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FINAL MEETING
OF THE TECHNICAL WORKING GROUP (TWG)
FOR THE REVIEW OF

THE BAT REFERENCE DOCUMENT
FOR WASTE INCINERATION (WI BREF)

SEVILLE,

23 – 27 April 2018 (indicative)

BACKGROUND PAPER (BP)

Purpose of this background paper and of the final technical working group (TWG) meeting

The objective of this background paper is to outline the main issues proposed to be discussed at the final meeting of the Technical Working Group (TWG) for the review of the BAT reference document for Waste Incineration (WI BREF).

The meeting is intended to be held in Seville in the period 23 to 27 April 2018 with the objective of agreeing upon the remaining work needed to finalise the review of the WI BREF. In particular, it is proposed that the TWG meeting focuses on:

- agreeing on the BAT conclusions and therefore on the actual text in Chapter 5 (and related items) of the WI BREF;
- agreeing on the main corresponding modifications proposed for the sections on 'Techniques to consider in the determination of BAT';
- identifying elements that should be mentioned in Chapter 7 of the WI BREF (Concluding remarks and recommendations for future work);
- agreeing the remaining work needed for finalising the BREF review.

This background paper includes:

- background information for the final TWG meeting;
- a summary of the main TWG comments received on the first draft of the revised WI BREF (published in May 2017) and the EIPPCB assessment of those comments;
- the proposed modifications to the draft WI BREF resulting from the TWG members' comments, focusing on the changes proposed to the draft BAT conclusions;
- the proposals to include, when appropriate, in the Concluding remarks and recommendations for future work Chapter of the BREF.

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Background information

The kick-off meeting for the review of the WI BREF was held from 19 to 22 January 2015 in Seville, Spain. The first draft (D1) of the revised WI BREF was issued in May 2017, with the consultation period for TWG members ending in September 2017. The TWG submitted close to 3 000 comments, all of which are available in BATIS.

The distribution by chapter or section of the comments received on D1 of the revised WI BREF is summarised in Table 1.

Table 1: Distribution of the comments submitted on the first draft of the revised WI BREF (D1, May 2017)

Chapter/ Section of the BREF	**Number of comments**	**Percentage of total**
GENERAL COMMENTS RECEIVED ON THE WHOLE DOCUMENT	4	0.1 %
PREFACE	7	0.2 %
SCOPE (of the BREF)	5	0.2 %
CHAPTER :1 GENERAL INFORMATION ON WASTE INCINERATION	59	2.0 %
CHAPTER 2: APPLIED PROCESSES AND TECHNIQUES	308	10.6 %
CHAPTER 3: CURRENT EMISSIONS AND CONSUMPTIONS LEVELS	412	14.2 %
CHAPTER 4: TECHNIQUES TO CONSIDER IN THE DETERMINATION OF BAT	653	22.5 %
CHAPTER 5: BEST AVAILABLE TECHNIQUES (BAT) CONCLUSIONS	1 396	48.1 %
CHAPTER 6: EMERGING TECHNIQUES	14	0.5 %
CHAPTER 7: CONCLUDING REMARKS AND RECOMMENDATIONS FOR FUTURE WORK	8	0.3 %
CHAPTER 8: ANNEXES	23	0.8 %
CHAPTER 9: GLOSSARY	9	0.3 %
CHAPTER 10: REFERENCES	3	0.1 %
TOTAL	**2 901**	**100 %**

All the comments that the TWG qualified as 'major' in their submission have been assessed by the EIPPCB, and those concerning the sections on 'Techniques to consider in the determination of BAT' and Chapter 5 (BAT conclusions for waste incineration) have been carefully considered in the preparation of this background paper.

We strongly advise you to have available a printed or electronic colour copy, as the text colour is intended to help you to take part in discussions at the final meeting.

Before coming to the meeting

As a TWG member you should read this background paper (BP) and Chapter 5 before coming to the meeting, in order to establish your position on the issues identified. Final TWG meetings are characterised by deep technical discussions and represent the last opportunity for the TWG to discuss the contents of the BREF and reach conclusions. Whether or not your position differs from any proposal in this background paper, you should come to the meeting prepared to justify your position based on a solid techno-economic basis, and **if you have a different view you will be required to present an alternative proposal and the basis for that proposal.**

IMPORTANT: Please bring the following documents with you to the meeting (all of these will be made available on the BATIS TWG members' workspace) as the *EIPPCB will not be able to provide you with hard copies at the meeting*:

- this background paper (colour version);
- the first draft of the revised WI BREF dated May 2017 (colour version);
- the updated graphs/figures including the emission levels (and emission prevention/reduction techniques used) reported for all the plants that submitted a questionnaire in 2016.

Aim and structure of this background paper

The aim of this background paper is to structure and enable efficient discussions at the final TWG meeting. Some items relevant to the BAT conclusions are proposed for discussion at the final TWG meeting (i.e. items in Section 1 of this BP) while other items are proposed to be discussed only if requested in advance of the meeting (i.e. items listed in Section 2 of this BP). Items are listed in Section 2 either because, based on the assessment of the TWG comments, they refer to BAT conclusions that are not considered to be controversial and therefore do not seem to require further discussion, or because they are not considered to have a specific bearing on the text of the BAT conclusions (e.g. some methodological and implementation issues that have already been discussed within the WI TWG). Please note that the order of the discussion items in this background paper will not necessarily be the order of the discussion at the meeting.

TWG members are requested to contact the EIPPCB at least 10 working days before the final TWG meeting **(i.e. by 6 April 2018)** if they wish **to request the discussion of any other items from Chapter 5 (i.e. BAT conclusions) at the meeting or to propose additional agenda items** for the meeting. Please note that the possibility of including additional items in the meeting agenda is extremely limited due to time restrictions.

Each item in this background paper is presented according to the following structure:

- the location in the first draft (D1) of the revised WI BREF (May 2017) where issues are presented;
- the current text in the first draft (D1) of the revised WI BREF (May 2017) that the issues relate to;
- a summary of the most relevant TWG comments related to the issues, made on the first draft (D1) of the revised WI BREF (May 2017); please note that comments that do not propose any changes are not summarised in this BP;
- the EIPPCB assessment of the comments;
- the EIPPCB proposal to resolve the issues.

The abbreviation 'D1' is only used for the purpose of this background paper and will not appear in the final WI BREF.

Different colours and text styles are used in the following sections to facilitate the understanding of this document. **It is therefore recommended to print this background paper in colour**. The following colour and text style codes are used:

Location in D1	*Page number and section in the first draft (D1) of the revised WI BREF (May 2017)*
Current text in D1	**Text of the sections from the first draft (D1) of the revised WI BREF (May 2017)**
Summary of comments	Individual comments or a summary of the main comments related to the item; reference to individual comments is made in the format “Origin of the comment – Comment number”, e.g. EEB-168. The numbering of the comments corresponds to the numbering in the Excel spreadsheet that compiles all comments from all TWG members
EIPPCB assessment	EIPPCB assessment related to the item
EIPPCB proposal	EIPPCB proposal that will be included in the latest version of the draft BAT conclusions for discussion at the final TWG meeting. Note that the revised BAT conclusions also include editorial corrections aimed to ensure a correct and consistent language use throughout the document. Such purely editorial corrections are not tracked in this Background Paper where it is evident that there are no substantive consequences.

