Biomass Heat Works Now

The British government is committed to decarbonise the UK economy. Good progress has been made on the 20% of our energy consumed as electricity (31.7% now comes from renewables).[1] But less progress has been made decarbonising the 40% of our energy consumed as heat (7.7% from renewables).[2]

The UK needs to accelerate the decarbonisation of heat during the 2020s, partly to catch up with the strategy established in 2010 to comply with the Renewable Energy Directive,[3] partly because it is off course for its Fourth and Fifth Carbon Budgets (2022-2030) without dealing with the 80% of energy that is not electricity,[4] and partly because climate science always identified that it is important to reduce carbon emissions sooner rather than later and recent research suggests a tighter limit (1.5°C warming) and timetable (12 years).[5]

The Renewable Heat Incentive is the government's main lever to replace fossil-fired heating. The amount of renewable heat generated under the RHI increased by around 2.5 TWh in 2018, around one-third of one percent of our heat demand.[6] Half of that came from medium biomass projects, but reduced tariffs have collapsed the installation rate in 2018.

The RHI closes to new entries in 2021, and so far it is not clear what will drive the decarbonisation of heat after that. It will not be the comparative cost of fossil heating fuels, which are some of the cheapest and lowest-taxed in Europe.[7] Recent strategy documents from government bodies have focused on the long-term to 2050, but it is essential to deliver as much decarbonisation as possible in the 2020s, and not treat it as mainly an R&D period.

Europe leads the world in decarbonising heat. Across the continent, biomass dominates renewable heat, and heat is the primary use of biomass.[8] Over 90% of that is in the form of solid biomass (e.g. wood and energy crops).[9] Half of the bioheat is used directly in homes (e.g. wood-fired boilers), and solid biomass also fuels most of the renewable district heating.[10] Solid biomass also fuels most of the 5% of bioheat supplied to the service sector and almost all of the 26% of bioheat used by industry (mostly in the paper, pulp and wood-product sectors).[11] Through this focus on the most practical options, over two-thirds of Swedish heat is renewable, and even countries like Denmark and Italy, with similar levels of afforestation to the UK, have achieved much higher levels of renewable heat.[12]

Solid biomass is often the practical option because of the nature of heat demand:

- It is much more seasonal than electricity or transport. Unlike most of the renewable alternatives, solid biomass can be stored simply and cheaply for months.
- Most of the demand is spread thinly across the country in buildings. Distribution losses make the long-distance transmission of heat impractical. That favours technologies like wood heating that are practical at relatively small-scale.
- Most of the buildings that will be standing in 2050 are already standing. Biomass is often the simplest green replacement for fossil-fired heat, because it offers a similar quality and controllability of heat and does not rely on modern standards of building efficiency.[13]
- In the case of industry, biomass is the most likely renewable to achieve the temperatures, pressures and load profiles required.

The government is rightly attempting to address the impact of solid-fuel combustion on air quality, particularly in urban areas. Most of that impact comes from burning poor-quality fuel in open fires and old stoves. Several studies have found that emissions from modern wood-heating appliances burning quality-controlled wood are orders of magnitude lower. Leeds University, for instance, found that emissions from a wood pellet stove with an Electro-Static Precipitator were less than 1% of those from a traditional stove.[14]

Modern wood-heating appliances have almost nothing to do with urban air quality, as the numbers installed in urban areas are massively outweighed by the numbers of primitive installations. 9 of the 12,779 modern biomass-heat systems installed under the domestic RHI are in London, out of an estimated 133,157 households using wood fuel in London.[15] Modern wood heating is mostly concentrated in rural, off-grid areas where it offers the most decarbonisation benefit and the least impact from negligible particulate emissions.

Some people fear that there is insufficient sustainable resource for significantly more biomass heat. Even if the resource were limited to its current level, we could do a lot more with it by converting it to heat or CHP with modern appliances at 70-90% than to electricity (or heat in primitive installations) at 15-35% efficiency.

But in reality, there is considerable scope for sustainable growth. The Forestry Commission estimate that approximately 2 million tonnes of our monitored harvest is used for woodfuel, but estimate that the amount of native woodfuel that could be available with different practices and priorities is around 8 million tonnes.[16] The Energy Technologies Institute estimated the potential for energy crops in the UK at around 55 to 85 TWh (around 10% of our heat) annually in the 2030s, using 2.7 – 6.5% of UK agricultural land.[17]

And as for imports, to take just one country, if the UK took enough wood pellets from the USA to meet 20% of its heat requirement, that would be less than just the reduction in demand for US forest products between 2006 and 2016.[18] Contrary to deforestation myths, the biomass stock in the forests that supply most of the developed world's wood fuel (e.g. in Europe and North America) has increased strongly and continuously since WWII,[19] thanks to good management spurred by demand for the product. It is reserved forest that has struggled.

