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EXPLANATORY & GUIDANCE document (E&G-d) on IED-based (draft) Waste Incineration BREF and BAT conclusions

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MAIN DOCUMENT

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Drafting Committee

This guidance document has been prepared by members of CEWEP, ESWET, FEAD and Euroheat & Power, in particular those who represent these industrial associations within the Technical Working Group (TWG) set up by the European Commission for the revision of the Waste Incineration BREF.

Their work started proactively nearly 2 years before the launch of the WI BREF review, within the Joint Working Group (JWG) settled by the CEWEP, ESWET, FEAD for this purpose, with the following goals:

- To identify areas where the sector improved
- To pinpoint potential issues linked to the review of the document
- To agree on proposals achievable and at the same time environment-friendly
- To promote the position through the TWG and towards the European Integrated Pollution Prevention and Control Bureau (EIPPCB).

Representatives of these associations attended all physical meetings, workshops, webinars and site visits of the TWG (see below Section 2.2 on Milestones). They as well had informal meetings with delegates of other entities represented in the TWG and with the European Commission' officers.

In the context of the WI BREF review, CEWEP, ESWET and FEAD also commissioned the INERIS institute to carry out an extensive study on the monitoring uncertainties at the very low emission levels required and achieved by waste-to-energy plants. The findings of the study were presented to the participants of the WI BREF review (Commission, Member States and other stakeholders) by its main author and revised in accordance with comments and questions. The original and revised reports were disseminated within the WI TWG, the members of the IED Article 13 Forum and the Expert Group following the revision of the EIPPCB document on Reference On Monitoring (ROM).

The present draft Guidance is an ongoing work intended to be regularly improved by European and national professional associations and other stakeholders in order to enhance its clarity and to spread the crucial information it contains to users of WI BREF BAT conclusions.

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About the signatory associations

CEWEP (Confederation of European Waste-to-Energy Plants) is the umbrella association of the operators of Waste-to-Energy plants across Europe. CEWEP's members are committed to ensuring high environmental standards, achieving low emissions and maintaining state of the art energy production from remaining waste that cannot be recycled in a sustainable way. CEWEP members operate 410 Waste-to-Energy plants in 22 European countries, with a capacity of over 80 million tonnes of residual waste.

ESWET (European Suppliers of Waste-to-Energy Technology) is the European association representing manufacturers in the field of Waste-to-Energy Technology. The purpose of ESWET is to raise awareness of the positive implications of the technology in terms of better waste management, energy and the environment and thus to foster the development and the dissemination of Waste-to-Energy technology at the European level. Technology from ESWET members is the heart in most of the Waste-to-Energy plants in Europe, treating non-recyclable municipal solid waste. This technology is also used by most plants worldwide.

FEAD (European Federation of Waste Management and Environmental Services) is the European federation representing the private waste and resource management industry across Europe. FEAD members are 21 national associations of waste management and environmental services whose members are 3.000, primarily private waste management companies. FEAD members companies play a key role in the transition to a circular economy by producing resources which can be reinjected in the economy and by supplying energy. They add value through innovative collection, sorting, recycling of secondary raw materials, material or energy recovery, in a competitive environment. FEAD members represent 260 waste-to-energy plants, recovering energy and construction materials from non-recyclable and non-compostable wastes, and therefore contributing to the implementation of the circular economy.

Euroheat & Power unites the district energy sector to drive forward sustainable heating and cooling. Our members include national district heating and cooling associations, utilities operating district energy systems, industrial associations and companies, manufacturers, universities, research institutes and consultancies active in the sector. As technology, district heating increase the energy efficiency of waste-to-energy plants, while waste-to-energy provides a reliable heat source for district heating. Most European district heating networks use energy from waste that contributes to their renewable energy share. The smooth implementation of the WI BREF requirements is an important issue for EHP.

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The information provided in this Explanatory and Guidance document (E&G-d) and its annexes, are given in order to help the stakeholders but accepts no responsibility or liability whatsoever of the authors.

Abbreviations

Acronyms and other abbreviations used in the main E&G-d and in its annexes are bundled with some definitions in Annex 1 to this E&G-d.

Foreword / Introduction

At the moment when this version of the Explanatory and Guidance document (E&G-d) is released, the WI BREF BAT conclusions have been approved (on 12/11/2019) but not yet been published. After publication of the WI BREF BAT Conclusions in the Official Journal of EU (expected in the coming days) and release on the EIPPCB website of the WI BREF in full (expected at the end of 2019), this document will be adapted – if necessary. The content of the WI BREF BAT conclusions is not systematically repeated in this E&G-d. They both must be read together.

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According to the Industrial Emission Directive (IED), Art. 21(3), within 4 years from the publication of the Best Available Techniques conclusions (BAT conclusions), as a Commission Implementing Decision, of the reviewed Waste Incineration BREF (BAT REFerence document), the permits of all the installations within its scope (and possibly national general binding rules) must be reconsidered and, if necessary, adapted to ensure compliance with the new requirements. In particular, in accordance with IED Art. 15.3, Emission Limit Values (All installations included in s) should be set to ensure that emissions do not exceed the BAT Associated Emission Levels (BATAELs). Therefore, if necessary, retrofitting work must be done at installation level in order to ensure that BATs are implemented within this time

At first glance, the WI BAT conclusions seem quite straightforward. However, when it is time to implement them it will be clear that there is a lack of background information on how to understand, interpret and apply them, as well as on the applicability of the BATAELs ranges. Currently, BAT conclusions often do not reference complementary legal requirements that are essential to grasp the framework, nor provide useful contextual information shared during the exchange within the WI BREF Technical Working Group.

In addition to complementing the BAT Conclusions with contextual information that is not contained in the Commission's text but is necessary to understand it, the goal of this Explanatory and Guidance document (E&G-d) is to help harmonising the implementation of WI BAT conclusions throughout Europe and everywhere it may be used. To this end, the structure follows a simple approach: first, the background information and open issues, then, at the end, the proposed solutions.

The document offers the Waste Incineration BREF users the necessary tools for:

- a better understanding of the background of the WI BREF and of the BAT conclusions, in particular about what is not clearly stated in them;
- assessing the techniques implemented in a given installation in terms of Best Available Techniques;
- identifying and assessing the possibilities to improve the installation in respect of environmental protection, using an integrated approach and considering techno-economical aspects;
- ensuring an appropriate implementation of the BAT conclusions;
- preparing the application form for the competent authorities, either for a new permit) or for reconsideration of the current permit The form will show that the installation is implementing or

will implement BATs that are adapted to the local conditions and the proposed changes to be BAT-compliant – if need be.

The three first chapters of this E&G-d provide information on the legal framework, the way the WI BREF was reviewed, the data used by the EIPPCB to set the BATAEL ranges and give a general overview of the BREF content.

Chapter 4 provides complementary information onto the WI BREF BAT conclusions which come from TWG documents and meetings and highlights the pending matters remaining to be set by Member States for implementation and compliance check.

Chapter 5 provides a list of practical proposals for the implementation of BAT conclusions, for assessment of their implementation (including a decision tree) and for verification of compliance. The details of the proposals are most often given in the annexes. Cross references are highlighted I yellow all over the E&G-d pieces.

Chapter 6 gives links to useful documents.

The annexes provide details on the most important points, step by step comments, detailed practical proposals and example forms to facilitate implementation of BAT conclusions and checking.

1 Legal framework

The legal framework in which the WI BREF and its BAT Conclusions (that we'll call WI BAT conclusions in this E&G-d) are included is complex and requires knowledge of the IED, the BREFs and the standards, along with other pieces of legislation. The way these different pieces interact is not always consistent and straightforward, as it will be explained in the next sections. This chapter aims at improving the clarity and the understanding of the different interactions between legislations that provide basis for WI permit writing.

1.1 Former IPPC directive (1996) – First WI-BREF (2006)

The first powerful tool to promote European Union (EU) environmental policy as a whole was the Integrated Pollution Prevention and Control (IPPC) directive of 1996[1]. All installations included in the scope of the directive had to prevent and reduce pollution, use energy efficiently, prevent accidents and limit their consequences by applying the Best Available Techniques (BATs).

The directive provided a definition of BATs and more specifically, in its Annex IV, provided *"considerations to be taken into account generally or in specific cases when determining best available techniques (…), bearing in mind the likely costs and benefits of a measure and the principles of precaution and prevention"*. The considerations were given as a list of 12 criteria: the use of low waste technology and of less hazardous substances, possibility to recycle or recover substances generated and used, achievable emissions, consumptions of resources, risk of impacting the environment and risk of accident, industrial implementation of the techniques, etc.

The IPPC directive did not mention BAT REFerence documents (BREFs), nor BAT Associated Emission Levels (BATAELs). On request of the Member States, the European Commission initiated afterwards the so-called Seville process to provide guidance reference documents (the BREFs) for all the sectors in the scope of the directive. Around 33 BREFs were published under IPPC directive between 2000 and 2009, most of them *"vertical"*, i.e. related to particular industrial activities, and a few *"horizontal"*

[1] IPPC Directive: Council Directive 96/61/EC of 24 September 1996.

addressing cross-sectoral issues[2]. Each BREF was drawn up by the European IPPC Bureau (EIPPCB), an entity created by the EU Commission in the office of the Joint Research Center (JRC) in Seville, together with a Technical Working Group (TWG) that included representatives of Member States, the concerned Industry and Environmental Non-Governmental Organisations (NGOs).

These IPPC-based BREFs, which listed BATs applicable to each specific sector, were given for information to help the competent authorities to assess if and how BATs were implemented at a given installation. The performances associated to BATs, the BATAELs, were experts' estimates of the typical[3] values that could be observed when using BATs. The Commission published in 2006 the IPPC-based WI BREF, BREF for waste incineration (and co-incineration[4]). The document was available in English only on the EIPPCB website. See below Sections 1.3 and 4.5 on the difference of nature between IPPC-based and IED-based BATAELs.

1.2 Industrial Emissions Directive (IED), 2010

1.2.1 Merger of 7 directives

Published in 2010, the IED was a merger of 7 directives: the IPPC directive, the Large Combustion Plants (LCP) directive[5], the Waste Incineration Directive (WID)[6] and 4 other directives. The numerous activities in the scope of the IED are listed in its Annex 1. They are nearly the same as the ones formerly covered by the IPPC directive.

The IED aims to achieve a high level of protection of human health and the environment taken as a whole by reducing harmful industrial emissions across the EU, in particular through better application of Best Available Techniques (BAT)[7]. It includes in its scope around 50'000 EU installations which all are required to be operated in accordance with a permit granted by Member States' competent authorities.

The IED kept most requirements and texts of the LCP directive (see IED Chapter 3 and Annex V) and of the WI directive (see IED Chapter 4 and Annex VI). This includes in particular the Emission Limit Values (ELVs) for air emissions on 4 substances[8] for LCP and on 36 substances[9] for WI as well as the ELVs for water emissions for WI Flue Gas Cleaning effluents on 27 substances[10].

The two first general chapters of IED are common provisions for the covered activities (that are listed under its Annex I) and were mostly influenced by the LCP directive.

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[2] *"Horizontal"* BREFs under IPPC directive: Energy efficiency, Emissions from storage and Industrial cooling systems. Are also "horizontal" the REFs (Reference documents, without BAT conclusions) on Economics and Cross-media effects (7/2006) and Monitoring of emissions to air and water from IED installations (7/2018).

[3] These typical values were not maximum values, and therefore not potential ELVs. See Section 4.5 below.

However, co-incineration of waste in cement kilns was addressed in the Cement & Lime BREF.

[5] The LCP directive 2001/80/EC that had replaced LCP directive 94/66/EC.

[6] The WID 2000, 2000/76/EC, had replaced the twin WIDs of 1989 for non-hazardous waste (89/369/ EEC and 89/429/EEC) and the Hazardous WID of 1991, which itself had replaced the Hazardous WID of 1978.

[7] Definitions of *'best available techniques', techniques', 'available techniques'* and *'best'* are given in IED Article 3 (10). The '*Criteria for determining best available techniques'* are given in IED Annex III.

[8] Dust, NOx, SO_2 and CO.

[9] 7 substances continuously monitored + 12 metals + 17 dioxins and furans compounds (TEQ).

[10] TSS + 9 metals + 17 dioxins and furans compounds (TEQ).

