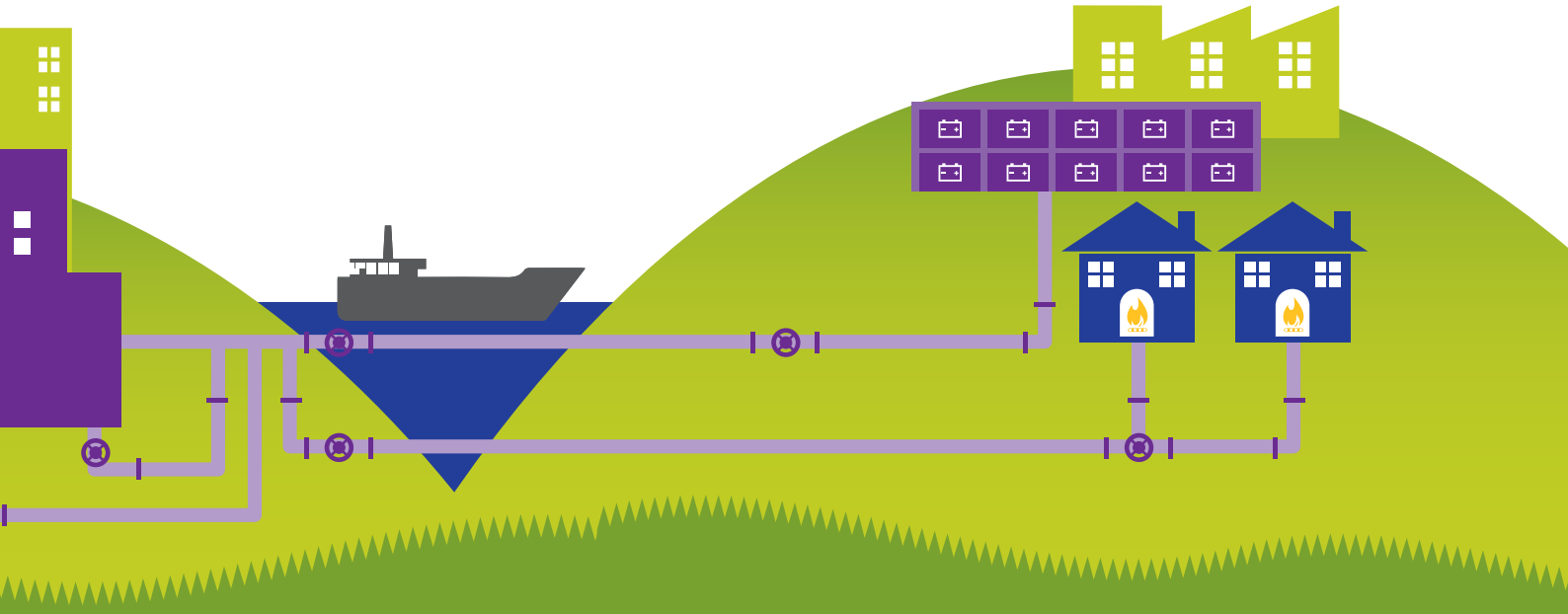


# Long Term Development Plan 2015

National Grid Gas Distribution



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# Foreword

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## Managing the gas network is a long-term business and we must continue to find better ways to provide the right services to our customers, at the right price.

The RIIO regulatory regime is now well established and will run until 2021. RIIO provides Revenue based on Incentives, Innovation and Outputs, which are in turn aligned with our customers' and stakeholders' requirements.

This document is part of our planning for the years to come. We have assessed future demand under a range of different scenarios, to inform anyone considering connecting to our system or working with us to transport gas. It is designed to be the start of a conversation.

Energy remains the focus of much public and political debate. The complex policy framework needed to meet conflicting requirements of security of supply, affordability and emissions reductions remains under close scrutiny. Our network transports gas energy to more than ten million UK customers – putting us at the heart of the solution to these challenges. We face some tough decisions ahead: all the more reason to start planning now for the years to come.

While developing the gas network of the future, we invest to safely and efficiently operate and improve today's network.

We plan to invest approximately £3.8bn in our assets during the RIIO period. This includes investment in network reinforcements and new connections for industrial, commercial and domestic customers. For example, we are seeing substantial activity in connecting new sources of gas to the grid, particularly for bio-methane sites. A new section in this plan focuses on the potential future of gas and it shows how new sources of renewable gas, using the network for HGV transport, could help deliver the UK's carbon reduction targets more cheaply for customers.

Innovation is about doing something different to benefit our customers and the environment. We have a good track record of introducing new technology and approaches into our business. We depend on two things to make this happen: helping our people to be creative and try new things, and successfully taking advantage of innovative solutions from our partners, suppliers and customers.

I hope you find our Long Term Development Plan (LTDP) both interesting and informative. We'd like your views on the plan, including ideas for improvement, via the [Feedback Form](#) on the National Grid website.

**David Parkin**  
**Director, Network Strategy**  
**Gas Distribution**  
**National Grid**

# Stakeholder engagement

We need our stakeholders to help us shape the services we provide, and the way we maintain and develop our network now and in the future. To do this, we need your views. We welcome your feedback at any time throughout the year.

We also hold an annual three-month consultation called “Have Your Say” during November to January. This is an opportunity for you to tell us what you think about how we engage and our service, as well as what you’d like us to focus on in the coming year.

Once we have received our stakeholders’ views, in April we publish a summary of the feedback in a document called “Committing to You”. This includes new commitments from us in response to the feedback. We will work with stakeholders to deliver on our commitments and update you in our annual progress report “Acting on Your Ideas”.

We received more than 130 responses to our 2014 formal three-month Have Your Say consultation. Our stakeholders told us how we were doing and what we should focus on. We responded with ten new commitments in April 2015 in Committing to You. We will soon report on how we are delivering on these commitments, and we’ve highlighted four of those that are relevant to this Long Term Development Plan.

You can read all our stakeholder engagement documents on our Talking Networks website. Register to get automatic updates, news and information about our consultations and new commitments. Continual feedback from our stakeholders helps us plan and improve. So please get in touch with us; your views can make a difference to the services we provide and what we focus on.

**We consult with you each year to understand your priorities and how we can improve our service. We make commitments and share our promises for the year. Following this, we let you know how we are acting on your feedback.**



How we’re acting on your feedback



Tell us how we can improve our services



We share our promises for the year

Our ten new commitments for 2015/16

We will keep our communities safe and warm

**1. We will continue to develop partnerships to raise awareness of the dangers of CO to help change our customers’ behaviour.**

**2. We will innovate to provide additional services to our vulnerable and fuel-poor customers.**

**3. We will work more closely with local and highway authorities to undertake our works safely, improve planning and coordination and deliver innovative solutions to minimise disruption.**

We are easy to do business with

**4. We will work with our stakeholders to review our asset data service to identify improvement.**

**5. We will continue to help shape industry change, working collaboratively to simplify processes that deliver positive outcomes for our customers.**

**6. We will work with our customers to review the service we provide for our non-standard works, for example diversions.**

**7. We will improve our communication and access channels.**

We are developing a future network to connect you to your energy

**8. We will continue to improve the bio-methane process and innovate for new uses and gas sources.**

**9. Through our people and our networks we will help shape the transition to a low-carbon future.**

We are delivering value for money

**10. We will continue to share our RIIO performance annually with our stakeholders and operate a safe, reliable and efficient network.**

# Background

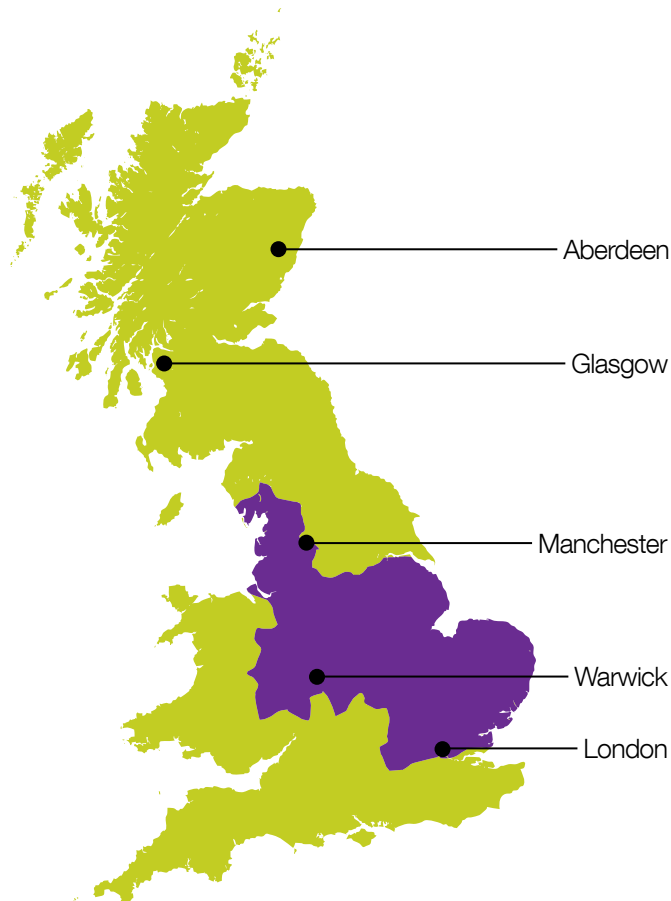
## This document outlines our assessment of future demand for National Grid Gas Distribution.

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

Most of our supply is from the National Transmission System. This environment changes as the industry develops renewable arrangements that will facilitate greener and sustainable energy supplies.

We look at supply and demand needs, what's important to our stakeholders and how our customers want to use our system when we decide how to invest in our networks.

This document contains essential information on our planning processes, including demand forecasting, system reinforcement projects and associated investment, as well as actual demands for the previous year. The main document provides an overview of the issues, with additional information provided in the appendix.



Gas Distribution UK system

## Demand overview

The latest peak demand forecast reduces by around 0.9% per year on average, over ten years. All forecasts are based on annual demands, which are then converted into peak demands, established through analysis of historical behaviour. As last year's relationship was the same, we've used it again this year.

