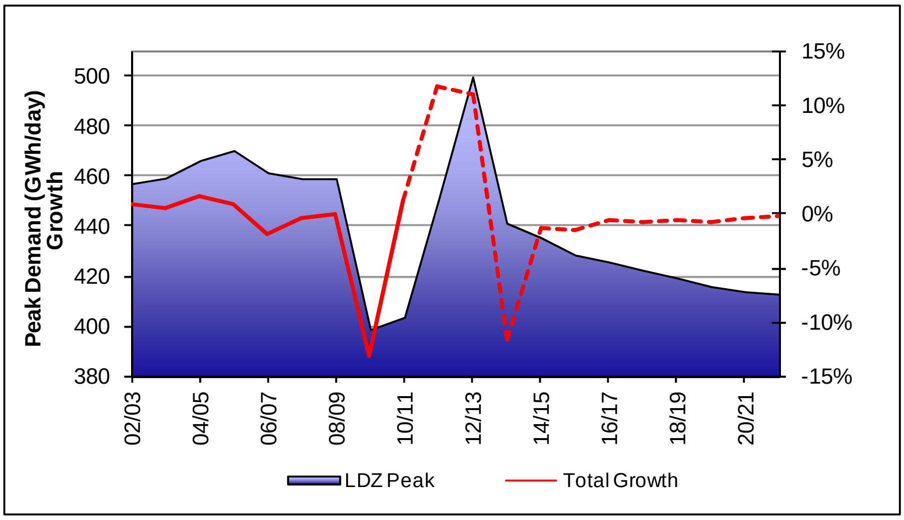


FIGURE 3.2I – West Midlands LDZ Historical and Forecast 1 in 20 Peak Gas Demand

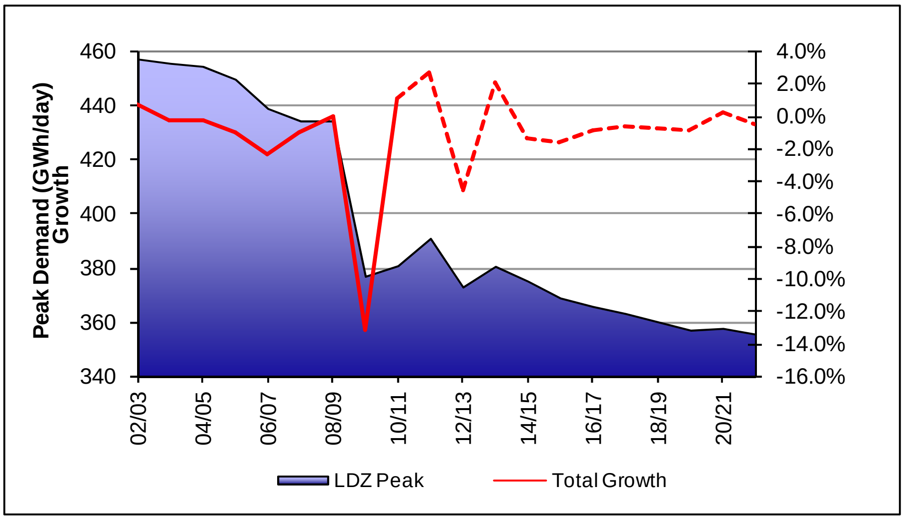


FIGURE 3.2J – East Anglia LDZ Historical and Forecast 1 in 20 Peak Gas Demand

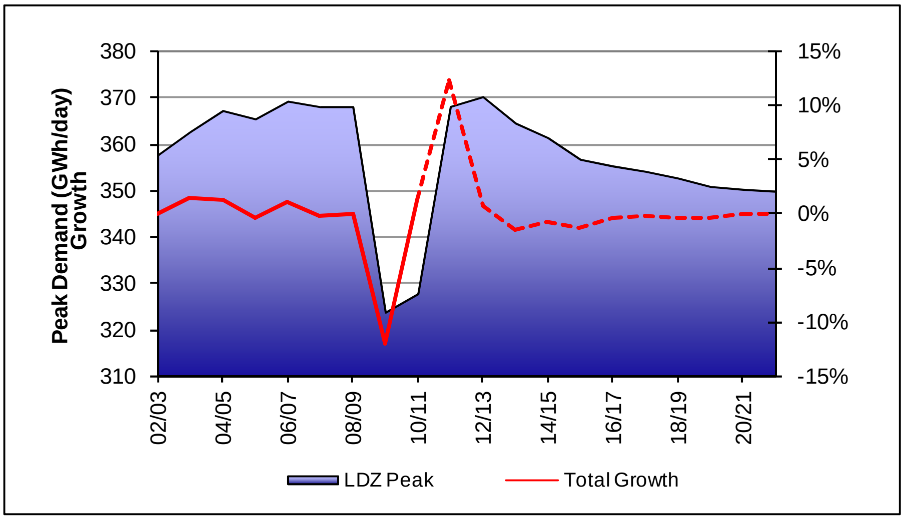


FIGURE 3.2K – London LDZ Historical and Forecast 1 in 20 Peak Gas Demand

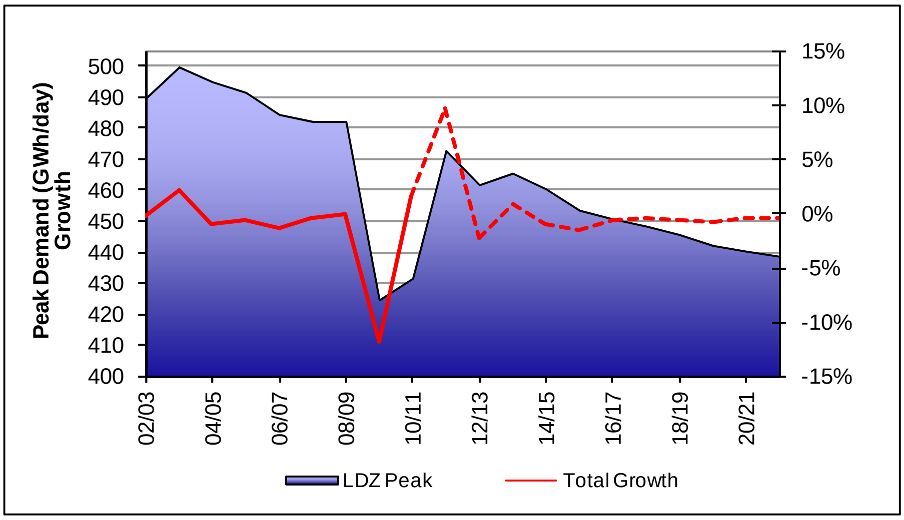
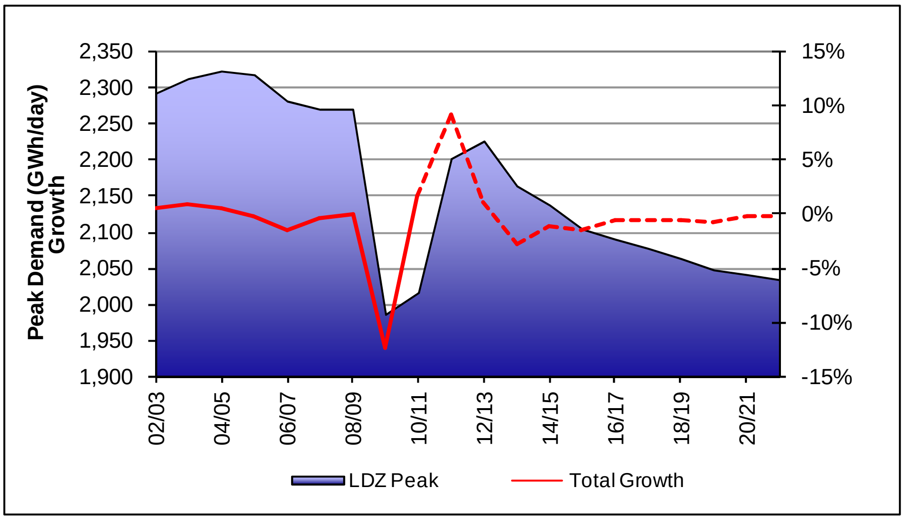


FIGURE 3.2L – Aggregate National Grid Gas LDZ Historical and Forecast 1 in 20 Peak Gas Demand



3.3 Forecast Comparisons

The following charts provide a comparison of the 2012 scenarios with those published in the 2011 Long Term Development Plan. The 2011 figure on the 2012 forecast curve is the actual throughput seen in 2011.

FIGURE 3.3A – Comparison of North West LDZ Annual Demand Forecasts – EP2 SNCWV

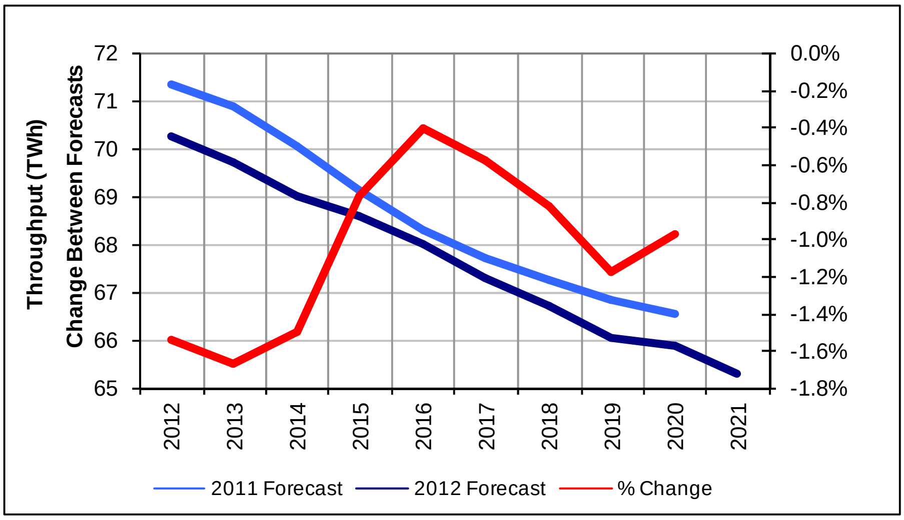


FIGURE 3.3B – Comparison of East Midlands LDZ Annual Demand Forecasts – EP2 SNCWV

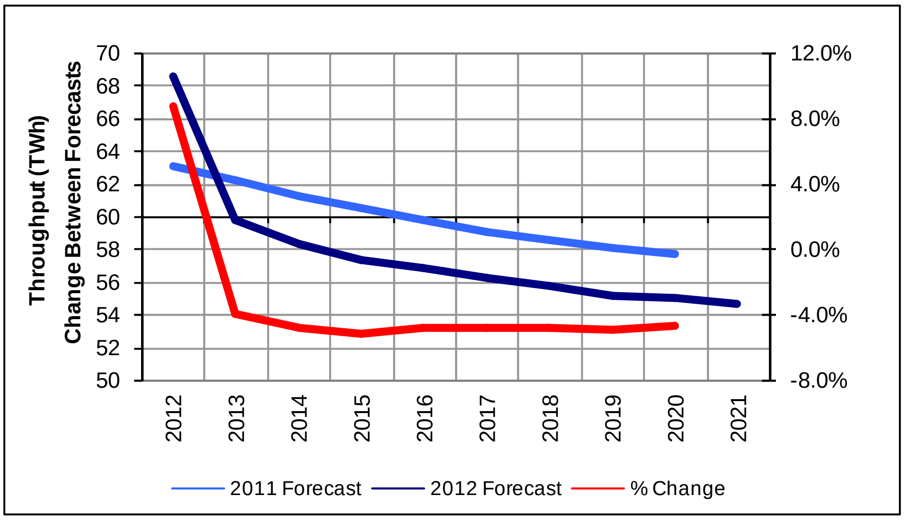


FIGURE 3.3C – Comparison of West Midlands LDZ Annual Demand Forecasts – EP2 SNCWV