1.2.2 BREFs & BAT conclusions

While the IPPC directive referred only to BATs, the IED also defines BREFs and BATAELs (see IED, Article 3). It defines as well BAT conclusions (IED, Article 3(12)), gives instructions on how they should be adopted (see IED Article 13.5) and published. It states that, within 4 years of their publication, the competent authority shall ensure that the permit conditions are reconsidered and if necessary updated to ensure that BATs are implemented (see IED Articles 14.3 & 21.3) and, in particular, that emissions do not exceed BATAEL values (Art. 15.3).

In order to lay down rules concerning the drawing up and reviewing of the BREF documents and the procedures to be followed, the so-called BREF drawing up guidance was published on 10/2/2012 as a Commission Implementing Decision (2012/119/EU). It describes the step of the so-called Seville process in details, including the general principles for the data collection on which each BREF review should be based on.

The chapter of the BREFs containing BAT conclusions should be designed to become a stand-alone document. Once the technical works are completed by the TWG, the final draft is firstly presented to the (IED) Article 13 Forum[11] for its opinion, then adopted by qualified majority of the Member States at (IED) Article 75 Committee[12], and translated into 23 EU official languages (see IED Article13.5). Afterwards the document is published in the Official Journal of the European Union (OJEU) as a Commission Implementing Decision and therefore becomes the reference for setting permit conditions (see IED Article 14.3). Although addressed to the Member States, it is directly applicable (without transposition[13]). However, Member States can adopt *'General binding rules'*, which would simplify the procedures for implementation (See Section 1.5 below).

The complete BREF document is usually made available on the EIPPCB website and only in English, about 4 to 6 months later.

NB: Both the wordings "BAT conclusions" and "BATs" have several meanings, which can be confusing. For instance, in the BAT conclusions chapter, "BAT" means "BAT conclusion". The different meanings are clarified in Table 1.1 of Annex 1 to this E&G-d.

1.2.3 BATAELs and BATAEL-based ELVs defined in NOC

Given the origin of the IED, it comes with no surprise that its general chapters were based on the text of the IPPC directive, which already covered many sectors. More in details, the IED defines BATAELs (see Art. 3.13) under Normal Operating Conditions (NOC) and requires that future ELVs must

[11] In accordance with Article 13 of the IED, the European Commission organises an exchange of information between Member States, the industries concerned, non-governmental organisations promoting environmental protection and the Commission. To this end, the Commission regularly convenes a forum composed of representatives of these entities to obtain the opinion of the forum on the proposed content of the BAT reference documents. More information on the IED Article 13 Forum can be found at: http://ec.europa.eu/environment/industry/stationary/ied/implementation.htm.

[12] In accordance with Article 75 of the IED, the Commission is assisted by a committee, which has the competence to deliver opinions on implementing acts concerning the following: guidance under Article 13(3)(c) and (d) of the IED, BAT conclusions (Article 13(5)), implementing rules for large combustion plants (Article 41) and the type, format and frequency of reporting by Member States (Article 72(2)). The committee is composed of representatives of the Member States and the Commission. More information on the IED Article 13 Forum can be found at: http://ec.europa.eu/environment/industry/stationary/ied/implementation.htm.

[13] The IED has been transposed by the MSs. Its Article 14.3 says: *"3. BAT conclusions shall be the reference for setting the permit conditions."*

be set to ensure that emissions, also during NOC, do not exceed these BATAELs (see IED, Art. 15.3 within 4 years further the publication of the specific BAT conclusions). In this document, we will call "BATAEL-based ELVs" these emission limits that will be set in future in permits based on the reviewed WI BAT Conclusions.

This distinction is of particular importance for the incineration sector, which is the only industrial sector for which compliance with the current ELVs(IED Annex VI ELVs) of the continuously measured emissions is not only required under NOC but within the Relevant Effective Operating Time (R-EOT)[14], i.e. as soon as and as long as waste is burning (see IED Annex VI, Part 8, §1.2). See below Section 4.3.

NB 1: This much more stringent specific regime for WI plants comes from the former WI directives[15].

NB 2: These BATAEL-based ELVs will thus coexist with the ELVs laid down in IED Annex VI, which are a reproduction of the former WI Directive. See Section 4.3.1 below.

1.2.4 Other BATAEPLs

In addition to BATAELs, the Commission introduced in its so-called Guidance on the drawing up of BREFs (Decision 2012/119/EU) the wider notion of BAT Associated Environmental Performance Levels (BATAEPLs). BATAEPLs include BATAELs but also BATAEELs (BAT Associated Energy Efficiency Levels) and possibly other kinds of performances, such as on consumptions (energy, water, material) or abatement efficiencies. The WI BAT conclusions includes BATAELs, and two kinds of other BATAEPLs: on energy efficiency (BATAEELs) and on remaining unburnt waste in bottom ash. See below in Section 5.1.3 more elements on the BATAEPL issue.

1.3 Differences between IPPC-based and IED-based BREF, BATs, BATAELs and other BATAE(P)Ls

The main differences between IPPC and IED in respect of BREFs, BATs, BATAE(P)Ls nature and obligation of compliance are summarised in the following Table.

[14] IED Annex VI, Part 8, 1.2 reads: *"The half-hourly average values and the 10-minute averages shall be determined within the effective operating time (excluding the start-up and shut-down periods if no waste is being incinerated) from the measured values after having subtracted the value of the confidence interval specified in point 1.3 of Part 6. The daily average values shall be determined from those validated average values."*

The Effective Operating Time (EOT) covers the period when the plant is in operation. In this E&G-d, we'll note "R-EOT", Relevant EOT, the period of time that is relevant for compliance with IED Annex VI ELVs, i.e. EOT except the start-up and shut-down periods when no waste is being incinerated (only the burner is in operation).

[15] See Article 11.11 of former WID 2000 (2000/76/EC).

	IPPC 1996	IED 2010
Implementation of **BATs** (Best Available Techniques) **in general**	**Mandatory** on the basis of the **general definition** of BATs.	**Mandatory** in reference to the **list of BAT conclusions** given in the BREF (see IED Art. 14.3) and of the **general definition of BATs.**
BREFs	Not mentioned in the IPPC directive. Introduced afterwards. **No regulatory value.** Only in English	Defined in the IED (see Art. 3.10 and 13). Only the chapter on **BAT-conclusions is translated into 23 languages of E.U.** and **is the reference for setting the permit conditions** (IED, Article 14.3).
Use of BREF **BAT conclusions**	**For information.**	Should be used as a reference (see above). However, the list of BATs (Best Available Techniques) listed in the BAT conclusions (a, b, c, etc.) is neither prescriptive nor exhaustive See below in Section 4.1.1 the two meanings of BATs. See also Table 1.1 of Annex 1 to this E&G-d.
BATA**E**Ls (BAT Associated **Emission** Levels)	Not mentioned in the IPPC directive. **For information in BREFs,** as **typical levels that can normally be observed** when using BATs.	**Futures ELVs must be set to ensure that emissions do not exceed BATAELs under** NOC (Normal Operating Conditions). See IED, Art 15.3.
(Other*) BAT**AE**PLs (BAT Associated **Environmental Performance** Levels) **: The notion of BATAEPL includes BATAELs. Here are only addressed non-BATAELs BATAEPLs*	Not mentioned in the IPPC directive. Added for information.	Introduced by the Commission's Guidance on drawing up of BREFs (Commission decision 2012/119/EU). Not mentioned in the IED. No requirement related to the BATAEPLs (other than BATAELs).

***Table 1**: comparison between IPPC and IED requirements in respects of BATs, BATAELs, BATAEPLs*

Generally speaking the IED sets a more detailed framework than the IPPC directive to ensure the correct application of BAT throughout

The list of BATs (Best Available Techniques) listed in the BAT conclusions is neither prescriptive nor exhaustive. See Section 4.1.2.1 and 5.1.1 below.

1.4 Other relevant BREFs and REF under IED

There are 34 BREFs (BAT REFerence documents) and REFs (REFerence documents) based on the IED that the Commission has published or is currently reviewing. Most of the previous vertical BREFs (made

under IPPC) addressing the sectors defined as well in the scope of the IED (see IED Annex I) are or will be revised. A few have been added. Some horizontal BREFs may not be revised. One REF has been revised, the Reference report on Monitoring (ROM). It is a 'REF' and not a 'BREF' because it does not contain BATs nor BATAELs. There is no mention of REFs in the IED but they are referenced in BREFs.

Besides the WI BREF, which will be addressed below in detail, when working on the incineration or co-incineration of waste, it is worth mentioning the following relevant BREFs, BAT conclusions and REF that can be downloaded from the EIPPCB website (http://eippcb.jrc.ec.europa.eu/reference/).

1.4.1 Production of Cement, Lime and Magnesium oxides BREF (CLM BREF)

The CLM BREF addresses the co-incineration of waste in cement kilns. Published in 2013 (BAT conclusions in April 2013), it is one of the first BREFs of second generation (i.e. revised under IED) and its BATAELs are not very stringent..

1.4.2 Large Combustion Plants BREF (LCP BREF)

The LCP BREF addresses the combustion of most fuels in plants with a rated thermal input of 50 MW or more, including biomass and the co-incineration of waste in certain cases. It is sometimes unclear if certain co-incineration plants are in the scope of the LCP BREF or in the one of the WI BREF. Some plants are excluded from the scopes of both BREFs but still in the scope of the IED. See in Annex 7 to this E&G-d the answer to question "*Is the incineration of all kinds of waste in WI BREF scope?*"

The reviewed LCP BREF BAT conclusions were published in July 2017 in the Official Journal of the EU. The associated BATAELs are much more stringent than the ELVs for LCPs in IED (see IED Chapter 3 and Annex V, dedicated to LCPs), which for some LCPs were not yet implemented because of the long periods granted to them for implementation by the IED. Not only for the 4 previously monitored substances (NOx, SO_2, dust and in some cases CO), the BATAEL values are lower but, in addition, for coal-, lignite-, peat- and biomass-fired LCPs, many new substances must be monitored, (more or less the same as for incineration plants).

1.4.3 Waste Treatment BREF (WT BREF)

The reviewed WT BREF BAT conclusions were published on 17th August 2018. It addresses all waste treatment routes except incineration and co-incineration, as well as landfilling (which, although in the scope of the IED, is not in the scope of any BREF).

Although waste incineration is excluded from its scope, the WT BREF addresses the Pre-treatment of waste prior to incineration and the Treatment of incineration fly ashes and other residues resulting from flue-gas cleaning (FGC).

1.4.4 Reference Report on Monitoring (ROM REF)

The Reference on Monitoring of Emissions to Air and Water from IED installations is mainly a tool for EIPPCB when drawing up or reviewing BREFs. Since it is a REF, it does not contain BATs nor BATAELs. It provides interesting information that can be used for the implementation of BREFs BAT conclusions but, being horizontal, it is not specific to any sector and therefore does not provide the detailed assessment that can be found in the study specially made by INERIS on this issue for the waste incineration sector. (See Annex 3 to this E&G-d that is dedicated to this point.) The ROM was published in July 2018 on the EIPPCB website. It is only available in English.

1.5 Implementation of IED and of BREF-BAT conclusions

Member States must ensure that no waste incineration or co-incineration plant is operated without a permit (see IED Article 4). The elements to be included in the application for permit are given in IED, Article 12 and the measures to be included in the permit are given in IED Article 14.

Permits will generally contain new requirements based on BAT conclusions in addition to the ones resulting from the specific annex of the IED (Annex VI for WI plants). The 2 pieces of legislation are linked and have to be used correctly and consistently. For example, WI plants are required by IED Annex VI to have ELVs for emissions to air monitored continuously within the R-EOT on half hourly and daily averages. This means that future permits will have ELVs based on both the IED Annex VI and the WI BAT Conclusions. (See more details on this in Section 4.3 below and Annex 2.a to this E&G-d).

The main tasks of the competent authority (i.e. the authority in charge of granting the permit to operate and of checking compliance), as well as the obligations of the operator, are laid down in IED Articles 14 to 16 and 18 to 24. We recall that the permits conditions for all the installations concerned will have to be reconsidered and, if necessary, updated to ensure that the requirements of the IED, including the use of BATs, are implemented in a 4-year span once the WI BAT Conclusions are published in the Official Journal of EU.

