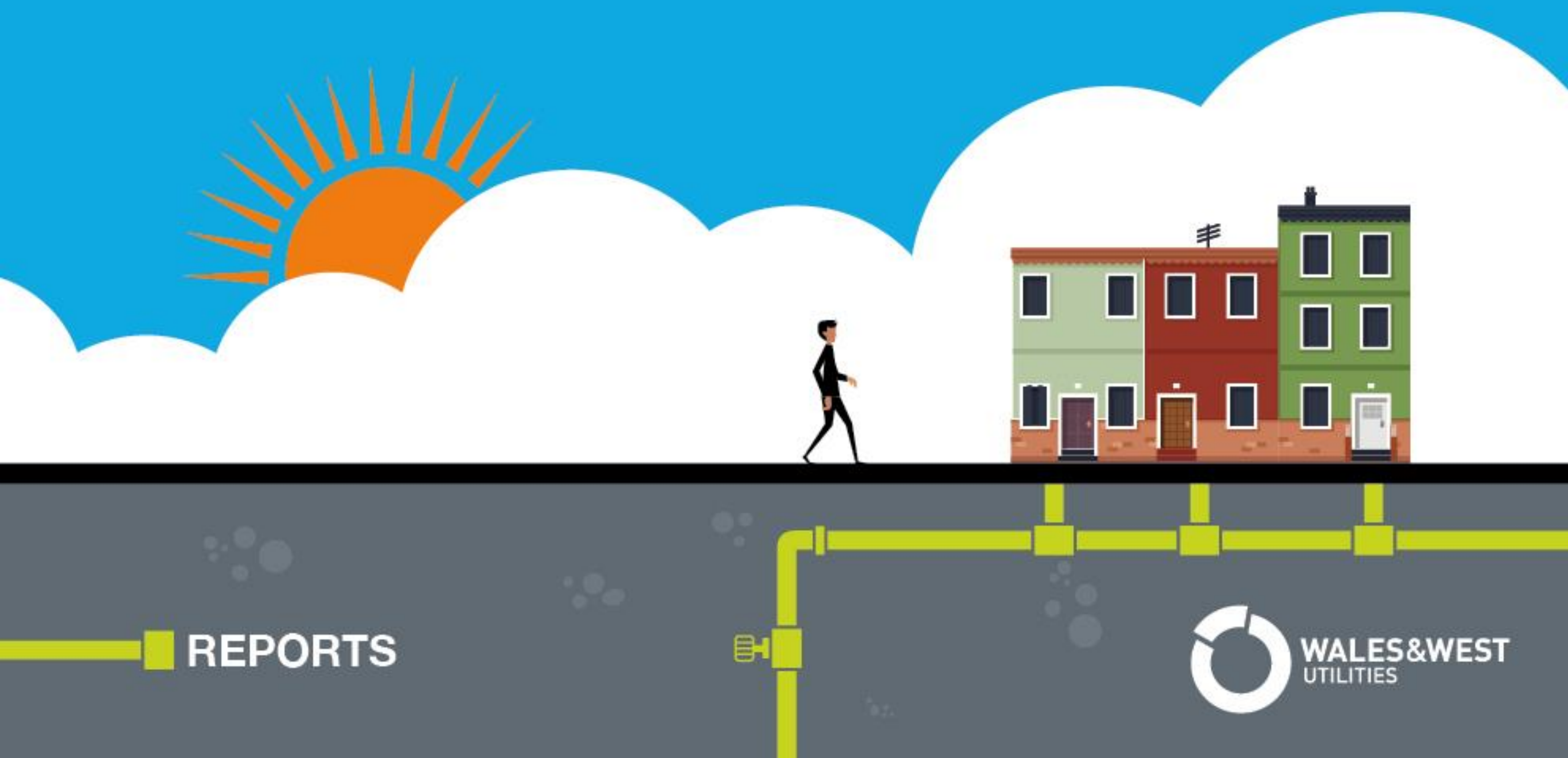
Wales & West Utilities

2016 Long Term Development Statement



1. Contents

Foreword

Chris Clarke - WWU
Director of Asset Management,
Health, Safety & Environment

The 2016 Long Term Development Statement is published in accordance with Standard Special Condition D3 of our Gas Transporters Licence and Section O4.1 of the Uniform Network Code (UNC) Transportation Principal Document (TPD).

These require that a Long Term Development Statement is published annually.

The Statement provides an indication of the usage for our pipeline system and likely developments. Companies that are contemplating connecting to our system or entering into transportation arrangements can use the statement to help identify and evaluate opportunities. It has been published at the end of the 2016 planning process following a reappraisal of our analysis of the market and demands on our Network within the South West (SW), Wales North (WN) and Wales South (WS) Local Distribution Zones (LDZs).

The Statement contains information on actual volumes, the process for planning the development of the system, including demand and supply forecasts, system reinforcement projects and associated investment.

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Disclaimer

This Long Term Development Statement is produced for the purpose of and in accordance with Wales & West Utilities' obligations under the Standard Special Condition D3 of the Gas Transporters Licence and Section O 4.1 of the Uniform Network Code in reliance on information provided pursuant to Section O of the Uniform Network Code. Section O 1.3 applies to any estimate, forecast or other information contained in this Statement. Wales & West Utilities' Long Term Development Statement is not intended to have any legal force or to imply any legal obligations as regards capacity planning, future investment and the resulting capacity.

Executive Summary

The purpose of this document is to outline our assessment of the future use of our gas distribution network and highlight any investment requirements. The assessment is based on our annual and peak supply and demand forecasts for gas usage in Wales and the South West of England.

Data and analysis is provided for the three local distribution zones (LDZs) that constitute the Wales & West Distribution Network (WWU). The three LDZs are:

- South West
- Wales South
- Wales North

The Wales & West gas distribution network is supplied by seventeen National Transmission System (NTS) Offtakes and fifteen biomethane supplies.

1.1 Context

This document contains the Wales & West Utilities annual and peak demand and supply forecasts which have been developed in conjunction with National Grid UK Transmission (UKT) and WWU local knowledge.

1.2 Demand and Supply Outlook

Our current demand forecast shows little variation from the forecasts in 2015. As such WWU's position on peak demands remains unchanged from last year with just a slight reduction in annual demand. The 2016 Forecasted demands show a slight fluctuation over the years ending with a small decrease of 3.77% by 2025. The decrease is mainly due to a reduction in the large daily metered (DM) industrial sector.

- South West LDZ is predicted to decrease in annual demand by 2.19% from 2015 to 2025.
- Wales South LDZ is predicted to decrease in annual demand by 5.27% from 2015 to 2025.
- Wales North LDZ is predicted to decrease in annual demand by 4.39% from 2015 to 2025.

Despite the slight forecasted decrease in annual demand, peak demand is considered to remain flat for the 10 year horizon and remains at the same level to that predicted last year.

1.3 Investment Implications

Even when we experience small overall increases in demand, this does not necessarily mean investment in the network is required. Conversely, when we experience small reductions in overall forecast demand we can often see localised growth in some areas across the network and there is an annual below 7 bar investment plan to accommodate this.

We have seen an increase in enquiries for embedded power generation which is providing a quick response alternative to renewable energy sources. We currently have 10 (8 new, 2 existing) stations connected to our below 7 bar network mainly in South Wales where it has taken the place of old industry. An additional 15 plants have accepted and are due to connect over the next 12 months and with over 100 additional enquiries in since April this year, this connected number has a real potential to grow.

Using an average daily volume and profile; if a further 100 sites connected then this would mean an additional 4.7 million cubic meters per day (mcm/d) on our peak day demand which is roughly 10% of total network demand and would trigger the need for reinforcement post 2020 and into GD2.

The immediate impact that these sites are having is on our storage rather than peak demand due to the way in which they take gas to cover the breakfast and tea time peaks. We are in storage deficit at a number of our Offtakes and because of this; we have identified a placeholder in 2021 and 2022 for £140k in each of the years in our 8 year plan to increase our line pack storage (costs associated with operating differently rather than installing pipe).

What if most commercial sites move to combined heat and power (CHP) increasing the demand for gas to produce power? Our commercial sector accounts for 17% of total network demand and if this demand was to increase by 20% to account for this move then an additional 1.637 mcm/d gas demand would be required adding to our peaks and driving reinforcement.

This drive towards fast acting renewable backup coupled with a move towards CHP in the commercial sector means we could well see an upsurge in gas demand. Will backup generation equal renewable demand by 2025? Will these power generation enquiries start to die down for WWU with planning being made more difficult for > 10MW sites in Wales and Hinckley Point C getting the go ahead?

There is still a lot of uncertainty about what gas demand will look like but confidence is growing that gas network will provide a crucial part of an integrated credible future energy scenario, supported by results from WWU projects; Bridgend Study & Cornwall Energy Island. Support for this view is spreading amongst DNs, industry and government.

The key point is that this area is not impacting peak demand at the moment but a flag is needed for potential reinforcement in GD2 for increases in peak demand and storage.
So even though we are not currently investing in the network, we are still investing in resources and process developments to manage these enquiries and new loads.

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1.4 Industry Development

The UK is now committed to legally binding environmental targets to deliver a sustainable future. We have environmental targets to achieve by 2020 and 2050. We must achieve these targets but we must also recognise the requirements to ensure security of supply within an uncertain economic climate and rising fuel poverty.

There are a number of key industry developments to note:

- The eight year price control period (RIIO GD1) began in April 2013. This includes some significant changes to networks allowances and network requirements such as:
    - Networks to engage more with stakeholders
    - Networks to be rewarded for delivery of Outputs
    - Networks to deliver innovative solutions to promote a sustainable energy sector
- There is a growing requirement to facilitate Renewable and other forms of gas into the Gas Network.
- The increase in renewable generation on the electricity system is leading to more variable flows at Gas Fired Power Stations embedded within the LDZ.

Our work to develop the network and to support development of industry arrangements must therefore incorporate these important developments. More information on these key developments can be found on the WWU, Joint Office and Ofgem websites

1.5 Next Steps

This Long Term Development Statement will be published on the WWU website (WWU - Long Term Development Statement). WWU actively solicit views and comments from interested parties.

2 Document Scope

2.1 Summary

The three LDZs in the Distribution Network (DN) are supplied by National Grid (NG) NTS through seventeen Offtakes, with the SW LDZ being divided into three distinct sub-systems.

Details of the above Offtakes and their respective capacities are summarised in Figure 2.1 below.

Figure 2.1 WWU Offtakes Summary

Subsystem Name	Offtake Location	Capacity		
		kscm/h	GWh/d	mcm/d
	LDZ:- SW			
Northern	Wiltshire (1)	122.08	31.74	2.93
	Gloucestershire (1)	115.83	30.12	2.78
	Bristol (1)	243	63.18	5.83
Central	Bristol (2)	150	39	3.6
	Somerset	175	45.5	4.2
Southern	Exeter (1)	62.5	16.25	1.5
	Plymouth	300	78	7.2
Other	Exeter (2)	121.67	31.63	2.92
	Gloucestershire (2)	45	11.7	1.08
Pressure Controlled	Devon	40	10.4	0.96
	Herefordshire	25	6.5	0.6
	Wiltshire (2)	21.29	5.54	0.51
	Worcestershire	37.92	9.86	0.91
	LDZ:- WS			
South Wales	Cardiff	434.04	112.85	10.42
	Swansea	235	61.1	5.64
	Newport	316	82.16	7.58
	LDZ:- WN			
North Wales	Wrexham	250	65	6

Assumed CV = 39 MJ/m^3

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Gas supplies, and the supply to our GDN through these Offtakes, are generally affected by the changes in gas production. We have seen a decline of gas production from the UK Continental Shelf Supplies (UKCS) and in order to compensate for the decline, NG has developed the NTS to support a number of projects to enhance interaction with mainland Europe and the Liquefied Natural Gas (LNG) markets. These include, for example: the Langeled Pipeline linking the offshore Norwegian gas network and the Ormen Lange gas field to the NTS, increased facilities for LNG imports into the Isle of Grain terminal, and a pipeline to connect the LNG facilities at Milford Haven, Wales to the NTS. The Dragon LNG facility and the South Hook terminal at Milford Haven are also fully operational.

In addition to the gas supplied from the NTS, a small volume of gas is available from 15 biomethane sites. This is a developing area and supplies are not currently sufficiently secure to be relied on to meet our peak demand and there is no obligation for these sites to commit to flat capacity bookings. As such these volumes are not considered when we consider our flat capacity booking requirements with the NTS.

2.2 Structure of the Document

The main body of this Statement (Chapters 3 to 6) sets out the key drivers and uncertainties affecting demand, supply and the provision of capacity on our pipeline system.

- Chapter 3 provides an overview of our latest demand forecasts and
- Chapter 4 gives a synopsis of our supply forecasts.
- Chapter 5 summarises our development plans on the Local Transmission System (LTS).
- Chapter 6 discusses the latest Industry developments affecting our Network.

Appendix 1 details the methodologies that have been used to produce our demand forecasts.

The remaining appendices provide details on actual gas flow data, system maps, connection specifications and commercial incentives. A glossary and conversion matrix is included at the end of the document.

Designing OUR FUTURE

We invest in our people so that we all have the skills, confidence and innovative thinking to build our business long into the future. We want to be a company people aspire to work for.

3 Demand

3.1 Summary

This chapter describes the key forecast assumptions and drivers that generate the ten year forecast demand for each of the three LDZs within our Distribution Network.

This chapter also includes the headline outcomes as well as a discussion on how current forecasts relate to those previously published (Section 3.3)

Further information, including the detailed numerical tables is provided in Appendix 2.