If the UK is to decarbonise its heat, it needs biomass to play a prominent role. That will not happen without some mechanism to reward the climate benefit. Learning from the RHI, to encourage good-quality, cost-efficient investment, that mechanism should be simple, stable, predictable, no more generous than necessary, and contingent on high standards.

If the greatest benefit and most suitable opportunities lie in off-grid areas, one option would be gradually-escalating fuel-duty on off-grid fossil fuels for heat. The gradual escalation allows for existing suppliers and users to plan and adapt, and for future operating costs to be taken into account when boilers are being replaced. Part of the additional tax revenue could be used to address any rural fuel-poverty impacts of the measure.

This is not the only option. There are other ways to provide a carbon value. The Wood Heat Association and UK Pellet Council have a range of options for policymakers to consider. The precise combination of measures is less important than the principle that biomass heat

should be rewarded for its climate benefit in order to encourage the decarbonisation of heat that the UK needs.

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[1] *Energy Trends*, April 2019, https://www.gov.uk/government/statistics/energy-trends-section-6-renewables
[2] *Energy Consumption in the UK 2018*, Table 1.04. https://www.gov.uk/government/statistics/energy-consumption-in-the-uk. 2017 figures. 2018 not yet available. The Renewables section of *Energy Trends, April 2019*, which provides the initial outturn for electricity and transport for 2018, does not even mention heat.
[3] *National Renewable Energy Action Plan for the UK*, Tables 3 and 4a, https://www.gov.uk/government/publications/national-renewable-energy-action-plan
[4] *Updated Energy and Emissions Projections 2018* (April 2019) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794590/updated-energy-and-emissions-projections-2018.pdf
[5] *UN Special Report: Global Warming of 1.5°C* (Oct 2018), https://www.ipcc.ch/sr15/
The Committee on Climate Change's recent report *Net Zero – The UK's contribution to stopping global warming* (May 2019) confirms that the UK should set a more ambitious trajectory, when the measures currently in place do not even put it on course for the old recommended trajectory.
[6] *RHI monthly deployment data*, https://www.gov.uk/government/collections/renewable-heat-incentive-statistics
[7] *Energy Trends*, Dec 2018, "Special feature – International energy price comparisons", https://www.gov.uk/government/statistics/energy-trends-december-2018
[8] Bioenergy Europe, *Statistical Report 2018*, Figures 2.5, 2.6, 4.1, 4.2. https://bioenergyeurope.org/statistical-report-2018/
[9] *ibid.* Figure 4.6. Biogas and municipal waste are each around 4%, and liquid biofuels and charcoal are < 1%.
[10] *ibid.* Figure 4.8 and Table 4.2.
[11] *ibid.* Figure 4.8 and Table 4.4.
[12] Eurostat, *Energy for heating/cooling from renewable sources* (Mar 2019), https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20190304-1
[13] In their recent response to the *Future Framework for Heat in Buildings* call for evidence, BEIS claimed that only 15% of "off gas grid dwellings are currently not suitable for electric heating". However, this claim derived from a report by delta-ee (*Technical feasibility of electric heating in rural off-gas grid dwellings*), which noted that this was only true for an average winter, and the figure rose to 36% in a 1-in-20 winter if ground-source heat pumps were mainly used, or 59% with air-source heat pumps (which have dominated heat-pump deployment in the RHI). Moreover, it did not take into account the need for hot water, nor the impact on the network from charging electric vehicles.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/762546/Future_Framework_for_Heat_in_Buildings_Govt_Response__2_.pdf
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/762596/Technical_Feasibility_of_Electric_Heating_in_Rural_Off-Gas_Grid_Dwellings.pdf
[14] Information provided by Prof Jenny Jones, from Mitchell, *PhD Thesis*, 2017.
[15] *RHI monthly deployment data*, Feb 2019, Table 2.3 for regional deployment under the domestic RHI (see note 6 above). *Summary results of the domestic wood use survey* (2016), Table 1.1 for estimated regional use of wood fuel, https://www.gov.uk/government/publications/summary-results-of-the-domestic-wood-use-survey. Similarly, also from the *RHI monthly deployment data*, 27 (<0.15%) of the 19,236 renewable-heat systems installed under the non-domestic RHI are in Inner London, and 108 (around 0.5%) across the whole of London. The non-domestic figures include other renewable-heat technologies besides biomass.
[16] Current deliveries: *Forestry Statistics 2018*, Chapter 2, https://www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/.
Potential: Forestry Commission's *Woodfuel Resource* project, https://www.eforestry.gov.uk/woodfuel/
[17] ETI, *Bioenergy: Enabling UK Biomass*, https://www.eti.co.uk/insights/bioenergy-enabling-uk-biomass
[18] USDA Forest Service, "Forest Resources of the United States 2017", preliminary RPA assessment tables. From tables 18, 19 & 41.
https://www.fia.fs.fed.us/program-features/rpa/docs/2017RPAFIATABLESFINAL_050918.pdf
[19] *ibid.* Tables 18 & 19.