



Department
for Environment
Food & Rural Affairs

UK Report on measures for 2015 exceedance of the Target Value for Nickel

December 2017



Llywodraeth Cymru
Welsh Government



© Crown copyright 2017

You may re-use this information (excluding logos) free of charge in any format or medium, under the terms of the Open Government Licence v.3. To view this licence visit www.nationalarchives.gov.uk/doc/open-government-licence/version/3/ or email PSI@nationalarchives.gsi.gov.uk

This publication is available at www.gov.uk/government/publications

Any enquiries regarding this publication should be sent to us at

Air Quality
Department for Environment, Food and Rural Affairs
Area 2C
Nobel House
Smith Square
London
SW1P 3JR

Email: air.quality@defra.gsi.gov.uk

With technical input from Ricardo Energy & Environment

www.gov.uk/defra

Contents

1. Introduction.....	4
1.1 This document.....	4
1.2 Background and Context.....	4
About Nickel	5
Reporting requirements for the exceedance of a target value	6
2. Overview of Affected Zones.....	7
2.1 General information on zones	7
2.2 Assessment details	9
Monitoring.....	9
Modelling	9
3. Measures	10
3.1 Overview of Measures.....	10
Industrial Measures	11
4. Next steps.....	11
Annex A: Zones	13
Annex B: Acronyms	14

1. Introduction

Government recognises the impact that 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.

Through improving air quality we can reduce both the short term and long term effects on people's health. It will have benefits to 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 nickel (Ni) in the UK for the compliance year 2015, including updates on the measures for exceedances in the compliance year 2013 and 2014¹, as reported to the European Commission in September 2015 and 2016. Defra also published 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 the Commission website: <http://cdr.eionet.europa.eu/gb/eu/annualair>.

1.2 Background and Context

The EU Directive² 2004/107/EC aims to improve and maintain air quality by setting target values for the concentration in ambient air of metals cadmium, arsenic and

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

² <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32004L0107&rid=1>

nickel and for benzo[a]pyrene. The target value for nickel is an annual mean concentration of 20 nanograms per cubic metre (ngm^{-3}) of ambient air or lower.

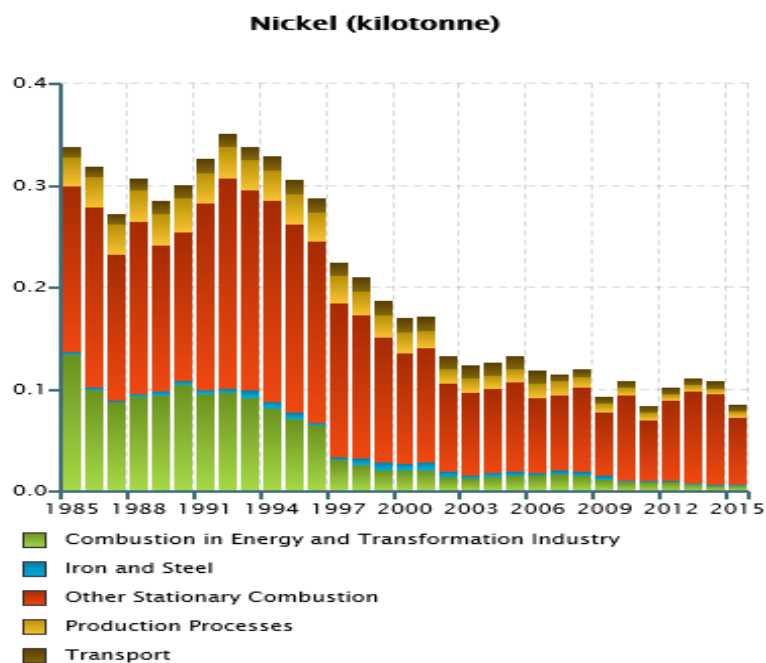
About Nickel

Nickel is a toxic metallic element found in ambient air as a result of releases from oil and coal combustion, metal processes, manufacturing and other sources. The main source of emissions to air of nickel in the UK is the combustion of heavy fuel oil as the use of coal has declined.

Nickel compounds are human carcinogens by inhalation exposure. They can cause irritation to the nose and sinuses and allergic responses and can lead to the loss of the sense of smell. Long-term exposure may lead to respiratory diseases and cancers³. Nickel can also pollute soil and water, thus having environmental impacts as well as health impacts.