## Investment implications

The indicative investment implications will be around £73.8m per year over the rest of the RIIO period, 2014/15 to 2020/21. This average annual spend reflects the RIIO-GD1 Final Proposals agreed with Ofgem in February 2013, and it is based on 2009/10 prices, however it does not include replacement-related expenditure.

Even though overall demand is going down, we must still invest to add exit capacity. This is because of possible local constraints within the networks due to Local Authority Strategic Development proposals that allow new developments. Other factors can include the dynamic nature of existing loads, as well as industries and customers migrating and changing within our networks.

We may also need to invest to help connect new sources of gas, including renewable gas, and to address shallow cover due to soil erosion on our LTS pipelines. However, our current plan does not include this investment.

## Your feedback

The 2015 planning cycle culminates in the Long Term Development Plan. The plan is based on UK Transmission demand scenario data from the 2015 Future Energy Scenarios (FES) consultation.

The Long Term Development Plan has been developed using demand scenarios produced by UK Gas Transmission, supported by feedback from their industry-wide consultation process, National Grid's UK Future Energy Scenarios.

We want this plan to deliver what's important to you so please contact us by:

- taking part in our annual consultation 'Have Your Say'
- providing feedback via our feedback form
- post to:

Colum Goodchild  
Asset Strategy & Investment Manager  
Networks Strategy, Gas Distribution  
Hinckley  
Leicestershire  
LE10 0NA

- Alternatively you can email [admin.netstrat.ukd@nationalgrid.com](mailto:admin.netstrat.ukd@nationalgrid.com)

# The future of gas

Before we look at our ten-year forecast for supply and demand, we want to highlight some of our key focus areas and long-term network development plans.



## Energy trilemma

To meet the UK's carbon reduction targets, we need to reduce carbon emissions and provide low cost energy. This is particularly important now, with the current focus on customers who might find themselves in fuel poverty. When we combine this with the nationally important need for secure energy, we have a set of competing demands that are highly complex to reconcile. (See diagram on opposite page).

We're convinced that gas distribution networks will continue to help meet the UK carbon reduction targets. This can be done at a lower cost to consumers than alternative ways, while maintaining a secure supply. We believe the best way to keep our supply secure is to have a variety of energy sources and technologies rather than rely on either unreliable renewables such as solar and wind, or a single electricity infrastructure to provide all our energy needs.

Supply, demand, heat and transport are all being considered in an effort to decarbonise the UK to meet the energy reduction target. You can read here about our thoughts and industry developments on this topic. We expect some of these developments to appear in our demand and supply forecasts

during the RIIO-GD1 price control period. These factors will also influence our investment plans in the next regulatory review period. For now, we are highlighting the possibilities in this area and we will discuss some of them with stakeholders and the industry as they start to feed into our long-term development plan.

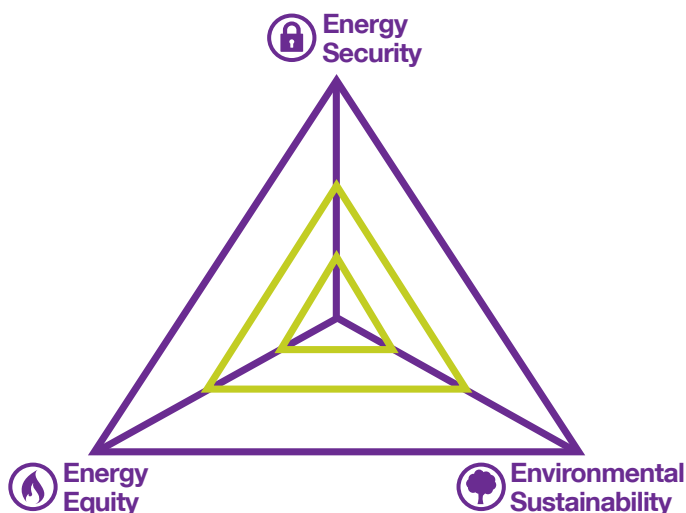
## Energy supply

Renewable gas can help decarbonisation domestic heating. We believe renewable gas could meet as much as 40 to 50% (circa 100TWh) of domestic demand by 2050. This is achievable with continued support for government incentives such as the Renewable Heat Incentive. The government will also have to be clear that gas will play an important role in the energy mix. This will give investors the confidence to invest long term.

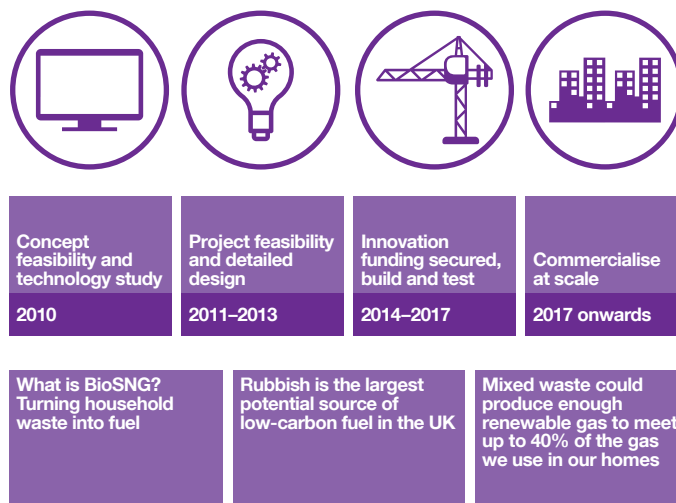
## Bio-methane connections

There have been more renewable gas-to-grid connections over the last two years; last year we successfully connected ten bio-methane projects providing heat to over 15,000 customers. Eight more are planned for 2015 and beyond and we are committed to delivering at least eighty projects by 2020.

<sup>1</sup> Feedstock is any renewable biological material that can be used directly or converted to produce a form of energy.



The Energy Trilemma [www.worldenergy.org](http://www.worldenergy.org)



The BioSNG project is in the test phase

Since our first connection in 2013, we have asked for customer feedback to help improve our processes and commercial frameworks. This helps us make the connections that will reduce our reliance on the transmission system for gas supply to our customers.

We have worked with our customers on a system to house both National Grid's and the customer's equipment in a single box. The first was installed in June with food waste feedstock<sup>1</sup>. This is more cost effective for the customer and uses less land, which should make it more feasible to connect other sources of renewable gas to our networks.

In November 2014 we connected our first project to the high pressure network using suitably qualified contractors to lay the pipeline and connect to our Local Transmission System (LTS). This has boosted competition in the connections market. We trialled new engineering solutions this year to connect the first biogas facility in the country to the gas network. We used a reinforced thermo plastic pipe operating at 19barg. These developments will help reduce costs, which will support renewable gas connections to the grid.

Uncertainty about funding of the RHI (Renewable Heating Incentive) is an ongoing challenge. There must be continued investment in renewables and low carbon heat in the UK so the sector can develop. In turn we will work hard to reduce costs through improvement and innovation.

## Renewable gas through gasification (BioSNG)

We will need large-scale production of renewable gas if it's to deliver as much as 40 to 50% of our domestic demand.

To help achieve this vision, National Grid, Wales and the West Utilities and their partners, Advanced Plasma Power, Progressive Energy and Carbotech, secured build funding from both Ofgem's Network Innovation Competition and the European BESTF-ERANET programme. The build will demonstrate renewable gas production by thermal gasification of domestic and commercial waste.

Once the pilot plant in Swindon is fully commissioned later in 2015, we can start testing and optimising the process. We expect to produce BioSNG by early 2016, when the facility will be used as a showcase to demonstrate the technology to industry stakeholders.

This project will allow us to examine a commercial scale demonstration plant and assess how this technology could affect supply and demand on our networks.

# The future of gas

## Transport – potential growth in CNG vehicles

Transport accounts for 25% of our greenhouse gas emissions, and there is no way to completely decarbonise it. Heavy goods vehicles (HGVs) and buses, which make up only 1.5% of road transport, account for 21% of transport emissions.

We are exploring the possibility of a fleet of vehicles that runs on compressed natural gas (CNG) and liquefied natural gas (LNG). The vehicles and infrastructure would offer a lower carbon, quieter and cheaper alternative to diesel. We are keen to help reduce road transport emissions and believe the gas network is an efficient way of supplying filling stations.


With a large gas distribution network, we are well placed to provide connections for customers who want to use natural gas-powered vehicles. We see the network as the backbone of a future national infrastructure and we expect the market to grow into the future. The graphic below shows the benefits of CNG.

This technology is not new; there are thousands of gas vehicles on the road internationally, with growing evidence to support using the technology. We are also starting to see manufacturers offering dedicated gas HGVs and buses in the UK, providing more choice for haulage and bus companies considering this technology.

**28%**  
Lower well-to-wheel  
CO<sub>2</sub> emissions



**Cleaner air**  
and lower noise levels

  
**20%**  
HGV account for  
of the greenhouse  
gas emissions



**c.40%**  
fuel cost saving  
compared with





Sustainable sources of gas have great potential to support the vehicle fuel sector. Whether it is from bio-methane or gasification, the environmental emissions on a comparable basis are around 70% less than diesel.

