National Infrastructure Assessment: Call for Evidence

Energy Networks Association (ENA) represents the “wires and pipes” transmission and distribution network operators for gas and electricity in the UK and Ireland. Our members control and maintain the critical national infrastructure that delivers these vital services into customers’ homes and businesses.

Since privatisation, the networks have delivered value for customers and the UK economy though improved performance and lower costs:

- Network costs are now 17% lower than they were when at the time of privatisation.
- The stability of the regulatory model has ensured consistent investment. Between 1990 and 2020, £80 billion will have been invested in the gas and electricity networks.
- This investment has delivered UK energy networks which are amongst the most reliable in the world. There has been a reduction in power cuts of 30% since 2002. The reliability of the transmission networks and gas distribution network is over 99.9%.

Executive Summary

Our networks are vital facilitators of the UK’s efforts to decarbonise the heat, power and transport sectors. The evolution already underway in our networks will ensure that customers continue to have secure and affordable supplies of gas and electricity in a sustainable energy system.

There is a growing appreciation across the energy industry of the need to ensure a whole system approach to infrastructure planning and operation in order to best meet the interests of UK customers. As the representative body for both gas and electricity networks, ENA is well placed to consider challenges across the power, heat and transport sectors in a holistic way, without bias towards particular technologies or energy sources.

This submission will outline the work being carried out by ENA and our member companies to facilitate the decarbonisation of heat, power and transport in a secure and affordable way, which considers the interests of customers as a priority:

- **The gas networks 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.**
- **Efficient use of the UK's extensive gas infrastructure will also play a long term role in meeting low carbon heat demand through the use of green gas such as biomethane and hydrogen. Green gas can also help decarbonising the transport sector as a fuel for Heavy Goods Vehicles (HGVs).**
- **Gas network companies are investing in new infrastructure through the Iron Mains Replacement Programme (IMRP). It is envisaged that the majority of low-pressure distribution network will be made up of polyethylene by 2030, making the transportation of hydrogen possible.**
- **Gas Distribution Networks (GDNs) are trialling innovation projects to demonstrate the potential that biomethane, hydrogen networks, and bio-SNG can play in the future energy system to deliver reliable, affordable and low carbon of energy for heat, cooking and transport. Regulatory and policy decisions must be made in the short term, prior to 2021, to enable the UK to benefit over the longer term from its gas network infrastructure and the exciting potential of green gas.**
- **The electricity networks are evolving to become smart grids, which will be crucial to connecting increased Distributed Generation (DG) from renewable sources and managing the changing nature of supply and demand associated with the low carbon technologies such as electric vehicles (EV). ENA is working with member companies and key stakeholders to define the changing roles and responsibilities of network operators to ensure a whole system approach is taken which identifies the best models to adopt for customers.**
- **The 28GW of generation now connected to the distribution network has required DNOs move away from their traditional passive role, to become**

more active managers, using real time data to make interventions on their networks to keep costs down for customers. With DNOs taking on an increasing number of system operator functions we have started to see the transition to a new Distribution System Operator (DSO) role.

- **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. 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 (Transmission System Operator – Distribution System Operator) 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.**
- **As we move towards a more flexible energy system 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.**

1. **<u>What is the highest value solution for decarbonising heat, for both commercial and domestic consumers? When would decisions need to be made?</u>**

The focus of the UK's decarbonisation effort has so far predominantly fallen on the electricity sector, and how we generate an increasing proportion of our power from renewable sources.

Only relatively recently has attention started to fall on how we meet the significant challenge of decarbonising heat, which accounts for around 45% of the UK's total energy needs.

The UK Government's target is for 12% of heat demand to be met by renewable sources by 2020, and the Scottish Government's Climate Change Plan has set a target for 80% of domestic heat to be from low carbon sources by 2032.

Meeting these targets, whilst meeting peak energy demand in winter, is recognised as possibly the biggest challenge facing the energy industry. It will require detailed consideration of how we make efficient use of our energy infrastructure, and how we adapt that infrastructure to ensure an affordable and secure progression to a low carbon economy. Any decarbonisation plan will also need to address power and transport, alongside heat, as part of a whole energy system approach.

There is a growing body of evidence which demonstrates the importance of gas, and the gas networks, in meeting peak heat demand in a secure and affordable way; both in the short term and over the long term as part of a sustainable energy mix.