Figure 1 shows the levels of nickel emissions in the UK and the main contributory sources. This shows that nickel emissions have reduced significantly since 1990.

Figure 1. Nickel emissions by sector (1990-2015)



³ WHO AQG 2000, PHE Compendium of Chemical Hazards

Assessment of levels of nickel in the UK with regards to the EU 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 nickel concentrations across the UK. National assessment is carried out each year for the previous calendar year and results are reported to the commission on an annual basis. The 2015 compliance assessment reported that the UK exceeded the target value for nickel in two zones in Wales.

Reporting requirements for the exceedance of a target value

Where a target value is exceeded, Member States shall specify the areas of exceedance and the sources contributing to it.⁴ Following an exceedance Member States must submit a report detailing the measures already taken 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. In the case of industrial installations covered by Directive 96/61/EC this means the application of best available techniques (BAT) as defined by Article 2(11) of that Directive (see industrial measures below). It is required that all reasonable measures should be taken that 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 2017 for 2015 compliance year – see Table 1).

This report on nickel is the third such report that the UK has produced and updates the Report on Measures produced for the exceedances reported for 2013 and 2014¹.

Table 1. Reporting timetable

Compliance year	“Year” (e.g. 2015)
Compliance assessment reporting	Sept 30 th “Year”+1 (e.g. 2016)
Report on Measures	Dec 31 st “Year”+2 (e.g. 2017)

⁴ Further detail on the reporting requirements can be found in the Commission Implementing Decision 2011/850/EC

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 has responsibility for meeting the target values in England. The Department for Environment, Food and Rural Affairs (Defra) has produced this report in cooperation with the Welsh Government.

2. Overview of Affected Zones

2.1 General information on zones

For the purposes of EU compliance reporting against EU Directive 2004/107/EC, the UK is divided into 43 zones termed agglomerations (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:

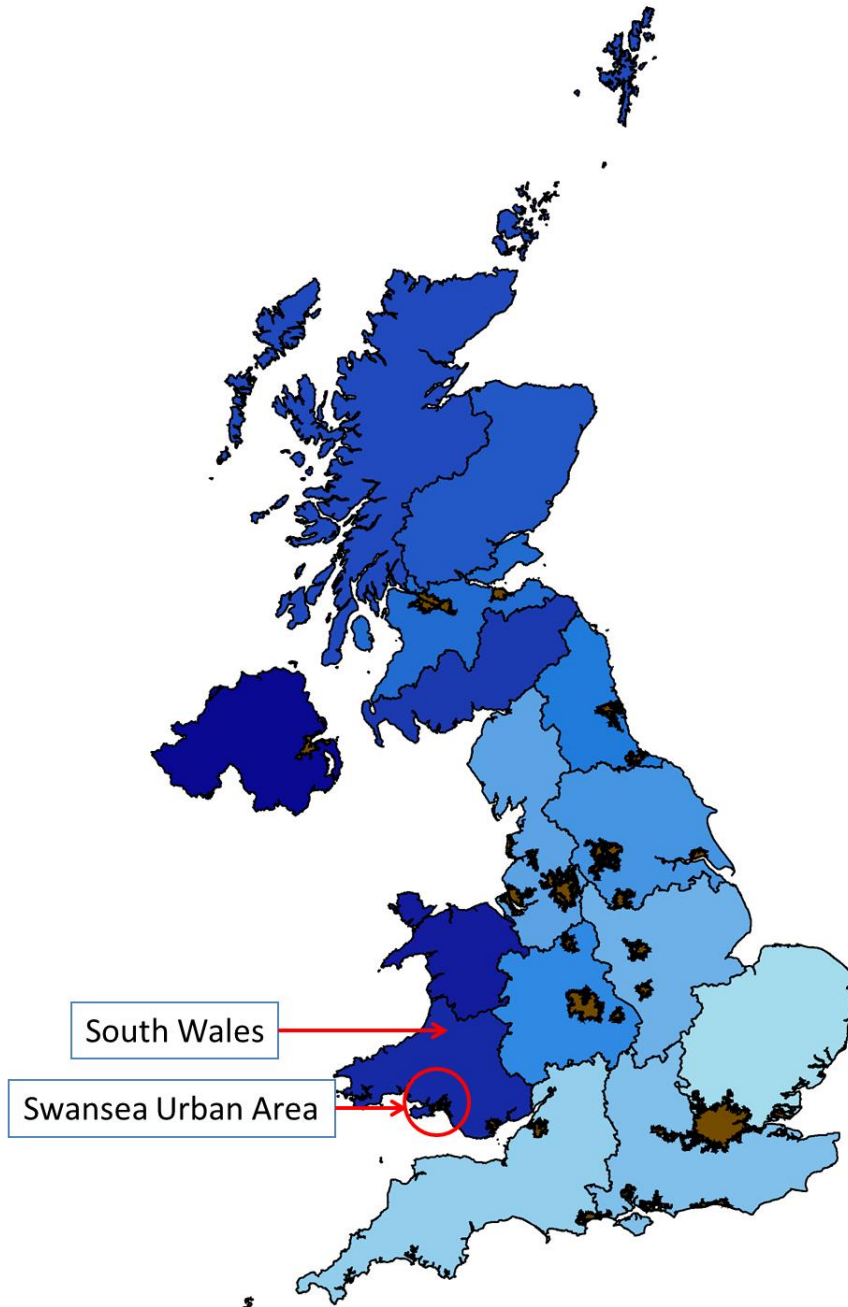
1. The boundaries of England's Government Offices for the Regions; and
2. The boundaries agreed by the Scottish Executive, National Assembly for Wales, and Department for Agriculture, Environment and Rural Affairs in Northern Ireland.

