

Industrial Strategy Response – A Vision from the Gas & Electricity Networks

Introduction

Energy Networks Association (ENA) represents the companies that operate and maintain the gas and electricity grid network in the UK and Ireland. Serving over 30 million customers, they are responsible for the transmission and distribution network of “wires and pipes” that keep our lights on, our homes warm and our businesses running.

Our energy networks have a strong track record of safely and securely providing the UK with the gas and electricity it needs, all whilst delivering for customers and the UK economy. It has done so in three key areas:

1. Trusted performance - UK energy networks are amongst the most reliable in the world and are recognised for their leading performance that meets the needs of all consumers, whether they be domestic and business.
2. Reduced costs - Network costs are now 17% lower than they were when at the time of privatisation and are projected to remain flat, and in some areas fall, into the next decade.
3. Investment & innovation - By 2020, the UK’s energy networks will have attracted some £80 billion of investment since 1990.

We warmly welcome the opportunity to respond to the Industrial Strategy Green Paper. This response includes our comments and suggestions on the proposed approach and ideas that are set out within it. It sets out a common and collective view of our members and focuses on how the networks will play a central role in achieving all of the ten pillars as set out in the strategy and emphasises how the networks are fundamental to achieving the strategy’s overall aim.

Overview

In this response you will see how ENA supports the development of a UK Industrial Strategy and its overarching objective to improve living standards and economic growth by increasing productivity and driving growth across the whole country. ENA also recognises the challenges set out in the strategy that must be met in delivering an enduring plan for the longer term that builds on our strengths and extends excellence into the future; closes the gap between the UK’s most productive

companies, industries, places and people and the rest; and makes the UK one of the most competitive places in the world to start or grow a business.

Energy, and the networks that deliver power and heat to our homes, businesses and industry across the UK, are a fundamental part of life in a modern, advanced society and play into the ten pillars identified in the strategy that drive growth. Energy is an essential public service and the lifeblood of a modern economy. If the Government's Industrial Strategy is to succeed then reliable, resilient and efficient energy networks will need to continue to demonstrate outstanding service and value for money and remain crucial to meeting future challenges and ensuring UK customers have access to secure, sustainable and affordable energy in the years to come.

Our response, therefore, not only sets out the important role that networks play now in delivering secure, low-carbon energy supplies at minimal cost to consumers, but also highlights the challenges faced in delivering the networks of the future and the conditions that we need to create for the benefits that this can deliver to be realised.

Looking ahead, the way in which we design, invest in and operate our energy networks will become increasingly central to delivering affordable energy and clean growth and the wider long-term vision set out in the government's strategy.

Decarbonisation is changing our energy system rapidly and the way in which energy is produced, supplied and consumed is very different from only a few years ago. The pace of change we are seeing is set to accelerate as take up of new technologies such as smart meters, energy storage and electric vehicles increases and consumers are seeing greater choice and control over the way in which they to use energy. For example, decarbonising the heat sector with hydrogen will make a major contribution to meeting the UK's obligations under the Climate Change Act and parts of the gas sector, such as Northern Gas Networks, have led projects which demonstrate the viability of taking this step.

Network companies have been quick to respond to these changing demands and innovate to remove barriers and facilitate investment in and take-up of low-carbon solutions. But the pace of change can be expected to hasten over the next decade and beyond, bringing unprecedented challenges in the way in which we design, operate and manage our networks.

Our members believe meeting these future challenges and maximising the contribution energy networks can make to clean growth will require greater co-ordination, one where industry, government and regulator share a common vision and shared responsibility with the aim of delivering outcomes for the benefit of the UK.

To this end we have identified a number of ways which the networks can facilitate the low carbon future, while reducing the bills of customers and ensuring secure energy supplies to UK consumers:

- Facilitating the development of the smart grid, and hence creating a level-playing field in which low carbon technologies and new 'flexible' service providers can flourish
- Utilising extensive gas network infrastructure in an innovative way to deliver new solutions for low carbon heat; including the injection of green gas such as biomethane into the grid.
- Helping to reduce customers' bills by increasing their interaction with the smart grid, opening up their options and investing in innovative solutions instead of traditional reinforcement
- Provision of a long-term stable regulatory environment that seeks to minimise risk and maximise investor confidence, delivering capitalisation and future investment needed in our networks;
- Continued commitment to innovation, not only in the development and introduction of new technologies and techniques, but in the regulatory frameworks under which networks operate, with barriers removed and new ideas & approaches encouraged;
- Industry change processes that are 'fit for purpose' being responsive to and effectively facilitating change in a rapidly changing environment;

In the following sections of our response, we expand on these and other aspects of the networks and how they will contribute to the Industrial Strategy and its objectives. Our response sets out the role that networks currently play in delivering energy to consumers of all types and its contribution to our economy; identifies some of the challenges networks face in continuing to be the enablers of a future resilient, affordable, low carbon energy system, sets out what we are doing to address those

challenges, and what the government can do to help remove potential barriers and risks. It also identifies new potential business opportunities the networks help to facilitate, where the UK can be a world leader and drive growth across the whole of the country.

