Northern Gas Networks

15 October 2013

Long Term Development Statement 2013

Northern Gas Networks

Contents

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Foreword

This document provides a ten-year forecast of transportation system usage and likely system developments that can be used by companies contemplating connecting to our system or entering into transport arrangements, to identify and evaluate opportunities. It is produced in accordance with Standard Condition D3 of Northern Gas Networks' Gas Transporters Licence.

The Statement explains our latest volume forecasts, system reinforcement projects and investment plans. It has been published at the end of the 2013 planning process following an appraisal of the current market conditions.

Layout

The Statement contains essential information on actual volumes and the process for planning the development of the system, including demand and supply forecasts, system reinforcement projects and associated investment. The main body of the document provides an overview of the key issues, with all details contained in the appendices.

Version and Circulation

Version Number: Final V 1.5 (15th October 2013)

This document and any updates to this document will be circulated electronically.

Circulation List:

Network Asset Risk Management and Safety Director
System Control Centre Manager

Background

The document sets out our assessment of the future demand and supply position for natural gas in Northern Gas Networks and outlines proposals for investment in the Local Transmission and Distribution Systems.

Northern Gas Networks manages the development, operation and maintenance of the High Pressure and below 7bar Distribution Networks. These extend from the inlet valves of the pressure regulating installations at the National Transmission System interface, to the outlet of the consumer's emergency control valve in the North East of England, Northern Cumbria and West, North and East Yorkshire.

The restructuring of the gas industry during 2005 led to the formalisation of relationships between various parties, not least between the Distribution Networks and National Grid Gas (NGG). Network staff has been involved in the development of key documents, which describe this relationship and the resulting processes. In order to fulfil its Licence obligation as a Gas Transporter, Northern Gas Networks is required to confirm to NGG the quantity of gas required at a number of different demand levels. This is stated as a request for Offtake Daily Quantity (Flat Capacity) and the amount of Storage (Flexibility) at each offtake. We also indicate the Peak Hourly Flow and associated Minimum Inlet pressure required for each point in the Network where gas is taken from the National Transmission System. After discussion between the two parties, NGG allocates these quantities in the Offtake Capacity Statements (OCS).

The forecasts described within this document have been prepared by Northern Gas Networks. The methodology for production of the forecasts is compliant with the demand forecasting requirements of Section H of the Uniform Network Code Offtake Arrangements Document.

Chapter One - Demand

1.1 Overview

This Chapter describes the forecast for gas demand ten years ahead for each local distribution zone (LDZ) within Northern Gas Networks. It also includes discussion on how current forecasts relate to previously published forecasts. Further information is provided in Appendix 2.

Demand forecasts have been prepared as part of an exchange of information that is intended to inform respective capacity planning processes between the Gas Distribution Networks and NGG. These forecasts are compliant with the demand forecasting requirements of Section H of the UNC Offtake Arrangements document.

1.2 Demand Forecasts

This section provides an outline of our latest gas demand forecasts and the key underlying assumptions.

The demand forecasts are based on planning assumptions derived from market observations and the view of specialist consultancies.

Demand forecasts are developed without knowledge of what weather conditions will prevail into the future, as such, they are made at seasonal normal temperatures (SNT). In order to compare actual throughput with the actual demand data is adjusted to account for the variance of actual weather and SNT. This is known as weather corrected demand.

Network Code requires a revision to seasonal normal values every five years and as such the basic seasonal normal temperatures were revised during 2009/10 and implemented on the 1st October for gas year 2010/11. These values reflected the generally warm weather that had been experienced over the past decade and also looked forward for the first time, using long term weather forecasts supplied by the Met Office, in conjunction with the Hadley Centre for Climate Prediction and Research. Derivation of the seasonal normal values is designed to reflect the most accurate statistical relationship between demand and weather. It does not attempt to estimate any potential impact of global warming and as such the peak 1 in 20 weather assumptions have not altered.

Prior to 2005 the revision of seasonal normal values was carried out using 35 years of weather data and this was revised and implemented in 2005 using 17 years of data.

The models have again been influenced by the recent demand patterns impacted by factors such as the warm weather, financial state of the economy, improved energy conservation and continuing high fuel prices.

1.2.1 Forecast Demands

This section provides an overview of our latest gas demand forecasts through to 2023/24. A more detailed view can be found in Appendix 2, which includes our forecasts for both annual and peak demand on a year-by-year basis.

On a Network basis annual gas demand is forecast to decrease by 4.93% over the next 10 years, with an average yearly decline of 0.5%.

2013 is the third year that NGN has forecast a decline in overall annual gas demand and this is related to a less than favourable economic outlook, increases in UK gas prices, and a reduction in 1 in 20 peak day forecasts.

At LDZ level, North East LDZ trend suggests a decline over the whole forecast period of 4.41%. The Northern LDZ forecast suggests decline over the whole forecast period of 5.53%.

Peak demand is forecast to decline by 4.97% over the 10 year period within Northern LDZ and 3.05% in North East. This compares with a decline of 5.58% and 4.14%, respectively, for these LDZs in the 2012 forecast.

Load Band	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
0-73 MWh	39.90	39.67	39.34	39.14	38.79	38.50	38.18	38.02	37.67	37.39	37.06
73-732 MWh	5.28	5.26	5.25	5.23	5.19	5.16	5.12	5.13	5.09	5.08	5.03
732-5860 MWh	4.73	4.71	4.70	4.67	4.64	4.62	4.59	4.60	4.58	4.59	4.57
Small User	49.92	49.65	49.28	49.03	48.63	48.29	47.90	47.75	47.34	47.06	46.67
Firm> 5860 MWh	22.06	22.08	22.16	21.96	21.99	21.92	21.93	21.96	21.86	21.84	21.85
Total Large / V. Large User	22.06	22.08	22.16	21.96	21.99	21.92	21.93	21.96	21.86	21.84	21.85
LDZ Consumption	71.98	71.73	71.45	70.99	70.62	70.20	69.83	69.71	69.20	68.90	68.51
LDZ Shrinkage	0.46	0.45	0.44	0.43	0.42	0.41	0.40	0.39	0.37	0.36	0.35
LDZ Demand	72.44	72.17	71.88	71.42	71.04	70.61	70.23	70.10	69.57	69.26	68.86

Table 1.2.1A – Northern Gas Networks Forecast Annual Demand – By Load Category

Note

- Figures may not sum exactly due to rounding.
- All figures in TWh

1.2.1.1 Annual Flows

The basis for any calculation of future demand is the accuracy of the previous forecast.

Table A.1.2.1.1 below provides a comparison of actual and weather corrected throughput during the 2012 calendar year with the forecast demands presented in the 2012 Demand Statement. Annual forecast demands are presented in the format of load bands/categories, consistent with the basis of system design and operation.

Northern Gas Networks	Actual	Weather Corrected	Forecast	Corrected v Forecast (%)
0-73 MWh	42.54	40.13	40.44	-0.8
73 – 732 MWh	5.53	5.23	5.33	-2.0
>732 MWh	27.97	27.03	28.72	-5.9
LDZ Shrinkage	0.47	0.47	0.62	-23.8
LDZ Total	76.51	72.85	75.11	-3.0

Table 1.2.1.1A

Note

- Figures may not sum exactly due to rounding.
- All figures in TWh

On a Network basis, the weather corrected annual throughput in 2012 (72.85 TWh) shows a reduction of 23% from the highest recorded throughput in 2002 of 94.7 TWh.

2012 was the tenth consecutive year when weather corrected annual throughput has reduced at a Network level.

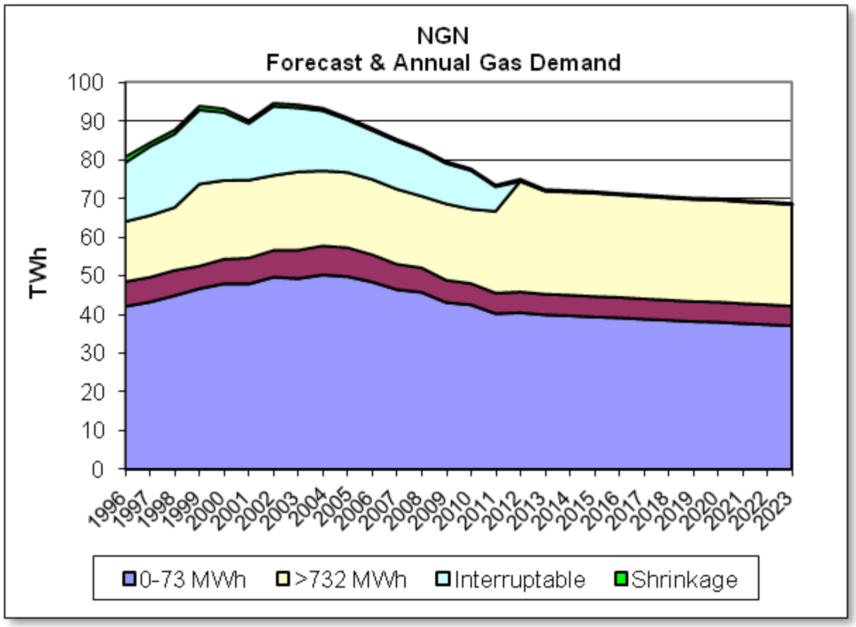


Figure 1.2A - Historical Throughput & Forecast Annual Gas Demand by Load Band

The chart above shows actual and forecast gas demand by load band through to 2023. The most significant change in this chart is the change in the Interruptible load in October 2011. From this date all previous interruptible loads become firm (because of UNC Mod 90) and as such are transferred into the relevant DM Firm category.