3.2 Demand Forecast overview

Our gas demand forecast levels in the current price control period from 2013 to 2021 is underpinned by our belief that Natural Gas will continue to play a significant role in the UK energy market beyond 2030. This is consistent with current statements made by the Department of Energy and Climate Change and underpinned by previous detailed analysis commissioned by WWU and other GDNs

In overview, the key headlines are:

- Annual demand is expected to show a slight fluctuation ending with a small decrease of 3.77% over the 10 year horizon as stated in section 1.2.

- During the next ten years, we have taken the prudent view that peak day demand in our network will remain flat from 2016/17 out to 2025/26 for all LDZs because there is insufficient evidence at this stage to suggest that the general efficiencies and downturn in gas usage would lead to demand reductions during periods of severe cold weather. This does not lead to any investment requirements.

- Response to the opportunities available in the new electricity market has caused a change in customer requirements and or behaviour. Significant increases in power generation enquiries for sites operating as part of the short term operating reserve (STOR) market have impacted on our requirement for storage. Increases in Biomethane connections and enquiries also impact on planning processes and

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"Within Day" operations as we now have to keep capacity available for when these sites operate.

The forecasts referred to within this document take account of national data and assumptions sourced from NG. A range of forecast scenarios are produced and we consider this information in conjunction with local knowledge and analysis to develop the final forecasts used to plan the network. In 2014, we commissioned energy consultants Delta-EE to carry out a review on peaks in the domestic load band and have used the results from this project again to develop the forecasts for the 2016 view of peak demand.

For more information on Gas Demand Forecasting Methodology please contact the Joint Office, link to website (Joint Office).

For further information on Delta-EE's work on Long Term Demand Forecasting for Peak Days please see (ENA Smarter Networks Portal) and Appendix A1.2

3.2.1 Demand and Weather Modelling

Due to the temperature sensitivity of the domestic load band, LDZ forecasts of annual demand are based upon an assumed average weather condition. The demand models adjust from actual to average weather conditions using factors known as Composite Weather Variables (CWVs). The CWVs are derived from temperature and wind speed data to optimise the correlation between demand and weather.

The Uniform Network Code obliges us to review, at least every 5 years, the definition and seasonal normal basis of all CWVs.

From 1st October 2015 Xoserve published revised seasonal normal composite weather variables (SNCWV) for use going forward. This includes a revised shortened weather history than was previously used. We have considered the impact of these revisions in this current iteration of our Long Term Development Statement.

For more detail on the change to the EP2 method and its effects on the demand forecasting process please refer to Appendix 3 - section A3.1 of this document.

3.2.2 Summary Econometric Assumptions

The agreed demand forecasts are an outcome of an annual demand process that estimates future demand from historical weather corrected data using a range of forecasted economic indicators and by taking into account increased domestic efficiency e.g. Boiler replacement, insulation levels etc.

In overview the key economic and other variables utilised in production of these forecasts by load band are:

0-73 MWh

Household numbers

Domestic gas price real terms

Real term household disposable income

Increased domestic efficiencies

Customer Behaviour

>73-732 MWh

Household numbers

Real non-manufacturing output

>732 MWh

Non-manufacturing output

Manufacturing output

Industrial gas price

Further market drivers have been included covering Climate Change Levy, generation of electricity through renewable sources, combined heat and power capacity and the EU emissions trading scheme. Domestic energy efficiency and affordable warmth programmes contribute to a reduction in growth within the Domestic sector.

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3.2.3 Interruptible Capacity

We annually assess the level of capacity required to operate the Network in a safe and secure manner and to comply with the obligation to meet 1 in 20 demand conditions. In previous years Interruptible capacity has been put out to tender in all areas, however no interest has been shown in this by customers within the WWU network. As such, from 30th September 2016 there are no longer any interruptible customers connected to WWU's network.

3.2.4 Forecast Demand charts

This section provides an overview of the latest gas demand forecasts through to 2025/26. A more detailed view can be found in Appendix 2, which includes forecasts for both peak and annual demand on a year-by-year basis. Peak Demand is expected to remain the same for the forecast period. However during the next ten years, annual gas demand is forecast to decrease by 3.77% between 2015/16 and 2025/26.

All loads have been modelled as "Firm Demand".

Figure 3.1 Historical and Forecast Peak Day Gas Demand for WWU

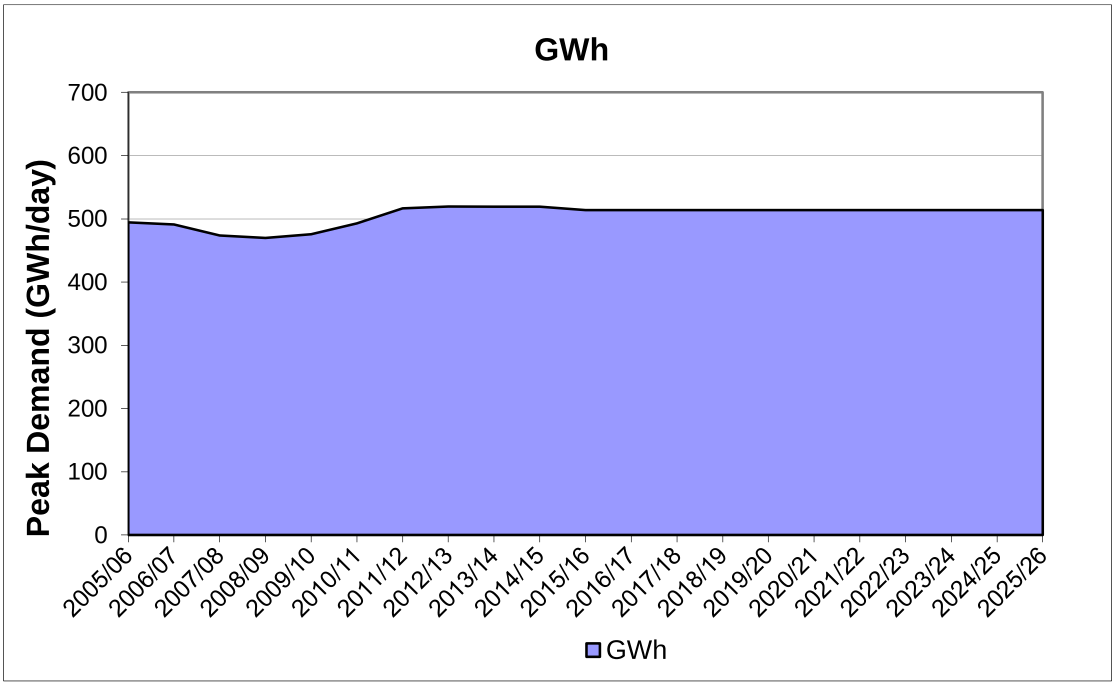


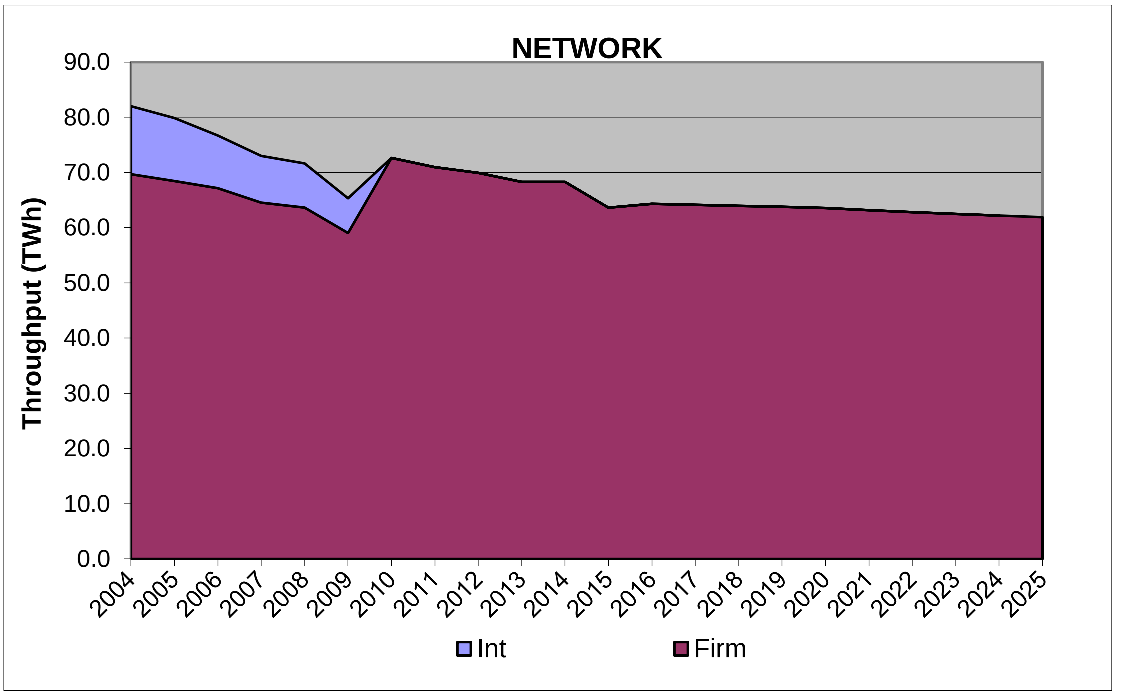
Figure 3.1 represents the view held by us, that demand will remain steady when considered alongside reasonably constant annual demands. This results in a flat forecast from 2015/16 onwards. Annual demand is falling in domestic and small commercial sectors driven by the following factors:

- Rising gas prices
- Installation of new gas boilers
- Increasing use of insulation
- Customers reducing thermostat settings to conserve energy

We expect some localised growth in the domestic sector.

There is evidence that customers change their behaviour during times of extreme weather conditions. There is a strong increase in demand when the weather turns cold. The peak in demand this creates must be factored in to calculations to avoid an underestimation.

Figure 3.2 Total Historical and Forecast Annual Gas Demand for WWU



In South West and North Wales LDZs the majority of the demand is from domestic energy users, whereas in Wales South the demand is more evenly spread between domestic and large industrial users. Throughput in WN is significantly less than in SW and WS.

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Figure 3.3 Historical and Forecast Annual Gas Demand for South West LDZ

