

## Written evidence submitted by SGN (DHH0057)

### Executive Summary

SGN welcomes the opportunity to respond to this inquiry. SGN manages the network that distributes natural and green gas to 5.9 million homes and businesses across Scotland and the south of England, providing warmth to over 14 million customers. Our strategy and long term plan to deliver net zero focusses on the replacement of the natural gas in our network with hydrogen and other green gases, enabling the decarbonisation of heat in Scotland and our southern network by 2045. We are installing hydrogen and green gas ready pipes across our networks to enable this transition.

The Committee on Climate Change (CCC) and other experts agree the UK's net zero targets cannot be met in a cost-effective way through electrification of heat and using heat pumps alone. This is because:

- Peak heat demand in winter is 4x peak electricity demand so repurposing the gas network for hydrogen reduces the investment needed in generation and reinforcement of the power grid
- The space constraints and thermal properties of our housing stock mean that for the majority a heat pump alone can't deliver the heat needed without disruptive and costly retrofit measures
- A hydrogen ready boiler supplied by a repurposed gas network which is already built to meet peak heat demand in winter, offers a route to decarbonise heat with less disruption for customers

### The challenge

A key aspect of decarbonising heating in line with net zero will be deliverability at scale and acceptance by consumers given the need to change the heating systems in each of the 30 million homes across GB. This means that while heat pumps may have a role to decarbonise buildings like those off the gas grid, other technologies like hydrogen for which the evidence base is being built have the potential to be the dominant future net zero heating technology.

Hydrogen can take advantage of our extensive gas network already connected to 83% of homes and built to meet peak heat demand - which is 4x peak electricity demand – in an affordable way. Research by Navigant for the Energy Networks Association highlighted a balanced transition where hydrogen and other green gases are used alongside some electrification of heat could deliver a £13bn/year saving to customers compared with full electrification.<sup>i</sup>

### Customer acceptance

The CCC estimate the large changes in existing homes that would be required for a switch to heat pumps will cost on average £26,300 per home to retrofit.<sup>ii</sup> Work by Wales and West Utilities in Bridgend highlighted 33% of customers would not have the financial means to change and a further 48% would need significant incentives to encourage them to invest their money to decarbonise their heating.<sup>iii</sup> Customers who have recently invested in a boiler which lasts ten to fifteen years are also likely to be resistant to having to change to a heat pump.

### Building and space constraints

As part of our Real Time Networks project, we tested how heat pumps would operate across a range of domestic properties in different weather conditions.<sup>iv</sup> The key finding was that for the majority of the GB housing stock, a combination of lack of exterior space and/or the thermal properties of the building mean that a heat pump alone is not capable of meeting the space heating requirement, or can do so only through the installation of highly disruptive and intrusive measures such as solid wall insulation, larger radiators or

underfloor heating. This means decarbonised gas solutions like hydrogen would be needed either to meet the entire heating needs of those properties or as part of a hybrid system to meet peak heating needs during cold periods when the efficiency factors of heat pumps are at their lowest.

#### Less disruptive options

SGN are of the view that a hydrogen ready boiler solution supplied by a repurposed gas network which is already built to meet peak heat demand in winter, offers the optimum route to decarbonisation of heat with the lowest levels of disruption and most value for customers. However, where hydrogen boilers are used in hybrid systems alongside heat pumps, this can significantly reduce the levels of disruption to the floors and interiors of homes, and the cost and disruption associated with the requirement to significantly upgrade the electricity distribution networks to cope with large numbers of heat pumps operating at peak times.

#### **What has been the impact of past and current policies for low carbon heat, and what lessons can be learnt, including examples from devolved administrations and international comparators?**

Heat has long been the Cinderella of energy policy as it is invisible and policy has focused on the more visible electricity sector. The first UK Government Heat Strategy in 2013 which focused on decarbonising heat through electrification and heat pumps resulted in limited progress as it became clear in the following years the challenge of decarbonising heat demand - which is 4x peak electricity demand in winter - was more complex than envisaged.