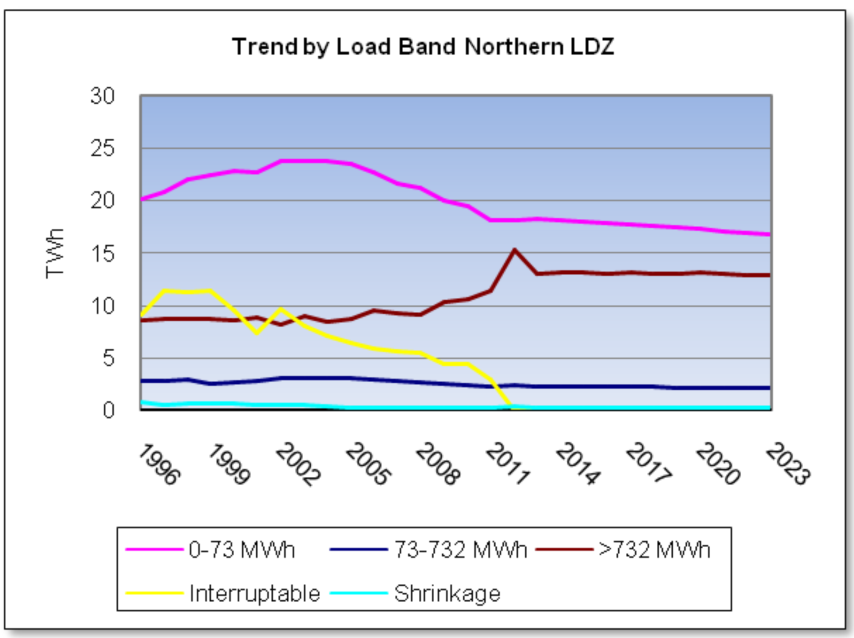


Figure 1.2B – Trend by Load Band Northern LDZ

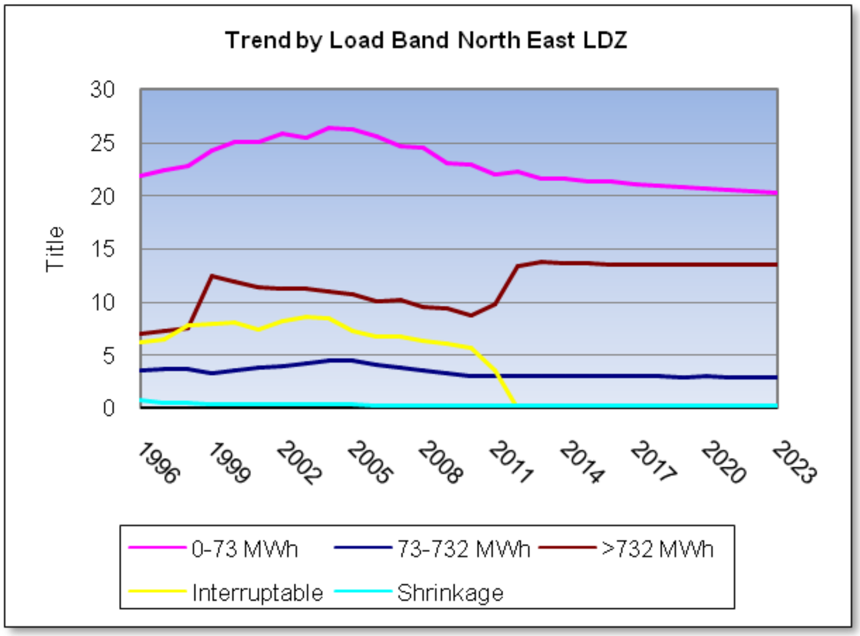


Figure 1.2C – Trend by Load Band North East LDZ

The trend graphs 1.2B and 1.2C opposite show energy by load band category for Northern and North East LDZ since 1996. The values from 1996 to 2012 are weather corrected annual throughput, and thereafter, the figures are taken from the 2013 Forecast Demand Statements.

Chapter Two - Supply and Storage

2.1 Supply

Gas is brought into the network through offtakes, above ground installations that are connected to the National Transmission System, which can operate with inlet pressures up to 85bar. Gas then passes through the Local Transmission System, into the Distribution System and onward to consumers.

The amount of gas NGN requires to satisfy its 1 in 20 Peak Day Firm commitment is requested from NGG on an annual basis via the OCS process.

This process involves the Network requesting an Offtake Daily Quantity (Flat Capacity) and an amount of Storage (Flexibility) for each offtake. We also indicate the Peak Hourly Flow and associated Minimum Inlet pressure required for each offtake. After discussion between the two parties, NGG will allocate these products in the Offtake Capacity Statement (OCS).The pressures quoted in the OCS are then modelled for each offtake to determine if any upgrade work is necessary.

An example of the Offtake Capacity Statement is shown below.

NE LDZ
2013/14

STATEMENT OF CAPACITY ALLOCATED

39.844 MJ/m3

All figures in mcm/d are at the above CV.

Offtake Name	Maximum Capacity Required		Assured Pressures	
	Demand	Storage	SOD	EOD
ASSL	0.360	0.054	41	38
BALD	0.118	0.018	38	38
BURL	1.292	0.030	43.5	43.5
GANS	1.500	-0.110	47.3	38
PANL	11.640	1.609	49	44.1
PAUL	3.508	0.274	46	44
PICK	0.721	0.060	41	38
RAWC	0.365	0.055	38	38
TOWT	5.521	0.300	45.7	38
	25.025	**2.290**		

Appendix Four gives more information about the Networks' offtakes.

2.2 Storage in the Network

Gas is stored at linepack facilities within the Network, to be used on a daily basis.

Within the Northern Gas Networks supply area, there are also a number of fixed storage sites, Low Pressure holders, and High Pressure storage sites. Following flow trials in early 2013, eight remaining LP holders were decommissioned and so far three holders have been purged of gas with a plan to extend this to a further 23 sites by 2023.

We have one operational above ground HP Bullet Storage site on the network. This site in Cumbria contains four HP vessels and provides around 39,000 scm (30 tonnes) of usable diurnal storage.

Chapter Three - Investment in the Distribution Networks

3.1 LTS Development Plan

The Local Transmission System is designed for transmission and storage of gas on the basis of satisfying the 1 in 20 peak day firm only forecast demands. The system is developed, based on demand and supply forecasts, to ensure that this capability is maintained.

Major projects currently in the 2013 Plan are shown below: -

LDZ	Project Name	Design	Build	Indicative Project Cost (£m)
NO	Wetheral NTS offtake Upgrade	2013	2015	2.50
NO	Warden Law PRI upgrade	2013	2015	1.50
NO	Chopwell PRI upgrade	2013	2016	1.50
NO	Penrith PRI upgrade	2016	2017	0.75
NO	Clay Flatts PRI upgrade	2016	2018	0.75
NO	Clay Flatts (storage) PRI upgrade	2016	2018	0.75

LDZ	Project Name	Design	Build	Indicative Project Cost (£m)
NE	Asselby NTS offtake upgrade	2013	2015	1.25
NE	Canal Rd PRI upgrade	2013	2016	0.75
NE	Keighley PRI upgrade	2016	2017	0.75
NE	Meadow Lane PRI upgrade	2016	2018	1.50

NGN are also developing a holder demolition programme within the Network which will realise cost savings associated with the operation and maintenance of these ageing assets.

An estimated 23 Low Pressure Gas holders are scheduled to be demolished over the RIIO-GD1 period up to 2021.

3.2 Below 7barg Distribution System

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

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

The distribution systems are designed and reinforced to meet a peak six-minute (Pk6) demand level, which is the maximum demand level, averaged over a six minute period, that may be experienced in a network under cold winter conditions.

We also continue to invest in the replacement of our transportation network assets, primarily for the renewal of mains and services within Distribution systems. This includes expenditure associated with decommissioning of mains and services to a programme agreed with the Health and Safety Executive. This covers the decommissioning of all smaller-diameter iron gas pipes (<= 8" diameter) within 30 metres of occupied buildings before April 2032, and the progressive decommissioning of larger iron pipes based on their Risk and Condition. Ofgem has agreed funding for this programme.