BATAELs are usually not expressed as single values but as ranges. One of the most important points is the setting of ELVs that ensure that, in Normal Operating Conditions (NOC), emissions do not exceed the BATAEL values (see IED Article 15.3). The requirement of IED Art.15.3 can be achieved:

a) Either by setting ELVs that do not exceed the BATAELs (IED Article 15.3 (a));
b) Or by setting ELVs higher than BATAEL values and checking at least annually that emissions have not exceeded the BATAELs (IED Article 15.3 (b)).

See below section 5.2.45 with proposal on how to set BATAEL-based ELVs.

It should be noted that MSs can adopt *'General binding rules'*[16] including requirements for certain categories of installations, such as incineration or co-incineration plants. Where general binding rules are adopted, the permit may simply include a reference to such rules (see IED, Articles 6 and 17). This simplifies significantly the application form and the discussions with competent authorities. In such case, the earlier these rules are adopted, the easier it will be for implementation.

2 WI BREF review

2.1 TWG and EIPPCB

As required by IED Article 13, in order to draw up and review BREFs, BATs, BATAELs and other BATAEPLs at European Union level, the European Commission organises and co-ordinates for each BREF, within a dedicated Technical Working Group (TWG), an exchange of information with experts from Member States (MSs), the Industry concerned and Environmental non-governmental organisations (NGOs).

The work is organised, led and controlled by the European Commission (DG Environment) and the European Integrated Pollution Prevention and Control Bureau (EIPPCB). The EIPPCB, which was

[16] IED Article 3.8 provides the following definition : *"(8) 'general binding rules' means emission limit values or other conditions, at least at sector level, that are adopted with the intention of being used directly to set permit conditions."*

established in 1997 to draw-up the first series of IPPC-based BREFs, depends on Commission's DG Joint Research Centre (JRC) and is therefore often called JRC-EIPPCB. Since the EIPPCB is based in Seville (Spain) the elaboration of BREFs is often referred to as the *"Sevilla process"*. The Seville team is composed of a few Commission officials (including the Head of Bureau), contract agents and seconded national experts sent for a few years by Member States. The EIPPCB writes the draft BREFs and BAT conclusions, analyses and assesses the comments of the TWG, submits some of them to the TWG in the Final Meeting (FM) and eventually drafts on the final version.

2.2 Milestones

TWGs meet only twice in plenary sessions: at Kick-off and Final meetings. In-between some web conferences or workshops on dedicated issues and site visits usually occur. See key milestones of the WI BREF process in Table 2 below.

The WI BREF Draft 1 and subsequent versions as well as the assessment of the comments and split views of the TWG members were accompanied by explanatory notes and, for the Final Meeting, by a so-called Background paper. Useful statements that can help to clarify some ambiguities remaining in the BAT conclusions and the rest of the BREF can be found in these documents. Some of them are referred to in the following sections and in the Annexes to this E&G-d.

WI BREF review milestone	Date	Comment
Reactivation of the TWG	12/5/2014	Around 200 registered TWG members
EIPPCB call for initial positions	20/6/2014	
Kick-off Meeting (KoM)	19 - 22/1/2015	Around 100 TWG members present. Creation of 3 subgroups: 1) data collect. and questionnaire 2) energy 3) residues
Residues-subgroup meeting in Berlin	15 - 16/7/2015	Organised by German UBA (EPA)
Drawing up of Questionnaires (Q)	4 to 12/2015	
Meeting in Seville of subgroup on Questionnaire	23-24/9/2015	
MSs sent Q to selected operators	1/2016	Q sent to ca. 500 well performing plants
Deadline for Q return (filled-in with data of year 2014)	4/2016	More than 350 filled-in Q from operators of WI and IBA plants
Site visits for EIPPCB and TWG members in Austria and Sweden	4/2016	W-t-E plants, HZW plant
Presentations organised by CEWEP-ESWET-FEAD with the main author of the INERIS report on monitoring and uncertainties	5/7/2016	in Brussels to Commission (DG ENV)
	26/9/2016	in Seville to EIPPCB and wider JRC staff
	21/10/2016	in Brussels to Article 13 Forum members and TWG members
Webinar on data collected in Q	24-25/11/2016	
Draft 1 (D1) of the revised WI BREF sent by EIPPCB to TWG	24/5/2017	Sent with 7 explanatory notes by EIPPCB

Site visits for EIPPCB and TWG members in France and Germany	6 & 7/2017	W-t-E plants, HZW plant, IBA plants, monitoring instruments workshop and INERIS Inter-lab comparison test bench
End of commenting period on D1	8/9/2017	2901 comments to EIPPCB
Workshop in Seville	4-5/12/2017	Exchange of views on key aspects
Background Paper and Pre-final BAT conclusions	23/2/2018	Sent to the TWG to prepare FM. (Only BAT conclusions presented at FM)
Final Meeting (FM)	23 to 27/4/2018	Around 100 TWG members present
Deadline to confirm split views	18/5/2018	Split views are the dissenting views expressed by TWG members during FM
Pre-final draft WI BREF sent to TWG with split views assessment	28/9/2018	Comments possible upon 4 weeks
Final draft WI BREF sent to TWG	14/12/2018	
IED Article 13 Forum	27/2/2019	Opinion given by MSs, Industry, NGOs (only on BAT conclusions)
IED Article 75 Committee	17/6/2019	(Positive) vote at qualified majority on approval of the reviewed WI BAT conclusions
Publication in OJEU of reviewed WI BAT conclusions in 23 languages	Tentative 11 /2019?	Commission Implementing Decision. Start of 4-year implementation period
Whole WI BREF made available	Tentative 12/2019?	On EIPPCB website in English

***Table 2**: Key milestones of the WI BREF review process*

2.3 The data set

355 questionnaires (see final WI BREF draft p. 147) filled in with operating data from year 2014 were returned by the operators to Member States which validated them (as much as they could) before sending them to the EIPPCB and the TWG. The questionnaire template was designed to fulfil the decisions taken during the Kick off Meeting (KoM). Since BATAELs refer to normal operating conditions (see Section 1.2.3 above) whereas daily averages in WI plants are calculated in Relevant Effective Operating Time (R-EOT) (see Section 4.3.1 below), it was necessary to collect all half hourly average values and try afterwards to filter out the measurements obtained during Other Than Normal Operating Conditions (OTNOC).

NB: since there is no European-wide list of OTNOCs the decision on which conditions were to be considered as such was taken by the EIPPCB. (See Sections 2.4 and 2.5 below and Annex 2.a to this E&G-d)

Among other pieces of information, the operators reported the 17,520 half hourly average values of the year for the 7 substances (HCl, HF, SO_2, NOx, Dust, CO, TOC) that, according to IED Annex VI, must be continuously monitored, as well as the ones of additional monitored substances, if any, such as for Hg and NH_3. Values were reported before subtraction of the confidence interval. (See Section 4.8 below)

The operators also reported the periodic measurement values of year 2014, and sometimes of the previous year(s), in order to try to have a more representative set of data at disposal, since often only two measurements a year are made per line.

In total, more than 45 million individual data were collected.

The EIPPCB asked questions to the operators. Member States were also requested to validate their answers.

2.4 Data filtering and processing

As already mentioned, BATAELs were going to be set referring to NOC. Since WI operators do not have compliance requirements referring to NOC for continuously monitored substances, it was necessary to collect all the half hourly values of 2014 with the idea to filter out ex-post the ones in OTNOCs and recalculate different daily averages that would fit with the BREF framework (i.e. in NOC). The EIPPCB requested the operators to painstakingly indicate for each and every half-hour of year 2014 if the line was in Normal Operating Conditions (NOC), in Other Than Normal Operating Conditions (OTNOC) operation and, if in OTNOC, in which kind of OTNOC (e.g. maintenance, start-up, stoppage, etc. See below Sections 4.3 and 5.2 and Annex 2 to this E&G-d dedicated to this issue). This had to be done manually on a case by case approach on the 17,520 rows of the templates because no automatic signal was available in the records to identify OTNOC situations.

Then the EIPPCB defined 8 filters and 12 combinations of them to filter out some individual values (see pp. 29-30/33 of the 7th paper accompanying D1, *"Compilation and presentation of plant-specific WI data in D1 of the revised WI BREF"*). The EIPPCB selected 3 of these combinations to define for daily and half-hourly averages what they called "Base" and "Fine" filtering options. Daily "Base" option excludes some OTNOC situations and daily "Fine" option excludes all OTNOCs plus the ½-hr average values above the IED Annex VI ½-hr ELVs as well as the days including less than 43 ½-hr average values in NOC. See details on these filters in Annex 2.a dedicated to NOC/OTNOC/EOT.

"Base" and "Fine" filtered data are presented in comprehensive graphs (see Annexes 8.6 to 8.8 to the draft WI BREF), plotting all WI lines having filled in the questionnaire

2.5 BATAELs derivation

The method to derive BATAELs from the data set is unknown to the TWG. The Preface (see p. ii) of the WI BREF Final draft reads about the final step of the derivation method: *"selection of the best available techniques (BAT), their associated emission levels (and other environmental performance levels) and the associated monitoring for this sector (…)"*, which does not indicate how filtered data were used to set BATAEL ranges.

About the selection method, the EIPPCB told the TWG (see presentation *"Derivation of BAT-AE(P)Ls" made by the EIPPCB during the workshop in Seville of 4-5 December 2017*) that *"The derivation of sound BAT-AE(P)Ls cannot result from a mere statistical assessment of the emission values reported in the filled-in questionnaires using an algorithm"*.

Only tiny modifications of BATAEL values were accepted during the Final Meeting by the EIPPCB on the BATAEL ranges it had proposed.

A study specially made for the WI BREF by INERIS monitoring experts on request of the Industry concluded that for most continuously monitored substances it was not possible to meet the requirements of the monitoring Standards at the level of BATAEL values. However, the uncertainty

issue was not taken into account in the BATAEL derivation process, neither in processing the data collected, nor in respect of compliance for comparing emissions to BATAEL value

For more details on this question, please see Section 4.8 below and Annex 3 to this E&G-d dedicated to the monitoring/uncertainty issue.

3 WI BREF content

3.1 WI BAT conclusions

3.1.1 Scope

The scope of the WI BREF and of its BAT conclusions includes the incineration and co-incineration of non-hazardous waste (> 3 t/h) and hazardous waste (> 10 t/day), for both disposal and recovery operations. Some co-incineration plants addressed In the Cement and Lime BREF or in the Large Combustion BREF are excluded. Some co-incineration plants although included in the scope of the IED may be excluded from the 3 BREFs (CLM, LCP, WI). See in Annex 7 to this E&G-d the answer to question "*Is the incineration of all kinds of waste in WI BREF scope?*" The WI BREF also includes the treatment of bottom ash (> 50 t/day if for disposal, > 75 t/day if for recovery or a mix of recovery and disposal).

The treatment of Flue Gas Cleaning residues as well as waste pre-treatment prior to incineration, if any, are not in WI BREF scope but addressed in the WT BREF.

3.1.2 New/Existing plants

The BAT conclusions often express BATAELs and BATAEELs as twofold ranges, one for new plants and one for existing plants. A *"New plant"* is by definition *"a plant first permitted following the publication of these BAT conclusions or a complete replacement of a plant following the publication of these BAT conclusions."*

Existing plants, that are defined as plants that are *"not a new plant*", must, as said above, have their permits reconsidered and implement BATs and BATAELs within 4 years of BAT conclusions publication. For new plants, the permit should of course immediately be based on the new BATs and BATAELs.

NB: An old plant may in some cases be given a new permit, but that doesn't in itself change the plant status to New Plant. Indeed, according to the definition above a "*New plant*" is *"a plant **first** permitted following…"*

3.1.3 BATs and BATAELs overview

BAT Conclusions are included in Chapter 5 of the WI BREF. The chapter is structured as follows:

- Scope
- Definitions
- Acronyms
- General considerations
- Bat conclusions
    - Environmental management systems
    - Monitoring
    - General environmental and combustion performance
    - Energy efficiency
    - Emissions to air
        - Diffuse emissions

        - Channelled emissions
            - Emissions of dust, metals and metalloids
            - Emissions of HCl, HF and SO_2
            - Emissions of NOX, N_2O, CO and NH_3
            - Emissions of organic compounds
            - Emissions of mercury
    - Emissions to water
    - Material efficiency
    - Noise
- Descriptions of techniques
    - General techniques
    - Techniques to reduce emissions to air
    - Techniques to reduce emissions to water

    Management techniques

The 37 BAT conclusions that are included in the chapter can be either narrative BAT conclusions (e.g. stating that it is BAT to set up a risk-based OTNOC management plan) or contain BATAE(P)Ls (e.g. a range for energy efficiency).