1. The Energy Networks: A cornerstone of the economy, facilitating growth in all regions of the country.

Networks are a cornerstone of the UK economy and are recognised the world over for their leading performance that places current and future consumers, domestic and business alike at the forefront of everything they do with over 30 million customers served by our gas and electricity networks. Networks have invested over £80bn since 1990 in replacing, extending and upgrading infrastructure. This investment has driven improved performance and has delivered amongst the safest, most reliable, efficient and sustainable networks in the world.

The networks provide employment in every town, city and region of the UK, directly employing over 30,000 people, with further jobs across the supply chain, including a high proportion that are highly skilled and high value. The networks play a significant role regionally and have forged and continue to build upon close working relationships with Local Authorities, universities and educational establishments.

The regional importance of networks cannot be underestimated, with networks facilitating growth across all areas of the country by ensuring businesses and industries are connected to the energy networks. Investment in the networks has allowed for more domestic and business consumers to be connected to a secure supply of energy, with around 100,000 new consumers connected to the local electricity distribution network each year and over 61,000 new gas connections in 2015/16 alone.

The networks continually provide a world leading service, performing strongly against key outputs set by the regulator for reliability, safety, customer satisfaction and the environment. The electricity networks are amongst the most reliable in Europe. Last year, power cut occurrence fell by 9%, with a reduction of over 50% over the last fifteen year period. On average, electricity customers will experience an interruption only once every two years and lose just 40 minutes of power a year. The gas networks also continue to improve to a level whereby if you're on the gas network your supply will be interrupted only once every 40 years.

All network sectors deliver customer satisfaction scores that would be the envy of virtually any other industry or company. Regular satisfaction surveys conducted by Ofgem with a range of customers shows consistent satisfaction of more than 80% in

the services provided by network companies, putting networks above any energy supply company and amongst the very best performers in the UK Customer Satisfaction Index.

1.2 Energy Costs

As highlighted in the industrial strategy, in order for businesses to grow, it is essential to keep energy costs down and for changes to energy infrastructure triggered by new technology to be coordinated. The costs of maintaining and operating the UK's networks is paid for by customers through their energy bills, and represents around 23% of the average dual fuel bill. For an annual cost of £85.03, or 23p a day, UK customers benefit from over 1 million kilometres of electricity network infrastructure. The average domestic customer bill for gas distribution networks is £130.49, which amounts to 36p per day for an extensive gas network which connects 85% of households to a secure and reliable energy source and provides 80% of the UK's overall energy during peak periods. Network costs have fallen 17% since privatisation in the 1990s, with costs projected to remain flat in real terms into the next decade. UK network costs compare favourably with other countries, with UK customers paying below the European average for both gas and electricity networks.

ENA welcomes the Government's plans to set out a long-term roadmap to minimise business energy costs and the need for transparency and open discussion on this topic. As tightly regulated companies, the networks are the most transparent part of the energy industry and reports by the regulator (OFGEM) provide clarity and detail on networks expenditure and the value customers are getting for their money. The networks have a strong record of investing in vital infrastructure whilst improving performance and keeping costs low. The strict price controls ensure that network returns are incentive based and dependent on companies providing a very high level of service for customers ensuring that the better the networks perform, the greater the benefit to the customer.

2. Future Challenges

In order for the networks to continue to deliver this high level of performance, the sector is adapting to the challenges set out in the Industrial Strategy. Networks are already connecting new distributed energy resources and facilitating new low carbon technologies. These challenges will increase as we progress further towards 2050

carbon reduction targets and uptake of new technologies increases. By embracing innovative solutions across gas and electricity networks the UK has made a strong start in facilitating the move to a smarter energy system, and we are well placed to become a world leader in the increasingly important global smart grid market.