Chapter Four - Commercial Developments

There are two significant industry developments to note for the period starting 1st October 2013:

- **RIIO-GD1** – a new regulatory price control period commenced in April 2013 with the introduction of the new RIIO framework to the gas distribution industry and will run until March 2021. This framework has introduced a number of significant developments and changes to the funding of distribution networks and the delivery of key services for customers. These include:

    - **Outputs Based** – NGN must measure and deliver a range of Outputs over the RIIO-GD1 period. These Outputs cover the six key categories of activity carried out by gas distribution networks – Safety, Reliability, Environment, Social Obligations, Connections and Customer Service.

    - **Incentives** – The framework includes strong financial and reputational incentives that ensure that good performing companies that exceed the delivery of their outputs will be rewarded, whilst those that fail to meet the necessary output requirements will be penalised.

    - **Innovation** - There are many elements of the RIIO framework designed to encourage innovation including a time-limited innovation stimulus package to fund innovation where the commercial benefits may be uncertain. This investment will be focussed on promoting and delivering a more sustainable energy sector within the UK.

  With the RIIO-GD1 framework now in place and embedded within NGN we are focussed on continuing to deliver a safe, reliable and environmentally responsible network and maintaining our position as the most efficient operator in the UK.

- **Distribution Network Entry** – Over recent years there has been an increasing level of interest in injecting gas directly into distribution networks from a range of conventional and non-conventional sources. These include gas derived from coal bed methane, landfill sites, anaerobic digestion and onshore gas fields. These developments have the potential to contribute significantly to increased security of supply and the transition to a low carbon economy.

  The industry has been fully engaged in addressing the technical, regulatory, legislative and commercial challenges that these developments present over this time. NGN will be continuing to work with the industry to seek ways of facilitating the development and deployment of these approaches in accordance with its licence obligations and targets set out within RIIO. In doing so play a direct role in the UK achieving its legally binding commitments to reduce Green House Gas emissions.

More detail about the RIIO process can be found on Ofgem's website:-

https://www.ofgem.gov.uk/network-regulation-%E2%80%93-riio-model

More detail about NGN RIIO-GD1 Business Plan can be found on Northern Gas Networks website:-

http://www.northerngasnetworks.co.uk/cms/54.html#riio

Appendix One - Process Methodology

A1.1 Demand

The purpose of this section is to give a brief overview of the methodology that is adopted to develop forecasts of annual and peak demand. The methodology can be categorised into three main modelling areas; annual demand, demand/weather and peak demand modelling.

A1.1.1 Annual Demand Modelling

The development of annual gas demand forecasts considers a wide range of factors, from complex econometrics 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. In the case of the forecasts presented in this document, assumptions include economic, fuel prices, environmental and tax policies. A number of these assumptions are based on data from independent organisations.

These forecasts are also benchmarked against the work of a number of recognised external sources, such as the DTI.

A1.1.1.1 LDZ Modelling

LDZ demand is split into four market sectors according to load size and supply type. 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 the Climate Change Levy, 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 LDZs.

A1.1.1.2 Industrial Loads

The production of forecasts within this sector is dependent on forecasts of individual new and existing loads based on recent demand trends, Transporting Britain's Energy feedback, load enquiries and commercial sources.

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 conditions 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 from temperature and wind speed data, defined and optimised for each LDZ, and give a straight-line relationship between demand and weather.

There is an obligation to review, at least every 5 years, the definition and seasonal normal basis of all CWVs. To meet this obligation, a comprehensive review was completed in 2005 in consultation with the Network Code Demand Estimation Sub-Committee (DESC). As agreed by DESC, the CWV definition for each LDZ was revised and includes a new seasonal profile that improves the seasonal shape of the CWV for demand modelling purposes. The SNCWV for LDZ demand has also been revised using 17 gas years of weather data (1987/88 to 2003/04) to take account of the effects of climate change on average demand. The annual demand forecasts produced since 2005 have been calculated using 17 year SNCWVs.

However, in 2006, the Met Office and three leading energy companies launched a pioneering scoping study into climate change and its potential impacts on the UK energy industry. The study was the first nationwide attempt to identify how climate change may affect energy generation; distribution and transmission, and demand. As well as initial indications on how climate change could impact the industry over the next century, it also identified areas where further research was required.

Following the scoping study an industry-funded project Energy Phase 2(EP2) was set up, involving 11 UK energy companies, focusing on the priorities identified by the earlier study. The EP2 process for weather correction not only takes into account historical weather trends but also uses long term weather forecasts to try to predict how gas demand will be influenced by environmental factors.

This basis for weather correction was again considered in 2009 and with input from the shipper community it was agreed to use a weather forecasting tool EP2 developed by the Met Office in conjunction with the Hadley Centre for Climate Prediction and Research. This basis for weather correction has been implemented for our forecasts from 2010 onwards.

The impact on annual demand is a reduction of around 3.5% when compared with the previous basis.

This change 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 licence obligations, from a longer period of weather data, in this case 1928/29 to 2008/09.

A1.1.3 Peak Day Demand Modelling

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/Licence obligations) and severe winter demand estimates.

A1.2 High Pressure Tier Planning

Although the development of DNs' Local Transmission Systems (LTS) is largely demand led, LTS capacity planning processes are not dissimilar to those utilised for the development of the NTS. DNs use forecast demand 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 LTS capacity constraints include:

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

As well as planning to ensure that LTS 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 and high-pressure vessels.

A1.3 Lower Pressure Tier Planning (<7 barg)

The lower pressure tier system (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 before the constraint causes difficulties within the network. Reinforcement is usually carried out by installing a new main or by taking a new offtake point from a higher-pressure tier. In general, the reinforcement project is of such a size that the work can be completed and operational before the following winter.

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.

The Investment Planning Policy defines the methodology to be followed for undertaking individual investments in a consistent and easy to understand manner. This policy is 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:

- Allocating the appropriate project management expertise to manage the project
- 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; and
- Post project and post investment review to ensure compliance and capture lessons learnt.

For major projects, all work is tendered through our design and delivery frameworks which were competitively tendered in 2012 and have been awarded as a 5 +1 +_1 +1 contract in order to 'back to back' with the RIIO regulatory period.

Tenders are received and evaluated against Project Execution, commercial and program delivery criteria. An award is then made to the tender which demonstrates the best value for NGN against all these criteria. The percentage split against the assessment criteria is determined based on the complexity and/or risk of the project.

All projects are completed in line with the Major projects Integrated Management System (IMS) which covers the 'cradle to grave' project lifecycle. The IMS is critical to ensuring NGN delivers projects consistently and in line with all relevant legislative requirements fulfilling NGN's obligations as the employer.

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. The project management process in particular makes use of professional consultants and specialist contractors, all of whom are appointed subject to competitive tender.

Appendix Two - Gas Demand Forecasts

A2.1 Demand

During the next ten years annual gas demand is forecast to decline by 5.53% in Northern LDZ and by 4.41% in North East LDZ.

Northern LDZ

Load Band	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
0-73 MWh	18.23	18.10	17.93	17.80	17.64	17.51	17.37	17.28	17.07	16.89	16.70
73-732 MWh	2.25	2.24	2.23	2.21	2.19	2.17	2.15	2.14	2.13	2.12	2.10
732-5860 MWh	2.15	2.13	2.12	2.11	2.09	2.08	2.07	2.06	2.05	2.04	2.02
Firm 5860 MWh - 1465 GWh	10.89	10.94	11.01	10.93	10.98	10.95	10.92	11.00	10.91	10.88	10.87
Large User	10.89	10.94	11.01	10.93	10.98	10.95	10.92	11.00	10.91	10.88	10.87
LDZ Shrinkage	0.20	0.20	0.19	0.19	0.18	0.18	0.17	0.17	0.16	0.16	0.16
LDZ Demand	33.71	33.61	33.49	33.24	33.09	32.90	32.69	32.65	32.32	32.10	31.85

Table A2.1A - Forecast Annual Demand by Load Category by LDZ from 2013 Demand Statements (TWh)

Note

- Figures may not sum exactly due to rounding.

