



Department
for Environment
Food & Rural Affairs

UK Report on measures for 2023 exceedance of the Target Value for Benzo[a]Pyrene

December 2025



Llywodraeth Cymru
Welsh Government



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1. Introduction

The UK and Welsh Governments ('Government') recognise the impact poor air quality can have on human health and the environment. Tackling air pollution is a priority. A cleaner, healthier environment benefits people and the economy. Clean air is vital for people's health and the environment, essential for making sure our cities, towns and villages are welcoming places for people to live and work, now and in the future, and to our prosperity.

In 2023, the UK Government produced a new Environmental Improvement Plan for England. In August 2020, the Welsh Government published their Clean Air Plan, Healthy Air, Healthy Wales. These documents set out how Government will work towards international targets to significantly reduce damaging emissions.

Improving air quality, can reduce both the short-term and long-term effects on people's health. This particularly benefits those who may find their conditions are made worse through exposure to air pollution. For example, people with heart or lung conditions or breathing problems, as well as reducing longer term impacts on everyone.

1.1 This document

This report provides an overview of the measures being taken to address the exceedances of the pollutant benzo[a]pyrene (B[a]P) in the United Kingdom (UK) for the compliance year 2023. It includes updates on the measures for exceedances in the compliance years 2013 – 2022¹, as reported in September 2014 – 2023, respectively.

Defra also publish an annual Air Pollution in the UK report alongside the compliance assessment submission which can be found here: <http://uk-air.defra.gov.uk/library/annualreport/index>. More detailed information on these exceedances and measures being taken to address them can be found in the individual zonal reports provided as an Annex to this document.

Copies of previous annual air quality submissions can be found on UK-AIR, [Air quality compliance xml files - Defra, UK](#).

¹ <https://uk-air.defra.gov.uk/library/bap-nickel-measures>

1.2 Background and Context

The Air Quality Standards Regulations 2010² aim to improve and maintain air quality by setting target values for the concentration in ambient air of the metals cadmium, arsenic and nickel, and for benzo[a]pyrene. The target value (TV) for B[a]P is an annual mean concentration of one nanogram (one billionth of a gram (10^{-9})) per cubic metre (m^{-3}) in ambient air or lower. The regulation requires the UK to report on measures in place to address the exceedance of the TV and that all reasonable measures, that do not entail disproportionate cost, should be taken to ensure this target is not exceeded.

About Benzo[a]Pyrene (B[a]P)

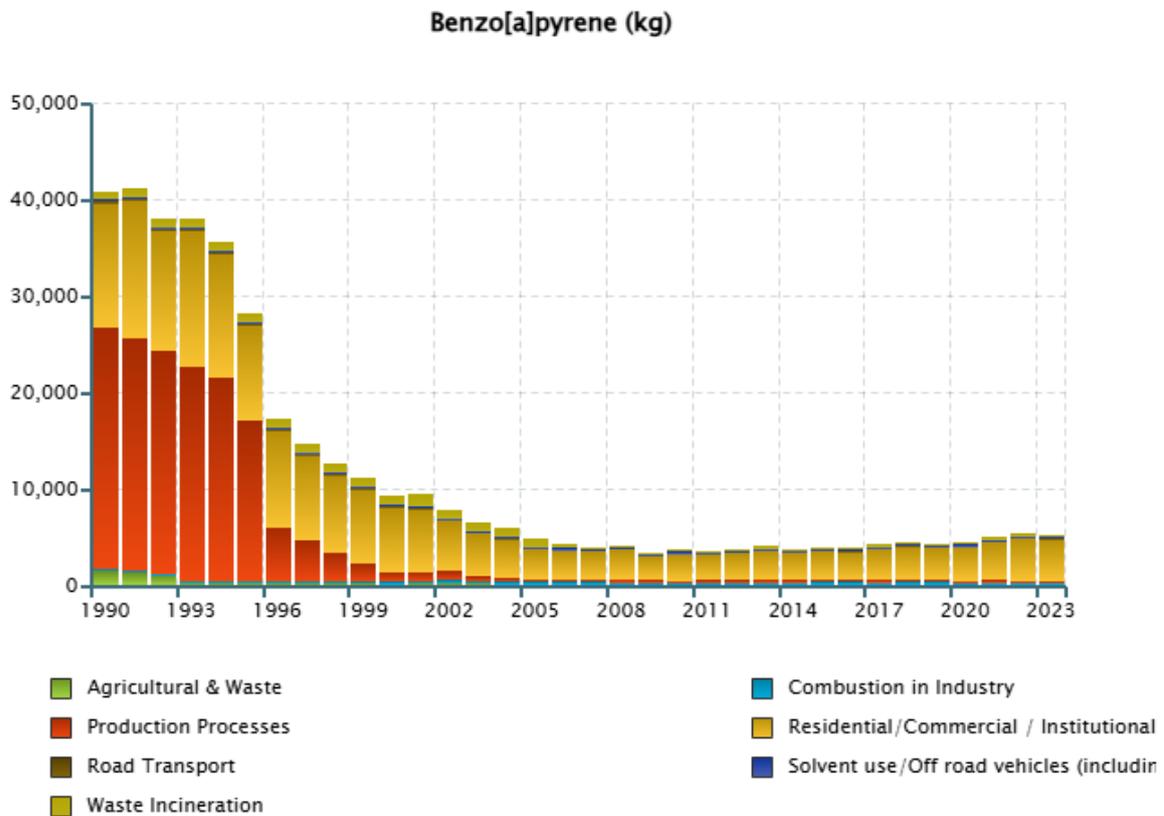
B[a]P is used as a 'marker' for a group of compounds known as polycyclic aromatic hydrocarbons (PAHs). PAHs are a large group of persistent, organic compounds that accumulate in the environment, people, and animals, and which have toxic and carcinogenic effects. Lung cancer is most clearly linked to exposure to PAHs through inhaled air³, but bladder cancer is also contributed to. These pollutants can bio-accumulate and be passed up the food chain thus contributing to health impacts as well as ecological impacts.

