Industrial emissions database and viewer: methodology note

January 2020 Version 2

This note was compiled by Aether for the European Environmental Bureau (EEB).

Contents

1. Introduction and overview of data sources

1.1. Purpose and scope of the data viewer

The EEB industrial plant data viewer[1] aims to:

- Increase the accessibility of publicly available quantitative information, bringing together plant-level data on emissions, fuel and or water use, production, efficiency, and other environmental impacts all in one place;
- Allow easy assessment of compliance of Emission Limit Values (ELVs) with Best Available Techniques (BAT) Associated Emission Levels (BAT-AELs), and trends in compliance over time;
- Increase transparency and accountability by providing a platform which brings together a variety of key permitting documents, including permits, compliance reports, monitoring results, environmental inspection reports and derogations applications;
- Provide a mechanism for operators and competent authorities to provide additional data and documents, or correct erroneous information in the public domain.

This projects directly follows up to the EEB "Burning the Evidence" report of November 2017, highlighting significant insufficiencies in public accessibility of information on industrial activities. It is a first attempt to implement the recommendations made by the EEB through a database built in-house, which tries to collect information and make it available to the public in a more user-friendly manner[2].

This first version of the data viewer displays plant-level information for power stations, CHP plants feeding into the electricity grid, and district heating plants with a thermal capacity >50 MW. The time period covered is 2004 to the latest year covered by the LCP database (see below - 2018 currently), at annual resolution. All relevant plants across Europe reporting to the LCP database are included, whether in an EU Member State or not. Further countries did report information on LCPs but were not included at this stage, because most benefit from derogations of the BAT standards through the Energy Community Treaty. These countries are Bosnia and Herzegovina, Georgia, Kosovo (under the UNSCR 1244/99), Montenegro, North Macedonia, Serbia and Ukraine.

[1] http://eipie.eu/projects/ipdv
[2] https://eeb.org/most-eu-countries-failing-to-ensure-effective-access-to-industrial-pollution-information/

1.2. Purpose of this document

This document intends to give a high-level explanation to informed users of the Tableau viewer of the data sources, methods and assumptions underpinning what can be seen in the Tableau viewer.

1.3. Data sources

The data viewer displays information held in an underlying EEB database. The database has been compiled from a variety of publicly available data sources or information obtained through access to document requests under the Aarhus Convention, and using published methods to calculate derived measures such as health costs per plant. Table 1 below lists the principal data sources used to build the database.

Table 1. List of data sources used to create the data viewer and underlying database

Dataset short name	Full name	Description	Link to data source
LCP database	Reported data on large combustion plants covered by the Industrial Emissions Directive (2010/75/EU)	The LCP database contains plant by plant information for Large Combustion Plants (LCP) on size, combustion technology, energy input, annual emissions (SO2, NOx and dust) in tonnes and operation under specific derogatory regimes of combustion plants.	https://www.eea.europa.eu/data-and-maps/data/lcp-9
E-PRTR database	The European Pollutant Release and Transfer Register (E-PRTR), Member States reporting under Article 7 of Regulation (EC) No 166/2006	The E-PRTR covers the releases to air, water and land as well as the transfers of pollutants in wastewater for 91 substances and across 65 industrial sub-sectors, and the transfer of waste from these industrial facilities. The register includes information of some 33,000 facilities in 33 countries (EU28, Iceland, Liechtenstein, Norway, Switzerland and Serbia).	https://www.eea.europa.eu/data-and-maps/data/member-states-reporting-art-7-under-the-european-pollutant-release-and-transfer-register-e-prtr-regulation-22
IED Registry	Industrial Reporting under the Industrial Emissions Directive 2010/75/EU and European Pollutant	The IED Register is a merger of the previous LCP and PRTR reporting combined with new elements under the IED reporting obligations such as	https://www.eea.europa.eu/data-and-maps/data/industrial-reporting-

	Release and Transfer Register Regulation (EC) No 166/2006	weblinks on permits, inspection reports or derogations. It covers reporting for 2017 and 2018 only. This will be the new reporting system in the future for all IED activities under the EU INSPIRE system coding.	under-the-industrial
ENTSOE	ENTSOE Transparency platform: Central collection and publication of electricity generation, transportation and consumption data for the pan-European market	Contains information on the real-time electricity generation (in MW) by generation unit, from 2015 onwards.	https://transparency.entsoe.eu/generation/r2/actualGenerationPerGenerationUnit/show
2017 LCP BREF	Best Available Techniques on Large Combustion Plants	Contains a snapshot of detailed information from 2010 from a selection of large combustion plants, including abatement technology installed, detailed combustion types, water consumption and water discharge characteristics.	http://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/JRC_107769_LCPBref_2017.pdf
Other documents	-	A collection of publicly available documents including permits, compliance reports, inspection reports, CEM data and derogations has been assembled from a wide variety of sources by the EEB following to formal access to document requests or from already accessible data on the various Member States or company websites	-

1.4. General disclaimer

This data viewer and underlying database have been created using publicly available sources of information. While some plausibility checks have been applied to emissions and fuel consumption data, implementing wider checks or corrections was not part of the scope of the project to create the viewer.

The EEB expects that the source organisations publishing these datasets implement appropriate QA/QC procedures, and takes no responsibility for inaccuracies in the viewer due to errors in the source data. The EEB cannot be held accountable for any errors in the data, which is based on the information provided by the industry and Member States' authorities.

