

Ecodesign Stoves and the Clean Air Strategy

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CLEAN AIR STRATEGY 2019

2019 Clean Air Strategy

In January 2019 the UK government published its Clean Air Strategy in which it stated that that the “increase in burning solid fuels (wood and coal) in our homes (domestic burning) is having an impact on our air quality and now makes up the single largest contributor to our national PM emissions at 38%”.

However, the headlines are misleading as the same document also states:

“What people burn and the appliance they use will have a significant impact on emissions.”

Which, within the industry which actively encourages regular maintenance, updating stoves to modern “Ecodesign” models is the way we are going. Something which is also mentioned in the report in the statement about stove/appliance efficiency, acknowledging that inefficient (old) stoves are not comparable in any way to newer stoves. Independent tests by Kiwa show that advanced Ecodesign Ready stoves produce up to 90% less emissions than open fires and up to 80% less than stoves that are over 10 years old.

“Not all forms of domestic burning are equally polluting. The appliance (for example, stove or fireplace), how well it is used and maintained, and what fuels are burnt in it, all make a big difference to how much pollution is produced. Significant air quality benefits can be realised through a new efficient appliance as compared with an old stove or open fire.”

“There are simple steps that households can take to limit emissions both indoors and out. Using cleaner fuels, in a cleaner appliance which is installed by a competent person, knowing how to operate it efficiently, and ensuring that chimneys are regularly swept, will all make a big difference.”

The true contribution of domestic burning to air pollution remains questionable and surveys and analysis done show that newer, Ecodesign Ready stoves can significantly reduce the amount of particulate matter emitted.

And to clarify the results of the findings, HETAS, with support from the SIA, has commissioned a review of existing scientific research, literature and methodologies that focus on the contribution of domestic burning to UK air pollution.

The review has been co-authored by:

- Edward J. S. Mitchell PhD
- Joshua Cottom PhD
- Douglas Phillips PhD
- Ben Dooley PhD

And has been subsequently peer reviewed by:

- Professor Alan Williams CBE, FREng University of Leeds
- Professor Jenny Jones FRSC, MEI University of Leeds.

Schiedel Chimney Systems provide energy efficient flue systems and liners and always promote, within installation instructions and advice guides, that sweeping and maintaining stove systems is critical for reducing emissions as well as prolonging the life of the chimney system and the appliance.

The 38% figure quoted by the Clean Air Strategy is based on the assumption that 6m tonnes of wood fuel are burnt each year in the UK. This figure was based on the findings in the BEIS Domestic Wood UK Survey published in 2016 using 1,206 members of the public using wood fuel to heat their homes.

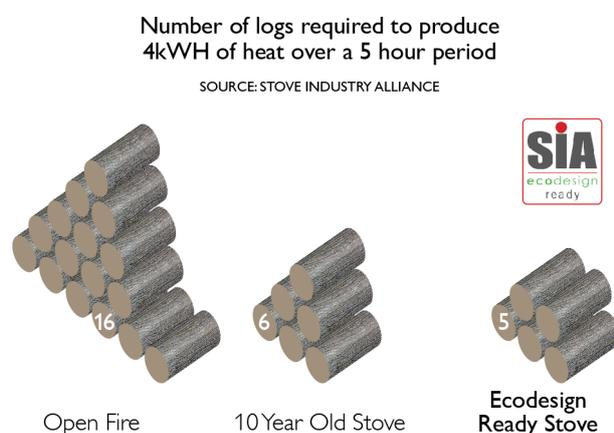
SIA's more comprehensive survey

In early 2019 the SIA conducted its own user survey to 10,620 members of the public who used wood stoves at home and using the same questions and methodology as applied to the BEIS survey.

More accurate figures.

The results of the SIA survey have been independently reviewed and verified by Kiwa UK, a world leader in Testing, Inspection and Certification (TIC) in energy supply (as well as other industries).

According to the SIA Survey, the volume of wood burnt each year in the UK is closer to 1.85m tonnes rather than the 6m tonnes concluded by the BEIS survey.



Applying this more up to date and accurate figure to the calculation used within the Clean Air Strategy the percentage of PM2.5 attributable to domestic wood burning would fall to 14.9% from 38%

Usage for heating.

