Wood Burners

- How big a problem are they?
- How can they best be used to minimise pollution?

PM2.5 particle hazard

- PM2.5 are 25um dia, 1/20th diameter of human hair
- The small size of PM2.5 particles allows them to bypass the body's natural defence mechanisms and infiltrate key systems
- PM2.5 particles seen as the most hazardous component in air pollution

PM2.5 particle hazard

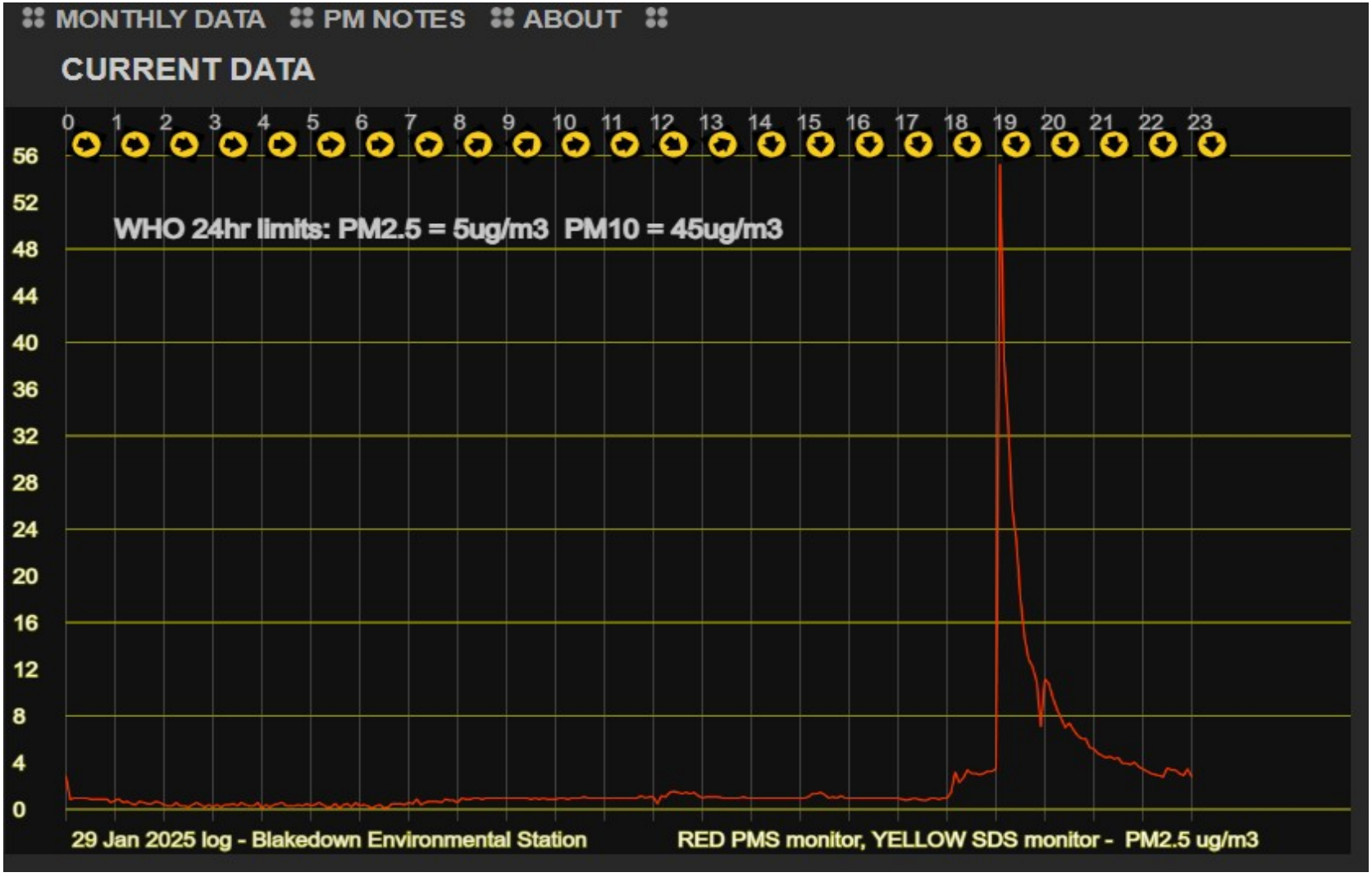
- Air pollution causes some 30,000 deaths/year in UK (report from Royal College of Physicians)
- The World Health Organization says air pollution causes some seven million deaths a year globally
- PM2.5 is the leading environmental cause of death worldwide, primarily due to related cardiovascular events and high blood pressure
- Woodburners cause some 20% of UK PM2.5