2.1 Supporting Clean Growth

One of the major challenges as set out in the Industrial Strategy is ensuring affordable energy and clean growth. The UK has an ambitious 2050 decarbonisation target to reduce emissions by at least 80% based on 1990 levels and the networks will play an important role in achieving this. We expect networks will not only be key enablers of low carbon technologies such as new nuclear, wind, energy storage, low-carbon gas and electric vehicles, but of major infrastructure projects and government initiatives such as HS2 and the Northern Powerhouse. Given the interaction between different parts of the energy market and wider economy, we need a ‘whole system’ approach which recognises and exploits the synergies between electricity and gas through the application of new technologies and processes, which will be dictated by cost reductions and competitive forces.

2.2 Innovation

Innovation is at the heart of this transformation of our networks, driven by the need to adapt to the challenges associated with decarbonisation and to use new technologies to help continue to deliver secure and affordable energy in a low carbon future. In recent years our networks have become the most innovative part of the energy industry, not only in the way our existing networks are most efficiently and effectively utilised, but in the frameworks under which they are regulated and as a platform for the testing and integration of new technologies.¹

This has been enabled by network innovation projects funded through the Low Carbon Network Fund (LCNF) and RIIO regulatory framework. The learnings from these projects have delivered vital technical understanding of technologies like energy storage and demand side response mechanisms to allow DNOs to make significant

¹ [Smarter Network Portal](#)

progress towards a DSO role in a short space of time. The RIIO regulatory framework introduced in 2013 has extended this approach to foster innovation across the electricity and gas network sectors. The networks companies share this knowledge through the Smarter Networks Portal to ensure that industry and therefore all customers can benefit from the findings from LCNF and RIIO innovation projects.

This approach to innovation has been vital and has helped to place the UK as a world leader in the development of smart networks of the future and as a catalyst for the development of products, know-how and capability that will enable the UK to capture an increasing share of emerging global markets for these ‘smart’ products and services. Smart network solutions are being rolled into ‘business as usual’ for companies and have already enabled close to £1bn of cost savings for customers to be embedded within the current RIIO ED1 price control which runs to 2023.

Innovation in the gas and electricity network sectors is facilitating the rapid connection of renewable sources of energy and is continuing to underpin the UK economy. Innovation in smarter networks can deliver new opportunities for economic growth and employment across all regions of the UK, with an estimated potential of £13 billion of Gross Value Added, £5 billion of potential exports to 2050 and 8,000 – 9,000 jobs over the 2020s and 2030s associated with smart grids.²

The UK is well placed to become a world leader in this increasingly important field if the correct regulatory and policy frameworks are implemented. It is important that the regulatory frameworks provide enough room for the networks to fulfil their aspirations in innovation. For example, NGN’s work has suggested that the switchover to a Hydrogen gas network could happen within the regulatory framework with negligible customer price impact. It is important that the frameworks incentivise this behaviour.

Gas network companies are pioneering new green gas technologies to help meet low carbon heat demand. The potential for hydrogen and biomethane to be delivered through our extensive gas network infrastructure is increasingly seen as a technically and economically feasible way to overcome the significant challenge of decarbonising heat. Over 80 sites in the UK are injecting green gas into the distribution network, already contributing more than 2.5TWh to domestic gas production³. It also presents an opportunity to make the UK a world leader in these sectors and to drive growth across the whole country: further detail on this opportunity is provided in Section 3.

² DECC, ‘Delivering UK Energy Investment: Networks’ (2015)

³ <https://www.gov.uk/government/statistics/rhi-deployment-data-february-2017>

2.3 The transition from DNO to Distribution System Operator

Delivering a secure and affordable low carbon energy system and facilitating clean growth, will require the traditional roles and responsibilities of network companies to change. The traditional role of the electricity distribution networks in the energy market has been relatively passive; taking electricity in one direction, from centralised sources of generation, such as traditional coal-fired power plants, to a consumer who uses it with relatively predictable levels of demand.

New energy technologies that offer consumers greater control over their energy use are disrupting this model, which has remained largely unchanged for well-over a century. The growth of intermittent renewables connecting to the electricity distribution network and the growth in electric heat and transport is already impacting on the nature of Distribution Network Operators (DNO), who operate local electricity networks, and the wider energy market.

- Distribution System Operator

The role of DNOs has already begun to change. As new energy technology has been installed, they have had to learn to manage electricity generated at a local level as well. This change has largely been driven by the rapid increase in smaller-scale, low carbon technology. There is now over 28GW of generation connected to the distribution network, which has required DNOs to use real time data to make interventions on their networks to maximise the efficient use of flexible generation and demand and keep costs down for customers. As a result, DNOs are now taking on an increasing number of 'system operator' type functions – traditionally the preserve of the National Grid at a more national level.