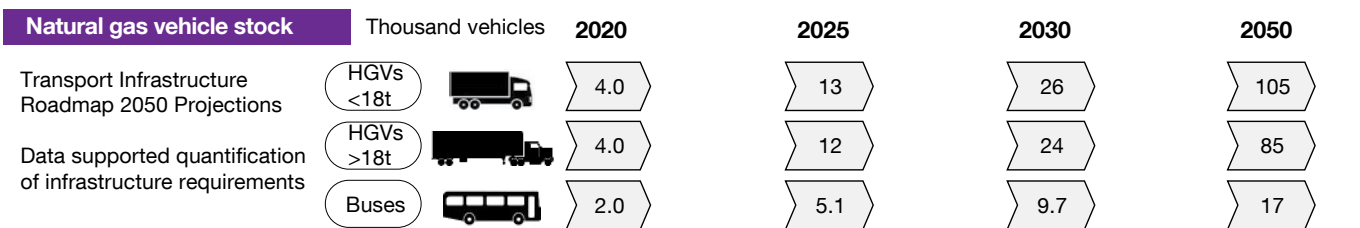
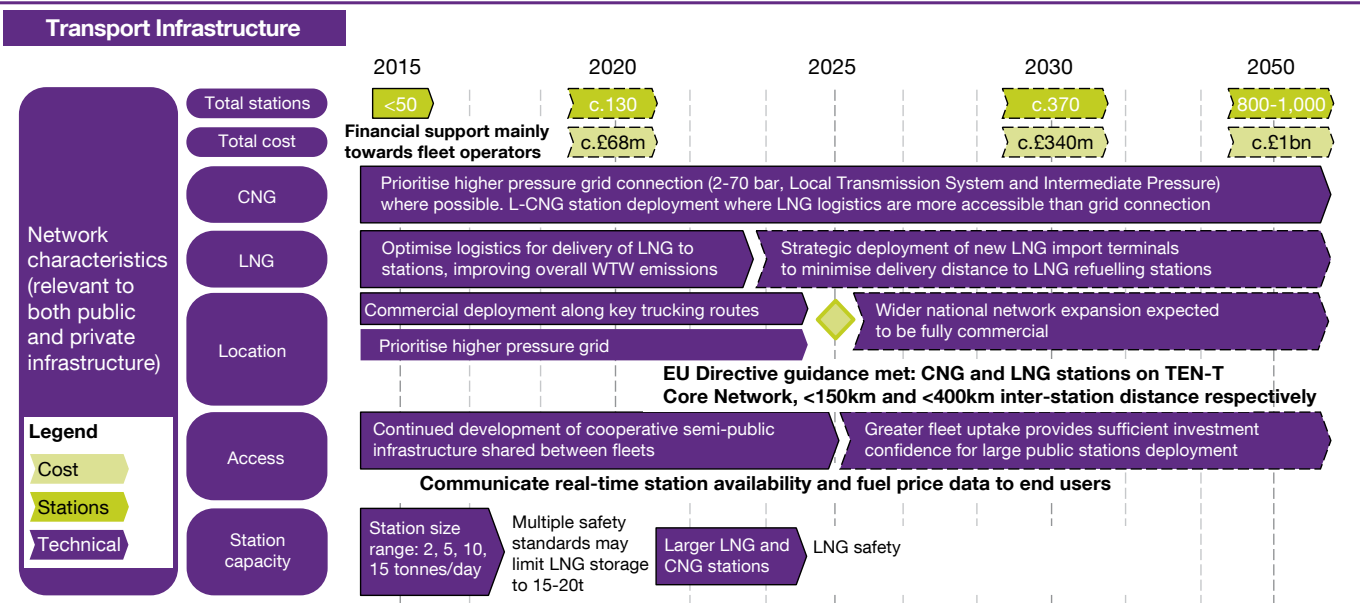
Working with CNG Services, we are in the process of building a CNG filling station on the M6 motorway in Leyland, near Stockport, to demonstrate the potential of this developing market. The new facility will be the first high pressure (LTS) connected public-access CNG filling station in the UK. It will refuel more than five hundred HGVs a day, or 3,500 kg of CNG per hour. The station's first major customer will be Waitrose, part of the John Lewis Partnership. This connection will increase network use but we won't need to invest any extra in our transmission system.

We have worked closely with the Low Carbon Vehicle Partnership to develop their vehicle fuels infrastructure road map for the Office of Low Emissions Vehicles and the Department for Transport. We are also part of a consortium led by Birmingham City Council looking at developing four gas filling stations around the city's edge. As members of the Natural Gas Vehicles (NGV) Network we are working with industry stakeholders to promote the use of gas in vehicles, to lobby for support, and to ensure there are industry standards. This early work will help us assess the likely impact on gas supply and demand.

For UK gas customers, the growth of this transport fuel sector will mean greater network use. This will eventually reduce the transportation cost per customer and help to reduce transport's environmental impact.

## Regulatory barriers will be the primary focus for enabling natural gas infrastructure, while a number of technical issues must also be resolved

methane



Dashed lines represent high uncertainty. Major milestone/enabler. Indicative fuel economy: dual fuel HGV = 60 kg/day, dedicated HGV = 75 kg/day. Costs based industry input, future cost reductions not included.

elementenergy

# The future of gas

## Future demand factors

Half of the UK's energy provides heat in buildings and industry, two thirds of it from natural gas.

The UK is decarbonising heat and we have seen demand fall because of the energy efficiency measures in industry and homes. The Future Energy Scenarios published by National Grid Transmission show that a 30% efficiency saving is possible if people continue to choose solid wall insulation, A-rated boilers and smart thermostats such as BG Hive or Worcester Bosch Wave.

**“Gas heat pumps could further reduce energy demand, offering efficiencies up to 150% compared against a traditional boiler”<sup>2</sup>**

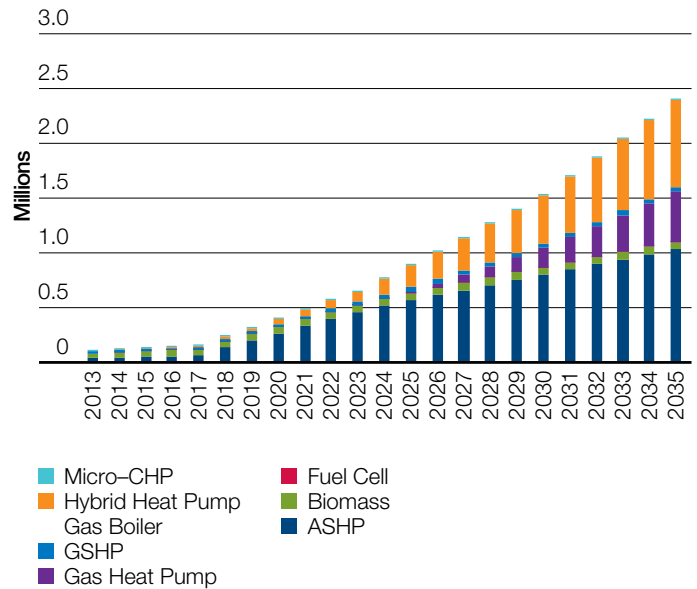
We know there will be more electric heating in future and gas demand will decrease. However, in all scenarios we've run, gas will still be needed for heat, particularly on peak days.

Our forecast demand now includes new technologies, such as air source heat pumps that will reduce customers' use of gas. We also include appliance technologies, such as gas sourced heat pumps and micro-CHP, which increase the efficient use of gas, reducing carbon intensity. These new and emerging technologies could help us be flexible as we meet our domestic peak heat demand.

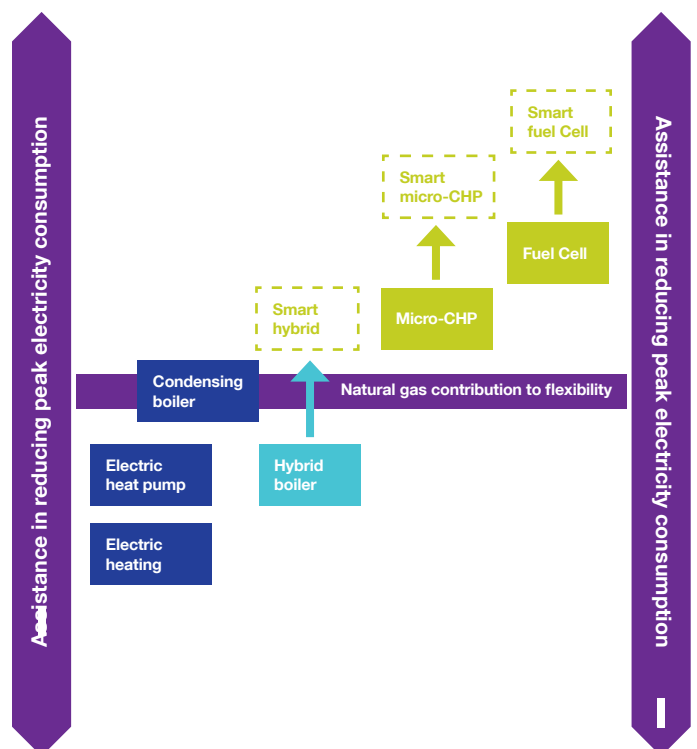
These new energy technologies will be used across electricity and gas and will help reduce the growing pressure on the electricity grid. New hybrid appliances powered from renewable electricity will be able to transfer to gas at peak times or at other times when there is not enough renewable electricity.

Other developments include smart technologies that can switch from electricity to gas depending on changes in the price of electricity, and smart appliances that can choose the cheapest or lowest carbon fuel. Combining all these technologies is the best way to make the most of renewables across both energy sources. It will also maximise the use of the assets that customers have already paid for. Looking further ahead, we are starting to research how micro-CHP and fuel cells might ultimately help us move to a hydrogen economy.

The following graph shows the new heating technologies included in our projections.



New Heating Technology Projections



Natural Gas Contribution to Heat Flexibility within the UK

<sup>2</sup> Gas Absorption Heat Pumps Paper – Ecuity Consulting ([www.ecuity.com](http://www.ecuity.com))  
Gas Absorption Heat Pumps - ENER-G Group ([www.ener-g.com](http://www.ener-g.com))

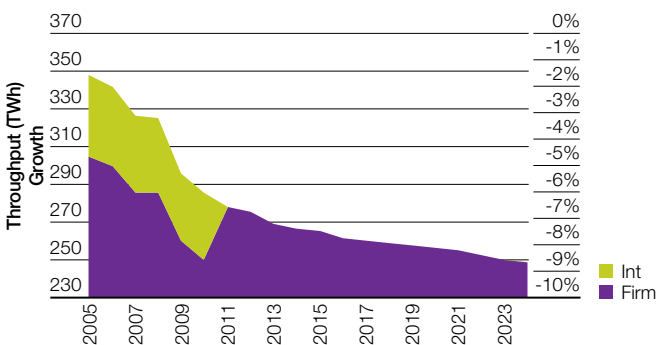
# Demand

This section looks at the demand forecast for the next ten years for National Grid Gas Distribution (UK).

