

**The Voice of the Networks**

# **Energy Networks Association**



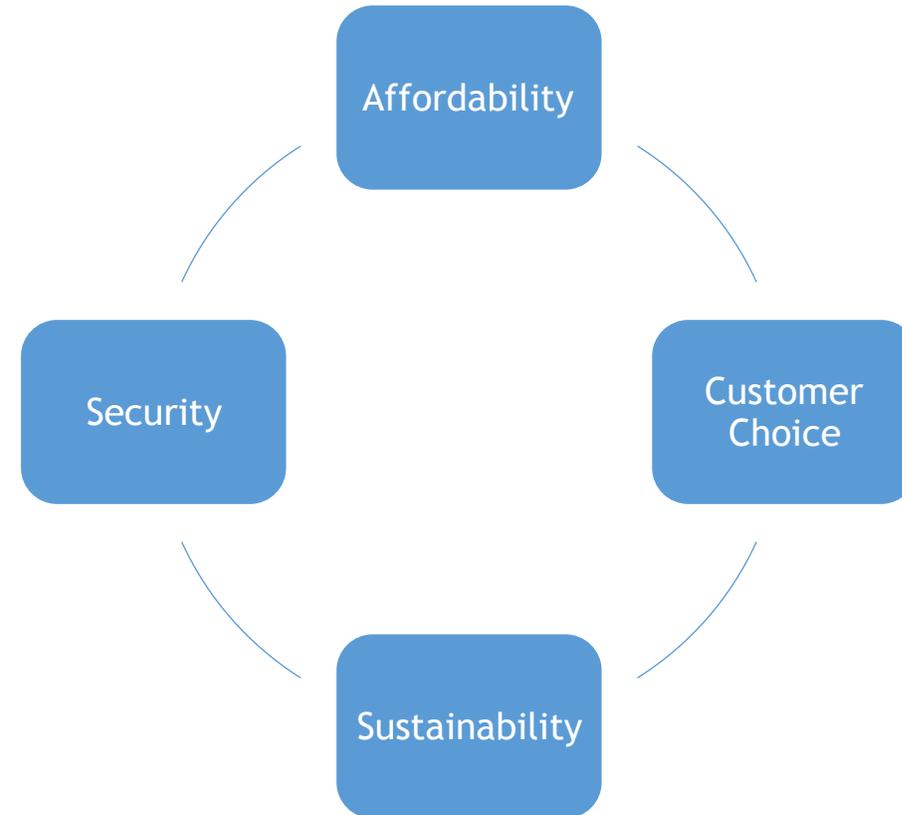
A Holistic Approach to our Energy System –  
The Central Role for Networks

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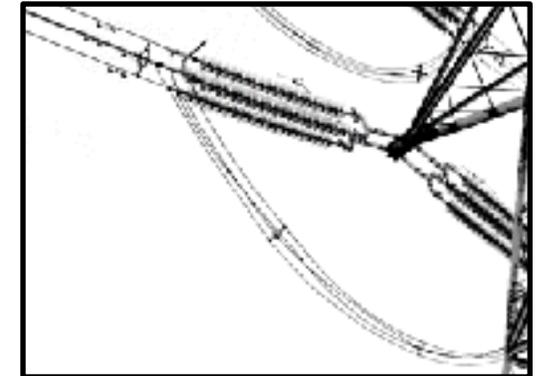


- As the representative body for the UK's gas and electricity networks, Energy Networks Association is well placed to analyse the whole energy system without bias towards any energy source.
- The traditional role of our electricity networks is changing. Driven by renewable distributed generation and low carbon technologies we are seeing smart network innovation and the transition to Distributions System Operators (DSOs).
- Any holistic consideration demonstrates clearly that our gas networks will have a vital role to play in the coming years; not just in an affordable progression to a low carbon economy, but also as a long term part of a sustainable energy mix through the injection of green gas into the grid.