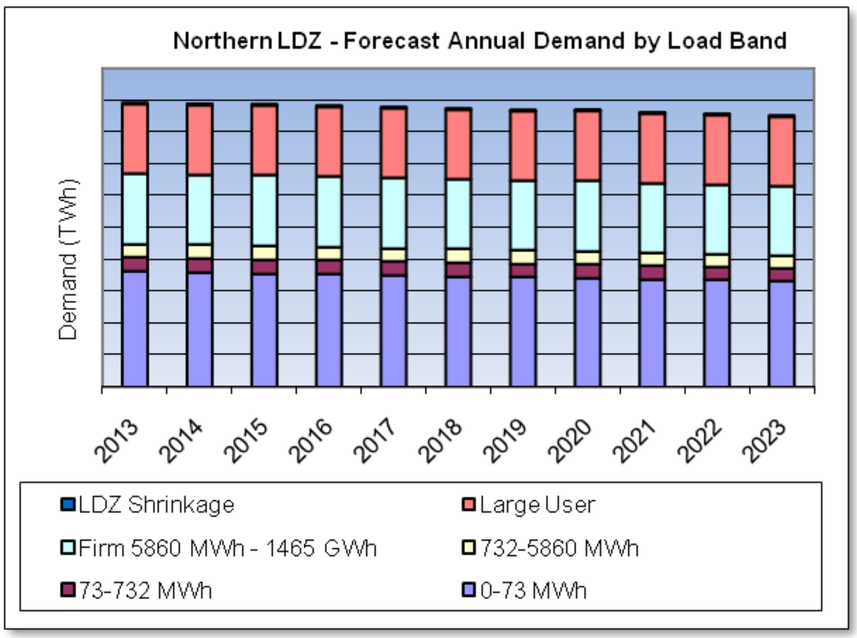


Figure A2.1B - Northern LDZ - Forecast Annual Demand by Load Band

North East LDZ

Load Band	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
0-73 MWh	21.67	21.57	21.41	21.34	21.15	20.99	20.81	20.75	20.60	20.50	20.37
73-732 MWh	3.03	3.02	3.02	3.01	3.00	2.99	2.97	2.99	2.96	2.96	2.93
732-5860 MWh	2.59	2.58	2.57	2.56	2.55	2.54	2.52	2.53	2.53	2.55	2.55
Firm 5860 MWh - 1465 GWh	11.17	11.14	11.15	11.03	11.01	10.96	11.01	10.95	10.95	10.96	10.97
Large User	11.17	11.14	11.15	11.03	11.01	10.96	11.01	10.95	10.95	10.96	10.97
LDZ Shrinkage	0.26	0.25	0.24	0.24	0.24	0.23	0.23	0.22	0.21	0.20	0.20
LDZ Demand	38.72	38.56	38.40	38.18	37.95	37.71	37.54	37.44	37.26	37.16	37.02

Table A2.1C - Forecast Annual Demand by Load Category by LDZ from 2013 Demand Statements (TWh)

Note

- Figures may not sum exactly due to rounding.

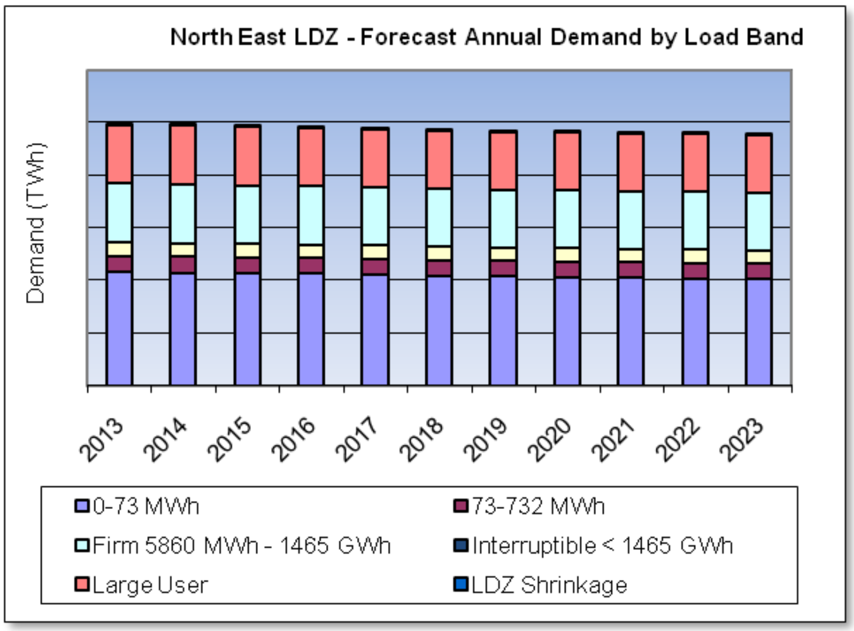


Figure A2.1D – North East LDZ - Forecast Annual Demand by Load Band

1 in 20 Peak Day Demand (GWh)											
LDZ	2013/ 14	2014/ 15	2015/ 16	2016/ 17	2017/ 18	2018/ 19	2019/ 20	2020/ 21	2021/ 22	2022/ 23	2023/ 24
Northern	231	230	229	228	227	225	224	223	222	221	219
North East	270	269	268	267	266	266	265	264	263	262	261
Total	500	499	497	495	493	491	489	487	485	483	481

Figure A2.1E - Forecast 1 in 20 Peak Day Firm Demands by LDZ from the 2013 Demand Statements

Notes

- Figures may not sum exactly due to rounding.
- All figures in GWh.

Weather-corrected throughput in the Northern LDZ fell by around 1.7% in 2012 when compared with 2011, the tenth consecutive year of gas demand falling. In North East LDZ weather corrected throughput fell by 0.4%, the eighth consecutive year of falling gas demand.

Weather-corrected throughput in NGN for the first eight months of 2013 was 2.6% lower than the same period in 2012. At an LDZ level, the Northern weather-corrected throughput was 3.4% lower, and North East LDZ was 1.9% lower.

A2.1.1 Key Assumptions in Developing NGN Demand Forecasts

A significant decline in GDP occurred during 2008/9 set against a long period of growth from 1992. The latest data suggest that the UK economy grew by 0.3 per in 2012 and included a 0.3 per cent reduction in the final quarter of 2012. 2012 growth figures include the positive impact of the Olympics on the economy which as a significant one-off factor has added to the complexity of understanding underlying movements in GDP during 2012.

This growth rate remains extremely weak by the standards of past economic recoveries. However, the labour market during 2012 continued to show a relatively strong position when compared to the continued weakness of GDP growth with employment and hours worked increasing.

NGN Regional Economic Assumptions

Gross Value Added (GVA) measures the contribution to the economy of each individual producer, industry or sector in the United Kingdom. GVA is used in the estimation of Gross Domestic Product (GDP). GDP is a key indicator of the state of the whole economy and equates to GVA plus taxes on products minus subsidies on products. Gross Value Added (GVA) growth in both LDZs has continued to be below the national average over the period 1990 to 2010, with the impact of the recession being felt at the same time as GB and being marginally more severe in both 2008 and 2009.

For the forecast period, GVA growth for both LDZs is assumed to be broadly flat for two more years out to 2015 as the Region struggles to recover from the recession and lags behind even the small recovery seen in the wider UK economy.

- 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. IN real terms, GDHI remained flat in 2011 i.e. no growth in household incomes. This has resulted in the regional assumptions for 2012, after correction to a base year of 2008, having zero growth.

- The Commercial and Services sector has seen historically seen significant growth in both LDZs before being halted by the recession post 2008. Growth in this sector is expected to recover slightly faster than regional GVA, but with some fluctuation in growth before the local economy settles down and the impact of public sector reform feeds through.

- The Manufacturing sector in both LDZs has seen a cycle of rise and fall over the last 20 years but the general trend is downwards and is expected to continue to decline but showing some signs of the historical cycle of rise and fall as recovery in the manufacturing sector nationally is reflected in the Northern half of England.

- The Industrial sector (which includes Construction) has seen a similar cycle of rise and fall as Manufacturing but the general trend is upwards over the last 20 years. It is expected to recover to counter some of the losses in Manufacturing with a good contribution from the Construction sector as new housing recovers and there is new development around the ports associated with the growth in offshore wind developments.

- Employment levels a reforecast to continue to improve across the period – reflecting the relative strength in employment seen in the wider economy. The key areas of regional growth are expected to be in the Commercial/Services sector in line with the economic recovery and the construction sector as new house building, in particular returns to the region. Manufacturing employment is expected to continue its decline over the period.

- The value for Inflation of 2.5% is used for both 2012 and 2013 returning to 2% for 2014 onwards.

Gas & Energy Prices

All prices in all markets have shown significant rises from 2002 for households and effectively from 1999 in the non-domestic market. This has been driven by the wholesale gas price rises, which has in turn been driven by rising oil prices. All historical fuel prices used in the development of the retail price indices forecasts are obtained from the Department for Energy and Climate Change (DECC) statistics.

The price paid for domestic fuels in real terms has risen by 5.7 per cent between Q2 2012 and Q2 2013. All 6 of the major energy suppliers announced price increases for both gas and electricity towards the end of 2012. Average prices increased by 8.0 per cent for electricity and 7.8 per cent for gas. The average annual 2012 electricity bill across all payment types has risen by £26 (5.7 percent) since 2011, to £479. Meanwhile, the average annual 2012 gas bill across all payment types has risen by £81 (11.3 per cent) since 2011, to £800.

Ongoing current price rises are anticipated to reflect the rise in wholesale prices with an ongoing premium of 1% above inflation and an additional 1% added to the current price to accommodate the future development of smart grids and smart metering as costs are passed on to customers.