## Scenario Appraisal

Our demand scenarios are based on planning assumptions, stakeholder engagement and our own market observations. The scenarios take into account reducing our carbon emissions, which is critical if we are to meet government targets in 2050. They also include planning assumptions derived from market observations, the view of specialist consultancies and data collected from UK Transmission's FES consultation process.

The consultation involves market participants including suppliers, consumers and consumer groups. It provides important feedback on the impact of market developments and data about the consumption of new and existing loads.



## Forecast demand

The graph below shows our gas demand scenarios through to 2024/25. There's a breakdown by local distribution zone (LDZ) network in Appendix A1, that includes our view for both annual and peak demand, year-by-year.

Annual gas demand is expected to drop in the next ten years. This year's forecast also includes the change in the composite weather forecast, which is reviewed every five years.

We worked with our service provider (UK Transmission) to develop demand scenarios as part of the demand forecast update for winter 2015/16.

The main differences between the scenarios for UK distribution gas demand are the expected levels of energy efficiency, views of the economy and how new houses will be heated.

## Forecast comparison and accuracy

Appendix A1 contains demand forecast information at a LDZ network level. Charts in Appendix A2 include:

- a comparison of the 2015 scenarios with those published in our 2014 Long Term Development Plan
- the accuracy of the forecasts published one and three years ago for the 2015/16 gas year.



# Connections

## Exit connections (new demand for gas)

The British gas industry has offered healthy competition in new gas connection services for more than ten years. National Grid offers domestic, non-standard and alteration quotations, while third parties such as gas transporters (GTs) and utility infrastructure providers (UIPs) give customers more choice. In 2014/15 there were around 7,000 third party, or competitive, connections adopted by National Grid or connected to our network, 20% higher than in 2013/14.

National Grid offers the following exit connection services:

- domestic connections and alterations
- non-standard new services: band 1, 2 & 3 (depending on load size and complexity)
- non-standard service alterations: band 2 & 3 (depending on load size and complexity).

Competitive connections fall into the following categories:

- GTs own and operate gas transportation systems. A physical connection is made to National Grid's network, allowing gas to be supplied to the GT's system. The connection to our network is the connected system exit point (CSEP)
- UIPs build gas infrastructure for customers. When complete, the UIP asks the gas transporter (i.e. National Grid) to adopt the pipeline. If the infrastructure has been designed and constructed to gas industry standards, it is owned and operated by the gas transporter.

There's information about our services, charges and terms and conditions at [www2.nationalgrid.com/UK/Services/Gas-distribution-connections/](http://www2.nationalgrid.com/UK/Services/Gas-distribution-connections/)

## Entry connections (new supply of gas)

Our Bio-methane Gas to Grid Customer Connection Guide helps our customers understand the connection process, from the initial customer enquiry, through project construction, to gas flowing on the first day.



Bio-methane installation with single box grid entry unit  
Inset: Single box grid entry unit

You can download the guide at:  
<http://www2.nationalgrid.com/UK/Our-company/Gas/Sustainable-Gas/>.

We respond to enquiries and give our customers technical guidance and support so they have the information they need to make the important decisions about their projects. We have developed our processes so they can be transferred easily to connections of unconventional gas sources such as shale and BioSNG.

We want to make it easy for bio-methane producers to connect and inject their renewable gas into the pipeline and grid network. Adding bio-methane to the grid will help the UK minimise its carbon footprint and use less unsustainable fossil fuel. It will also increase the security and diversity of energy supplies.

We will work with our stakeholders to connect new sources of gas so that these exciting new technologies can play their role in meeting the UK's future energy needs and carbon reduction targets.



Industry arrangements covered by the Uniform Network Code (UNC) have changed recently and you can read them on the Ofgem website.

The UNC is a contract between shippers, suppliers and gas transporters. It manages the commercial arrangements between the parties and underpins the GB Gas Industry. Any party to the UNC can propose a modification to the contract and all parties then discuss, develop and vote on any recommended changes, which are agreed by Ofgem.

## NTS exit reform

A change introduced in October 2012 to the exit capacity regime means we can now use different capacity products to manage the balance between gas supply and demand in our networks safely and efficiently. These include;

- long-term, medium-term, firm and off-peak daily products
- using agreed industry processes to manage our use of capacity and transfer capacity between offtakes if necessary
- long-term, medium-term and daily release of NTS offtake (flexibility) capacity, which is an integral part of our operating strategy.

## EU Gas Day

Last year the UNC was modified to align the UK Gas Day with the Gas Day in EU Network Codes. This change (Modification 0461) alters the start of the gas day from 06:00 to 05:00 from 1 October 2015.

## Future developments

There are no plans to change the UNC but a National Grid NTS industry review is looking at how system flexibility is used within the National Transmission System. The review will define what we mean by 'system flexibility' and explore how this could be used in the future. Discussions about this could influence the exit regime. A link to more information on the National Grid website is below:

<http://www.talkingnetworkstx.com/SF-What-is-System-Flexibility.aspx>

Industry arrangements covered by the Uniform Network Code (UNC) have changed recently and you can read them on the Ofgem website.



# Future investments

## Key capital investment

National Grid Gas's five gas distribution networks are supplied from the National Transmission System (NTS) via offtakes in the local distribution zones (LDZs). The high pressure (HP) distribution network transports and stores the gas, which is then cascaded down the intermediate (IP), medium (MP) and low pressure (LP) tiers. Most customers are supplied from the below 7 barg distribution network.

The annual update of the supply and demand forecasts helps develop National Grid Gas Distribution (UK)'s investment plans. This section looks at the sanctioned investment and reinforcement projects being considered for construction between 2015/16 and 2020/21.

## Investment planning process

The aim of the investment planning process is to review gas demand and storage requirements in light of winter experience, and update gas demand and supply forecasts along with other factors.

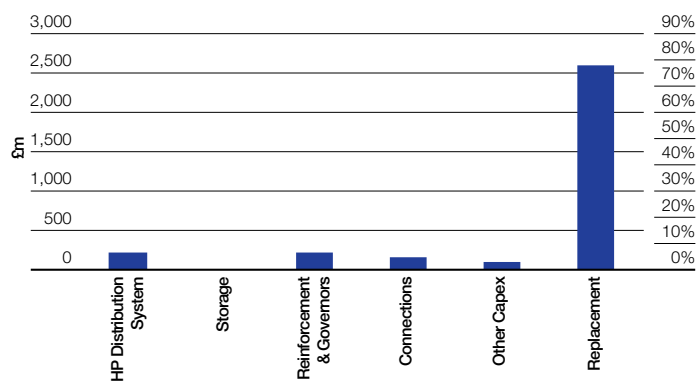
We use this information to identify the investment that's needed to efficiently and effectively maintain a reliable network. Here is a view of the investment needs that came out of the latest planning cycle.

The annual update of the supply and demand forecasts helps develop National Grid Gas Distribution (UK)'s investment plans.

## Planned investment

Indicated below is the expected level of net capital expenditure over the next six years, 2014/15 – 2020/21 (as per our RIIO business plan) split by the following categories:

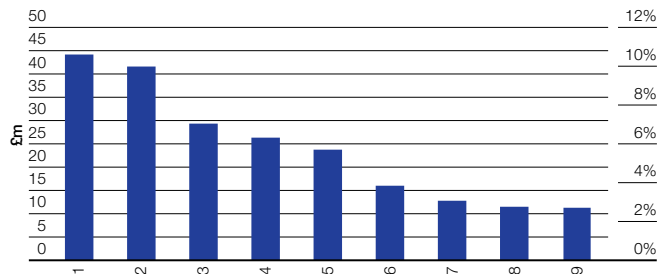
- **'High pressure distribution system'** relates to investment to maintain and develop equipment that operates at pressures greater than 7 barg. For example, investment in a replacement pre-heater.
- **'Storage'** relates to investment on both low and high pressure storage installations.
- **'Reinforcement and governors'** relates to investment, both general and specific, that increases the capacity of below 7 barg systems, typically by constructing new mains and governor installations.
- **'Connections'** relates to the net cost to National Grid Gas of connecting new gas consumers, both domestic and non-domestic, to the gas supply network.
- **'Other capex'** relates to investments on lower pressures gas network assets such as medium pressure valves or pressure management and, notably, pressure elevation to avoid reinforcement.
- **'Replacement'** relates to the money invested in replacing old metallic mains, metallic services and riser pipes in blocks of flats.



Total Investment by Type



This does not show capital investment to provide additional entry capacity. There may be significant investment in this capacity depending on how quickly new sources of gas are developed and how many connections National Grid has to fund.



Capital Expenditure 2015/16 - 2020/21

The following capital investment projects represent over half (53%) of our capital investment plan (excluding Repex and Connections):

- below 7barg obsolete replacements
- preheating replacement (water bath heaters)
- Capex O&M recharges
- MP and IP strategic valve remediation
- <7barg special crossings remediation
- pressure management equipment replacement
- repair of pipeline metal loss defects
- inline pipeline inspections
- reduced depth of cover pipelines.

Here's an overview of our key capital expenditure projects.

## Below 7barg obsolete replacements

This programme of work replaces equipment that is, or soon will be, obsolete. This ensures that our networks remain reliable and that operational expenditure is well spent and benefits our customers.

### Preheating replacement (water bath heaters)

As steel pipelines are subject to constant expansion and contraction from the pre-heating of gas, this can lead to the pipeline materials becoming brittle. We need to invest in our ageing fleet of water bath heaters so we can maintain the integrity of our pipeline and mains networks.