B[a]P is a by-product of incomplete combustion. The main national sources of emissions to air of B[a]P in the UK are from domestic coal and wood burning, industrial processes (e.g. coke production) and fires (e.g. accidental, bonfires, open fireplaces etc.). Figure 1 shows the main national sources of emissions of B[a]P in the UK. This shows that total emissions have decreased by 90% since 1990 due to reduced emissions from 'agriculture and waste', as a result of the cessation of stubble burning, and 'production processes' including the closure of a number of aluminium plants. However, while emissions decreased consistently between 1990 and 2005, subsequently they have stabilised and even increased in some recent years, predominantly due to increased emissions from domestic combustion. However, as emissions from domestic combustion of wood and coal are widely distributed, this does not currently lead to any exceedances.

² [The Air Quality Standards Regulations 2010 \(legislation.gov.uk\)](https://www.legislation.gov.uk)

³ WHO AQG 2000, PHE Compendium of Chemical Hazards

Figure 1. B[a]P emissions by sector (1990-2023)



UK Assessment

Assessment of levels of B[a]P in the UK with regards to the UK Target Value are made through a combination of modelling and fixed monitoring. There is a requirement to undertake monitoring at a fixed number of locations to assess key emissions sources, particularly near to large industrial emission sources. Undertaking modelling alongside monitoring enables the UK to calculate concentrations at locations where monitoring is not conducted providing a fuller picture of B[a]P concentrations across the UK. The air quality compliance assessment is carried out annually. The results are reported by 30th September each year, for the previous calendar year.

The 2023 compliance assessment reported that the UK exceeded the target value for benzo[a]pyrene in two zones: both in Wales.

Reporting requirements for the exceedance of a target value

Where a target value is exceeded, appropriate authorities in UK are required to specify the areas of exceedance and the sources contributing to it⁴.

Following an exceedance, appropriate authorities in the UK must submit a report detailing the measures already taken, ongoing or that will be taken, to reduce levels of this pollutant. Particularly those directed at the main emission sources in order to attain the target value. The Environmental Permitting Regulations (EPR) 2016 (England & Wales) aim to prevent or minimise pollution by placing stringent limits on emissions from industrial sources. It is required that all reasonable measures should be taken, which do not entail disproportionate cost. The report must be submitted no later than 2 years after the end of the year in which the exceedance triggering the measure was observed (i.e. the end of 2025 for the 2023 compliance year – see Table 1).

This report on B[a]P is the tenth such report that the UK has produced and updates the Report on Measures produced for the exceedances reported for 2013 – 2022¹.