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

In 2015, two of the 43 zones in the UK were reported to have exceeded the target value for nickel (1 non-agglomeration and 1 agglomeration zone). The affected zones were:

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

Figure 2. Map of the UK showing location of zones and agglomerations exceeding the Nickel target value in 2015 (note: the arrows are for the purposes of labelling the zone or agglomeration and do not point to the location where the exceedance occurred – see zonal reports for more detail)



Of the two exceedances reported, one was monitored ([UK0027](#)) and one was modelled ([UK0041](#)). There are detailed zonal reports for each of these exceedances.

The exceedances in both zones in Wales are attributed to emissions from the same industrial sources, which are located close to the zone boundary. 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.

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 European Directives. The use of models, alongside monitoring, allows for a reduction in the number of monitoring stations required and has the added benefits 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.

Monitoring

Monitoring situated near to large industrial sources is important for assessing the impact of industrial emissions on concentrations where there is relevant public exposure. In 2015 there were 24 monitoring sites measuring nickel concentrations in the UK. These monitors collect samples of particulate matter from the air (PM10 – Particulate Matter of size fraction up to 10 microns). Samples are analysed to determine the concentrations. More information on the UK monitoring of metals covered by the Fourth Air Quality Daughter Directive (EU Directive 2004/107/EC) can be found on UK-Air ^{5,6}.

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 EU Air Quality Directives. Modelling is undertaken for 11 air pollutants each year, including nickel and completed each year in time for compliance assessment submission at the end of September. The model performs an annual calculation covering the whole

⁵ http://uk-air.defra.gov.uk/assets/documents/annualreport/air_pollution_uk_2014_issue_1.pdf

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

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

of the UK and outputs concentrations on a 1km grid. These grid squares are assigned to each of the 43 zones and agglomerations for the purposes of assessing compliance status with respect to limit and target values in the Directives.

Modelling calculates concentrations based on estimates of emissions of nickel from all known sources. The model calculates background concentration of nickel from all area sources (e.g. domestic fuel use, commercial and traffic sources).

Large and small point sources (e.g. from industrial activity) are modelled separately and added to the background concentrations from all other sources.

Exceedance situations established either by national scale modelling or fixed monitoring are further examined using additional modelling 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 sources and reasons behind an exceedance. Such fine scale assessments are only conducted where exceedance situations are identified.

Currently the modelling for nickel in Wales suggest a shortfall in terms of known emissions as the model cannot account fully for the measured concentrations without assuming an additional unknown fugitive emission source in the vicinity of the monitoring site.

Given the level of uncertainty in the extent and cause of the local exceedance in South Wales/Swansea, the Welsh Government undertook further measurement studies to help identify the predominant sources and outputs are set out in section 4 (next steps) below.