These changes are the first steps in a transition for DNOs towards an empowered Distribution System Operator (DSO) role, whereby they act as the active system operator at the local distribution level rather than passively delivering electricity from the high voltage national grid. This transition has in part been enabled by network innovation projects funded through the Low Carbon Network Fund and RIIO regulatory framework. The learnings from these projects have delivered vital technical understanding of technologies like energy storage and demand side response mechanisms to allow DNOs to make significant progress towards a DSO role.

DNOs have adapted effectively to facilitate a rapid increase in distributed generation, as part of the wider progression towards a smarter network and a more flexible energy system. The technical governance and understanding is in place to meet the new challenges. As the uptake of distributed energy resources and new low carbon technologies increases, now is the time to consider changes to upscale capability and

capacity for active management of the network at the distribution level. For example, digital connectivity and the rollout of 5G offers significant potential in terms of facilitating the DNO to DSO transition.

- TSO-DSO Project

The DSO evolution cannot be viewed in isolation as it will have a significant impact across the system and have implications for the way distribution operators interact with service providers and other parties. Transmission and distribution network operators have already had to respond to the rapid increase in distribution generator connections, by addressing operational issues caused by an increasing amount of energy flowing back onto the distribution network and being exported onto the transmission network.

There is now a need for greater collaboration between network companies and industry stakeholders to utilise new energy technologies, such demand-side response and storage, as part of business-as-usual.

ENA has launched a major programme of work to consider these changes and the impact of the DSO transition across the system and particularly the need for closer working between network operators at the transmission and distribution level. The TSO-DSO project will bring network operators and key stakeholders together to explore some of the detailed challenges around evolving roles and responsibilities in the short, medium and long term to ensure that the best models for UK customers are identified and taken forward. This work will be essential to delivering affordable energy and clean growth and to ensuring that the UK networks sector continues to be seen as world-leading.

There are several development areas that have been identified that will form part of the TSO-DSO project which will include: system security and benefits to customers; ensuring transparency of contracted actions to facilitate the market to provide network solutions in a whole system view; improving forecasting; reviewing connection arrangements; EU codes, planning standards & LCTs; and considering how Independent Distribution Network Operators (IDNOs) and private wire networks are reflected in TSO-DSO developments.

It is essential that thinking on this topic is customer centric so that changes are designed to advance the public interest, rather than being designed around technologies or existing industry processes and structures. There is a customer experience workstream envisaged in ENA's TSO-DSO project to ensure that this remains a focus. It is also important that risks are properly managed as the transition towards actively managing a very high number of devices instead of the traditional

situation of managing a small number carries significant threats, particularly in terms of security. The ENA is well placed to understand these risks and facilitate industry change that protects customers.

2.4 Regulatory and commercial barriers to flexible energy

- Enabling Storage

As highlighted in the Industrial Strategy Green Paper, there is huge potential for the UK to be a world leader in energy storage. The UK will only be able to realise this potential if its energy networks are able to support its development and deployment. Storage on the electricity distribution network can play a role alongside other solutions in meeting the challenge of increased variability from renewable generation.

Through innovation funding mechanisms network companies have trialled storage technologies and explored the potential of battery storage technology to deliver benefits to customers.

For battery storage to play a role in the balancing of the network in a low carbon future, there needs to be further clarity on how it is treated from a regulatory perspective. There is ambiguity within the existing framework as to whether DNOs can own and operate storage assets where that involves buying and selling energy into the market. ENA members believe storage has an important role to play in addressing network challenges and therefore should be available to network operators to support their networks.

Storage needs to be considered as one potential form of flexibility and all different forms of distributed energy resource should be treated on a level playing field. In some cases, bidirectional electricity storage (e.g. batteries, but not exclusively), because of its need to charge and discharge, can increase rather than reduce network loading where other solutions (such as energy vector - heat or hydrogen) do not. We need to ensure that the market place provides equal and fair access and charging arrangements for all types of flexibility without artificially distorting the market to certain types.

Our members support flexibility, including storage, being procured from the competitive market place as a commercial service. However, we do not yet know if the commercial market place can provide viable storage services in the highly location specific manner networks may need, therefore we believe that the option to allow network operators to own and operate storage in the future, where it can provide

benefits to consumers but where the market place cannot provide it, should not be precluded at this stage.