The UK benefits from an extensive gas network, which delivers over 720TWh of energy to customers and covers 284,000km. It is an extremely valuable asset and a feat of engineering which has helped industry to grow and has provided an affordable way to heat our homes over many decades. Making efficient use of this asset is in the overwhelming interest of consumers; is necessary to meet peak heat demand; and will enable us to keep costs low as we move to a low carbon economy.

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. Whilst the way we heat homes and businesses will gradually change as we decarbonise, gas is set to remain dominant for some time at least.

Over 80% of peak energy usage is currently derived from gas. Without gas and 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 set 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 not a viable solution to meeting low carbon heat demand. The gas network will be required to mitigate the increased demand on the electricity network from low carbon technologies such as heat pumps and electric vehicles. Reinforcing the electricity

network to meet peak heat demand in winter, if possible, has been shown to be a prohibitively expensive pathway for the decarbonisation of heat.[1]

The cheap and reliable nature of gas for heat has very important implications for energy affordability and fuel poverty. Heating your home by gas is around 3 times cheaper than using electricity and saves consumers over £400 per annum compared to alternatives. Low carbon solutions which make the most of existing infrastructure will reduce cost, as well as minimising disruption to communities and businesses from new developments.

The role of the gas networks in combating fuel poverty is demonstrated in the Fuel Poor Network Extension (FPNES) scheme. In 2014-15, 60,000 new gas connections were provided by the Gas Distribution Networks. Of these, over 12,000 were delivered under the FPNES as part of the networks' social obligations for households considered to be 'fuel poor'. An additional 15,000 households were connected in the previous year, in total meeting around 30% of the networks' target for 2013-2021.

A study carried out by Wales and West Utilities considered the decarbonisation challenges from a consumer perspective, and found that in Bridgend, which is representative of a typical British town, over 80% of customers had little or no financial means of moving away from gas heating to more expensive alternatives, and would therefore require a significant amount of subsidy if they were to do so. The study also concluded that even with the significant level of subsidy which would be required take up of alternative energy infrastructure solutions can take up to 50 years.[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 network.

The UK's gas distribution network companies (GDNs) are leading innovation projects which are providing technical understanding of green gas injection into the grid, as

[1] Delta EE Report, "2050 Pathways for Domestic Heat" (2012)
[2] Wales and West Utilities, "Bridgend Future Modelling" (2015)

well as demonstrating commercial potential and highlighting necessary regulatory changes to encourage growth in the sector.

- *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.[3] By January 2016, 2.35 TWh of renewable gas had been injected into the grid.[4]

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.

Unlike other low carbon heat options, such as electric heat pumps or heat networks, the use of biomethane utilises existing infrastructure and requires no expansion of the gas or electricity network, saving customers money. By removing the need build new infrastructure, there is an added economic benefit in minimising disruption to road users and businesses from new developments. 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.

[3] BEIS RHI Deployment Statistics, November 2016, https://www.gov.uk/government/statistics/rhi-deployment-data-november-2016

[4] Aggregated figure from Ofgem RHI Public Report, as at 3 January 2016. https://rhi.ofgem.gov.uk/.

- *Hydrogen*

Of the various forms of green gas which could be injected into the network, Hydrogen offers another 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. 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.

Through the Iron Mains Replacement Programme (IMRP), it is envisaged that the majority of low-pressure distribution network will be made up of polyethylene by 2030, making the transportation of hydrogen possible in principle.

Hydrogen would offer many of the same benefits as biogas in terms of making use of existing infrastructure to decarbonise UK heat demand; it would leave no carbon footprint as the combustion of hydrogen with oxygen results in water and heat. Studies have shown that customers' existing appliances could operate safely with up to 10% hydrogen concentration.

The injection of hydrogen into the gas network also has potential benefits in terms of energy storage and a solution to the intermittency of wind generation. Known as 'Power to Gas' technology, excess electricity generated from wind can be converted into hydrogen gas through a process of electrolysis and stored in the gas network to meet heat demand. National Grid estimate that the gas network currently has up to 650 GWh of storage, and even if all the UK wind generation were to be stored in this way it would use only 5% of the grid.

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 electric is much more difficult but also provides the biggest return on carbon reduction.

In addition National Grid Gas Distribution's 'HyDeploy' project will demonstrate on Keele University's private network 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.