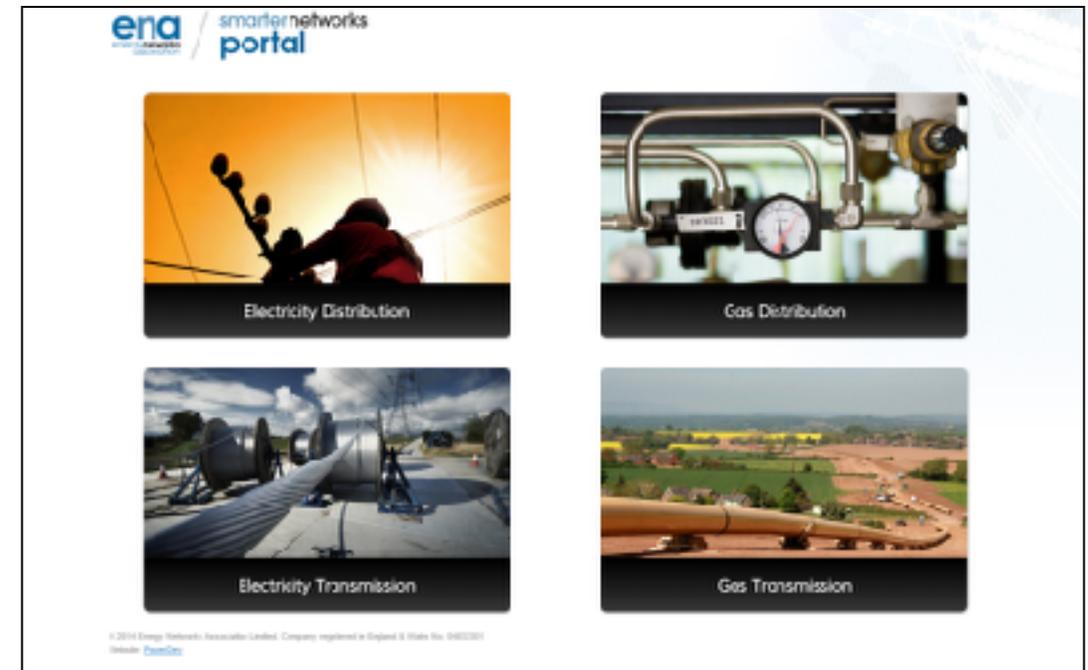


## Drivers of Change

- The growth of intermittent renewables connecting to the electricity distribution network and the possible electrification of some sources of heat and transport will profoundly impact on nature of electricity demand and supply with implications for electricity network infrastructure and the role of Distribution Network Operators (DNOs).
- Rapid increase in DG connections – 27GW DG now connected. 10GW of solar including 6GW in the last two years, massively surpassing recent expectations.
- Electrification of some heat and transport will significantly increase demand on the network and result in new, less predictable demand profiles.
- The pace and nature of change is unpredictable, and so electricity networks are working to adapt and become flexible.



- DNOs are already meeting the challenges of increasing DG and changing demand patterns by deploying new smart technologies on the networks. The distribution network is moving away from the traditional, passive role and is being run in a more intelligent and active way so that the operation responds in real time to demand and supply.
- These active networks will play a crucial role in reducing the need for investment in traditional network reinforcement, while maintaining network reliability in a low carbon energy system.
- Low Carbon Network Fund - between £4.5bn and £7.8bn net benefit to consumers from LCNF projects if they are rolled out across the UK. Project innovations already being transferred into Business as Usual for companies.
- **Close to £1bn of savings in ED1 business plans as a result of innovative solutions.**



# The Gas Networks

- The challenges of the low carbon transition will also require an approach, which recognises the vital role of gas and the gas networks in affordable and secure energy future. Currently over 80% of energy at peak time is derived from gas. The gas network will provide vital support to electricity infrastructure during peak usage both during the low carbon transition and as part of a lower carbon future. If the use of electric heating becomes more prevalent, the electricity network will also need to cope with greater seasonal peaks in winter.