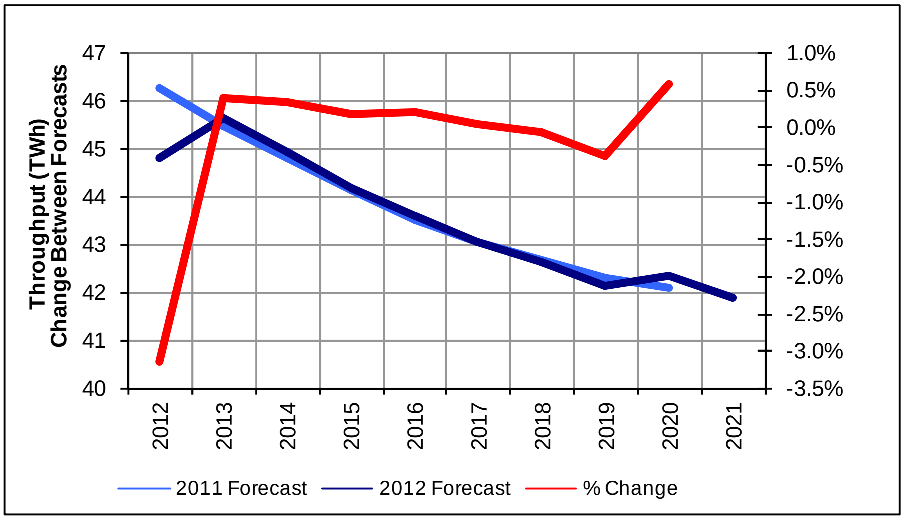


FIGURE 3.3D – Comparison of East Anglia LDZ Annual Demand Forecasts – EP2 SNCWV

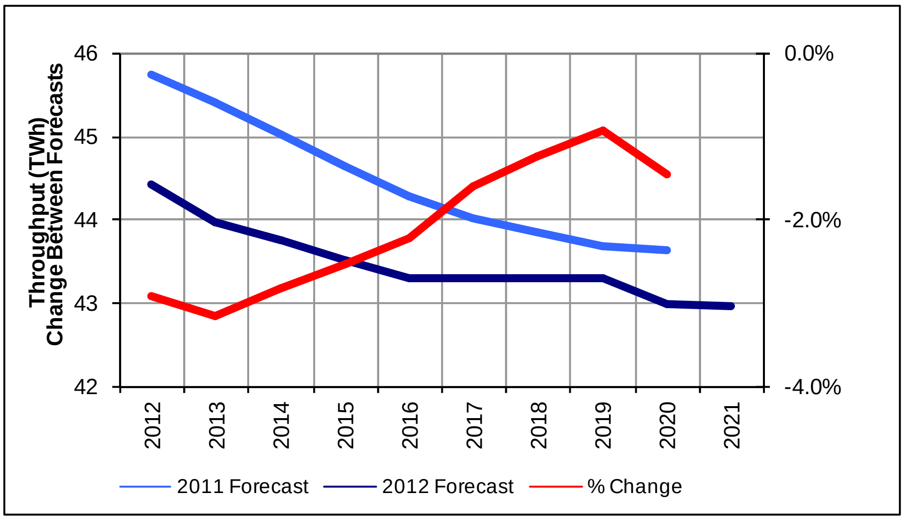


FIGURE 3.3E – Comparison of London LDZ Annual Demand Forecasts – EP2 SNCWV

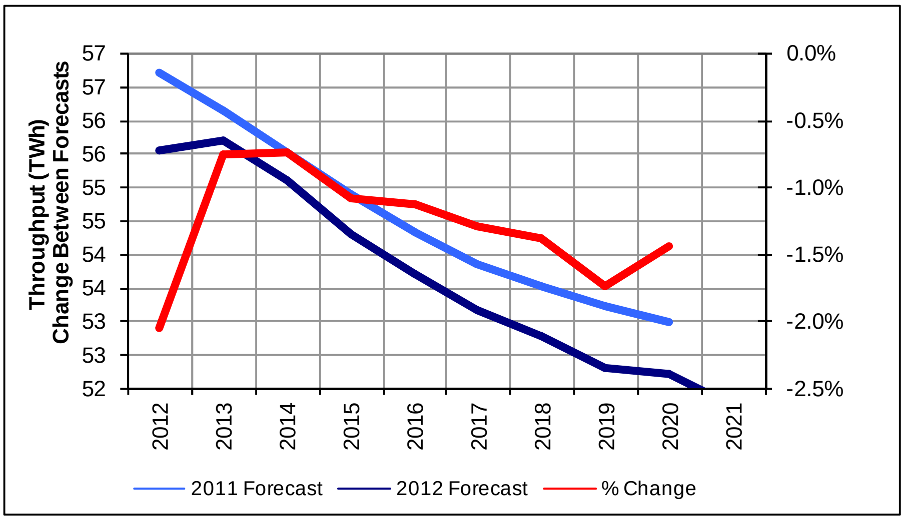
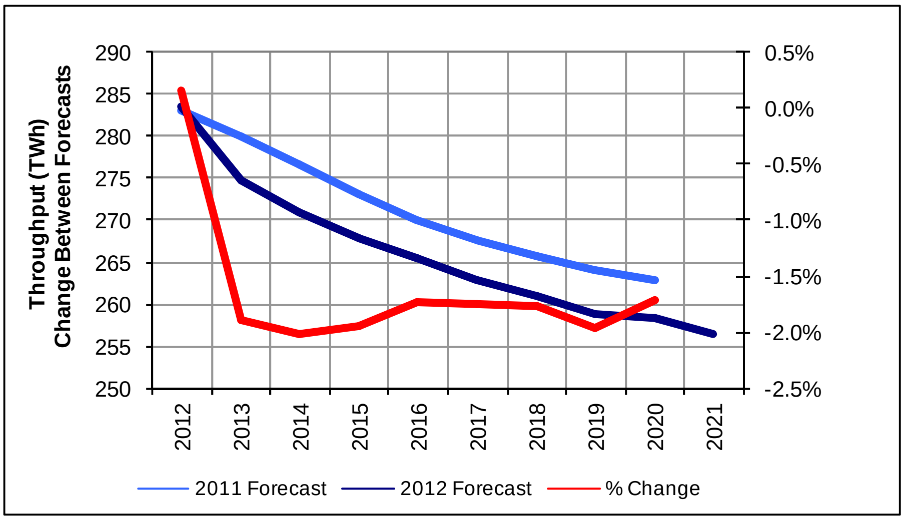


FIGURE 3.3F – Comparison of Aggregate National Grid Gas LDZ Annual Demand Forecasts – EP2 SNCWV



3.4 Forecast Accuracy

In the summer of 2008, there was a significant crisis in the Financial Services sector which pushed the UK into recession. Energy demand declined significantly as a result of this. The demand forecast produced in 2008 prior to the financial crisis did not anticipate this demand reduction.

The following charts show the accuracy of the forecasts published 1 and 3 years ago for the 2011/12 gas year.

FIGURE 3.4A – Accuracy of 1 and 3 year ahead peak 1 in 20 demand forecasts

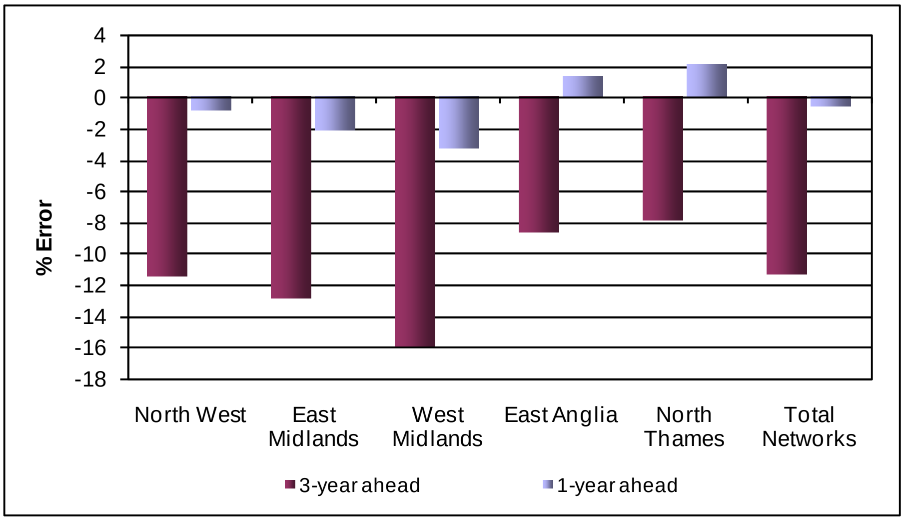
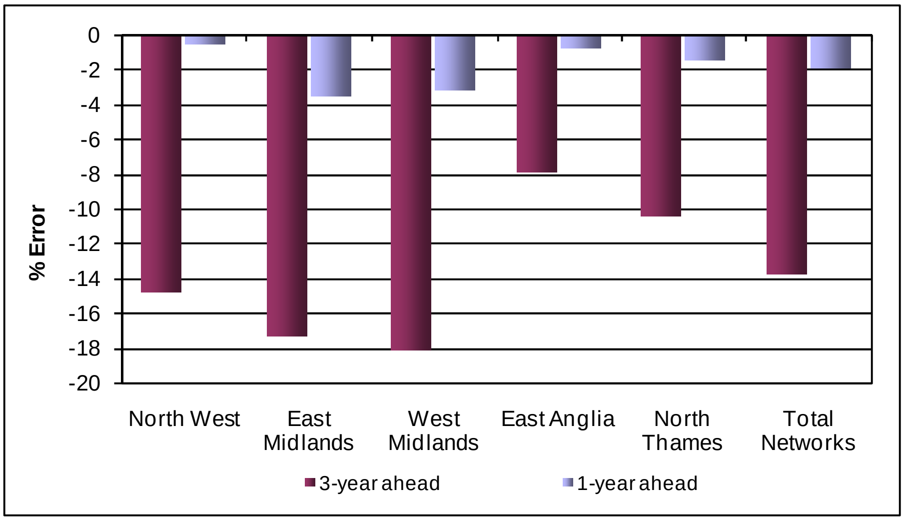


FIGURE 3.4B – Accuracy of 1 and 3 year ahead annual demand forecasts



Chapter Four

4. Capacity Provision and Capital Expenditure

4.1 Overview

4.1 Overview

The annual update of the supply and demand forecasts is a key building block in developing the investment plans of the Distribution business.

Network models are analysed to ensure that the forecast demand levels can be transported in future years and, if not, work is carried out to identify the system reinforcement necessary to meet these demand levels. This reflects our Gas Transporters' Licence obligation to provide transportation capacity consistent with meeting 1 in 20 peak day demand (definition in the Glossary).

National Grid Gas' four gas distribution networks are supplied from the National Transmission System (NTS) via offtakes within the local distribution zones (LDZ's). Transportation and diurnal storage are provided by the high pressure (HP) distribution network, before the gas is cascaded down the intermediate (IP), medium (MP) and low pressure (LP) tiers. The majority of the customers are supplied from the below 7 barg distribution network.

This chapter presents the currently sanctioned reinforcement projects and those that are presently under consideration for construction between 2012/13 and 2017/18. It must be noted that National Grid and Ofgem are currently working through the price control process in order to determine the allowances for the majority of this period. This will have a significant impact on our ability to complete some of the projects detailed below.

Appendix 4 shows the current high pressure distribution network.

4.1.1 Replacement Programme update

Currently replacement of iron pipelines is the only realistic way of proactively maintaining buried pipes that do not benefit from Cathodic Protection. Without Cathodic Protection, which cannot be installed retrospectively, the condition of metallic pipes progressively deteriorates as the metal oxidises. As this occurs their ability to safely contain the gas within them declines.

It was referenced in our 2011 Long Term Development Plan that the HSE had indicated that gas distribution network operators should change the way in which the replacement programme is structured. Following the conclusion of the Health and Safety Executive (HSE) and Ofgem's 10 year review of the Iron Mains Replacement Programme (the 30:30 Programme) in June 2011, the HSE proposed the Iron Mains Risk Removal Programme, referred to as the new Three Tier Framework. This Three Tier Framework moves away from the current 30:30 programme which mandated the decommissioning of all Iron mains within 30 metres of a property by 2032, to a three (diameter) tiered approach.

In response to the HSE's proposal we have worked collaboratively with the independent Gas Distribution Networks to develop the framework to meet the requirements of this new regime.

Tier 1 (less than or equal to 8" diameter)

The proposed framework requires a minimum length of pipes to be replaced annually made up of the 20 percent highest risk (defined as "seed") pipes, with the remaining 80 per cent to be selected on safety, environment and efficiency considerations.