Table 1. Reporting timetable

Compliance year	“Year” (e.g. 2023)
Compliance assessment reporting	Sept 30 th “Year” +1 (e.g. 2024)
Report on Measures	Dec 31 st “Year” +2 (e.g. 2025)

In the UK, responsibility for meeting air quality target values is devolved to the national administrations in Scotland, Wales, and Northern Ireland. The Secretary of State for Environment, Food and Rural Affairs (Defra) is responsible for meeting the target values in England. Defra has co-ordinated the production of this report in conjunction with the Welsh Government.

⁴ [The Air Quality \(Miscellaneous Amendment and Revocation of Retained Direct EU Legislation\) \(EU Exit\) Regulations 2018](#)

2. Overview of Affected Zones

2.1 General information on zones

For the purposes of the compliance reporting against Air Quality Standards Regulations 2010, the UK is divided into 43 zones, termed agglomeration zones (large urban areas) and non-agglomeration zones (regional areas). There are 15 non-agglomeration zones (Non-AZ) and 28 agglomeration zones (AZ). The 15 non-agglomeration zones match:

1. The boundaries of England's former Government Offices for the Regions; and
2. The boundaries agreed by the Scottish Executive, Welsh Government, and Department for Agriculture, Environment and Rural Affairs in Northern Ireland.

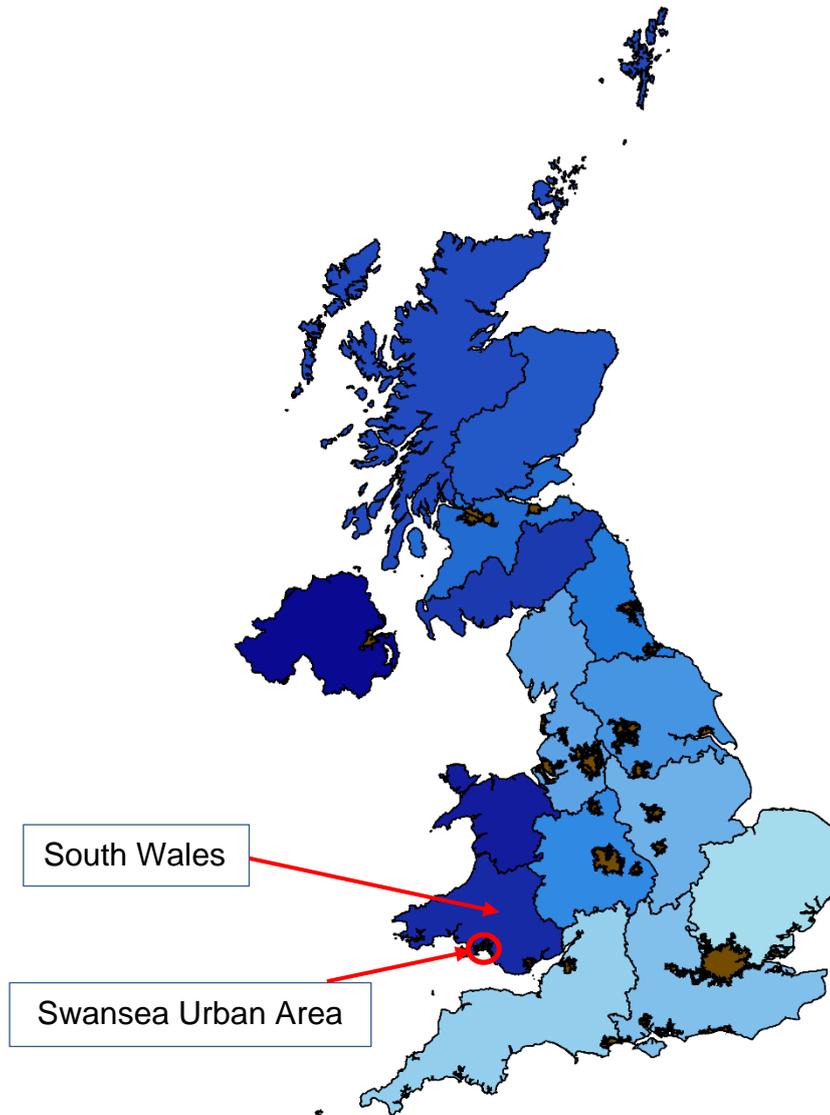
An agglomeration zone is defined as any urban area with a population greater than 250,000.