Working plan after the meeting

After this final TWG meeting, the revised draft of the WI BREF will be completed by the EIPPCB, including the addition of Chapter 7 (Concluding remarks and recommendations for future work). Afterwards, the TWG will be given another short commenting period that should focus on the changes made as a result of the conclusions reached at the final TWG meeting. The EIPPCB will then take these comments into account, together with the 'minor' comments submitted on D1, to produce the final draft (FD) that will be submitted for opinion to the IED Article 13 Forum. In the final step, the BAT conclusions will be submitted for formal approval to the IED Article 75 Committee. This will be followed by the adoption of the BAT conclusions by the Commission and their publication on the Official Journal of the European Union.

Abbreviations used in this background paper

Abbreviation	Meaning
AMS	Automated measuring system
AT	Austria
BAT	Best Available Techniques (as defined in Article 3(10) the IED)
BAT-AEL	Emission level associated with the BAT (as defined in Article 13(3) of the IED)
BAT-AEPL	BAT-associated environmental performance level (as described in Section 3.3 of Commission Implementing Decision 2012/119/EU)
BAT-AEEL	Energy efficiency levels associated with BAT, a type of BAT-AEPL
BATIS	BAT Information System
BE	Belgium
BP	Background paper
BREF	BAT reference document (as defined in Article 3(11) of the IED)
CEFIC	Conseil Européen de l'Industrie Chimique (European Chemical Industry Council)
CEPI	Confederation of European Paper Industries
CHP	Combined heat and power
COD	Chemical oxygen demand
CW	Clinical waste
CWW BREF	BAT reference document for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector
CZ	Czech Republic
D1	First draft of the revised WI BREF from May 2017
DE	Germany
DK	Denmark
DSI	Dry sorbent injection
EEB	European Environmental Bureau
EIPPCB	European IPPC Bureau
E&P	Euroheat & Power
ELV	Emission limit value
EMS	Environmental Management System
EN	European Standard adopted by CEN (European Committee for Standardisation, from its French name Comité Européen de Normalisation)
ES	Spain
EURITS	European Union for Responsible Incineration and Treatment of Special Waste
FEAD	European Federation of Waste Management and Environmental Services
FI	Finland
FIR	Fédération Internationale du Recyclage
FR	France
HW	Hazardous waste
HWE	Hazardous Waste Europe
IED	Industrial Emissions Directive (2010/75/EU)
ISO	International Organisation for Standardisation. Also international standard adopted by this organisation
IT	Italy
KOM	Kick-off meeting of the TWG for the review of the WI BREF
LCP BREF	BAT reference document on Large Combustion Plants
LHV	Lower heating value
LOI	Loss on ignition
MSW	Municipal solid waste
ROM	JRC Reference Report on Monitoring of emissions to air and water from IED installations
MS	EU Member State
ND	Not determined

NFM BREF	BAT reference document for the Non-Ferrous Metals Industries
NMVOC	Non-methane volatile organic compounds
NL	The Netherlands
ONHW	Other non-hazardous waste
OTNOC	Other than normal operating conditions
PCB	Polychlorinated biphenyl(s)
PCDD	Polychlorinated dibenzo-*p*-dioxin(s)
PCDF	Polychlorinated dibenzofuran(s)
POPs	Persistent Organic Pollutants as defined in Regulation (EC) No 850/2004 of the European Parliament and of the Council and amended by Commission Regulation (EU) No 756/2010
PT	Portugal
SCR	Selective catalytic reduction
SE	Sweden
SNCR	Selective non-catalytic reduction
SS	Sewage sludge
TOC	Total organic carbon
TSS	Total suspended solids
TWG	Technical Working Group
UK	United Kingdom
VOC	Volatile organic compounds
WBLW	Water-based liquid waste
WI BREF	BAT reference document on Waste Incineration
WT BREF	BAT reference document on Waste Treatment
WIQ	Waste incineration questionnaire

1 ITEMS PROPOSED FOR DISCUSSION AT THE FINAL TWG MEETING FOR THE REVIEW OF THE WI BREF

1.1 Scope, Definitions, General considerations

1.1.1 Scope

Location in D1:	*P. 677 – Chapter 5*
Current text in D1:	These BAT conclusions concern the following activities specified in Annex I to Directive 2010/75/EU: 5.2 Disposal or recovery of waste in waste incineration plants: (a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour; (b) for hazardous waste with a capacity exceeding 10 tonnes per day. 5.2 Disposal or recovery of waste in waste co-incineration plants: (a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour; (b) for hazardous waste with a capacity exceeding 10 tonnes per day; whose main purpose is not the production of material products and: • which combust only waste, other than waste defined in Article 3(31)(b) of Directive 2010/75/EU; or • where more than 40 % of the resulting heat release comes from hazardous waste; or • which combust mixed municipal waste. 5.3 (a) Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving the treatment of slags and/or bottom ashes from the incineration of waste. 5.3 (b) Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day involving the treatment of slags and/or bottom ashes from the incineration of waste. These BAT conclusions do not address the following: • Pre-treatment of waste prior to incineration; this may be covered by the BAT conclusions for Waste Treatment (WT). • Treatment of incineration fly ashes and other residues resulting from flue-gas cleaning (FGC). These may be covered by the BAT conclusions for Waste Treatment (WT). • Incineration or co-incineration of exclusively gaseous waste. • Treatment of waste in plants covered by Article 42(2) of Directive 2010/75/EU. Other BAT conclusions and reference documents which could be relevant for the activities covered by these BAT conclusions are the following: • Waste Treatment (WT); • Economics and Cross-Media Effects (ECM); • Emissions from Storage (EFS); • Energy Efficiency (ENE); • Industrial Cooling Systems (ICS); • Monitoring of Emissions to Air and Water from IED installations (ROM); • Large Combustion Plants (LCP).

