KPMG

Energising the North

An evaluation of the economic contribution of the energy sector to the North of England

A report for Northern Gas Networks

January 2017

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1 Executive summary

The new, post-EU referendum Government has signalled its intent to develop a 'modern industrial strategy' and to address the problem of uneven economic progress across the country[1]. The Chancellor's Autumn Statement in November 2016 reiterated the Government's intent and commitment to infrastructure and innovation in order to contribute to raising Britain's productivity[2]. The Government has also signalled its intent to harness innovation in energy systems to meet emissions targets at lowest cost.[3]

Northern Gas Networks (NGN) commissioned KPMG LLP to produce an independent report looking at the present and future economic contribution of the energy sector in the North of England (defined in this report as the Yorkshire and The Humber, North West and North East regions), and ways in which it can address the 'energy trilemma' of needing to balance the considerations of security of energy supply, decarbonisation and affordability.

The 'Northern energy economy' is already making an important contribution towards economic growth. The region has deployed projects, programmes and initiatives to address the energy trilemma. The region has developed potentially transformative low-carbon technologies of the future such as hydrogen networks. Its universities are conducting research into the smart energy networks that will be required in future to ensure security of supply in an energy system with high levels of distributed energy and intermittent renewables. It has already invested in proven low-carbon technologies such as biomass conversion. These initiatives have put the region in a good position to take advantage of the economic opportunities afforded by the ongoing decarbonisation of the UK. This means that, as the Government defines its new industrial strategy, the Northern energy economy has the potential to deliver jobs, innovation and investment.

Our analysis focuses on the energy sector as a driver of economic growth. Previous reviews identified energy as one of the North's four 'prime' capabilities. 'Prime' capabilities were identified as differentiated and distinctive at a pan-Northern

[1] 'The importance of industrial strategy' - Speech by Greg Clark, Secretary of State for Business, Energy and Industrial Strategy, to Institute of Directors annual conference, 27 September 2016. Available at: https://www.gov.uk/government/speeches/the-importance-of-industrial-strategy

[2] Autumn Statement 2016: The Chancellor's speech in full, 23 November 2016. Available at: http://www.telegraph.co.uk/business/2016/11/23/autumn-statement-chancellors-speech-full/

[3] https://www.gov.uk/government/speeches/greg-clark-speech-at-energy-uk

level, highly productive, and able to compete at national and international scales[4]. The sector also supports economic activity through the provision of safe, secure and affordable energy supplies. Continued investment in the Northern energy economy can help all sectors of the Northern economy to achieve their economic potential.

The key messages of our analysis are summarised as follows:

The Northern energy sector is already vibrant	The North plays an important role in energy innovation in the UK	The North has the potential to act as an 'energy leader' in the UK
The energy sector is already contributing to the Northern and UK economy. From 1997 to 2014, the Northern energy sector (comprising the North West, the North East and Yorkshire and The Humber) accounted for c23% of total UK economic value[5] for the energy[6] sector. In 2014, the Northern energy sector contributed some £3.5bn in GVA to the regional and the UK economy.	The North plays an important role in areas including smart grids, decarbonised gas (e.g. hydrogen), offshore wind and transport. Key projects include development of electric vehicles by Nissan in Sunderland, H21 City Gate Project in Leeds, the Smart Grids Centre based in Newcastle, the National Centre for Energy System Integration, the National Institute for Smart Data Innovation and the Siemens offshore wind turbine factory in Hull. Many other developments are also underway across the region.	We identify the potential for energy to increase GVA growth by up to £2.3bn by 2050 by building on existing capabilities and exploiting opportunities in smart power, decarbonised gas and transport. Innovation and efficiencies across these energy systems will be needed to realise secure, clean and lowest cost energy supplies.

We have developed a snapshot of the current annual economic activity associated with the 'Northern energy economy', in terms of Gross Value Added (GVA), disaggregated into its key component parts. GVA measures the contribution to the economy of each individual producer, industry or sector in the country/region in question[7].

Figure 1.1 shows the current adjusted breakdown of the energy sector GVA in the North of England. Our GVA baseline totals £3.5 billion in 2014 prices.