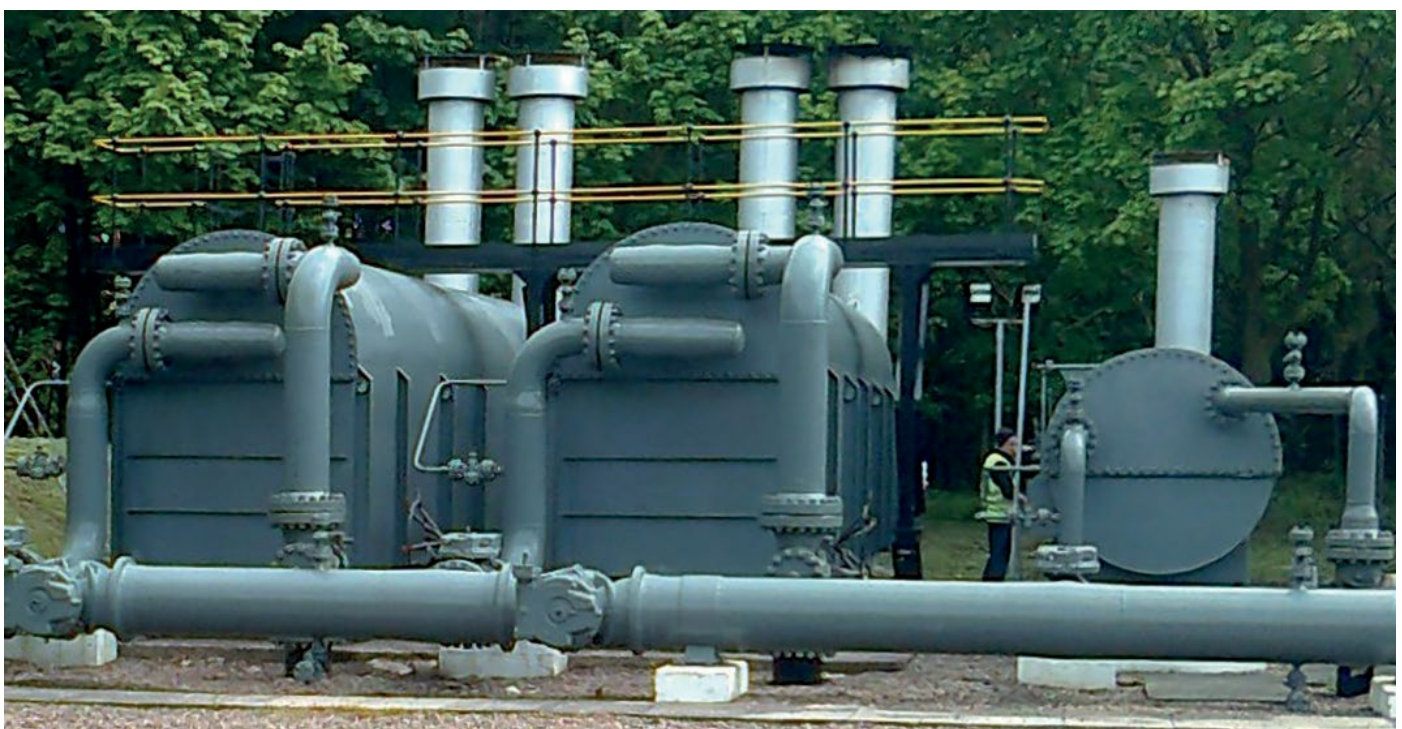
Using reliable and cost efficient systems we can target expenditure to replace or repair water bath heaters to make sure they perform well to benefit our customers and comply with the EU Medium Combustion Plant directive.

### MP and IP valve remediation work

We need to maintain our strategic valves so we can ensure security of supply and reduce the impact on customers after emergency repairs on our gas networks. This investment will make sure that our strategic valves operate correctly and comply with current design standards.

### <7barg special crossing remediation

As above, investment in our distribution crossing will maintain a secure supply of gas. This remediation work will include re-validating the pipework coating protection systems and crossing supports structures.



# Planned reinforcements



Significant asset investment above £500,000  
by National Grid geographic network

## Above 7barg reinforcements

Network models are analysed to make sure that the future forecast demand levels can be transported. If not, work is carried out to identify how the system should be reinforced. This reflects our Gas Transporters' Licence obligation to provide transportation capacity consistent with meeting 1 in 20 peak day demand<sup>3</sup>.

The high pressure distribution system is designed to transmit and store gas while maintaining the 1 in 20 peak day criterion. Using demand forecasts, the system is developed to maintain this capability. Significant distribution pipeline or associated asset projects (greater than £0.5million) approved and under consideration are shown above.

## Below 7barg reinforcements

The below 7barg system must operate between levels of pressure defined by statute, regulation and safe working practices. We are developing the below 7barg distribution system, investing in mains, services and associated plant so we can provide capacity to customers who want to connect to our network and to other gas transporters' requests for transportation services.

When we quote any connections to our network, we assess capacity on a first-come, first-served basis. This means

that the capacity available today might not be there tomorrow, so for long-term projects, information about current available capacity will be out of date by the time a development is complete.

If capacity is not available for a development, it can be provided. The service level agreements within the connections process allow for lead times to deliver any reinforcement requirement. Over the life of a proposed development, there should be no expected issues, but the cumulative effect of a large number of loads may well overload the upstream systems, so they must be carefully managed. Potentially higher pressure system reinforcement can pose a problem, but this is rare and would be picked up at the connections request stage. These are usually phased and this shouldn't stop the development.

It is difficult to decide how any site will be developed and what pressure tier will be appropriate. The UIPs/GTs will ask for a connection when it suits them. This means that a site could be connected at any one of many points and until there's a connection request, it is difficult to plan. A single site might be split into many sites for different GTs, all wanting connections for their part of the 'planned' site.

What we can say upfront is whether or not there is infrastructure in an area, and if that infrastructure is capable of supplying an identified development.

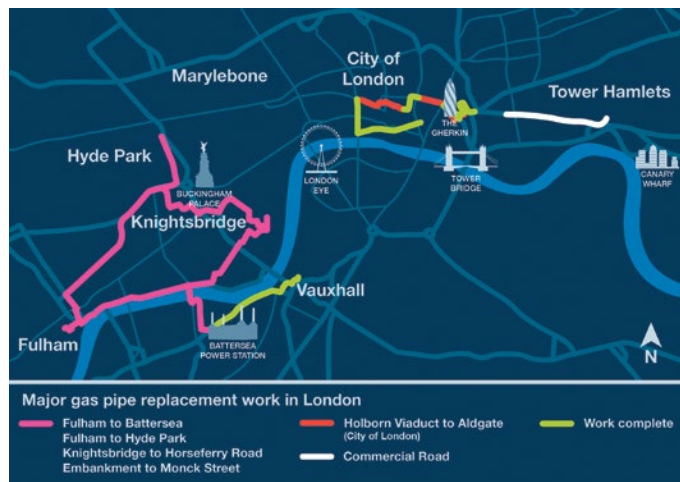
<sup>3</sup> The 1 in 20 peak day demand is the level of demand, within day gas flow variations, that, in a long series of winters, with connected load held at the levels appropriate to the winter in question, would be exceeded in one out of 20 winters, with each winter counted only once.



# London supply strategy



Victorian metallic pipeline



Major Gas pipe replacement work in London

The London Supply Strategy is a 15-year project spanning RIIO-GD1 and RIIO-GD2 to make some of the city's medium-pressure Victorian metallic pipelines safer. Most of these city centre pipes are more than 100 years old and close to some nationally important landmarks and buildings.

The project aims to create a robust medium-pressure network in London's city centre operating at 2barg. The RIIO-GD1 workload is valued in the region of £50m. The diagram above shows where mains are being replaced.

The scope in RIIO-GD1 includes:

- replacement of 28km MP mains
- River Thames tunnel crossing
- renewal of 7 PRI sites (pit governors) including one located in Hyde Park
- remediation of 40 large diameter strategic valves along the route of the mains replacement.

We've talked to stakeholders and will consult them throughout the project. This has included:

- talking to the local community and businesses about the proposed works
- working with Transport for London and the local London borough councils to agree road closures, diversion routes and traffic management plans
- working with the Thames Tideway Tunnel project to ensure a coordinated approach to working in similar areas around Chelsea Embankment
- working with the Royal Parks to arrange surveys when there were no events in Hyde Park.

After the London Supply Strategy RIIO-GD1 project is complete, a RIIO-GD2 project will replace another 24km of mains to further reduce process safety risks associated with the Victorian metallic pipelines. The projects will provide vital infrastructure to support London's economic growth and help maintain its position as a leading 21st century city.



## £50m

The RIIO-GD1 workload is valued in the region of £50m

## Other considerations

### Reduced depth of cover pipelines

Line walking inspections have been reintroduced to help spot pipes that are not well covered.

Pipes with a shallow depth of cover were identified in 2010/11 so walking the line was brought back to identify third party damage and reduced depth of cover. Walking inspections of the LTS (Local Transmission System) pipeline network is a good way to accurately measure and record the depth of LTS pipelines.

A shallow depth of cover is when the pipeline is below the recommended minimum industry depth. This recommended depth is to minimise the risk of third party damage, for example from agricultural activities such as ploughing. These pipelines were originally laid to industry standard, but over time farming and weather can lead to soil erosion.

The line walking inspections show that 47km of LTS pipelines have shallow depth of cover. Once identified these pipe sections will be resurveyed and the affected pipeline lengths will be quantified.



Making sure pipes are deep enough has a high priority as damage or failure to an LTS pipeline could mean loss of supply, safety and environmental risk. We have allocated £11.4m in our business plan over the rest of the RIIO period to deal with this issue. However, as these shallow pipes were not identified before we developed our Final Proposal Business Plans, our set allowance did not account for this additional expenditure. We have an opportunity in the near future to agree funding, with Ofgem, for these remediation activities that will satisfy network integrity and safeguard against third party interference.

We must make sure that we can manage the risk posed by these pipelines. Steps to mitigate risk include:

- legal agreements
  - restrictive covenants
  - easement amendments
- improved pipeline marking and liaison with landowner (in non-agricultural areas)
- top soil replacement and reinstatement
- pipeline crossing construction
- pipeline diversions.

We expect that these activities will address approximately 5km of LTS pipelines per year from 2017/18. We will have to draw up legal agreements with involved parties, which will take time. In principle, National Grid will seek legal agreements first because physical solutions such as diverting the pipeline will be expensive.

### Property portfolio

We are looking at our property portfolio with our joint venture partners to identify properties that could be transformed and land that could be developed as part of our optimise initiative. This will help us make sure that we keep the costs of non-operational sites to a minimum, which will benefit our customers.