For some data entries that are either wrong or missing some manual corrections or additions were made and are flagged as such.

In some cases, some big lignite fired units with a small share of waste co-incineration disappeared from the data reporting and had to be manually added back. That was the case for the German Lippendorf, Jänschwalde, Boxberg units.

However, the EEB is proactive in feeding back identified errors to the EEA and alerting the European Commission's DG Environment or other entities responsible for reporting requirements and other data publishers, to ensure that these can be corrected as quickly as possible. The EEB expects a fundamental overhaul of current reporting requirements so that a transparent and multi-purpose and user-friendly centralised EU database is finally elaborated[3].

1.5. Entities shown in the data viewer

The data viewer presents data at the level reported in the LCP database, for individual **plants**. Each plant is identified consistently in the data over time with a unique **Plant ID**, which links together all the information taken from the LCP database. This is more reliable than the plant name, which is inconsistently reported and often changes over time.

The data sources listed above contain data reported at differing levels of spatial aggregation:

- The LCP database contains **plant** level data on air emissions, fuel use or regulatory status;
- The E-PRTR database contains **facility** level data on annual emissions to air and water as well as waste generation;
- The IED Registry database contains **installation and plant** level data on various environmental aspects but the matching of the installation parts to the plant has not been made consistently;
- The ENTSO-E database contains **power system resource** level data;

[3] See notably section 6 of the following briefing https://mk0eeborgicuypctuf7e.kinstacdn.com/wp-content/uploads/2020/03/EEB-basic-elements-on-Industry-Strategy-IED-FIN-1.pdf

- The 2017 LCP BREF contains **installation and plant** level data on various environmental aspects, but refers to a limited set of plants and dates back to 2010.

There is no strict relationship between all these levels of reporting, but each E-PRTR facility is made up of at least one plant in the LCP database, making the LCP database the more disaggregated of the two. In relation to the EU Registry hierarchy, the plant level data reported in the LCP database corresponds roughly with the "installation" level in the former system. The IED Registry is further disaggregated to installation part / installation level but matching has not been made consistently by the Member States. This level was chosen because the legal BREF standards apply at installation / plant level (individual release points – stacks).

Combining data at different levels of aggregation is dealt with in a variety of ways, using summation, splitting rules, and making certain assumptions depending on the type of information and nature of the relations. More details are provided below.

2. Plant details and documents

2.1. Basic details

The following basic plant details are taken directly from the LCP database:

- plant name
- location (city, country geographic coordinates)
- thermal capacity
- type of combustion
- Activity (broad categories)

Other information was taken from the E-PRTR database, including:

- Competent authority details
- Detailed activity classification (NACE and E-PRTR codes)

The viewer displays a single set of static plant details across the whole time series. However, in both datasets there are many missing records, particularly for earlier reporting years, and sometimes the information changes over time. To produce a single set of static details per plant, the most recent non-missing entries were taken for each attribute.

2.2. Abatement techniques installed

The list of abatement techniques installed at each plant is taken from the 2017 LCP BREF (see Table 1). The 2017 LCP BREF follows from an information exchange but provides a snapshot of techniques installed in 2010, and as such may not represent the current situation at any given plant. In the absence of more up-to-date publicly available information, operators and competent authorities are encouraged to provide updated information through our interactive submission tool (see section 7). For other entries, the information is made by in house EEB expert judgement and assumptions and flagged as such.

Entities in the 2017 LCP BREF information exchange often do not correspond one-to-one with LCP Plant IDs. In order to assign a single list of abatement techniques to each plant, the following rules are applied:

- Where one entity in the 2017 LCP BREF corresponds to >1 LCP plant, it is assumed that all of the constituent plants have the same set of abatement techniques installed;
- Where one LCP plant corresponds to >1 entity in the 2017 LCP BREF , a manual check is made for consistency across the 2017 LCP BREF entities. In cases where all the 2017 LCP BREF entities have an identical set-up (the majority of cases), this is assigned to the plant. Where there are differences, the set-up accounting for the majority of generation capacity is assigned to the plant.

Note: The 2017 LCP BREF contains information for only a selection of plants, so in many cases this information will be missing. Users are invited to contribute data where there is a gap (see section 7).

2.3. Derogations list

The information on a subset of transitional derogations applicable to each plant is reported in the LCP database. This applies to all optional derogations within the IED (chapter III, Articles 31-35 included) except for article 15.4 (allowing less strict emission limit values due to geographical location or plant technical characteristics from the relevant 2017 LCP BREF standards). Information on which plants have a derogation under article 15.4 or planning to receive a derogation is compiled on a plant-by-plant basis by searching for publicly available documents, official requests and feedback from project partners, reported IED Registry information and as such may currently be incomplete.

A short summary text is provided in the data viewer when the derogation title is hovered over. The full definitions of the derogations can be found in the IED legislation[4].

[4] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010L0075

2.4. Facility documents

Permits, derogation documents, compliance reports, inspection reports, continuous emissions monitoring (CEM) or other emission results data and other documents have been compiled gradually by EEB on a plant-by-plant basis. These are stored in the SharePoint library, to which the links within the “Facility details and documents” tab take you when clicked.