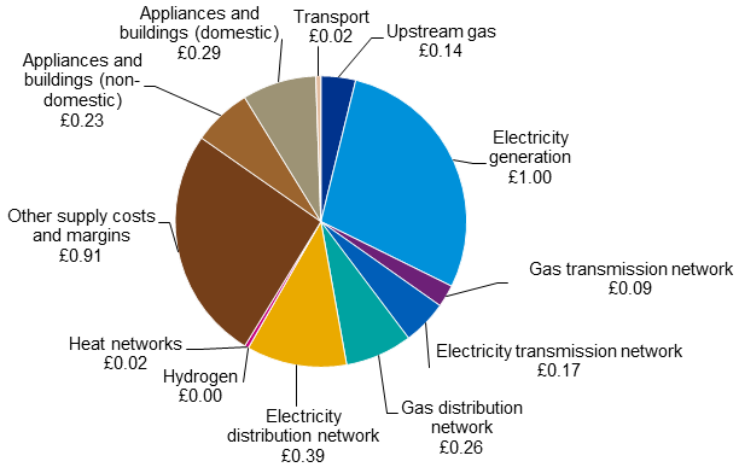
[4] SQW http://www.sqw.co.uk/files/5414/6723/8824/16987_-_TfN_-_NPH_IER_-_Executive_Summary_-_Final_24_June_2016.pdf (Prime sectors are defined as Advanced Manufacturing, Health Innovation, Energy and Digital).

[5] 'Economic value' defined as Gross Value Added (GVA). Figures taken from GVA (Income Approach) reference tables. Available at: http://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/regionalgrossvalueaddedincomeapproach

[6] This excludes oil & gas production and is defined as the electricity, gas, steam and air conditioning supply sector.

[7] ONS. Available at: http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/guide-method/method-quality/specific/economy/national-accounts/gva/relationship-gva-and-gdp/gross-value-added-and-gross-domestic-product.html

Figure 1.1 Breakdown of current energy sector GVA in the North of England (in £billion)



Source: KPMG analysis

Component	Description
Upstream gas	Gas extraction production and services
Electricity generation	Generation of electricity at power plants such as Drax, distributed generation, batteries, etc.
Gas/electricity transmission networks	Infrastructure, building and maintenance of pipes and transport services provided by the networks Conversion to hydrogen networks, appliance conversions, building of hydrogen production plants, CO2 transportation, investment in storage facilities (offshore gas fields, salt caverns), etc. Conversion to heat networks
Gas/electricity distribution networks	
Decarbonised gas (Hydrogen)	
Heat networks	
Other supply costs and margins	Energy supply businesses in the North
Appliances and buildings (domestic and non-domestic)	Appliances manufactured, designed, installed, repaired, etc. in the North
Transport	EVs, hydrogen fuel cell vehicles, ULEV components, batteries, etc.
Upstream gas	Gas extraction production and services
Electricity generation	Generation of electricity at power plants such as Drax, distributed generation, batteries, etc.
Gas/electricity transmission networks	Infrastructure, building and maintenance of pipes and transport services provided by the networks

In order to assess the future economic contribution of the Northern energy economy, we consider how GVA associated with each component part (as set out in Figure 1.1) will evolve in the period out to 2050. Given the considerable uncertainty around future economic growth, we plot growth prospects for each component part of the Northern energy economy under three different scenarios, or 'energy pathways', in which a different energy mix is used to meet expected future consumer demand.

For the purposes of this study, KPMG have developed three illustrative scenarios to quantify the economic growth of the energy in the North in terms of GVA and employment. Our scenarios are subject to a number of variables, all of which are uncertain. As such, the scenarios outlined in this report should be considered illustrative and should not be used for forecasting purposes.

All three energy pathways, summarised in Table 1.1, use technologies and fuels that are available and could, with the will and investment, start to be implemented today. We have chosen these scenarios from a published report that we completed earlier this year for the Energy Networks Association (ENA)[8], as representative of the different extremes of decarbonisation solutions.