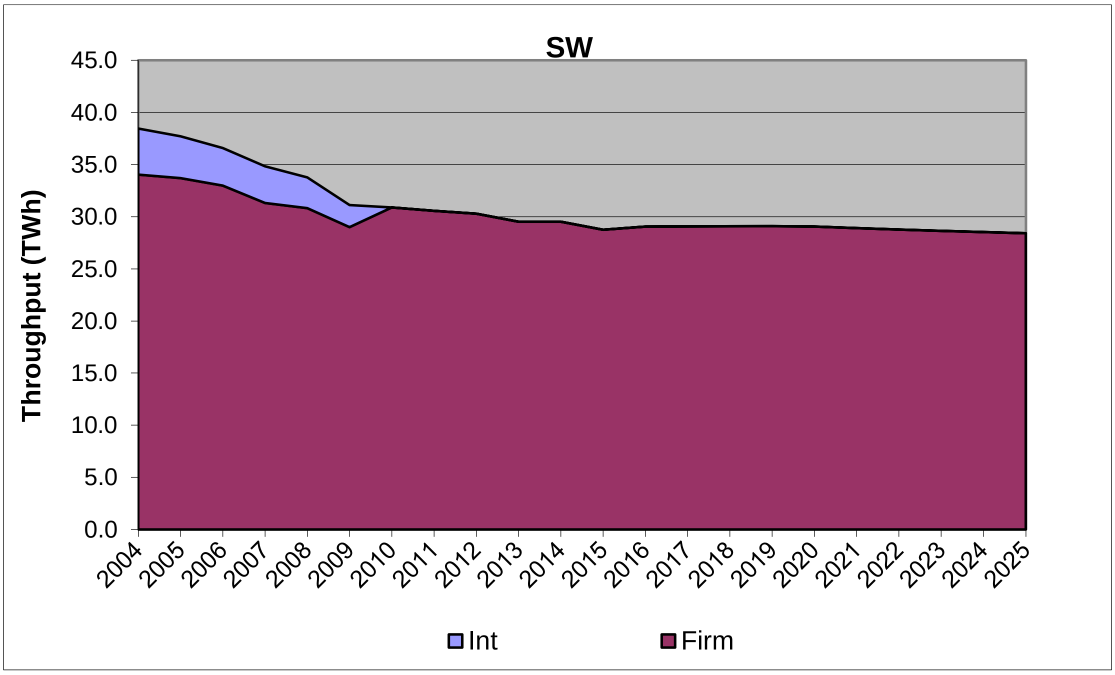


Figure 3.4 Historical and Forecast Annual Gas Demand for Wales South LDZ

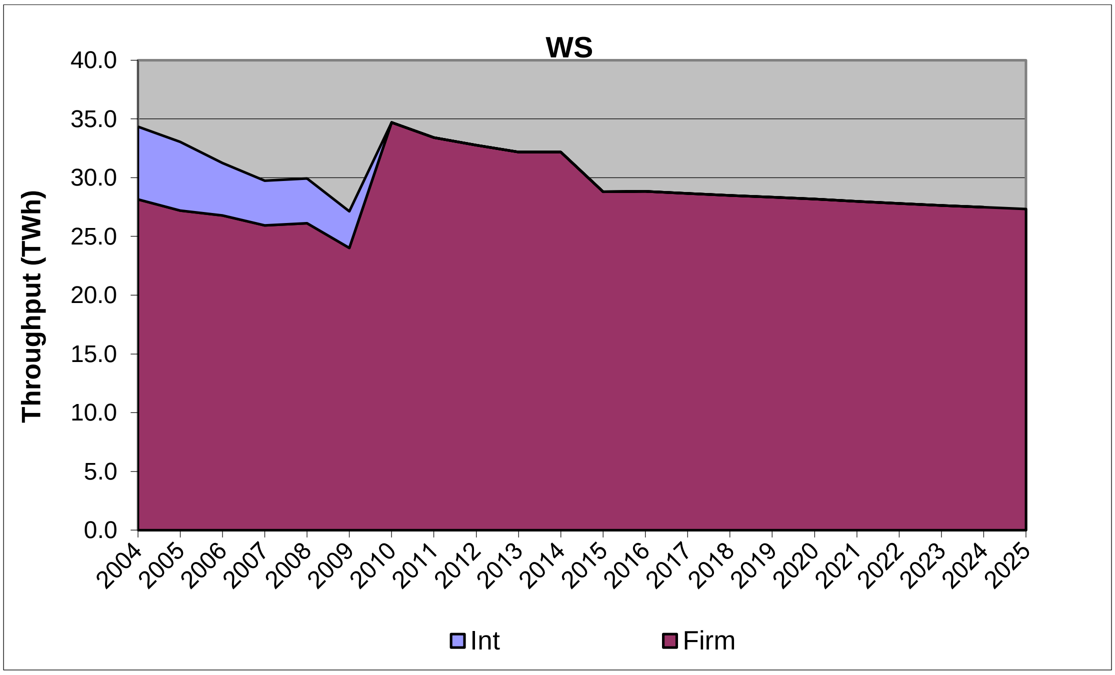


Figure 3.5 Historical and Forecast Annual Gas Demand for Wales North LDZ

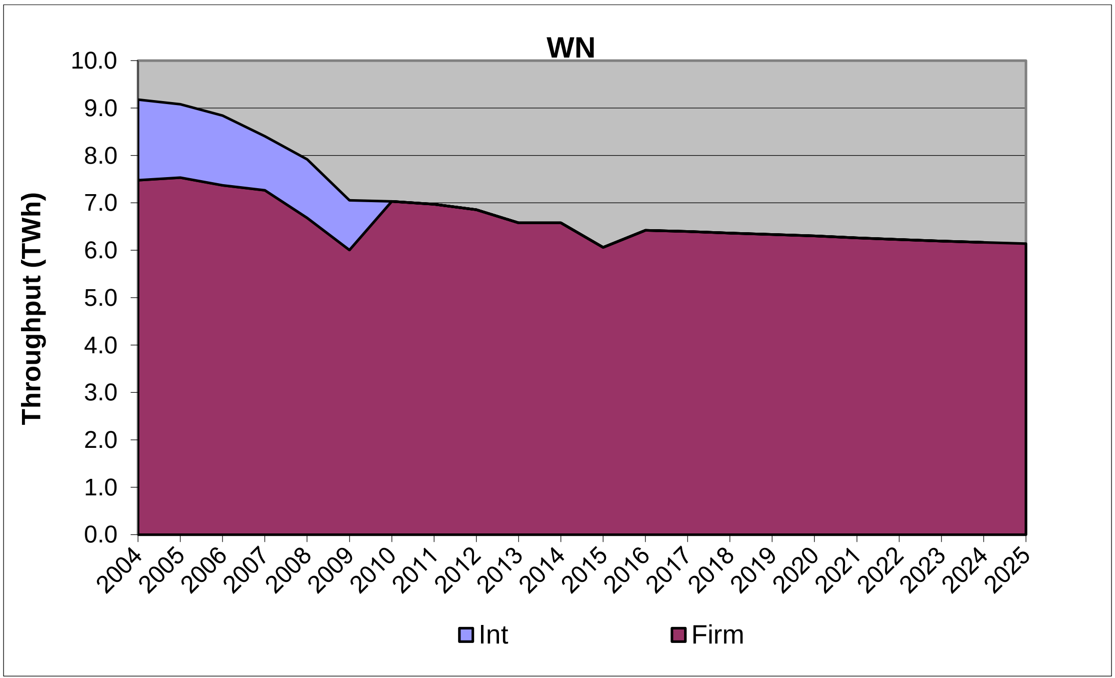
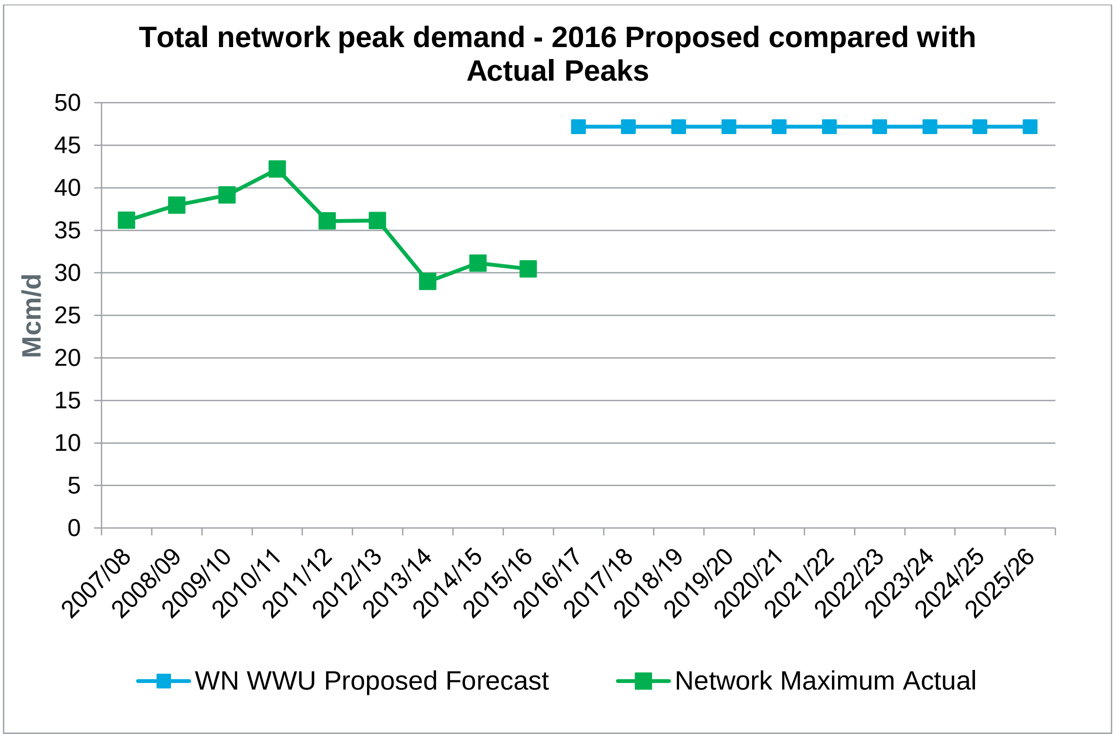


Figure 3.6: Forecast Peak Day Demand – 2013 Proposed compared to Actual (non-weather corrected) Maximum Demand

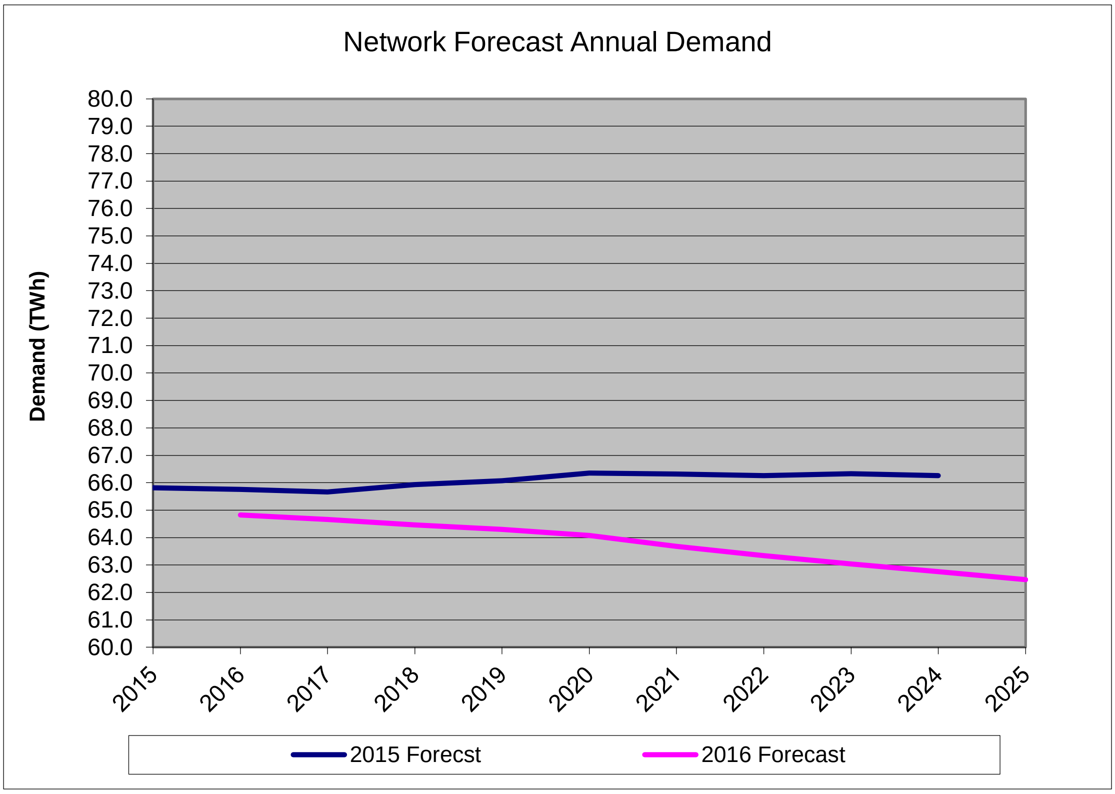


Information on the demand forecasting process is available in Appendix 1.

3.3 Forecast Comparisons

The following chart shows the comparison of the 2015 and 2016 Annual forecasts and, as our peak forecasts haven't changed, the 2016 Forecasted Peak Day. These highlight the impact of the various assumptions on the different types of demand (Annual and Peak).

Figure 3.8: A Comparison of Total DN Annual Demand Forecasts



Whilst modelled forecasts for 2016 are 64.82 TWh, we are currently expecting 63.88 TWh for 2016. This compares to 2015: 60.7 TWh, 2014: 57.8 TWh and 2013: 67.6 TWh.

The main cause for these differences is down to how the Large Industrial demands operate in comparison to their forecasted bookings.