In 2023, two of the 43 zones in the UK were reported to have exceeded the target value for B[a]P (one non-agglomeration zone (non-AZ) and one agglomeration zone (AZ)). The affected zones were:

1. Swansea Urban Area (UK0027) (AZ);
2. South Wales (UK0041) (Non-AZ).

The locations of these zones are indicated on the map shown in Figure 2. The exceedance in the Swansea Urban Area zone was reported based on measurements. The exceedance in the South Wales zone was reported based on model results. In both zones, the exceedances are attributed to the same industrial emissions sources. The zonal reports provide a detailed breakdown of the affected area in each zone, including information about where the exceedance occurs, how it was assessed, information on sources of the exceedance and location maps.

Figure 2. Map of the UK showing locations of the zones and agglomerations exceeding the B[a]P target value in 2023 (note: the arrows are for the purposes of labelling the zone and do not point to the location where the exceedance occurred – see zonal reports for more detail)



Map of the UK showing location of non-agglomeration zones (blue) and agglomeration zones (brown). Zones exceeding the B[a]P target value in 2023 are indicated.

2.2 Assessment details

The UK's annual assessment of compliance is based on a combination of information from the UK national monitoring network and the results of modelling assessments. The level of fixed monitoring is strictly defined by Air Quality Standards Regulations 2010. The use of models, alongside monitoring, allows for a reduction in the number of monitoring stations required and has the added benefit of enabling air quality to be assessed at locations without monitoring sites. Modelling also provides additional information on source apportionment (understanding which sources are the main contributors to the concentrations observed) and projections (predicting future concentrations) required for the development and implementation of air quality plans, as well as this report on measures.

It is worth noting that not all of the monitors located in the zones reported as exceeding exceeded the target value. Through assessment using both modelling and monitoring, consideration is given to the likely distribution of emissions from the predominant source and therefore a fuller picture of the distribution of B[a]P in the area is reported.

Monitoring

Incomplete burning of fuel can emit significant amounts of B[a]P. Levels emitted will depend on the type of fuel, the type of appliance, the efficiency of combustion and the level of emissions abatement that is in place. Large industrial sites where solid fuel is thermally treated (e.g. coke and sinter plant activities at steel works) are the most significant sources of industrial B[a]P emissions in the UK due to the volume of solid fuel used and the nature of the industrial process. Monitoring situated near to large industrial sources of these types is important for assessing the impact of industrial emissions on concentrations where there is relevant public exposure.

There are 36 monitoring sites measuring B[a]P concentrations in the UK. These monitors collect samples of particulate matter from the air (PM₁₀ – Particulate Matter of size fraction up to ten microns in aerodynamic diameter). Samples are analysed to determine the concentrations of twenty-one individual PAHs, including B[a]P, and concentrations of B[a]P are assessed against the target value. More information on the UK monitoring of pollutants covered by the Air Quality Standards Regulations 2010 can be found on UK-Air ^{5,6}.

⁵ <http://uk-air.defra.gov.uk/library/annualreport/index>

⁶ <http://uk-air.defra.gov.uk/networks/network-info?view=pah>

Modelling

The UK's modelling for compliance assessment is undertaken using a national-scale model known as Pollution Climate Mapping (PCM)⁷. PCM has been designed to assess compliance with environmental objectives at locations defined within UK Air Quality Standards Regulations 2010. Modelling is undertaken for eleven air pollutants each year, including B[a]P and completed each year in time for compliance assessment submission at the end of September. The model performs an annual calculation covering the whole of the UK and outputs concentrations on a 1 km square grid. These grid squares are assigned to each of the forty-three zones and agglomerations for the purposes of assessing compliance status with respect to target values in the regulations.

Modelling calculates concentrations based on estimates of the spatial pattern of emissions of B[a]P from all known sources. The model calculates the background concentration of B[a]P from all area sources (e.g. domestic solid fuel use, commercial and traffic sources). Modelled B[a]P concentrations are calibrated to those measured at background monitoring stations to ensure concentrations from modelling and monitoring are consistent. Source apportionment indicates that elevated concentrations due to domestic sources are largely driven by contributions from domestic combustion of coal and wood.

Large and small point sources (e.g. from activity at steel works and industrial activity) are modelled separately and added to the background concentrations from all other sources. In order to obtain a model result that is consistent with measured concentrations, the modelled contribution from the point source is calibrated using monitoring data from the national network. Industrial sites only are used to calibrate these large point source contributions. Source apportionment from the industrial sectors indicates that the modelled exceedances are largely driven by the contribution from emissions from coke production.