- *BioSNG*

Alongside biomethane, GDNs are investigating ways to make efficient use of domestic waste in meeting heat demand. 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. Individual components of the plant are now being operated in standalone mode, prior to end-to-end operation of the process, which is expected to take place in Q2 2016.

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.

A suitably-designed RHI with a dedicated tariff for biomethane from thermal sources is essential to support the first full-scale commercial BioSNG plants, and the current review of the RHI affords an ideal opportunity to put such a tariff in place. Separating the tariffs acknowledges and supports the different status of market maturity between Biomethane from AD and thermal sources.

The UK Gas Networks role in a 2050 Whole Energy System

There is a growing body of evidence which demonstrates that decarbonising heat will require a holistic approach which considers the interests of customers and retains a role for the gas network in delivering green gas to homes and businesses. As well as recent reports from Policy Exchange[5] and Imperial College[6], Energy Networks Association commissioned KPMG to produce the 'The UK Gas Networks role in a 2050 whole energy system' in 2016.[7]

This report explored the ways that the heat sector can be decarbonised, by looking at four possible future scenarios; evolution of gas networks and green gas; prosumer (self-generating heating and energy solutions); diversified energy sources with different technologies used across the country; and electric future with a switch to electric heating systems like heat pumps.

The report finds that evolution of the gas networks, injecting green gas such as hydrogen into the grid, offers significant cost savings against alternative low carbon heating sources. It is also shown to be the most practical scenario in terms of technical feasibility and, importantly, acceptance from customers and society. The value that customers place in the convenience and reliability of current heating solutions is shown to be an important consideration in future policy decisions.

The analysis identifies advantages from continued use of the gas network, and concludes that the future is likely to include a range of solutions borrowing from each of the scenarios considered.

Recommendations from the report include:

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

[5] Policy Exchange, "Too Hot to Handle? How to decarbonise domestic heating" (2016)
[6] Imperial College, "Managing Heat System Decarbonisation", (2016)
[7] KPMG, "'The UK Gas Networks role in a 2050 whole energy system' (2016)

- Transport decarbonisation policy needs to be integrated with power and heat decarbonisation policy

Policy and Regulatory Considerations

The next price control period for Gas Distribution Networks, RIIO-GD2, will commence from March 2021 providing a fast approaching deadline for decisions regarding heat decarbonisation in light of the recommendation listed above.

Work is already under way to consider regulatory issues that will need to address to facilitate green gas injection into the network. An innovation project being undertaken by SGN in Oban is looking to demonstrate that the UK gas quality regulations (The Wobbe Index) could be safely widened. Current regulations are based on the composition of North Sea gas, and green gases such as biomethane require expensive processing in order to meet existing standards.

If the Oban project does demonstrate that national standards could be safely revised then it would open up the market to a more diverse range of energy sources by removing processing costs and improving the comparative economic case for green gas injection. SGN estimate that revising the Wobbe Index could save the industry £325 million each year and result in lower prices for consumers. The project will report its findings to the regulator Ofgem this summer.

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

The decision to reduce the support available to primary energy crop projects could potentially reduce the number of new gas to grid project being commissioned, given that large amounts of food waste are currently locked in to long term contacts. ENA and its members strongly recommend that the government's waste policy should be aligned to changes in the RHI, to ensure that sufficient feedstock is available to meet the government's ambitions for lower-carbon gas.

As the Committee on Climate Change suggested in their report on the Next Steps for UK Heat Policy,[8] the government needs to consider how to support green gas production once the current RHI funding expires. Early decisions will help investors and the networks prepare for likely developments in the 2020s.

We would like to see closer working between the Scottish Government and the UK Government as they work to identify the best approaches to long term heat decarbonisation in pursuit of the renewable heat targets set out above.

2. What does the most effective zero carbon power sector look like in 2050? How would this be achieved?

ENA members recognise that traditional roles and responsibilities of network companies will need to change to deliver a secure and affordable low carbon energy system. In order to facilitate a transition to a low carbon economy, energy networks are adapting infrastructure and rolling out innovation in smart network solutions to maintain security of supply, deliver efficiency and keep the cost to consumers low.

The traditional role of the electricity distribution networks in the energy market has been relatively passive; taking energy in one direction, from generation to consumer with predictable levels of supply and demand.

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 the nature of Distribution Network Operators (DNO) and the wider energy market.