This proposed framework changes our current Tier 1 prioritisation and planning process, however, because we have already developed a zonal methodology during the current price control period, the changes for Tier 1 can be accommodated effectively into our existing delivery model. A summary of the benefits we have seen in the current review cycle which will continue into the next eight years (RIIO-GD1) are:

- Reduced mobilisation and de-mobilisation costs due to projects being of greater pipe length.
- More holistic mains design because all the pipes in an area are being replaced at the same time enabling more integrated solutions over piecemeal replacement.
- Fewer connections between replaced pipes and those remaining in use.
- More efficient customer liaison and better customer experience as customer disruption can be managed more effectively and will be over quickly.
- Better relationship with Highway Authorities and better outcomes in terms of traffic management and reinstatement.

Tier 2 (greater than 8" less than 18" diameter)

The HSE required Gas Distribution Network Operators to establish a Risk Threshold for Tier 2 pipes. Any Tier 2 pipe with a risk score over this Threshold is mandated to be actioned to be taken off risk. We have been central to the Risk Threshold development work in collaboration with the other GDNs.

The defined network Risk Thresholds correspond with a 1 in 1,000,000 probability per annum that a person living or working within 30m of a Tier 2 pipe becomes a fatality. A separate Threshold applies to each Network. The Thresholds are based upon the best information that is currently available. They are set at a level whereby there is a 99% confidence that the risks are not being understated.

Tier 3 (18" and above)

There is no mandatory work in this category instead we have developed in conjunction with the HSE a maintenance regime to apply to these assets. Our maintenance policy reflects the principles established in the Tier 2 risk threshold by targeting the higher risk pipes.

In addition, we have assessed remediation of Tier 2 and 3 iron pipes within 30m of a property based on a cost benefit analysis model to assess whether there is work which brings net benefits to consumers. This, coupled with condition based replacement of any non HSE policy mains, ensures the integrity of our networks and that they are fit to transport gas.

4.2 Investment Plans

4.2.1 Investment Planning Process

The aim of the investment planning process is to review gas demand and storage requirements in light of winter experience, updated gas demand and supply forecasts and other factors, then identify the necessary investment requirements to efficiently and effectively address these needs. The investment requirements arising out of the latest planning cycle are summarized within the 2011 Long Term Development Plan. The investment plans detailed below take into account the implementation of interruption reform.

4.2.2 Planned Investment

Table 4.2 indicates the expected level of net capital expenditure in the 2012/13 – 2017/18 and 2012/12 – 2020/21 (as per our RIIO business plan submission) periods split by the following categories -

- 'High Pressure Distribution System' relates to investment in maintaining and developing equipment that operates at pressures greater than 7 barg. For example investment in a replacement pre heater.
- 'Storage' relates to the investment on both low and high pressure storage installations.
- 'Reinforcement & Governors' relates to investment both general and specific in increasing the capacity of below 7 barg systems, typically by constructing new mains and governor installations.
- 'Connections' relates to the net cost to National Grid Gas of connecting new gas consumers, both domestic and non-domestic, to the gas supply network.
- 'Other Capex' relates to investments on lower pressures gas network assets such as Medium Pressure valves or Pressure Management.
- 'Replacement' relates to the money invested in replacing old metallic mains, metallic services and riser pipes in blocks of flats.

TABLE 4.2 - Forecast capital expenditure by category

Type of Investment	Amount of investment[1] £m	
	2012/13 – 2017/18	**2012/13 – 2020/21**
High Pressure Distribution System	137	186
Storage	0	0
Reinforcement & Governors	121	170
Connections	115	174
Other Capex	49	74
Replacement	2712	4084
Total	**3134**	**4688**

[1]The figures above are taken from the net 2009/10 constant cost base plan, which was submitted as part of our April 2012 RIIO submission. The figures represent our current investment proposals and the finalised numbers will form part of Ofgem's Final Proposals in December 2012.

No capital investment in the provision of additional Entry Capacity is shown in this table. It is possible that significant investment in such capacity may be required depending upon the rate of development of new sources of gas and the requirement upon National Grid to fund such connections.

4.3 Development of High Pressure Distribution System

The high pressure distribution system is designed for transmission and diurnal storage on the basis of ensuring maintenance of the 1 in 20 peak day criterion. The system is developed, based on demand forecasts, to ensure that this capability is maintained. Significant distribution pipeline projects (greater than £0.5million) approved and under consideration are shown in table 4.3.1.

It should be noted that pipeline construction projects typically take three years to complete. The dates stated are the main year of construction activity and not necessarily the year of commissioning.

4.3.1 Approved Projects and Under Consideration 2012/13 to 2017/18

Year	***Project Name***	***Scope***	***LDZ***	***Status***
2012/13	Bolton	Reinforcement	North West	Under Consideration – awaiting planning application outcome
2014/15	Holmes Chapel Offtake	PRS Rebuild Capacity	North West	Under Consideration
2014/15	Wootton	PRS Rebuild Capacity	East of England	Under Consideration
2015/16	Blyborough Offtake	PRS Rebuild Capacity	East of England	Under Consideration
2015/16	Buttermilk Bridge	PRS Rebuild Capacity	North West	Under Consideration
2016/17	Westfield (Site rebuild)	PRS Rebuild Capacity	East of England	Under Consideration

4.4 Development of Below 7barg Distribution System

The below 7barg system is constrained to operate between levels of pressure defined by statute, regulation and safe working practices.

We continue to develop the below 7barg distribution system, investing in mains, services and associated plant to meet the needs of providing capacity to customers wishing to connect to our network and other Gas Transporters’ requests for transportation services.

The below 7barg systems are designed to meet a peak six-minute (pk6) demand level, which is the maximum demand level (averaged over a six minute period) that can be experienced in a network under cold winter conditions, assuming reasonable diversity of demand. National Grid Gas Distribution will continue to invest for reinforcement and new connections consistent with the growth in peak day demand forecast in this document.

National Grid Gas Distribution will also continue to invest in the replacement of existing transportation network assets, primarily the renewal of mains and services within Distribution systems. This includes expenditure associated with the Enforcement Policy initiated by the

HSE for decommissioning all iron gas mains within 30 metres of buildings within a 30-year period.

Significant below 7barg projects (greater than £0.5million) are shown in table 4.4.1. (Replacement projects not shown).

4.4.1 Projects approved and under consideration 2012/13 to 2017/18

Year	***Project Name***	***Scope***	***LDZ***	***Status***
2012/13	Scj – Cambridge Biomedical Campus	Specific Reinforcement	East of England	Under Consideration
2012/13	Scj – Elean Business Park	Specific Reinforcement	East of England	Under Consideration
2013/14	Manor Road, Kempston Hardwick	Specific Reinforcement	East of England	Under Consideration
2013/14	Scunthorpe	General Reinforcement	East of England	Under Consideration
2013/14	East Retford	General Reinforcement	East of England	Under Consideration
2013/14	Staveley	General Reinforcement	East of England	Under Consideration
2013/14	Fulham PRS	General Reinforcement	North London	Under Consideration
2013/14	Battersea PRS	General Reinforcement	North London	Under Consideration
2013/14	Leamouth PRS	General Reinforcement	North London	Under Consideration
2013/14	Fulham to Battersea Reinforcement	General Reinforcement	North London	Under Consideration
2013/14	Leamouth to Bow Reinforcement	General Reinforcement	North London	Under Consideration
2013/14	Bow Common PRS	General Reinforcement	North London	Under Consideration
2013/14	Woodchurch IP	General Reinforcement	North West	Under Consideration
2013/14	James Bridge Regeneration Wednesbury	General Reinforcement	West Midlands	Under Consideration
2014/15	Meadowhall/Wentworth Reinforcement	IP Pressure Elevation	East of England	Under Consideration
2015/16	Canonbury Square	District Governor (R6) Replacement	North London	Under Consideration

Chapter Five

5. Commercial Developments

5.1 Exit Capacity

To facilitate the network sales, various changes were required to the commercial framework for gas transportation. Ofgem is involved in the development of these industry arrangements, which are contained within the Uniform Network Code (UNC). The latest information relating to these issues can be found on the Ofgem website: http://www.ofgem.gov.uk/.

The NTS Exit Capacity Regime includes the following features:

- User Commitment i.e. DNs and NTS direct-connects (e.g. power stations) booking and paying for NTS Exit Capacity.
- Long Term, Medium Term and Daily Release of NTS Offtake (Flat) Capacity.
- Long Term, Medium Term and Daily Release of NTS Offtake (Flow Flexibility) Capacity.
- NTS Constraint Management Tools (including interruptible services).

A sale of long term capacity (enduring) rights took place in July 2011 together with a sale of medium term (annual) capacity rights for 2012/13. Further developments in this area include a review of the offtake rules (e.g. Agreeing Pressures and Flow Swaps) due for completion later in the year. In addition, a modification has been proposed to allow for the removal of Deemed Applications from the regime (although, overruns and their associated charges will remain).

5.2 DN Interruption

On 15th March 2007, Ofgem directed the implementation of the UNC Modification Proposal 0090: Revised DN Interruption Arrangements with an implementation date of 1 April 2008. This established a regime whereby the DN Operators determine interruption volumes by location and offer for sale a range of interruptible terms in an annual tender process three years ahead of the rights taking effect. Successful applicants therefore, have revised interruptible terms three years from sale and unsuccessful applicants receive a firm service in the same timescale. The first sale of interruptible rights took place in June 2008 with a subsequent sale in October 2008 for the rights to take effect from 2011 onwards. Further sales of interruptible rights took place in June 2009, June 2010 and June 2011. Since 2009, interruption rights can be offered for sale two years (as well as three years) ahead of when they take effect in the annual tender process. The daily regime is now live (commenced 1st October 2011).

Chapter Six

6. Gas Entry

Overview

In addition to gas from the National Transmission System, gas can now enter the system from local gas producers enabling the introduction of renewable sources of gas in to the system. Biologically derived renewable gas, is now flowing to consumers.

Gas enters our Network through a ‘Delivery Facility’ located downstream of where the biogas is produced.

This is a picture of the first renewable gas delivery facility that was connected to the National Grid Gas Distribution system in 2010.

The Delivery Facility is connected by a pipeline known as the ‘Connection Pipe’ to our existing pipe network.

The Gas Safety Management Regulations define the specification that gas has to meet in order to enter our Network. (For your information we have reproduced the gas specification in Appendix 5.3).

To ensure that we are complying with these regulations we carry out the gas composition measurements. Should the gas fall outside these parameters the facility can be isolated by the use of a remotely operated valve. We also measure the volume and energy content of the gas entering our Network utilising a Volume flow meter to measure the calorific value. The calorific value has to be in a prescribed range which may mean that biogas producers have to enrich the gas with propane under certain circumstances.

Additionally GSMR stipulates that gas must be Odorised before it enters the Network. This characteristic smell is added to maintain the safety of the public and this process is carried out at the Delivery Facility.

The connection point to our existing Network will be determined by the volume of gas the producer requires to input, as we need to ensure that there will be enough local gas demand in the area where the connection is being made. In circumstances where local off Peak demand is insufficient, a connection to an alternative part of our system perhaps further away will be required.

Contact Damien Hawke, our Network Design Manager if you want to learn more about putting gas into our Distribution pipes. His contact details are:

Damien Hawke
Network Design Manager
Network Strategy
National Grid
Block 4, Area 6
Brick Kiln Street
Hinckley
Leicestershire
LE10 0NA

Appendix One

A1 Process Methodology

A1.1 Demand

Our gas demand forecasts are currently developed using the methodology set out in the 2012 UK Future Energy Scenarios Document produced by National Grid Transmission (NTS) (published in 27th September 2012) but with slightly different input assumptions to the scenarios presented in the document. For more information on this methodology please see the Gas Demand Forecasting Methodology document on the National Grid website.

The development of annual gas demand forecasts considers a wide range of factors from complex econometrics and scenario axioms to an assessment of individual load enquiries. For any forecasting process a set of planning assumptions is required which, if necessary, can be flexed to create alternative scenarios. For the forecasts presented in this document these assumptions cover areas including, but not restricted to, the economy, fuel prices, environmental considerations and government policies. A number of these assumptions are based on data from independent organisations and our forecasts are also benchmarked against the work of a number of recognised external sources.