BATAELs are provided for air emissions at the stack, air emissions from bottom ash treatment and water emissions.

BATAEPLs, other than BATAELs, are associated to a few BAT conclusions: unburnt in bottom ash (BAT conclusion 14), energy efficiency (BAT conclusion 20).

The BATAELs for air emissions at stack are provided in BAT conclusion 25 to 31. They are summarised in the table below.

Air emission at stack		IED Annex VI daily and periodic ELVs			BATAELs (WI BREF draft 12/2018)		
Substance	**Unit (11% O_2, dry)**	**IED ELV**	**Max Conf. interval [1]**	**Sampling period**	**NEW plants**	**EXISTING plants**	**Sampling period**
Dust	mg/Nm³	10	3	Daily	**<2-5**		Daily
T(V)OC	mg/Nm³	10	3	Daily	**<3-10**		Daily
CO	mg/Nm³	50	5	Daily	**10-50**		Daily
HCl	mg/Nm³	10	4	Daily	**<2-6**	**<2-8**	Daily
HF	mg/Nm³	1	0,4	Daily	**<1**		Daily [2]
SO_2	mg/Nm³	50	10	Daily	**5-30**	**5-40**	Daily
NO_x (SCR, SNCR…)	mg/Nm³	200	40	Daily	**50-120**	**50-150**	Daily
SNCR, if SCR not possible						**up to 180**	
NH_3 (SCR or SNCR) (Exist. SNCR not wet)	mg/Nm³				**2-10**	**2-10 (15)**	Daily
Hg	µg/Nm³	50		Periodic, short term	**<5-20**		Daily [3, 4]
					1-10		Long term sampling [3]
					<5-20		Periodic, short term [3]
PCCD/F [5]	ng $_{I\text{-}TEQ}$/Nm³				**<0.01-0.06**	**<0.01-0.08**	Long term sampling [6]
PCCD/F + DL-PCB [5]	ng $_{I \& WHO\text{-}TEQ}$/Nm³				**<0.01-0.08**	**<0.01-0.1**	
PCCD/F [5]	ng $_{I\text{-}TEQ}$/Nm³	0.1		Periodic, short term	**<0.01-0.04**	**<0.01-0.06**	Periodic, short term
PCCD/F + DL-PCB [5]	ng $_{I \& WHO\text{-}TEQ}$/Nm³			Periodic, short term	**<0.01-0.06**	**<0.01-0.08**	
Cd+Tl	mg/Nm³	0.05		Periodic, short term	**0.005 - 0.02**		Periodic, short term
Sb+As+Pb+Cr+Co +Cu+Mn+Ni+V	mg/Nm³	0.5		Periodic, short term	**0.01-0.3**		Periodic, short term

(1): According to IED Annex VI, Part 8, Section 1.2, the value of the confidence interval should be subtracted from the measured values to determine the half-hourly average values and then the daily average values.
(2): HF continuous measurement may be replaced by periodic measurements if HCl emission are proven to be sufficiently stable.
(3): Hg continuous measurement may be replaced by long-term sampling or periodic measurements if incinerated waste Hg content proven low and stable (e.g. mono-streams of waste of a controlled composition).
(4): Hg ½-hr average indicative value (not BATAELs) for new plants 15-35 µg/Nm³, for existing 15-40 µg/Nm³.
(5): Either the BATAELs for PCDD/F or the BATAELs for PCDD/F + DL-PCBs apply. DL-PCB monitoring does not apply if DL-PCBs are proven to be less than 0.01 ng $_{WHO\text{-}TEQ}$/Nm³.
(6): The long term sampling BATAELs do not apply if the emission levels are proven to be sufficiently stable.

Table 3: *Summary of IED daily continuous and periodic ELVs and of IED-based BATAELs*

BATAEL for emissions to air from the enclosed treatment of bottom ash is given in BAT conclusion 26: 2 to 5 mg/Nm^3.

The BATAELs for emissions to water from Flue Gas Cleaning and/or Bottom ash storage or treatment are given in BAT-c n° 34.

ELVs higher than the BATAELs given in BAT conclusion 34 may be set if the flue gas condensate is led to a waste water treatment plant designed and equipped appropriately to abate the pollutants concerned, provided this does not lead to a higher level of pollution in the environment. (See Note 1 to Table 5.8 in BAT-c 34.)

3.2 Useful information in the rest of the WI BREF

The other chapters of the WI BREF are useful if one wants to have a deeper understanding of the content of Chapter 5, i.e. the BAT Conclusions. It should be stressed that these chapters are only in English and that they have not be shaped with the purpose of being the basis for future permits, unlike Chapter 5.

Chapters 1 and 2 include description of the sector and of techniques used in the sector. Chapter 4 provides useful details on the techniques that are simply listed in chapter 5. However, the applicability section of techniques described in chapter 4, which was quite detailed in the 1st version (2006, IPPC-based) of the WI BREF, is now nearly systematically replaced by *"generally applicable"*. See about that Section 4.1.2.3 below.

WI BREF Chapter 3 provides information on WI plants current emissions and on the filters used by the EIPPCB to filter out the emissions data received in the questionnaires corresponding to assumed OTNOC situations (on this issue, see Annex 2.a to this E&G-d) as well as a paragraph about the potential high relative uncertainty on some reported emission values (see Section 4.8 below). It also provides bar charts showing the distribution of these values. More detailed graphs on air emissions can be found in WI BREF Annexes 8.6 to 8.9.

WI BREF Chapter 6 mentions some emerging techniques. Chapter 7 on Concluding remarks and Recommendations for future works is the only place where the uncertainty issue is mentioned in respect of using BATAEL to set ELVs, although the text refers specifically to the lower end of ranges, while the study undertaken by INERIS (see Section 5.2.3 and Annexes 3 to this E&G-d) did not link the issue to lower ends only.

WI BREF Annex 8.2 provides useful examples of Energy efficiency calculations. Annex 4 to this E&G-d gives complementary information.

4 What is missing in WI BAT conclusions – Necessary complementary information

This Chapter aims at summarising pieces of information that are useful to implement the WI BAT conclusions and that, either are said in other documents (such as directives) or chapters of the BREF other than BAT conclusions, or were discussed within the TWG during the BREF drawing-up.

4.1 BATs & BATAELs format

4.1.1 Standard format

According to Commission Implementing Decision 2012/119/EU, Section 3.2, each individual BAT conclusion is presented using a standard format, the structure of which depends on whether or not an environmental performance level is associated with BAT.

BAT conclusions are numbered so as to facilitate referencing. It should be noted that WI BAT conclusions are called "BAT 1" to "BAT 37", which may create an ambiguity between "BATs", Best Available Techniques, and "BAT conclusions" which themselves give a list of Best Available Techniques, usually numbered a), b), c) etc., allowing to reach the objective of the BAT conclusions. (About the different meanings of "BAT" and "BAT conclusions" please see Table 1.1 in Annex 1 to this E&G-d)

In order to avoid any ambiguity, in this E&G-d, BAT conclusions are called "BAT conclusion 1" to "BAT conclusion 37" or abbreviated into "BAT-c 1" to "BAT-c 37".

Each BAT conclusion begins with the indication of the environmental objective(s)/benefit(s) pursued followed by 'BAT is to use' and the technique or combination of techniques that can be used to achieve this (these) objective(s).

BAT conclusions also contain a short description of the technique(s) or combination of techniques identified to satisfy the environmental objective(s)/benefit(s) referred to and includes a statement on its applicability in the sector concerned.

For those BAT conclusions to which are associated emission levels or other performance levels, these BATAELs or other BATAEPLs are given at the end of the individual BAT conclusion, most often in the form of a table. They are usually expressed as ranges to reflect the differences within a given type of installation that result in variations in the environmental performances achieved when applying BAT. Expressions of the type '< X to Y' (i.e. '< X' for the lower end of the range, Y for the upper end) are sometimes used where the lower end of the range cannot be accurately defined, e.g. when the data reported in the information exchange is close to the detection limit.

4.1.2 Comments

4.1.2.1 Techniques described in BAT conclusions are neither prescriptive nor exhaustive

The words at the beginning of the standard text of individual BAT conclusions, i.e. 'BAT is to', should be understood with in mind the statement of the Commission Implementing Decision 2012/119/EU, Article 3.1, repeated in the WI BREF, General considerations, 1st paragraph, which reads: "*The list of techniques described in the BAT conclusions is neither prescriptive, nor exhaustive. Other techniques may be used that ensure at least an equivalent level of environmental protection.*"

4.1.2.2 Detailed description of techniques

The individual BAT conclusions themselves only include a short description of the techniques identified as BAT. More detailed information on these techniques can be found in the second part of BAT conclusions (WI-BREF Chapter 5, Section 5.2) and in Chapter 4 of the WI BREF.

4.1.2.3 Generally applicable BAT conclusions

According to the WI BREF General considerations, unless otherwise stated, the BAT conclusions are generally applicable. However, every time the question was raised by TWG members, the JRC-EIPPCB clarified that *"generally applicable"* does not mean *"always applicable"*. Indeed, many BAT conclusions

provide several *"generally applicable"* techniques and usually the performance can be achieved by implementing only one or two of them.

4.2 Key Environmental Issues (KEI)

One of the decisions of the Kick off Meeting (KoM) was to divide pollutants in different categories to identify the so-called Key Environmental Issues (KEI). Further to discussions within the TWG, the EIPPCB concluded the following in respect of air emissions about KEIs/Non-KEIs. (See the 6th document accompanying WI BREF Draft 1, dated 24/5/2017 *,"EIPPCB reflections on some Key issues raised within the WI TWG in the period preceding the release of the 1st Draft of the revised WI BREF (D1)"*, pp. 3-5).

- KEIs (Key Environmental Issues): NOx, NH_3, Hg, PCDD/F, Dust/metals, PCB-DL, HCl, SO_2
- Non-KEIs: HF, TVOC, CO[17], CO_2, CH_4, N_2O, PM_{10} and $PM_{2.5}$, PCBs & PAHs.

The prioritisation is reflected in the setting of BATAEL values explained by the EIPPCB as follows.

- "*for key pollutants, both the higher and the lower ends of the proposed BATAEL ranges were derived from the collected plant-specific data;"*
- "*for non-key pollutants for which an ELV is set in the IED"* [HF, TVOC, which replaces TOC, and CO, recognised by the TWG at KoM (Kick-off meeting) as only an operating parameter], "*only the lower end of the proposed BAT-AEL range is based on the analysis of the collected plant-specific data, the higher end proposed is the same as the IED Annex VI´s ELV;"*
- "*for non-key pollutants for which no ELV is set in the IED"* [CO_2, CH_4, N_2O, PM_{10} et $PM_{2.5}$, PCBs & PAHs], *"no BAT-AELs are proposed."*

NB: no mention of this approach is provided in WI BAT Conclusions.

4.3 Compliance in NOC and within the R-EOT

4.3.1 BATAEL-based ELVs in NOC, IED Annex VI continuous ELVs within the R-EOT

As said above (see Section 1.2.3), according to the general section of the IED (see Articles 3.(13) and 15.3) it is required to all sectors listed in Annex I that ELVs must be set in permits to ensure that emissions do not exceed BATAELs under NOC (Normal Operating Conditions). In the case of incineration and co-incineration plants in the scope of the reviewed WI BAT conclusions, this will apply to daily average values of continuously monitored substances (since there is no ½-hr BATAELs; see Section 4.4 below), to periodically monitored substances and to continuous sampling.

NB 1: In order to distinguish these ELVs from the ones given in IED Annex VI, they are called BATAEL-based ELVs in this E&G-d.

NB 2: The reference is to BATAELs that can be found in BAT Conclusions that have been reviewed under the IED regime. In the case of the WI BREF, this refers to the BATAELs included in the WI BAT Conclusions published in XXXX 2019 and not the ones that can be found in the 2006 WI BREF made under IPPC directive.