From Gemini AI we have:

- Particles often carry toxic chemicals, heavy metals, and organic compounds, which are then distributed internally
- Exposure can trigger asthma attacks, worsen Chronic Obstructive Pulmonary Disease (COPD), and increase respiratory infections like pneumonia.
- PM2.5 is classified as a human carcinogen, affecting the lungs
- Research suggests PM2.5 can reach the brain, contributing to neurodegenerative diseases, and cognitive decline.
- Exposure during pregnancy is linked to adverse birth outcomes

Traditional woodburner lay-up

- Crumpled newspaper (or firelighter) followed by kindling, followed by ever larger pieces of wood
- Then light the paper and hope!
- Pollution near stove is shown in subsequent slides
- Smoke blowback from top & bottom vents caused by initial column of cold air in flue
- Following two curves are for standard lay


MONTHLY DATA
PM NOTES
ABOUT
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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
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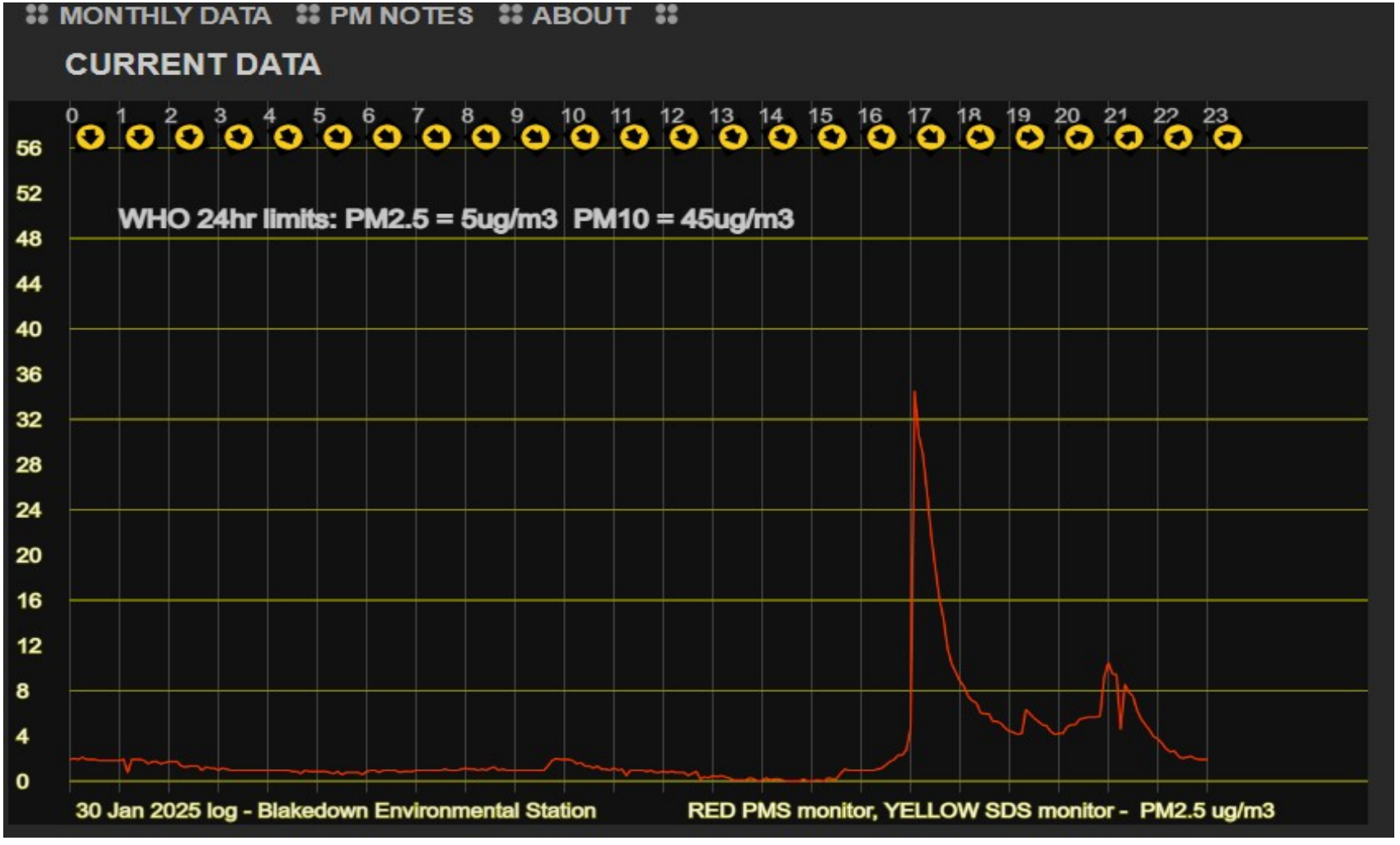
WHO 24hr limits: PM2.5 = 5ug/m3 PM10 = 45ug/m3
29 Jan 2025 log - Blakedown Environmental Station
RED PMS monitor, YELLOW SDS monitor - PM2.5 ug/m3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Air Particle measurment unit

Air Particle measurement unit

- Built into a small hearing aid case
- Powered off USB port or USB battery pack for off-site measurements
- Uses a Raspberry Pi microprocessor linked to wifi and to cloud data storage, data then downloaded by my environmental monitor system and formatted into a graph on the web page.

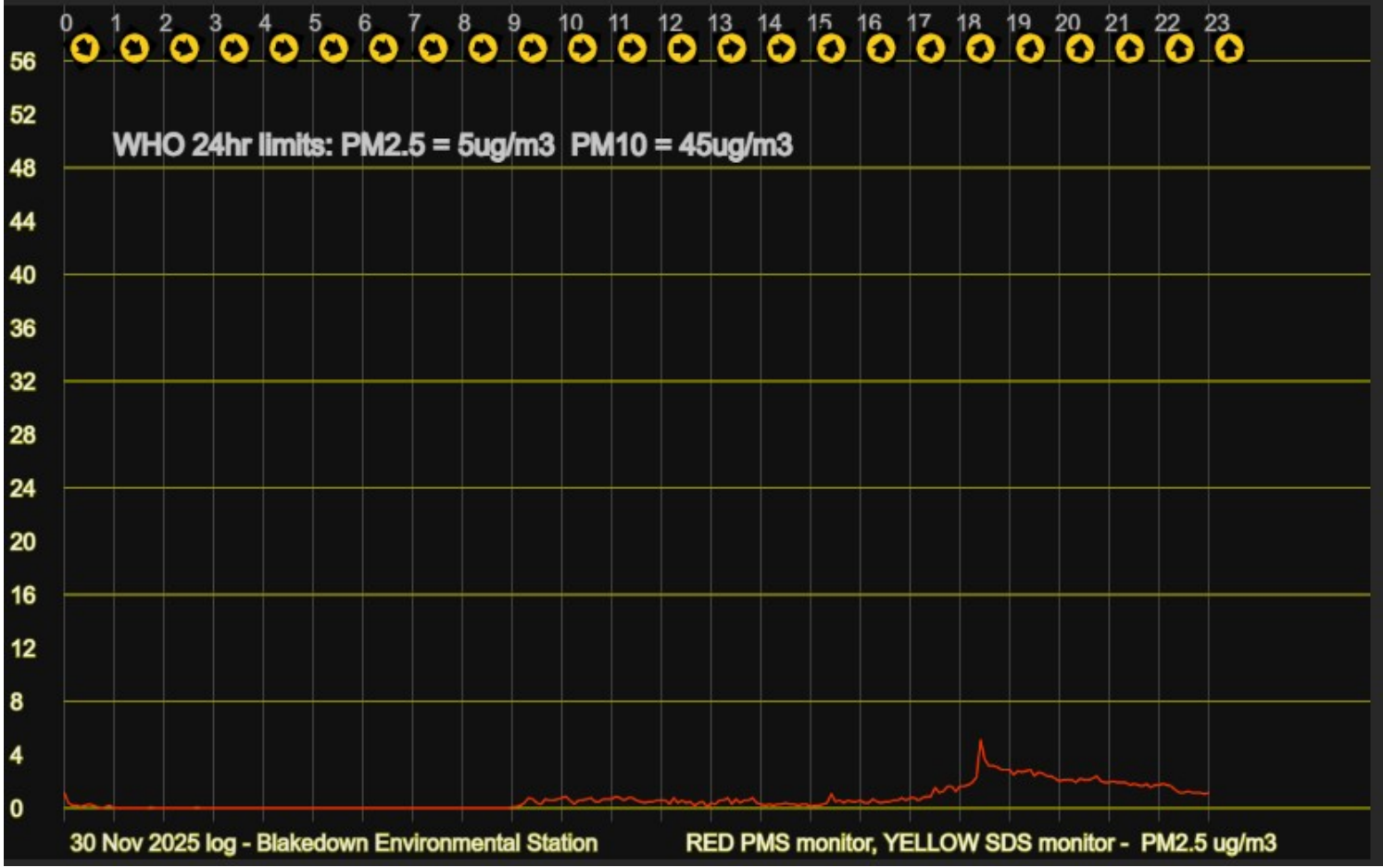
Air Particle measurement unit

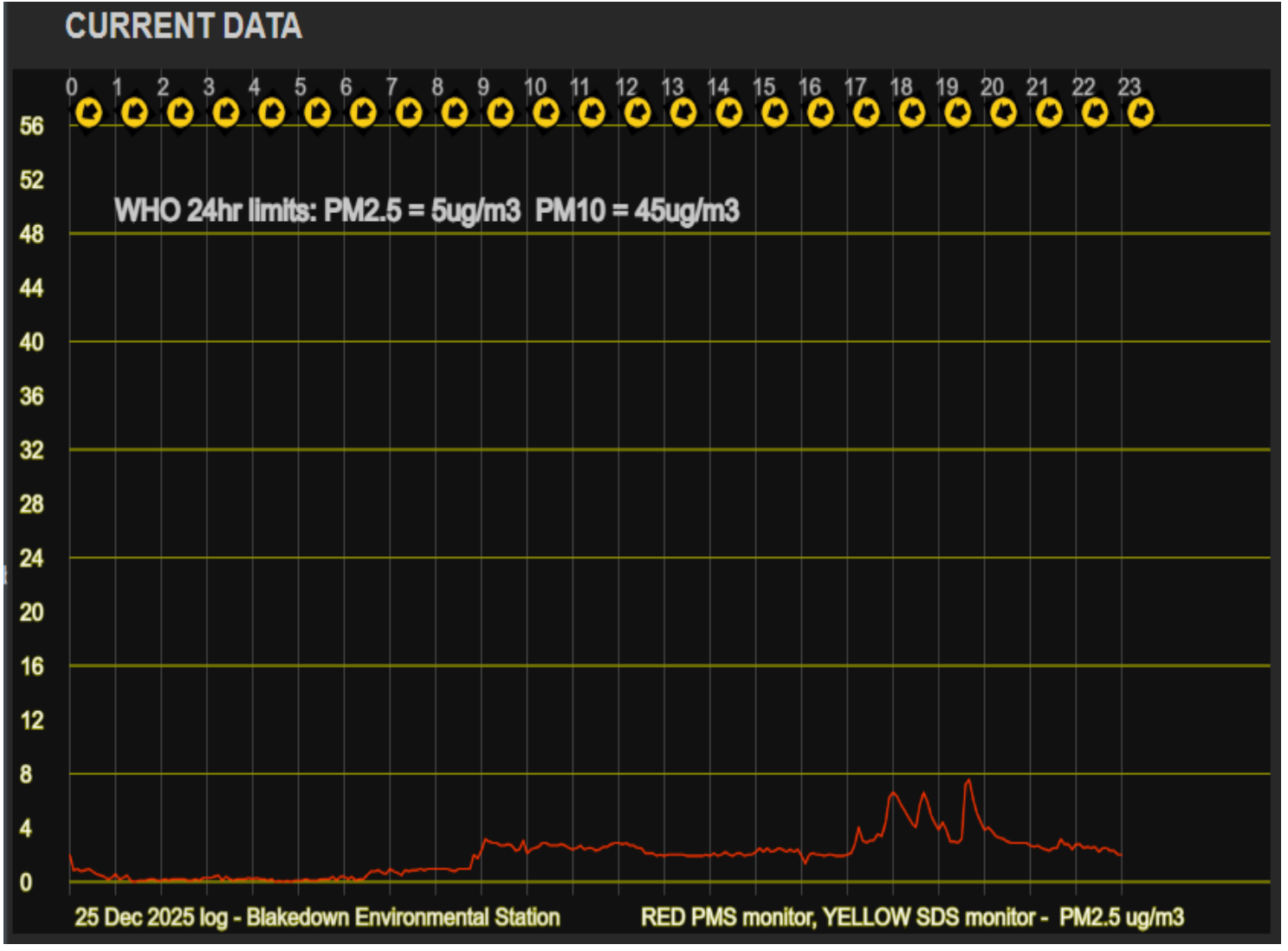
- A second monitor measures outside pollution but this unit is currently not working as it got a bit wet in the recent downpours!

- PM2.5 values were measured opposite the stove, this is the air I breath!
- Previous curve values are way above recommended levels
- However there is no really safe level !
- Following two curves for an ‘UpSideDown’ lay

MONTHLY DATA PM NOTES ABOUT

CURRENT DATA




CURRENT DATA
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WHO 24hr limits: PM2.5 = 5ug/m3 PM10 = 45ug/m3
25 Dec 2025 log - Blakedown Environmental Station
RED PMS monitor, YELLOW SDS monitor - PM2.5 ug/m3

Upside-Down Woodburner Layup

- Large wood at bottom (2/3” dia) then decreasing size, built as high as possible.
- Insert firelighter about 2/3rds up ensuring lots of kindling above
- Open bottom vent, close top vent
- Light the fire and enjoy the ~30min show
- When hot (10mins) , open top vent , close bottom vent

pre-prepared lay-up wood box

Advantages

- Strong updraught minimises smoke 'blowback'
- No need to open door during fire-up period
- At end of burn, stove & flue are very hot, ideal for subsequent low pollution wood burning
- Very low deposit on glass due to lack of smoke

Woodburning Guidelines

- Only burn previous year's dried out wood
- Avoid treated woods (Ply, MDF, Decking, some Pallets)
- Keep the fire hot, let it burn out hot - not damped down
- Refuel by opening door slowly, and for the minimum time
- Check glass door seals regularly
- Fit flue-liner to get a hotter, cleaner burn
- Only use in cold weather
- Be considerate to neighbours

General considerations

- UK air pollution legislation mainly ineffective as it does not cover the invisible PM2.5 particles, only visible smoke!
- Difficult to assess relative danger of wood burners compared to other sources of air pollution, ie. frequent continental pollution & the annual Bonfire Night!
- Better not to burn wood at all but if you must – be responsible !
- Following curves each tell a story

Bonfire Night - PM10

From the Continent

From my Neighbours

CO_2 Emissions from Wood

- Burning wood releases same CO_2 as allowing it to rot down

  Both recycle the carbon trapped in the wood
- The tree stores carbon taken from the atmosphere as CO_2
- Burning wood releases CO_2 again and if it's sustainably managed then a new replacement tree will take in that CO_2 – albeit some 40 years later!
- One problem is that with the climate & environment crises we don't have the luxury of a 40 year wait !
- But gas CH emits a lot of CO_2 by releasing a massive 200m year store.

Links

Real-Time Blakedown Environmental monitor station at

http://www.mecol.co.uk/weather/logplotter.html *

- Global air pollution - https://www.iqair.com/gb/earth
- **YouTube 20x Video** https://www.youtube.com/watch?v=V7AVvdv1soE
- PLAY VIDEO

***** press the PM++ button several times to cycle through the missing outside sensor

if no graphs show do a screen refresh, or go to Today

Feedback

- If you have any comments on your results from doing an upside-down fire please email me on

  geowarm3@gmail.com