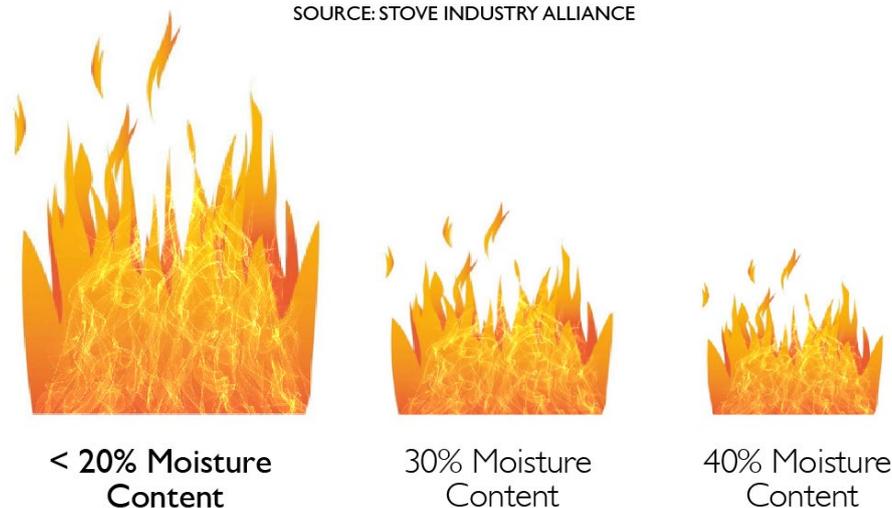
The SIA survey also showed that 96.5% of users were using their appliances for heating and not purely for aesthetic purposes. This is a vital consideration and a valid endorsement of wood fuel as part of an affordable low carbon heating strategy for the UK.

Stoves are always a focal point for any house and home and are instantly desirable. However, these are not for aesthetic purposes only. People who don't have a wood burner, automatically assume the purpose is for aesthetics, however, in some cases firing up a stove tends to heat larger rooms far quicker than conventional radiators would.

For example, Norfolk Woodburners, a HETAS Accredited installation company, installed one into a room which was traditionally difficult to heat up, even with efficient radiators. Also using a low moisture content logs, which are carbon neutral, means that there is more heat generated, less emissions due to the dryness and a longer burn cycle.

Heat output from logs at different moisture contents (kWh)

SOURCE: STOVE INDUSTRY ALLIANCE



“We are absolutely thrilled with the wood burner and it has done a fantastic job of heating the lounge. For a room that has always struggled to get above 17 degrees before, to see 25.5 degrees on the thermostat was an absolute delight.”

<https://www.schiedel.com/uk/heating-up-that-constantly-cold-room/>

Ecodesign stoves

Ecodesign is the European-wide programme to lower emissions from stoves. It comes into force in the UK in 2022. [SIA Ecodesign Ready](#) stoves have been sold for several years now and meet the Ecodesign requirements.



A DEFRA exempt stove is a stove that has been tested against the government's criteria for emission levels. DEFRA approved stoves are limited on the amount of smoke that they will produce during all stages of normal operation. Quite simply, these stoves limit the level the stove can be starved of air during the burning process. The lack of air in a stove creates more smoke.

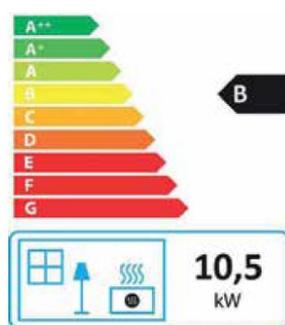


The limits for Defra and Ecodesign are different and based on different measurement methods but for a Typical 5 kW stove at 80% efficiency the Limit for Defra would be 6.67 g/h. Defra exemption requires stoves to demonstrate they have low smoke emission at both a Rated or Nominal output level and at a minimum output or minimum air-setting.

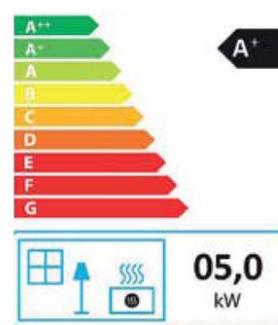
Schiedel always recommend Ecodesign Ready stoves. This mark is awarded to wood burning appliances that are verified by [HETAS](#) and meet the five fundamental requirements of the Regulation for efficiency and emissions:

- Seasonal efficiency,
- Nitrogen Oxide
- Carbon Dioxide emissions
- Particle Matter
- Organic Gaseous Compounds.

The SIA user survey also found that more than 27% of appliances are open fires or stoves that are over 10 years old. As a result of significantly reduced efficiency when compared to modern wood burning stoves, open fires and older stoves account for over 51% of the UK's annual wood fuel consumption.