3. Measures

3.1 Overview of Measures

The UK has a number of measures that are being taken to address emissions of nickel from industrial sources.

Industrial Measures

Industrial emissions of nickel are regulated under the Environmental Permitting (England and Wales) Regulations (EPR). (Scotland and Northern Ireland have similar legislation in place which performs the same function). In particular, the EPRs transpose a number of EU Directives on industrial emissions. Foremost amongst these, and most relevant for nickel emissions, is the Industrial Emissions Directive (IED) EU Directive 2010/75/EU⁸. This Directive sets stringent Emission Limit Values for pollutants emitted from a number of industrial sectors such as Large Combustion Plants and incinerators. The IED also requires that the operators of industrial facilities use the 'best available techniques' (BAT) to reduce their 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)⁹. There are 32 BREFs/BATCs, covering a wide range of industrial sectors, all of which are due to be reviewed by 2020. The Non-Ferrous Metals BREF for example was reviewed and recently adopted and its requirements will need to be reflected in permits by 2020. The revised iron and steel BREF (adopted in 2012) (currently under review) are also relevant. Depending on the size and location of the plant, the regulator for these sites is either Natural Resources Wales (when in Wales), the relevant local authority or (in England) the Environment Agency.

All necessary measures not entailing disproportionate costs have been taken by the local industrial operators with emissions of nickel to air.

4. Next steps

A further assessment was undertaken for the annual compliance assessment for 2016 and this was submitted in September 2017. The next compliance assessment for levels of nickel in 2016 will be submitted to the European Commission in September 2018.

Since 2015, the Welsh Government has continued to invest in a number of activities to further understand the key sources of emissions and enable industry and regulators to implement measures to ensure compliance with the target value in future years. As indicated in section 2 (modelling), as current modelling continues to suggest a shortfall in terms of known emissions contributing to measured concentrations at Tawe Terrace, the Welsh Government undertook further detailed assessments to help improve the confidence in the source apportionment and further

⁸ <http://ec.europa.eu/environment/industry/stationary/ied/legislation.htm>

⁹ <http://eippcb.jrc.ec.europa.eu/reference/>

confirmation/identification of the predominant sources, and confirm the spatial extent of the exceedance.

In order to understand the concentrations being observed, with regards to industrial activity in the area, the sampling frequency was increased at the Pontardawe Tawe Terrace measurement site from weekly to daily sampling. This has helped assessment of the relationship of nickel concentrations with the concentrations of other metals and local meteorological conditions.

Measurements identified a strong correlation between nickel (Ni) and manganese (Mn), a combination of elements used within processes at Wall Colmonoy. In addition, when combined with meteorological data (particularly wind direction from the north east) measurements indicated that Wall Colmonoy (a local industrial facility) was a significant source of nickel at the Tawe Terrace monitoring station.

In addition the Welsh Government funded a project by King's College London which deployed current state-of-the-art, high time resolution, metals monitoring equipment to measure concentrations of nickel and other metals in Pontardawe, combined with novel methods of assessment to strengthen the confidence in the identification of the predominant sources of nickel. Outputs from this analysis also indicated high nickel concentrations were associated with low dispersion conditions of local sources, probably Wall Colmonoy and was able to identify characteristic emissions profiles from the local area and from down the valley. This work has demonstrated the value of higher time resolution measurement data as a powerful tool for validating and improving local modelling assessments. In addition the work has helped to focus mitigation actions on the industrial processes thought to contribute most to ambient concentrations, resulting in a continued downward trend in annual average concentrations. Welsh Government will continue to work with regulators and industry to help understand and minimise emissions sources. Improvements in operating procedures and new abatement measures have resulted in significant reductions in emissions and preliminary measurements in 2017 show mean offsite Ni concentration below the target value.

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/ni_southwales_UK0041_reportonmeasures_2015.pdf
South Wales	UK0041	https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_southwales_UK0041_reportonmeasures_2015.pdf

Annex B: Acronyms

AZ	Agglomeration Zone
BAT	Best Available Techniques
BAT-AEL	BAT-associated emission limits
BREF	BAT Reference Documents
EPR	Environmental Permitting (England and Wales) Regulations
IED	Industrial Emissions Directive
Mn	Manganese
Ni	Nickel
Non- AZ	Non- Agglomeration Zone
PCM	Pollution Climate Mapping