

## **A submission by Institution of Mechanical Engineers to the BEIS Committee's consultation on decarbonising heat in homes**

**December 2020**

### **About the Institution of Mechanical Engineers**

The Institution of Mechanical Engineers (IMechE) represents 120,000 engineering professionals and students in the UK and across the world.

This submission has been prepared by the [Process Industries Division](#) and the [Construction and Building Services Division](#).

The Engineering Policy Unit of the IMechE informs and responds to UK policy developments by drawing on the expertise of our members and partners.

### **Reason for Submitting Evidence**

The decarbonisation of heat in domestic homes not connected to the gas grid is not well understood and is currently inadequately addressed in UK government energy policy.

Waste heat and district heating is under-utilised in the UK compared with many other countries in Europe.

### **Evidence**

*1. 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?*

Past and present policies have not supported or encouraged low carbon heating at scale.

There are many examples of how available waste heat has been ignored and 'thrown away'; even though it could be easily used to heat buildings including homes.

The Pilkington Glass energy study is a good example of what goes wrong when policies interfere with good engineering practices and an economic opportunity. Pilkington have 3 separate float glass plants which use 5MW of electricity 24 hours per day 365 days per year. They found purchased electricity costs rising and had an energy study carried out which showed that on site generation of power at each of the three sites would provide 5 MW waste heat which could serve the town of St Helens using a district heat network. Whilst this was

progressing, the energy manager at the Liverpool City Region Local Enterprise Partnership (LEP) was informed and immediately tried to take over and wanted to include the scheme into a list of potential energy projects for the region. This created confusion uncertainty and lack of confidence and the scheme fizzled out.

Similarly, the project to construct a sea wall across the Mersey to prevent future flooding and produce tidal power energy which include zero carbon heating ground to a halt once the energy manager at the LEP got involved – despite being extremely profitable as a venture.

Across the UK there are many examples of very profitable long term low carbon energy schemes. Sadly the involvement of local government seems to stall and often kill them off.

There are some good examples where a developer has created a low and zero carbon scheme because it made good economic sense and was the best solution. Not all developers are able to move ahead but one that did was Peel at their Media City development Salford, where they have constructed and operate a district heat network now.

One major point to note is that successful energy schemes must supply communities – not just housing. The mix is extremely important in order to optimise operational loads.

Mixed use developments must be supported and encouraged and the current planning system which likes to 'see' developments in a predestined category destroys net zero schemes.

In many parts of the country and particularly the north, there is a preconception that each development must stand alone and cannot be part of a mixed use scheme. This creates a culture whereby individual developers do their own thing and tend to resort to traditional utility supplies.

Local planning is similarly flawed. For example there are many new housing developments happening in Lancashire now – ranging from say 50 houses to 500 houses – and they are having gas supplies installed. This is hard to understand when shared district heating would be better for the occupants and when UK gas has less than two years capacity left.

*2. 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)?*

All new developments must follow the Royal Academy of Engineering report on 'Sustainable Living Places' which was supported by MHCLG and Planning Authority.<sup>1</sup>

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<sup>1</sup> <https://www.raeng.org.uk/policy/policy-projects-and-issues/sustainable-living-places>

Heat networks should be allowed to connect any existing or future waste heat generation into their network.

Heat storage should be included to allow seasonal storage.

*3. 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?*

There are considerable challenges in decarbonising heat in rural locations that are off the gas grid, where homes often use gas bottles (fossil fuels) or oil to meet water and space heating needs. For these households there are very few viable low-carbon options. Technologies that are typically proposed in this regard focus on electricity use, for example heat pumps, but unfortunately it is often the case that these rural dwellings are in areas where, in addition to there being no gas mains available, the power supply is severely constrained by local power grid capacity and constraints. In such situations electrically powered heat pumps are simply not technically feasible.

On the other hand, in rural locations where power grid infrastructure is adequate for heat pump installation, property owners or tenants can consider the technology unattractive because of their historical/listed building status; the potential permanent or temporary visual impact of installation; their relatively high cost (particularly in the case of air source heat pumps); or simply a lack of room for the equipment.

According to the recent (April 2020) BEIS consultation document "Future Support for Low Carbon Heat: Consultation"<sup>2</sup>, about 20% of off the gas grid fossil fuel supplied homes are not currently suitable for low temperature heat pumps and are better suited to high temperature heating, such as the combustion of biomass fuels. However, the same document points out that the use in homes of individual biomass boilers can present fuel sustainability and air quality issues. Other heat decarbonisation technologies frequently proposed include the deployment of a district heating system, but rural housing is typically of a low-density character not suitable for such an approach.

The Process Industries Division Board of the IMechE therefore recommends that in the forthcoming Buildings and Heat Strategy, BEIS explores more fully UK Government incentivisation of building scale technologies that use the combustion of processed biogas (e.g. biomethane) to heat the space and water in rural off gas grid homes. This approach is underutilised in the UK.