Figure 3.9: Peak Demand Forecasts for WWU

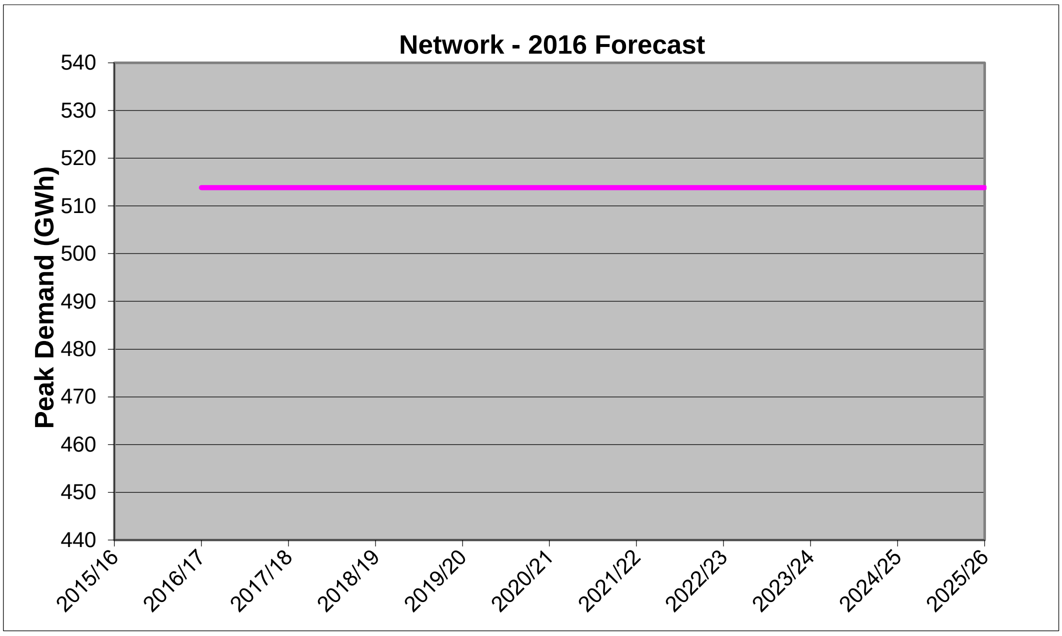


Figure 3.10: Peak Demand Forecasts for South West LDZ

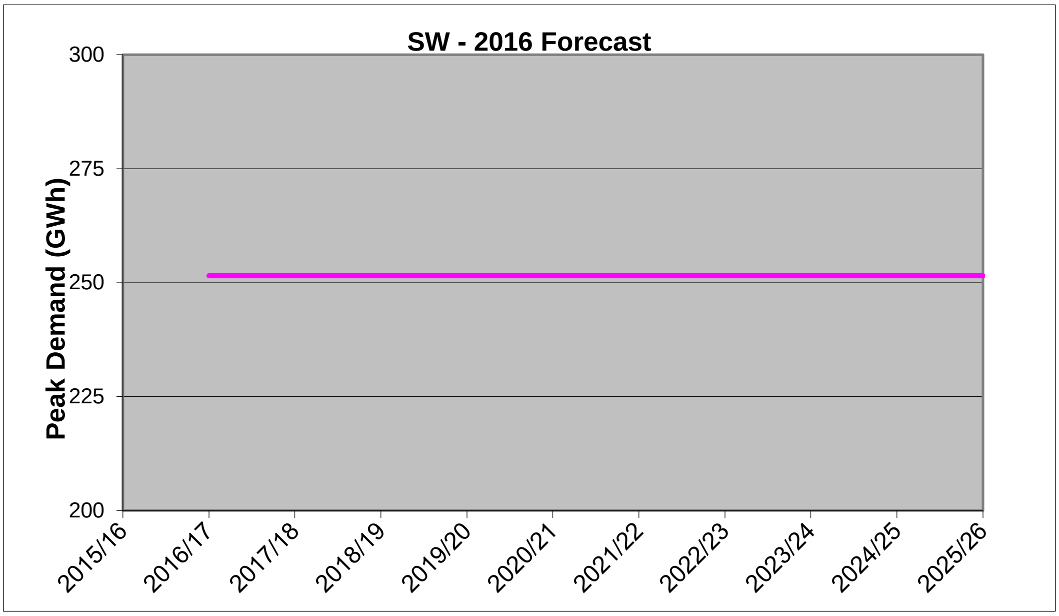


Figure 3.11: Peak Demand Forecasts for Wales South LDZ

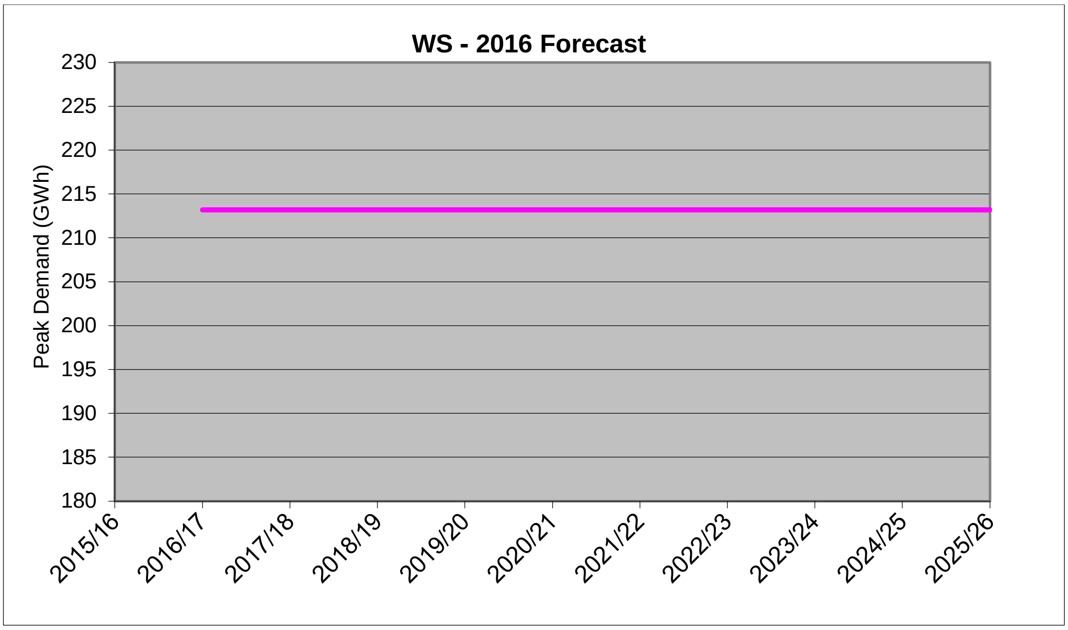
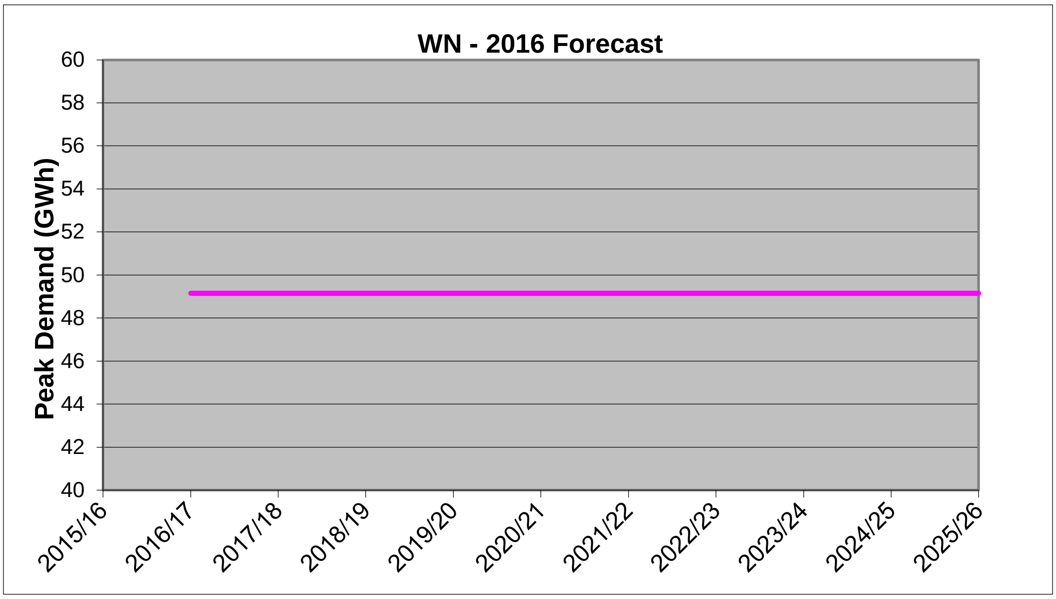


Figure 3.12: Peak Demand Forecasts for Wales North LDZ



*Please note that the Peak Day Forecasted volumes shown in energy in the above graphs have not changed since last year's forecast.

4 Supply

4.1 Overview

We develop the local transmission and distribution systems to meet the requirements of the demand forecasts. In turn, National Grid Transmission (NGT) will develop the national system in line with supply and demand forecasts and this will be detailed within their development statement. NG Gas Ten Year Statement

Our supply is mainly brought into the Network from the NTS via the 17 Offtake sites; in addition we have fifteen biomethane supplies. However, as these feeds are subject to the customers' requirements, we do not assume they will be flowing at peak and therefore WWU book sufficient NTS capacity to meet peak day demand requirements. The gas enters the LTS and is stored within the network of pipes in the form of "linepack" and also in High Pressure Storage Vessels.

4.2 Network Facilities

4.2.1 Avonmouth LNG

The storage site at Avonmouth which was operated by NG and fed into the South West LDZ via a Network Entry Point on the LTS closed on 30th September 2016.

The closure of this site means we no longer need to blend the boil-off gas that was being produced by this site and injected into the WWU LTS network.

4.2.2 Bio Methane Sites

WWU currently have 15 biomethane plants connected to the network; however studies have shown that DN Entry could increase significantly out to 2030. If this is the case, significant network redesign may be needed to facilitate and support these connections.

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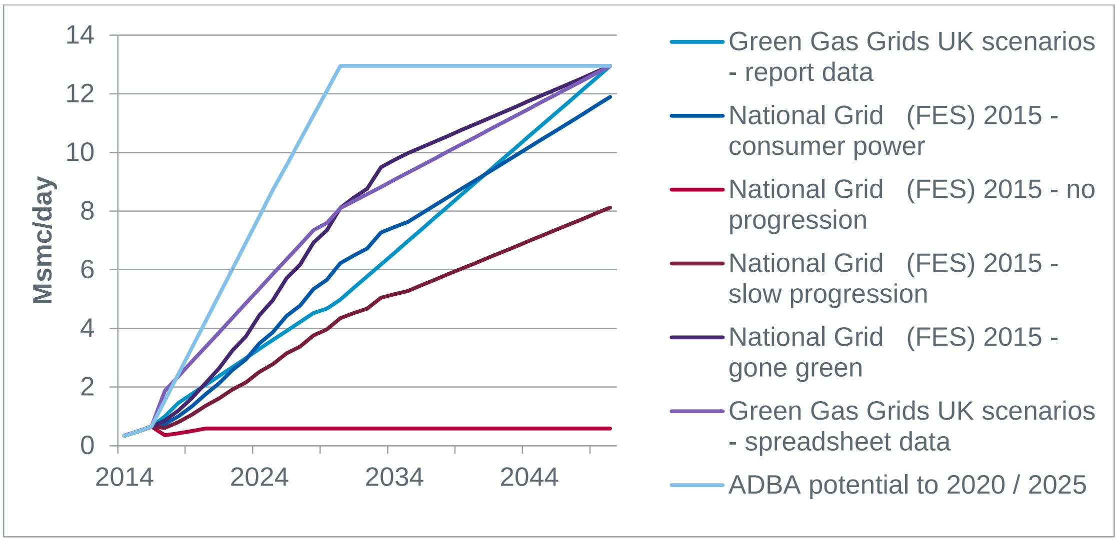
Projected annual biomethane production profiles vary between different national energy scenarios, depending on the policy measures which are assumed to be in place. Scenarios for 2030 vary from a "failure" or no increase scenario (production of 0.6 mcm/d), to the highest prediction of 13 mcm/d, which is equivalent to over a thousand "Biomethane to Grid" plants with a production rate of 500 standard cubic meters per hour (scmh).

Figure 4.1 shows a range of scenarios for future biomethane production, based on existing literature. The first five scenarios were generated by extrapolation and interpolation of data from two reports: Green Gas Grids (EU project) UK roadmap, 2014 (UK scenarios, report data and spreadsheet data), and National Grid Future Energy Scenarios, 2015 (Consumer Power, Slow Progression and Gone Green scenarios). The final scenario was based on achieving the maximum potential for biomethane, as estimated by ADBA (Anaerobic Digestion & Bioresources Association) for 2020/2025, by 2030.

Figure 4.1 Biomethane production scenarios to 2050, in MCMD



Five of the seven scenarios predict production in 2030 to be close to 7.5 mcmd, which would be equivalent to 625 Biomethane to Grid (BtG) plants injecting at 500 scmh. The "no progression" scenario is the lowest, assuming that there will be little increase from current levels of production of around 0.6 mcmd, and the ADBA potential scenario is the highest, assuming that the maximum potential of 13 mcmd is reached by 2030.

In 2014, total gas demand was approximately equivalent to 190 mcmd of biomethane (770 TWhr/year). Assuming a relatively flat demand profile between now and 2030, biomethane

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could account for a maximum of 7% of UK gas consumption by 2030. A more likely share, based on the scenarios above, would be around 4% (based on 7.5 mcmd).

4.3 Network Supplies

Figure 4.2 provides details of the current and future capacity and flows through our Offtake sites. The forecast flows are intended to meet the forecast demand requirements detailed in Chapter 3. Appendix 3 provides details of the annual flows during the 2015 calendar year.

Figure 4.2 WWU Offtakes

Subsystem Name	Offtake Location			Capacity
		kscm/h	mcm/d	
	LDZ:- SW			
Northern	Wiltshire (1)	122.08	2.92	1.76
	Gloucestershire (1)	115.83	7.20	3.71
	Bristol (1)	243	1.08	0.71
Central	Bristol (2)	150	0.96	0.44
	Somerset	175	2.93	2.52
Southern	Exeter (1)	62.5	0.91	0.51
	Plymouth	300	2.78	2.04
Other	Exeter (2)	121.67	4.20	2.78
	Gloucestershire (2)	45	1.50	1.29
Pressure Controlled	Devon	40	0.51	0.21
	Herefordshire	25	3.60	2.08
	Wiltshire (2)	21.29	0.60	0.37
	Worcestershire	37.92	5.83	4.69
	LDZ:- WS			
South Wales	Cardiff	434.04	10.42	8.69
	Swansea	235	5.64	3.69
	Newport	316	7.58	7.17
	LDZ:- WN			
North Wales	Wrexham	250	6.00	4.5

4.4 Security of Supply

We invest to ensure that the security of the Network's supply is maintained in line with the obligations detailed in our Licence to Operate. Our investment programme, discussed in Chapter 5 details a number of projects that have been identified to ensure that the security of supply is not compromised.

5 Investment in the Distribution Network

5.1 Distribution Network

We manage the operation and maintenance of the LTS and below 7 Bar DN in three LDZs:

- SW
- WS
- WN

We will continue to develop and invest in our DN in order to operate a safe and efficient network and to meet customers' requirements for any growth that is forecast.

We are certificated to asset management standard ISO55001 and we plan investment in line with the principles of the standard. At the highest level these are:

- Identification of performance requirements of physical assets using stakeholder analysis (including growth)
- Identify any risks that assets will cease to meet the required performance
- Put actions in place to address any change in requirements or close identified gaps.

5.2 Local Transmission System Development Plan

The LTS is designed for transmission and storage on the basis of ensuring security of supply at 1 in 20 peak day conditions. The system is developed, based on supply and demand forecasts, to ensure that this capability is maintained.

In order to better understand the reliability and condition of our assets and to understand how this will change over time with different investment scenarios, we have utilised Condition Based Risk Management (CBRM) models to date. These decision support tools assist us with planning, justifying and targeting future investment to maintain the current high level of safety and reliability of the gas supply network and cover pressure reduction installations (PRIs) and pipelines.

We are currently developing monetised risk models which give a more sophisticated approach to assessing the risk of assets and inform intervention plans to manage that risk.

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5.3 Below 7 Bar System

The below 7 Bar distribution system is constrained to operate between levels of pressure defined by statute, regulation and safe working practices. It is 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 can be experienced in a network under cold winter conditions.

Due to the increase in biomethane and below 7 Bar connected power generation “peaking” plants, we have started analysing the impact of these loads by creating below 7bar models that are analysed transiently. This in depth analysis could have a significant impact on this part of the network.