**Customer Choice** - Gas is the fuel choice for UK consumers, meeting the heating needs of almost 85% of domestic properties and the cooking needs of around 50% residential and service sector buildings.



**Security** - Over 80% of peak energy usage is currently derived from gas. Without gas and the gas networks there is simply not enough energy for the UK to function or the means to transport that energy at peak periods.



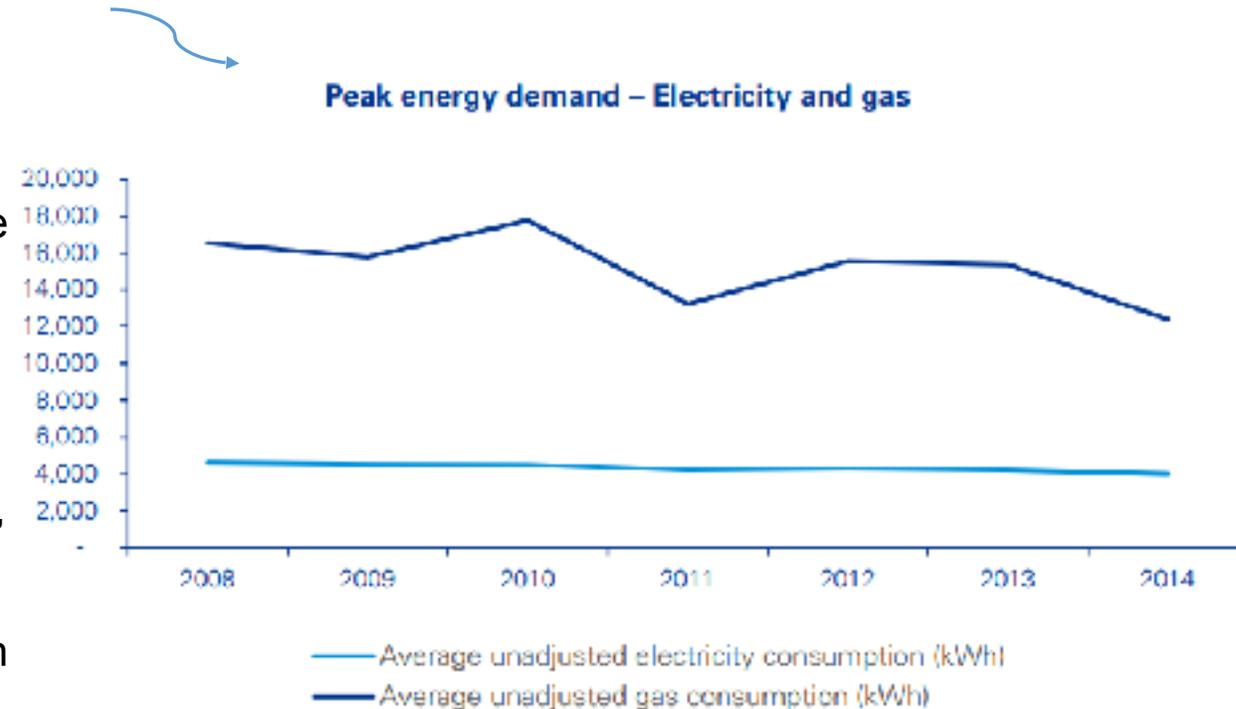
**Sustainability** - Peak gas and electricity demand is 25 times higher than existing low carbon capacity.



**Affordability** - Heating your home by gas is around 3 times cheaper than using electricity and saves consumers over £400 per annum compared to alternatives.

The energy trilemma is a challenge now, but will become more difficult by 2050 as interventions (with associated costs) will be needed to achieve decarbonisation policy aims. The trilemma is:

- **Security of supply:** The need to ensure we have enough energy to sustain our economy is a vitally important consideration for policy makers. This is particular important for supply energy at peak times.
- **Delivering energy efficiently:** As increased energy efficiency takes hold, there will still be a critical need to maintain the security of energy supplies. Gas remains a readily available source of energy for the GB market and this looks set to continue to be the case in the longer term.
- **Decarbonisation of heat:** The Climate Change Act 2008 commits the UK to reducing carbon emissions by at least 80% in 2050 from 1990 levels. The biggest driver of change across the energy sector is the reduction of carbon emissions across power, heat and transport. Decarbonisation of power is already well advanced but heat and transport are lagging significantly behind. Gas, as the major source of heat, will need to be decarbonised in some way.