Exceedance situations established either by national scale modelling or fixed monitoring are further examined using finer-scale modelling (outside of the PCM model) carried out at a more detailed spatial resolution in order to understand the scope of the exceedance. Such assessments are used to refine the national scale PCM assessment and compliance is reported based on these more detailed model results for these locations. Additional information input into the finer scale models includes more detailed emissions source information (with up-to-date information on emission amount and release characteristics obtained from the process operators and regulators) and local meteorological data. Such assessments enable a more detailed assessment of the exceedance situation, helping to establish the key

⁷ <http://uk-air.defra.gov.uk/data/gis-mapping>

sources and reasons behind an exceedance. Such fine scale assessments are only conducted where exceedance situations are identified. Further additional modelling of this type was also undertaken for the industrial exceedances in the Swansea Urban Area and the South Wales zone and further details are available in the zonal annex.

3. Measures

3.1 Overview of Measures

The UK has a number of measures being taken to address emissions of B[a]P from industrial sources.

Industrial Measures

Industrial emissions of B[a]P are regulated under the Environmental Permitting (England and Wales) Regulations (EPR) 2016 (as amended) and the Air Quality Standards Regulations 2010. The EPRs (and equivalent legislation in Scotland and Northern Ireland) transposed the Industrial Emissions Directive (IED) into UK law, which aim to prevent or minimise pollution by placing stringent limits on emissions from industrial sources.

The EPR sets stringent Emission Limit Values (ELVs) for pollutants emitted from a number of industrial sectors such as large combustion plants and incinerators. The EPR also requires the operators of industrial facilities use the 'best available techniques' (BAT) to reduce emissions, and that they demonstrate this by complying with BAT-associated emission limits (BAT AELs). BAT and their BAT-AELs are set out in BAT reference documents (BREFs)⁸.

The iron and steel (IS) sector is the principal source of B[a]P emissions. The IS BREF was published in March 2012 and such installations were required to comply with new requirements within 4 years of adoption. The IS BREF contains stringent requirements for iron and steel works to significantly reduce their fugitive emissions of a variety of pollutants. This includes PAHs due to unintended escape from an industrial process or location, often from unknown/unmitigated routes or sources.

The Regulators in Wales (Natural Resources Wales (NRW)) expected operators to comply with the new BAT conclusions (BATC), and where required, technically

⁸https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/221044/pb13898-epr-guidance-part-a-130222.pdf

upgrade their facilities by 8th March 2016. However, plans to refurbish or replace existing coke ovens to achieve the required reductions would require large-scale financial and technical investment, therefore, some site operators were unable to make the requisite changes by this deadline.

Article 15(4) of the IED, as transposed into UK law allows for the application of derogations from BATC-AELs that contribute meeting B[a]P target values where costs for large plant process units with a long operational lifetime outweigh the environmental benefits. Also, there are no BAT-AELs that are specific to B[a]P emissions, contained within the IS BREF

In essence, the IED, as transposed into UK law takes into account disproportionately higher costs to an operator within the definition of BAT. Given this as explained above, B[a]P does not have a BAT Associated Emission Limit in the IS BREF, but a Target Value set out by air quality legislation EU Directive 2004/107/EC as transposed into UK law by the Air Quality Standards Regulations 2010, that aims to improve and maintain air quality. NRW has also agreed a programme of works with relevant site operators to ensure compliance with relevant BAT-AELs that affect B[a]P emissions. These approaches by the two Regulatory bodies will deliver the required environmental improvement without imposing an unreasonable burden on industry.

Energy Efficiency Measures

The Non-domestic and Domestic Renewable Heat Incentive (RHI) schemes help businesses, public sectors, non-profit organisations, and domestic customers meet the cost of installing renewable heat technologies. The types of heating that can be claimed in the non-domestic scheme range from biomass to heat pumps and biomethane, amongst others. In the Domestic scheme, heat can be claimed for biomass, solar water, and certain heat pumps. Both schemes have closed to new applicants, but existing participants continue to receive payments. The Non-domestic RHI scheme was open from November 2011 to March 2021 and the Domestic scheme from April 2014 to March 2022.

The Boiler Upgrade Scheme helps domestic customers and businesses in England and Wales, to replace fossil fuel heating systems with a heat pump or biomass boiler, by providing a grant to cover some of the costs involved. The scheme has been open since May 2022.