We will continue to invest in capital for reinforcement and new connections consistent with the peak day demand forecast in this document. We will continue to invest in the replacement of our transportation network assets, primarily for the renewal of mains and services within our Distribution System. This includes expenditure associated with the three tier approach initiated by the HSE for metallic mains replacement under the 30:30 programme. This is our 30-year gas mains replacement programme (from 2000) requires all iron mains within 30 metres of a building to be replaced. From 2013 to 2021 we will replace around 3,360km of metallic gas mains, at an annual cost of £70 million.

In the coming years further non-demand driven investment may be required as we start to investigate other requirements such as hydrogen injection, blending services and compression.

Following a review for the requirement of local gas storage provided by Low Pressure Gas Holders to satisfy daily peaks in demand, all of our holders have been retired from service.

Our programme of holder demolition funded in RIIO-GD1 is near completion, and the remaining holder demolition will be funded in the next price control period. In some instances the works include environmental remediation and disposal of land.

5.4 Condition Based Capex

We own, operate and maintain almost 4,000 above ground installations, over 35,000 kilometres of pipeline and supply over 2.5 million customers. Our asset policy is to balance the needs of supplying our customers and ensuring both public and employee safety are not compromised whilst minimising environmental impact and public nuisance.

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The technical asset life varies across the whole range of our asset base. These are only a guide with the key drivers being: Condition, Serviceability, Security, Obsolescence, Legislation and Safety.

5.5 Project List

The table in Figure 5.3 details the projects planned for our network for the current price control period.

Figure 5.1 Planned Projects for 2017 – 2024

Project Type	Workload Volume
2017	
LTS Sleeves	2
LTS Pipeline - Condition/Remedial Work - Proactive	148
LTS Pipeline - Condition/Remedial Work - Reactive	65
HP Storage	1
LTS Diversions	4
Offtake & PRI - E & I Work - Proactive	34
Offtake & PRI - E & I Work - Reactive	0
Offtake & PRI - CPNI	3
Offtake & PRI - Security	3
Offtake & PRI - Mechanical - Proactive	121
Offtake & PRI - Mechanical - Reactive	96
System Ops Work	9
2018 to 2024	
LTS Sleeves	16
LTS Pipeline - Condition/Remedial Work - Proactive	834
LTS Pipeline - Condition/Remedial Work - Reactive	675
HP Storage	42
LTS Diversions	29
Offtake & PRI - E & I Work - Proactive	99
Offtake & PRI - E & I Work - Reactive	14
Offtake & PRI - CPNI	2
Offtake & PRI - Security	21
Offtake & PRI - Mechanical - Proactive	843
Offtake & PRI - Mechanical - Reactive	672
System Ops Work	161

*Proactive and Reactive work includes ALL types of work even down to inspections and painting etc.

This is a reflection of the current view on demands. Should future demand statements change the outlook on general growth or new large loads connect to the network then we will make necessary investments in our assets to meet the gas demand requirement.

There is a continued program of Condition based work for Pipelines and Pressure Reduction Station's (PRSs) in the network beyond 2016/17 which has been identified at a high level as listed above, with detailed scoping on going throughout the price control period.

WALES&WEST UTILITIES

Driving OUTSTANDING SERVICE

We work hard to give our customers a reliable service and peace of mind by putting their needs at the core of our business.

6 Industry Developments

6.1 Summary

The UK is now committed to legally binding environmental targets to deliver a sustainable future. We have environmental targets to achieve by 2020 and 2050. We must achieve these targets but we must also recognise the requirements to ensure security of supply within an uncertain economic climate and rising fuel poverty.

There are a number of key industry developments to note:

- The eight year price control period (RIIO GD1) began in April 2013. This includes some significant changes to networks allowances and network requirements such as:
    - Networks to engage more with stakeholders
    - Networks to be rewarded for delivery of Outputs
    - Networks to deliver innovative solutions to promote a sustainable energy sector

- From October 2012, the industry moved into the "Enduring period of Exit Reforms". There is a growing requirement to facilitate Renewable and other forms of gas into the Gas Network. The increase in renewable generation on the electricity system is leading to more variable flows at embedded Power Stations and new requests to connect Power Stations to both above 7 Bar and below 7 Bar networks.

Our network planning and work to develop industry arrangements must therefore incorporate these important developments. More information on these key developments, can be found on the Wales & West Utilities and Ofgem websites.

In addition to these three key industry developments, one should also note developments with regard to:

- Distribution Network Charges (DN Charges) and Charging Volatility
- Distribution Entry and Storage (DN Entry and Storage)

These areas are covered below in sections 6.2 and 6.3.

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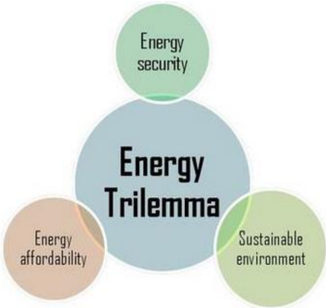
6.2 Gas as an Essential Component of Future Energy Policy



When contemplating the future of energy we have to take into account the "Energy Trilemma". The energy trilemma is the issue of how best to reach demanding low carbon targets when energy from renewable sources is either unavailable or unreliable and without requiring huge hikes in consumer energy bills.

Gas provides the following:

- A balanced solution to the energy trilemma
- Surprising new study results show gas should be an essential component of future energy policy

The surprising results of our new study in South Wales demonstrate that no current energy pathway would deliver the UK energy trilemma - the carbon reductions required at an affordable cost whilst maintaining security of energy supplies.

- The surprise essential component of the study is the beneficial role that gas can play
- The results from our energy research project carried out in Bridgend, show:
  - that gas should continue to be a key feature of future energy policy
  - gas is needed to meet peak energy demands
  - further innovation is required to help decarbonise natural gas
  - a transition away from gas for heating would add cost, carbon and put security of supply of risk
  - almost 80% of consumers have no or little money to invest in alternative energy solutions

6.2.1 The Bridgend Study

Steve Edwards (Head of Regulation) discusses the findings from the "Bridgend Study" carried out by WWU:

Steve Edwards – WWU
Director of Regulation & commercial

"Our Bridgend study results show how gas can actually be part of the answer to the transition to a low carbon energy future that won't cost the earth either.

The results of our project suggest that a balanced approach - including maintaining current levels of carbon taxation, adopting innovative gas heating appliances, and increasing the amount of green gas injected into gas networks, would result in optimum carbon reduction, and at a much more affordable cost to the consumer.

Our work also suggests that this balanced approach supports energy intensive industries. This is important as, faced with dramatically increasing levels of carbon taxation featured as part of current energy policy, manufacturing businesses are moving away from the UK, with an associated negative impact on jobs and the economy. And this isn't just theory – the steel industry in the UK has shed more than 2,000 jobs, with the industry blaming the *"…relatively high electricity prices in the UK for such energy-intensive businesses, compounded by the extra cost of climate change policies."*[1]

We are certainly not suggesting a one size fits all approach. New homes in the future will be built in a different way accommodating low carbon technologies. However in 2050, 80 per cent of our housing stock will still be houses that are already built today, and the cost of retrofitting these with the latest in low carbon technology means this is not really an affordable option.

From analysing our project results, we are suggesting that a sensible solution could be a combination of smart metering to reduce energy use; more efficient heating technologies and micro-generation boilers where gas generates electricity as well as heat - so that when we can't rely on power from renewables consumers can generate their own.

The gas industry has a part to play here too, we need to continue to maximise the opportunities to decarbonise gas. This not only includes getting more 'green gas' into the public gas networks, but also the possibility of blending other gases – such as hydrogen, with natural gas to significantly reduce emissions from gas while minimising costs for homes and businesses.

But what we are not saying is that gas is the solution for everyone. Wales & West Utilities is involved in a collaborative industry project to help customers to choose the best energy solution for them - whether that is changing from one fuel to another, or introducing the optimum energy mix to keep homes warm and bills low.

When implemented, the project will enable consumers to design a bespoke energy solution - giving people the information to make choices and to make the best decision for their homes.

One thing is clear though - it is only gas that can meet peak energy demands.

[1] Tata Steel announces 1,200 job cuts, BBC News, 20 October 2015: BBC News article

The figures are startling. Peak gas and electricity demand is around 25 times higher than existing low carbon generation can meet. And currently the UK gas network transports approximately 10 times the energy of that of the electricity network.

Gas should not be considered alongside coal and oil as a relic of a dirty fuel past. Gas and the opportunity provided by the existing network infrastructure can play a key role in future energy policy - making sure increasing energy demands are met and delivering a low carbon, value for money energy future".

6.2.2 Medium Term Outlook

In the 2020s there is an indication that increasing use of gas CHP to create heat networks will increase demand on the local gas systems. This is due to the transfer of electricity generation from national power plants to more locally produced electricity. In addition the increase of intermittent renewable generation on the electricity system is leading to more variable flows at gas fired power stations embedded within the LDZ, thus increasing capacity requirements.

6.3 The Distribution Network Charges (DN Charges) & Charging Volatility

The DNs have licence requirements to keep their Transportation Income charging methodology under review and maintain cost reflectivity. This has resulted in a number of changes to charging methodologies.

1. Rebasing of System charges to recover 95% of system related costs through capacity based charges.
2. Changing the percentage split between costs recovered through System charges and costs recovered through Customer charges to reflect our cost structure.
3. Restructured the System charges to reflect our cost structure as opposed to the previous System charges which were based on the national cost structure.
4. Implementing new charging arrangements for Shippers taking gas which has entered the Distribution network directly.
5. Changing from the current supply point charging to a single meter point charging arrangement. This was implemented in October 2015.

Following implementation of UNC Modification Proposal 186, DNs present quarterly Modification (Mod) 186 reports to Shippers at the Distribution Charging Methodology Forum (DCMF) showing future movements in Allowed Revenue and the potential price changes resulting from those movements. The reports form an important part of the DCMF to which all Shippers are invited. The Mod 186 report is published by each DN on their website as well as the Joint Office website.

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The RIIO GD1 Price Control which runs for the period 2013/14 to 2020/21 improves the predictability of transportation charges. This is because the DNs cannot recover incentives from outperforming Ofgem targets until two years after the year in which they were earned. This means that there is certainty in the incentive value included in the Allowed Revenue for price setting. Similarly, any over or under recoveries of Allowed Revenue (k) are subject to a two year lag which again ensures certainty in the k value used in Allowed Revenue for price setting.

We did respond to an Ofgem consultation seeking views on how to minimise charging volatility. In this response we suggested a number of ways in which charging volatility could be minimised. Ofgem published a final decision on this issue and this can be found on the Ofgem website.

6.4 Distribution Network Entry and Storage

WWU recognise and support the increasing interest in DN entry and storage including gas from LNG, anaerobic digesters and coal bed methane and we are currently reviewing a number of enquiries for new connections in 2017. Gas from non-fossil sources contributes to achieving the UK Government's climate change targets. In 2013 Networks introduced a change to their transportation charging methodology to better reflect the use of the System by Shippers injecting gas at DN entry points. Connections for entry and storage to the WWU network will be provided in accordance with our licence obligations and our first biomethane DN Entry site went live in 2013.

Key issues for gas entry include gas quality, odorisation, flow weighted average CV and the capacity available on the system.

Further details on current gas quality specifications can be found in appendix A5.3.1 and further information on our connections process for DN Entry is available at the following location Distributed Gas Connections Guide

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6.5 Standardisation of notice periods for offtake rate changes for NG NTS Exit Users

In order to improve efficient operation and support the changing needs of DN Customers, particularly Combined Cycle Gas Turbine (CCGT) users, we have led the development of arrangements at the NTS Offtakes and also led changes to the Uniform Network Code to assist these customers Further information is available at Joint Office Mod 407.

6.6 Gas Day Change

UNC Mod 461 was introduced to change the UNC Gas Day to align with the gas day in European Network Codes. Prior to 1st October 2015 the gas day was defined from 06:00 to 06:00. With effect of the 1st October 2015 the definition of the gas day changed to 05:00 to 05:00. We successfully implemented this change, and further information is available at Joint Office Mod 461

6.7 Project Nexus

Project Nexus is the replacement for UK Link. This system is fundamental to supporting the commercial gas regime. The implementation of this project was delayed and as such is due to be implemented by June 2017. Further information is available at Joint Office Nexus, Part of this project has seen all multi metered supply points disaggregated and reconfirmed as single meter supply points.

Designing OUR FUTURE

We invest in our people so that we all have the skills, confidence and innovative thinking to build our business long into the future. We want to be a company people aspire to work for.

7 Innovation

7.1 Innovation Summary

Lucy Mason - WWU Innovation Manager

Innovation is key for designing our business for the future, supporting the provision of a reliable gas supply whilst protecting and helping the environment and, importantly, delivering best value for money for gas consumers.

The Network Innovation Allowance (NIA) scheme, which is operated by our regulator Ofgem, is now in its third year. We committed £1.1 million to innovation in 2015/16. We are carefully investing this money in projects which provide real benefits to our customers, both now and for the future.

Our annual "Network Innovation Allowance Annual Summary" which details how we, and our innovation partners, have used the third year NIA is available on our website.

The key headlines are:

- As our 2014/15 report outlined, our innovation focus for 2015/16 was on making sure we understand the role gas could play in the energy future of the UK. In the recent past, the expectation from government and others has been that gas networks would be switched off within the next 20-30 years, to be replaced by electrified heat. However, it is becoming clear that the electrification of heat brings with it many challenges – both technical and economic. We think that the work we are doing with partners demonstrates that gas and gas distribution networks are key to a future energy supply that is affordable, secure & reliable, and environmentally sustainable.

- We took part in 33 innovation projects. Of these projects, 22 were worked on collaboratively with one or more of the other Network Licensees. We were the lead GDN on 7 of these projects.

- As well as fostering new innovation, we have worked hard to embed innovation projects from previous years into our day to day activities for the benefit of our customers and other stakeholders.