When a document relates to more than one plant, the same document is duplicated for all relevant plants. It is assumed that e.g. an inspection report, compliance report or permit would cover all the units or plants of the same facility. In many cases, CEM data received is available in one file but could relate to different units or plants within the facility. In some countries, mainly Italy, which provides a wealth of information on annual compliance reports that can easily exceed 30MB in size, it was decided to save the material only once in a parent folder of the same facility, and to provide a word document indicating the parent folder and weblinks to the given reports in the other relevant plant part folders. Users are invited to search the plant again with the parent LCP_D ID code to access the documents of that facility.

Users should bear in mind that some information in these documents, especially quantitative information, may relate to plants other than the plant of interest, or to an aggregate figure across several plants.

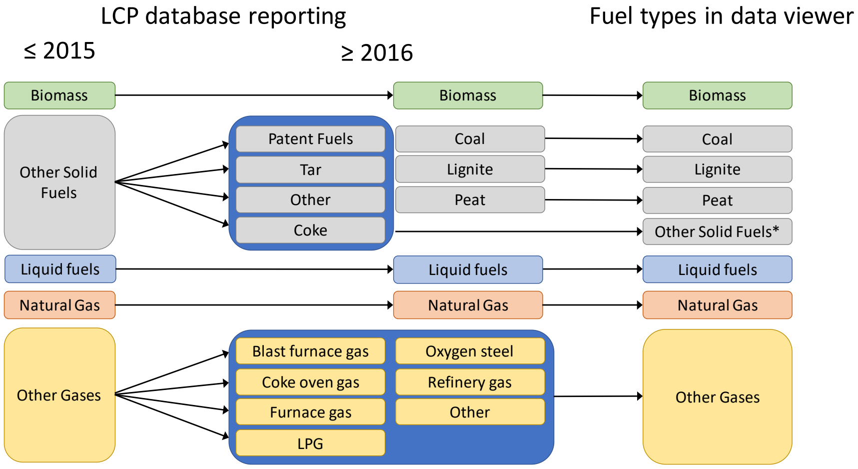
3. Emissions and fuel use data processing

3.1. Fuel consumption and allocation of "Main fuel type"

3.1.1. Change in fuel reporting between 2015 and 2016

For years up to and including 2015, fuel consumption was reported in the LCP database in energy units (TJ), for 5 broad categories of fuel. From 2016 onwards, more detailed reporting has been required, with greater detail within solid and gaseous fuel usage. This switch in fuel reporting is illustrated below in Figure 1.

Figure 1. Fuel types reported in the LCP database up to 2015 (left), from 2016 onward (middle), and fuel types displayed in the data viewer.



For example, many plants burning coal or lignite therefore report mainly "Other Solid Fuels" consumed up to 2015, but then coal or lignite respectively from 2016 onward. The data viewer displays fuel usage as reported in the LCP database, and as such this spurious "switch" in fuel type has not been corrected.

3.1.2. Aggregate fuel types

In the viewer, "Other Solid Fuels" and "Other Gases" are reported as aggregate fuel categories in all years. Up to 2015 "Other Solid Fuels" includes coal, lignite and peat. From 2016 onwards, coal, lignite and peat are displayed individually, and "Other Solid Fuels*" consists of only coke, tar, patent fuels and "other" fuels. These aggregate categories are reported to simplify the data viewer, on the basis that most of the fuel types within these are consumed only in small quantities and by relatively few plants.

3.1.3. Allocation of main fuel type

Classifying plants by the main fuel type burned in any given year is useful for a variety of purposes:

i) When considering the latest year, it can be used as a filter to find specific types of plants on the data viewer home page;

ii) It is used as an attribute by which to assign Best Available Techniques Associated Emission Levels (BAT-AELs), Associated Energy Efficiency Levels (BAT-AEELs), and IED Emission Limit Values (ELVs) (see Section 4 below).

The main fuel type is assigned in each year individually, simply as the fuel type with the largest reported consumption out of all fuel types. Note that in some cases this may still represent <50% of total fuel consumption.

3.2. Emissions data and allocation of E-PRTR emissions data to plants

3.2.1. Source of emissions data

Data on annual emissions (in tonnes) of NO_x, SO_2 and particulate matter (PM, reported as "Dust") are taken from the LCP database at the plant level. These are the only pollutants reported in that database. Emissions of all other pollutants (CO_2, mercury and HCl to air, and mercury and cadmium to water are displayed directly in the viewer, but many others are required to estimate health costs; see section 5) are taken from the E-PRTR, at the facility level.

3.2.2. Allocation of E-PRTR emissions to plants

The mapping between plants and facilities is provided by the **E-PRTR National IDs** reported for each plant in the LCP database. E-PRTR facilities are frequently made up of more than one plant in the LCP database. Where this is the case, emissions at the facility level are split in proportion to the relative total fuel consumption of the constituent plants, according to the following equation:

$$E_{p,x} = E_{facility,x} * \frac{FC_p}{\sum_{p=1}^{P} FC_p}$$

Where $E_{p,x}$ is emissions of pollutant *x* from plant *p* in tonnes, $E_{facility,x}$ is emissions of pollutant *x* from the facility to which plant *p* belongs, FC_p = fuel consumption of all fuels (in TJ) at plant p, and *P* is the set of plants making up a given facility.