This includes our low-pressure storage sites where we have decommissioned gas holders and the associated treatment works as part of Project Nexus. Suitable sites can then be sold for development.



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# 47km

of LTS pipelines have  
shallow depth of cover

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# Innovation

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## For Today



### Customer Experience

Reduce the size and duration of our replacement and remediation activities. Continually improve our safety standards and improve our customer and stakeholder experience through proactive engagement.



### Cost Efficiency

Continually reduce the cost of running our network by optimising the way we work, improving the efficiency of assets and the cost effectiveness of our investment decisions.



### Life Extension

Extend the life of our assets through increased monitoring and new remediation techniques. Increase our utilisation and network reliability, thereby reducing disruption of service



### Environment

Reduce our impact on the environment through energy demand and waste reduction and wherever possible have a positive impact on the environment in which we work.

## For Tomorrow



### Unconventional Supplies

Open up the use of our network to alternative energy sources. Increase diversity and security of supply through the identification of renewable gas sources.



### Future Network

Facilitate integration of our network into the wider energy chain to ensure least cost energy provision for our customers.

Over the next three to five years we plan to continue to embed innovative outputs and best practice into our business.

We are in the third year of NIA funding under RIIO, and our portfolio has continued to grow. We aim to deliver value for our customers and to help deliver our stakeholder commitments: to keep people safe, be reliable, safeguard future generations, provide value for money and deliver quality service for all. With that in mind we have a diversified set of projects, and our focus is now starting to shift towards implementing the outputs of these projects.

We are focusing on six Value Areas, which reflect the RIIO Outputs and our Gas Distribution Ambition. These areas have been split into two categories: For Today and For Tomorrow, as shown on the opposite page.

## Customer experience

We are emphasising 'no dig' projects, using technologies to reduce disruption and interruptions to our customers. Some examples include the PRISM (pipe replacement in-situ manufacturing) project, where we are spray-lining existing cast iron pipes with a polymer to create a fully structured liner. We can do this without excavating to remove the existing cast iron pipe. This can significantly reduce the cost of our iron mains replacement work and the down time of the network.

## Cost efficiency

By optimising our processes, improving the efficiency of assets and the cost effectiveness of our investment decisions, we can continually reduce the cost of running our network. Also, by identifying new materials, we can reduce the cost to connect to our network. This is demonstrated by a recent project to install and commission a 19barg PE pipeline between a bio-methane plant and our LTS network. Changing from steel to PE at this pressure tier makes it quicker to lay the mains – in this instance one week rather than six – saving time and money.

## Life extension

Monitoring and remediation techniques help reduce service disruption and increase our network reliability. We have been trialling cured in place pipe (CIPP) for use on our distribution networks as an alternative to replacing our larger diameter iron pipes.

## Environment

We strive to reduce our waste and energy demand, which will help us meet our 2050 environmental commitments. We are developing a new fogging unit that uses novel atomiser technology from the pharmaceutical industry to improve the mono-ethylene glycol saturation in lead yarn joints in cast iron pipes. This could reduce gas leakage significantly.

## Unconventional supplies

Security of supply is an essential element of our research, so it is important that our network can transport gas from a variety of different renewable sources. Through the Network Innovation Competition, we are hoping to deliver pipeline quality gas at a BioSNG pilot plant in Swindon. The gasification plant and associated gas quality equipment have been built and it is due to be commissioned by the end of 2015.

## Future network

We are integrating our network into the wider energy chain to provide the lowest cost energy for our customers. We are installing a connection to a CNG filling station in Leyland, Lancashire, from our LTS – the first time a CNG station is connected to this pressure tier in the UK. The project aims to understand the economic and environmental credentials of CNG as a transport fuel and to promote the use of the UK's LTS as the best way to deliver CNG.

## Looking ahead

The 27 project phases completed in 2014/15 are currently either being progressed to the next stage of development in 2015/16 or the outputs are being implemented into the business. Over the next three to five years we plan to continue to embed innovative outputs and best practice into our business.

# Appendices

## A1 – Supply and demand data

This section contains the forecast for demand looking ten years ahead by geographic network.

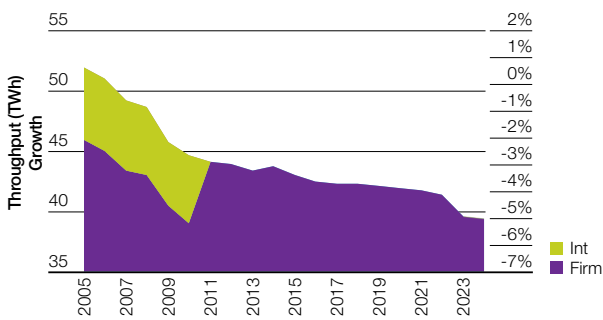
Each network contains four graphs detailing:

- historical and forecasted annual gas demand
- historical and forecasted 1 in 20 peak gas demand
- comparison in demand between 2014 and 2015
- load breakdown by category.

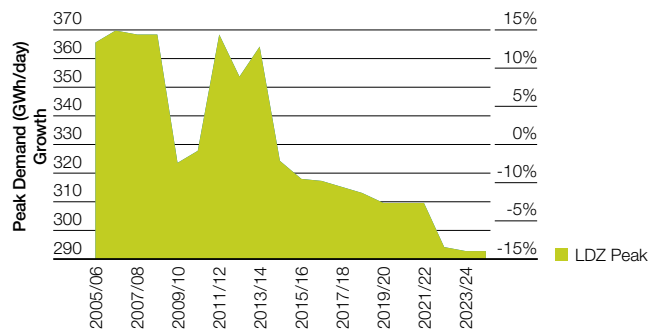
This information should help our stakeholders to review the changes in our forecasted demand through to 2023/24 so that they can anticipate how the information could influence any potential commercial considerations.

All graphs shown in this section, and the data that sits behind them, can be downloaded in an Excel format from the National Grid website.

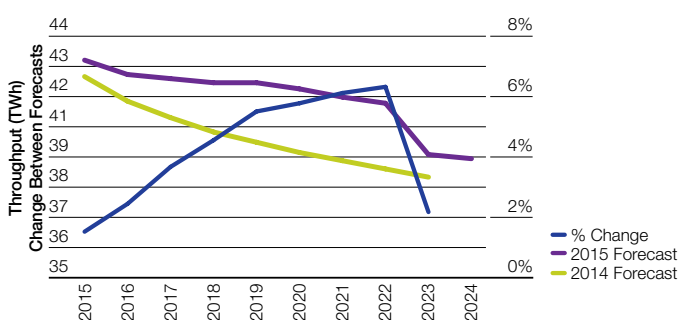
### East Anglia Network



East Anglia LDZ Historical & Forecast Annual Gas Demand



East Anglia LDZ Historical & Forecast 1 in 20 Peak Gas Demand

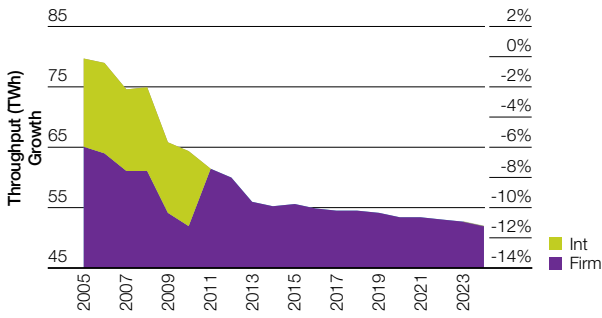


Comparison of East Anglia LDZ Annual Demand Forecasts

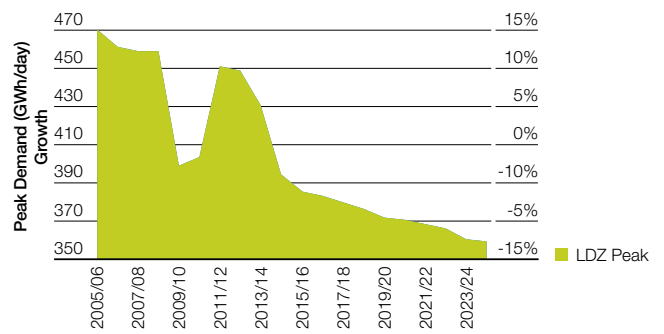


East Anglia LDZ Forecast Annual Demand – Split by Load Categories

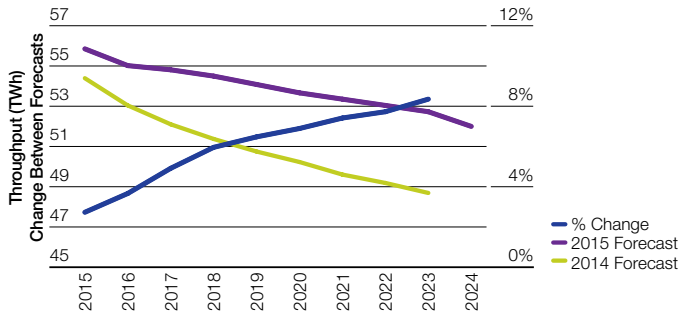
## East Midlands Network



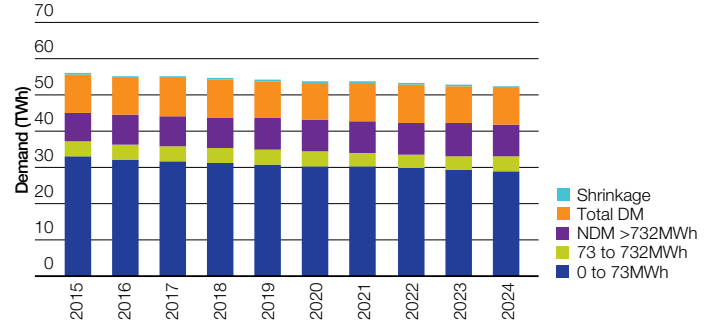
East Midlands LDZ Historical & Forecast Annual Gas Demand