Source: DECC, FCUK 2015 Tables 3.02

- There are a number of sources of green gas, such as biomethane and hydrogen, which can be used in our networks to provide heat and fuel for transport, and offer a range of benefits alongside their contribution to reduced carbon emissions.
- GDNs are leading innovation projects which are providing technical understanding of green gas injection into the grid, as well as demonstrating commercial potential and highlighting necessary regulatory changes to encourage growth in the sector.



## BIOMETHANE

60 Biomethane to Grid injection plants capable of producing 4.65 million Megawatts of renewable gas.



## BIO-SNG

National Grid demonstration plant in Swindon looking at turning domestic household waste into green gas for injection into the network.



## HYDROGEN

Northern Gas Networks H21 Leeds Citygate, which aims to investigate the challenges, benefits, risks and opportunities of converting the existing gas network in Leeds, to a hydrogen network.



## GAS IN VEHICLES

Green gas can make a significant contribution to decarbonising the transport sector, particularly HGVs. National Grid have connected the UK's first high pressure, CNG filling station for HGVs at Leyland.

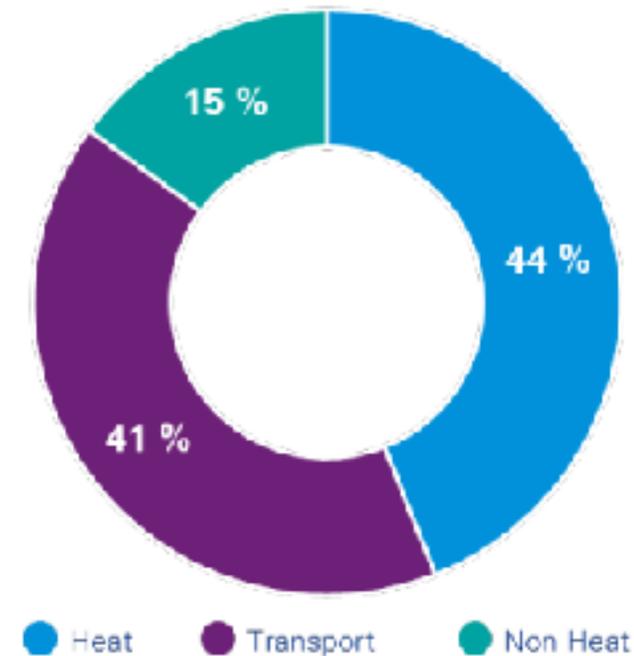
A recent KPMG report commissioned by ENA has demonstrated the vital role the gas network will play in supporting and mitigating the increasing demands on our electricity network from decarbonisation. **'The UK Gas Networks role in a 2050 whole energy system'** looked at four scenarios which show potential ways that energy demand, particularly heat demand, could be met in 2050.

Common assumptions were used across all scenarios. For example, each scenario meets the UK's 2050 carbon emissions target and under all scenarios, the 2050 electricity generation mix is assumed to comprise natural gas, renewables and nuclear.

In particular, the report looks at:

- The options for which fuels will be used to provide residential and commercial heat demand.
- The implications for our two major energy networks, the gas and electricity grids.
- The cost implications and impact of change at property and infrastructure levels.
- The impact of transport (road & rail) on decarbonisation.

Current GHG Omissions



Source: DECC

### 1 Evolution of Gas networks

- Gas remains the main heating fuel for the majority of customers
- Heat is partially decarbonised. The majority of customers convert to Hydrogen gas, derived from natural gas with CO2 permanently stored (sequestered) under the continental shelf.
- Transport is mostly decarbonised
- Gas distribution networks are mostly used for Hydrogen gas across the country.