For example, if two plants A and B make up E-PRTR facility X, and burn 100 TJ and 50 TJ of fuel respectively, then 66.7% of the emissions reported in the E-PRTR will be allocated to plant A, and 33.3% to plant B.

Where no fuel usage information is reported, or when it is zero, facility emissions are instead allocated to plants proportional to thermal capacity.

3.3. Estimation of emitted pollutant concentration and implied emission factor (IEF)

3.3.1. Emitted pollutant concentrations

The concentration of pollutant *x* in gas emitted from a plant is estimated by dividing the annual emissions quantity of pollutant *x* (E_x; in tonnes), by a calculated annual flue gas volume emitted (*FG*; in Nm^3), then converting to mg/Nm^3:

$$C_x = 10^9 * \frac{E_x}{FG}$$

Where C_x is the concentration of pollutant x in emitted gas (mg/Nm^3), E_x is the annual emissions (tonnes) of that pollutant, and *FG* is the annual flue gas volume emitted (Nm^3).

To calculate flue gas volume (*FG*), a standard flue gas volume (V_f) per GJ of fuel burned for each fuel type is applied to the reported annual fuel consumption (in TJ) of each fuel type (FC_f), then summed and converted to give a total flue gas volume estimate in Nm^3:

$$FG = 1000 * \sum_{f=1}^{F} (FC_f * V_f)$$

The fuel-specific flue gas volumes (Vf) applied are shown in 2 below.

Table 2. Fuel-specific flue gas factors used to estimate annual flue gas volume

Fuel type	Excess oxygen	Specific flue gas volume (Nm^3 / GJ)
Biomass	6%	382.2
Coal	6%	350.0
Lignite	6%	420.0
Peat	6%	370.0
Other Solid Fuels	6%	350.0
Liquid fuels - boilers	3%	321.7
Natural Gas - boilers	3%	299.9
Other Gases - boilers	3%	299.9
Liquid fuels – gas turbines	15%	965.1
Natural Gas - gas turbines	15%	899.7
Other Gases - gas turbines	15%	899.7

The value of 420 Nm^3/GJ for lignite is the middle value of a wide range, which depends on calorific value and water content of the fuel.

These flue gas volumes and excess oxygen assumptions are based on the EEA technical report "Air pollution from electricity-generating large combustion plants"[5]. Where solid fuel combustion was reported for plants defined as gas turbines, excess

[5] https://www.eea.europa.eu/publications/technical_report_2008_4

oxygen was assumed to still be 6%, as such fuels are not combusted in turbines and thus are either reported erroneously or combusted via a separate process.

No concentrations are calculated for emissions to water, as the total quantity of discharged water is not known for most plants.

3.3.2. Implied emission factors (IEFs)

The implied emission factor expresses the tonnes of pollutant emitted per TJ of fuel burned, found simply by dividing the emissions (in tonnes) by the total fuel burned. Although to some extent correlated with emitted gas concentrations, this is a useful way of summarising the emissions intensity of fuel combustion which is not influenced by variation in flue gas volume among fuel types. IEFs are the basis of the plausibility checks implemented in the data viewer (see section 3.5).

3.4. Highest and lowest emitting plants by plant type

In the emissions and compliance tab of the data viewer, the pollutant concentration emitted from the plants of the same "type" emitting the highest- and lowest-concentrations of the selected pollutant in each year are displayed in the charts.

For this purpose, plant "type" is defined by plants having a particular combination of:

- Thermal capacity, broken down into categories of: < 100 MW, 100 – 300 MW (inclusive) and >300 MW
- Type of combustion, including boiler, diesel engine, gas engine, gas turbine, and "Other"
- Main fuel type combusted in a given year.

3.5. Emissions and fuel consumption plausibility flags

Emissions and fuel consumption reported in the LCP database is not always accurate and consistent, for reasons such as reporting for the wrong plant or wrong level of aggregation, order-of-magnitude errors through reporting incorrect units.

In order to draw attention to potential reporting errors, the data viewer includes warning flags that indicate emissions that appear too high or too low relative to reported fuel consumption, or fuel consumption that appears too high or too low compared with plant thermal capacity and reported operating hours.

The basis for these checks follows the quality assurance logic applied by the European Environment Agency (EEA) to E-PRTR and LCP integrated reporting[6]. A brief

[6] https://eebidp.sharepoint.com/sites/IndustryDatabase/Shared%20Documents/Database%20and%20other%20files/Documentation/linked%20documents/E-PRTR_and_LCP_QAQC_V3.0.pdf?CT=1597849772145&OR=ItemsView

overview is given here, but consult sections 7.1, 10.1 and 10.2 in the document in the EEA document for full details.

3.5.1. Emissions flags

For each fuel type and pollutant (CO_2, NO_x, SO_2 and Dust), an "expected" implied emission factor (IEF) has been derived through EEA work from several years of reported data (Table 3).