UK Emissions Trading Scheme

Launched in January 2021, the UK Emissions Trading Scheme (UK ETS) replaced the UK's participation in the EU ETS. The UK ETS is a cap-and-trade system where a cap is set on the total amount of certain greenhouse gases that can be emitted by

sectors covered by the scheme. This limits the total amount of carbon that can be emitted. The cap gradually reduces over time. Within this cap, participants receive free allowances and/or are required to purchase emission allowances at auction or on the secondary market to off-set their emissions. The UK ETS is a joint scheme run by the UK, Scottish and Welsh Governments and Northern Ireland Department of Agriculture, Environmental and Rural Affairs which collectively make up the UK ETS Authority.

UK energy efficiency schemes

The Climate Change Agreements (CCA) scheme is a targeted scheme to support competitiveness and energy efficiency across fifty-three industrial sectors. It provides a tax discount in return for companies signing up to stretching energy efficiency improvement targets. The current CCA scheme ran from April 2013 until March 2025. A new, longer-term scheme will begin in 2026.

The Energy Savings Opportunity Scheme (ESOS) is an energy assessment scheme that is mandatory for all large undertakings (non-SMEs). Qualifying organisations must measure their total energy consumption and carry out audits (or equivalent) of the energy used by their buildings, industrial processes, and transport to identify cost-effective energy saving measures, by 5 December 2015 and every four years thereafter.

The Streamlined Energy and Carbon Reporting framework (SECR) covers all UK quoted and large UK businesses, requiring them to disclose energy and emissions information and details of the key energy efficiency actions taken in their annual reports. The new UK Sustainability Reporting Standards (UK SRS) are expected to replace the SECR from some businesses from 2026.

The CRC Energy Efficiency Scheme (to 2019) was a mandatory scheme covering large, non-intensive, users of energy in both the public and private sectors. The scheme ended with the 2018/19 compliance year, as announced at the March 2016 Budget. The CRC sought to incentivise the uptake of energy efficiency measures where the energy use by organisations is not covered by other schemes namely Climate Change Agreements and the EU Emissions Trading System (EU ETS).

Combined Heat and Power (CHP) can improve energy efficiency by up to 30%. The UK Government has introduced a number of fiscal support mechanisms designed to improve the economics of operating CHP plants. Since 2000, the CHP Quality Assurance (CHPQA) Scheme has assessed the primary energy savings of participating CHP plants to certify it either fully or partly, as “Good Quality” CHP. Certification through the CHPQA scheme makes the operators eligible for exemptions from the Carbon Price Support and Climate Change Levy taxes,

business rates exemptions, and enhanced capital allowances (until 31 March 2020). Renewable CHP plants can also receive support under the Renewable Heat Incentive, Renewables Obligation and Contracts for Difference dependant on when they became operational.

4. Next steps

The compliance assessment for 2024 was submitted in September 2025. For the 2024 assessment, there were no reported exceedances for B[a]P. This was associated with the closure of the Morfa coke ovens at the Tata Steel UK Port Talbot steelworks on 20th March 2024. Comparisons of the results between the 2013 – 2024 assessments can be seen here: <http://uk-air.defra.gov.uk/data/gis-mapping>. The next compliance assessment for levels of B[a]P in 2025 will be published in September 2026.

Annex A: Zones

Zone or agglomeration	Zone code	Link to zonal report
Swansea Urban Area	UK0027	https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/bap_swansea_UK0027_reportonmeasures_2023.pdf
South Wales	UK0041	https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/bap_southwales_UK0041_reportonmeasures_2023.pdf

Annex B: Acronyms

AQSR	Air Quality Standards Regulations
AZ	Agglomeration Zone
B[a]P	Benzo[a]Pyrene
BAT	Best Available Techniques
BAT-AEL	BAT-associated emission limits
BREF	BAT Reference Documents
CAA	Clean Air Act 1993
Defra	Department for Environmental, Food & Rural Affairs
EA	Environment Agency
ELV	Emission Limit Value
EPR	Environmental Permitting (England and Wales) Regulations
EU	European Union
IED	Industrial Emissions Directive
Non- AZ	Non- Agglomeration Zone
PAHs	Polycyclic Aromatic Hydrocarbons
PCM	Pollution Climate Mapping
SCA	Smoke Control Area
TV	Target Value
UK	United Kingdom