Stove or Fire from 10 Years ago

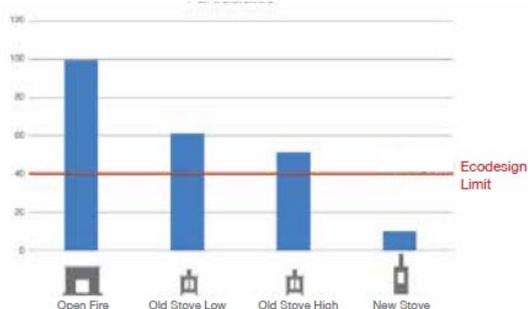


Ecodesign Stove or Fire - 80% Efficient

Modern Ecodesign reduces particulate emissions by up to 90%

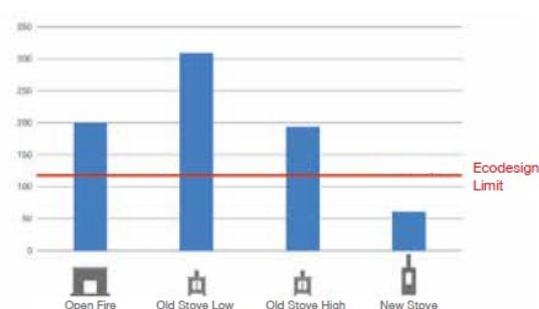
Burning wood produces particulate matter (PM) but the amount produced depends on how the wood is burnt. Independent research conducted by Kiwa Gastec on behalf of the SIA has shown that SIA Ecodesign Ready stoves can **reduce** particulate emissions by 90% compared to an open fire and 80% compared to an old stove

Particulates comparison with Ecodesign Stove



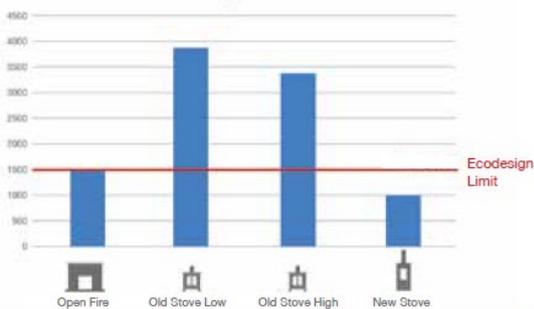
Particulates	Open Fire	Old Stove
Improvement	90%	80% - 84%

OGC (Organic Gaseous Compounds) comparison with Ecodesign Stove



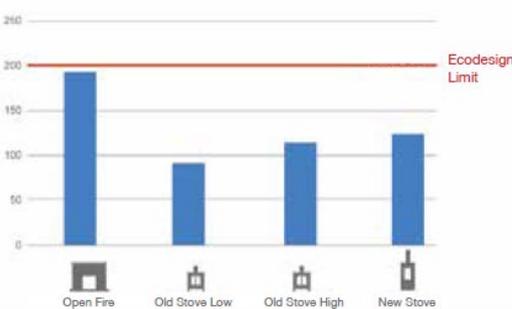
OGC	Open Fire	Old Stove
Improvement	70%	65% - 80%

CO (Carbon Monoxide) comparison with Ecodesign Stove



CO	Open Fire	Old Stove
Improvement	33%	68% - 74%

NOx (Nitrogen Oxides) comparison with Ecodesign Stove



NOx	Open Fire
Improvement	34%

Replacing older stoves and open fires with new Ecodesign ready stoves would reduce emissions by nearly 45% and, with this reduction applied, wood burning would account for around 8% of PM2.5 emissions in the UK.

Regarding secondary particulate matter, the release of precursor gases (e.g. VOCs and NOx) can significantly increase the mass of PM emitted from stoves, and this is an issue with

open fires and older stoves. However, the SIA Review concludes that efficient modern appliances can see these reduced to near zero during stable combustion conditions.

Ecodesign Ready stoves along with a properly installed, high quality chimney system, which is regularly maintained, reduces primary PM, secondary PM precursors and toxicity.

Volatile organic compounds (VOCs) are compounds that easily become vapours or gases. VOCs are released from burning fuel such as gasoline, wood, coal, or natural gas. They are also released from many consumer products such as; cigarettes and solvents.

NOx is a term for nitrogen oxides that are most relevant for air pollution, namely nitric oxide (NO) and nitrogen dioxide (NO2). Smog and acid rain are formed from NOx gases. NOx gases tend to be the result of the reaction among nitrogen and oxygen during combustion of fuels, such as hydrocarbons at high temperatures. Examples would be car engines. In urban areas with a large number of vehicles, such as London, the emissions can be a significant source of air pollution.