Table 1.1 High level description of energy pathways used in our economic growth scenarios

Energy pathway	Description
Evolution of gas	Hydrogen becomes a key fuel in heat and transport.
Diversified energy sources	Uses a mix of heat networks, hydrogen, natural gas and electricity networks for heat and electric vehicles for transport.
No progression	Assumes that the energy mix used today remains the same to 2050 both in terms of fuels and demand proportions.

While we consider our analysis is an informative contribution to this matter, the uncertainty around the assumptions we make in each scenario means that the results of the calculations that are based on them, and the conclusions we reach in this report, are also subject to a significant level of subjectivity and uncertainty.

The results of our analysis are highlighted in the summary and charts below:

Estimated total GVA in 2050[9]

Scenario 1: £5.6 billion

Scenario 2: £5.8 billion

Scenario 3: £3.5 billion

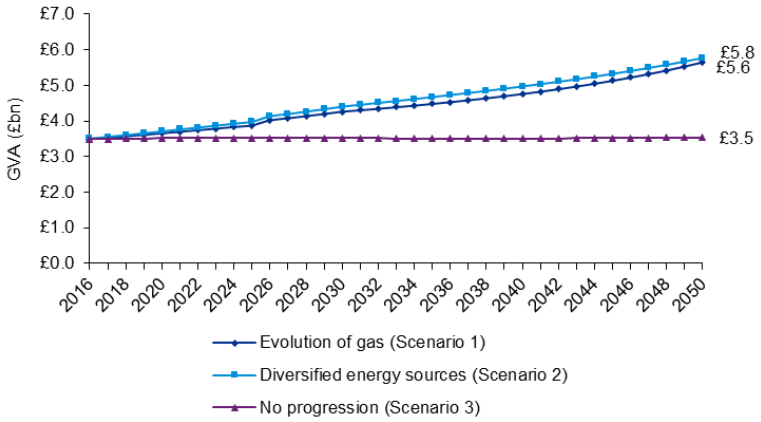
Total jobs in 2050[10]

Scenario 1: 68,674

Scenario 2: 83,956

Scenario 3: 61,098

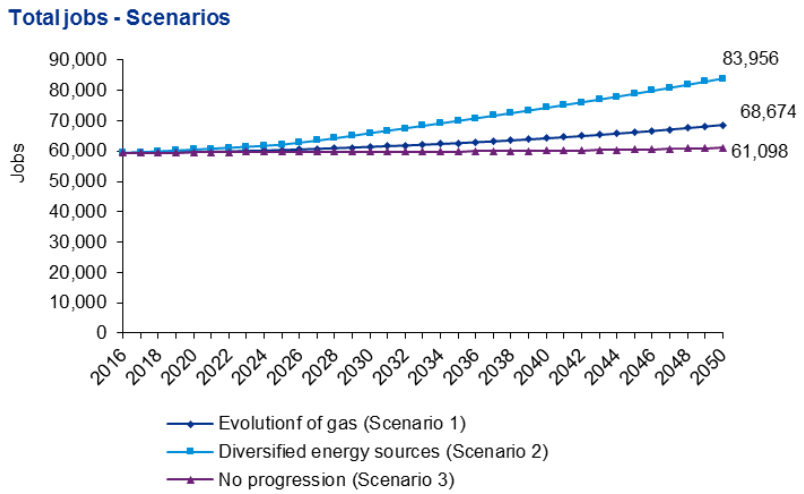
Total annual GVA to 2050 - Scenarios



8 https://www.energynetworks.org/assets/files/gas/futures/KPMG%20Future%20of%20Gas%20Main%20report%20plus%20appendices%20FINAL.pdf

9 Direct and indirect GVA.

10 Direct and indirect jobs.



It is worth noting that the difference in jobs between Scenarios 1 and 2 can be attributed to the fact that we have not included supply chain jobs related to hydrogen due to a lack of data to calculate these. We expect these to run into several thousands which would narrow this difference.

Meeting 2050 decarbonisation targets will be challenging. It will require changes to heat and transport energy supplies alongside decarbonisation of power.

Scenario 1 (Evolution of gas) assumes that gas provided to homes and businesses is decarbonised through the substitution of hydrogen for natural gas. Scenario 2 (Diversified energy sources) assumes that a mixture of hydrogen, heat networks and additional electrification substitutes for natural gas.