Table 3. Expected IEFs by fuel type and pollutant

Fuel type	Expected IEF (t/TJ)			
	SO_2	NO_x	PM	CO_2
Biomass	0.0084	0.0703	0.0042	112
Coal	0.3463	0.1598	0.0202	94.6
Lignite	0.3463	0.1598	0.0202	101
Liquid fuels	0.1999	0.1108	0.0089	74.1
Natural Gas	0.0007	0.0297	0.0006	56.1
Other Gases	0.0111	0.0369	0.0007	44.4
Other Solid Fuels	0.3463	0.1598	0.0202	97.5
Peat	0.3463	0.1598	0.0202	106

Emissions are flagged as too high when the IEF is more than 20 times the expected value (for NOx, SO2 and Dust), or more than 2 times the expected value (for CO_2).

Emissions are flagged as too low when the IEF is less than $1/100^{th}$ (SO_2, Dust), $1/10^{th}$ (NO_x) or 80% (CO_2) of the expected value.

Flagged emissions show up as pink-coloured bars in the emissions timeseries chart in the viewer.

3.5.2. Fuel consumption flags

Given reported thermal capacity, there is a theoretical maximum possible fuel consumption, if the plant runs for all hours in a year (8760 in non-leap years, 8784 in leap years).

Reported fuel consumption is flagged as too high if more than 5% higher than this maximum (this small buffer is allowed to account for rounding of reported consumption or thermal capacity).

It is flagged as too low when:

- Less than 70% of total capacity is used (this is a slight modification from the EEA logic)
- Operating hours are reported
- Effective operating hours at full capacity (total fuel consumption / thermal capacity) are more than 50% lower than reported operating hours

This logic assumes that plants normally operate near to their thermal capacity, but there may be good reasons why this is not the case. For this reason, the flag should be used as a warning only.

If operating hours are not reported, then the "low" flag is not assigned, as there is no other variable against which to check fuel usage.

4. BAT and IED compliance scenarios

4.1. Allocation of BAT-AELs, BAT-AEELs and IED ELVs to plants

The data viewer presents information on plant emissions and energy efficiency relative to a variety of different legal annual average concentration limits:

- Best Available Technique Associated Emission Levels (BAT-AELs) and Associated Energy Efficiency Levels (BAT-AEELs)[7,8]
    - Upper limit (this is the upper, lenient BREF level) – stricter BAT for the BAT-AEEL on energy efficiency
    - Lower limit (this is the lower, stricter BREF/BAT level, from 2016 onwards) – lenient BAT for the BAT-AEEL on energy efficiency
- Industrial Emissions Directive – Emission Limit Values (IED ELVs), those are the maximum allowable limits at EU level set in the Annexes of the IED[1]
- Specific permit limits

These "limits" in turn provide a range of counterfactual emissions scenarios assuming exact compliance, from which the impacts of a non-compliant plant becoming compliant can be assessed.

BAT-AELs and IED ELVs (and associated impact scenarios) are shown in the data viewer for emissions to air of NOx, SO2, PM (both), and for mercury and inorganic chlorine compounds (BAT-AELs only).

[7] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32001L0080&from=EN
[8] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017D1442&from=EN

Limits are not shown for emissions to water, as emission concentrations cannot be calculated due to insufficient data reporting by most countries (see section 3.3.1). However, the EEB endeavours to present more data on water emissions and water consumption in a second phase. Data collection is ongoing.

4.1.1. Assigning BAT AELs and IED ELVs

BAT-AELs and IED ELVs are assigned to plants via a rule-based lookup on the plant attributes available in the LCP database.

The attributes taken into account in defining the appropriate BAT-AEL, BAT-AEEL, or IED ELVs for each plant are:

- Main fuel type
- Type of combustion plant (i.e. boiler, diesel engine, gas engine, gas turbine)
- Plant age (new / existing plants)
- Thermal capacity

However, in the LCP BAT Conclusions document[9], in some cases additional factors are relevant to defining the AEL, for which data is not available in the LCP database. To deal with these cases, the following assumptions were made:

- The exceptions to AELs for installations with <1500 hours of operation were not taken into account;
- It was not possible to distinguish between coal/lignite pulverised combustion (PC) and fluidised bed combustion (FBC) boilers >300MW_{th}. Instead, the AEL range for FBC boilers was used;
- It was not possible to distinguish between combined and open-cycle gas turbines (CCGT and OCGT). Instead, the AEL range for a CCGT with a net total fuel utilisation of ≥ 75 % was used;
- Other exceptions to the AELs were only applicable in very specific circumstances, e.g. coal-fired PC boiler plants put into operation no later than 1 July 1987, which are operated < 1 500 h/yr and for which SCR and/or SNCR is not applicable.

Where such assumptions and simplification results in an incorrect AEL or ELV, users are encouraged to contact EEB with the correct figures, as well as the actual permit limits if these are currently not shown for the plant in question (see section 7).

The lookup tables used in the allocation are available on request.

[9] https://www.eea.europa.eu/publications/technical_report_2008_4

Note that legal permit limits are being sourced by the EEB on a plant-by-plant basis directly from permit documents, and may not be shown in the data viewer for all plants, as this compilation is an ongoing task. Therefore only a few plants may display those permit limits, and only for those the "compare plants" option for ELV comparison will work. Furthermore, not all permit ELV are displayed (e.g. CO, NH3), but they can be identified in the permit documents.

4.2. Conversion to quantity of pollutant emitted by compliance scenario

Once a set of concentration limits has been allocated to a plant, these are then converted back into annual emission quantities by multiplying the concentration limit by the flue gas volume. This is the reverse conversion to that used to estimate annual average pollutant concentration, in section 3.3.1.