A1.1.1 LDZ Modelling

LDZ demand is split into market sectors according to load size and supply type (i.e. daily or non daily metered). For each sector models have been developed that make allowance for economic conditions, local demand intelligence, new large load enquiries, relative fuel prices, potential new markets and other factors, such as government policy, that could affect future growth in demand.

By adopting this approach we are able to take account of varying economic conditions and specific large loads within different LDZ's.

A1.1.2 Demand/Weather Modelling

Due to the temperature sensitivity of LDZ markets, forecasts of annual demand are based upon an assumed average weather condition to allow underlying year-on-year changes to be identified. The related demand models developed for overall LDZ demand and a number of sub-LDZ load categories, are based on factors known as Composite Weather Variables (CWVs). The CWVs are derived mainly from temperature and wind speed data which is defined and optimised for each LDZ and so gives a predominately straight-line relationship between demand and weather.

The annual demand forecasts have been calculated using EP2 SNCWVs. These SNCWVs are calculated from the climate warming data for 2012/13 forecast by the Met Office for the energy industry.

This has had no impact on the 1 in 20 peak day demands or the 1 in 50 severe load duration curves which continue to be calculated, as per the relevant statutory and license obligations, from a longer period of weather data, in this case 1928/29 to 2010/11.

A1.1.3 Peak Day Demand Modeling

Once the annual demand forecasts and daily demand/weather models have been developed a simulation methodology is employed using historical weather data for each LDZ to determine the peak day (in accordance with statutory/License obligations) and severe winter demand estimates. This process is detailed in the forecasting methodology document referred to at the beginning of this chapter.

A1.2 High Pressure Distribution Planning

Although the development of the HP Distribution Systems is largely demand led, the capacity planning processes are not dissimilar to those utilised for the development of the NTS. Forecast demands are used to model system flow patterns and produce capacity plans that take account of anticipated changes in system load and within-day demand profiles.

The options available to relieve High Pressure Distribution capacity constraints include:

- Uprating pipeline operating pressures;
- Constructing new pipelines or storage;
- Constructing new supplies (Offtakes from the NTS), regulators and control systems.

As well as planning to ensure that High Pressure Distribution pipelines are designed to the correct size to meet peak flows, there is a requirement to plan to meet the variation in demand over a 24-hour period. Diurnal storage is used to satisfy these variations and may consist of gas held in linepack, low-pressure gasholders or high-pressure vessels.

A1.3 Below 7 barg Distribution Planning

The lower pressure below 7 barg distribution system is designed to meet expected gas flows in any six-minute period, assuming reasonable diversity of demand. Lower tier reinforcement planning is based on LDZ peak demand forecasts, adjusted to take account of the characteristics of specific networks.

Network analysis is carried out using a suite of planning tools with the results being validated against a comprehensive set of actual pressure recordings. The planned networks are then used to assess future system performance to predict reinforcement requirements and the effects of additional loads. Reinforcement options are then identified, costed, and programmed for completion. Reinforcement is usually carried out by installing a new main, pressure elevation within the pressure tier, or by taking a new Offtake point from a higher-pressure tier.

A1.4 Investment Procedures and Project Management

All investment projects must comply with our Investment and Disposals Guidelines, which set out the broad principles that should be followed when evaluating high value investment or divestment projects. Proposals should reflect the drive for efficiency, safety and the environmental benefits that form the core of our asset management framework.

The investment guidelines define the methodology to be followed for undertaking individual investments in a consistent and easy to understand manner. Together with the planning and budgeting methodology, they are used to ensure maximum value is obtained. For non-mandatory projects, the key investment focus in the majority of cases is to undertake only those projects that carry an economic benefit. For mandatory projects, such as safety-related work, the focus is on minimising the net present cost whilst not undermining the project objectives or the safety or reliability of the network. The successful management of major investment projects is central to our business objectives. Our project management strategy involves:

- Determining the level of financial commitment and appropriate method of funding for the project;
- Monitoring and controlling the progress of the project to ensure that financial and technical performance targets are achieved;

- Post project and post investment review to ensure compliance and capture lessons learnt.

When a major investment project is approved, a multi-discipline team prepares an Invitation to Tender in accordance with the EC Utilities Directive. For major projects, specialist consultants with experience of preparing and evaluating tender documents are used.

Tenders are received and evaluated against previously agreed technical, quality, safety, financial and programme criteria. An award is then made to the most economically advantageous tender consistent with these criteria.

The successful contractor completes the project in accordance with an agreed programme of works. We manage the project, but on some major projects we utilise project services support from specialist contractors and professional consultants, all of whom are appointed subject to competitive tender. We also manage the funding of the project by careful financial monitoring and cost control. It remains the contractor's responsibility to directly manage and supervise the works. Following completion, a Post Completion Review is carried out to provide feedback to management on project performance and to improve future decision making processes.

Our project management of major investment projects is designed to ensure that they are delivered on time, to the appropriate quality standards, at minimum cost.

Appendix Two

A2. Gas Demand & Supply Volume Forecasts

A2.1 Demand (figures are based upon scenario S8)

TABLE A2.1A – North West LDZ Forecast Annual Demand – Split by Load Categories (TWh)

Load Category	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
0 to 73 MWh	41.1	39.5	38.3	37.2	36.4	35.6	35.0	34.5	34.3	33.8
73 to 732 MWh	5.3	5.1	5.0	4.9	4.8	4.8	4.7	4.6	4.5	4.5
NDM >732 MWh	7.8	7.8	7.9	7.9	8.0	8.1	8.1	8.1	8.2	8.2
Total NDM	54.1	52.4	51.2	50.0	49.2	48.4	47.8	47.2	47.0	46.4
Total DM	15.2	16.5	17.1	18.0	18.3	18.5	18.5	18.4	18.5	18.5
Total LDZ	69.3	68.9	68.3	68.0	67.5	66.9	66.3	65.6	65.5	64.9
Shrinkage	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3
Total Demand (Throughput)	69.8	69.3	68.7	68.3	67.8	67.2	66.6	65.9	65.8	65.2

Gas Supply Year	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22
Total Demand (Throughput)	68.1	68.9	68.2	67.9	67.3	66.6	66.5	66.1	66.0	65.3	65.2

Notes

- Volumes are based on weather data from the EP2 standard.
- Figures may not sum exactly due to rounding.

- FIGURE A2.1A – North West LDZ Forecast Annual Demand – Split by Load Categories (TWh)

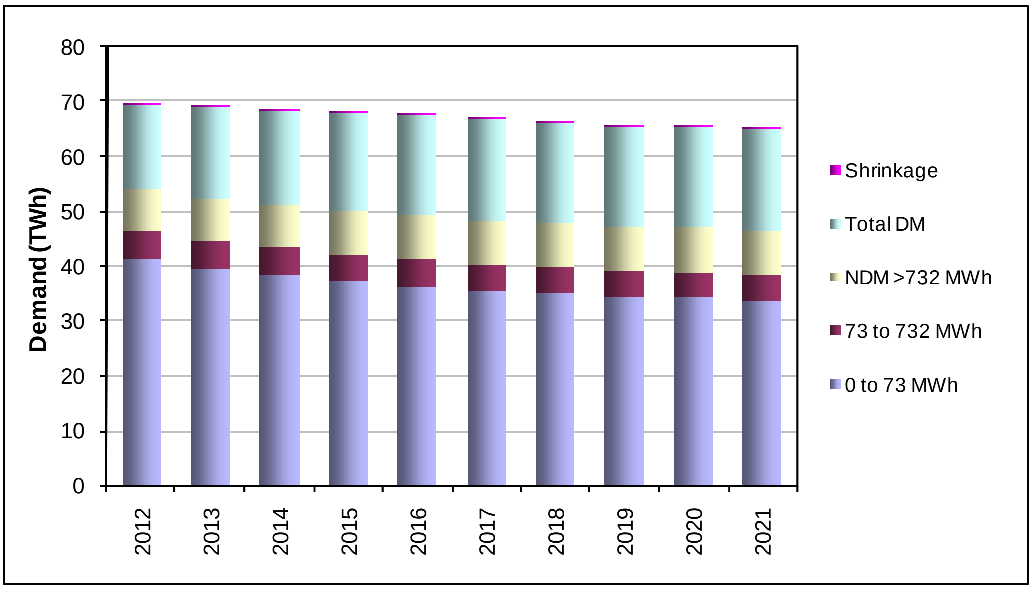


TABLE A2.1B – East Midlands LDZ Forecast Annual Demand – Split by Load Categories (TWh)

Load Category	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
0 to 73 MWh	39.4	34.3	34.4	33.4	32.7	31.9	31.4	31.0	30.8	30.4
73 to 732 MWh	4.8	4.2	4.2	4.1	4.1	4.0	4.0	3.9	3.9	3.8
NDM >732 MWh	8.2	7.5	7.8	7.8	8.0	8.0	8.1	8.1	8.2	8.2
Total NDM	52.4	45.9	46.4	45.4	44.8	44.0	43.5	43.0	42.9	42.4
Total DM	15.6	14.7	11.4	11.5	11.6	11.8	11.8	11.8	11.9	12.0
Total LDZ	68.0	60.6	57.8	56.9	56.4	55.8	55.4	54.8	54.7	54.3
Shrinkage	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2
Total Demand (Throughput)	68.4	60.9	58.1	57.2	56.7	56.1	55.6	55.1	55.0	54.6

Gas Supply Year	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22
Total Demand (Throughput)	59.4	64.3	55.8	56.8	56.3	55.7	55.5	55.2	55.1	54.6	54.5

Notes

- Volumes are based on weather data from the EP2 standard.
- Figures may not sum exactly due to rounding.

FIGURE A2.1B – East Midlands LDZ Forecast Annual Demand – Split by Load Categories (TWh)

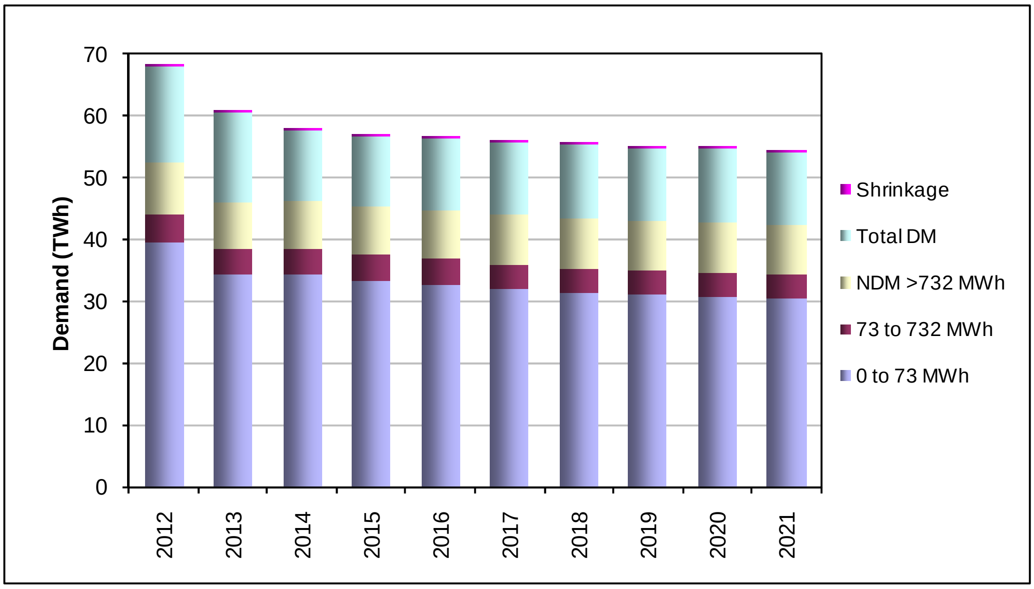


TABLE A2.1C – West Midlands LDZ Forecast Annual Demand – Split by Load Categories (TWh)

Load Category	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
0 to 73 MWh	29.1	29.3	28.7	28.0	27.3	26.7	26.3	26.0	26.0	25.6
73 to 732 MWh	3.9	3.9	3.9	3.8	3.8	3.7	3.6	3.6	3.5	3.5
NDM >732 MWh	6.5	6.8	6.9	6.9	7.0	7.1	7.1	7.1	7.2	7.2
Total NDM	39.5	40.0	39.5	38.7	38.1	37.5	37.1	36.6	36.8	36.3
Total DM	4.8	5.4	5.0	5.1	5.2	5.2	5.2	5.2	5.3	5.3
Total LDZ	44.4	45.4	44.5	43.8	43.2	42.7	42.3	41.8	42.0	41.6
Shrinkage	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total Demand (Throughput)	44.7	45.7	44.8	44.1	43.5	43.0	42.6	42.1	42.3	41.8

Gas Supply Year	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22
Total Demand (Throughput)	45.4	43.1	44.1	43.8	43.3	42.8	42.6	42.3	42.2	42.0	41.8

Notes

- Volumes are based on weather data from the EP2 standard.
- Figures may not sum exactly due to rounding.