Storage, and flexibility more generally, must be considered as part of a whole system solution to deliver benefits to customers with closer working between the System Operator and network operators. There needs to be clarity on which services can be stacked and how to deliver whole system benefits so that certainty is provided for investment/innovation. This is likely to encompass more access to information across industry parties. This is likely to be an evolutionary development path, but there needs to be a development initiative to consider this and this is a priority for consideration in the ENA's TSO-DSO project in 2017.

- Network charges and price signals for flexibility

ENA members agree that current use of system and connection charging arrangements will need to develop to meet the needs of a smart, flexible energy system.

Our members have identified a number of current issues that are likely to merit consideration in the near future. We will define these issues as a priority for 2017 within ENA's TSO-DSO Project so that we can better scope what changes we believe might be required and how they might be implemented mindful of other industry initiatives (e.g. Ofgem's work on charging arrangements for embedded generation).

It is important that charging mechanisms should reflect principles of:

- Harmonised charging methodologies across Transmission and Distribution to deliver the best value for customers.
 - Equality in charging to ensure that all flexibility providers and customers are presented with a level playing field.
- Developing Carbon Capture and Storage

In our future energy system Carbon Capture and Storage could have an important role to play, particularly in facilitating decarbonised gas: capturing and storing carbon from steam methane reformation would produce low carbon hydrogen that would then have zero greenhouse gas emissions at the point of use. Northern Gas Networks' H21 project has provided valuable learning on the feasibility of hydrogen including the role of CCS technology.

Given its potential use in other areas of the economy, CCS should be a key part of the Industrial Strategy, and the government should identify clusters (e.g. for hydrogen production) where it can be promoted. This could include areas with heavy industry, and those with access to potential storage assets in the North Sea.

2.5 Skills

In order to tackle new challenges which come with the UK's aspiration of a low carbon economy and deliver this transition, dedicated groups of skilled people equipped to build and maintain the smarter network will be required. Despite these challenges being met with increased investment in innovation and development, research indicates an impending problem with the availability of skills. ENA welcomes the inclusion of skills as one of the key pillars of the industrial strategy and the recognition of the importance of developing skills.

The networks and the wider energy sector have seen a shrinking workforce despite a lower than average sector turnover of 3-5%. It is not just our infrastructure that is ageing but key workers, particularly those in technical and crafts roles. Our networks are facing a skills gap which has the potential to be the biggest barrier to innovation and smart grid development over the coming years accompanied by a higher than average number of 'hard to fill' vacancies (36%) .

An ageing workforce demographic means that we are going to see a huge amount of experience leaving the industry over the next decade, with a peak year of retirement in 2024. Augmenting the issue is a large number of forecasted natural wastage; and a need for re-skilling, up-skilling and retention of existing staff to accommodate the integration of low carbon technologies. The Energy & Efficiency Industrial Partnership states that 221,000 new recruits will be required in the Energy and Utility sector within the next 10 years, with over 50% of the sector's workforce leaving or retiring by 2023 with others moving to other sectors.⁴

In electricity networks, we will need to employ over 15,000 people by 2023 to maintain current workforce levels, representing 74% of the workforce today. Within the distribution network workforce, 27% of staff is aged 53 years or more. In the gas sector, data shows that for a 15 year period between 2011 and 2025 around 4,277 FTEs are expected to retire from the industry. Nearly 1,000 of these are expected to be amongst those working at highly qualified/experienced management levels. The skills gap is also an issue across the energy sector and one that needs to be addressed urgently.⁵

The industry is working to bridge this gap and has a strong track record in investment in skills development through individual and collaborative efforts, for example the work

⁴ Energy & Utilities Workforce Renewal & Skills Strategy 2020

⁵ EU Skills Workforce Planning Model

of EU Skills and the National Skills Academy for Power. This encourages a partnership approach to developing the skilled workforce needed through a variety of employer led and Government initiatives on apprenticeships (Trailblazer, Apprenticeship Levy), sector specific qualifications and standards, and the delivery of high quality training, assessment and assurance.

These challenges apply not only to the network businesses but to the contractor supply chain, which now comprises a significant part of the workforce. A number of initiatives have therefore been implemented, including the Energy & Utilities Skills Partnership and Skills Accord, in order to promote sustained investment throughout the sector.

All of this work is supported by a commitment to long term workforce planning and the development of strategy models that provide the robust industry intelligence needed to address future skills requirements.