- An example of innovation that is now business as usual is the ductile iron window cutting tool. It ultimately reduces the time our customers are off gas during essential gas pipe replacement work, reducing the level of disruption experienced. This project was completed in 2014/15 and we have been training our operatives to use the tools in 2015/16.

- We continue to achieve high customer service scores as reported to Ofgem, while winning the prestigious IGEM Customer Service Award in 2016 – the sixth time in the last eight years.

- The time customers are off gas during planned work has reduced by 7% in this period.

- We retain our Institute of Customer Service Accreditation at distinction level, one of the only five companies in the UK with this honour – the only network and the only utility company.

- Winners of the RoSPA Gold Award for an unprecedented third consecutive year – recognising our excellence in managing safety and our industry leading performance.

- The first gas company in the world to achieve certification to ISO 55001, the standard for asset management.

- Winning the BITC responsible large business of the year award in 2016 – for the values that drive everything we do – including our innovation work.

Looking ahead, we plan further investment and research aligned to tackling today's challenges and developing a sustainable future.

Our core business priorities and values will remain central to our innovation strategy in the future. We continue to focus on the future role of gas to help deliver the UK's energy requirements.
Using our strong connections with academia, industry experts, housing providers and the government, we will seek opportunities during 2016/2017 to demonstrate potential solutions to the findings of our earlier research projects. We will continue to participate in projects that

will trial and demonstrate emerging technologies and seek to further understand and overcome the barriers identified in our NIA projects such as Bridgend Future Modelling. The challenges of this will be to discover how cost effective, sustainable and practical these emerging technologies can be. We have also built an energy simulator – taking into account heat, light and power demands. We have used this to assess the Cornwall Energy Island programme (a joint venture between Cornwall County Council and the Eden Project). The results of this study demonstrated that the proposed solution (to make Cornwall self-sufficient on renewable energy alone) is not economically viable. We will be working with Cornwall Energy Island to assess other potential ways of meeting Cornwall's energy needs, particularly focusing on biomethane and hydrogen.

Additionally, we plan to study the impact of climate change to our assets. We held four engagement workshops across our network in April 2016, which were attended by 107 of our stakeholders including local authorities, charities and customer groups. In table discussion groups, we explained the work we have already done so far on climate change impact mapping, in addition to our plans to build on the work to further communicate and share learning with the wider utility sector. All of the table discussion groups agreed with this planned activity, with 53% of attendees notably wanting us to do more than we propose. Taking the pilot project through to a demonstration scale testing in a live asset management environment helps to meet the expectations of our stakeholders and secure the resilience of our network in a changing climate.

It will take three years to complete and will involve a full-scale demonstration to develop climate change impact mapping for the WWU distribution geography.

Appendix 1: Process Methodology

A1.1 Introduction

Demand forecasts have been developed using the methodology defined within Uniform Network Code OAD Section H, for more information refer to Joint Office OAD Section H.

A1.2 Demand Forecasts for Wales & West Utilities planning

Models have been built for each load band that relates weather correct demand to economic variables using established Econometric techniques. For large loads local information is used where available, for example information on new loads or known future changes in demand.

Forecasts are produced for annual demand and peak day demand. Different models and techniques are used for these two purposes. The forecasts of peak day demand is a forecast of demand under extreme conditions and therefore uses statistical distributions designed to model extreme values. Peak day modelling uses the full historical weather from 1928/29 through to present. The weather data is used in conjunction with seasonal normal demand and a simulation technique to produce a 1 in 20 peak demand for each LDZ. This can then be applied to the previously forecast annual demands to produce peak daily demand across the ten-year forecast period.

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A1.3 NDM profiling and Composite Weather Variable

Demand Estimation parameters are calculated based on SNCWV. From 1st October 2015 Xoserve have published revised SNCWV for use going forward. This includes a revised shortened weather history than was previously used. We have considered the impact of these revisions in this current iteration of our Long Term Development Statement.

A1.4 Supply

NG own and maintain the NTS which supplies our network through 17 offtakes. Exit Capacity bookings at these offtakes are made by us as per the arrangements in Uniform Network Code and further information regarding the release of capacity by NTS is described at the following location; NTS Exit Zones and Exit Capacity Constraint Actions

Where available, Biomethane sites are also providing small volumes of gas. Whilst the number of sites are few and in the absence of historic data, we do not consider that these volumes can be assumed to be available at peak, with no commitment from these suppliers to provide flat capacity and as such bookings for equivalent NTS capacity are also made to ensure security of supply. However, as the number of sites increases this will be reviewed.

A1.5 LTS Planning

We use a forecast of 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.
- Constructing new pipelines or storage.
- Constructing new supplies (offtakes from the NTS), regulators and control systems.
- DN Entry when available and secure.
- Offering customer interruption via the interruption capacity auctions

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 consists of gas held in linepack and high-pressure vessels.

A1.5.1 Below 7 Bar Distribution Planning

The lower pressure tier 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 priced and programmed for completion before any potential 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.

A1.6 Investment Procedures and Project Management

All investment projects must comply with our Investment Procedures, which set out the broad principles that should be followed when evaluating high value investment or divestment projects. Governance is carried out by our Committee structure.

The investment procedures define the methodology to be followed for undertaking individual investments and cover the following stages:

- Project Planning
- Financial Appraisal
- Project Approval
- Project Monitoring
- Project Completion

Primarily the purpose of investment is to maintain the safe supply of gas to the customer. Projects are either mandatory or discretionary investments and are considered on the basis of:

i) Maintenance of security of supply,
ii) Financial & commercial impact, and
iii) Mandatory requirements such as legal or HSE obligations.

All investment proposals fully account for the technical, safety, environmental and financial aspects.

The successful management of major investment projects is central to our business objectives. Our project management strategy involves:

- Determining the level of financial commitment.
- Monitoring and controlling the progress of the project to ensure that financial and technical performance targets are achieved.
- Post Completion Reviews and Post Investment Appraisals to ensure compliance and capture lessons learnt.

Our management of 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 2: Gas Demand & Supply Volume Forecasts

A2.1 Demand

NB: Volumes are estimated using CWV derived on the EP2 basis implemented in 2016.

Figures may not sum due to rounding.

Figure A2.1 – Forecast 1 in 20 Peak Day Firm Demand (GWh per day).

LDZ	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
South West	252	252	252	252	252	252	252	252	252	252
Wales North	49	49	49	49	49	49	49	49	49	49
Wales South	213	213	213	213	213	213	213	213	213	213
Network Total	514	514	514	514	514	514	514	514	514	514

Figure A2.2 – South West LDZ Forecast Annual Demand Table – Split by Load Categories (TWh).

Calendar Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
0 - 73.2 MWh	18.53	18.52	18.54	18.55	18.53	18.39	18.26	18.15	18.03	17.92
73.2 - 732 MWh	3.04	3.04	3.04	3.04	3.04	3.03	3.03	3.03	3.03	3.02
>732 MWh	4.17	4.19	4.19	4.19	4.19	4.18	4.18	4.17	4.17	4.17
NDM Consumption	25.74	25.76	25.77	25.79	25.75	25.60	25.47	25.34	25.23	25.11
DM Firm Consumption	3.32	3.32	3.31	3.31	3.31	3.30	3.30	3.30	3.30	3.31
Total LDZ Consumption	29.06	29.07	29.09	29.10	29.06	28.91	28.77	28.65	28.53	28.41
Total Shrinkage	0.27	0.27	0.27	0.27	0.27	0.26	0.27	0.27	0.28	0.28
Total Throughput	29.32	29.35	29.36	29.36	29.33	29.17	29.04	28.92	28.81	28.69
Gas Supply Year	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Total Throughput	29.31	29.36	29.37	29.39	29.18	29.08	28.96	28.89	28.68	28.62

Figure A2.3 – South West LDZ Forecast Annual Demand Graph – Split by Load Categories (TWh).

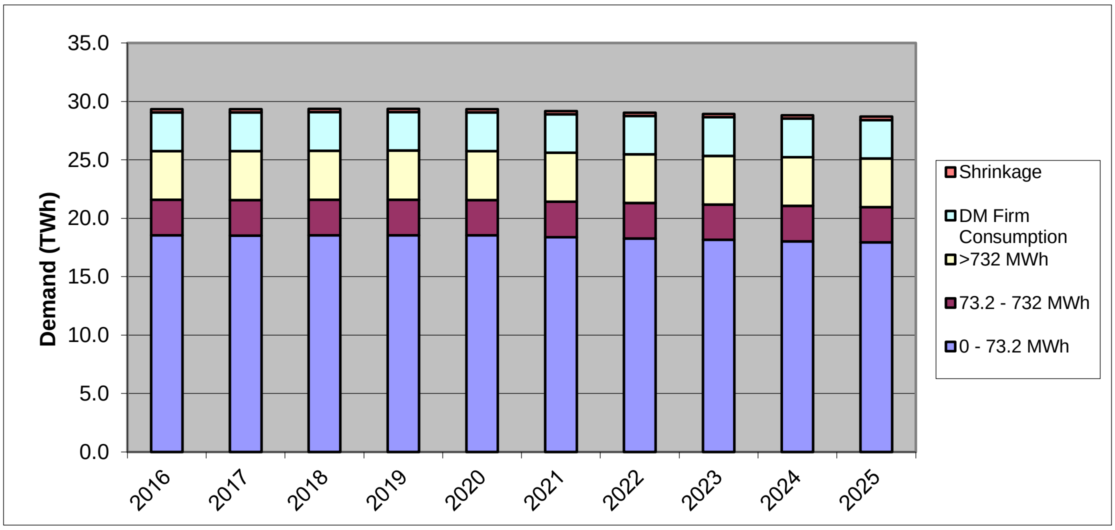

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Figure A2.4 – Wales South LDZ Forecast Annual Demand Table – Split by Load Categories (TWh).

Calendar Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
(a) 0 - 73.2 MWh	11.69	11.63	11.59	11.56	11.50	11.41	11.33	11.25	11.17	11.09
(b) 73.2 - 732 MWh	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.40	1.40	1.40
>732 MWh	2.22	2.23	2.23	2.23	2.23	2.23	2.22	2.22	2.22	2.22
NDM Consumption	15.32	15.27	15.24	15.20	15.14	15.04	14.96	14.87	14.79	14.71
DM Firm Consumption	13.52	13.38	13.25	13.14	13.03	12.94	12.84	12.76	12.69	12.62
Total LDZ Consumption	28.83	28.66	28.49	28.34	28.18	27.98	27.80	27.63	27.49	27.33
Total Shrinkage	0.17	0.19	0.19	0.19	0.19	0.18	0.19	0.21	0.22	0.22
Total Throughput	29.01	28.84	28.67	28.52	28.37	28.17	28.00	27.85	27.71	27.55
Gas Supply Year	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Total Throughput	28.68	28.42	28.17	27.94	27.62	27.39	27.16	26.98	26.72	26.54

Figure A2.5 – Wales South LDZ Forecast Annual Demand Graph – Split by Load Categories (TWh).

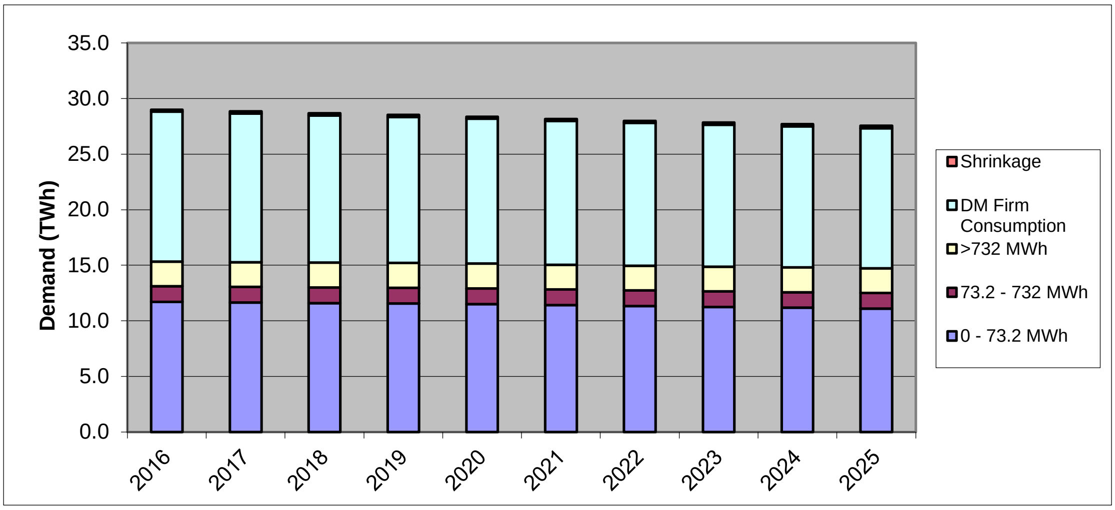
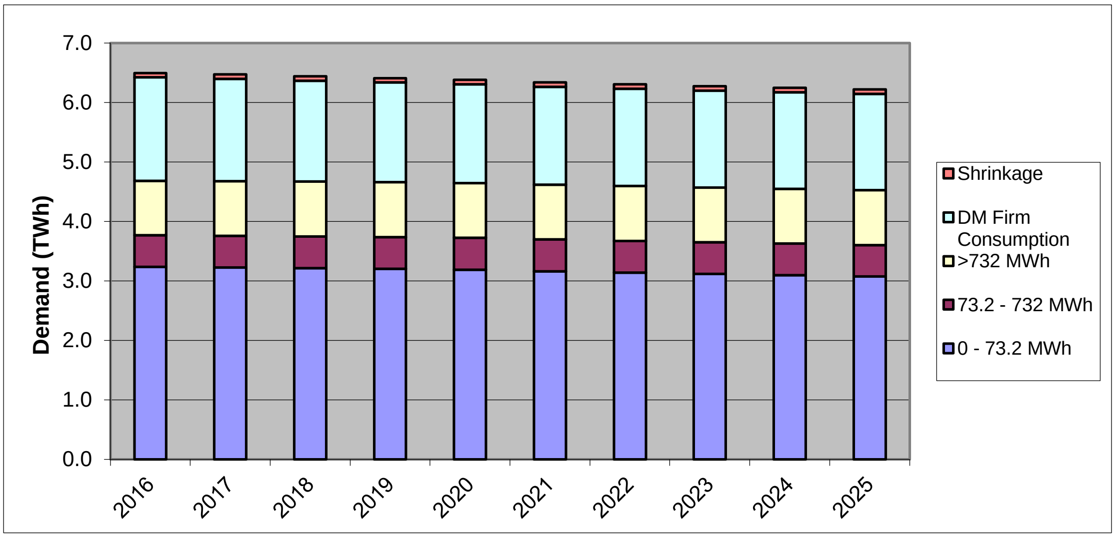


Figure A2.6 – Wales North LDZ Forecast Annual Demand Table – Split by Load Categories (TWh).