Summary of comments:	1. Coverage of waste co-incineration activities - Clarify the term "mixed municipal waste" as defined in Article 3(39) of Directive 2010/75/EU (CZ-20, Eurelectric-1, FR-745). - Exclude the disposal or recovery of waste in large combustion plants covered by the BREF LCP BREF (Eurelectric-2, CZ-21). - Do not exclude co-incineration plants whose main purpose is the generation of material products to avoid the risk of loopholes for some new or existing installations, by deleting reference (HU-1, HWE-1, EEB-112) or specifying "when covered by other BREFs" (FR-644). - Do not exclude the incineration or co-incineration of exclusively gaseous waste to avoid the risk of loopholes for some new or existing installations, by deleting reference (HU-3, HWE-3) or specifying "functioning as abatement devices" (FR-646). - Remove the reference to plants "which combust only waste, other than waste defined in Article 3(31)(b) of Directive 2010/75/EU" (FR-645), or replace it with plants "referred to in IED Article 42(2)(a)(i) when they are not covered by another BREF" (HU-2, HWE-2). 2. Coverage of IBA treatment activities - In order to avoid excluding the treatment of ashes that could be classified as hazardous, either: (a) replace reference to Activities 5.3(a) and 5.3(b) of IED Annex I with a more generic reference to the handling and treatment of slags and/or bottom ashes from the incineration of waste (IT-6, IT-7), or: (b) add to the scope the activity of treatment of hazardous slags/bottom ashes as part of Activity 5.1(b) (AT-69, CEWEP-ESWET-555). 3. Coverage of waste pre-treatment activities - Do not exclude all waste pre-treatment activities prior to incineration but only exclude them for the part covered by the WT BAT conclusions, i.e. in terms of reduction of emissions from those pre-treatment activities, as the wording of the scope contradicts the fact that pretreatment is mentioned in BAT 2 and BAT 22 (SE-76, EEB-99). 4. Other BAT conclusions and reference documents that may be relevant - Mention also CWW (CEFIC-9), LVOC (CEFIC-10), and CLM (Eurits-46).
EIPPCB assessment:	1. Coverage of waste co-incineration activities - Since the definition of "mixed municipal waste" is already provided in the IED, there is no need to repeat it in the BAT conclusions. - The exclusion of co-incineration in the cases covered by the BAT conclusions for LCP is already provided by the specification included in the bullet points under Activity 5.2 (co-incineration). The BAT conclusions do not make a distinction whether the thermal input of the plant is above or below 50 MW. - At the kick-off meeting (see KOM report, Conclusion 11) it was agreed "to exclude from the scope of the WI BREF those co-incineration plants whose main purpose is the generation of material products". In line with this decision, no data were collected from such plants. - At the kick-off meeting (see KOM report, Conclusion 3) it was agreed that TWG members share in BATIS the list of the plants incinerating only gaseous wastes operating in the EU, and that the way to address this issue would take into account their number and their environmental impacts throughout the EU. The outcome (see EIPPCB email to the WI TWG dated 5 May 2015) was that only four such plants were identified as being in operation in the EU (two in Germany, one in Finland and one in Spain), and that their environmental impact is thus very limited. - The scope of the WI BAT conclusions takes into consideration the types of installations covered by other BAT conclusions. Explicitly spelling out the specific plant categories that are covered or excluded, rather than referring to other BAT conclusions, ensures that the scope of the BAT conclusions, which are self-standing documents, is clear from the document itself without the need to consult other BAT conclusions. - The inclusion of co-incineration plants which combust only waste stems from complementarity with the BAT conclusions for LCP and is not the same condition as the exclusion of plants covered by Article 42(2) of the IED: it is possible for a plant to be excluded from the scope of the WI BAT conclusions not because it is covered by Article 42(2), but because it does not fulfil the

	condition of combusting only waste other than the types of waste referred to in Article 3(31)(b) of the IED. • The reformulation suggested in HU-2 and HWE-2 also seems inconsistent because the text of the scope refers in this case to plants that are *included* in the scope, and not to plants *excluded*. 2. Coverage of IBA treatment activities • The BAT conclusions refer to specific IED Annex I activities. The data and information collection underpinning the WI BREF review reflects a situation in which bottom ashes were classified as non-hazardous. It may not be appropriate for the same techniques to also be considered BAT for the treatment of bottom ashes containing hazardous substances in all cases. 3. Coverage of waste pre-treatment activities • Pre-treatment activities such as the separation of recyclables are not specific to the WI sector; the references to pre-treatment made in BAT 2 and BAT 22 are general for the management of the areas where such activities may take place, where relevant to the incineration process, and do not include specific conclusions as regards which pre-treatment activities take place and how they are conducted. 4. Other BAT conclusions and reference documents that may be relevant • The CWW BREF contains general information on waste water treatment techniques that may also be relevant for the WI sector, which can be cross-referenced in the BREF. It is not clear which specific information from the CLM and LVOC BAT conclusions may be relevant, considering e.g. that cement kilns are explicitly excluded from the scope of the WI BAT conclusions.
EIPPCB proposal:	1. Coverage of waste co-incineration activities • Keep the scope of waste co-incineration activities unchanged. 2. Coverage of IBA treatment activities • Keep the scope of IBA treatment activities unchanged. 3. Coverage of waste pre-treatment activities • Keep the exclusion of pre-treatment activities unchanged. 4. Other BAT conclusions and reference documents that may be relevant • Keep the list unchanged.

1.1.2 Definitions

<table>
<tr><td>Location in D1:</td><td><i>P. 678 – Chapter 5</i></td></tr>
<tr><td>Current text in D1:</td><td>For the purposes of these BAT conclusions, the following general definitions apply:
<table>
<tr><th>Term</th><th>Definition</th></tr>
<tr><th colspan="2">General terms</th></tr>
<tr><td>Bottom ash treatment plant</td><td>Plant treating slags and/or bottom ashes from the incineration of waste in order to separate and recover the valuable fraction and to allow the beneficial use of the remaining fraction</td></tr>
<tr><td>Clinical waste</td><td>Infectious or otherwise hazardous waste arising from healthcare institutions (e.g. hospitals)</td></tr>
<tr><td>Existing plant</td><td>A plant that is not a new plant</td></tr>
<tr><td>Fly ash</td><td>Particles from the incineration chamber or formed within the flue-gas stream that are transported in the flue-gas</td></tr>
<tr><td>Gross electrical efficiency</td><td>Ratio between the gross electrical output of the turbine and the waste/fuel energy input expressed as the lower heating value</td></tr>
<tr><td>Gross heat efficiency</td><td>Ratio between the gross heat output and the waste/fuel energy input. The energy input is expressed as the lower heating value; the gross heat output is expressed as the sum of:
• the generated electricity output of the turbine
• for direct export of steam and/or hot water, the exported thermal power less the thermal power of the return flow
• the thermal power to primary heat exchangers</td></tr>
<tr><td>Hazardous waste</td><td>Hazardous waste as defined in Article 3(2) of Directive 2008/98/EC</td></tr>
</table>
</td></tr>
</table>

Incineration plant	Either a waste incineration plant as defined in Article 3(40) of Directive 2010/75/EU, or a waste co-incineration plant as defined in Article 3(41) of Directive 2010/75/EU, covered by the scope of these BAT conclusions
Major plant upgrade	A major change in the design or technology of a plant with major adjustments or replacements of the process and/or abatement technique(s) and associated equipment
Municipal solid waste	Solid waste from households (mixed or separately collected) as well as solid waste from other sources that is comparable to household waste in nature and composition
New plant	A plant first permitted following the publication of these BAT conclusions or a complete replacement of a plant on the existing foundations following the publication of these BAT conclusions
Other non-hazardous waste	Non-hazardous waste that is neither municipal solid waste nor sewage sludge
Residues	Substances or objects generated by the activities covered by the scope of this document, as waste or by-products
Sewage sludge	Residual sludge from the storage, handling and treatment of domestic, urban or industrial waste water, except if this residual sludge constitutes hazardous waste
Slags and/or bottom ashes	Solid residues removed from the furnace once wastes have been incinerated

Term	**Definition**
Pollutants and parameters	
As	The sum of arsenic and its compounds, expressed as As
Cd	The sum of cadmium and its compounds, expressed as Cd
Cd+Tl	The sum of cadmium, thallium and their compounds, expressed as Cd+Tl
CO	Carbon monoxide
Cr	The sum of chromium and its compounds, expressed as Cr
Cu	The sum of copper and its compounds, expressed as Cu
Dust	Total particulate matter (in air)
HCl	All inorganic gaseous chlorine compounds, expressed as HCl
HF	All inorganic gaseous fluorine compounds, expressed as HF
Hg	The sum of mercury and its compounds, expressed as Hg
N_2O	Dinitrogen monoxide (nitrous oxide)
NH_3	Ammonia
NH_4-N	Ammonium nitrogen, expressed as N, includes free ammonia (NH_3) and ammonium ($NH4^+$)
Ni	The sum of nickel and its compounds, expressed as Ni
NO_X	The sum of nitrogen monoxide (NO) and nitrogen dioxide (NO_2), expressed as NO_2
PAHs	Polycyclic aromatic hydrocarbons
Pb	The sum of lead and its compounds, expressed as Pb
PCBs	Polychlorinated biphenyls
PCDD/F	Polychlorinated dibenzo-*p*-dioxins and -furans
POPs	Persistent Organic Pollutants as defined in Regulation (EC) No 850/2004 of the European Parliament and of the Council and amended by Commission Regulation (EU) No 756/2010

Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	The sum of antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel, vanadium and their compounds, expressed as Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V
SO_2	Sulphur dioxide
SO_4^{2-}	Dissolved sulphate, expressed as SO_4^{2-}
TOC	Total organic carbon, expressed as C (in water)
TSS	Total suspended solids. Mass concentration of all suspended solids (in water), measured via filtration through glass fibre filters and gravimetry
Tl	The sum of thallium and its compounds, expressed as Tl
TVOC	Total volatile organic carbon, expressed as C (in air)
Zn	The sum of zinc and its compounds, expressed as Zn

Summary of comments:

1. General
    - Merge the two different definitions sections, the one in chapter 5 and the other in the BREF Glossary section (CEWEP-ESWET-554, FEAD-211).
    - Align the tables of definitions in the WI BREF and in the WT BREF (CEFIC-19).
2. Bottom ash treatment plant
    - Exclude from the definition metal recovery (Eurits-1) and plants where only de-ironing is operated (HWE-4, ES-29, HU-4).
3. Goss electrical efficiency
    - Modify the definition taking into account all the energy inputs (waste, auxiliary fuel, electricity) and the fact that electricity is produced by the generator. Check also the units of the definition (energy/power) (DE-3).
    - Modify the definition taking into account how energy efficiency is determined in WIQ Annex II (CEWEP-ESWET-556).
    - Restrict the applicability of this definition to the incineration of municipal solid waste, other non-hazardous waste and sewage sludge (HWE-5, HU-5).
4. Gross heat efficiency
    - Restrict the applicability of this definition to the incineration of municipal solid waste, other non-hazardous waste and sewage sludge (HWE-6, ES-30, HU-6).
    - Use the term “gross total efficiency” instead of “gross heat efficiency” (AT-75).
    - Add an additional point for internal energy demand to the list of elements whose sum makes up the gross heat output (AT-70, AT-71).
    - Use the R1 formulae for MSW plants. For HWIs, use the definition of the WI BREF 2006 (BAT 26 b (iii)), which refers to boiler efficiency only (Eurits-48).
    - Define the gross heat efficiency as the ratio between the gross heat output plus the gross electrical output of a back-pressure turbine and the waste/fuel energy input calculated according to the formulae given in BAT 21 (CEWEP-ESWET -557).
    - Define the gross heat efficiency as the gross used heat energy related on the total energy input (waste, auxiliary energy (fuel, electrical, thermal energy)). The used gross heat energy includes support thermal energy as well as exported thermal energy. It has to be considered, that the used thermal energy means the difference between the provided thermal energy (output) and the internal input thermal energy (heat energy or enthalpy as a difference, e.g. provided energy with steam or hot water less the internal input energy of steam, feed water, etc.) (DE-27).
5. Residue
    - Replace the definition by the definition in Article 43 of the IED (ES-31), or delete it because there is already a definition in Article 43 of the IED (HWE-52, FR-647, HU-7).
    - Delete the following words in the definition: "as waste or by-products" (PL-19).
6. Other non-hazardous waste
    - Provide examples of other non-hazardous wastes meant by the definition (EEB-100).
7. Clinical waste
    - Clarify that not all clinical waste is infectious (FEAD-210, CEWEP-ESWET-558).

	8. TOC • Provide a more concrete or detailed explanation (CEFIC-20). • Add a definition for TOC in the solid fraction (Eurits-50). 9. POPs • Clarify definition of POPs taking into account also the more recent amendments of the EU POP Regulation (CZ-25, NO-1, E&P-4, SE-46, SE-105, FEAD-7, UK-32, CEWEP-ESWET-565). 10. New definitions • Add a definition for waste co-incineration plant, waste incineration line, grouped lines and group of lines (CEWEP-ESWET-559, CEWEP-ESWET-560, CEWEP-ESWET-561). • Add a definition for start-up / shutdown-periods (CZ-23, Eurelectric-8). • Clarify when a half-hourly average is considered valid (CZ-24, Eurelectric-9). • Add a definition for OTNOC (BE-6, CEWEP-ESWET-563, FR-746), NOC (CEWEP-ESWET-562), EOT (CEWEP-ESWET-564). • Add a definition for wood waste (Eurelectric-7). • Add a definition for continuous and periodic measurement (IT-8). • Add a definition for dioxin-like PCBs (Eurits-49).
EIPPCB assessment:	1. General • The BAT conclusions chapter of the BREF is a stand-alone chapter and for this reason needs its own definitions section. The BREF document has its own definitions section in the Glossary and usually contains more definitions than those necessary in Chapter 5. • Purely editorial modification to align the text (e.g. of the pollutant definitions) with the most recent BAT conclusions for similar sectors can be considered. 2. Bottom ash treatment plant • The definition of bottom ash treatment plant is intended to exclude the cases where only a de-ironing treatment of the slag and/or bottom ash is carried out at the WI plant, because in these cases the purpose of a beneficial use of the remaining fraction is not fulfilled. This can be made clearer with specific language in the definition. 3. Gross electrical efficiency • The definition of gross electrical efficiency could be improved taking into account comment DE-3. However, the imported electrical energy should not be part of the energy balance to derive the electrical energy efficiency because, to enable a better comparability among different lines/plants, the objective is the efficiency of the incineration line/plant without considering any waste pre-treatment or other side activities carried out at the installation. This is in line with the way in which the data have been gathered. • The determination of the gross electrical efficiency is addressed in the General considerations and in the Monitoring sections of the BAT conclusions. The definition could therefore be streamlined by maintaining in the Definitions section the general concepts and shifting the more operational details to the other sections. • Plants incinerating hazardous waste or sewage sludge may face constraints in achieving the optimal use of the energy they recover due to: their size (they are often smaller than waste-to-energy plants), their location (possibly closer to where the waste is generated than to the potential users of the energy recovered), and their design (more oriented towards destroying the waste than to the efficient recovery of the energy content of the waste). • For the incineration of hazardous waste or sewage sludge, the efficiency in producing steam or hot water (boiler efficiency) can be an appropriate parameter to determine the energy efficiency performance. 4. Gross heat efficiency • The D1 proposal for BAT 3 (monitoring of energy efficiency) was to base the determination of the gross total heat efficiency at the level of the plant. However, to better take into account the complex design of the energy recovery system of some waste incineration plants, the energy balance for the determination of the energy efficiency can also be done at the level of a part of the plant. “Part of a plant” may include for instance a line and its own steam system in isolation, but also a partitioning of the steam system connected to one or more boilers, where e.g. part of the steam is routed to a condensing turbine, and the rest is directly

exported.