FIGURE A2.1C – West Midlands LDZ Forecast Annual Demand – Split by Load Categories (TWh)

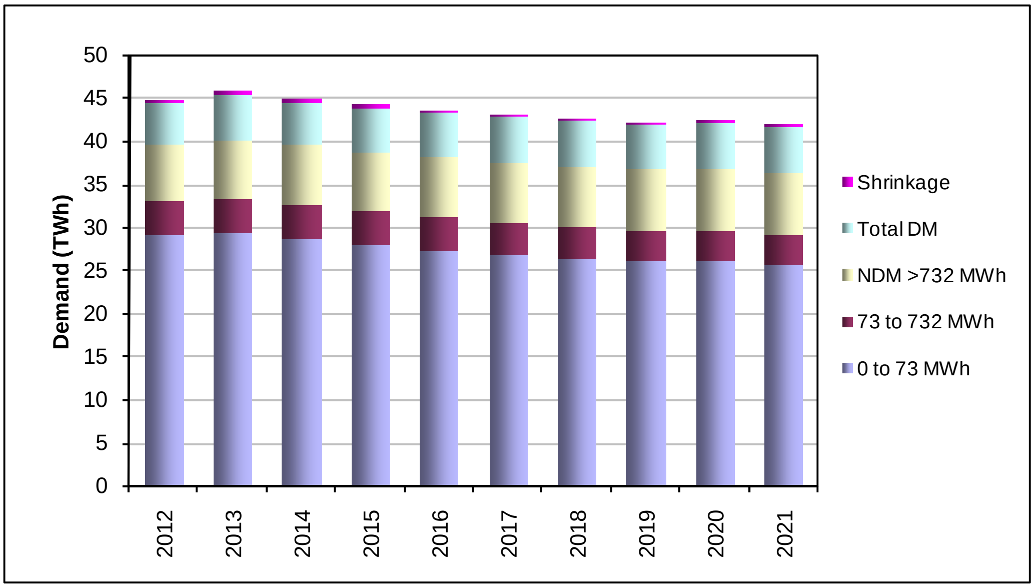


TABLE A2.1D – East Anglia LDZ Forecast Annual Demand – Split by Load Categories (TWh)

Load Category	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
0 to 73 MWh	27.8	27.1	26.7	26.2	25.8	25.6	25.5	25.4	25.1	25.3
73 to 732 MWh	3.7	3.6	3.6	3.6	3.6	3.6	3.5	3.5	3.5	3.5
NDM >732 MWh	5.6	5.8	5.9	6.0	6.1	6.2	6.2	6.3	6.3	6.4
Total NDM	37.1	36.5	36.2	35.8	35.5	35.4	35.3	35.2	34.9	35.2
Total DM	7.1	7.3	7.4	7.5	7.6	7.7	7.8	7.9	7.9	7.6
Total LDZ	44.2	43.8	43.5	43.3	43.1	43.1	43.1	43.1	42.8	42.8
Shrinkage	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Demand (Throughput)	44.4	44.0	43.8	43.5	43.3	43.3	43.3	43.3	43.0	43.0

Gas Supply Year	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22
Total Demand (Throughput)	44.5	44.6	44.2	43.9	43.7	43.4	43.4	43.3	43.4	43.0	43.0

Notes

- Volumes are based on weather data from the EP2 standard.
- Figures may not sum exactly due to rounding.

FIGURE A2.1D – East Anglia LDZ Forecast Annual Demand – Split by Load Categories (TWh)

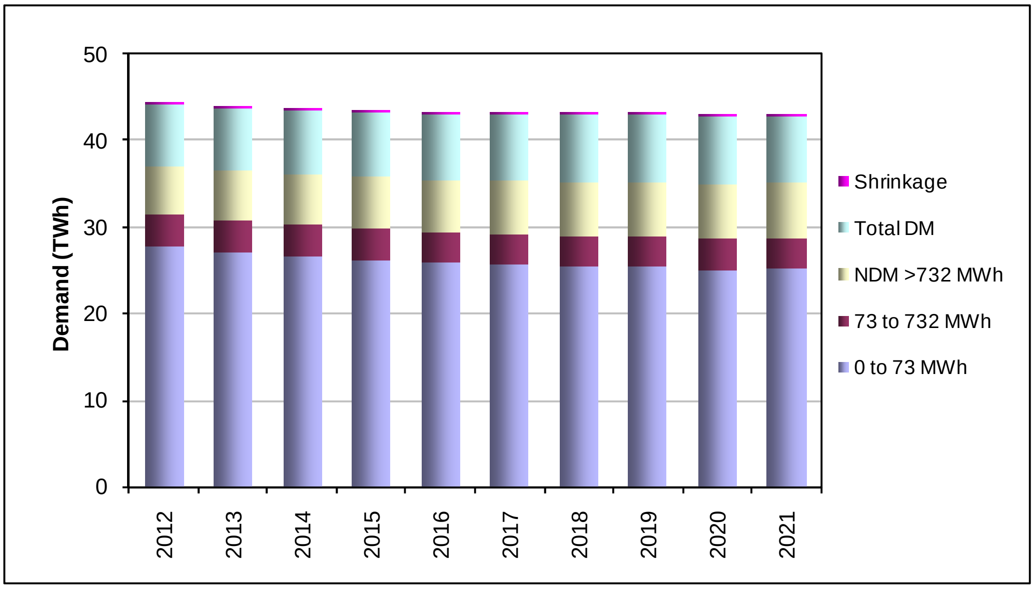


TABLE A2.1E – London LDZ Forecast Annual Demand – Split by Load Categories (TWh)

Load Category	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
0 to 73 MWh	35.0	34.6	33.7	32.8	32.0	31.3	30.7	30.3	30.0	29.5
73 to 732 MWh	6.1	6.2	6.2	6.1	6.2	6.1	6.1	6.1	6.1	6.0
NDM >732 MWh	8.5	8.8	9.0	9.1	9.3	9.5	9.6	9.6	9.7	9.8
Total NDM	49.6	49.6	48.9	48.0	47.5	46.9	46.4	45.9	45.8	45.4
Total DM	5.5	5.7	5.8	5.9	5.8	5.9	6.0	6.0	6.0	6.0
Total LDZ	55.1	55.3	54.7	53.9	53.3	52.8	52.4	51.9	51.8	51.4
Shrinkage	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total Demand (Throughput)	55.5	55.6	55.0	54.2	53.6	53.1	52.7	52.2	52.2	51.7

Gas Supply Year	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22
Total Demand (Throughput)	54.6	53.1	53.8	53.3	52.9	52.4	52.3	52.1	52.0	51.5	51.4

Notes

- Volumes are based on weather data from the EP2 standard.
- Figures may not sum exactly due to rounding.

FIGURE A2.1E – London LDZ Forecast Annual Demand – Split by Load Categories (TWh)

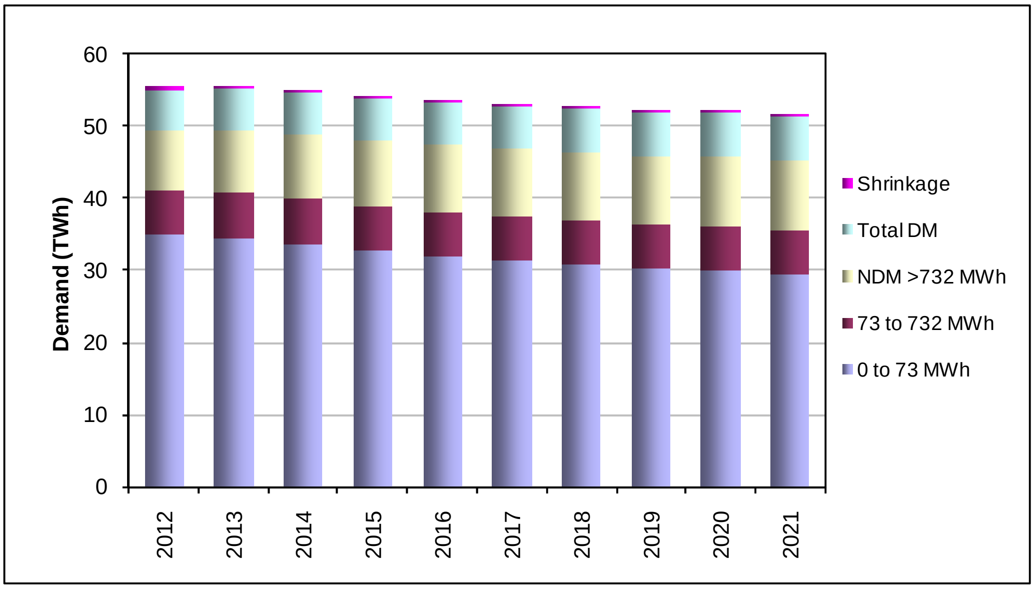


TABLE A2.1F – Aggregate National Grid Gas LDZs Forecast Annual Demand – Split by Load Categories (TWh)

Load Category	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
0 to 73 MWh	172.4	164.7	161.8	157.6	154.2	151.2	148.9	147.2	146.3	144.7
73 to 732 MWh	23.7	23.1	22.9	22.6	22.4	22.2	22.0	21.7	21.5	21.3
NDM >732 MWh	36.6	36.6	37.4	37.8	38.4	38.8	39.2	39.2	39.5	39.7
Total NDM	232.7	224.4	222.2	217.9	215.0	212.2	210.1	208.0	207.3	205.7
Total DM	48.3	49.5	46.7	48.0	48.5	49.0	49.4	49.2	49.6	49.3
Total LDZ	281.0	273.9	268.8	265.9	263.5	261.2	259.5	257.2	256.9	255.0
Shrinkage	1.7	1.6	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3
Total Demand (Throughput)	282.8	275.5	270.3	267.4	265.0	262.7	260.9	258.6	258.3	256.3

Gas Supply Year	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22
Total Demand (Throughput)	271.9	274.1	266.1	265.6	263.6	260.9	260.2	259.0	258.7	256.4	255.9

Notes

- Volumes are based on weather data from the EP2 standard.
- Figures may not sum exactly due to rounding.