Calendar Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
(a) 0 - 73.2 MWh	3.23	3.22	3.21	3.20	3.19	3.16	3.14	3.12	3.09	3.07
(b) 73.2 - 732 MWh	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
>732 MWh	0.91	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
NDM Consumption	4.68	4.68	4.67	4.66	4.64	4.62	4.59	4.57	4.55	4.53
DM Firm Consumption	1.74	1.72	1.70	1.68	1.66	1.65	1.64	1.63	1.62	1.62
Total LDZ Consumption	6.42	6.40	6.36	6.33	6.30	6.26	6.23	6.20	6.17	6.14
Total Shrinkage	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08
Total Throughput	6.49	6.47	6.44	6.41	6.38	6.34	6.30	6.27	6.24	6.22
Gas Supply Year	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Total Throughput	6.48	6.45	6.42	6.39	6.34	6.31	6.28	6.26	6.21	6.20

Figure A2.7 – Wales North LDZ Forecast Annual Demand Graph – Split by Load Categories (TWh).



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Appendix 3: Actual Flows 2015

A3.1 Annual Flows

As forecasts are made without knowledge of what weather conditions will prevail into the future they are made at seasonal normal temperatures. In order to compare actual throughput with forecast values the impact of weather needs to be removed from the figures. This is known as weather corrected demand.

The Network Code requires a revision to seasonal normal values every five years and as such the basic seasonal normal temperatures were revised during 2015/16 and implemented on the 1st October for gas year 2016/17.

Figure A3.1 – South West LDZ Annual Demand 2015 (TWh)

	2015 Actual Demand	Weather Corrected Demand	2015 Forecast Demand
0 – 73 MWh	18.09	18.55	18.59
73 – 732 MWh	2.83	2.89	2.73
> 732 MWh Firm	7.17	7.43	7.87
Interruptible	0.00	0.00	0.00
Total Consumption	28.10	28.86	29.20
Shrinkage	0.23	0.23	0.27

Figure A3.2 – Wales South LDZ Annual Demand 2015 (TWh)

	2015 Actual Demand	Weather Corrected Demand	2015 Forecast Demand
0 – 73 MWh	3.32	3.24	3.36
73 – 732 MWh	0.51	0.51	0.49
> 732 MWh Firm	2.26	2.30	2.43
Interruptible	0.00	0.00	0.00
Total Consumption	6.09	6.05	6.27
Shrinkage	0.05	0.05	0.07

Figure A3.3 – Wales North LDZ Annual Demand 2015 (TWh)

	2015 Actual Demand	Weather Corrected Demand	2015 Forecast Demand
0 – 73 MWh	11.17	11.37	11.56
73 – 732 MWh	1.33	1.35	1.32
> 732 MWh Firm	11.08	11.25	16.96
Interruptible	0.00	0.00	0.00
Total Consumption	23.59	23.97	29.84
Shrinkage	0.12	0.12	0.17

The weather corrected demand gives the expected level of demand for 2015 had the weather been at its seasonal normal value. As can be seen in the tables above the Actual Demand in 2015 was lower than the Seasonal Normal in the Wales North and South West areas but compared to the Forecast Demand, they were all lower.

A3.2 Maximum and Peak Flows

The coldest weather occurred on 20th January 2016 for South West and South Wales and 17th January 2016 for North Wales. These days coincided with the days of maximum firm demand for the Wales South and South West. The maximum firm demand for the whole network this gas year occurred on the 20th January 2016 and was 30.31mcm.

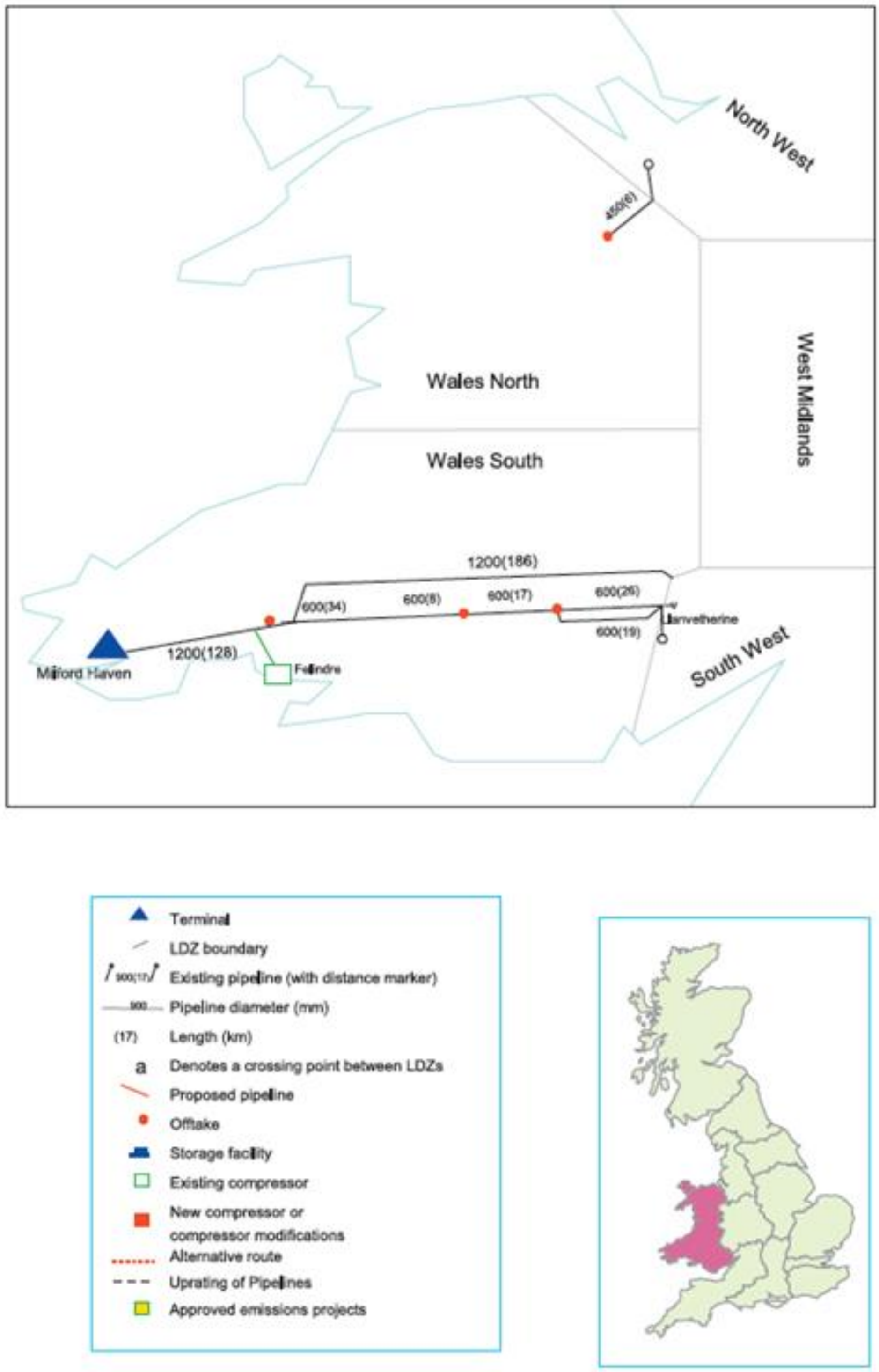
The maximum and minimum for the LDZs are shown in the following table

Figure A3.4 – LDZ Peak and Minimum Flows (mcm)

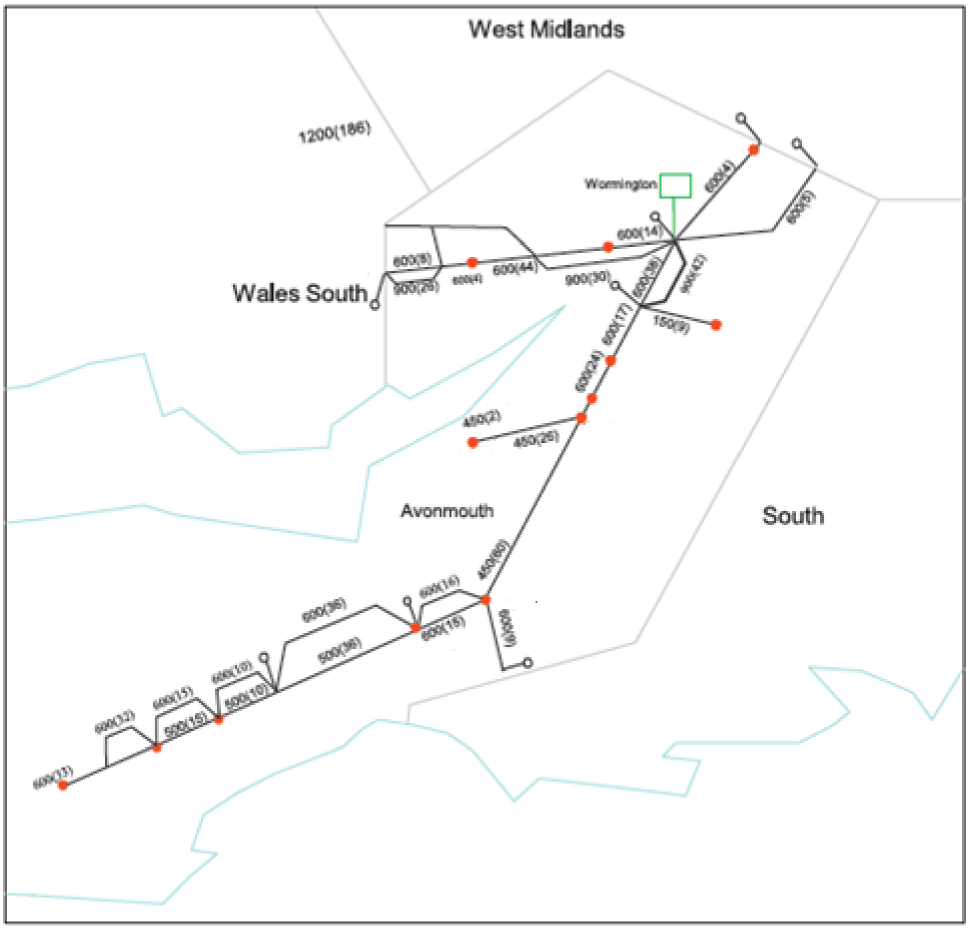
LDZ	Maximum MCM	Maximum Occurred on	Minimum MCM	Minimum occurred on	1:20 forecast peak 2014/15
WS	11.32	20/01/2016	2.59	03/09/2016	19.56
WN	2.91	21/01/2016	0.62	07/09/2016	4.50
SW	16.23	20/01/2016	2.43	23/07/2016	23.11

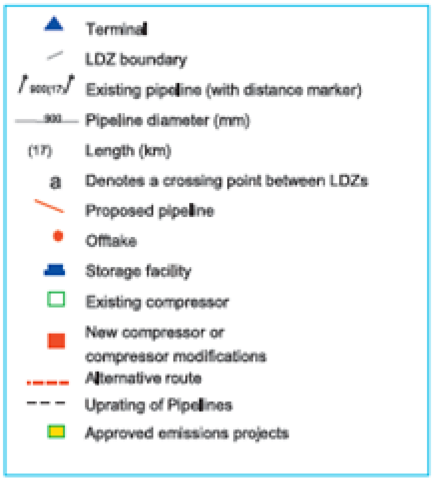
Appendix 4: The Gas Transportation System

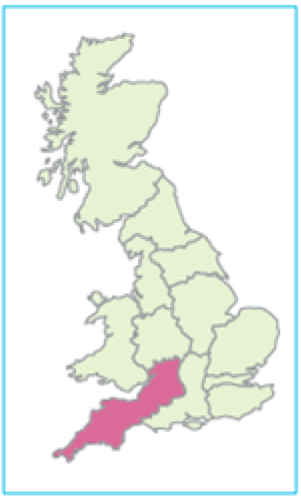
A4.1 Wales North and Wales South (WN & WS) NTS