- Waste incineration plants may use a considerable part of the energy produced for the cleaning of the flue-gas. This can include the case of plants that use the heat produced for flue-gas reheating. In order to define an energy efficiency indicator that allows the sound comparison of the gross energy efficiency performance of the plants and that it is consistent by analogy with the gross electrical efficiency concept, it seems appropriate to include in the thermal power output the energy produced that is used internally.
- The use of R1 criteria is addressed in Section 0 of this BP. Chapter 5 of the 2006 WI BREF does not provide a definition of gross heat efficiency. How to calculate the gross heat efficiency is addressed in Section 0 of this BP.
- A specification of the type of turbine generator can help better define the heat efficiency. How the gross energy efficiency is calculated is addressed in the General considerations section of the BAT conclusions chapter.
- The TWG subgroup on energy issues concluded to sum, without using any correction factors, the heat and the electricity produced when using a back-pressure turbine. This is a possible way to calculate the energy efficiency of the plant or of a part of the plant.
- The units of the elements that together constitute the gross heat efficiency can be made more consistent taking into account the proposal DE-27. Such details, however, do not need to be included both in the Definitions and in the General considerations section.
- The D1 proposal does not take into account the electrical energy input because usually most of it is used for waste pre-treatment, which is outside the proposed scope of the WI BAT conclusions and outside the energy boundaries used in the data collection.

5. Residue
   - A definition of residue is provided in Article 43 of the IED: it applies however for the purposes of Chapter IV thereof.
6. Other non-hazardous waste
   - The precise classification of wastes (for instance the distinction between MSW and ONHW) is an implementation issue and is of little consequence for the purposes of these BAT conclusions.
7. Clinical waste
   - The definition covers waste arising from healthcare institutions that is infectious or hazardous for other reasons. Therefore the notion that not all of it is infectious is already included.
8. TOC
   - A distinction between TOC in water and TOC in solid residues can be made for increased clarity.
9. POPs
   - Amendments to the POP Regulation have resulted in updates of the list of POPs and are worth mentioning.
10. New definitions
    - A definition of waste co-incineration plant is already included in the definition of incineration plant. The definition used in the WIQ is the merging of the IED definition and the scope of the BAT conclusions. However, a definition of “incineration of waste” could be added to clarify that it includes also co-incineration, when this takes place in a plant covered by the BAT conclusions.
    - The term “incineration line” is not used in the BAT conclusions.
    - The term “grouped lines” is not used in the BAT conclusions. It has been used in the questionnaire to identify a group of lines that have a common point of release of emissions to air.
    - The term “group of lines” is not used in the BAT conclusions.
    - The TWG, including with the proceedings of an "OTNOC subgroup" made up of different members of the WI TWG representing MS, industry and NGO, could not agree on a proposal for a complete list of possible cases of OTNOC and for a definition of start-up and shutdown periods.
    - The concept of a valid half-hourly average is an implementation issue linked to compliance. The definition of half-hourly average is included in the General considerations section of the BAT conclusions.
    - The terms NOC and EOT are not used in the BAT conclusions.

	• The definition of wood waste is not needed because the wording is self-explanatory; no specific proposal has been made either. • For clarification, the definitions of continuous and periodic measurement could be added to the definitions. • The definition of dioxin-like PCBs can be added since this pollutant has a BAT-AEL.
EIPPCB proposal:	1. General • Keep two Definitions sections, one in Chapter 5 and the other one in the Glossary of the BREF. 2. Bottom ash treatment plant • Specify that the definition excludes the sole operation of coarse metals separation at the waste incineration site. 3. Goss electrical efficiency • Improve the gross electrical efficiency definition taking into account the fact that the electricity is produced by the generator, and harmonise the units. Streamline it taking into account the energy efficiency part of the General considerations section and the BAT conclusion on energy efficiency monitoring (BAT 3). 4. Gross heat efficiency • Improve the gross heat efficiency definition by harmonising the units and streamlining it taking into account the energy efficiency part of the General considerations section and the BAT conclusion on energy efficiency monitoring (BAT 3). 5. Residue • For incineration plants, align the definition with that of Article 43 of the IED. Extend the definition to also cover IBA treatment plant. 6. Other non-hazardous waste • Keep the definition unchanged. 7. Clinical waste • Keep the definition unchanged. 8. TOC • Separate the definition of TOC into TOC in water and TOC in solid residues. 9. POPs • Use a generic way to refer to the amendments of Regulation (EC) No 850/2004 of the European Parliament and of the Council. 10. New definitions • Add a definition of: boiler efficiency, loss on ignition, continuous and periodic measurement, incineration of waste, and dioxin-like PCBs. 11. Streamlining and clarification of other definitions • Align the definition of new plant with the current wording of the most recent BAT conclusions (e.g. WT). • Clarify in the definition of Hazardous Waste that, for the purposes of the BAT conclusions, it does not include Clinical Waste. • Streamline the wording of the definition of Sewage Sludge with that used for Hazardous Waste.

1.1.3 General considerations

1.1.3.1 Emission levels associated with the best available techniques (BAT-AELs) for emissions to air

Location in D1:	*P. 681 – Chapter 5*

Current text in D1:

Emission levels associated with the best available techniques (BAT-AELs) for emissions to air

Emission levels associated with the best available techniques (BAT-AELs) for emissions to air given in these BAT conclusions refer to concentrations, expressed as mass of emitted substances per volume of flue-gas under the following standard conditions: dry gas at a temperature of 273.15 K and a pressure of 101.3 kPa, and expressed in the units mg/Nm^3, µg/Nm^3, ng I-TEQ/Nm^3 or ng WHO-TEQ/Nm^3.

The reference oxygen levels used to express BAT-AELs in this document are shown in the table below.

Activity	**Reference oxygen level (O_R)**
Incineration	11 vol-%
Bottom ash treatment	No correction for the oxygen level

The equation for calculating the emission concentration at the reference oxygen level is:

$$\boxed{E_R = \frac{21 - O_R}{21 - O_M} \times E_M}$$

Where:

E_R: emission concentration at the reference oxygen level O_R;
O_R: reference oxygen level in vol-%;
E_M: measured emission concentration;
O_M: measured oxygen level in vol-%.

For averaging periods, the following definitions apply:

Averaging period	**Definition**
Half-hourly average	Average value over a period of 30 minutes of continuous measurement
Daily average	Average over a period of 24 hours of valid half-hourly averages obtained by continuous measurement
Average over the sampling period	Average value of three consecutive measurements of at least 30 minutes each (1)
Long-term sampling average	Average value over a sampling period of 2 to 4 weeks

(1) For any parameter where, due to sampling or analytical limitations, a 30-minute measurement is inappropriate, a more suitable sampling period may be employed. For PCDD/F and dioxin-like PCBs, one sampling period of 6 to 8 hours is used in the case of short-term sampling.

When waste is co-incinerated together with non-waste fuels, the BAT-AELs for emissions to air given in these BAT conclusions apply to the entire flue-gas volume generated.