Distribution System Operator

The growth of Distributed Generation (DG) has outstripped expectations in recent years, with solar PV connected, already surpassing levels previously expected by 2030. The 28GW of generation now connected to the distribution network has required

[8] https://www.theccc.org.uk/wp-content/uploads/2016/10/Next-steps-for-UK-heat-policy-Committee-on-Climate-Change-October-2016.pdf, p. 70-71.

DNOs move away from their traditional passive role, to become more active managers, using real time data to make interventions on their networks to keep costs down for customers.

With DNOs taking on an increasing number of system operator functions we have started to see the transition to a new Distribution System Operator (DSO) role. This has 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 in a short space of time. The networks share this knowledge through the Smarter Networks Portal to ensure that all customers can benefit from the findings from LCNF and RIIO innovation projects.[9]

Smart network solutions utilising storage and demand side response 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. A recent report commissioned by Ofgem further highlighted the significant benefits that can be delivered for customers as these innovations are rolled out across the UK in the years ahead.[10]

DNOs have adapted effectively to facilitate a rapid increase in Distributed Generation, and the technical governance and understanding is in place to meet the challenges outlined above. The requirement now is to consider changes to the energy market to upscale capability and capacity for active management of the network at the distribution level and enable a full 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 DG connections by

[9] Smarter Networks Portal

[10] Ofgem Network Innovation Review (2016)

working more closely to address operational issues caused by an increasing amount of energy flowing back onto the distribution network and being exported onto the transmission network.

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 (Transmission System Operator – Distribution System Operator) 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.

There are several development areas that have been identified that will form part of the TSO-DSO project:

• Development and alignment of Transmission and Distribution incentives to deliver whole system benefits is key to optimising network investment, system security and delivering benefits to consumers.

This includes using the mechanisms available within RIIO-T1/ED1 to deliver whole system benefits in the short- to mid-term and then subsequently RIIO-T2/ED2.

• Transparency of planned/anticipated contracted actions, which will be vital in order to facilitate markets to provide network solutions in a whole system view. This needs to include transparency to customers, market participants, DSOs and SO.

• Improved forecasting, both in terms of better longer to medium term forecasting of load and generation growth and more joined up forecasting across DSOs and the SO.

• Connection arrangements will be reviewed.

• EU codes, planning standards & LCTs are key drivers that would merit further discussion & consideration.

• 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.

Regulatory and commercial barriers to flexible energy

- Enabling Storage

Storage on the electricity distribution network can play a role alongside other solutions in meeting the challenge of increased intermittency 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. Examples include SSEN's NINES project in Shetland which included the installation of a battery to deliver learning regarding the operation of MW scale batteries on a constrained distribution network. UK Power Networks Smarter Network Storage project explored how energy storage could be used to provide benefits to consumers by deferring traditional network reinforcement and demonstrated additional benefits that can be gained from the technology to maximise value. In order to achieve these additional benefits, the technology can be used for a range of other system-wide services, to benefit other electricity system participants.

In order 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.

However, storage needs to be considered as one potential form of flexibility and all different forms of distributed energy resource should be treated fairly to provide flexibility. 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 and not 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).

Examples of these issues include:

- Generation connection and constraint management payments, addressing the different approaches to constraints between transmission and distribution, the impact of changes to constraints on flexible connected generators and the approach to generation connections and charges where high cost constraints are not addressed by connection charges (more than one voltage level above the point of connection).
- Intermittent generation and demand (including behind the meter generation) avoiding use of system charges. As most DG does not pay Balancing Services Use of System (BSUoS) charges, it does not contribute to the cost associated with the impact of intermittent generation on balancing charges. Therefore, there is a lack of incentive for these generators to reduce the balancing costs they impose.

Charging mechanisms should reflect principles of:

- Whole system cost reflectivity (rather than focusing on individual licensed parties) 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.

Support for innovation through the regulatory framework

We believe that the current support arrangements for network innovation are broadly fit for purpose and continue to be required.

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 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.

Facilitating Low Carbon Connections

Demand for connections has been on the rise for a number of years, but with changes in Government policy in areas such as distributed generation (DG), this has significantly outstripped predictions. UK growth and the development of new technologies such as storage have also presented additional challenges for Distribution Network Operators (DNOs) with more speculative requests for connections.