FIGURE A2.1F – Aggregate National Grid Gas LDZs Forecast Annual Demand – Split by Load Categories (TWh)

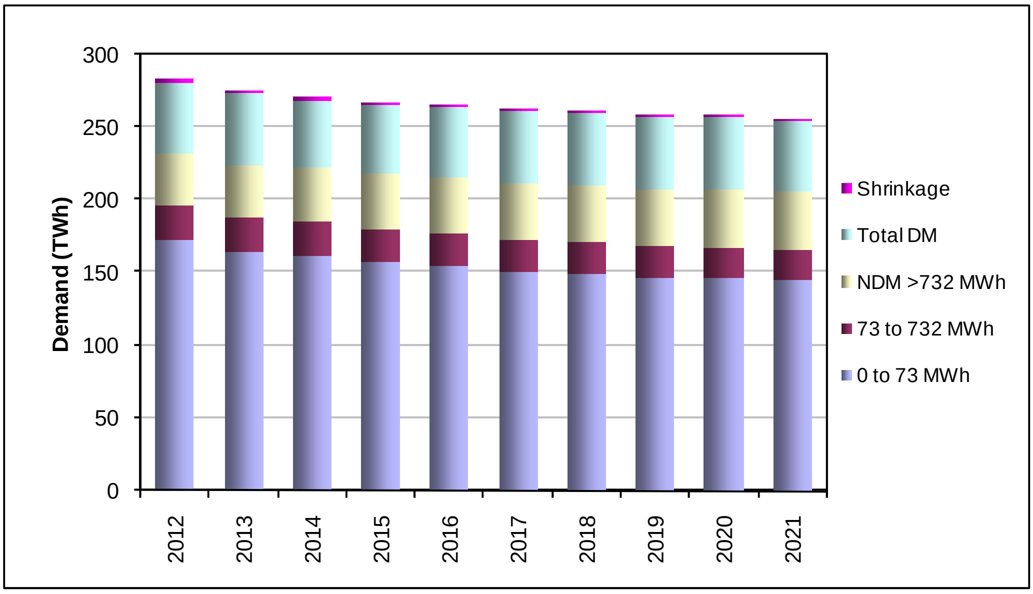


TABLE A2.1G - Forecast LDZ Annual Demands – Split by Supply Type (TWh) EP2

LDZ	Load Category	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
NW	Firm	70	69	69	68	68	67	67	66	66	65
	Int	0	0	0	0	0	0	0	0	0	0
	Total	70	69	69	68	68	67	67	66	66	65
EM	Firm	68	61	58	57	57	56	56	55	55	55
	Int	0	0	0	0	0	0	0	0	0	0
	Total	68	61	58	57	57	56	56	55	55	55
WM	Firm	45	46	45	44	44	43	43	42	42	42
	Int	0	0	0	0	0	0	0	0	0	0
	Total	45	46	45	44	44	43	43	42	42	42
EA	Firm	44	44	44	44	43	43	43	43	43	43
	Int	0	0	0	0	0	0	0	0	0	0
	Total	44	44	44	44	43	43	43	43	43	43
NT	Firm	57	57	56	55	55	54	54	54	53	53
	Int	0	0	0	0	0	0	0	0	0	0
	Total	55	56	55	54	54	53	53	52	52	52
LDZ Total	Firm	285	277	271	269	266	264	262	260	259	258
	Int	0	0	0	0	0	0	0	0	0	0
	Total	285	277	271	269	266	264	262	260	259	258

TABLE A2.1H - Forecast 1 in 20 Peak Day Firm Demand by LDZ (GWh per day)

LDZ	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22
NW	518	520	511	504	496	492	489	485	481	479	477
EM	451	500	441	435	428	426	422	419	416	414	413
WM	391	373	381	375	369	366	363	360	357	358	356
EA	368	370	365	361	357	355	354	353	351	350	350
NT	473	462	466	461	454	451	449	446	442	441	439
LDZ Total	2,201	2,225	2,163	2,137	2,103	2,089	2,077	2,063	2,047	2,041	2,034

FIGURE A2.1H - Forecast 1 in 20 Peak Day Firm Demand by LDZ (GWh per day)

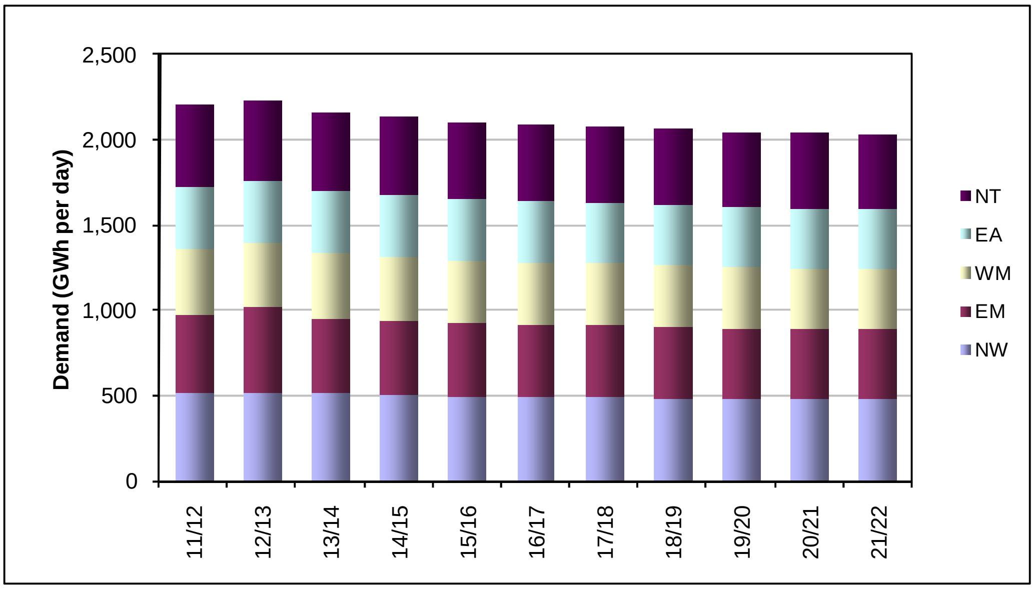
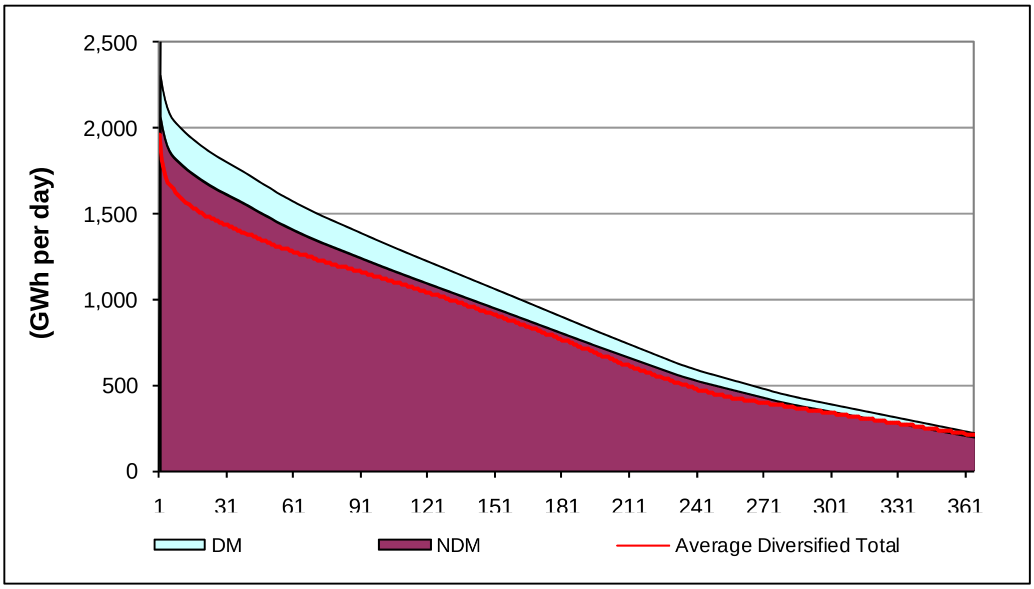


FIGURE A2.1I – 1 in 50 Severe Load Duration Curve



Appendix Three

A3. Actual Flows 2011

This Appendix describes annual and peak flows during the calendar year 2011

A3.1 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 1928/29, and consequently the weather corrected annual demands and forecasts were based on a 17-year seasonal normal condition derived from gas years 1993/94 to 2009/10. Following industry consultation, this moved to the EP2 basis from 2010.

Tables A3.1A to A3.1E provide a comparison of actual demands during the 2011 calendar year with the forecasts presented in the 2011 Long Term Development Plan. Annual demands are presented in the format of LDZ bands/categories, consistent with the basis of system design and operation. All figures have been corrected to the new EP2 basis.

TABLE A3.1A - North West LDZ Annual Demand for 2010 (TWh)

TWh	2011 Actual Demand	Weather Corrected Demand	2011 LTDP Forecast Demand
0-73 MWh	38.1	40.1	43.1
73-732 MWh	5.1	5.4	5.6
>732 MWh Firm	22.6	22.9	22.7
Interruptible	0.0	0.0	0.0
Total Consumption	65.7	68.4	71.4
Shrinkage	0.4	0.4	0.4
Total Throughput	**66.2**	**68.8**	**71.8**

TABLE A3.1B - East Midlands LDZ Annual Demand for 2010 (TWh)

TWh	2011 Actual Demand	Weather Corrected Demand	2011 LTDP Forecast Demand
0-73 MWh	31.7	34.5	36.5
73-732 MWh	3.9	4.2	4.4
>732 MWh Firm	20.9	21.3	23.3
Interruptible	0.0	0.0	0.0
Total Consumption	56.5	60.1	64.2
Shrinkage	0.3	0.3	0.3
Total Throughput	**56.8**	**60.4**	**64.5**

TABLE A3.1C - West Midlands LDZ Annual Demand for 2010 (TWh)

TWh	2011 Actual Demand	Weather Corrected Demand	2011 LTDP Forecast Demand
0-73 MWh	27.3	29.8	31.2
73-732 MWh	3.7	4.0	4.1
>732 MWh Firm	11.6	11.9	12.3
Interruptible	0.0	0.0	0.0
Total Consumption	42.7	45.8	47.6
Shrinkage	0.3	0.3	0.4
Total Throughput	**43.0**	**46.1**	**48.0**

TABLE A3.1D - East Anglia LDZ Annual Demand for 2010 (TWh)

TWh	2011 Actual Demand	Weather Corrected Demand	2011 LTDP Forecast Demand
0-73 MWh	25.6	27.5	29.2
73-732 MWh	3.3	3.6	3.7
>732 MWh Firm	11.7	12.0	12.8
Interruptible	0.0	0.0	0.0
Total Consumption	40.6	43.0	45.7
Shrinkage	0.2	0.2	0.2
Total Throughput	**40.8**	**43.3**	**45.9**

TABLE A3.1E - North London LDZ Annual Demand for 2010 (TWh)

TWh	2011 Actual Demand	Weather Corrected Demand	2011 LTDP Forecast Demand
0-73 MWh	31.9	34.3	36.7
73-732 MWh	5.7	6.0	6.4
>732 MWh Firm	14.0	14.5	14.5
Interruptible	0.0	0.0	0.0
Total Consumption	51.6	54.9	57.6
Shrinkage	0.4	0.4	0.4
Total Throughput	**51.9**	**55.2**	**58.0**

TABLE A3.1F - Aggregate National Grid Gas LDZ Annual Demand for 2010 (TWh)

TWh	2011 Actual Demand	Weather Corrected Demand	2011 LTDP Forecast Demand
0-73 MWh	154.5	166.2	176.8
73-732 MWh	21.8	23.2	24.2
>732 MWh Firm	80.8	82.7	85.5
Interruptible	0.0	0.0	0.0
Total Consumption	257.1	272.1	286.5
Shrinkage	1.7	1.7	1.7
Total Throughput	**258.8**	**273.8**	**288.2**

Tables A3.1A to A3.1F indicate that the weather was warmer than normal reducing total throughput by 1.2TWh from the forecast. Demand in the LDZ sector was slightly over-forecast, with all users consuming slightly less than forecast.

A3.2 Maximum and Peak Day Flows

Table A3.2A shows actual LDZ entry flows on the maximum demand day of gas year 2011/12 compared to the forecast peak daily flows in a 1 in 20 cold winter.

TABLE A3.2A - Actual GD UK Input Flows on Maximum Demand Day of Gas Year 2011/12 (mcmd)

LDZ	Maximum Day	Demand	1 in 20 Forecast Peak for 2011/12
North West	09-Feb-12	37.74	45.58
East Midlands	08-Feb-12	32.36	39.90
West Midlands	08-Feb-12	28.22	34.48
East Anglia	11-Feb-12	26.56	32.82
North London	08-Feb-12	33.48	42.12

Notes

- Peak forecast refers to the 1 in 20 Peak Day Firm Demand forecast in the 2011 Long Term Development Plan.
- EM and NW flow above forecast peak on the 20th of December 2010 occurred because Interruptible load remained connected, additional NTS exit capacity being acquired within day to support this.