On the other hand, the IED also lays down specific rules for the incineration sector (see IED, Annex VI). Among other requirements, Annex VI provides a list of ELVs for emissions to air that includes half hourly and daily average values for continuously monitored substances[18] and average values for

[17] It was acknowledged at KoM that CO was an operating parameter and not an environmental parameter.. The point should be raised in the course of the next IED revision.

[18] Plus, in option, a 10-minute average ELV for CO in place of the half-hourly one.

periodically monitored substances. More specifically, it requires compliance with the (current) ELVs set in the same Annex (the now so-called “safety net”, see Section 4.4 below) for the continuously measured emissions within the Effective Operating Time as soon as and as long as waste is burning (see IED Annex VI, Part 8, §1.2), called R-EOT in this E&G-d (See Section 1.2.3 above).

However, the ELVs for periodically monitored substances, which are under the general regime in IED Annex VI (since its Part 8 does not apply to periodic monitoring), will remain applicable only in NOC. And, since they are higher than the BATAEL values, it will only be necessary in future to check compliance of periodically monitored substances with the BATAEL-based ELVs.

Therefore, after the publication of the reviewed WI BAT Conclusions, the overall framework for setting emission limit values for incineration plant will include BATAEL-based ELVs referring to NOC for all substances and, in addition, the IED Annex VI ELVs referring to the R-EOT for daily averages as well as for ½-hr averages.

In summary, for future requirements regarding ELVs, the legal picture will become twofold. Table 5 below summarises when ELVs should comply in NOC and/or within the R-EOT.

Monitoring regime	Period	Substances	BATAEL-based ELVs	IED Annex VI ELVs
Continuous	Daily average	Dust, HCl, HF, SO_2, NOx, TOC, CO	**In NOC**	**In R-EOT (NOC & OTNOC when waste burning)**
		Hg*, NH_3	**In NOC**	-
	½-hr average	Dust, HCl, HF*, SO_2, NOx, TOC, CO**	-	**In R-EOT (NOC & OTNOC when waste burning)**
	10-min average	CO**	-	**In R-EOT (NOC & OTNOC when waste burning)**
Long term sampling	2 to 4 weeks, every month	PCDD/F + DL-PCB*	**In NOC**	-
		*PCDD/F**	**In NOC**	-
		*Hg**	**In NOC**	-
Periodic	Every 6 months	*Hg**	**In NOC**	**In NOC**
		Heavy metals, PCDD/F	**In NOC**	**In NOC**
		*PCDD/F + DL-PCB**	**In NOC**	
: Conditional/Optional (See BATAELs in Table 3 above)* * CO: IED Annex IV either ½-hr or 10-min*				

Table 5: *Regulatory requirements on compliance either in NOC or within the R-EOT for the different air ELVs required by the IED for air emissions at stack. The NOC and R-EOT situations in this table refers to the status of the incineration line*

NB: This Table 2 is also shown as Table 2.a-2 in Annex 2.a to this E&G document (and completed by Table 2.a-3 for water emissions).

4.3.2 Definition of NOC/OTNOC – Calculation of averages in NOC

Normal Operating Conditions and Other Than Normal Operating Conditions (OTNOC) are not defined at European level, neither in the IED nor in the WI BREF. However some examples of OTNOC are provided in the IED and in Decision 2012/119/EU.

Annexes 2 to this E&G-d address these issues in detail.

Moreover, the WI BREF does not explain how were calculated nor how to calculate in future the daily averages in NOC. It was considered an implementation issue, and thus outside the scope of the BAT conclusions. (See more information about that in Annex 3.a to this E&G-d). This is problematic because BATAELs are expressed as daily averages in NOC and it is important to know how to calculate averages that are consistent with the levels reported in the BAT Conclusions.

An upcoming CEN standard proposes solutions for that. See Annex 3.d to this E&G-d and Section 5 of Annex 2.a.

4.3.3 Water emissions

See Section 5.3 of Annex 2.a to this E&G-d.

4.4 Daily BATAELs only (No ½-hr BATAELs)

The revised WI BAT conclusions only include daily BATAELs for continuously measured emissions to air. The continuously monitored substances are controlled via half hourly and daily averages (see Section 4.3.1 above and IED, Annex VI), but at the Kick off Meeting, the EIPPCB pointed out that *"when the waste characteristics change drastically the waste gas cleaning devices may not be able to react as quickly, therefore a half-hourly average is not appropriate in order to represent the performance of the BAT under normal operating conditions."* (See KoM report §2.5.1). Therefore it was decided: "Subject to the data collection, where practicable and justified, to also express BATAELs in concentrations as half-hourly averages for those pollutants monitored continuously." (See KoM report §2.5.1).

After checking the data collection, the EIPPCB stated *("EIPPCB reflections on some Key issues (…)"* p. 5) that:

- on one hand, the representability of the observed maxima becomes more challenging when the averaging period becomes shorter;
- on the other hand, the IED Annex VI ½-hr ELVs already provide a sufficient safety net level for short-term emissions;
- and therefore that WI BAT conclusions would not include half hourly BATAELs

Indeed:

- some flexibility is needed because of pollution peaks in the waste input;
- the obligation to meet stringent daily average values derived from the daily BATAELs prevent the operator to let emission concentrations increase on short term;
- the ½-hr average values are anyway limited by the IED Annex VI ELVs in R-EOT. (No other industrial sector has to comply with ELVs also in OTNOC):
- and therefore half hourly BATAEL-based ELVs are not necessary.

However, operators and regulators of incineration plants are accustomed to comply with ELVs for both ½-hr and daily average values for continuously monitored air emissions, as requested by IED Chapter 4 and Annex VI. Since BAT Conclusions have to be used as a basis for future permits (see IED art. 14.3), the absence of half hourly BATAELs in the WI BAT conclusions could create some confusion Therefore, some TWG members requested that the WI BAT conclusions provide ½-hr BATAELs or that ½-hr BATAELs of the 1st WI BREF (2006) should apply.

However the EIPPCB answer was clear: *"The environmental performance of the techniques can be most clearly associated with emission levels expressed as daily, or longer-term, averages. Half-hourly emission levels, where substantially different from the daily average emission levels, are usually driven by specific operating conditions. For half-hourly averages, the IED already includes half-hourly ELVs to provide a safety net against emission peaks."*[19].

In other words, in order to apply consistently the legal framework, when setting ELVs in environmental permits, the half-hourly limits should only be taken from IED, Annex VI and BATAELs should only be used for daily limits.

[19] See EIPPCB Background paper of February 2018 for the Final meeting of April 2018.

4.5 The difference of nature between IPPC-based and IED-based BATAELs

Indeed, the nature of BATAELs changed from BREFs under IPPC to BAT Conclusions under IED and they should not be compared: the IPPC-BATAEL values given in the 2006 WI BREF were typical values resulting from expert's estimates (i.e. values commonly obtained on an installation in operation), whilst the IED-based BATAELs are capping values for future BATAEL-based ELVs. Therefore, the latter should be based on the maximum relevant values of the year.

This is illustrated in Figure 1. This figure shows an example of daily averages collected in one year for HCl emissions to air. The yellow oval shows typical values corresponding to the IPPC BATAEL approach. IED BATAELs on the other hand would be set on the basis of the few highest values (points in the orange circles) if these points are obtained in Normal Operating Conditions.

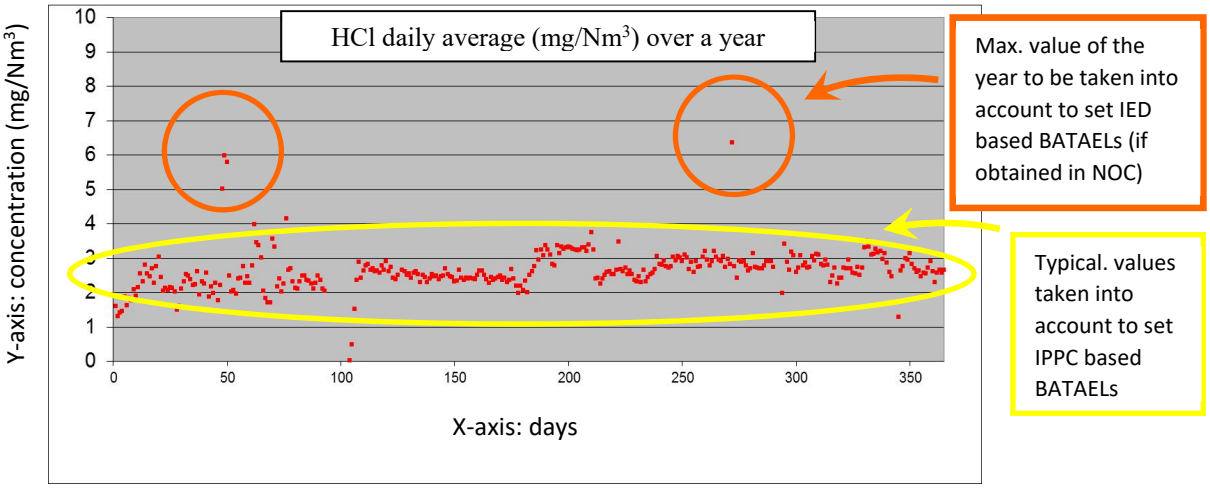

Figure 1: *Daily average emission values of HCl over a year from a Waste-to-Energy plant. The typical values circled in yellow corresponds to IPPC-based BATAELs. The few points circled in orange were obtained in Normal Operating Conditions and (see above the NOC/EOT issue in Section 4.3) have to be taken into account when setting IED-based BATAELs, since these BATAELs will be capping values for future ELVs*

4.6 Limited integrated approach

IED Art. 3(10) states that *"'best available techniques' means […] techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole".* In addition to the specific mention of the environment as a whole in the IED, the so-called BREF guidance (Decision 2012/119/EU) also refers to cross-media effects in §2.3.8: *"In the process of establishing these BAT conclusions, the overarching criteria of the environmental performance of the techniques, including cross-media implications, as well as their costs, are considered in relation to the industry sector."*.

However, most of the BATAEL ranges were defined substance by substance, without assessing a correlation between different emissions.

BAT conclusions provides very little information on cross-effects. For instance, comment would have been welcome on the relationship between HCl and SO_2 emission levels in case of sodium bicarbonate additive, between NH_3 and NOx in case of SNCR, or between HCl and NH_3 in respect of measurement systems.

None of the plants used to set the BATs/BATAEPLs were fulfilling at the same time the maximum performances of the BAT conclusions, i.e. lower end of all BATAELs as well the upper end of BAT Associated Energy Efficiency Levels (BATAEELs).

4.7 Costs

No real enquiry was done on costs for the WI BREF. The TWG members were asked to update the costs of the 2006 BREF but since it is very difficult to take costs into consideration in a general approach, the BATs and BATAELs drawing up was made with very little cost assessment.

This is attested in the Preface of the WI BREF, which reads: *"Where available, economic data have been given together with the descriptions of the techniques presented in Chapter 4. These data give a rough indication of the magnitude of the costs and benefits. However, the actual costs and benefits of applying a technique may depend strongly on the specific situation of the installation concerned, which cannot be evaluated fully in this document. In the absence of data concerning costs, conclusions on the economic viability of techniques are drawn from observations on existing installation.*

Therefore, no cost/benefit analysis of the implementation of BATAELs was made.

However, some TWG members provided examples where a reduction of ELVs, leading to a tiny reduction of emissions, could significantly increase the economic (CAPEX and/or OPEX) and environmental cost, due to higher resources consumption (reagents, electricity, water, fuel …) or other emissions and residue production increase (cross effects). In such cases, the global result could be negative for the environment.

It should be noted that lowering the ELVs does not necessarily lower the emissions significantly. Indeed the incineration sector has for years reported emissions much lower than the yet very low ELVs it has to meet. This is also the reason why there was room, according to the EIPPCB, to further decrease the emission limits (data observed from Questionnaires showed low emissions). However, setting the capping limits (i.e. upper end of the BATAELs) at the level of observed emissions and decreasing therefore the margin between operating values and emission limits will often only increase the risk of breach and the attached consequences without necessarily reducing the emissions and the already minimal impact of incineration plants in the EU. (See Figure 2 below)

On the contrary, too low ELVs may trigger the start-up of often much dirtier and/or fossil based peak-load or emergency plants in systems where the WtE-plants that serve as base load have to lower or temporarily stop its production in order to avoid even a small breach of a daily ELV.