We believe one of the key lessons from this was that there wasn't yet a complete evidence base to make key heat policy decisions and that there is no 'silver bullet' one size fits all solution. We therefore welcomed the resulting programme of evidence building that BEIS commenced in 2018 which is looking at the role and potential mix of different technologies including hydrogen and hybrid heating systems. We are working closely with BEIS and contributing towards this through our projects like H100 Fife which aims to provide key evidence on the role hydrogen could play by demonstrating a world first 100% green hydrogen for heating network.<sup>v</sup>

The deployment of the green gas biomethane into the gas network has been one of the main success stories under the Renewable Heat Incentive (RHI), the UK Government's main policy in the last decade to increase deployment of low carbon heat. We have 40 plants connected to our networks supplying enough net zero green gas for over 200,000 homes.

The RHI has suffered from regular cuts to tariffs that has seen peaks and troughs in deployment which has affected investor confidence – the design of the Green Gas Levy which will succeed the RHI from 2021 must provide stability if it is to attract investment in further plants and help the government reach their ambition of tripling biomethane capacity by 2030, and our target of supplying enough green gas for 450,000 homes by 2026.<sup>vi</sup>

We think the levy should be extended to support a 20% hydrogen blend. The HyDeploy project is currently demonstrating this can be safely used in existing pipes and appliances.<sup>vii</sup> If rolled out GB-wide, it could save around 6 million tonnes of carbon dioxide emissions every year, the equivalent of taking 2.5 million cars off the road.<sup>viii</sup>

The requirement that all new gas boilers installed since 2005 are 90% efficient condensing models compared to the 70% efficient non-condensing versions they replaced is one of the most successful policies that has been introduced to reduce household heating emissions and bills. This highlights how a straightforward change to

building regulations to mandate that all new boilers are hydrogen ready could be introduced to prepare households for when the local gas network is converted from natural gas to hydrogen. We believe this is a low regrets change the Government should implement as a priority.

**What key policies, priorities and timelines should be included in the Government's forthcoming 'Buildings and Heat Strategy' to ensure that the UK is on track to deliver Net Zero? What are the most urgent decisions and actions that need to be taken over the course of this Parliament (by 2024)?**

**We are calling on the Government to introduce a range of important policies to enable industry to invest in hydrogen technologies in the UK and drive the next stage in scaling hydrogen solutions. These include:**

1. The development of a cross-departmental hydrogen strategy within the UK Government to give industry and investors confidence in the ambition and commitment to lead the international race to develop hydrogen;
2. The transfer of gas quality standards from the Gas Safety (Management) Regulations (GS(M)R) legislation to an IGEM industry standard. Future changes to this standard could allow the safe increase of the volume of hydrogen allowed in the gas network from the current 0.1% to 20%. This blend could be safely used in existing appliances;
3. Unlocking regulatory funding support for SGN's H100 Fife project as the first community scale trial of 100% hydrogen heating.<sup>ix</sup> This will provide the evidence on hydrogen as a zero carbon heating fuel and enable government heat policy decisions around 2024;
4. Changes to building regulations to mandate that all future boilers are 'hydrogen-ready' once the current prototypes become commercially available; This would utilise the 1.6 million a year gas boiler replacement cycle to ready households for conversion to hydrogen which
5. The development of a Contracts for Difference type incentive mechanisms for blue and green hydrogen to allow it to realise the same cost reductions as offshore wind.

**Which technologies are the most viable to deliver the decarbonisation of heating, and what would be the most appropriate mix of technologies across the UK?**

A key aspect of decarbonising heating in line with net zero will be deliverability at scale and acceptance by consumers given the need to change the heating systems in each of the 30 million homes across GB. This means that while heat pumps may have a role to decarbonise buildings like those off the gas grid, we believe a hydrogen ready boiler solution supplied by a repurposed gas network - which is already built to meet peak heat demand in winter - offers the optimum route to decarbonise heat at the scale required with the lowest levels of disruption and most value for customers.

