Decarbonising the UK's heating system

What does decarbonisation of heating mean?

Decarbonisation of the heating system refers to the removal of carbon produced during the production of heat to warm our homes and buildings, and to heat our water. Heat is a complex problem, which must consider different property types and categories of end-users, meaning that policies for heat must always be tailored. Emissions from electricity are easier to reduce because of access to better developed technologies such as wind, solar etc. But it has proved harder to decarbonise heating.

General overview of the UK's heat supply:

The scale of the challenge is large given that 20% of the UK's GHGs come from heating for buildings. Heating and hot water also make up 40% of energy use (Aldersgate Group).

- 70% of the UK's heating is provided by natural gas and 13% by electricity.
- The Committee on Climate Change (CCC) said in 2016 that if the UK is to meet its targets set out in the 2008 Climate Change Act then it is necessary that the UK has largely eliminated these emissions by 2050.

What steps has the government taken so far?

The government's 2017 Clean Growth Strategy described decarbonising heat as "our most difficult policy and technology challenge to meet our carbon targets". However, they have brought in a number of measures:

- In the Clean Growth Strategy, the government committed to phasing out the installation of high carbon forms of fossil fuel heating in businesses and homes off the gas grid during the 2020s. This only applies to businesses that aren't on the gas grid.
- The Renewable Heat Incentive (RH) has been the principle mechanism to date, with the government spending £4.5 billion to support the deployment of low carbon heat technologies between 2016 and 2021. The RHI gives households or businesses money for installing low carbon heat technologies, such as heat pumps. By the end of 2021 the government expects that the RHI will have supported renewable heat installations into 2% of UK households (DECC, 2016).
- They have committed to investing £184 million in research and development programmes for new heating technologies.

The Committee on Climate Change says that progress has largely stalled and the government now needs a new policy framework.

Potential solutions

The government must develop a **more comprehensive heat policy**. The main issue with decarbonising heat is the lack of direction on how best to proceed. Reducing emissions from the heating network needs to be based on two factors: **reducing demand** and **decarbonising the supply**.

There are numerous potential solutions to **decarbonising the supply** to the heating network:

Energy efficiency:

This is the first step towards the decarbonisation of heating. With regards to **reducing demand**, we need to improve the energy efficiency of homes through retrofitting existing homes and setting higher standards for new builds. Zero Carbon Homes was a policy which almost went ahead in 2015 but was scrapped at the last minute. This policy would have cut emissions from new homes to zero. You can read a briefing on this policy from ECIU here.

Increasing the supply of low carbon gases in the network:

- Currently, the supply of low carbon gases, such as biomethane and hydrogen, make up a tiny proportion of the heating supply. When combusted as a fuel, hydrogen only releases water. Hydrogen can be produced via electrolysis (from water using an electric current) or conversion from methane. However, for the latter to be carbon-neutral, it requires carbon capture storage technology.
- Hydrogen can be used as a gas itself or *blended* with existing natural gas supplies (see Keele University Hydeploy). The UK used to have a greater quantity of hydrogen in its gas mix that it currently permits (called town gas). Presently we permit less than 1% hydrogen to be in our gas supplies, whereas other counties allow a greater quantity with no adverse effects and lower emissions.
- Increasing their supply would mean less reliance on high carbon emitting sources.
- Injecting biomethane into the gas grid is a means of decarbonising supply without requiring changes from consumers. However, its potential is limited to around 5% of gas consumption (CCC).
- National Grid has estimated that per annum enough gas to meet 20-33% of domestic gas demand from BioSNG and biomethane. *
- These methods are just low carbon sources and they do still emit some CO2.
- Such a shift must be supported by all of the network companies so that their assets don't become worthless.
- In May 2018, plans for the first large scale hydrogen power plant were announced, predicted to supply heat for thousands of homes in the North West of England. The plan, which hasn't yet secured funding, proposes storing the carbon captured during the hydrogen extraction process in the gas fields in Liverpool Bay. It is estimated that this project, HyNet, would provide £17 billion to the northwest's economy and provide over 5000 jobs, as well as saving over 1 million tonnes of C02 emissions. These proposals are still in discussions with the government and Ofgem, so you could ask your MP to show support such initiative.

*__Terminology__
BioSNG: synthetic natural gas from biomass.
Biomethane: a naturally occurring gas produced through the anaerobic digestion of organic matter.

