

# ESTIMATING EMISSIONS FROM BOILERS

## Summary

### Base Year: 2008

Because of lack of recent, representative and reliable activity datasets, atmospheric emissions from industrial and commercial boilers for the 2008 base year were not estimated; they were simply assumed to be the same as those in the LAEI 2006.

### Projection Years: 2011 and 2015

Because of lack of recent, representative and reliable activity datasets for the 2008 base year, projections of atmospheric emissions from industrial and commercial boilers to 2011 and 2015 were not undertaken; instead projections of atmospheric emissions from industrial and commercial boilers to 2011 and 2015 were basically assumed to be the same as those in the LAEI 2006 (using 2010 projection).

## 2008 emission estimation methodology: (Same as the LAEI 2006 methodology)

The original atmospheric emissions from industrial and commercial boilers were estimated using the methodology employed by Warren Spring Laboratory and NETCEN in their original boiler survey in 1997. The methodology entailed phoning boiler sites/operators to find out whether the sites/operators were still using oil; and if yes, ascertaining the types and volumes of oil used. The information from sites/operators was then augmented with other pertinent proxy datasets, where appropriate. For the completion of the LAEI 2008, 39 new sites/operators were added to the original list. These sites and their emissions were provided by the 2007 Pollution Inventory (PI) database. Atmospheric emissions for the industrial and commercial boilers were then estimated from the fuel throughput using emissions factors obtained from the UK Emissions Factor Database (UK EFD).

During the original boiler survey conducted by Warren Spring Laboratory and NETCEN, the following information was obtained for each site/operator:

1. Type of fuel used (*ft*)
2. Amount of fuel used (*FU*), L yr<sup>-1</sup>

Atmospheric emissions from boiler – expressed in tonnes yr<sup>-1</sup> - were then estimated from the amount of fuel used (FU) by applying the emissions factors (see Table 1 below) obtained from AP-42 and the UK EFD in accordance with Equation 1 below.

$$BE_{p,ft} \text{ (tonnes yr}^{-1}\text{)} = FU * EF_{p,ft} * 10^{-3} \quad \text{Equation 1}$$

Where

- <sup>1)</sup>  $BE_{p,ft}$  = Emissions from boiler for pollutant  $p$  from fuel type  $ft$ <sup>1</sup>, (tonnes yr<sup>-1</sup>)
- $FU$  = Fuel used, L yr<sup>-1</sup>
- <sup>3)</sup>  $EF_{p,ft}$  = Emission factor for pollutant  $p$  from using fuel type  $ft$ , (tonnes m<sup>-3</sup>)
- $10^{-3}$  = Conversion factor<sup>2</sup> from litre (L) to cubic metre (m<sup>-3</sup>)

**Table 1: Emission factors for boilers**

	Residual Oils <sup>3</sup> (tonnes m <sup>-3</sup> )	Distillates <sup>4</sup> (tonnes m <sup>-3</sup> )	Source
SO <sub>2</sub> <sup>5</sup>	0.00047	0.000034	AP-42 1.3
NO <sub>x</sub>	0.0066	0.0024	AP-42 1.3
CO	0.0006	0.0006	AP-42 1.3
NM VOC	0.000136	0.000041	AP-42 1.3
PM	0.00347	0.00024	AP-42 1.3
PM <sub>10</sub>	0.0021514	0.000132	AP-42 1.3
Benzene	0.000000026	0.000000026	AP-42 1.3
Methane	0.000057	0.000026	AP-42 1.3
CO <sub>2</sub>	3.11667	3.14233	UK EFD

Notes:

1.  $1 \text{ m}^3 = 1,000 \text{ litres}$
2. Tonnes m<sup>-3</sup> = tonnes of pollutant per m<sup>3</sup> fuel oil

<sup>1</sup>  $ft$  is either Residual Oils or Distillates

<sup>2</sup> See Conversion factors at the end of next page

<sup>3</sup> Residual Oils include heavy and medium fuel oils

<sup>4</sup> Distillates include paraffin, kerosene and gas oil.

<sup>5</sup> The percentage by weight of sulphur in fuel (i.e., the sulphur content) was assumed to be 2.5-3% for Residual Oils and 0.2-0.4 % for Distillates). The lower values (2.5% and 0.2% for Residual Oils and Distillates respectively) were assumed in determining the emission factors.