Government and Ofgem are aware of the challenges this poses for network companies, however, they also want to see the removal of perceived barriers to growth. Networks themselves are not the barriers, and in fact enable this growth, however, they are constrained by the policy and regulatory framework they must operate within. A number of positive actions to improve the situation are already underway, with the support of the developer community

o Stakeholder Engagement

Over recent years DNOs have implemented a number of measures to improve how they provide information for developers and DG connectors as well as making them a key stakeholder in their business planning. These efforts have resulted in satisfaction levels of 80%.

So-called heat maps are now available to show connectors where capacity exists and DNOs provide connections surgeries which allow an opportunity for those wishing to

get a connection to get advice, guidance and support at an early stage. ENA is now responsible for organising the annual DG Fora which take place in Cardiff, Glasgow and London to bring together the DG, IDNO and DNO sectors to look at how both connections and competitive market can be improved.

- Investment ahead of need

DNOs have been grappling with the challenges of anticipatory investment for many years and it is one area that significantly holds back the ability to provide additional capacity to support unknown, but predictable growth. Trials for allowing isolated anticipatory investment are underway with WPD and UKPN where some constraints issue have been greatest. This allows the DNOs to invest ahead of need and charge subsequent connectors for the reinforcement that was made. Allowing more scope for investment ahead of need in some areas would give DNOs far greater flexibility to plan the network. While continuing to protect customers from unnecessary costs is important, the current constraints are clearly a result of DNOs not having the freedom to invest in anticipation of justified future need.

- Facilitating Competition - Competition in Connections Code of Practice

Following a consultation by Ofgem, a licence condition was approved requiring the development of a Code of Practice to govern the way DNOs provide the necessary services associated with competitive connections. The new Code of Practice will better inform the process and ensure the best service for customers. It represents a significant step forward in the further development of the competitive connections market. Through the new website, all parties will be able to influence the development of the Code of Practice and consequently the services which DNOs provide to further improve competition.

- Making the best use of current network assets - Connection Milestones

Setting connection milestones is one option that will assist issues of unused capacity. Where the offered capacity is not being used and sufficient progress as to demonstrate intention to use allocated capacity isn't seen, DNOs will be able to withdraw their offer and allocate it to other connectors who are ready to progress. We have been working

closely with the DG community on this and it has received support but we are continuing to consult on this.

o Assessment and Design Fees

The scale of applications to connect to the distribution network has represented a significant challenge for network operator businesses and we believe that the current arrangements for Assessment & Design fees require change to focus on a fairer allocation of costs, so the right people pay for the design work undertaken by networks.

Currently there is no cost for submitting a request for a connection and the work associated with processing an offer. This has resulted in a significant number of speculative requests being undertaken by DNOs rather than developers seeking a collaborative discussion with the network operator.

The costs for these are only charged on those who accept the connection offer and they are also required to meet the costs of those offers which are not accepted. These speculative submissions account for around 70% of all requests and the changes we have proposed could make a real difference and provide a better service to customers. We would urge Government to move quickly with Ofgem to make the necessary changes.

3. What are the implications of low carbon vehicles for energy production, transmission, distribution, storage and new infrastructure requirements?

Ultra Low Emission 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 and a greater level of unpredictable demand.

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 in the EV sector to feed into the development of UK standards for electric vehicles, charging connections and charging infrastructure.

Smart charging is a significant enabler to maximising the use of EVs (and storage assets more generally) and minimising the impact on the networks, therefore it is key to promote and engage customers of the benefits of smart charging. In a market where EV uptake is increasing, this is a significant and near-term challenge.

It is also important for the development of 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.

We would encourage the Government to coordinate an approach to accessing EV charging infrastructure that meets the needs of the industry and consumers. ENA members have worked collaboratively to carry out a highlevel assessment of the potential impact of more widespread roll-out of electric vehicles and the associated charging smart-charging infrastructure. Part of that work included an analysis of the potential network investment cost to support charging infrastructure for EVs, which identified that under some relatively ambitious but nevertheless plausible take up scenarios there would be a need for substantial investments between now and 2040. We would be happy to discuss this work, and potentially to develop it further, as part of the ongoing dialogue with BEIS.

Gas in 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 the use of low carbon gas in vehicles can make another important contribution. This will be particularly important in the transportation of heavy goods, as the electrification of Heavy Goods Vehicles (HGV) is not 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 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 refueling 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,[11] and the government needs to ensure that this is joined up with an infrastructure strategy that provides sufficient refuelling capacity.

[11] https://www.gov.uk/government/consultations/renewable-transport-fuel-obligation-proposed-changes-for-2017