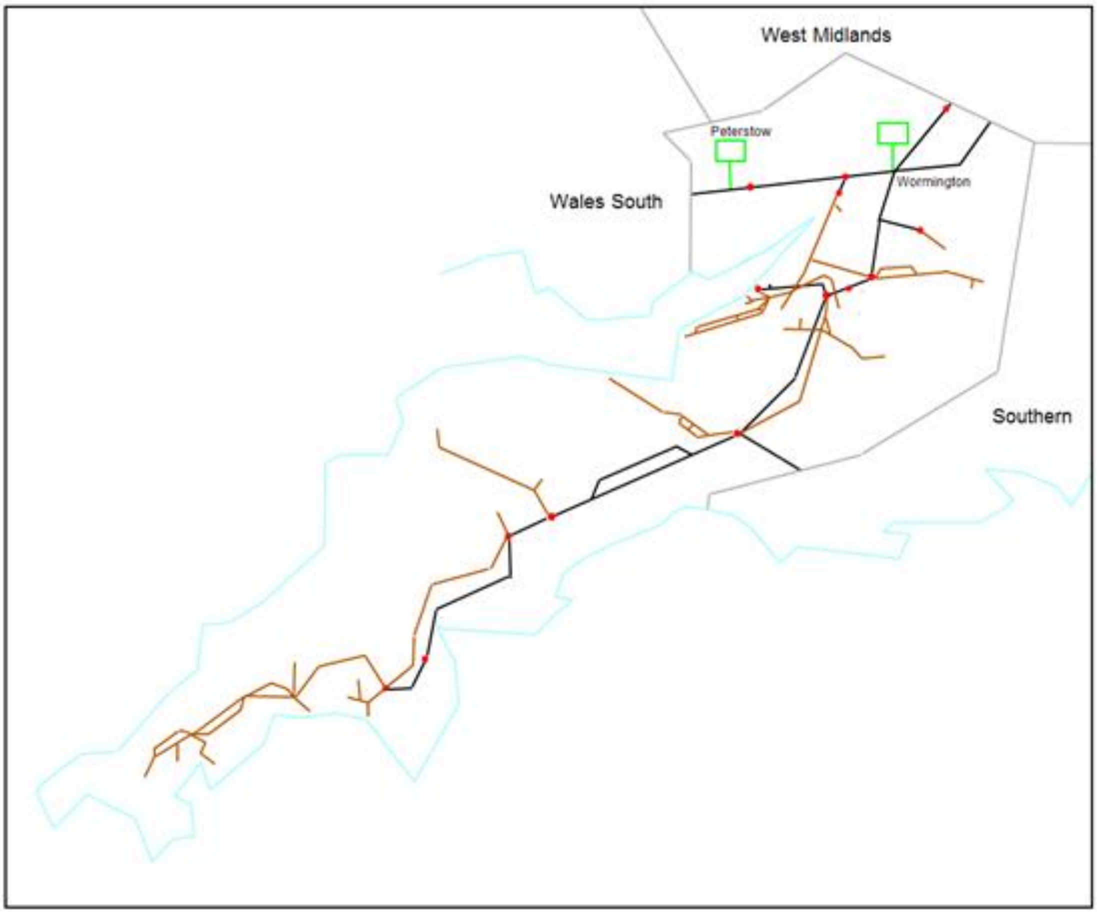
A4.2 South West (SW) NTS

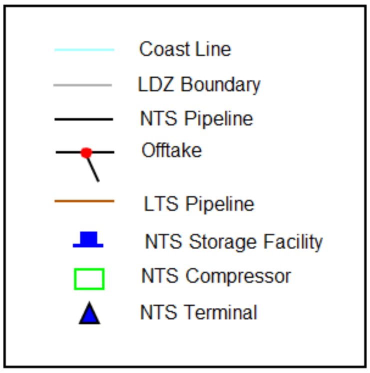






A4.3 South West (SW) LDZ - LTS





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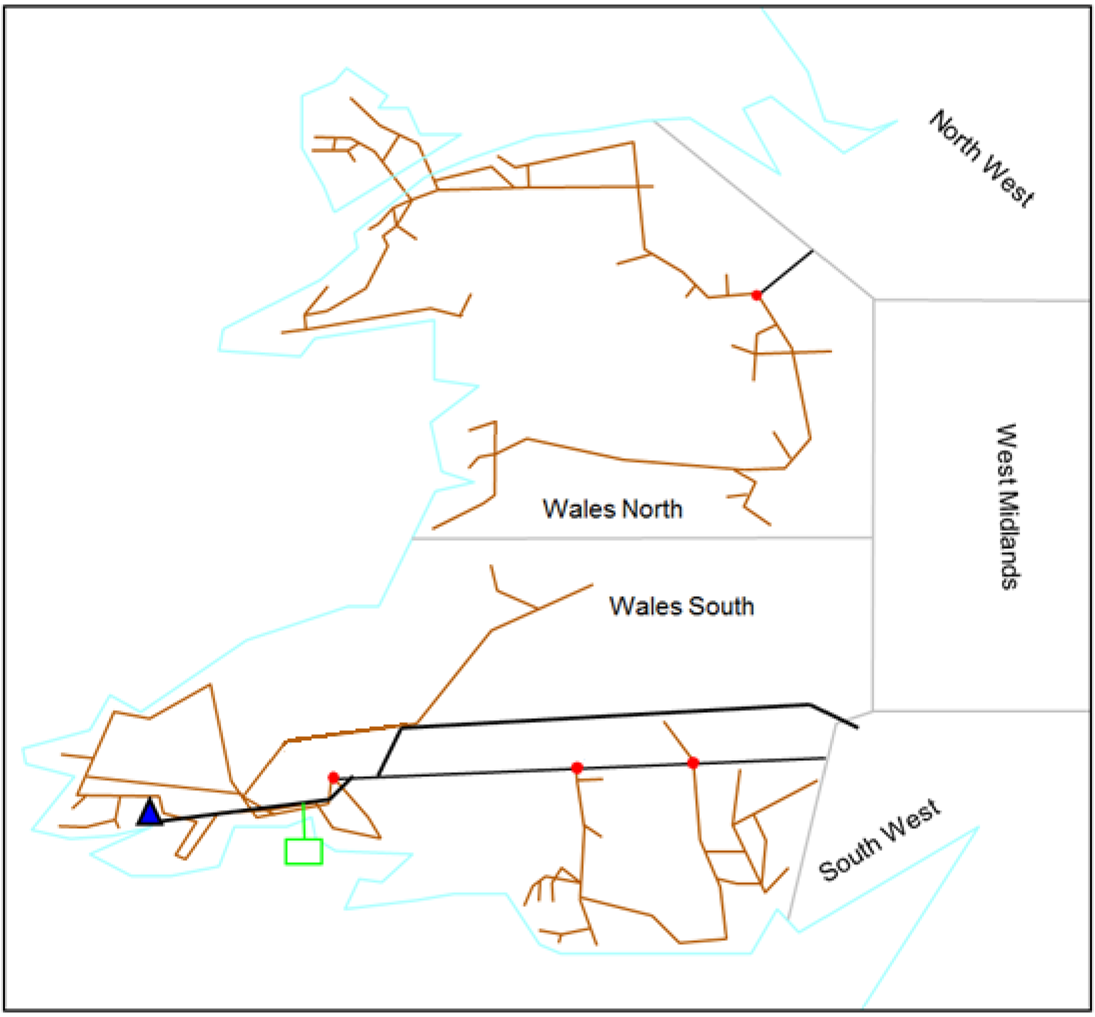
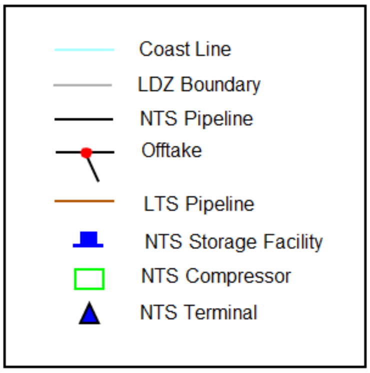
A4.4 Wales North and Wales South (WN & WS) LTS



A4.6 Code LDZ Maps



Appendix 5: Connections to WWU System

A5.1 Introduction

We offer connection services in line with our Gas Act obligations. System entry connections conditions are detailed in Section A5.3 below.

Our exit connections allow gas to be taken 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-WWU pipeline transporting gas to premises consuming more than 2,196 MWh per annum.

Please note that in addition to new pipes being termed connections, any requirement to increase the quantity of gas delivered to or taken from the system 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 – Statement of Principles and Methods to be used to determine charges for Gas Distribution Connections Services', which is supported by our Connections and Other Distribution Services Charges Document. Both documents can be downloaded from our web site (www.wwutilities.co.uk).

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.

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A5.3 Information for System Entry Connections

We require a Network Entry Agreement or Connection Agreement with the respective operator 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

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:

- Our ability to continue to meet statutory obligations (including, but not limited to, the Gas Safety (Management) Regulations 1996 (GS(M)R)).
- The implications of the proposed gas composition on system running costs.
- 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 1% (molar) - HSE has now issued a class exemption to GS(M)R to allow network conveyance of gas with an oxygen content <= 1% (molar) at pressures up to 38 barg
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). Please note that there is a proposal by NG to modify the UNC to a limit of 2.5% (as mentioned above the limit is indirectly limited by the GS(M)R)

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 Becquerels/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
18. Siloxanes
    - Tests for siloxanes and the determination of safe limits are subject to ongoing work. The limits and testing regime will be updated as industry best practice develops

Please 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.

A5.4 Additional Information Specific to System Exit Connections

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

A5.4.1 Offtake Pressures - Distribution Network Connections

Gas will normally be made available to consumers at a pressure that is compatible with a regulated metering pressure of 2 mbar. Information on the design and operating pressures of distribution pipes can be obtained by contacting us.

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 2,196 MWh 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 self-laid pipe to premises with an expected consumption of more than 2,196 MWh per annum or the connection is to a pipe in our system which is not a relevant main, these pipes do not automatically belong to 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 prior to the planning phase of any project.

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, resource 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.

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Appendix 6: Gas Transporter Licence

A6.1 Overview

Our Gas Transporter (GT) Licence arrangements include a number of incentives, which are there to incentivise the networks to focus on specific outputs valued by Stakeholders. We have an Exit Capacity Incentive which is there to encourage us to minimise our Flat Capacity bookings with the NTS. In the longer term, if we can reduce our flat capacity requirements from the NTS, the NTS may be able to avoid additional investments and therefore minimise costs to gas users.

A6.2 Distribution Network Exit Incentive

Following a robust and transparent price control review process we have been given baseline volume capacity allowances. Each October we agree with the NTS our flat capacity requirements for the gas year ahead (Oct to Sept). Each year, our booking requirements then are compared to the upfront volume allowances and if we are able to book less than the allowances we can earn additional revenues but if we have to book more than the baseline up front allowances we will have revenue deducted. The incentive is symmetrical and does not have any caps or collars. Any gains or losses are shared with gas consumers.

For further details on our incentives please refer to our Gas Transporter licence and the Ofgem website.

Appendix 7: 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. One millibar (mbar) equals 0.001 bar.

Calorific Value (CV)

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

Climate Change Levy (CCL)

Government tax on the use of energy within industry, commerce and the public sector in order to encourage energy efficient schemes and use of renewable energy sources. CCL is part of the 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.

Combined Cycle Gas Turbine (CCGT)

A Combined Cycle Gas Turbine is a unit whereby electricity is generated by a gas powered turbine and also a second turbine. The hot exhaust gases expelled from the first turbine are fed into the heat exchanger to generate steam, which powers the second turbine.

Combined Heat and Power (CHP)

The simultaneous generation of electricity and heat for use within buildings or processes, by recovery of the heat produced in the power generation process.

Connected System Exit Point (CSEP)

This is 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 or Independent Distribution Network (iDN)

An independent gas transporter responsible for the operation and maintenance of the LTS and <7barg DNs within a defined geographical boundary.

Distribution System

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

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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 bullets and gasholders, or in the form of Linepack within transmission, i.e. >7barg, pipeline systems.

Exit Zone

A geographical area (within an LDZ) that consists of one or more Offtakes that, on a peak day, receive gas from the same NTS pipeline.

Formula Year

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

Gas Holder

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

Gas Transporter (GT)

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

Gas Supply Year

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

Interconnector

A pipeline transporting gas to another country. The Irish interconnector transports gas across the Irish Sea to both the Republic of Ireland and Northern Ireland. The Continental Interconnector transports gas between Bacton and Zeebrugge. The Continental Interconnector is capable of flowing gas in either direction.

Interruptible Service

A service where the transporter can interrupt the flow of gas to the supply point in return for lower transportation charges.

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 stored within the National or Local Transmission System at any time.

Liquefied Natural Gas (LNG)

Gas stored in liquid form.

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 from the NTS. Consists of LTS and distribution system pipelines.

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Local Transmission System (LTS)

A pipeline system operating at >7barg that transports gas from 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, pipeline systems and offtakes. Designed to operate at pressures up to 85 bar. NTS pipelines transport gas from terminals to 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. WWU provide odorisation at Offtakes.

Office of Gas and Electricity Markets (Ofgem)

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

Offtake

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

Own Use Gas (OUG)

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

Price Control Review (PCR)

Ofgem's periodic review of our allowed returns, the current PCR runs for the period 2013/14 to 2020/21

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.

Shipper or Uniform 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)

NG's annual industry-wide consultation process encompassing their 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 (Flow Weighted Average CV cap is set at 1 MJ/m^3 above the lowest CV).

UKCS

United Kingdom Continental Shelf

Uniform Network Code (UNC)

The document that defines the arrangements between WWU, NG, the other DNs and System Users.

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Appendix 8: 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.

Note

All volume to energy conversions assumes a CV of 39 MJ/m^3.

To: Multiply	**GWh**	**mcm**	**Million therms**	**Thousand toe**
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

All conversions are to 3 decimal places and therefore may not include the full conversion factor.

GWh = GigaWatt Hours

mcm = Million Cubic Metres

Thousand toe = Thousand Tonne of Oil Equivalent

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