There has been a steady rise in the real price of industrial gas prices for many years but with significant fluctuations in line with the fluctuation in wholesale prices. Annual prices increased by 3 per cent between 2011 and 2012 for electricity and 8 per cent for gas (including CCL in real terms).

Ongoing current price rises are anticipated at this level in line with the trend in rising wholesale prices and a premium of 0.5% is added to the current price in the short term to accommodate the development of smart grids and smart metering as some costs are passed on to customers initially. The lower premium level is anticipated as non-domestic customers will see greater benefits from this technology compared to domestic customers and hence be early adopters or already have some form of smart metering already.

1 in 20 Peak Day Demand Methodology

NGN is continuing with the use of the traditional methodology for calculating the 1 in 20 peak day and have seen some evidence of some small changes in the behaviour of customers in severe weather which suggests that there may be a need to review the methodology. There is clear evidence that average consumption per customer (especially in the domestic sector) has been falling, driven by rising gas prices, which has been encouraging the replacement of inefficient gas boilers and installation of cheaper forms of insulation. But it is also possible that customers are trying to conserve energy by turning thermostats down when heating is on, particularly during the shoulder months of April and September.

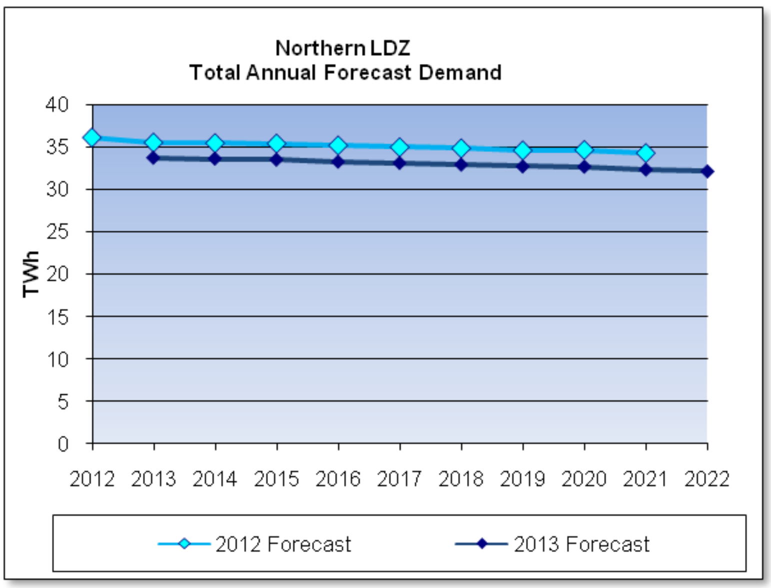
However it is becoming clearer that customers cannot maintain this behaviour during extreme weather conditions and a significant divergence in consumer behaviour under normal/average weather conditions and extreme weather conditions. There is growing evidence to suggest that a cold weather upturn in demand is becoming stronger and needs to be factored into the methodology to avoid underestimating peak demand on the coldest days. The conventional approach that assumes there is a linear relationship between demand and Composite Weather Variable may no longer be entirely valid under certain circumstances.

Another area of interest is the different behaviour patterns during extreme weather where there is the presence of significant quantities of precipitation (primarily snow). This has the effect of changing gas demand, typically reducing larger NDM and DM demand and in some circumstances increasing to a degree small NDM demand. This is however a transient effect in long periods of cold weather as businesses, schools etc. get back to normal operation.

These effects can be seen in the profile of NGN's forecast peak demands over the period. Peak demands continue to fall but a slower rate than annual demand over the same period.

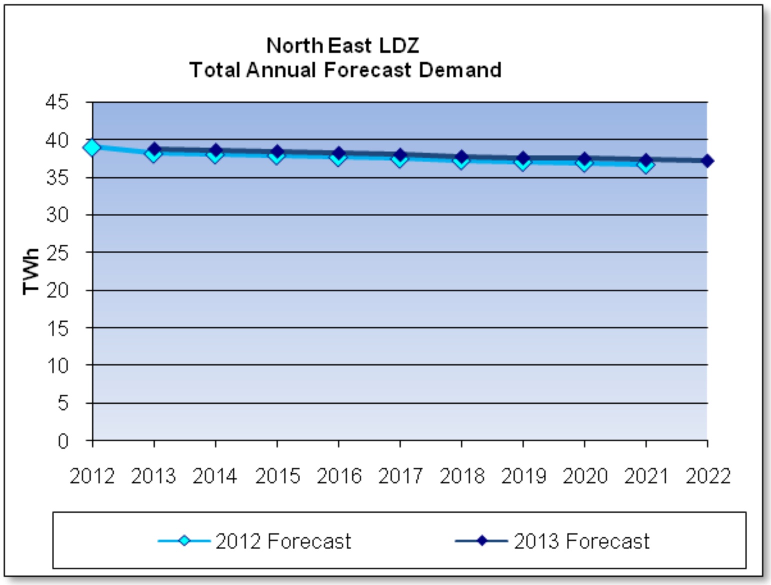
A2.2 Forecast Comparisons

The following charts provide a comparison of the current forecasts with those published in the 2012 Demand Statements.



	Forecast (TWh)		
Year	**2012 DS**	**2013 DS**	**% Difference**
2013	35.51	33.71	-5.06
2014	35.45	33.61	-5.19
2015	35.40	33.49	-5.41
2016	35.19	33.24	-5.53
2017	34.98	33.09	-5.40
2018	34.84	32.90	-5.57
2019	34.61	32.69	-5.55
2020	34.66	32.65	-5.79
2021	34.29	32.32	-5.76

Figure 2.4A – Northern LDZ Total Annual Forecast Demand



Year	Forecast (TWh) 2012 DS	2013 DS	% Difference
2013	38.17	38.72	1.44
2014	38.07	38.56	1.29
2015	37.94	38.40	1.20
2016	37.70	38.18	1.25
2017	37.49	37.95	1.23
2018	37.28	37.71	1.16
2019	37.09	37.54	1.22
2020	36.96	37.44	1.29
2021	36.72	37.26	1.46

Figure 2.4B – North East LDZ Total Annual Forecast Demand

Appendix Three - Actual Flows 2012

A3.1 Annual Flows

Annual forecasts are based on average weather conditions. Therefore, when comparing actual throughput with forecasts, throughput has been adjusted to take account of the difference between the actual weather and the seasonal normal weather.

The result of this calculation is the weather corrected throughput.

The weather corrected throughput and forecast demands listed below assume a weather condition based on weather data for a 17 year period from 1987 to 2004.

The basis for any calculation of forecast demand is the accuracy of the previous forecast.

Tables A3.1.1 and A3.1.2 provide a comparison of actual and weather corrected throughputs during the 2012 calendar year, with the forecast demands presented in the 2013 Demand Statements. Annual demands are presented in the format of LDZ and NTS load bands/categories, consistent with the basis of system design and operation.

NO 2012	Actual	Weather Corrected	Forecast	Corrected v Forecast(%)
NDM Firm 0 to 73.2 MWh	19.38	18.40	18.13	1.5
NDM Firm 73.2 to 732 MWh	2.39	2.28	2.31	-1.5
Firm >732	13.75	13.40	15.34	-12.7
Shrinkage	0.21	0.21	0.31	-31.9
Total LDZ	35.72	34.29	36.09	-5.0

Table A3.1.1 Northern LDZ Throughput

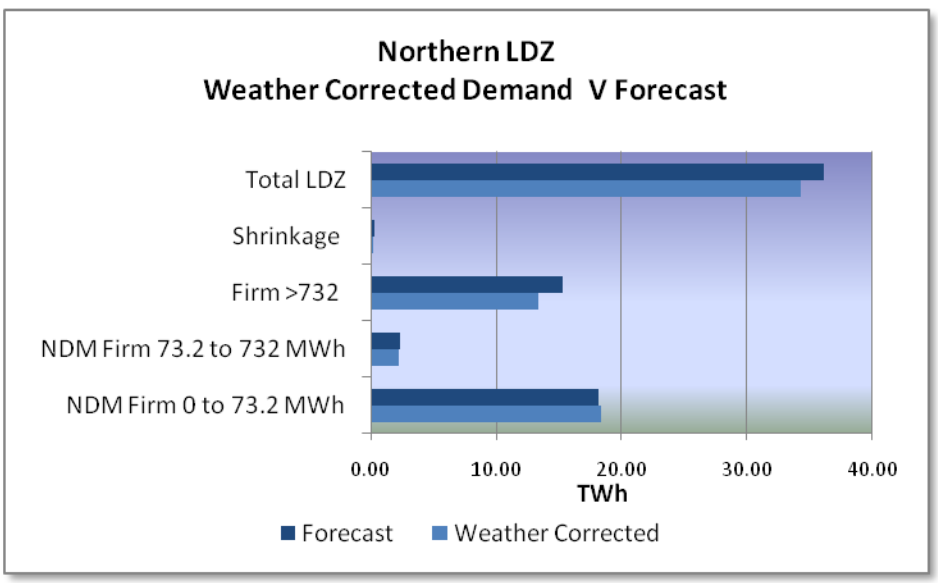


Table A3.1.1A Northern LDZ Weather Corrected Demand V Forecast

Looking at the Northern LDZ throughput in comparison with the forecast we can see that in the majority of load bands, the forecasts were overstated. Overall the total forecast LDZ demand was 5% lower than actual weather corrected throughput.