With the number and range of required skills increasing in line with the development of a smart energy system, the Industrial Strategy will need to consider how to ensure that the UK has the necessary skills base as a priority. This will need to form part of wider commitment to developing a safe, skilled and sustainable workforce that also possesses the skills and competencies to deliver the required infrastructure investment within the RIIO price control framework.

3 Achieving UK environmental goals at lowest cost

3.1 Decarbonisation of Heat

Decarbonisation of heat and transport is a major challenge for the UK economy. Energy used for heat accounts (in terms of final consumption) for approximately 45% of our total energy needs, and is critical for families to heat their homes on winter days. Gas is the fuel of choice for UK consumers meeting the heating demands of almost 85% of domestic properties and the cooking needs of around 50% of residential and service sector buildings. Over 80% of peak energy usage is currently derived from gas and without the gas grid there is simply not enough energy for the UK to function, or the means to transport that energy to end users during peak periods. With the population expected to increase by 22% by 2050, total energy demand will increase significantly.

Whilst electrification of heat can play a role in some areas, full electrification is unlikely to be a viable solution to meeting low carbon heat demand. The gas network will be required to mitigate the increased demand on the electricity networks from low carbon technologies such as heat pumps and electric vehicles. Reinforcing the electricity

network to meet peak heat demand in winter alone, if possible, has shown to be an expensive pathway for the decarbonisation of heat. KPMG's study of 2050 Energy Scenarios found that decarbonising gas would be the most cost-effective scenario for meeting overall UK heat demand and complying with the Climate Change Act.

The UK's gas network is an extremely valuable asset and a feat of engineering that has helped industry to grow and provided an affordable way to heat our homes over many decades. It will have an important transitional role to play in a holistic approach to meeting carbon reduction targets, which considers affordability, energy security and customer choice. Decarbonising gas will play a major role in meeting global carbon reduction commitments, and there is an opportunity for the UK to develop technology and expertise which can be exported around the world.

3.2 Green Gas and Low Carbon Heat

As well as being vital to meeting heat demand in the short term and over the transition to a low carbon future, the gas networks can play a long term role in a sustainable energy system through the injection of green gas into the grid. The gas networks are exploring new and innovative technology which presents an exciting opportunity for the UK which could not only contribute to the UK achieving its environmental targets but boost the UK economy and regenerate regions and make the UK a world leader in these sectors. The projects currently underway are located in different regions of the UK and will ensure growth across the whole country, contributing to the government's aim of rebalancing the economy.

Developing green sources of gas makes use of the UK's extensive gas grid, avoiding infrastructure or decommissioning costs which might otherwise be incurred. They provide minimal disruption to consumers compared to heating technologies which require extensive changes in the home.

- Hydrogen

Of the various forms of green gas which could be injected into the network, hydrogen offers an area of exciting potential. While there are still uncertainties surrounding its availability and cost it could play a significant role in meeting future heating requirements, as it does in Hong Kong where 49% of the town gas mix is hydrogen. Hydrogen leaves no carbon footprint as the combustion of hydrogen with oxygen results in water and heat. The use of hydrogen rich gas in the UK networks is also not a new concept, as demonstrated by the historic use of town gas in this country. Studies

have shown that customers' existing appliances could operate safely with up to 10% hydrogen concentration.

Northern Gas Networks and its partners are leading an innovative trial, H21 Leeds Citygate, which aims to investigate the challenges, benefits, risks and opportunities of converting the existing gas network in a major UK city, Leeds, to a hydrogen network. The study is designed as a blue print which would be transferable to other UK cities where the decarbonisation of heat, transportation and electricity is much more difficult but also provides the biggest return on carbon reduction.

In addition National Grid Gas Distribution and Northern Gas Networks' 'HyDeploy' project will demonstrate that natural gas containing levels of hydrogen (10% to 20%) beyond those permitted by the current safety standards (0.1%) can be distributed and utilised safely.

SGN are committed to a 100% hydrogen network demonstration in Scotland and are currently undertaking feasibility studies for 3 sites, seeking to select the most economic and viable location. Each site will be scalable and will look to utilise the hydrogen infrastructure in place for other applications including hydrogen vehicles and Combined Heat and Power (CHP) applications.

- Biomethane

Biomethane injection into the grid has seen rapid growth in recent years, driven by GDN innovation and Government support through the Renewable Heat Incentive (RHI). The Non Domestic RHI provides support to 58 biomethane to grid plants across the UK already, and a further 28 have applied for the scheme. By January 2016, 2.35 TWh of renewable gas had been injected into the grid.

The Government's target is for 12% of heat demand to be met by renewable sources by 2020, and biomethane has the potential to meet over 10% of domestic UK heat demand by that year.