TABLE A3.2B - Actual GD UK Input Flows on the Minimum Demand Day of Gas Year 2011/12 (mcmd)

LDZ	Minimum Day	Demand
North West	18-Aug-12	6.47
East Midlands	18-Aug-12	4.65
West Midlands	11-Aug-12	3.36
East Anglia	19-Aug-12	3.25
North London	19-Aug-12	4.04

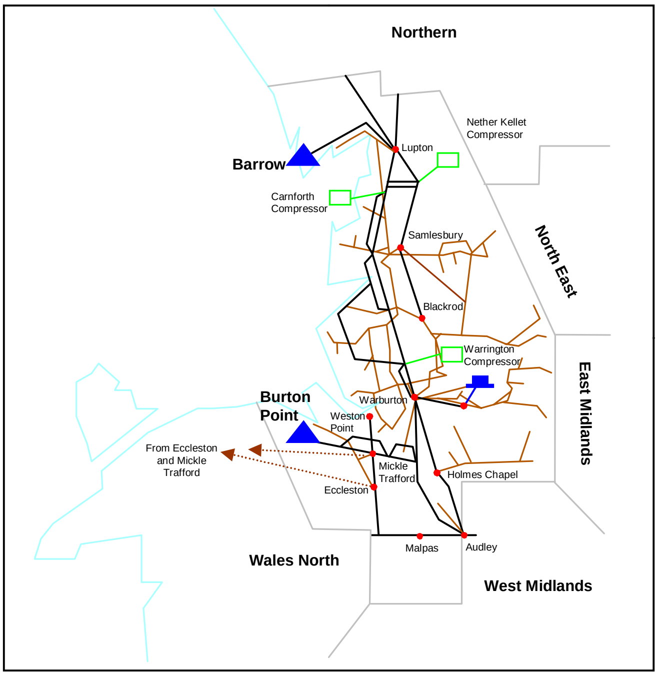
Note

- Due to linepack changes, there may be a small difference between total demand and total supply on the day.

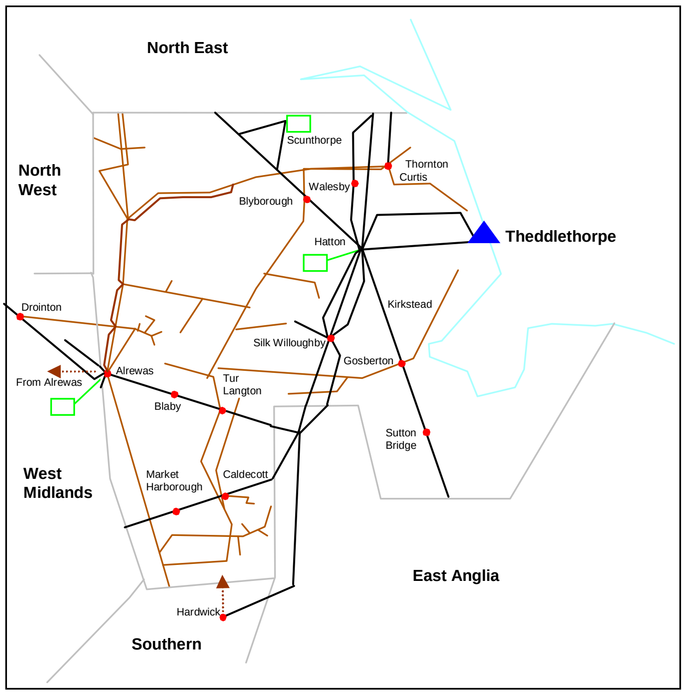
Appendix Four

A4. The Gas Transportation System

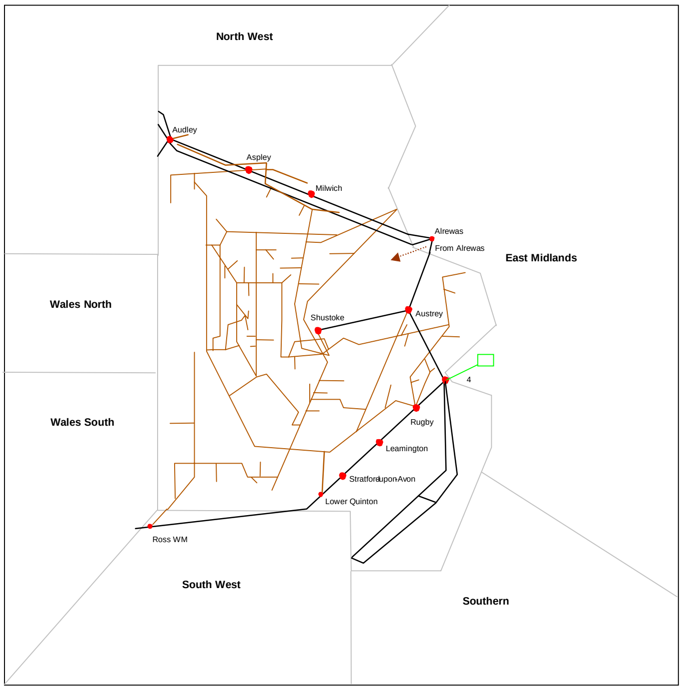
A4.1 North West (NW) Network Code LDZ – HP Distribution System



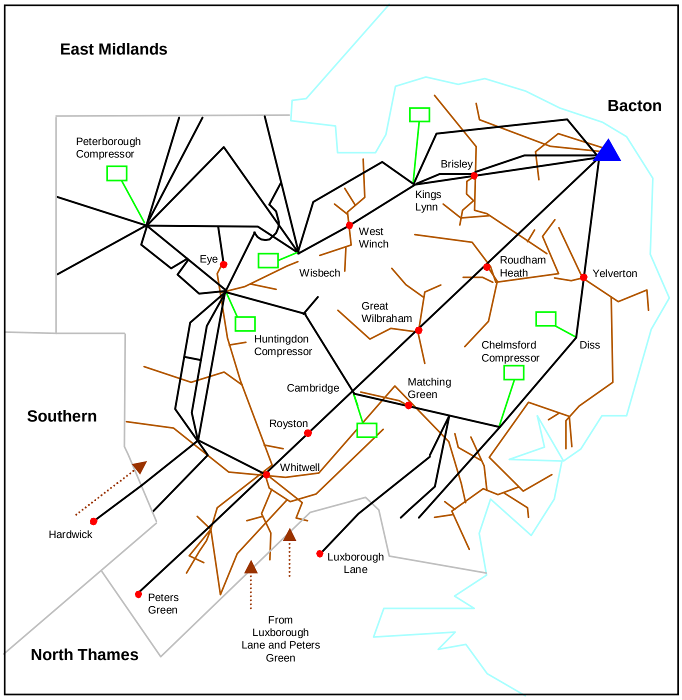
A4.2 East Midlands (EM) Network Code LDZ – HP Distribution System



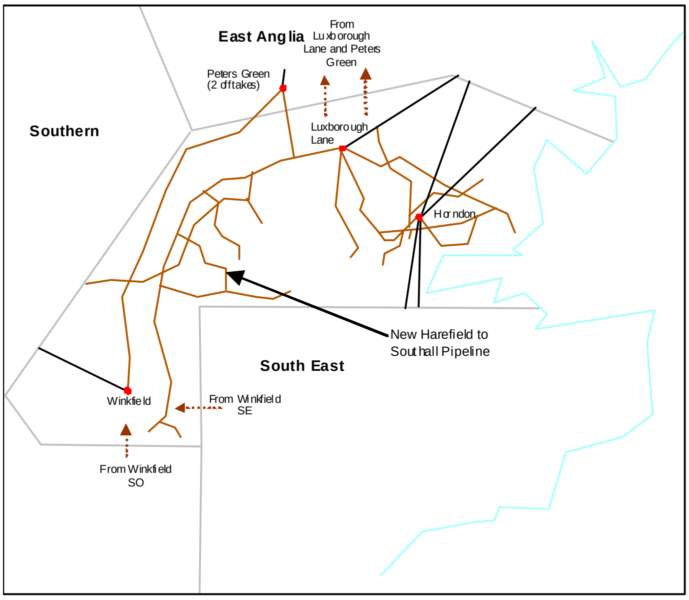
A4.3 West Midlands (WM) Network Code LDZ – HP Distribution System



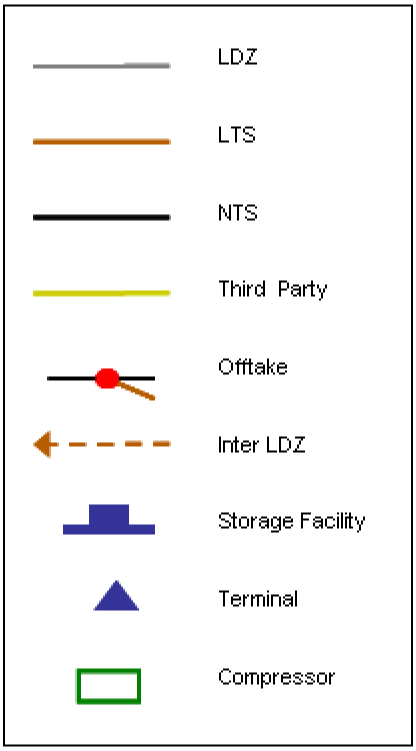
A4.4 East Anglia (EA) Network Code LDZ – HP Distribution System



A4.5 North London (NT) Network Code LDZ – HP Distribution System



A4.6 Key - Network Code LDZ Map



Appendix Five

A5. Connections to the National Grid Gas Distribution System

A5.1 Introduction

Within the space of a few years, the gas industry in Britain has evolved to where many alternative connection services are now available on a competitive basis.

Indeed, whilst we continue to offer connection services in line with our Gas Act obligations, customers and developers now have the option to choose other parties to build their facilities, have the connection vested in or adopted by the host gas transporter (depending upon circumstances), pass assets to a chosen system operator, transporter, or retain ownership of them.

The following are the generic classes of connection:

- Entry Connections: connections to gas delivery facilities processing gas from renewable sources e.g. Anaerobic Digestion plants, gas producing fields or, LNG vaporisation facilities, for the purpose of delivering gas into our system.
- Exit Connections: connections that allow gas to be offtaken from our system to premises (a ‘Supply Point’) or to Connected System Exit Points’ (CSEPs). There are several types of connected system including.
  - A pipeline system operated by another gas transporter.
  - Any other non-National Grid pipeline transporting gas to premises consuming more than 2,196MWh per annum.
- Storage Connections: connections to storage facilities for the purpose of temporarily offtaking gas from our system and delivering it back at a later date.

Please note that Storage may both deliver gas to the system and offtake gas from the system and therefore, specific arrangements pertaining to both Entry and Exit Connections will apply.

In addition to new pipes being termed connections, any requirement to increase the quantity of gas delivered or offtaken is also treated as a new connection.

A5.2 General Information Regarding Connections

Our connection charging policy for all categories of connection is set out in the publication “Standard Condition 4B Of The Gas Transporter Licence – National Grid Gas Statement Of Principles And Methods To Be Used To Determine Charges Of Connection Services” (Licence Condition 4B Statement), which is supported by the Connections Services Charges Document.

Both documents can be downloaded from our web site, or can be obtained by writing to the following address:

Damien Hawke
Network Design Manager
Network Strategy
National Grid
Hinckley Operations Centre
Brick Kiln Street
Hinckley
Leicestershire
LE10 0NA

Additional information relating to the connection process, including contact details, can also be found on the website.

It should be noted that any person wishing to connect to our system, or requiring increased flow should contact us as early as possible to ensure that requirements can be met on time, particularly if system reinforcement is required as outlined in A5.4.3.

A5.3 Additional Information Specific to System Entry and Storage

We require a Network Entry Agreement or Storage Connection Agreement, as appropriate, with the respective operator of all delivery and storage facilities to establish, among other things, the gas quality specification, the physical location of the delivery point and the standards to be used for both gas quality and the measurement of flow.

A5.3.1 Network Entry Quality Specification

"National Grid is working with producers, Ofgem, DECC, HSE, equipment suppliers and other GDN's to ensure technical and commercial barriers to entry are speedily removed where demonstrated to enhance the market and not affect the operation of the Network and working within the prescribed limits associated with National Grids Licence to Operate and taking into account our existing statutory and contractual obligations.

National Grid is developing it's Legal, Commercial and Technical process to assist the developing market of Bio Methane production for Grid Injection and embed such process developments as business as usual. The connecting Party should contact National Grid (**renewablegas.ukd@uk.ngrid.com**) at the earliest possibility in the project to establish the required entry points, network capacity and to further discuss the requirements associated with Network Entry Quality Specifications (**A5.3.2)**."