NE 2012	Actual	Weather Corrected	Forecast	Corrected v Forecast(%)
NDM Firm 0 to 73.2 MWh	23.16	21.72	22.31	-2.6
NDM Firm 73.2 to 732 MWh	3.14	2.95	3.02	-2.4
Firm >732	14.22	13.63	13.38	1.9
Shrinkage	0.26	0.26	0.31	-15.7
Total LDZ	40.78	38.56	39.02	-1.2

Table A3.1.2 North East LDZ Throughput

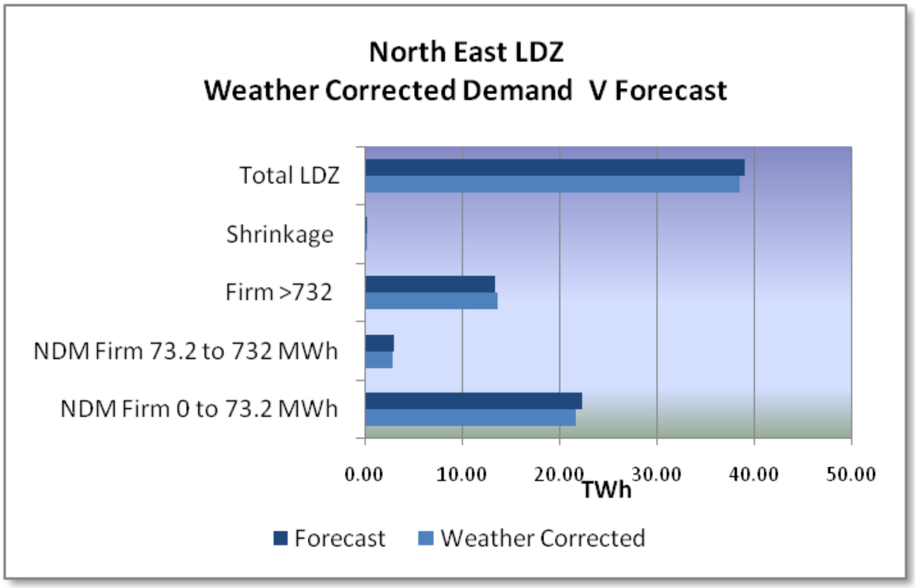


Table A3.1.1A North East LDZ Weather Corrected Demand V Forecast

Similarly, the North East LDZ forecast was overstated in most load bands, but the Firm >732 category. At an LDZ level the weather corrected throughput was 1.2% lower than forecast.

A3.2 Peak Flows

Record total throughput in Northern LDZ is 21.08mscm on 30th January, 2003, and in North East LDZ the record stands at 24.42mscm on 28th January, 2004.

During the last winter period, the day of highest total throughput in the Network was 17th January 2013. In the North East LDZ demand levels were 20.10 mscm, 0.2% lower than the winter of 2011/12. In the Northern LDZ this day was also the highest throughput, when demand levels were 17.28 mscm – this was 2.8 % higher than the previous winter.

The throughput in North East LDZ on 17th January equated to 81.2% of peak day firm only forecast demand. In Northern LDZ the throughput was 78.9% of peak day firm only forecast demand.

Over the next ten years, peak day forecast demand is expected to decline by 4.97% in Northern and 3.05% in North East LDZ.

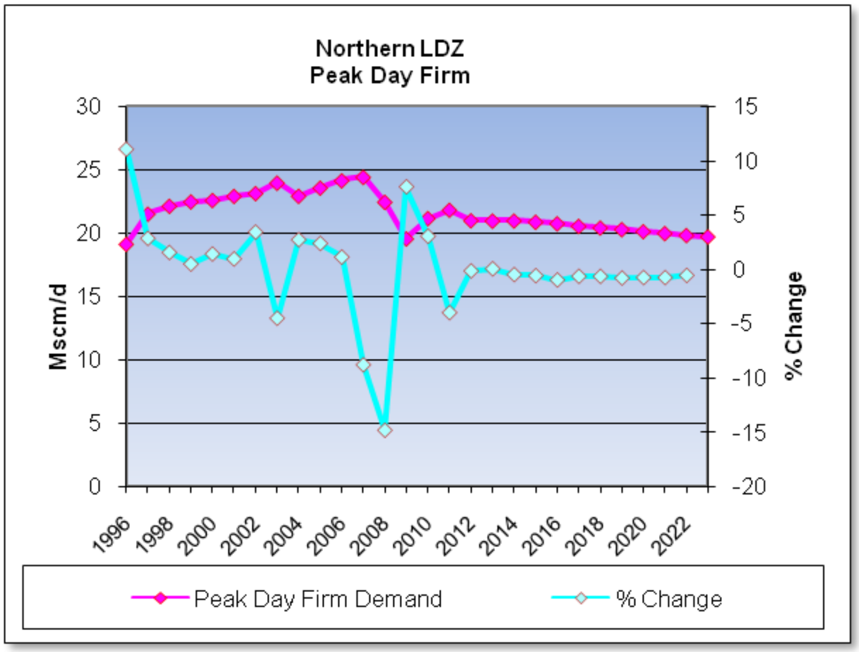


Figure 3.2a – Historical Throughput & Forecast Peak Day Firm Demand for Northern LDZ

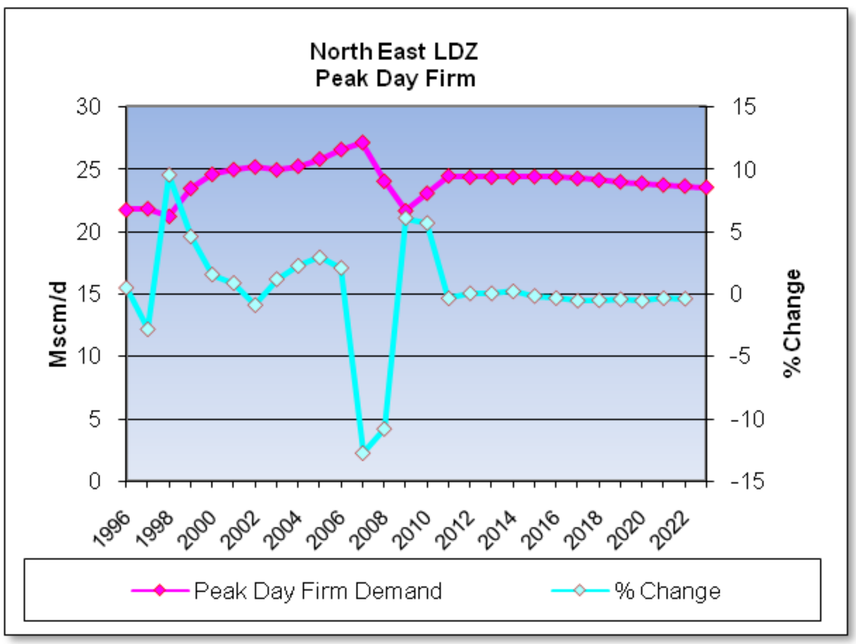


Figure 3.2b – Historical Throughput & Forecast Peak Day Firm Demand for North East LDZ

Appendix Four - Offtakes

As an indication of available capacity at the Network's offtakes, the 2015 requested Peak Flow from NTS has been plotted against the Maximum Offtake Capacity in 2013.