4.8 Considerations on uncertainties

In accordance with what was agreed on during the Kick-off Meeting, the operators reported data without the subtraction of measurements uncertainty. They were requested to indicate the uncertainty of their instruments but since the overall uncertainty is usually not known, most of them reported either the maximum relative uncertainty stipulated in IED Annex VI as 95% confidence interval or the uncertainty of the online instrument as mentioned in its QAL 1 certificate, which does not include all the uncertainties of the system.

As mentioned in the 6th document accompanying WI BREF Draft 1, dated 24/5/2017, *"EIPPCB reflections on some Key issues (…)"*, the EIPPCB considered that the validation of the data was the task of Member States and that it could not re-analyse the conditions under which emission levels were

measured at each plant. We can therefore conclude that the uncertainty of the measurements collected and used to derive BATAELs is not known.

When setting BATAELs, in respect of uncertainty, the EIPPCB checked that the proposed values were above a threshold based on the limit of quantification of the online instrument. However, the limit of quantification is a parameter linked to the online instrument alone and does not show the overall uncertainty of measurements (such as uncertainties of the Data Acquisition and Handling System, the ones due to sampling, the one introduced by calibration of the online instrument, or uncertainties due to cross-sensitivity of other components in the flue gas matrix). The INERIS study commissioned by CEWEP; ESWET and FEAD for this purpose shows that for many substances, BATAELs are set at concentrations that do not allow compliance with the requirements of the relevant standards on monitoring. (See more in Annex 3 to this E&G-d on uncertainties).

In that respect, the EIPPCB said in the above-mentioned document (*"EIPPCB reflections on some Key issues (…)"*) that *"the updating of environmental standards provides opportunities to improve the performance of monitoring equipment, thereby stimulating innovation, and to adjust or develop EN standards, if necessary."*

However, the uncertainty issue is not mentioned in the WI BAT conclusions. During the Final meeting, under pressure of the TWG, the EIPPCB eventually accepted to add a paragraph in Chapter 7 of the BREF, named *"Concluding remarks and recommendation for future work"*, to warn the reader that there could be a potential difficulty with uncertainties:

"For emissions to air of dust, HCl, HF, CO, TVOC, SO_2, metals and metalloids including mercury, NH_3, as well as PCDD/F and dioxin-like PCBs, the TWG highlighted the potential difficulty, at the time when the Waste Incineration BREF was under review, of assessing compliance with emission limit values when these are set around the lower end of the BAT-AEL ranges, due to the likely increase of the relative measurement uncertainty (i.e. the uncertainty expressed as a percentage of the measured value) with decreasing emission levels."

Further to the request of a MS, an additional sentence will be added, as reported in document "*13 Forum opinion"*, p. 5, comment 20: *"Add a concluding remark in chapter 7, recognising the ongoing CEN work to review and update measurement standards that are relevant for the implementation of the WI BAT conclusions."*

Another paragraph was later added by EIPPCB in Chapter 3 of the WI BREF final draft (see p. 148) warning about the very low values reported by some plants and making a reference to the INERIS study.

This means that the implementation of BATAELs to set ELVs and the ensuing compliance assessment would need to be done with rules different from the ones of the current standards because of the lower ELVs to be derived from NOC. EIPPCB made its position clear in the assessment of split views rationale for the review of the LCP BREF dated 22/2/2016 (see p. 122): *"Quality assurance requirements as defined in EN standards cannot prescribe the setting of certain BAT-AEL ranges in BAT conclusions. BAT conclusions are secondary legislation taking precedence over EN standards."* This answer was given to 6 members of the LCP BREF TWG who were requesting to ask the relevant CEN Technical Committee to provide an opinion on the availability and suitability of equipment, systems and methods to measure, in compliance with the CEN standards, emissions within the range of the proposed BATAELs[20].

[20] These BATAELs proposed for LCP were at levels similar to the ones of WI BAT conclusions.

The severe difficulty to meet the requirements on uncertainty at BATAEL levels was later confirmed by the Commission. In a letter to CEWEP dated 20/9/2019, the Head of the unit in charge of BREFs, the Commission recognises that: *"Both BAT conclusions and some parts of the IED refer to EN and/or other available standards to measure emissions. DG Environment continues to cooperate with DG GROW and CEN on work to improve standard measuring methods. It is also recognised that standard reference methods need to be validated at lower concentrations. In view of these needs, DG Environment is exploring the technical issues and to explore financing that work. The results of such work also depends on technical progress in instruments and methods. It is also to be noted that the established procedures are complex and time consuming."*

In other words, the Best Available Techniques in monitoring do not allow for the time being and foreseeable future to meet the requirements of the monitoring standards made mandatory by the IED and the WI BAT conclusions at the low concentrations encountered in Waste incineration BATAELs. A clear solution to this issue has not been found yet, as shown by the scattered pattern of approaches considered in different regions/Member States.

See more on this issue in Section 3.3.2 of Annex 3.a to this E&G-d.

4.9 BATAELs and other BATAEPLs are operating values – No compliance rules

BATAELs are directly derived from operating values. No information is provided in the BAT conclusions on the conditions to check compliance between emissions and BATAEL-based ELVs. Indeed the EIPPCB considers that, according to IED Article 14(1), *"assessment of compliance with the ELVs set in a permit it is an implementation issue"* and therefore *"it is for the Member States to establish compliance assessment conditions."* (See the 6th accompanying document sent to TWG with D1 dated 24/5/2017, *"EIPPCB reflections on some key issues …"*.

For instance, the EIPPCB assessment in Background paper, p. 16/150 states: *"Rules for compliance are implementation issues that are beyond the technical scope of the BAT conclusions."* This had already been said in the above-mentioned LCP split view assessment of 22/2/2016 (see p. 112 and p. 160): "*The split view refers to the use of BAT-AELs for setting ELVs and to the consideration of measurement uncertainties, which are implementation and compliance issues going beyond the remit of the LCP TWG."*

BATAEL based ELVs have to be set considering the need of a margin for operating contingencies and uncertainty. See Annex 3to this E&G-d on Uncertainty issues.

4.10 BATAELs and other BATAEPLs expressed as ranges

In the BAT conclusions, BATAELs and other BATAEPLs are expressed as ranges, which often are wide.

Even if, according to the Commission Implementing Decision (2012/119/EU), both the upper and the lower ends of the ranges have to be derived in Normal Operating Conditions, very little information is provided in BAT conclusions on how to understand and use these ranges. Only three footnotes state that the lower end of a particular BATAEL range can be achieved when using a particular technique.

On the other hand, as said above (see Section 4.1.2.3), many techniques given as BAT are listed as *"generally applicable"*. As repeated many times by the EIPPCB, this does not mean that they are "always applicable". The wording is used when there is no general reason to prevent the use of the technique.

Therefore, in principle, the upper ends of all BATAELs are achievable with all proposed techniques but, for lower values, achievability depends upon the techniques that are chosen, upon the values retained from other BATAELs and BATAEPLs (because of cross-effects) and upon the waste composition (in particular in case of mono-streams). However, even in the cases where low levels would be achievable in respect of abatement techniques, the problem would be to comply with the requirements of the monitoring standards on uncertainties because of the limited performances of the Standard Reference Methods of measurement.

However, in order to be sure to always comply with ELVs, operators must maintain the emissions well below them. This means that a large part of the operating values may well be in the area of lower BATAEL values even when ELVs are set in the upper parts of the ranges. See Figure 2 below.

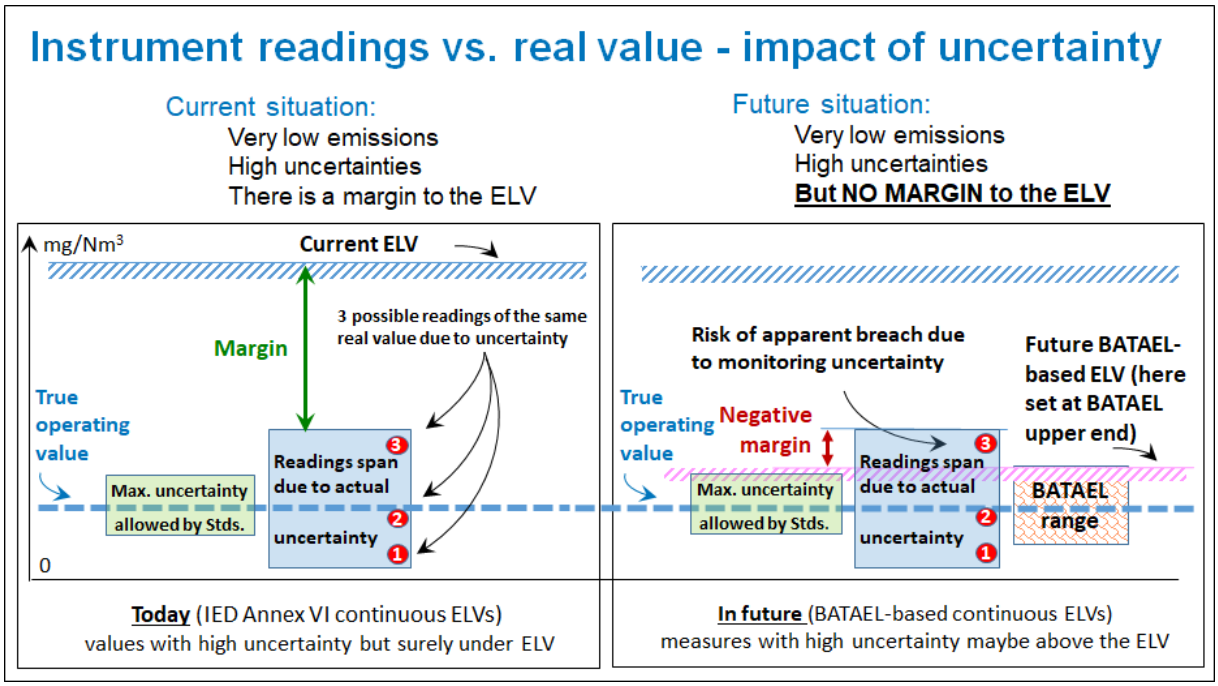

Figure 2: *Schematic diagram. The Y-axis shows emission concentration. The height of the green boxes shows the uncertainty requested by the monitoring standards that should be complied with according to both IED Annex VI and the WI BAT conclusions. The real uncertainties as reported by INERIS correspond to the height of the blue boxes. The blue dashed line represent the true value (which in real life is neither known nor a constant). The red dots show 3 readings in the real uncertainty range. With the current IED Annex VI ELV, thanks to the margin between the ELV and the operating value, the operator and the regulator are certain that the values – even though not exact – are below the ELV (as shown on the left hand drawing). On the right hand side, it can be seen (e.g. with dot n° 3) that it might not be possible to ensure that the real value (although well below the ELV in the example) as read by the monitoring system is actually below the BATAEL-based ELV.*

NB: This Figure 2 is also shown as Figure 3.a-1 in Annex 3.a to this E&G document.

4.11 Undefined conditions

The WI BAT conclusions indicate (see General considerations) that the BATAEL values refer to dry gas, at 273.15 K, 101.3 kPa and, for incineration flue gas (but not for IBA facility extracted air) 11% O_2.

Other conditions are not defined, such as:

- What is NOC and the precise boundaries between NOC and OTNOC situations

- The way to calculate daily average values and ½-hr average values, which are the basis for calculating daily averages
- How to take into account the uncertainties now that some ELVs will be different from the ones of IED Annex VI.

Indeed, as said above (see Sections 4.8 & 4.9), according to the EIPPCB, in respect of uncertainties, the rules to implement the BATAELs to set ELVs and to check compliance with BATAEL-based ELVs that are lower than IED Annex VI ELVs are not necessarily the same as the ones given in IED Annex VI for continuous ELVs within the R-EOT[21]

5 Implementation of BAT conclusions – Proposals

As it has been seen above:

- a number of questions have been left pending in the WI BAT conclusions (OTNOC, uncertainties…),
- the EIPPCB said that the rules given in IED Annex VI do not necessarily apply to BATAEL-based ELVs,
- the way the data provided by the operators were processed (filtered, selected…) to derive BATAEL and therefore the manner the BATAEL ranges should be understood cannot be found in the WI BAT conclusions…

In order to help the stakeholders and to stir and encourage a level playing field at EU level in the implementation of the WI BAT conclusions, we propose here below practical solutions to solve the pending issues.