Ecodesign IS supported by the Government

Both Defra and the Mayor of London are backing the installation of SIA Ecodesign Ready stoves to reduce emissions from wood burning.

In its Clean Air Strategy Defra recognises that all wood burning is **not** the same and that reductions in particulate emissions, (PM), can be achieved through the installation of Ecodesign Ready stoves burning Ready to Burn logs.

The Mayor of London showed his support for Ecodesign Ready stoves by sponsoring two adverts in the Evening Standard encouraging Londoners to only burn dry wood and choose a Defra exempt stove which is also Ecodesign Ready.



Sadiq Khan went on to say:

"The Stove Industry Alliance (SIA) and Woodsure have launched their voluntary "Ecodesign Ready" and "Ready to Burn" labels to help consumers make the right choice in London and other smoke control areas."

Speaking at the launch of SIA Ecodesign Ready on behalf of Dr. Thérèse Coffey Parliamentary Under Secretary of State for the Environment, Simon Hoare MP, said:

"The Ecodesign Ready brand is a great example of industry taking the lead to promote the benefits of more efficient and cleaner technologies and bringing them to the market. Ecodesign Ready stoves will help to cut air pollution."

Neil Parish MP, Chair of the Select Committee Environment Food & Rural Affairs, said:

"What the SIA is doing fits in with the world we have; we have problems in our inner cities with very high levels of NO_x and particulates. Anything we can do to reduce that from open fires and others, through SIA Ecodesign Ready stoves has got to be an absolute benefit."

Air Pollution from Stoves overstated

Analysing the assumptions made to date on the UK's wood fuel consumption reveals large uncertainty in the BEIS 2016 Domestic Wood Use Survey's figures and indicates that the contribution to air pollution from wood burning has been significantly overstated.

The above estimates of domestic wood burning's contribution to national PM emissions is based on the current emission factors with the NAEI (National Atmospheric Emissions Inventory).

The Review of the Impact of Domestic Combustion on Air Quality also highlights that these emission factors are three times the level of emissions permitted under the new Ecodesign legislation, which is now implemented in modern Ecodesign Ready stoves.

To summarise, this means that more efficient stoves will drastically reduce the particulate emissions

Already, we have older stoves being replaced on the recommendation of HETAS Accredited Chimney Sweeps and Professionals, who will regularly sweep the stove and chimney system and advise on the emissions and condition of it. Generally, when replacing the stove, the chimney system or liner also is replaced, and this will drastically improve the efficiency and reduce the particulate matter emissions.

This means that a further review of air quality is needed.

Education is always key. The industry regularly posts information about the correct quality wood using schemes such as the Ready to Burn Scheme by WoodSure.

Tearing down old furniture with impure wood is clearly going to create additional emissions in the same way a poorly maintained car will give off bad emissions.

The HETAS Sweeps can always identify if poor quality wood is used by inspection of the stove and chimney system.

Improved Testing

Finally, one of the other issues is the testing equipment used in the research.

An aethalometer is the common instrument used for measuring air particles. The majority of aethalometers used for quantitative monitoring within the UK carry high levels of uncertainty due to large amounts of variation within the instruments default values.

The aethalometers used in the King's College research are only 2 wavelength and cannot distinguish domestic wood burning on its own from other biomass combustion sources.

The accuracy may be improved by upgrading the network of aethalometers from 2 wavelengths to 7 wavelengths,

In order to assess particulate matter from wood smoke, the King's College report uses levoglucosan as a measurement to support the aethalometer results. Levoglucosan is an organic compound with a six-carbon ring structure formed from the pyrolysis of carbohydrates, such as starch and cellulose.

As a result, levoglucosan is often used as a chemical tracer for biomass burning in atmospheric chemistry studies, particularly with respect to airborne particulate matter.

Along with other tracers such as potassium, oxalate, and gaseous acetonitrile, levoglucosan has been shown to be highly correlated with regional fires. This is because the gas emitted by the pyrolysis of wood (biomass) contains significant amounts of levoglucosan.

Levoglucosan has only been found detectable in low temperature samples (150-350 °C), which means that this cannot distinguish definitively between different sources of biomass combustion as levoglucosan is also produced by other processes such as cooking and cigarette smoke.

This means that its value as an indicator for smoke from controlled biomass combustion in modern domestic wood stoves, which operate at temperatures above 500 °C, is "very doubtful". Levoglucosan is a marker for coal combustion as well as wood.

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