Electrify the heating network by installing heat pumps:

- Heat pumps are powered by electricity and move heat from the ground or the air into the home.
- Heat pumps are the leading low carbon option for buildings not connected to the gas grid. There is potential for them to be rolled out to buildings connected to the gas grid also.
- Given that it is easier to decarbonise the electricity network, providing heat by using electricity could be effective to reduce emissions from heating- they are currently suitable in around 10 million homes connected to the gas grid (CCC).
- Heat pumps are very expensive, costing roughly double the price of a new boiler.
- The Energy Saving Trust estimates that heat pumps can lead to significant annual bill savings when replacing a variety of older boiler systems (with effective insulation measures in place). However, they can lead to slightly higher bills compared to the latest fossil-fuel boiler models.

Combined Heat and Power (CHP):

- CHP captures heat that is used in the energy generation process. In conventional ways of generating electricity, large volumes of heat are wasted so this is a much more efficient process. In fact efficient ratings of CHP plants can reach 80% and above. In today's coal and gas-fired power stations, up to two thirds of the overall energy consumed is lost in this way. Read more.

Increase the use of district heating:

- District heating schemes, often referred to as 'central heating for cities' or neighbourhoods, consist of networks of insulated pipes used to deliver heat, in the form of hot water or steam, from the point of generation (usually a local energy generation centre) to homes and businesses.
- These systems are efficient and low cost because they can make use of waste heat from electricity generation. However, less than 20% of UK heating needs can be fulfilled in this way
- District heating requires a certain density of heat demand in order to be economic, making them more suitable to urban areas (CCC).
- Copenhagen has one of the most successful systems in the world, with many benefits: it cuts household bills by 1,400 EUR annually, and has saved Copenhagen district the equivalent of 203,000 tons of oil each year, amounting to 665,000 tons CO2.

The diagram below provides a simple explanation. Underground pipes carry hot water from the local energy centre into homes. A Heat Interface Unit (HIU) gives users the same control over hot water as they would have had with a boiler.

Both CHP and District Heating are both cheaper options than heat pumps, but their implementation on a large scale would require large initial cost and disruption to lay the pipes

under the roads. Care in installation is especially important, to ensure that future transitions are still possible to say hydrogen conversion.

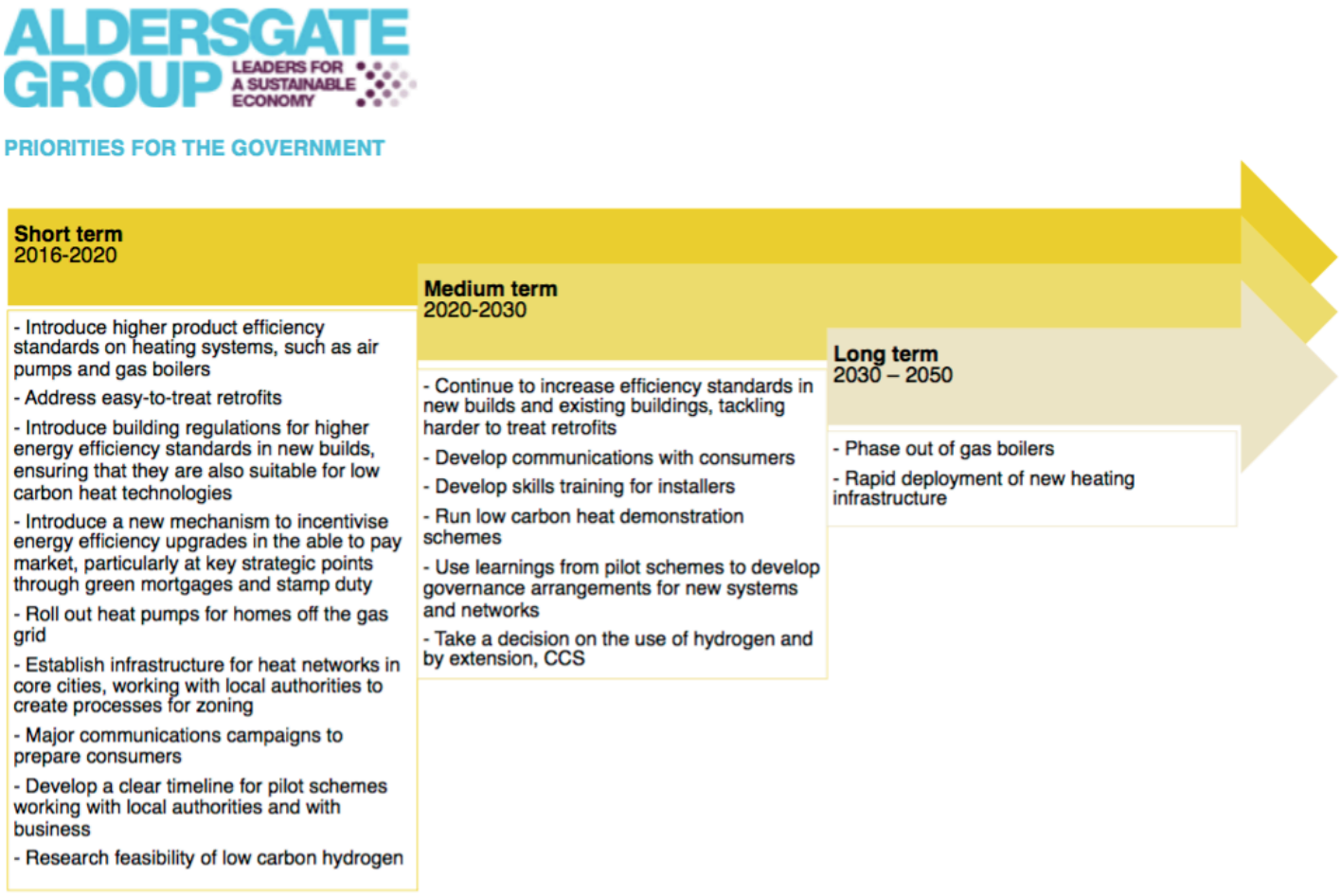
Image Source: The Centre for Decentralised Energy