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The implementation of BAT conclusions should be done taking into account the specific situation of the plant, such as if it is New or Existing[22], its expected lifetime, the techniques already implemented in it, its capacity, its location, the presence in the surroundings of other industries or activities, etc.

It should be noted that *"Article 14(3) provides that BAT conclusions shall be the reference for setting permit conditions. […] BAT (other than BAT AELs), where the notion of 'reference' implies that the same result must be achieved, without necessarily prescribing how."* (See Ref. Ares(2018)5705900 - 08/11/2018). In other words, BAT which do not have BAT-AELs have the legal status of mandatory references for setting permit conditions. This implies that these are not absolute requirements, but there is a margin of discretion for competent authorities to implement these in the permits if it can be established by the competent authority that an alternative technique can guarantee equally reliable results.

[21] It should be noted that the methods to calculate the daily averages and to take uncertainties into account are not exactly the same between MSs.

[22] According to the WI BAT conclusions definitions:
- a New plant is "A plant first permitted following the publication of these BAT conclusions or a complete replacement of a plant following the publication of these BAT conclusions."
- an Existing plant is "A plant that is not a new plant.".

5.1 Assessment of the implementation of BAT conclusions without and with BATAELs or other BATAEPLs

5.1.1 Assessment of the implementation of the techniques described in BAT conclusions

All 37 BAT conclusions should be checked one by one when the assessment of the BAT implementation is made.

Some of them need to be checked independently for each incineration line, some others can be checked at plant level or by group of lines. The form proposed in Annex 6.a to this E1G-d can be filled in either line by line or for a group of lines or even at plant level. This depends on the structure of the plant: lines using or not the same processes, presence of condensing or back pressure turbines, etc. (see Section 5.1.3 below)

Some BAT conclusions (BAT-c) require the use of a technique, e.g. BAT-c 1, which requests to elaborate an environmental management system. In such case, the operator (permit holder) or the permit applicant should indicate that the technique is or will be implemented and, if necessary, provide evidence of it.

Some BAT conclusions require that a technique or several techniques or an appropriate combination of the techniques listed in the BAT conclusion are implemented. In such case, the operator or the applicant should indicate which technique(s) is (are) or will be implemented in order to meet the goal of the BAT conclusion.

For BAT conclusions including BATAELS or other BATAEPLs, the operator or the applicant should indicate that the performances are or will be in the BATAEL or other BATAEPL range (see § below).

Since BATs are neither prescriptive nor exhaustive (as said at the beginning of the WI BAT conclusions in compliance with Guidance Decision 2012/119/EU, section 3.1), the operator or the permit applicant may propose a technique or a combination of techniques in substitution of the technique(s) listed in a BAT conclusion. In such case, he should explain how the proposed technique(s) will reach the goal of the BAT conclusion.

Indeed, BAT conclusions are the reference for setting the permit conditions (see IED Article 14.3) However the competent authority can set permit conditions on the basis of a best available technique not described in any of the relevant BAT conclusions, if it satisfies the following conditions (see IED Article 14.5):

- That the technique is determined by giving special consideration to the criteria listed in IED Annex III in the spirit of an integrated approach aiming at a high level of protection of the environment taken as a whole as requested in IED Article 1 and evoked in a number of IED recitals.
- For BAT conclusions including BATAELs, the requirements of IED Article 15 are complied with.

The criteria given in IED Annex III, that are to be optimised in an integrated approach taking into account the whole environmental performance of the plant, cover e.g. emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and restoration of the site upon closure.

In addition, as said in the EU website[23] presentation of the IED in accordance with IED Article 15.4, *"the IED allows competent authorities some flexibility to set less strict emission limit values. This is possible only in specific cases where an assessment shows that achieving the emission levels associated with BAT described in the BAT conclusions would lead to disproportionately higher costs compared to the environmental benefits due to the geographical location or the local environmental conditions or the technical characteristics of the installation. The competent authority shall always document its justification for granting such derogations."*

The proposed general procedure to assess compliance with BAT conclusions is summarised in Figure 3 below in the form of a decision tree. Annexes 6.a and 6.b to this E&G-d propose forms to fill in for that purpose.

[23] See http://ec.europa.eu/environment/industry/stationary/ied/legislation.htm-

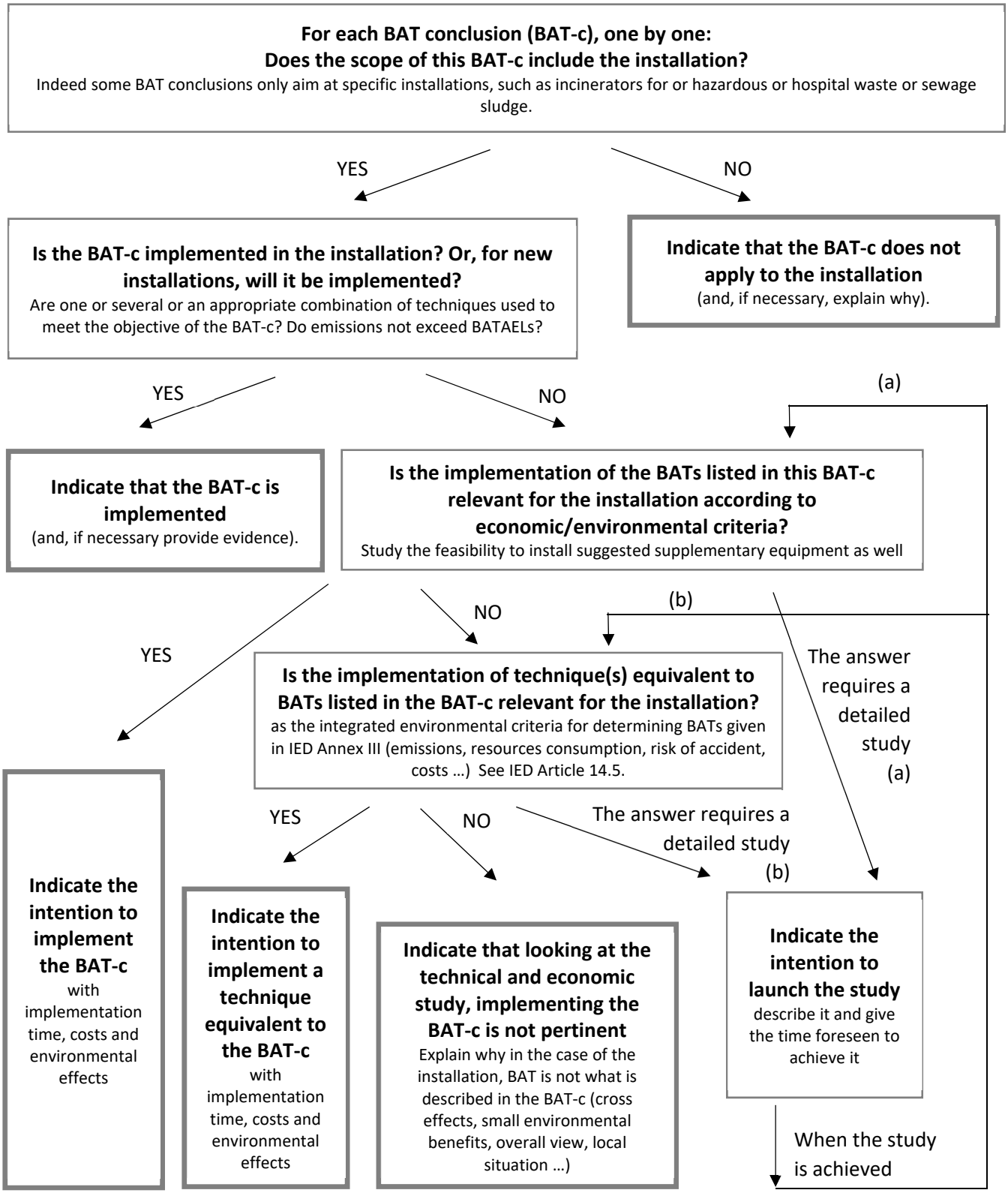

***Figure 3**; Schematic procedure to assess BAT conclusions implementation*

5.1.2 Assessment that emissions do not exceed BATAELs in NOC – Proven low and stable emissions

Special attention should be paid to BATs including BATAELs. Indeed, as said above (see Section 1.2.3 and 4.3), IED Article 15.3 requires that emissions do not exceed BATAEL values in NOC. However, as already said, up to now the operators have no indication provided by the control system telling if the line is in NOC or in OTNOC.

In the period before the WI BATC enters into force, operators have to assess if the continuous air emissions of an existing line do not exceed the BATAELs, In order to as far as possible reflect plant performance in NOC, it is proposed to check the emissions over the 3 last years (or over the available years for recent plants) and:

- either to check all averages exceeding the BATAELs upper end and to check whether they occurred in OTNOC situations
- or to check for each continuously monitored substance if the 98th centile of the valid daily averages over the period of time do not exceed the BATAEL upper end. The assumption made here is that OTNOC situations do not occur in more than 2% of the days; but this is only for assessment of the past. For the future, switches between NOC and OTNOC need to be identified when they occur (see Annex 2.c to this E&G-d).

For new lines or plants, the assessment can be made on the basis of the emissions expected in NOC.

For periodically monitored air emissions, the proposal is to check that all values over 3 years are in the BATAEL range.

For long term monitored substances, the proposal is to check that all values over 3 years are in the BATAEL range. However, as these measurements have usually been made up to now in R-EOT, an adjustment may be needed.

For water emissions, the proposal is to check that over 3 years all daily averages for TSS and for other substances all monthly daily average values but one[24] are in the BATAELs ranges. If not, it should be checked if some OTNOC situations relevant for water emissions occurred in the corresponding period. (See Section 6.3 of Annex 2.a to this E&G-d).

NB: BATAEL values being very low, it may be useful to check the concentration in input water.

More information on NOC/OTNOC can be found in Annexes 2a to 2.c to this E&G-d.

More information on methods to assess that emissions do not exceed BATAELs in NOC can be found in Annex 5 to this E&G-d, in particular in Section *"GENERAL COMMENTS applicable to air emissions addressed in BAT-c 25 to BAT-c 31"*.

In the comments on BAT-c 4 in Annex 5 to this E&G-d, criteria are proposed to determine *"Proven sufficiently stable emission of HCl ", "Proven low and stable mercury content", "Waste containing brominated flame retardants", "Proven sufficiently stable emission of PCDD/F and PCB-DL".*

5.1.3 Assessment of the Energy Efficiency (See BAT conclusion 20)

Contrary to BATAEL-based ELVs that are to be checked continuously or periodically in the long term and to the R1 criterion (which according to the Waste Framework Directive is used to determine if a

[24] Compliance rule similar to the one in IED Annex VI Part 8, Point 2. See Annex 5 to this E&G-d, comments on BAT-c 34.

MSW incinerator is a Recovery operation), BATAEELs have to be checked once in Performance test conditions at nominal design conditions. They should only be recalculated in case of modifications of an existing incineration plant that could significantly affect the energy efficiency.

For existing plants, the calculations to check the energy efficiency against BATAEELs are based on performance test reports if available and on design operating data at nominal load if not.

For new plants, they are based on design calculation at nominal load (e.g. the contractual performance data) that should be checked once the Performance test is achieved.

Since a plant can be a producer of electricity and/or heat, it was necessary to provide suitable formulas for different energy setups. In the case of a combined heat and power (CHP) plant, one should in principle use the exergy parameter to provide an overall evaluation of the efficiency, but exergy is not commonly used in European legislation and a different approach was needed. The energy efficiency of a CHP plant was in the end assessed by defining whether the main purpose is the production of heat or electricity.

More information on the calculation of the energy efficiency can be found in Annex 4.

It should be noted that the IED requires that BATAEL-based ELVs be set in the revised permits to ensure that the emissions in NOC do not exceed BATAEL values (see above Section 1.3 and beginning of Section 5) but does not mention explicitly BATAEELs. Although these BATAEELs can be used to assess the performances of the plant, they have a different legal status than BATAELs, as the IED does not explicitly require compliance with them (see article 15.3).