Hybrid heating systems where an electric heat pump works alongside a boiler using hydrogen or biomethane has the potential to form part of the solution to decarbonise heating because of the age of the UK's housing stock which means many properties are unlikely to be suitable for a heat pump only solution.<sup>x</sup>

**What are the barriers to scaling up low carbon heating technologies? What is needed to overcome these barriers?**

Customer acceptance

Delivering net zero heat will require much greater levels of engagement with customers than the first stage of the energy transition that focused on upstream changes to the type of electricity being generated. Removing emissions from heating will require changes inside all homes and businesses as well as industry. Even with generous support under the domestic Renewable Heat Incentive (RHI), only 10,667 domestic heat pumps were installed in 2019 compared to 1.67 million gas boilers.<sup>xixii</sup>

At the moment around 85% of GB homes use natural gas transported through one of the most extensive gas networks in the world. SGN believes policymakers should pursue the available pathways to remove the carbon from heating that are cost-effective and deliverable. A change to hydrogen would enable customers to keep their familiar and responsive central heating systems which would now produce heat without carbon.

#### Building and space constraints

As mentioned in our introductory comments, our Real Time Networks project tested how heat pumps would operate across a range of homes in different weather conditions.<sup>xixiii</sup> For the majority of the GB housing stock, a combination of lack of exterior space and/or the thermal properties of the building meant that a heat pump alone was not capable of meeting the space heating requirement, or could do so only through the installation of disruptive and intrusive measures such as solid wall insulation, larger radiators or underfloor heating. A decarbonised gas solution like hydrogen would enable these barriers to be overcome as a hydrogen boiler would be the same size as the natural gas one is today and could deliver enough heat to avoid the need for the most disruptive in-home measures.

#### Costs

The costs of a heat pump need to be factored into Government thinking around the deliverability of widespread transition to heat pumps. Many households will be unable to afford the £26,300 estimate the CCC have made of the average cost to switch a house to an air source heat pump. SGN are of the view that upfront costs to customers in the heat transition need to be minimised as much as possible and that hydrogen ready boilers which are expected to cost no more than £50 more than a traditional boiler today, offers a more affordable as well as less disruptive option for the majority of customers. They can be rolled out utilising the natural churn cycle for gas boilers which could equip over half the housing stock with net zero ready systems in a decade.

#### **How can the costs of decarbonising heat be distributed fairly across consumers, taxpayers, business and government, taking account of the fuel poor and communities affected by the transition? What is the impact of the existing distribution of environmental levies across electricity, gas and fuel bills on drivers for switching to low carbon heating, and should this distribution be reviewed?**

The gas and electricity networks operate under Ofgem's price control framework called RIIO. As we move into the RIIO-2 period from 2021 it will be critical for Ofgem to ensure the new price control period enables the building of the strategic network infrastructure required to meet net zero. Final Determinations on RIIO-2 will be made at the end of this year by Ofgem. Making the right investments, in the right places at the right time will be essential to meeting net zero in as cost effective way as is possible, allowing network companies to socialise the cost of investments over as long a period as is possible. Furthermore, it represents a critical component in a green recovery, supporting the economy and creating jobs, while at the same time minimising the risk of stranded assets.

We believe minimising upfront costs faced by customers to decarbonise their heating is key. As mentioned in our answer to the previous question, the upfront costs to switch an average house to a heat pump would likely be beyond the means of many households, particularly given the current squeeze on household finances. Hydrogen ready boilers are expected to cost no more than £50 more than a gas boiler today which would need to be replaced anyway at the end of its 10-15 year lifespan. The H21 Leeds City Gate project has set out how the costs of converting the gas network to hydrogen could be paid for by the regulated gas network price control periods in a similar way to the current programme to replace old metal gas mains with hydrogen ready polyethylene plastic pipe.<sup>xiv</sup>

**What incentives and regulatory measures should be employed to encourage and ensure households take up low carbon heat, and how will these need to vary for different household types?**

One approach to drive demand for low carbon heat would be to create a Net Zero Heating Obligation (NZHO). This could enable a coordinated and strategic approach to the significant challenge of decarbonisation of heating. It should focus on delivering lower emissions for least cost, least disruption and maximum resilience to consumers over time. As part of this it would identify where hydrogen (and biomethane) is the most suitable technology to decarbonise home heating. It could provide certainty there would be a market for hydrogen that is generated. While the details of a NZHO would need to be refined, we think it could provide the long term certainty that private capital needs to invest.