The use of biomethane processed from organic waste streams (such as food waste, agricultural residues and animal waste, manure, etc.) to decarbonise heat in rural homes would provide a route to helping meet a broad range of UK Government policy objectives/targets aimed at achieving net zero by 2050. These would include BEIS policy objectives to decarbonise heat, localise energy

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<sup>2</sup> <https://www.gov.uk/government/consultations/future-support-for-low-carbon-heat>

supply in distributed systems, deliver clean growth, stimulate a green recovery and realise the UK Industrial Strategy, as well as those of Defra to reduce food waste, improve the sustainability of farming and address air quality degradation amongst others.

### **On promoting district heating:**

In addition, district heat networks supplied from existing energy generation including hospital energy centres, data centres and such like should be promoted and incentivised. Connections to thermal energy power plants must be started and developed. The UK is one of the few countries in the world that makes little use of the waste heat from power stations. Other countries use it. The amount of heat discarded annually is more than needed to heat every building in Britain. But it cannot because we have no heat networks to supply is heat to users.

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

Communities in rural locations throughout the UK have in their environs organic waste resources (food waste, agricultural residues, animal wastes, etc.) which can be processed to provide biogas for use in decarbonising heat in homes. The route to local processing of these resources is through small, community-scale, or farm scale, anaerobic digestion (AD) of the waste and subsequent biogas upgrading (to biomethane) in a small-scale processing plant. The resulting fuel can then be locally distributed, or aggregated and distributed, for use in the space and water heating of rural homes that are off the gas grid. The resulting renewable energy source could also be used locally to generate low carbon / zero carbon (if animal waste based) electricity, thereby providing power decarbonisation in rural locations suffering from power grid connectivity constraints.

The main barriers to the widespread rural deployment of biomethane AD plants include:

1. The unavailability of an AD solution for rural producers who do not have a gas mains connection i.e. those that do not have proximity to a gas grid injection point.
2. The relatively large-scale and high cost of available AD plants and biogas processing (upgrading) equipment in the UK.
3. Issues associated with adding waste streams to AD plants in an attempt to improve operational commercial viability.

The solution to the first two barriers is for UK Government to incentivise the engineering development and commercially viable deployment of efficient small-scale AD plants and biogas processing (upgrading) equipment, together with systems for off the gas grid distribution of the biomethane production for cases where proximity to a gas grid injection point is not available. The Institution of Mechanical Engineers is aware of several private companies that are researching

and piloting such plant and systems but does not see UK Government policy or regulatory support for their widespread development and/or deployment.

In order to encourage a market on the demand side for these supply-side technologies, BEIS should support the use of biomethane for decarbonising heat in rural off the gas grid domestic dwellings. However, BEIS's recent (April 2020) "Future Support for Low Carbon Heat: Consultation" document proposed that the Clean Heat Grant Scheme will not support biogas (Biomethane) combustion by households for heat decarbonisation and the Green Gas Support Scheme will only be available to AD operators that have a gas main injection point. The Process Industries Division Board therefore considers it important that BEIS's forthcoming 'Buildings and Heat Strategy' incentivises the combustion of biomethane in building-level technologies for heat decarbonisation in homes, particularly those that are off the gas grid in rural locations. Doing so will generate off-gas-grid householder demand for equipment technologies and biogas fuel, establishing and stimulating the growth of low carbon equipment and gas supply chains ahead of the planned phaseout of fossil fuel fired boilers within 15 years (see the UK Government's recently published 'The Ten Point Plan for a Green Revolution'<sup>3</sup>). From an engineering perspective, BEIS can help not only through financial incentives but also by ensuring that a supportive regulatory environment is put in place for the safe use of biogas for heat in domestic dwellings.

In addition to the above, other barrier include:

- Confusion and perhaps some scepticism amongst local authorities and LEAs.
- Competencies of the industry are poor or non-existent. (The Professional Engineering Institutions, including IMechE, could undertake to provide a competency scheme).

Finally, it seems like BEIS has spent so much money on district heat studies which have not progressed and ignored obvious successful opportunities.

5. 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?

Most low carbon heating schemes appear to be cost effective. The problem is the confusion around approvals, support for pipe laying activities and so forth.

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<sup>3</sup> <https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution>

6. 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?

Allow ESCOs to charge a fair price for heat supplied (based on current costs ) and a fair service charge. House holders will not have boilers to service and replace and should be charged a similar cost – say £1000 per year.

7. 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?

Look at successful schemes to identify key issues. For example, the Eldonians had a very good approach to their scheme in Liverpool and would have completed by now without obstruction from the LEP.

8. 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?

Community-led and owned ESCOs should oversee governance, coordination and delivery of low carbon heating. They should have the necessary support from the Local authorities where they are installing and running systems.

### **Contributors**

This submission has been prepared by the IMechE's Process Industries Division and the Construction and Building Services Division and represents their views.

### **For further information contact:**

Matt Rooney CEng MIMechE, Engineering Policy Manager, Institution of Mechanical Engineers.

[Matthew.rooney@imeche.org](mailto:Matthew.rooney@imeche.org)