East Midlands LDZ Historical & Forecast 1 in 20 Peak Gas Demand

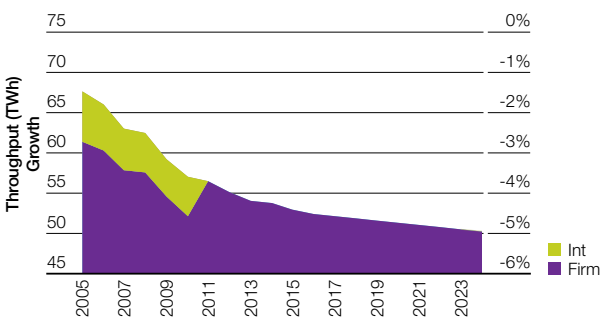


Comparison of East Midlands LDZ Annual Demand Forecasts

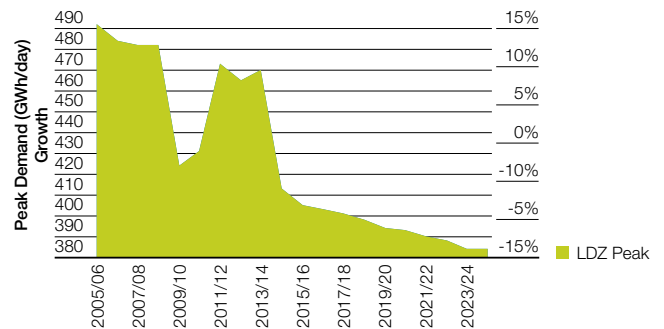


East Anglia LDZ Forecast Annual Demand - Split by Load Categories

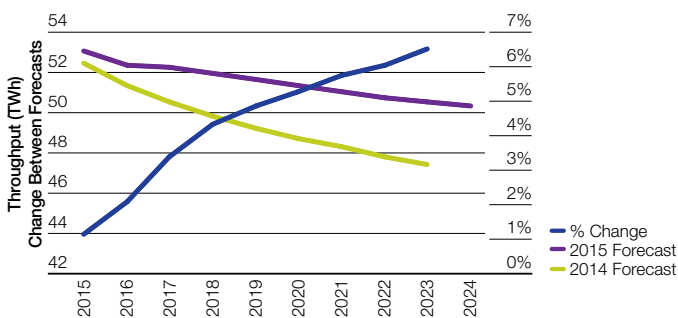
## North London Network



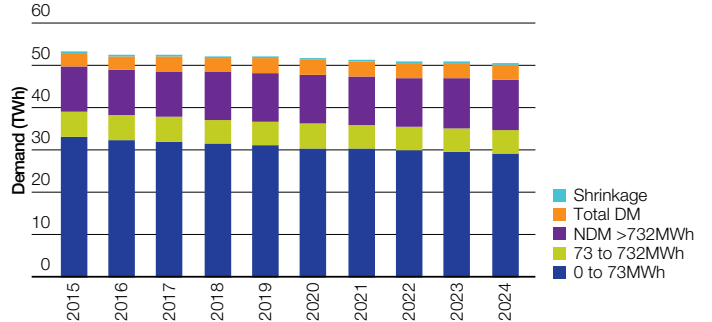
North London LDZ Historical & Forecast Annual Gas Demand



North London LDZ Historical & Forecast 1 in 20 Peak Gas Demand



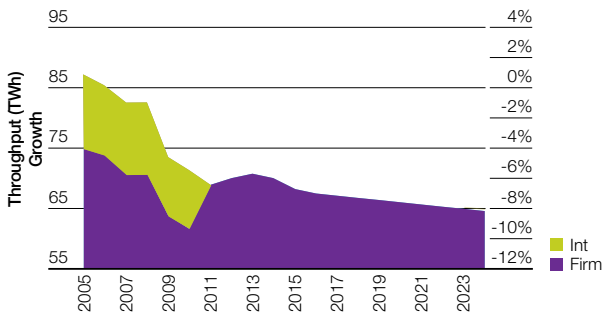
Comparison of North London LDZ Annual Demand Forecasts



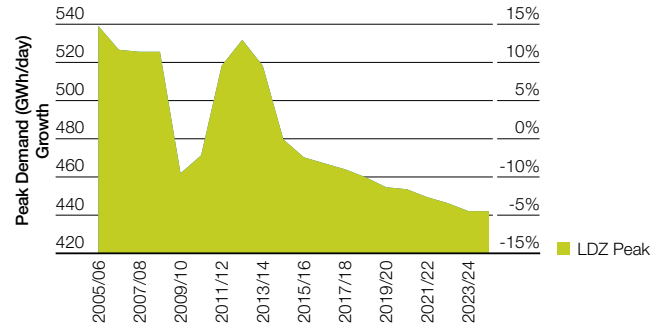
North London LDZ Forecast Annual Demand - Split by Load Categories

# Appendices

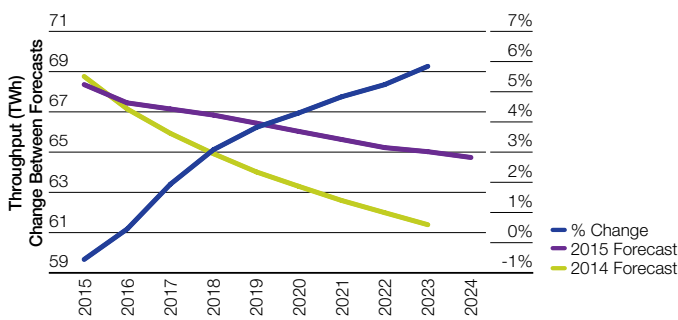
## North West Network



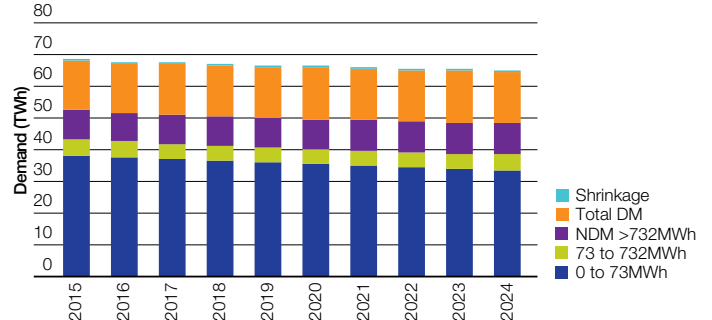
North West LDZ Historical & Forecast Annual Gas Demand



North West LDZ Historical & Forecast 1 in 20 Peak Gas Demand

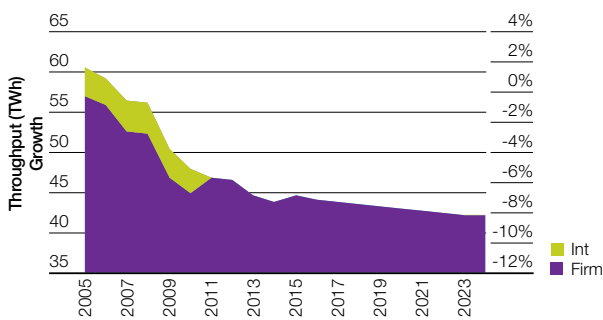


Comparison of North West LDZ Annual Demand Forecasts

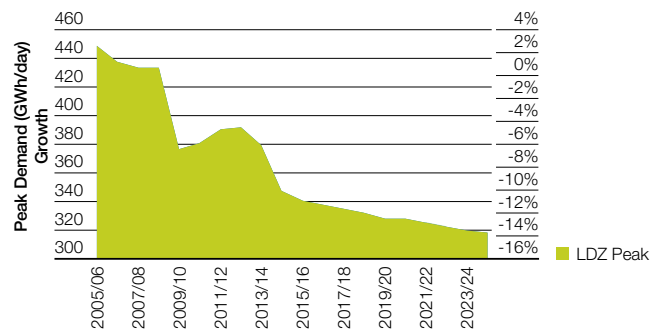


North West LDZ Forecast Annual Demand - Split by Load Categories

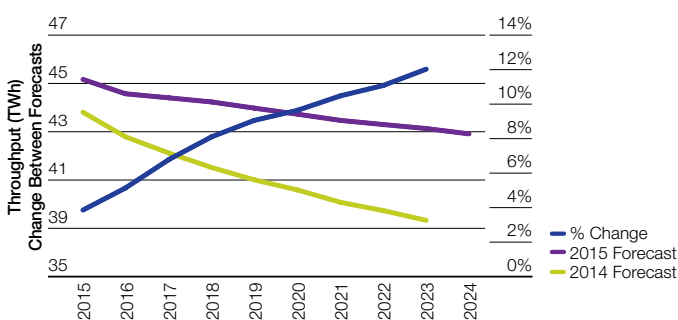
## West Midlands Network



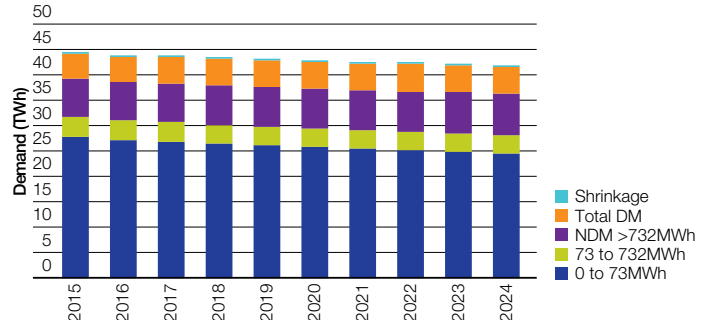
West Midlands LDZ Historical & Forecast Annual Gas Demand



West Midlands LDZ Historical & Forecast 1 in 20 Peak Gas Demand



Comparison of West Midlands LDZ Annual Demand Forecasts



West Midlands LDZ Forecast Annual Demand - Split by Load Categories



## A2 – Actual flows 2014

### Annual flows

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

Recent winters have included some of the warmest in the weather data history employed for demand modelling, dating back to 1928/29. This means that the weather corrected annual demands and forecasts were based on a 17-year seasonal normal condition derived from gas years 1993/94 to 2009/10. Following industry consultation, this moved to the EP2 basis from 2010.

Tables A3.1A to A3.1E compare actual demands during the 2014 calendar year with the forecasts presented in the 2014 Long Term Development Plan. Annual demands are presented in the format of LDZ bands/categories, consistent with the basis of system design and operation. All figures have been corrected to the new EP2 basis.