Summary of comments:	1. <u>Reference oxygen level</u> • Specify that the volume associated with the reference oxygen level is dry (CEWEP-ESWET-570, FEAD-219, FEAD-220, FEAD-221). • Align the reference oxygen level with the provision of the IED Annex VI, Part 6, Point 2.7. (NO-2) or add that the equation is applicable only when OM > OR (HU-8, Euritis-2, HWE-7). 2. <u>Averaging period</u> • Daily average: replace the current definition with: "Average over a period of 24 hours of sufficient valid half-hourly averages obtained by continuous measurement in normal operating conditions (i.e. after discarding all 1/2-hr average values obtained in OTNOC)". (CEWEP-ESWET-573, FEAD-226). • Average over the sampling period should not always be over the three consecutive measurements. (CZ-27, FI-2, NL-1, CEWEP-ESWET-568, Eurelectric-11). • Replace the "Long-term sampling average" with "'Long-term sampling period" and modify the associated definition as "'Value obtained over a sampling period of 2 to 4 weeks'" (IT-9). • Allow longer periods for "long-term sampling averages" by setting it as "at least 2 weeks" without a maximum time limit (CZ-26, FI-1, Eurelectric-10). 3. <u>Other</u> • Add that a valid daily average value is obtained when no more than five half-hourly average values in any day are discarded due to malfunction or maintenance of the continuous measurement system. No more than ten daily average values per year shall be discarded due to malfunction or maintenance of the continuous measurement system (HU-10). • Add the text in the IED on the confidence interval (Eurits-51). • Add a table for the confidence interval for the higher ends of the BAT-AEL ranges (FR-750). • Add Section: "Stability of the levels of emissions" with the following wording: "A level of emission is proven to be sufficiently stable when it has been demonstrated on a period of one year that the variation of the levels of emission as a daily average is low and the yearly average is below 50% of the permitted level of emission." (HWE-57). • Include clarification on the application of BAT conclusions in the case of different waste types being incinerated. (Eurelectric-4)
EIPPCB assessment:	1. <u>Reference oxygen level</u> • It is already stated in the text that the reference conditions refer to dry gas. For clarity "dry" can also be added to volume percentage in the table. • An oxygen level of 11 (dry) vol-% matches the data as collected and used to derive BAT-AEPLs so it does not seem appropriate to refer to another oxygen level. 2. <u>Averaging period</u> • Rules for compliance elements are an implementation issue and not part of the definition of daily average. • For some parameters associated with low measured concentrations, the extension of the sampling time may substitute the three consecutive measurements approach. • The term “average” in “long-term sampling average” is intended to refer to the (long) averaging period, not to any averaging between a possible set of discrete measurements. The term “long-term sampling average” can be changed to remove the possible ambiguity and its definition amended to take into account the possibility to have a longer sampling period. 3. <u>Other</u> • Rules for compliance are implementation issues that are beyond the technical scope of the BAT conclusions. • Concerning the confidence intervals, it is an established practice not to repeat IED provisions in BAT conclusions. • Moreover, little information is available on the confidence intervals at emission levels other than those of the IED Annex VI ELVs. • The term "sufficiently stable emission level" was already used in recent BAT conclusions (e.g. LCP) and its operational specification is an implementation

	issue. - The application of the BAT conclusions for the incineration of different waste types at the same time is an implementation issue.
EIPPCB proposal:	1. Reference oxygen level - In the table where the reference oxygen level is set, add that the gas is dry. - Keep only one reference oxygen level at 11 (dry) vol-%. 2. Averaging period - Replace the wording "Long-term sampling average" with "'Long-term sampling period" and modify the associated definition to "'Value obtained over a sampling period of at least 2 weeks". - Change footnote (^{1}) as follows: "(^{1}) For any parameter where, due to sampling or analytical limitations, a 30-minute sampling/measurement and/or an average of three consecutive measurements is inappropriate, a more suitable procedure may be employed. For PCDD/F and dioxin-like PCBs, one sampling period of 6 to 8 hours is used in the case of short-term sampling." 3. Other - Keep the current text unchanged.

1.1.3.2 Emission levels associated with the best available techniques (BAT-AELs) for emissions to water

Location in D1:	*P. 682 – Chapter 5*
Current text in D1:	**Emission levels associated with the best available techniques (BAT-AELs) for emissions to water** Emission levels associated with the best available techniques (BAT-AELs) for emissions to water given in these BAT conclusions refer to concentrations (mass of emitted substances per volume of waste water), expressed in the units mg/l or ng I-TEQ/l. The BAT-AELs refer to daily averages, i.e. 24-hour flow-proportional composite samples. Time-proportional composite sampling can be used provided that sufficient flow stability is demonstrated. The BAT-AELs for emissions to water apply at the point where the emission leaves the installation.
Summary of comments:	1. 24-hour flow-proportional composite samples - Add other methods for sampling emissions to water (e.g. spot-random sampling) (CZ-29, Eurelectric-16). 2. Water BAT-AELs' applicability - Add that the BAT-AELs apply to direct discharges. (PT-3, Eurelectric-14).
EIPPCB assessment:	1. 24-hour flow-proportional composite samples - The IED already states that for emissions to water of Hg, Cd, TI, As, Pb, Cr, Cu, Ni and Zn a flow-proportional representative sample of the discharge over a period of 24 hours is used. Spot sampling can be used for the measurement of the TSS. 2. Water BAT-AELs' applicability - Table 5.8 already states that the BAT-AELs for emissions to water refer to direct discharges. Repetition should be avoided.
EIPPCB proposal:	1. 24-hour flow-proportional composite samples - Add the spot sampling for TSS. 2. Water BAT-AELs' applicability - Keep the wording unchanged.

1.1.3.3 Energy efficiency levels associated with the best available techniques (BAT-AEELs)

Location in D1:	*P. 682 – Chapter 5*
Current text in D1:	**Energy efficiency levels associated with the best available techniques (BAT-AEELs)** An energy efficiency level associated with the best available techniques (BAT-AEEL) refers to the ratio between the plant´s gross energy output(s) and the energy input into the thermal treatment unit(s), including waste and other fuels, at actual plant design and for the plant operated at full load. BAT-AEELs are expressed as a percentage. The waste/fuel energy input is expressed as lower heating value.
Summary of comments:	• For the incineration of HW, the energy efficiency level should be the ratio between the plant´s gross energy output(s) and the energy available at the boiler (ES-17, HU-11, Eurits-4, HWE-8). • BAT-AEEL should not apply to the incineration of HW (CEFIC-17). • Add to the definition of BAT-AEEL that it can be related also to line or group of lines and that it refers to the plant design at performance test conditions (CEWEP-ESWET-580, FEAD-231). • Reconsider the general gross energy approach and take the net energy output as a reference for electrical efficiency of an incineration plant (BE-5). • Add a section explaining the energy efficiency formulas and the cases 1, 2 and 3 as used in WIQ Annex II. (CEWEP-ESWET-664).
EIPPCB assessment:	• For the energy efficiency of plants incinerating HW, see assessment in Section 1.1.2. • In order to enable a stable plant operation, operators measure or estimate the calorific value of the hazardous wastes that are going to be incinerated. In any case the BAT-AEELs are related to plant design values as confirmed from the performance test. • Depending on the plant configuration, it is possible that the energy efficiency is better determined for a part of a plant, or separately for different parts of the same plant. • Incineration plants use part of the electricity and/or heat produced for the FGC system. Using the net instead of the gross efficiency would seemingly result in penalising plants that need to use more energy to treat their emissions. • The description of the cases where the gross electric efficiency and where the gross heat efficiency are determined can be improved taking into account the way in which the energy efficiency data have been gathered. • To align the specification of gross heat efficiency with the analogous specification of gross electrical efficiency, the thermal power used internally can be taken as one of the elements to be included in the numerator of the gross heat efficiency formula. • To better describe the energy performance of the incineration of HW and of SS, the boiler efficiency concept can be added under the General considerations.
EIPPCB proposal:	• Add that the BAT-AEELs may also apply to a part of a plant. • For the incineration of MSW, ONHW and hazardous wood waste, specify that the BAT-AEELs are expressed either as gross electrical efficiency or as gross heat efficiency. • Include the BAT-AEEL specifications in the form of simple formulas for gross electrical efficiency and gross heat efficiency. • For the incineration of sewage sludge and of hazardous waste, specify that the BAT-AEELs are expressed as boiler efficiency. • Include an Annex to the WI BREF with some examples of energy efficiency calculations based on the data collected from best performing plants prevalently incinerating MSW, ONHW, SS or HW with different plant configurations.