As well contributing to a reduction in carbon emissions, the injection of biomethane into the grid offers wider benefits to the whole energy system in terms of affordability, security and customer choice. Furthermore, biomethane does not require new domestic appliances to be installed, meaning further cost savings for bill payers and making it an attractive option for customer's heating needs.

In addition to environmental and financial benefits of biomethane to grid, it offers a source of domestic gas which increases the diversity and security of supply, reducing the UK's reliance on foreign imports.

Continued support through the RHI will be crucial for biomethane to grid to continue the impressive contribution it is making to 2020 renewable heat targets.

- BioSNG

Alongside biomethane, GDNs are investigating ways to make efficient use of domestic waste in meeting heat demand, helping to deliver a more circular economy. Through the Gas Network Innovation Competition established by Ofgem, National Grid Gas Distribution has launched a project looking at turning household waste into gas which can be injected into the gas network.

The project is developing a demonstration plant in Swindon, which processes refuse derived fuel into pipeline-quality bio-substitute natural gas (BioSNG) that is indistinguishable from 'normal' gas used for heating and cooking. The construction and commissioning of the BioSNG pilot plant is now complete. By early in the next decade a fleet of BioSNG plants could be in operation, delivering large quantities of renewable gas into Britain's gas pipeline network.

The Committee on Climate Change (CCC) have described action to support low carbon gas as 'low regrets' in the short term, while the Government builds its evidence base on longer term heat policy options. Support for Bio-SNG reduces carbon emissions in the short term, and will help develop a world-leading UK industrial base for low carbon gas.

4. Low Emission Vehicles

Tackling emissions in the transport sector will clearly be vital if the UK is to meet its ambitious carbon reduction targets, and it is in this area where electric vehicles and the use of low carbon gas in vehicles can make a crucial contribution. Low emission vehicles can also help to combat the growing air pollution crisis, where the UK has persistently breached air pollution limits set under EU law. The networks have a central role in the facilitation of ultra-low emission vehicles.

- Electric Vehicles

DNOs are anticipating an increase in demand on their network from a growing number of electric vehicle (EV) charging points, and more people charging EVs at home. As well as increasing demand on the network, electric vehicles present a number of challenges for DNOs associated with simultaneous charging of cars at peak times, particularly in clusters, and a greater level of unpredictable demand. Despite these challenges EVs can provide a valuable source of flexibility, particularly in the short term, as they can be used to balance the variability of low carbon generation whilst utilisation existing infrastructure.

In order to facilitate these changes in electricity demand DNOs are working closely with partners, including OLEV, to ensure that infrastructure is able to meet the challenges posed by EVs in the years ahead. DNOs also work with stakeholders to feed into the development of UK standards for electric vehicles, charging connections and charging infrastructure.

In order to maximise the use of EVs (and storage assets more generally) and minimise the impact on the networks it is necessary to:

- Promote and engage customers on the benefits of smart charging.
- Develop the supporting infrastructure for EVs that technology and commercial standards develop to enable visibility and control smart charging of vehicles. It will be essential that electricity networks have visibility of the location, availability and dynamic usage of charging infrastructure. Standards will also allow for safe, secure, and interoperable smart charging to be realised.
- Encourage the Government to coordinate an approach to accessing EV charging infrastructure that meets the needs of the industry and consumers. Collaborative work from ENA members has included a high level assessment of the potential impact of more widespread roll-out of EV and the associated smart-charging infrastructure. This work included an analysis of the potential network investment cost to support charging infrastructure for EVs, which identified that there would be a need for substantial investments between now and 2040.
- Determine how best to embrace the large potential of vehicle-2-grid services for the benefit of both the end user and the network operators

- Gas in Vehicles

The use of gas in vehicles can make an important contribution to reducing emissions in the transport sector, particularly in the transportation of heavy goods as the electrification of Heavy Goods Vehicles (HGV) is not currently practical.

HGVs account for 20% of the UK's carbon emissions. Natural Gas Vehicles (NGVs) not only produce lower levels of greenhouse gas than diesel engine alternatives, but could also provide up to 40% fuel cost savings compared with diesel. Gas vehicles could provide up to 28% reduction in CO2 emissions in the transportation of goods in the UK.

National Grid have connected the UK's first high pressure, public-access Compressed Natural Gas (CNG) filling station for HGVs at Leyland, which is capable of 'fast filling' over 500 HGVs a day. John Lewis Partnership has signed up to use the station for refuelling its fleet of HGV's as part of the company's commitment to reducing its carbon footprint. When fully operational the plant will be able to reduce greenhouse gas emissions by more than 5000 tonnes per year.