TWh	2014 Actual Demand	Weather Corrected Demand	2014 LTDP Forecast Demand
0–73 MWh	26.9	32.9	27.9
73–732 MWh	3.5	4.2	3.6
>732 MWh Firm	13.2	18.6	11.8
Interruptible	0.0	0.0	0.0
Total Consumption	43.6	55.8	43.3
Shrinkage	0.2	0.3	0.2
<b>Total Throughput</b>	<b>43.8</b>	<b>56.0</b>	<b>43.5</b>

Table A3.1A – East Anglia LDZ Annual Demand for 2014 (TWh)

TWh	2014 Actual Demand	Weather Corrected Demand	2014 LTDP Forecast Demand
0–73 MWh	33.5	26.7	33.6
73–732 MWh	4.2	3.6	4.2
>732 MWh Firm	19.1	11.7	18.0
Interruptible	0.0	0.0	0.0
Total Consumption	56.8	42.1	55.8
Shrinkage	0.3	0.2	0.3
<b>Total Throughput</b>	<b>57.0</b>	<b>42.3</b>	<b>56.1</b>

Table A3.1B – East Midlands LDZ Annual Demand for 2014 (TWh)

TWh	2014 Actual Demand	Weather Corrected Demand	2014 LTDP Forecast Demand
0–73 MWh	33.5	33.0	35.3
73–732 MWh	6.1	6.1	6.1
>732 MWh Firm	14.1	11.9	12.4
Interruptible	0.0	0.0	0.0
Total Consumption	53.7	51.1	53.8
Shrinkage	0.3	0.3	0.3
<b>Total Throughput</b>	<b>53.9</b>	<b>51.3</b>	<b>54.0</b>

Table A3.1C – North London LDZ Annual Demand for 2014 (TWh)

TWh	2014 Actual Demand	Weather Corrected Demand	2014 LTDP Forecast Demand
0–73 MWh	38.9	37.9	40.1
73–732 MWh	5.3	5.4	5.3
>732 MWh Firm	25.4	23.1	24.8
Interruptible	0.0	0.0	0.0
Total Consumption	69.6	66.4	70.3
Shrinkage	0.4	0.4	0.4

<b>Total Throughput</b>	<b>69.9</b>	<b>66.7</b>	<b>70.6</b>
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Table A3.1D – North West LDZ Annual Demand for 2014 (TWh)

TWh	2014 Actual Demand	Weather Corrected Demand	2014 LTDP Forecast Demand
0–73 MWh	28.4	28.2	29.0
73–732 MWh	3.9	4.0	4.0
>732 MWh Firm	12.9	11.9	11.3
Interruptible	0.0	0.0	0.0
Total Consumption	45.3	44.1	44.3
Shrinkage	0.3	0.3	0.3

<b>Total Throughput</b>	<b>45.6</b>	<b>44.4</b>	<b>44.6</b>
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Table A3.1E – West Midlands LDZ Annual Demand for 2014 (TWh)

### Maximum and peak day flows

The following table reflects actual LDZ entry flows on the maximum demand day of gas year 2013/14 compared to the forecast peak daily flows in a 1 in 20 cold winter.

LDZ	Maximum Day	Demand	1 in 20 Forecast Peak for 2014/15
East Anglia	02-Feb-15	23.36	0.00
East Midlands	02-Feb-15	29.72	0.00
North London	02-Feb-15	28.66	0.00
North West	02-Feb-15	33.17	0.00
West Midlands	20-Jan-15	24.03	0.00

Table A3.2A – Actual GD UK Input Flows on Maximum Demand Day of Gas Year 2014/15 (mcmd)

LDZ	Minimum Day	Demand
East Anglia	09-Aug-15	3.53
East Midlands	08-Aug-15	4.61
North London	09-Aug-15	4.00
North West	22-Aug-15	6.61
West Midlands	08-Aug-15	3.53

Table A3.2B – Actual GD UK Input Flows on the Minimum Demand Day of Gas Year 2014/15 (mcmd)



## North West



## East Midlands



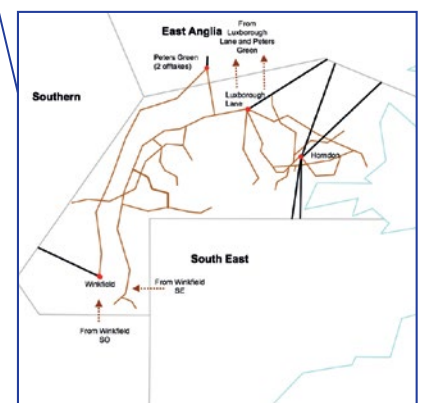
## East Anglia



## West Midlands



## North London



## Links and key contacts

If you have an enquiry about our service or would like to give feedback on anything in our 2015 Long Term Development Plan, here is a list of industry and business contacts.

### Ofgem

[www.ofgem.gov.uk](http://www.ofgem.gov.uk)

The agency responsible for regulating Great Britain's gas and electricity markets.

### Joint Office of Gas Transporters

[www.gasgovernance.co.uk](http://www.gasgovernance.co.uk)

Read about the Uniform Network Code on the Joint Office website. This site also contains details of live modifications to the UNC document and details of the technical committees.

### DECC

[www.DECC.gov.uk](http://www.DECC.gov.uk)

DECC is a government department with functions relating to UK energy supply and the mitigation of climate change.

### xoserve

[www.xoserve.com](http://www.xoserve.com)

Organisation responsible for the management of the UK sites and meters database.

### Energy Networks Association

[www.energynetworks.org/](http://www.energynetworks.org/)

Organisation that represents electricity and gas network operators. They influence decision makers about regulation, cost and safety matters and facilitate best practice and collaboration across energy industries.

### National Grid

[www.nationalgrid.com](http://www.nationalgrid.com)

The main National Grid corporate website, where you will find details of services for Gas Distribution, Gas and Electricity Transmission as well as our non-regulated business.

### Gas Distribution Exit Connections

[www2.nationalgrid.com/UK/Services/Gas-distribution-connections/](http://www2.nationalgrid.com/UK/Services/Gas-distribution-connections/)

Website that provides information and process details for Exit Connections and capacity enquiries to the National Grid Gas Distribution network.

### Gas Distribution Bio-Methane Connections

<http://www2.nationalgrid.com/UK/Our-company/Gas/Sustainable-Gas/>

Website that provides details for Entry Connections to the National Grid Gas Distribution network.

### Gas Distribution Innovation Team

[www.nationalgrid.com/innovation](http://www.nationalgrid.com/innovation)

Website for showcasing current Gas Distribution innovation projects.

Alternatively, email: [box.gd.innovation@nationalgrid.com](mailto:box.gd.innovation@nationalgrid.com)

### National Grid Gas Distribution Talking Networks

[www.talkingnetworksngd.com/](http://www.talkingnetworksngd.com/)

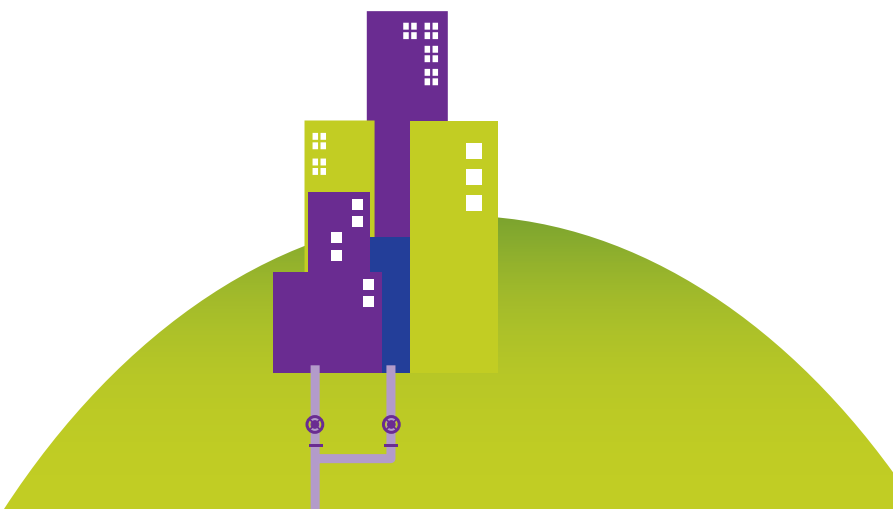
Web portal for our stakeholders to share views and feedback throughout the year to help us plan, shape our business and the wider industry.

### National Grid Future Energy Scenarios

<http://www2.nationalgrid.com/uk/industry-information/future-of-energy/future-energy-scenarios/>

Website that provides details of National Grid's view on UK energy use into the future.

Smell gas? Contact the National Gas Emergency Service if you have any concerns about gas safety on: 0800 111 999



This statement is produced for the purpose of and in accordance with National Grid Gas plc's obligations in Special Condition D3<sup>4</sup> of its DN Gas Transporters Licence and section O4.1 of the Transportation Principal Document of the Uniform Network Code in reliance on information supplied pursuant to section O of the Transportation Principal Document of the Uniform Network Code. Section O1.3 of the Transportation Principal Document of the Uniform Network Code applies to any estimate, forecast or other information contained in this statement.

For the purpose of the remainder of this statement, National Grid Gas plc will be referred to as National Grid. National Grid would wish to emphasise that the information must be considered as illustrative only and no warranty can be or is made as to the accuracy and completeness of the information contained within this Document. National Grid Gas nor the other companies within the National Grid group, nor the directors, nor the employees of any such company shall be under any liability for any error or misstatement or opinion on which the recipient of this Document relies or seeks to rely other than fraudulent misstatement or fraudulent misrepresentation and does not accept any responsibility for any use which is made of the information or Document or (to the extent permitted by law) for any damages or losses incurred.

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<sup>4</sup> Special Condition D3 requires that a statement, published annually, shall provide a ten-year forecast of Distribution Network Transportation Activity concerning likely use of the pipeline network and system developments that can be used by companies, who are contemplating connecting to our system or entering into transport arrangements, to identify and evaluate opportunities.

## National Grid

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