**What action is required to ensure that households are engaged, informed, supported and protected during the transition to low carbon heat, including measures to minimise disruption in homes and to maintain consumer choice?**

Work to raise public awareness needs to outline there are various solutions to decarbonise heating, of which heat pumps are one of those solutions. Pursuing heat pumps as the silver bullet to decarbonise all home heating could lead to customers installing heat pumps in homes where it cannot deliver enough heat to keep the occupants warm.

A public awareness strategy will need to be run at an appropriate time when the evidence base on the most suitable options for certain houses, cities and regions is further developed. SGN believe there is a need to move messaging away from negative messaging that technologies like boilers using natural gas may be 'banned'. Positive messaging like all boilers installed from a certain date will be hydrogen or net zero ready feels like a more effective way of engaging the public in the transition.

One of the key benefits of hydrogen is it retains the level of choice that people have today of whether they want to heat their homes using a gas or electricity solution. A change to heat pump only systems would remove this and would require government to tell constituents and voters that the gas network which 83% of households rely on for heating is being turned off and they would the need to spend on average £26,300 to install a heat pump and the highest levels of efficiency needed for it to operate efficiently. That could be a difficult message to deliver to households who are just about managing.

Requiring that all new boilers installed from around 2025 are 'hydrogen-ready' would take advantage of the current 1.67 million a year gas replacement cycle for gas boilers when they reach the end of their lives.

Through this process, heating systems could be made net zero ready without the need for Government to mandate a switch to heat pumps which would require the disruptive retrofitting of homes to install larger radiators and the highest levels of insulation. When the gas network is converted from the current methane natural gas, a 30-45 minute engineer visit would be required to convert the boiler so it can burn hydrogen which releases zero carbon emissions.

**Where should responsibility lie for the governance, coordination and delivery of low carbon heating? What will these organisations need in order to deliver such responsibilities?**

We believe that a whole energy systems approach is key and have developed a whole systems charter of how we will work more closely with the electricity network operators in our regions going forward as there is ever closer integration between power, transport and heat. To implement something like a Net Zero Heat Obligation which we mentioned in our answer to question 6, we believe there may be a need for a regional delivery body to oversee the deployment of the different low carbon heating technologies in the coordinated way that will be needed to deliver net zero. While different towns and local areas will have energy plans, there is a need to ensure that they all tie in to deliver net zero at a national level.

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<sup>i</sup> <https://www.energynetworks.org/assets/images/Resource%20library/ENA%20Gas%20decarbonisation%20Pathways%202050%20FINAL.pdf>

<sup>ii</sup> <https://www.theccc.org.uk/wp-content/uploads/2019/02/UK-housing-Fit-for-the-future-CCC-2019.pdf>

<sup>iii</sup> <https://www.smarternetworks.org/cdn/project/1858055c-d4cd-e711-93f1-001517891cc5/document/ebae0685-bc51-47b5-9178-a89a00b1e169/BridgendPhase2.docx>

<sup>iv</sup> <https://www.sgn.co.uk/about-us/future-of-gas/hydrogen/real-time-networks>

<sup>v</sup> <https://www.sgn.co.uk/H100Fife>

<sup>vi</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/880304/rhi-evaluation-biomethane-synthesis-2020-powerpoint.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/880304/rhi-evaluation-biomethane-synthesis-2020-powerpoint.pdf)

<sup>vii</sup> <https://hydeploy.co.uk/>

<sup>viii</sup> <https://hydeploy.co.uk/faqs/much-difference-20-hydrogen-make-uk-carbon-emissions/>

<sup>ix</sup> <https://www.sgn.co.uk/H100Fife>

<sup>x</sup> <https://www.sgn.co.uk/about-us/future-of-gas/hydrogen/real-time-networks>

<sup>xi</sup> <https://www.gov.uk/government/statistics/rhi-monthly-deployment-data-march-2020-quarterly-edition>

<sup>xii</sup> <https://www.eua.org.uk/record-boiler-sales-show-how-decarbonisation-will-work/>

<sup>xiii</sup> <https://www.sgn.co.uk/about-us/future-of-gas/hydrogen/real-time-networks>

<sup>xiv</sup> <https://www.northerngasnetworks.co.uk/wp-content/uploads/2017/04/H21-Report-Interactive-PDF-July-2016.compressed.pdf>