For pollutants and plants having no applicable BAT-AEL or IED ELV, the emissions under the alternative scenarios are the same as the reported emissions. In these cases, the scenarios will not be visible in the data viewer, as the lines or points are hidden beneath the reported values.

"Old" and "New" ELVs

Emission limit values have been in place since the 1980s for LCPs. In order to meet ceiling directives, these limits have been reduced over the years with successive regulatory documents. These documents only set out emission limits for NOx, SO2 and Dust, as these were the pollutants covered under the ceiling directives. The "Old" ELVs used in the database were introduced in October 2001 and were relevant until 2016, when the ELVs specified under the IED came into force. These ELVs were to be included in licencing for new plants (granted a licence to operate after 1st July 1987). In addition, slightly higher limits were set out for existing plants. However, the decision also sets out that ELVs from existing plants can be reduced slowly as part of a national plan. The "New" ELVs under the IED are more stringent still.

5. Electricity generation and efficiency

Electricity generation data (in average annual MW) is taken from the ENTSOE transparency platform (see Table 1). This provides data at the level of the “generation unit”, which does not usually correspond in a one-to-one manner with the definition of a plant in the LCP database. A mapping between ENTSOE generation unit ID and LCP Plant ID was first developed manually, based on matching the names. Plant-level electricity generation was then calculated as follows:

- Where several ENTSOE generation units make up a single LCP plant, electricity generation is simply summed up across the relevant generation units.
- By contrast, where a single ENTSOE generation unit comprises several LCP plants, electricity generation is allocated to each plant in proportion to the total fuel consumption of all fuels (in the same way as E-PRTR facility emissions are allocated).

To calculate efficiency, the electricity generation in average annual MW is converted first to annual MWh by multiplying by 8760 or 8784 hours (for non-leap and leap years respectively), then to annual TJ by multiplying by 0.0036. This TJ generation value is then divided by the total annual fuel consumption of all types, to give efficiency.

Note: electricity generation data is not available for all plants, due to the incompleteness of the ENTSOE data, and also to difficulties in mapping some generating units to plants. Users are invited to contribute data where there is a gap (see section 7) or send an email to industrydatabase@eeb.org.

6. Impacts

6.1. Health costs

6.1.1. Calculating health costs from emissions

Estimating the health costs resulting from air pollution is a challenging and complex subject. Undertaking detailed modelling for each plant in the LCP database was well beyond the resources available for the building of the viewer, so a simpler but consistent approach was taken, which translates emissions quantities directly into health costs.

The approach used was based on the results of an EEA report "Costs of air pollution from European industrial facilities 2008–2012"[10]. Table 3.1, A2.7 – A2.9, and A3.4 – A3.6 in that report provide country-specific (in most cases) monetary estimate of the cost of mortality and morbidity, per tonne of pollutant emitted ("health cost factors").

For the data viewer, the "Value of a Statistical Life" (VSL) valuation is used, which tends to be generally about 3 times higher than the alternative "Value of Life Years" (VOLY) lost (the other measure presented in the EEA report). The main rational behind that choice is the following: unlike the US, the EU has no harmonised method for the internalisation of damage costs for air pollution. In the US, the VOLY method was judged as biased against the elderly, and therefore dismissed as a valid method. Even if choosing the approximative factor 3 higher VSL damage cost method, compared to the US, the value of statistical life (VSL) of EU citizens is still valued three times less, in contradiction with OECD recommendations. By choosing a more favourable method for the industry and underestimating air pollution damage costs, the cost-benefit assessment used for derogations is severely biased. Therefore, the EEB considers that only the VSL method should be used as a first indicator for potential air pollution damage costs.

Health costs are calculated first for each pollutant individually. Health cost factors are applied to the annual emissions estimates, then multiplied by a "sectoral adjustment" (Eurodelta II factor), which is specific to each pollutant (tables A4.1 – A4.3 in the EEA report), to account for differences in the locations and characteristics such as emission height of stacks in different sectors. For France, Germany, Spain and the UK there are country specific sectoral adjustments, whereas for all other countries an average adjustment was applied. Finally, an inflation factor of 15.3% is applied to the monetary estimates to convert 2005 to 2010 prices, which represents the central year of the time series covered in the data viewer. This is a very conservative factor that may be reviewed in the next phase.

Total health costs are simply the sum of individual pollutant health costs. As well as those pollutants available to view in the data viewer, health cost factors are calculated for a range of other organic pollutants and heavy metals, using E-PRTR emissions data. While these cannot be viewed individually, they are included with the total health cost figure.

A detailed lookup table showing the health cost factors and sectoral adjustments can be provided on request.

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[10] https://eebidp.sharepoint.com/sites/IndustryDatabase/Shared%20Documents/Database%20and%20other%20files/Documentation/linked%20documents/Costs-air-pollution_Tech20-2014_final.pdf?CT=1597850211115&OR=ItemsView

6.1.2. Health costs under alternative compliance scenarios

Health costs under alternative scenarios are calculated in the same way as for reported emissions, using the estimated annual emission quantities of pollutants if compliant with the various limits (see section 4.2).

Important: the health costs under the alternative compliance scenarios only take into account differences in emissions of pollutants covered by the BAT-AELs or IED ELVs. For those pollutants not covered, emissions are assumed to be the same as reported emissions for all compliance scenarios, so the health costs associated with these does not change.