Northern Gas Networks are also working with Leeds City Council on a similar CNG project. The Department for Transport are considering further changes to the support mechanism for renewable fuels including gas, and the Government needs to ensure that this is joined up with an infrastructure strategy that provides sufficient refuelling capacity.

Concluding remarks: the importance of our energy networks to delivering the Industrial Strategy

Energy will be at the heart of the industrial strategy. It underpins all ten of the pillars and is essential to meeting the overall aim to improve living standards and economic growth by increasing productivity and driving growth across the whole country. Without efficient, secure, low cost and low carbon energy, this will not be possible. As highlighted, the UK's network companies are already adapting critical infrastructure and trialling smart technologies to facilitate the transition to a low carbon energy system and enable the industrial strategy to deliver economic growth in line with the UK's carbon reduction commitments. It is important to remember that all countries are facing the same challenges as the UK and this presents a big opportunity. If we invest in innovation now, the UK can cement its status as world leader in an increasingly important global field.

In conclusion, we believe that the Industrial Strategy must deliver the following to be successful:

- **Whole Systems Approach:** The current regulatory framework requires development to align mechanisms for network operators to take a view across the system as a whole and there is a greater need to ensure that investments to support the whole system are supported by the efficiency framework. This must be addressed to facilitate the market and deliver the best value for customers through efficient traditional and smart investment.
 - **Recognise the evolving nature of our electricity networks:** Our electricity networks are evolving, in response to new energy technologies which are able to offer more control over the way in which we generate and use electricity, helping deliver better value for customers.
 - **Long term skills strategy:** in order to address the skills issues, a long term skills strategy is required. ENA members support many of the messages and proposed approach to skills outlined in Energy and Utility Skills Partnership's 'Workforce Renewal and Skills Strategy'⁶.
 - **Attractive environment to investors:** the market for the new technology highlighted in our response (e.g. storage, electric vehicles, hydrogen) is dependent on investment and this requires long term regulatory certainty for the supply chain to de-risk investment. It is essential that the networks have a fair and consistent regulatory framework for all forms of flexibility providers.
 - **Upgrading and adapting Infrastructure:** in order for the networks to continue to deliver the exceptional service they provide now, it is important that the network companies are well capitalised to secure scale of investment needed over coming years, including attracting inward investment. This includes investing in smart infrastructure that enables low-carbon, flexible and innovative solutions to connect to the grid at the best cost to the customer.
 - **Transitional period:** as we transition to a low carbon economy, the networks are encouraged to take more risks e.g. new processes/technologies. It is important that this additional risk is recognised within the regulatory regime.
 - **Long term support for innovation and R&D:** The networks are using innovation and the use of new technologies to make the most efficient use

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<http://www.euskills.co.uk/sites/default/files/Workforce%20Renewal%20and%20Skills%20Strategy%20FINAL.pdf>

of the existing infrastructure capacity to meet the needs of customers in a sustainable, secure and affordable way. ENA members believe that the current support arrangements for networks innovation are broadly fit for purpose and continue to be required. There are a number of areas where the UK has the opportunity to become world leader, and ENA welcomes the pillar to invest in science, research and innovation highlighted in the Industrial Strategy. We have identified that there could be improvements made to the schemes to:

- Support innovation that delivers value across the whole system and beyond individual network or system operator business scope.
- Introduce a stronger link to innovation priorities from developing Government policy thinking (e.g. industrial strategy).
- Support trialling of emerging commercial and market models and not just technology to be embedded into network/system operator operations.
- Facilitate cross energy vector projects (e.g. Hydrogen and CCS) and not just electricity (e.g. in NIA/NIC).
- Supporting local energy (including community energy schemes) provision to the areas that need to be supported to ensure approaches exist to support those least able to adopt smart flexibility technologies.
- Innovation projects towards the end of price control windows are driven to shorter timescales to complete in time, whereas supporting longer timeframes may allow projects time to demonstrate value.

The energy industry requires a long term, strategic approach to ensure that the interests of customers are met now, and over the coming decades. We welcome the Government's Industrial Strategy as an opportunity to make an important contribution to that long term view.

The networks will continue to be the foundation of the UK economy, facilitating clean growth through the developing smart grid and providing export opportunities and highly skilled jobs across all regions of the UK; all of which are essential elements of a successful industrial strategy.