1.1.3.4 Destruction efficiency

Location in D1:	*P. 682 – Chapter 5*
Current text in D1:	**Destruction efficiency** The equation for calculating the destruction efficiency (DE) of POPs contained in the waste is: $$DE = 1 - \frac{\text{POPslag+POPfash+ POPwater+ POPfgas}}{\text{POPwaste}}$$ Where: • $\text{POP}_{\text{waste}}$ is the mass of POPs in the waste prior to incineration; • POP_{slag} is the mass of POPs remaining in the incineration slag/bottom ash; • POP_{fash} is the mass of POPs ending up in the fly ashes and in dry FGC residues; • $\text{POP}_{\text{water}}$ is the mass of POPs ending up in the waste water from FGC and in the related waste water treatment sludge; • POP_{fgas} is the mass of POPs emitted with the flue-gas.
Summary of comments:	• Adapt the equation for calculating the Destruction Efficiency in order to clarify and simplify it. (PT-5, Euritis-3). For MSW POPwaste cannot be exactly determined (CZ-3). • Delete the section on destruction efficiency (CZ-28, ES-2, NO-3, PT-5, CEFIC-21, CEWEP-ESWET-575, Eurelectric-15, Eurits-3, E&P-3). • Add methodology on how to use the equation (HU-12, HWE-9). • Add the units of the different POPs (CEWEP-ESWET-574).
EIPPCB assessment:	• The Destruction Efficiency gives information on the performance of the incineration process in terms of reducing the hazardousness of the HW treated. It is a parameter that depends on the type of incineration process used, on the techniques applied, and on how those are designed, operated and maintained. • The TWG has provided examples where the Destruction Efficiency has been determined (see attachments to comment DE-1). • The proposed equation is a mass balance that takes into account all the possible streams. The POP contained in some of these streams may be estimated instead of being measured (e.g. the quantity of POP_{fash} and $\text{POP}_{\text{water}}$ can be calculated by measuring the POPs concentration before and after the flue-gas cleaning system). • The methodology on how to use the equation is an implementation issue as it is for the operator and the competent authority to agree case by case on the best way to determine each component of the equation for the specific case (e.g. in some cases it may be appropriate to determine the Destruction Efficiency based on only one substance that is identified as the most resilient to the incineration process; see also EIPPCB assessment under Section 1.3.5). • The unit to express the elements of the Destruction Efficiency equation also depend on which POP or group of POPs is the object of the calculation. In any case, the Destruction Efficiency is a pure number, the units at the numerator and denominator being the same.
EIPPCB proposal:	• Keep the Destruction Efficiency paragraph unchanged.

1.2 Environmental Management System

1.2.1 EMS

Location in D1:	*P. 683-684 – Section 5.1.1*
Current text in D1:	**BAT 1. In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:** i. commitment of the management, including senior management; ii. definition, by the management, of an environmental policy that includes the continuous improvement of the environmental performance of the installation; iii. planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; iv. implementation of procedures paying particular attention to: a. structure and responsibility; b. recruitment, training, awareness and competence; c. communication; d. employee involvement; e. documentation; f. effective process control; g. planned regular maintenance programmes; h. emergency preparedness and response; i. safeguarding compliance with environmental legislation; v. checking performance and taking corrective action, paying particular attention to: a. monitoring and measurement (see also the JRC Reference Report on Monitoring of emissions to air and water from IED-installations – ROM); b. corrective and preventive action; c. maintenance of records; d. independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; vi. review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness; vii. following the development of cleaner technologies; viii. consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life including: a. avoiding unnecessary underground structures; b. incorporating features that facilitate dismantling; c. choosing surface finishes that are easily decontaminated; d. using an equipment configuration that minimises trapped chemicals and facilitates drainage or cleaning; e. designing flexible, self-contained equipment that enables phased closure; f. using biodegradable and recyclable materials where possible; ix. application of sectoral benchmarking on a regular basis. Specifically for incineration plants and, where relevant, bottom ash treatment plants, BAT is to also incorporate the following features in the EMS:

	x. waste stream management plan (see BAT 10 and BAT 11); xi. residues management plan including measures aiming to: a. minimise the generation of residues; b. optimise the reuse, regeneration, recycling and/or energy recovery of the residues; c. ensure the proper disposal of residues; xii. OTNOC management plan (see BAT 19); xiii. accident management plan (see BAT 2); xiv. odour management plan where odour nuisance at sensitive receptors is expected and/or has been substantiated, including: a. a protocol for conducting odour monitoring in accordance with EN standards (e.g. EN 13725); it may be complemented by measurement/estimation of odour exposure (e.g. according to EN 16841-1 or EN 16841-2) or estimation of odour impact; b. a protocol for response to identified odour incidents, e.g. complaints; c. an odour prevention and reduction programme designed to identify the source(s); to measure/estimate odour exposure; to characterise the contributions of the sources; and to implement prevention and/or reduction measures; xv. noise management plan (see also BAT 36) where noise nuisance at sensitive receptors is expected and/or has been substantiated, including; a. a protocol for conducting noise monitoring; b. a protocol for response to identified noise and vibration incidents; c. a noise and vibration reduction programme designed to identify the source(s), to measure/estimate noise and vibration exposure, to characterise the contributions of the sources and to implement prevention and/or reduction measures. **Applicability** The scope (e.g. level of detail) and nature of the EMS (e.g. standardised or non-standardised) is generally related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have (determined also by the type and the amount of waste processed).
Summary of comments:	1. General • Keep under BAT 1 only the EMS standard text, deleting the parts related to waste management plan, OTNOC, accident management plan (DE-5). • Add that when ISO 14001:2015(CEWEP-ESWET-583, FEAD-124) or EMAS or a corresponding environmental management system (CEFIC-24) is applied the requirements given in BAT 1 are fulfilled. • Delete BAT 1 and move the EMS BAT to a horizontal BREF (CEWEP-ESWET-586). • Replace BAT 1 with the BAT 1 from the WT BAT Conclusions (ES-3). • Specify that not all the features described in the points from x on are always part of the EMS (Eurelectric-17, FEAD-125). • Delete point viii. a. "avoiding unnecessary underground structures" (FEAD-47). 2. Waste stream management • Specify at point x that BAT 10 refers to WI plants and that BAT 11 refers to IBA treatment plants (ES-33, HU-14, HWE-53). 3. OTNOC management plan • Delete point xii (CEFIC-22). • Delete BAT 19 and specify in point xii that the aim of the OTNOC management plan is to reduce the frequency of OTNOC and their impacts on emissions. (HU-15, HWE-54). 4. Odour management plan • Delete point xiv (CEFIC-23). • Delete point xiv(a) (FEAD-127).