6.2. Water consumption and discharge characteristics

Data on water consumption, and the average temperature, pH and total suspended solids (TSS), cadmium (cd) and mercury (hg) concentration in discharge water is taken from the 2017 LCP BREF , which is a snapshot of activity in 2010.

Total annual water consumption is the sum of process and cooling water consumption.

As explained in section 2.2, entities in the 2017 LCP BREF do not correspond one-to-one with LCP plants. In order to aggregate and split water consumption in many-to-one and one-to many cases, the same rules were applied as for electricity consumption.

TSS, cd and hg concentration, pH and temperature, were averaged where several 2017 LCP BREF entities correspond to one LCP Plant ID; besides, where one of the 2017 LCP BREF entities corresponds to many LCP Plants the same value was applied to all unchanged.

Due to bad reporting design, water consumption and discharge information is very limited and made available in a non-user-friendly format.

In France, information on water release (avg. concentrations, flow, temperature) and consumption (differentiating the origin of water) was available at a country level for the 2016-2018 period and in excel format, allowing direct data import to the EEB database following plant matching. For that reason, only data for the French LCPs and a limited set of 2017 LCP BREF plants (dating back to 2010) is made available in this first version of the database.

The EEB endeavours to present more data on water emissions and water consumption in a second phase, which shall also include water consumption from associated activities, in particular lignite mining. Data collection is ongoing. *Note: the 2017 LCP BREF contains information for only a selection of facilities, so in many cases this information will* *be missing. Data collection is ongoing on water release and consumption, also on lignite mining. Users are invited to contribute data where there is a gap (see section 7).*

6.3. Land grab

For lignite plants only, the impact of electricity production on land use ("land grab") is estimated. Lignite is singled out in this regard due to the predominance of open-cast mining for lignite over deep mining, and well as the low calorific value of the fuel.

Land grab is expressed in terms of tonnes of earth extracted annually to supply the fuel for each lignite plant. To calculate land grab, the annual quantity of lignite consumed (in TJ) is first converted to tonnes of lignite assuming a default calorific value of 11.9 GJ per tonne. This is then multiplied by a standard conversion factor of 5, based on a study from Őko-Institut commissioned by Agora EnergieWende and the European Climate Foundation[11], which is the tonnes of earth removed per tonne of lignite mined. Whilst in reality this is likely to vary from mine to mine, e.g. in the Balkans that factor is lower, this average factor was used for simplification reasons.

No mine-specific data was found. Once again, operators and authorities are invited to submit more accurate data if available.

Note: The land grab factor is currently under review as to the metric used. The current metric represents a London double-decker bus in terms of tonnage volume extracted. In the next version other metrics that are more soil and agriculture related are considered, e.g. crop yield equivalents. Users are invited to provide suggestions. Mine related data collection is ongoing, in particular on water impacts. The second version of this database will provide more reporting on the land grab and mine related impacts.

[11] Őko-Institut (2017), Die deutsche Braunkohlenwirtschaft. Historische Entwicklingen, Ressources, Technik, wirtschaftliche Strukturen und Umweltauswirkungen, https://eebidp.sharepoint.com/sites/IndustryDatabase/Shared%20Documents/Forms/AllItems.aspx?originalPath=aHR0cHM6Ly9lZWJpZHAuc2hhcmVwb2ludC5jb20vOmY6L3MvSW5kdXN0cnlEYXRhYmFzZS9FZ2NsS2ZtcVVrZEVwclF4c00xRGZod0JCX3Q2dWpHc1JpeTRRVE95VXp0ZGh3P3J0aW1lPU96OTNWeVpFMkVn&id=%2Fsites%2FIndustryDatabase%2FShared%20Documents%2FDatabase%20and%20other%20files%2FDocumentation%2Flinked%20documents%2FAgora%5FDie%2Ddeutsche%2DBraunkohlenwirtschaft%5FWEB%2Epdf&parent=%2Fsites%2FIndustryDatabase%2FShared%20Documents%2FDatabase%20and%20other%20files%2FDocumentation%2Flinked%20documents

7. User contributed information: please contribute to improve the database

7.1. What users can do

Users are encouraged to contribute with data, documents, comments, and corrections where data is missing or appears incorrect in the viewer. This way, the data viewer would provide more up to date, reliable information that would benefit users and allow fact-based and transparent reporting.

Although the situation varies from country to country, the main gaps relate to the following aspects):

- More recent continuous emissions monitoring (CEM) results (in concentrations) on the pollutants subject to this monitoring requirements (NOx, SO2, dust and CO, NH3, mercury), yearly averaged results for 2018, 2019, 2020;
- Up to date permit conditions (emission limits);
- Water consumption data and release information for 2018, 2019 and 2020 (annual average), with focus on TSS, hg, cadmium, flow, temperature, and wider consumption data, also on mining activities;
- Fuel specs information on lignite (e.g. mercury and Sulphur content, water content and heating value)
- Abatement techniques in process of implementation for lignite combustion (NOx, hg).

Users can provide these information by sending an e-mail to industrydatabase@eeb.org, requesting permission to upload data to the EEB Industry Database Project SharePoint site[12], and uploading the information via the dedicated form.