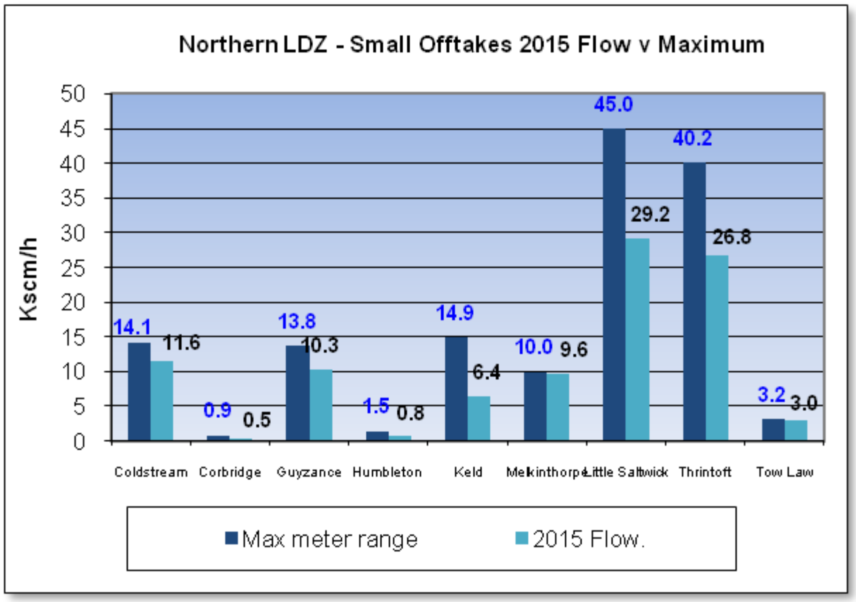


Figure 4.0a – Northern LDZ Small Offtakes 2015 Flow Vs Maximum

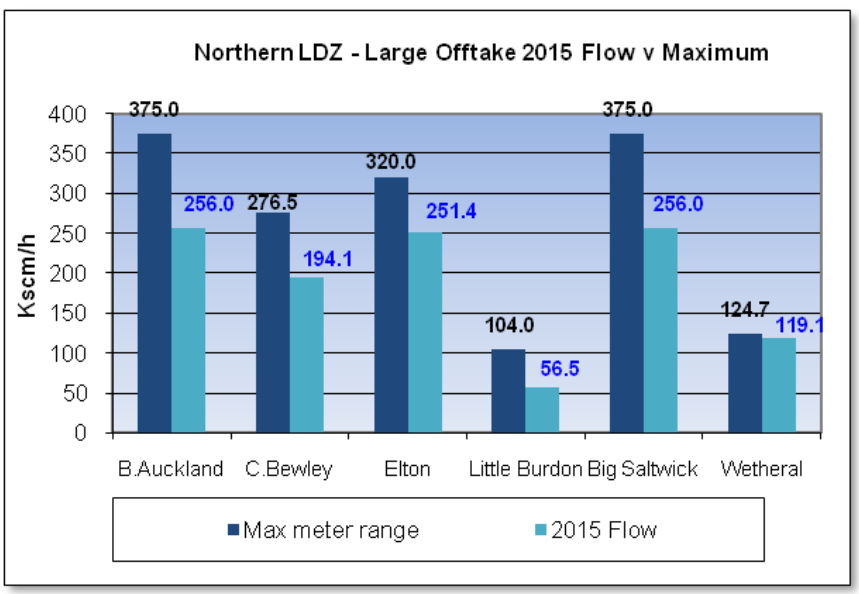


Figure 4.0b – Northern LDZ Large Offtakes 2015 Flow Vs Maximum

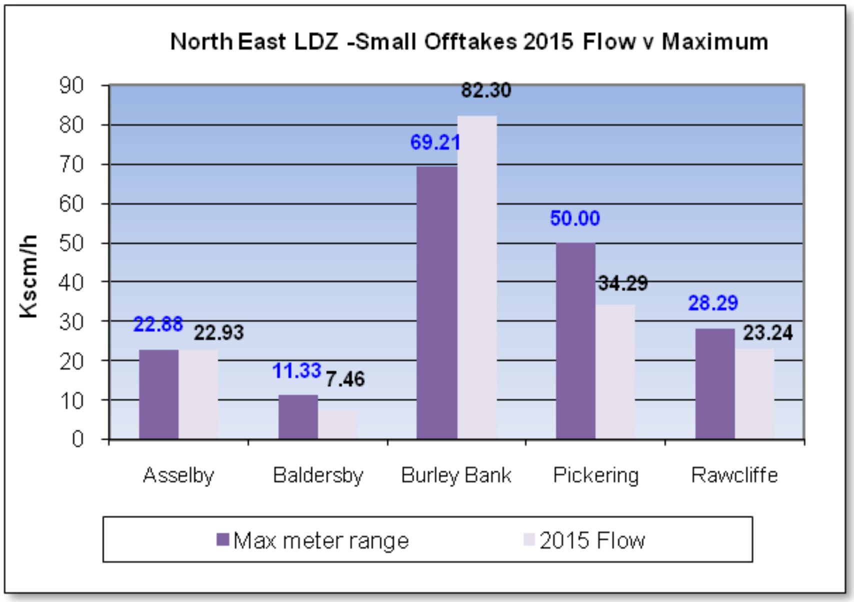


Figure 4.0c – North East LDZ Small Offtakes 2015 Flow Vs Maximum

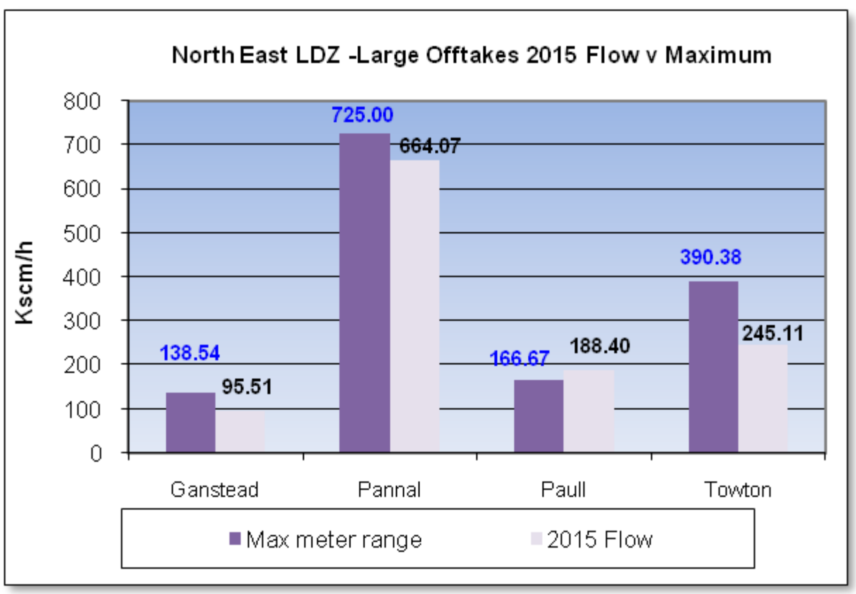


Figure 4.0d – North East LDZ Large Offtakes 2015 Flow Vs Maximum

- Paull offtake is part of a multi junction complex and parts of the site are owned by NGG and NGN. We are in discussion with NGG to determine the best solution to the capacity issues we have.
- Asselby offtake is also shown as short of capacity in 2015. However, we have identified that the regulators do have enough capacity but the meter requires some upgrade work.
- Burley Bank offtake is also shown as short of capacity in 2015. We are looking to add this site to our upgrade programme prior to 2015.