For any new entry connection to our system, the connecting party should notify us as soon as possible as to the likely gas composition. We will then determine whether the gas can be accepted taking into account our existing statutory and contractual obligations. Our ability to accept gas supplies into the system is affected by, among other things, the composition of the new gas, the location of the system entry point, volumes entered and the quality and volumes of gas already being transported within the system. In assessing the acceptability of any proposed new gas supply, we will take account of:

a) Our ability to continue to meet statutory obligations (including, but not limited to, the Gas Safety (Management) Regulations 1996 (GS(M)R));

b) The implications of the proposed gas composition on system running costs; and

c) Our ability to continue to meet our contractual obligations

For indicative purposes, the specification set out below is usually acceptable for most locations and encompasses but is not limited to the statutory requirements set out in the GS(M)R.

1. Hydrogen Sulphide
   - Not more than 5mg/m^3
2. Total Sulphur
   - Not more than 50mg/m^3
3. Hydrogen
   - Not more than 0.1% (molar)
4. Oxygen
   - Not more than 0.001% (molar)[1]
5. Hydrocarbon Dewpoint
   - Not more than -2°C at any pressure up to 85bar
6. Water Dewpoint
   - Not more than -10°C at 85bar
7. Wobbe Number (real gross dry)
   - The Wobbe Number shall be in the range 47.20 to 51.41MJ/m^3
8. Incomplete Combustion Factor (ICF)
   - Not more than 0.48
9. Soot Index (SI)
   - Not more than 0.60
10. Gross Calorific Value (real gross dry)
    - The Gross Calorific Value (real gross dry) shall be in the range 36.9 to 42.3MJ/m^3, in compliance with the Wobbe Number, ICF and SI limits described above. Subject to gas entry location and volumes, we may set a target for the Calorific Value within this range.
11. Inerts

[1] This is more stringent than the Gas Safety Management Regulations require. The value shown here has been used for many years within the British gas industry and may have been used by a demand customer in the vicinity of a proposed entry point for the purpose of designing specialist appliances e.g. a chemical plant where gas is used as a feedstock. Where this is the case we will insist that this limit is maintained so that the interests of the existing customer are protected, otherwise on a site by site basis we may be prepared to allow gas with a higher oxygen content to enter the network however we are bound by the Regulations in respect of the amount of discretion that we can use.

- Not more than 7.0% (molar) subject to
- Carbon Dioxide: not more than 2.0% (molar)

12. Contaminants
    - The gas shall not contain solid, liquid or gaseous material that may interfere with the integrity or operation of pipes or any gas appliance within the meaning of regulation 2(1) of the Gas Safety (Installation and Use) Regulations 1998 that a consumer could reasonably be expected to operate
13. Organo Halides
    - Not more than 1.5 mg/m^3
14. Radioactivity
    - Not more than 5 Becquerels/g
15. Odour
    - Gas shall be odorised with odorant NB (80% tertiarybutyl mercaptan, 20% dimethyl sulphide) at an odorant injection rate of 6 mg/SCM, which may be varied at the DN Operator's request by up to plus or minus 2 mg/SCM to meet operational circumstances.
16. Pressure
    - The delivery pressure shall be the pressure required to deliver natural gas at the Delivery Point into our Entry Facility at any time taking into account the back pressure of our System at the Delivery Point as the same shall vary from time to time
    - The entry pressure shall not exceed the Maximum Operating Pressure at the Delivery Point.
17. Delivery Temperature
    - Between 1°C and 38°C

Note that the Incomplete Combustion Factor (ICF) and Soot Index (SI) have the meanings assigned to them in Schedule 3 of the GS(M)R.

In addition, where limits on gas quality parameters are equal to those stated in GS(M)R (Hydrogen Sulphide, Total Sulphur, Hydrogen, Wobbe Number, Soot Index and Incomplete Combustion Factor), we may require an operational tolerance to be included within an agreement to ensure compliance with the GS(M)R.

Under the requirements of the Gas (Calculation of Thermal Energy) Regulations 1996 and Amendment 1997, we are required to determine calorific value at locations directed by, and in a manner approved by, the Industry Regulator Ofgem. Instrumentation we use to determine calorific value is approved by Ofgem for use only within a composition range specified by Ofgem for that type of instrument. Consequently, we may require limits in hydrocarbon and inerts content so as to allow us to comply with the approval range of such calorific value determination instrumentation.

Due to continuous changes being made to the system, any undertaking made by us on gas quality prior to signing an agreement will normally only be indicative.

We are working with the DTI and Ofgem in assessing the compatibility of existing specifications (both statutory and contractual) with the longer term needs of the UK in respect of additional gas supplies, and the European Association for the Streamlining of Energy Exchange (EASEE-gas) in the development of a Gas Quality harmonisation Common Business Practice. The outcomes of these projects could ultimately result in changes to our network entry quality specifications in the future.

A5.4 Additional Information Specific to System Exit Connections

Any person can contact us to request a connection, whether a shipper, operator, developer or consumer. However, gas can only be offtaken where the Supply Point so created has been confirmed by a shipper, in accordance with the Network Code.

A5.4.1.2 Distribution Network Connections

Gas will normally be made available for offtake to consumers at a pressure that is compatible with a regulated metering pressure of 21mbar. Information on the design and operating pressures of distribution pipes can be obtained by contacting our Network Strategy team at the following address:

Damien Hawke
Network Design Manager
Network Strategy
National Grid
Block 4 Area 6
Brick Kiln Street
Hinckley
Leics
LE10 0NA

A5.4.2 Self Lay Pipes or Systems

In accordance with Section 10(6) of the Gas Act, and subject to the principles set out in the published Licence Condition 4B Statement and the terms and conditions of the contract between us and the customer in respect of the proposed connection, where a party wishes to lay their own service pipe to premises expected to consume 2,196MWh per annum or less, ownership of the pipe will vest in us once the connection to the our system has been made.

Where the connection is for a pipe laid to premises expected to consume more than 2,196MWh per annum or the connection is to a pipe in our system which is not a relevant main, self laid pipes do not automatically vest in us. However, subject to the principles set out in the published Licence Condition 4B Statement and the relevant contractual terms and conditions, we may take ownership of pipes to such premises.

Parties considering laying a pipe that will either vest in us or is intended to come into our ownership should refer to the published Licence Condition 4B Statement and make contact with our Network Strategy team at the above address.

A5.4.3 Reasonable Demands for Capacity

Operating under the Gas Act 1986 (as amended 1995), we have an obligation to develop and maintain an efficient and economical pipeline system and, subject to that, to comply with any reasonable request to connect premises, provided that it is economic to do so.

However, in many instances, specific system reinforcement may be required to maintain system pressures for the winter period after connecting a new supply or demand. Details of how we charge for reinforcement and the basis on which contributions may be required can be found in the published Licence Condition 4B Statement. Please note that dependent on scale, reinforcement projects may have significant planning, resourcing and construction lead-times and that as much notice as possible should be given. In particular, we will typically require two to four years' notice of any project requiring the construction of high pressure pipelines or plant, although in certain circumstances, project lead-times may exceed this period.

Appendix Six

A6. Glossary

Annual Quantity (AQ)

The AQ of a supply point is its annual consumption over a 365-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. All references to bar in this document refer to gauge pressure i.e. barg.

One millibar (mbarg) equals 0.001 bar.

Calorific Value (CV)

The ratio of energy to volume measured in Megajoules per cubic meter (MJ/m3), which for a gas is measured and expressed under standard conditions of temperature and pressure.

Climate Change Levy (CCL)

The 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 government's Climate Change Programme (CCP).

Composite Weather Variable (CWV)

A single measure of weather for each LDZ, incorporating the effects of both temperature and wind speed. A separate composite weather variable is defined for each LDZ.

Compressor Station

An installation that uses gas turbine or electricity driven compressors to boost pressures in the pipeline system. Used to increase transmission capacity and move gas through the network.

Connected System Exit Point (CSEP)

A connection to a more complex facility than a single supply point. For example a connection to a pipeline system operated by another Gas Transporter.

Cubic Metre (m^3)

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

Daily Metered Supply Point

A supply point fitted with equipment, for example a datalogger, which enables meter readings to be taken on a daily basis. Further classified as SDMC, DMA, DMC or VLDMC according to annual consumption.

Datalogger

An electronic device that automatically records, stores and transmits meter readings (such transmission usually being via PSTN lines).

Distribution Network (DN)

An administrative unit responsible for the operation and maintenance of the local transmission system (LTS) and <7bar distribution networks within a defined geographical boundary, supported by a national Emergency Services organisation.

Distribution System

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

Diurnal Storage

Gas stored for the purpose of meeting, among other things, 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. >7bar, pipeline systems.

EP2

EP2 is the application of Met Office forecasts of UK Climate Change to National Grid's weather data.

Exit Zone

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

Formula Year

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

Gas Transporter (GT)

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

Gasholder

A vessel used to store gas at Low pressure for the purposes of providing diurnal storage.

Gas Supply Year

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

High Pressure (HP) Distribution System

A pipeline system operating at >7bar that transports gas from NTS offtakes to distribution systems. Some large users may take their gas direct from the HP Distribution System.

Interruptible Service

A service that offers lower transportation charges but where we can interrupt the flow of gas to the supply point.

Kilowatt hour (kWh)

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

Linepack

The volume of gas within the High Pressure Distribution 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 (1 in 50 Severe)

The 1 in 50, or severe, load duration curve is that curve which, in a long series of years, with connected load held at the levels appropriate to the year in question, would be such that the volume of demand above any given demand threshold (represented by the area under the curve and above the threshold) would be exceeded in one out of fifty years.

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 (>7 bar) and lower pressure distribution system pipelines.

National Transmission System (NTS)

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

National Transmission System Offtake

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

Non-Daily Metered (NDM)

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

Odorisation

The process by which the distinctive odour is added to gas supplies to make it easier to detect leaks. We provide odorisation at NTS offtakes.

Office of Gas and Electricity Markets (Ofgem)

The regulatory agency responsible for regulating the UK’s gas and electricity markets.

Own Use Gas (OUG)

Gas used by us to operate the transportation system. Includes gas used for compressor fuel, heating and venting.

Peak Day Demand (1 in 20 Peak Demand)

The 1 in 20 peak day demand is the level of demand, within day gas flow variations, 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 (PCR)

Ofgem's periodic review of our allowed returns, the next PCR will set returns for the period April 2013 to March 2021.

Seasonal Normal Composite Weather Variable (SNCWV)

The seasonal normal value of the CWV for a LDZ on a day is the smoothed average of the values of the applicable CWV for that day in a significant number of previous years.

Seasonal Normal Temperature (SNT)

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

Shipper or Network Code Registered User (System User)

A company with a Shipper Licence that is able to buy gas from a producer, sell it to a supplier and employ a GT to transport gas to consumers.

Shrinkage

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

Supplier

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

Supply Hourly Quantity (SHQ)

The maximum hourly consumption at a supply point.

Supply Offtake Quantity (SOQ)

The maximum daily consumption at a supply point.

Supply Point

A group of one or more meters at a site.

Therm

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

Transporting Britain's Energy (TBE)

The annual industry-wide consultation process encompassing the Ten Year Statement, targeted questionnaires, individual company and industry meetings, feedback on responses and investment scenarios.

Unaccounted for Gas (UAG)

Gas lost during transportation. Includes leakage, theft and losses due to the method of calculating the Calorific Value.

Uniform Network Code (UNC)

The Uniform Network Code will replace the Network Code and defines the rights and responsibilities for all users of gas transportation systems. It provides all system users with equal access to the transportation services.

UK-Link

A suite of computer systems that supports Network Code operations. Includes Gemini for energy balancing; Supply Point Administration; Invoicing; and the Sites and Meters database.

Appendix Seven

A7. Conversion Matrix

To convert from the units on the left hand side to the units across the top multiply by the values in the table.

	To: Multiply	GWh	mcm	Million therms	Thousand toe
From:	**GWh**	1	0.092	0.034	0.086
	Mcm	10.833	1	0.370	0.932
	Million Therms	29.307	2.710	1	2.520
	Thousand toe	11.630	1.073	0.397	1

Note: all volume to energy conversions assume a CV of 39 MJ/m^3

GWh = Gigawatt Hours

mcm = Million Cubic Metres

Thousand toe = Thousand Tonne of Oil Equivalent