### 3 Diversified energy sources

- A mixture of different technologies is used in different areas of the country
- Heat is partially decarbonised with a mixture of biomass sourced heat networks, gas and electric heating.
- Transport is partially decarbonised.
- Gas distribution networks only used in half of the country.

National infrastructure

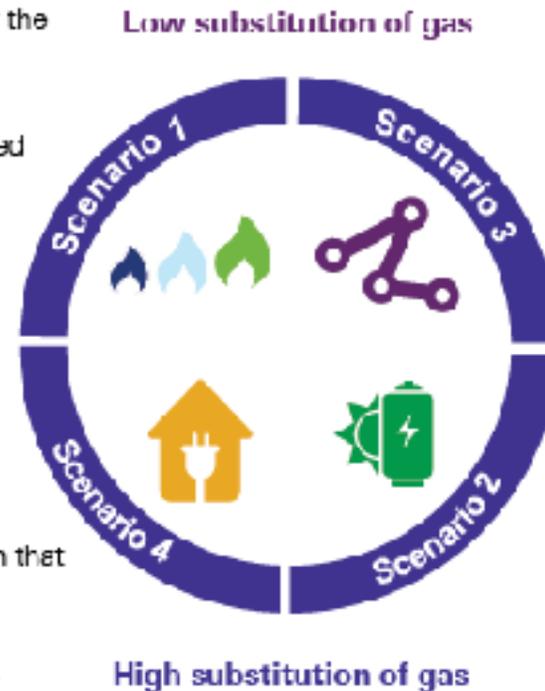
Local infrastructure

### 4 Electric Future

- Switch to electric heating systems.
- Heat is decarbonised with assumption that power generation is completely decarbonised by 2050.
  - Majority of Transport is decarbonised.
- Gas distribution networks not used.

### 2 Prosumer

- Self-generating heating and energy solutions develop, but only provide minority of energy, the rest use electric heating.
- Heat is decarbonised with a mixture of self-generating heat and storage, and electric heating.
  - Majority of Transport is decarbonised.
  - Gas distribution networks not used.



# Conclusions from the Report

	Practical obstacles	Incremental cost	Incremental cost per consumer up to 2050
Evolution of Gas	Low/Medium	£104-122bn	£1,500-5,000
Prosumer	Very high	£251-289bn	£11,000-12,500
Diversified energy	Medium/High	£150-188bn	£3,800-6,000
Electric Future	High	£274-318bn	£12,000-14,000

## Cost of Change

- Large investment will be needed to decarbonise the heat sector which ever option is chosen; meeting winter peak heating demand is a critical cost driver.
- Large investment will be needed to convert homes and businesses to new energy sources.
- Continuing to use the gas network offers significant savings versus alternative heating sources.

## Practicality of change

- Decarbonisation of heat will require a major fuel source change.
- Customers value the convenience and reliability of the current heat system, which presents a barrier to change
- Practical issues for customers such as space, affordability and changed performance present a barrier to change
- Major changes to energy systems and installation of new networks will face practical planning and installation challenges.

## Policy implications and recommendations



Policy and regulatory decisions are needed on the future for gas and heat. Without such decisions, there is a risk that families and businesses will pay more than they need to and decarbonisation targets will not be met.



But long term energy regulatory and market frameworks need to retain flexibility so as to deliver the best 'whole energy' solution for 2050.



Transport decarbonisation policy needs to be integrated with power and heat decarbonisation policy and planned over the same timescales.



Due to the long term nature of network investments, gas and electricity policy decisions need to be firmed up ahead of the next RIIO network price controls.



Major investment is needed to decarbonise gas and heat in the home. Funding and delivery decisions e.g. via energy supply or network companies, probably need to be taken by Government.



More detailed assessment on the acceptance of major change by consumers and society is needed, with regard to both policy and practicality aspects.



Gas and heat innovation funding and piloting needs to continue, especially in areas that help to firm up the understanding of options for 2050.

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