5.1.4 Assessment of the unburnt substances in bottom ash (BAT conclusion 14)

For existing plants, the assessment of the contents of unburnt substances (TOC or LOI) can be made by using the values reported during the 3 last years, or the available ones for recent plants. Indeed, the BATAEPL upper ends are equal to the limit values set in IED Article 50.

For new plants, the assessment can be made from the design values (e.g. the contractual performance data) and checked afterwards in operation at the same time when IED Article 50 limit values are checked.

5.2 Implementation of IED Article 15.3

IED Article 15.3 requires that the competent authority set ELVs that ensure that, under NOC, emissions do not exceed the BATAELs as laid down in the decisions on BAT conclusions as reviewed under the framework of the IED.

Before setting these BATAEL-based ELVs, compliance conditions that are not tackled in BAT Conclusions should be clarified, in particular those listed above (see Section 4.11). The following sections of this guidance aim at showing proposals for these compliance aspects.

5.2.1 NOC/OTNOC boundaries

We recall that IED Annex VI requires that continuously monitored substances are controlled during the Relevant Effective Operating Time (R-EOT), which includes Normal Operating Conditions (NOC) and some Other Than Normal Operating Conditions (OTNOC).

Since BATAEL-based ELVs are applicable during NOC, the first step is to classify time as operation in NOC. This can be done by identifying OTNOC and excluding the corresponding measurements from those in R-EOT.

As said above (see Section 4.3), OTNOCs are not defined as well. However, the IED and the Guidance provide examples of OTNOC situations. Moreover, when preparing the data set to draw up the BATAEL values, the EIPPCB listed some OTNOC operating conditions considering that, if none of them were reported, *"normal operation is assumed"*. The EIPPCB then discarded the values reported by the operators in the questionnaire when corresponding to this list of examples. See details in Annex 2a.

In accordance with the EIPPCB approach to filter out data to set BATAELs, the values reported during start-up and shutdown with and without waste combustion, malfunctioning or maintenance of the automated monitoring system, maintenance, breakdown, failure, malfunction or leak in the abatement system or in the process, by-pass of the abatement system, other exceptional conditions should be filtered out to select the emission in NOC.

Annex 2b to this E&G-d proposes criteria to determine the boundaries between some OTNOCs and NOC.

Annex 2.c to this E&G-d provides a non-exhaustive inventory of OTNOCs with potential effect on emissions that can easily be reported by the control system alarms.

Section 5.3 of Annex 2.a to this E&G-d proposes a non-exhaustive list of OTNOCs potentially influencing water emissions.

5.2.2 Calculation of daily averages in NOC – Valid half-hourly averages

EIPPCB indicates (see WI BREF Final draft p. 149 and Filter "43" pp. 29-30/33 of the note accompanying WI BREF Draft 1, *"Compilation and presentation of plant-specific WI data in D1 of the revised WI BREF"*, dated 24/5/2017) that, with the 'fine' data filter a daily average is discarded when more than 5 half-hourly averages are filtered out due to one of the conditions listed in the IED or the Guidance document (2012/119/EU) as examples of OTNOC situations. See Annex 2.a to this E1G-d on NOC/OTNOC and filtering.

It is therefore proposed to follow the EIPPCB approach in order to be consistent with the data comparison: when calculating the daily averages, one should use the ½-hr average values determined from the measured values after having subtracted the uncertainty in NOC and discard daily average values when there are less than 43 half-hourly averages in NOC. See Section 5.1.2 of Annex 2.a to this E&G-d.

To determine the validity of half-hourly averages in NOC, the proposal is to follow the two-third rule provided in the new standards on DAHS, EN 17255-1. At least 20 minutes out of 30 should be in NOC and valid (no malfunction or maintenance of the continuous measurement system). See Section 5.1.2 of Annex 2.a and Annex 3.d to this E&G-d.

5.2.3 Maximum uncertainties

As mentioned in the previous section, daily averages are calculated from the measured half hourly values after having subtracted the value of the confidence interval (see IED, Annex VI Part 8 point 1.2). In IED Annex VI Part 6 point 1.3, confidence intervals at 95% (95% CI) are given as a percentage of the daily ELV for the 7 continuously monitored substances (10% for CO, 20% for SO_2 and NOx, 30% for dust and TOC, 40% for HCl and HF). This means that the maximum uncertainty allowed for instance for HCl, is 4 mg/Nm^3 (the daily ELV for HCl is 10 mg/Nm^3, therefore 40% of 10 mg/Nm^3).

The INERIS report (see Annex 3) concludes that, although these maximum uncertainties can be met by the online instruments themselves (AMS, Automated Measuring Systems), they most often cannot be met by the complete measuring chain in particular taking into account the calibration[25] with SRMs (Standard Reference Methods) when the emissions are very low and stable. The only exception to this is the case of NOx emissions.

The INERIS study shows that the relative uncertainty, which is more or less a constant at high concentrations, increases exponentially when concentration decreases to very low levels. On the other hand, the absolute uncertainty is quite constant at the low concentrations that are typical emission values of the waste incineration sector. Given the complexity of this topic, the solution in the long-term probably can only be found with significant changes in the standards that cover the monitoring aspects of waste incineration and in improvement of the SRMs.

In the meantime, the INERIS report can be used as the basis to set new requirements on uncertainty. If this is for any reason not viable during permitting procedures, then it is proposed that the maximum allowed uncertainties given in IED Annex VI (*de facto* in absolute values) should be applied in absolute value.

For the two substances for which continuous BATAELs are set that were not subject to an ELV in Annex VI of the IED, namely Hg and NH_3, it is proposed to set the maximum uncertainties as it is done:

- For Hg, in Germany (17.BimSchV[26]): 40% at 30 µg/Nm^3, i.e. 12 µg/Nm^3.
- For NH_3, in France (Arrêté 20/9/2002[27]): 40% at 30 mg/Nm^3, i.e. 12 mg/Nm^3 [28].

See Section 5 of Annex 3.a to this E&G-d.

5.2.4 Proposing BATAEL-based ELVs

According to IED Article 15.3, there are two ways to ensure that emissions under NOC do not exceed the BATAEL values:

- The first one is (see IED Article 15.3(a)) to set ELVs that do not exceed the BATAELs
- The second one is (see IED Article 15.3(b)) to set ELVs higher than BATAELs and to check at least annually that the emissions under NOC did not exceed the BATAELs.
  NB: it is also possible under 15.3 (b) to set BATAEL-based ELVS which are different in terms of period of time or of reference conditions, with the same conditions that is that, annually, the competent authority assesses the results of emissions monitoring to ensure that emissions under NOC did not exceed the BATAELs.

Both solutions should be considered.

Indeed, keeping in mind that emissions to air depend on the quality of waste input with fluctuating composition and that BATAELs are a selection of operating values elaborated substance by substance, without a margin between the ELV and the maximum obtained value (see Figure 2 above) and that the uncertainties are already higher than what is requested by monitoring standards (see Sections 2.4, 2.5 and 3 to Annex 3.b to this E&G-d), it would be judicious not to set ELVs much lower than the BATAELs upper ends except maybe for NOx.

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[25] Required by IED, Annex VI Part 6 Point 1.2.

[26] See 17. BimSchV 2/5/2013: § 8 p. 7/24 for the daily ELV and Annex 4 p. 23/24 for 95%CI. No CI95% for NH_3.

[27] See Arrêté 20/9/2002: Article 18 for 95%CI and Annex 1, point e for the daily ELV.

[28] The INERIS report 2017 indicates (see pp. 18 and 73-76) that there are significant interferences between HCl and NH_3

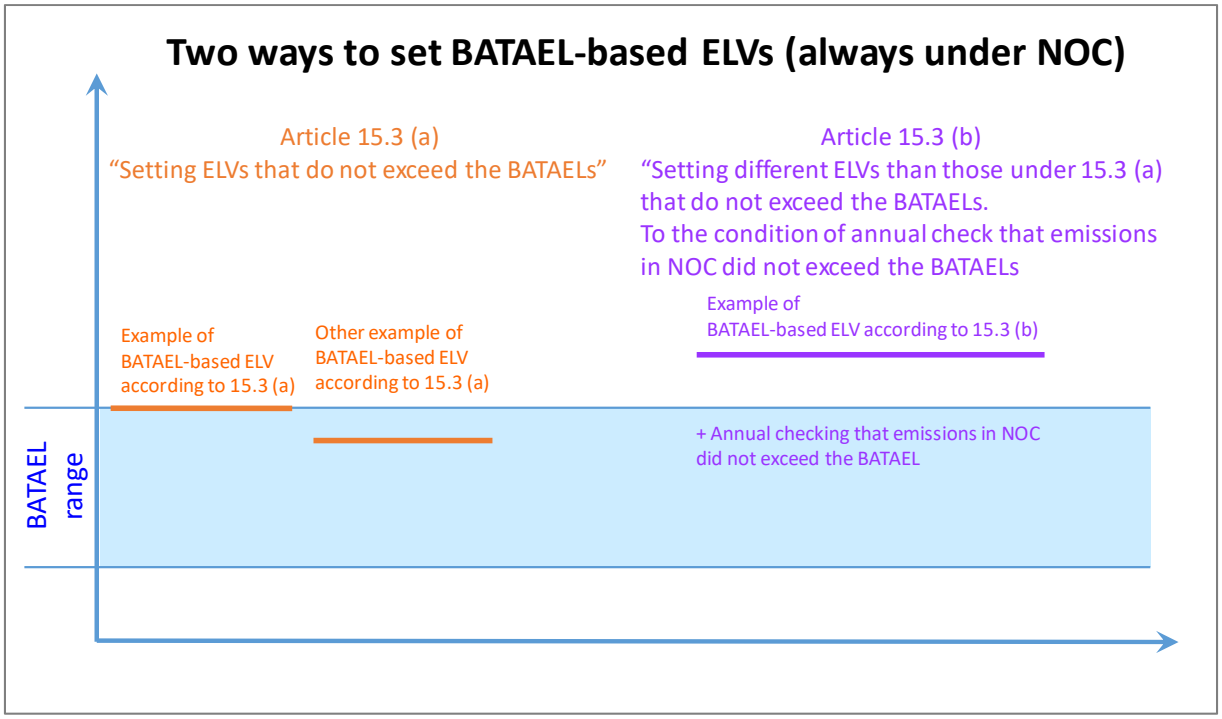

Figure 4: *The two ways to set BATAEL-based ELVs in NOC according to IED Article 15.3 (a) and (b)*

6 Useful reference documents

6.1 Official documents

- IED, Industrial Emission Directive (2010/75/UE of 24/11/2010): https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010L0075
  and http://ec.europa.eu/environment/industry/stationary/ied/legislation.htm
- IPPC Integrated Pollution Prevention and Control directive (96/61/EC of 24/9/1996): https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31996L0061
  and, codified Directive 2008/1/EC of 15/1/2008): https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0001
- Guidance document on the collection of data and on the drawing up of BREF (…) (2012/119/EU, Commission Implementing Decision of 10/2/2012): https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012D0119
- WI BREF BAT conclusions, final draft and, when finalised, (expected November 2019), the final version: http://eippcb.jrc.ec.europa.eu/reference/
- WI BREF in full (expected end 2019) will be available as well at: http://eippcb.jrc.ec.europa.eu/reference/

6.2 INERIS report

https://www.ineris.fr/fr/study-performances-existing-and-under-development-amss-automated-measuring-systems-and-srms-0

or: http://www.cewep.eu/2017/12/01/ineris-report-on-monitoring-of-air-emissions/

o:r http://www.eswet.eu/reports.html

or: https://www.fead.be/news/10-other-news/177-ineris-report-on-accuracy-of-air-emissions-measurement

6.3 Note to warn stakeholders on hasty use of BATAEL ranges given in WI BREF draft 1 – European level

On signatory associations websites

6.4 Other documents

Other useful documents are available on demand at CEWEP, ESWET or FEAD.

7 CONTENT of the Explanatory & Guidance document (E&G-d)

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MAIN DOCUMENT

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2.a The NOC/OTNOC/R-EOT issue

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6.a BAT-conclusions checklist for Energy-from-Waste installations incinerating MSW and similar waste and/or Sewage sludge and/or Clinical waste

6.b BAT-conclusions checklist for IBA treatment plants

ANNEX 7 – Frequently Asked Questions