Scenario 2 shows a slightly higher economic activity than Scenario 1 because a diversified decarbonisation is likely to involve greater changes to existing infrastructure than the hydrogen solution in Scenario 1. Scenario 3 (No Progression) assumes that decarbonisation targets are not met, but existing energy assets are replaced with equivalent resources.

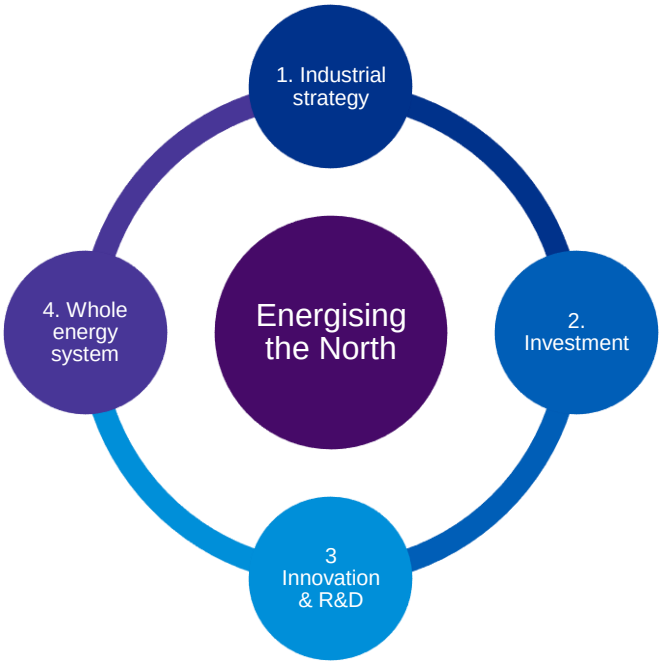
Making it happen

The future Northern energy economy is likely to comprise power, heat and transport in a more integrated way than currently exists. Expected key features of the future energy mix:

- Generation, but with a more diverse, low carbon fuel mix;
- Networks should remain vital to transport energy to consumers and businesses;
- Low carbon appliances and transport should become increasingly important; and
- Different parts of the power sector should become increasingly interlinked e.g. power and heat through hydrogen conversion, and transport and power through electric cars and HGVs. Delivering across these energy vectors in the most efficient and cost effective way will be an important factor to deliver low cost, secure, and clear energy supplies.

Given these developments and based on our analysis we have suggested four key ‘pillars’ that could enable the Northern energy economy to take advantage of the opportunities on offer. Embracing this could allow the North to play a full role in addressing the energy trilemma and increase the economic competitiveness of the region.

1 **Industrial strategy**: The Government is prioritising its industrial growth strategy, alongside meeting emissions targets. We suggest that low carbon energy should play a key role in an industrial strategy for the North. It could embrace the resourcing, training and skills provision that a growing and evolving energy sector requires, together with infrastructure (e.g. digital, transport) improvements that could drive increased productivity and enable growth.



2 **Investment:** Continuing investment should ensure that the Northern energy economy is able to meet the demand of the region and develop the low-carbon, decentralised, energy systems of the future. Investor confidence is vital in attracting the required investment to the North.

3 **Innovation & R&D**: Changing energy systems may offer considerable opportunities for innovation that can create new goods and services. The North already has capabilities in energy-related R&D, for example in relation to smart networks. It would be important that this focus is maintained (and even strengthened) in the future.

4 **Whole energy system**: Different parts of the energy system are becoming increasingly interlinked. Solutions developed in one sector can have implications elsewhere. For example, increased penetration of electric vehicles may have implications for the energy demand profile of households. By looking across customer needs for energy, the Northern energy economy could deliver the powerful synergies and efficiencies that benefit customers and businesses. Another example relates to the use of hydrogen to power vehicles – if hydrogen vehicles are adopted and rolled-out at scale, electrolyser systems could offer grid balancing services (which enhances the grid's ability to manage renewables) and power to gas storage, which would have an impact on the gas infrastructure.

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