There are also potential **knock-on benefits** from pursing different heat pathways, i.e. pursuing hydrogen for heat could lead to more widely (and cheaply) available hydrogen which could in turn help in the increase of hydrogen cars. Your MP may be interested to hear of these wider benefits.

What can you ask your MP to do?

- If emissions from heating are to be largely eliminated by 2050, a national programme to switch buildings on the gas grid to low-carbon heating would need to begin around 2030, requiring imminent government decisions (CCC). You can ask your MP to question the progress of such policies in Parliament.
- The UK is unique in its extensive gas network and having boilers in every home. In the long term (2030 to 2050) we need to see the phasing out of gas boilers. You can ask your MP to find out when the government will set out this long-term vision and report back to you.
- Providers of hydrogen and heat pumps for example will need to further develop and test their products ahead of government decisions. You can speak to your MP about the required government support for this. For example, hydrogen requires carbon capture and storage (CCS) and heat pumps require a sufficiently sized market. Your MP could write to the Minister for Energy and Clean Growth, Claire Perry MP.
- You can talk to your MP about upgrading standards for new builds, so that they not only reduce energy demand but also are compatible with future installations of low carbon heating systems. This will not only reduce the financial demand in the future from retrofitting, but also new builds 'lock in' emissions. With an estimate of 8 million new homes to be built by 2050, homes must be built with the future in mind.
- You could ask your MP about their thoughts on the reintroduction of the Zero Carbon Homes Policy. The long lifespan of houses means that we need to now be building homes that are future ready, in line with emission reduction targets. This ask is particularly pertinent following the recent announcement from Labour of their 'street by street' insulation policy to increase energy efficiency of homes. Policy support is urgently needed to drive energy efficiency improvements.
- The Hydepoly Project at Keele University is looking into the potential for blending hydrogen into the normal gas supply to reduce carbon dioxide emissions. You could provide your MP with some information on this project and ask them to support more hydrogen blending as a means to reduce emissions and encourage greater hydrogen research.
- Some methods of producing hydrogen require carbon capture and storage (CCS) to be carbon neutral. The Committee on Climate Change says how CCS is essential to most decarbonisation pathways and certainly essential to the most-cost-effective ones. CCS is now largely understood but remains undeveloped in the UK, and requires more support from the government. You can ask your MP to push for a strategy on the deployment of CCS.

This timeline of proposed Government priorities from the Aldersgate Group can help you to plan some further asks of your MP.



Meeting with your Councillor on this issue

It is just as important that local governments plan for the future in their area. Increasing public engagement in your local area for example can provide a local mandate for low carbon heat systems (Aldersgate Group). Hope for the Future can also support you to meet with your councillor on this issue, we would be delighted to hear from you. Contact us here.

Useful links

- This has quite a lot of useful information, particularly about the RHI.
- This report from OFGEM has a lot of information about potential solutions.
- This is a report from the CCC on the future of heat policy, referenced many times in this resource

- This briefing from The Aldersgate Group,
  an alliance of leaders from businesses, civil society and politics, which drives action for a sustainable economy, provides further detail and all that is discussed in this resource.
- This is a report on the scope for low carbon gases to be used: