

## Environment Agency internal briefing note on UKWIN article July 2018

### What is this briefing note about?

This briefing has been put together by the Environment Agency in response to a report published by UK Without Incineration (UKWIN) on 17 July 2018 entitled “Waste Incineration and Particulate Pollution: A failure of governance”<sup>i</sup>. This briefing is primarily intended for internal Environment Agency use, but can be shared externally if required.

This briefing addresses the various points made in the UKWIN report and provides further information about the challenges around monitoring particulates at the very low concentrations found in the exhaust gases of modern municipal solid waste (MSW) incinerators (also known as energy-from-waste or EfW plants). It also provides data on the amount of particulate matter and oxides of nitrogen (NO<sub>x</sub>) emitted from EfW plants compared to other common sources, and how we assess the impact of an EfW plant’s emissions when deciding whether to grant a permit. A list of key messages can be found at the end of the briefing.

### Some explanation about different sizes of particulate matter and how it is monitored

Particulate matter (PM), also known simply as “dust”, is emitted from many different sources including cars, household wood burning and agriculture. PM is classified according to size, with the smaller particles thought to be more likely to have an impact on health. PM<sub>10</sub>, for example, is all particles with a diameter of 10 micrometres *or less*, and therefore includes smaller particles such as PM<sub>2.5</sub> and PM<sub>1</sub> etc.

There is currently no validated, commercially available equipment for continuously monitoring PM<sub>10</sub> and PM<sub>2.5</sub> emissions from EfW plants. Instead, plants are required to continuously measure *total* particulate matter (TPM). TPM includes particulates of *all* sizes including PM<sub>10</sub>, PM<sub>2.5</sub>, PM<sub>1</sub> etc as well as ultrafine particles (i.e. particles with a diameter of less than 0.1 micrometres).

Equipment is available to monitor PM<sub>10</sub> and PM<sub>2.5</sub> *discontinuously* i.e. by using temporary monitoring equipment to sample the exhaust gas and then working out the results in a laboratory. Indeed, all new EfW plants are required to carry out this test when they first start operating. However, the concentrations of PM in the exhaust gases of modern EfW plants are so low that it is very difficult to get an accurate result from these tests, and will remain so until new monitoring methods and technology can be developed, validated and standardised for use.

In summary, specific emissions of PM<sub>10</sub> and PM<sub>2.5</sub> from EfW plants can’t be accurately measured using current technology. However, this isn’t really a problem as all EfW plants continuously measure their TPM emissions, which includes particulates of *all* sizes. If we then want to know the impact of PM<sub>10</sub> from an EfW plant under the worst-case scenario, we can simply assume that *all* of the TPM measured is PM<sub>10</sub>, and the same for PM<sub>2.5</sub> and so on.

### How does the Environment Agency assess impacts of EfW plants on the environment and human health?

We use a number of methods, but one of the key assessments for PM<sub>10</sub>, PM<sub>2.5</sub> and NO<sub>x</sub> is to compare the modelled emissions from the EfW plant with the European air quality standards for these pollutants (also taking into account the existing levels of pollution around the plant). To do that, we assume that the plant operates at its permitted limits 100% of the time (when in reality it won’t, especially for TPM where plants often operate at around 10% of their limits). For PM<sub>10</sub> and PM<sub>2.5</sub> we also assume that TPM = PM<sub>10</sub> = PM<sub>2.5</sub> as explained above. Making these assumptions means that we assess the worst-case scenario, which is what we then base our permitting decisions on, and we also consult Public Health England (PHE) on every application that we receive.

### Do EfW plants make a big contribution to particulate matter and NO<sub>x</sub> emissions in the UK?

The table overleaf shows estimates of the amount of pollution that was released by different example sources listed in the Government’s National Atmospheric Emissions Inventory<sup>ii</sup> (NAEI, which is referenced in the UKWIN report). These include figures for domestic wood burning (i.e. wood fires and stoves in people’s homes) and emissions from road transport including cars, buses and lorries.

The data shows that emissions from EfW plants make up just 0.03% / 0.05% of total UK PM<sub>10</sub> / PM<sub>2.5</sub> emissions. This is compared to 5.35% / 4.96% from traffic and 22.4% / 34.3% from domestic wood burning. For NO<sub>x</sub> the figures are 1.12% from EfW plants compared to 33.5% from traffic and 0.57% from domestic wood burning.

2016 NAEI category	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>
MSW incineration	0.057 kt = <b>0.03%</b>	0.057 kt = <b>0.05%</b>	9.97 kt = <b>1.12%</b>
Domestic wood burning	38 kt = <b>22.4%</b>	37 kt = <b>34.3%</b>	5.1 kt = <b>0.57%</b>
Cars, buses, lorries	9.1 kt = <b>5.35%</b>	5.36 kt = <b>4.96%</b>	298.9 kt = <b>33.5%</b>
<b>Total UK emissions</b>	<b>170 kt</b>	<b>108 kt</b>	<b>893 kt</b>

(Source: <http://naei.beis.gov.uk>; kt = kilotonne i.e. 1000 tonnes)

It is also important to understand that the overall impact of an EfW plant's emissions on human health for a given amount of PM or NO<sub>x</sub> released will be lower than if that same amount was emitted by a car or a domestic wood fire. This is because EfW plants have tall stacks (chimneys) which help to disperse their emissions, whereas a car exhaust pipe or a chimney on a house releases its emissions much closer to ground level.

### Are emissions from EfW plants causing significant health effects in England?

We consult Public Health England (PHE) on every EfW plant application that we receive and we will not issue a permit if its emissions will cause significant pollution or harm to human health. PHE has also published the following position statement on the health impact of waste incineration: *“Modern, well managed incinerators make only a small contribution to local concentrations of air pollutants. It is possible that such small additions could have an impact on health but such effects, if they exist, are likely to be very small and not detectable.”* The study of all 22 British EfW plants in operation 2003–10<sup>iii</sup> indicates very low concentrations of incinerator-related PM<sub>10</sub> within 10 km of the plants at postcode level.

### What is the Environment Agency's response to the points covered in the UKWIN report?

The following table provides a summary of our responses to the main points covered in the UKWIN report and should be read together with the information above.

Claim made or policy called for	Environment Agency response
The public have been “kept in the dark about PM <sub>10</sub> and PM <sub>2.5</sub> emissions” as there is no equipment available for their continuous monitoring.	The fact that PM <sub>10</sub> and PM <sub>2.5</sub> emissions cannot be continuously monitored does not mean that they cannot be estimated and the estimates made publically available. Indeed, this is what the NAEI does, with data available to the public going back to 1970. The 2016 data for example shows that EfW plants emitted an estimated 57 tonnes of both PM <sub>10</sub> and PM <sub>2.5</sub> , representing 0.03% and 0.05% of total UK emissions respectively. In comparison, the NAEI estimates that domestic wood burning accounted for 22% and 34% of total UK PM <sub>10</sub> and PM <sub>2.5</sub> emissions respectively.
There is a “TPM fiddle” which prevents the public from being told about TPM emissions from incinerators.	All EfW plants must continuously monitor and report TPM emissions on a quarterly basis. The results of this monitoring are placed on the public register and show that many EfW plants operate at around 10% of their emission limit for TPM.
There is a “no equipment fiddle” which allows operators to say they can't measure PM <sub>10</sub> and PM <sub>2.5</sub> when in actual fact they can measure them “by proxy”.	The method used by the NAEI is not a form of <i>measurement</i> but rather it is a conservative <i>estimate</i> of the PM <sub>10</sub> and PM <sub>2.5</sub> emissions which relies on the simple assumption that TPM = PM <sub>10</sub> = PM <sub>2.5</sub> .
Incinerator operators have been ignoring Environment Agency guidance on reporting PM <sub>10</sub> and PM <sub>2.5</sub> ; PM <sub>10</sub> and PM <sub>2.5</sub> reporting should be made mandatory and guidance should be strengthened and enforced.	As explained above, EfW operators cannot specifically measure their PM <sub>10</sub> and PM <sub>2.5</sub> emissions in an accurate way. As the UKWIN report highlights, our Pollution Inventory (PI) guidance suggests that emission factors can be used. However, these emission factors are from 2000 (when not all EfW plants were required to be fitted with bag filters) which may help explain the difference between the UKWIN figures (226.1 tonnes for England in 2017) and the NAEI data (57 tonnes for the whole of the UK in 2016). We are in the process of updating our guidance to make it clear that PM <sub>10</sub> and PM <sub>2.5</sub> emissions must be reported on the PI, as well as providing an updated method to enable operators to estimate them.
A limit value should be placed on PM <sub>1</sub> emissions from incinerators if possible.	A limit on PM <sub>1</sub> emissions is arguably not necessary as PM <sub>1</sub> will be included in TPM emissions, and in any case, PM <sub>1</sub> emissions will be taken into account when assessing an EfW plant's emissions against the air quality standards for PM <sub>10</sub> and PM <sub>2.5</sub> (which will both include PM <sub>1</sub> and ultrafines as explained above).
An incineration tax should be introduced under the “polluter pays” principle and there should be a moratorium on new incinerators until this and the other policies mentioned are in place.	Whether waste incineration should be taxed or a moratorium put in place are decisions for the Government and not the Environment Agency. We will continue to consider permit applications for new EfW plants in the same way i.e. by assessing the impacts of particulates and other pollutants on the environment and human health.

## Summary/key messages for a non-technical audience

- The UKWIN article is about municipal solid waste (MSW) incinerators, also known as energy-from-waste or EfW plants.
- The article talks mainly about emissions of particulate matter (PM), which is also known simply as “dust”. PM is emitted from many different sources including cars, household wood burning and agriculture.
- PM can be classed by size e.g. PM<sub>10</sub> refers to all particles with a diameter of 10 micrometres (µm) **and smaller**, and PM<sub>2.5</sub> means those with diameter of 2.5 µm **and smaller**. This means that PM<sub>1</sub> and “ultrafine particles” (with a diameter of less than 0.1 µm) are included in PM<sub>10</sub> and PM<sub>2.5</sub> measurements.
- Emissions of PM<sub>10</sub> and PM<sub>2.5</sub> from modern EfW plants are so low that they cannot be accurately specifically measured using currently available technology. However, this isn’t a problem as all EfW plants continuously monitor emissions of total PM (TPM) which includes particles of **all** sizes including PM<sub>10</sub>, PM<sub>2.5</sub>, PM<sub>1</sub> and ultrafine particles.
- EfW plant operators report their continuous monitoring results (including TPM) to the Environment Agency (EA) every 3 months and these are all placed on the public register<sup>iv</sup>.
- EfW plants also submit annual reports of their emissions to the EA’s Pollution Inventory (PI). The UKWIN article is critical of the fact that EfW plants do not always provide estimates of their PM<sub>10</sub> and PM<sub>2.5</sub> emissions to the PI. Because of this, the EA is going to update its guidance to make it clear that estimates for these pollutants need to be submitted in the future.
- When the EA assesses applications for new EfW permits, they compare the maximum emissions from the plant against European air quality standards. For PM<sub>10</sub> and PM<sub>2.5</sub> this means making a worst-case assumption that all of the EfW plant’s emissions will be either PM<sub>10</sub> or PM<sub>2.5</sub>. The EA will not issue a permit for an EfW plant if its emissions will cause significant pollution or harm to human health, and it consults Public Health England (PHE) on every application it receives.
- PHE’s position is that well run and regulated modern Municipal Waste Incinerators are not a significant risk to public health. This view is based on detailed assessments of the effects of air pollutants on health and on the fact that modern and well managed Municipal Waste Incinerators make only a very small contribution to local concentrations of air pollutants.
- For more information on PHE’s position, see:  
<https://www.gov.uk/government/publications/municipal-waste-incinerator-emissions-to-air-impact-on-health>
- EfW plants are an extremely small source of PM in the UK, giving rise to just 0.03% / 0.05% of total UK PM<sub>10</sub> / PM<sub>2.5</sub> emissions in 2016 according to government estimates. This compares to 5.35% / 4.96% from traffic and 22.4% / 34.3% from wood fires and stoves in people’s houses.
- The other pollutant mentioned in the UKWIN article is oxides of nitrogen (NO<sub>x</sub>). EfW plants are also a relatively small source of NO<sub>x</sub> in the UK, giving rise to 1.12% of emissions in 2016 compared to 33.5% from traffic and 0.57% from domestic wood burning according to government estimates.

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<sup>i</sup> [http://ukwin.org.uk/btb/Particulate\\_Pollution\\_July\\_2018.pdf](http://ukwin.org.uk/btb/Particulate_Pollution_July_2018.pdf)

<sup>ii</sup> <http://naei.beis.gov.uk/data/>

<sup>iii</sup> <https://pubs.acs.org/doi/pdf/10.1021/acs.est.6b06478>

<sup>iv</sup> <https://environment.data.gov.uk/public-register/view/index>