Appendix Five - The Gas Transportation System

Northern LDZ Schematic

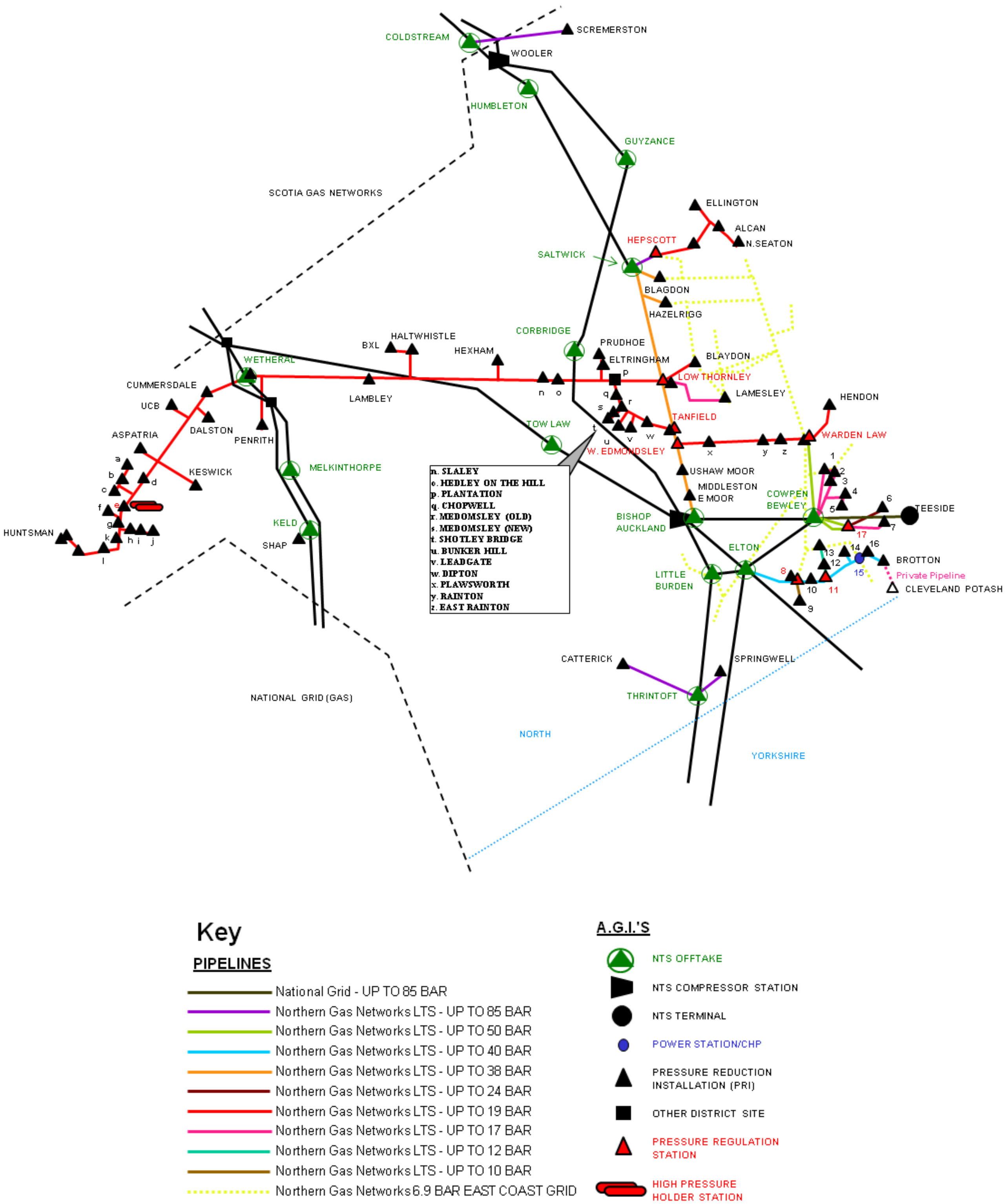


Figure A5.1A

North East LDZ Schematic

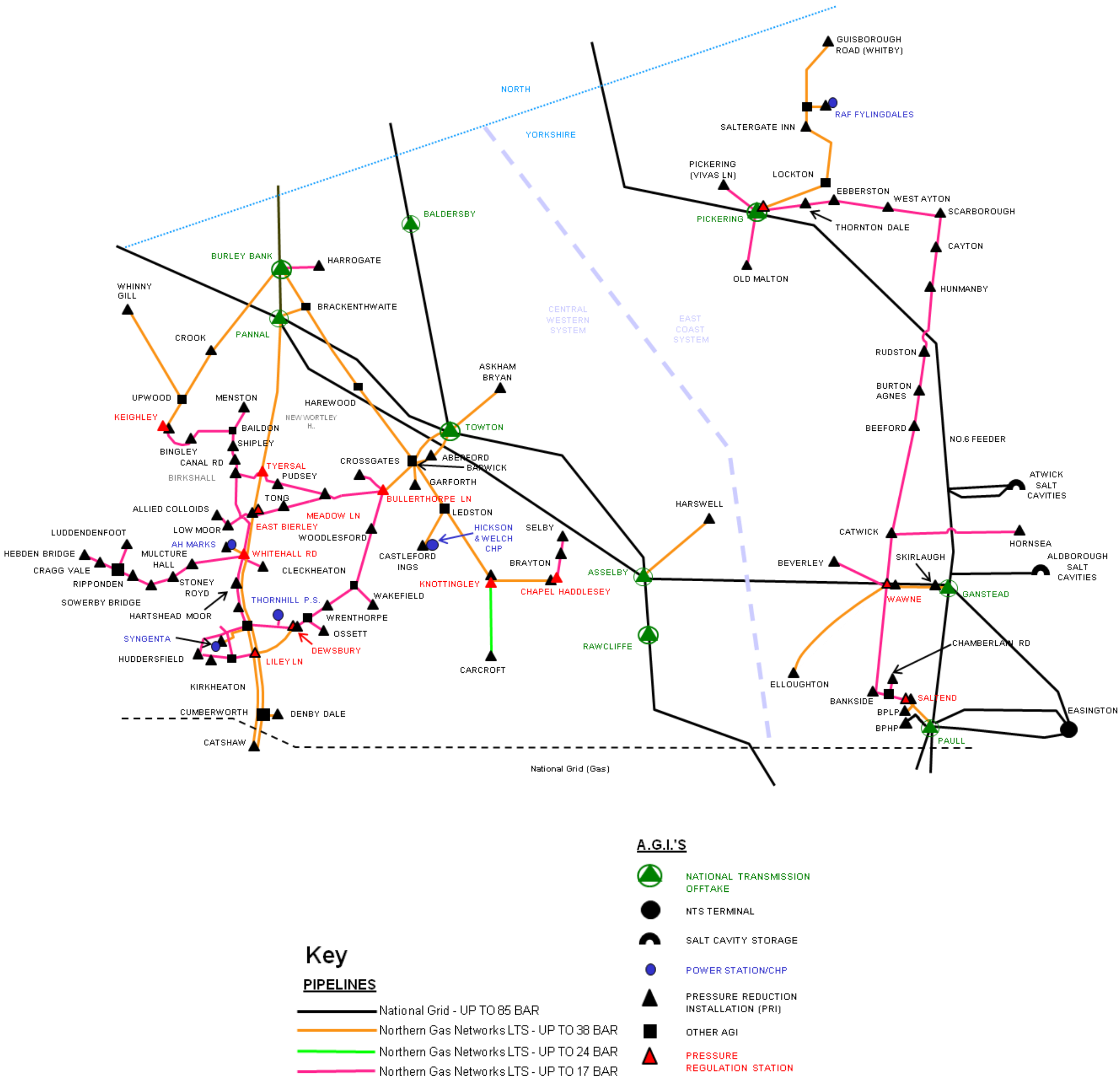


Figure A5.1B

Appendix Six - Connections to our System

A6.1 Introduction

Within the space of a few years, the gas industry in Britain has evolved from a situation where one company provided all new connections, to one where many alternative connection services are now available on a competitive basis.
Indeed, whilst Northern Gas Networks continues to offer connection services in line with our Gas Act obligations, customers and developers 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 delivery facilities processing gas from gas producing fields or, potentially in the future, LNG vaporisation (i.e. importation) facilities, for the purpose of delivering gas into the NGN system. Biomethane is a fully renewable source of energy and NGN is fully committed to maximising the entry of biomethane into our gas network
- 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-NGN pipeline transporting gas to premises consuming more than 2,196MWh per annum; and
  - **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.

NGN is working with producers, Ofgem, DECC, HSE, equipment suppliers and other DN's to ensure technical and commercial barriers to entry are speedily removed.

We have received a number of enquiries to enter biomethane into our pipeline system and anticipate that several of these facilities will be connected during the 10 year planning period.
These sites use a variety of feedstocks for this process such as crops, sewage, livestock and supermarket wastes and range in entry capacity from 250 – 1,200 cubic metres per hour.

It should be noted that any third parties 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 A6.7.

A6.2 Additional Information Specific to System Entry and Storage Connections

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.

A6.2.1 Network Entry Quality Specification

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.
The ability of Northern Gas Networks 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, pressure ranges 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 the following.

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.

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/m3

2. Total Sulphur
    - Not more than 50mg/m3

3. Hydrogen
    - Not more than 0.1% (molar)

4. Oxygen
    - Not more than 0.001% (molar)

5. Hydrocarbon Dewpoint
    - Not more than -2°C at any pressure up to 85barg

6. Water Dewpoint
    - Not more than -10°C at 85barg

7. Wobbe Number (real gross dry)
    - The Wobbe Number shall be in the range 47.20 to 51.41MJ/m3

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/m3, 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
    - 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/m3

14. Radioactivity
    - Not more than 5 Becquerel/g

15. Odour
    - Gas delivered shall have no odour that might contravene the statutory obligation not to transmit or distribute any gas at a pressure below 7 barg, which does not possess a distinctive and characteristic odour.

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.

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 Government 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.

A6.3 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.

A6.4 National Transmission System (NTS) Connections

For information regarding NTS Connections visit http://www.nationalgrid.com/uk/Gas/connections

A6.5 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 21mbarg.

A6.6 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 the appropriate office prior to the planning phase of any project.

A6.7 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.

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, resource and construction lead-times and that as much notice as possible should be given. In particular, we will typically require three 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.

Glossary

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.

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.

Distribution Network (DN)
An administrative unit responsible for the operation and maintenance of the local transmission system (LTS) and <7barg distribution networks within a defined geographical boundary.

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. >7barg, pipeline systems.

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 Northern Gas Networks, are licensed by the Gas and Electricity Markets Authority to transport gas to consumers.

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

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

Interruptible Service
A service that offered financial incentives to customers but under which we can interrupt the flow of gas to the supply point. This ceased in October 2011.

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 National or Local Transmission System at any time.

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 offtakes. Consists of LTS and distribution system pipelines.

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

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

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 our offtakes.

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 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.

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.

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.

Therm
An imperial unit of energy. Largely replaced by the metric equivalent: the kilowatt hour (kWh). 1 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
The document that defines the contractual relationship between System Users.
The Uniform Network Code has replaced the Network Code and, as well as existing arrangements, covers the arrangements between all gas transporter.