Modern Biomass Boilers and Air Quality

Modern Biomass technology is a highly sophisticated, well-regulated, low-emission heat source, which is essential to UK decarbonisation.

Biomass is the largest contributor of low-carbon heat to date, and the government's Biomass Strategy recognises its importance for sectors that are complex to decarbonise.[1]

However, support is waning for biomass as an alternative fuel. Due to conflation with more traditional wood heating systems, like open fireplaces, authorities and public bodies are concerned about the particulate emission of wood heat, and worry it will undermine the progress towards the UK's 2040 air quality target 10µg/m^3 target

Air quality targets ($PM_{2.5}$)

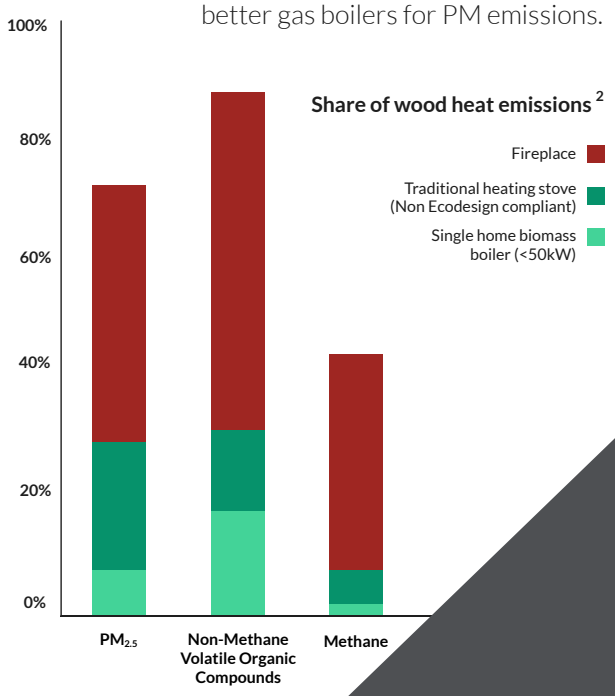
WHO recommendation [4]	UK target (2040) [3]	EU Law [5]
5µg/m^3	**10µg/m^3**	**20µg/m^3**

However, not all wood heat is created equal.

$PM_{2.5}$ emissions per GJ-1	Single home biomass boiler (<50kW)	Traditional heating stove (Non Ecodesign compliant)	Fireplace
Solid $PM_{2.5}$ (g GJ-1)	30	150	260
Condensable $PM_{2.5}$ (g GJ-1)	30	650	640

Unsophisticated wood burning creates radically different particular emissions from advanced biomass boiler heating systems

Today, emissions from biomass boilers can be reduced even further using modern Electrostatic Precipitation Technology (ESP). This can remove up to 99% of particulates, which means that biomass heat can rival or better gas boilers for PM emissions.



AIR QUALITY EXPLAINED

Particulates: Airborne particles and droplets, especially less than 2.5 microns in size ($PM_{2.5}$) or less than 10 microns in size (PM_{10}).

VOC: Volatile Organic Compounds. Carbon compounds with vapour pressure at room temperature.

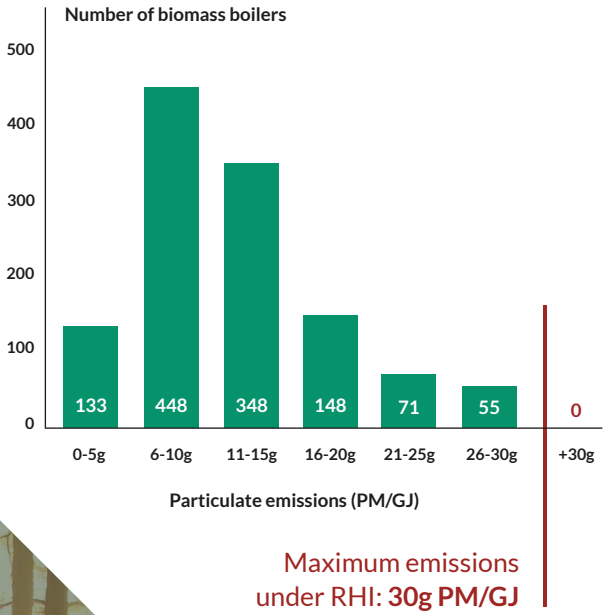
NO_x: Nitrous Oxides. Harmful chemical compounds, typically Nitric Oxide (NO) and Nitrogen Dioxide (NO_2)

Existing regulations ensure that biomass doesn't compromise air quality.

- Environmental Permitting Programme
- Industrial Emissions Directive
- Clean Air Act
- Large Combustion Plant Directive
- Renewable Heat Incentive (RHI) and Ecodesign certification for small scale biomass

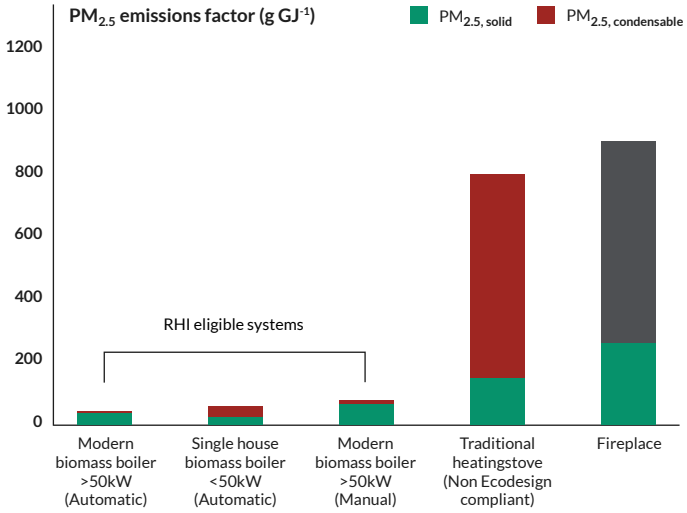
Additionally, the average particulate emissions of biomass boilers stands well below the maximum permitted under the RHI scheme.

Number of registered biomass boilers per particulate matter emissions according to boiler emission certificates (2018) [6]



Maximum emissions under RHI: **30g PM/GJ**

The result is a stark contrast in $PM_{2.5}$ emissions. [2]



The technological and regulatory contrast means that traditional wood burning and biomass energy are not remotely comparable.

	Modern Biomass boiler	Wood Burning Stove
Emissions testing	✓	✗
Mandatory annual service	✓	✗
Regulated Fuel	✓	✗

Boiler technology clearly outperforms open fireplaces for particulate emissions when wood heat sources are compared. [2]

The biomass heat industry would welcome any opportunity to discuss our industry-leading air quality credentials with government and regulators.

Please contact the REA Wood Heat Forum for more information.

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Sources: [1] 'Biomass Strategy', DESNZ, 2023 | [2] 'Emissions from RHI Eligible Boilers: A Response to the BEIS Consultation', Edward Mitchell, 2018 | [3] 'Particulate Matter (PM2.5 targets) in the Environment Act: Monitoring Assessment Methods', DEFRA | [4] 'WHO global air quality guidelines: particulate matter ($PM_{2.5}$ and PM_{10}), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide', World Health Organization, 2021 | [5] 'Directive 2008/50/EC of the European Parliament and of the Council', European Union 2008 | [6] 'Air quality and Biomass Heating', Frank Aaskov