For information relating to plant attributes or fuel consumption, this will likely not be labelled as user-provided information in the viewer. Rather, changes will be made directly to the underlying data sources (e.g. LCP or E-PRTR database), or used to refine allocation of BAT-AELs, for example.

However, when continuous emissions monitoring (CEM) data or permit limit information is provided, this is labelled as a separate line in the data viewer, to allow comparison with estimated numbers and with BAT-AELs and IED ELVs respectively.

[12] https://eebidp.sharepoint.com/sites/IndustryDatabase/Lists/userinputform/AllItems.aspx

Documents uploaded will be added to the SharePoint folder for the relevant plants, and become available in the viewer (when next updated) to the general public.

7.2. What utilities and companies can do

Some operators provide environmental performance information (such as monitoring results on air and water emissions) directly on their company websites, that is updated on a daily basis for the CEM results. **Utilities are strongly encouraged to provide the CEM data results directly to the EEB.** Those utilities willing to set up a live-link reporting channel to automatically update the information can send an email to industrydatabase@eeb.org.

The EEB will include a ranking of utilities in terms of transparency and pro-active data dissemination in the next version of the database, or communicate about it through dedicated campaign work.

7.3. What technique providers can do

Once the consolidation of data is made, the EEB will provide dedicated briefings on countries and utilities covering their track record of permit ambition level, compliance with BAT standards, and investment in pollution control.

Laggards and frontrunners will therefore be identified and exposed in the public media. Updating the technique relevant section may allow technique providers to identify LCPs where there is improved pollution prevention uptake potential, thus providing a business opportunity for technique providers while at the same time improving compliance promotion with BAT standards.

Technique providers have up to date information on which techniques the operators have implemented, plan to implement, could implement but resist due to cost implications to the operator. In case the information is provided with the explicit request to remain "anonymous", the EEB will strive to ensure transparency while respecting the request of the technique provider.

7.4. What Member States' authorities can do

The EEB has already assessed national databases in terms of accessibility and user friendliness of data in its "Burning: the evidence" report published in 2017. Recommendations for improvements are contained in that report[13], and updated in section 6 of the briefing "EU industrial strategy for achieving the 'zero pollution' ambition set with the EU green deal (large industrial activities)"[14].

[13] https://eeb.org/publications/61/industrial-production/47539/burning-the-evidence.pdf
[14] https://mk0eeborgicuypctuf7e.kinstacdn.com/wp-content/uploads/2020/03/EEB-basic-elements-on-Industry-Strategy-IED-FIN-1.pdf

However, many Member States did not make any progress since then, and the EEB had to rely on time-consuming access to documents requests in order to obtain basic information. In addition, over eight months after such requests were issued, some countries have not provided yet the requested data.

These request cover environmental information that cannot be considered confidential. It is therefore a responsibility of public servants to act in a pro-active and transparent manner and ensure this information is disclosed and available to the public. The EEB calls on national ministries and competent authorities to help fill the gaps, and work towards an improvement of the EU reporting systems on industrial activities[15].

7.5. What the European Commission and the European Environmental Agency can do

The EEB is not entrusted with the role of being the guardian of the Treaties, but the European Commission is. Properly designed reporting obligations and proper control over the way information is reported are essential to obtain a EU-wide, user-friendly and multi-purpose data reporting system that includes sufficient, high-quality data from the EU's largest industrial activities.

To improve the data reporting situation, the EEB calls on the European Commission and the European Environment Agency to[16]:

- Reject any IED Registry reports that are either incomplete or contain misguiding information, such as dummy placeholders or fake weblinks;
- Initiate infringement proceedings against member states that fail on proper reporting, make the information public, and block pending state aid decisions until these issues are fixed;
- Reject "disappearing plants" (e.g. the German lignite units), and reintegrate data manually;
- Amend without further delay the Commission Implementing rules on IED reporting[17] to achieve the following main objectives:
    - To set an EU IED permit report template for ELV reporting

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[15]See notably section 6 of this briefing: https://eeb.org/publications/61/industrial-production/47539/burning-the-evidence.pdf

[16] These points were raise by the EEB during a sneak preview presentation of the IPDV to the European Commission and the European Environment Agency: https://www.dropbox.com/s/p4e76uua2pe5qjy/LCP%20webinar%20presentation%20final.pdf?dl=0

[17] https://eur-lex.europa.eu/search.html?DTN=1135&DTA=2018&qid=1597830036800&DB_TYPE_OF_ACT=decision&DTS_DOM=ALL&excConsLeg=true&typeOfActStatus=DECISION&type=advanced&SUBDOM_INIT=ALL_ALL&DTS_SUBDOM=ALL_ALL

- To require direct and instant reporting (e.g. to the EEA) of the continuous emissions monitoring for air - and monthly averaged water - pollutants
    - To set harmonised reporting standard and require sharing on annual compliance report information (Art 14(1) point d of the IED)
- Improve integration of EU data-reporting, and notably:
    - Enable ENTSO-E matching with LCP-D Ids;
    - Enable the integration of water data (e.g. WISE);
    - Set metrics for production volumes (E-PRTR)
- More generally consult with NGOs and the public, and include them in this process, because they are an “end user” of that information.

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https://eebidp.sharepoint.com/sites/IndustryDatabase/Lists/userinputform/AllItems.aspx

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