	• Clarify that odour measurements should only be carried out when the odour management plan foresees them (AT-4), and that the odour management plan is to be set up during the planning (AT-4) or commissioning (FEAD-126) of the installation. • Allow the use of other protocols for carrying out ambient odour monitoring in point xiv. a. (UK-33). • Move point xiv(b) at the end of the heading paragraph and require former (a) and (c) to be included in the protocol to cope with the case of complaints (CEWP-ESWET-584). 5. Noise management plan • Delete point xv(a) (FEAD-128). • Clarify that noise measurements should only be carried out when the noise management plan foresees them (AT-5, CEWP-ESWET 585) and that the noise management plan is to be set up during the planning of the installation (AT-5, CEWP-ESWET 585) or commissioning (FEAD-129).
EIPPCB assessment:	1. General • Most of the BAT 1 wording is standard text which is already used in several published BAT conclusions. The parts that are sector-specific (e.g. waste stream management, OTNOC management plan) are inspired mainly by the BAT conclusions for LCP and for WT, and have been shaped to best fit the incineration and the IBA treatment sectors. The applicability already recognises flexibility in the implementation (scope and nature) of the EMS. • At the moment a horizontal BREF that addresses the EMS has not been foreseen by the IED Article 13 Forum. • Whether the adoption of a certified EMS fulfils BAT 1 is not an issue specific to Waste Incineration. • The IED Article 13 Forum is in the process of revising the general part of BAT 1. 2. Waste stream management • The BAT 10 and BAT 11 statements already refer respectively to waste incineration and to bottom ash treatment. It is possible to split point x to better clarify that waste stream management applies to waste incineration plants and output quality management applies to bottom ash treatment plants. 3. OTNOC management plan • The details of the OTNOC management plan are laid out in BAT 19. Point xii is linked with this BAT conclusion. It can be clarified that it applies to waste incineration plants. 4. Odour management plan • Even if the incineration of waste is generally not considered an activity with a considerable odour impact, it is necessary to handle waste properly to avoid odour emissions. The odour management plan addresses this issue. The protocol to conduct odour monitoring is essential to quantify the odour impact. • BAT is to have an odour management plan in place. Whether it is designed during the planning or the commissioning of the installation is an implementation issue. • Specifying when an odour monitoring campaign is to be conducted is part of the protocol for conducting odour monitoring. • The specific elements of the list (a-c) describe what an odour management plan should contain. They are not in a sequential order. • Specifying the use of EN 13725 for the sampling and analysis of odour emissions fulfils the purpose of ensuring comparability of results. The two mentioned standards (16842-1 and 16841-2) are examples of methods for the determination of odour exposure. • Given the rather lengthy description, the readability of the BAT conclusions could be improved by moving the descriptive text to Section 5.2 “Description of techniques”, and cross-referencing it. 5. Noise management plan • If noise issues are not properly addressed, the incineration plant can have a noise impact. A noise management plan is put in place to avoid it. • BAT is to have in place a noise management plan. Whether it is designed during the planning or the commissioning of the installation is an implementation issue.

	- Specifying when a noise monitoring campaign is to be conducted is part of the protocol for conducting noise monitoring. - Given the rather lengthy description, the readability of the BAT conclusions could be improved by moving the descriptive text to Section 5.2 "Description of techniques", and cross-referencing it. - Vibration is not a significant environmental issue for the WI sector.
EIPPCB proposal:	1. <u>General</u> - Keep BAT 1 in the WI BAT conclusions with all its elements, pending conclusion of the discussion taking place at the level of the IED Article 13 Forum. 2. <u>Waste stream management</u> - In point x, specify that BAT 10 applies to WI plants. - Add a new point for output quality management for bottom ash treatment plants, linked to BAT 11. 3. <u>OTNOC management plan</u> - Specify that the OTNOC management plan applies to incineration plants. 4. <u>Odour management plan</u> - Move the descriptive text to Section 5.2 of the BAT conclusions and add a cross-reference to that section. 5. <u>Noise management plan</u> - Move the descriptive text to Section 5.2 of the BAT conclusions and add a cross-reference to that section. - Remove vibration from the description of the noise management plan. 6. <u>Diffuse dust emissions management</u> - Add a point for diffuse dust emissions management for bottom ash treatment plants.

1.3 Monitoring

1.3.1 Energy efficiency

Location in D1:	*P. 685 – Section 5.1.2*
Current text in D1:	**BAT 3. BAT is to determine the gross electrical efficiency and/or the gross total heat efficiency of the incineration plant by carrying out a performance test at full load ([1]), according to EN standards, after the commissioning of the plant and after each modification that could significantly affect the gross electrical efficiency and/or the gross total heat efficiency of the plant. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.** ([1]) In the case of cogeneration plants, if all of the steam produced at full load is converted to electricity, the gross electrical efficiency is determined. If, for technical reasons, not all of the steam produced at full load can be converted to electricity, the gross total heat efficiency is determined instead.
Summary of comments:	1. General • Clarify in the BAT statement that the gross electrical efficiency and the gross total heat efficiency are alternatives (FI-3). • Replace everywhere 'plant' by 'plant or line or group of lines'. Add a reference to BAT21 (CEWEP-ESWET-593). • Determine the energy efficiency according to the R1 criteria given in Directive 2008/98/EC (CZ-5, E&P-6). • Determine the gross electrical and/or gross heat efficiency using e.g. the design data rather than the result of the performance test. (AT-120). • For the export of heat and steam, add that the nominal capacity of the heat exchangers and steam export devices will be used. If for some reason they are oversized, the correct nominal capacity will be resized through a correction factor. (CEWEP-ESWET-591). • Restrict the applicability to MSW, ONHW and SS, and exclude hazardous waste incinerators (Eurits-7, HWE-10, HU-16). • Do not require testing to EN standards for existing installations, or for plants below a certain capacity (<10 000 t/year). (UK-17). • Specify which EN standards apply (ES-5); if none exist, delete the reference to EN and ISO and specify alternative guidelines (BE-7). • No EN standards are available for the determination of the energy efficiency of incineration plants. For boiler efficiency refer to the FDBR Guideline and for steam turbines efficiency refer to IEC 60953-1 (FEAD-131, FEAD-132, CEWEP-ESWET-590). • Merge this BAT conclusion with the energy efficiency description in the General Considerations section. (CEFIC-26). 2. Footnote • Change "converted to" by "used to produce" (CEWEP-ESWET-597). • Change footnote ([1]) to specify that for CHP plants oriented towards heat production the gross heat efficiency is determined, while in case of CHP plants oriented towards electricity production the gross electricity efficiency is determined. (DE-11, IT-11, CEWEP-ESWET-592, Eurelectric-19). • Add a footnote for the case of CHP units mainly oriented towards the production of heat and for which for technical reasons the performance test cannot be carried out with the unit operated at full load; in this case the test can be supplemented or substituted by a calculation using full load parameters. (DE-16, Eurelectric-20).
EIPPCB assessment:	1. General • It can be clarified in the statement that only one of the efficiency parameters is determined.

	• In order to more explicitly address cases where the determination of a unique energy efficiency level for the whole plant would be technically problematic, the term "plant" can be complemented with "part of plant". • At the kick-off meeting (see KOM report, Conclusion 43) it was concluded to set BAT-AEELs for the design of the new plant to be verified during the performance test and to consider setting BAT-AEELs based on actual performance for existing plants. • To establish the plant efficiency, the R1 formula uses annual values. This means that the techniques applied by the plant will show different performances in different years depending on factors at least partially outside the operator´s control. Thus, the performance test determines in a more accurate way the performance that can be achieved with the applied techniques. • It can be specified that where the performance test cannot be carried out at full load, the design data can be taken into account to determine the energy efficiency. When doing so, there are cases in which it is important to rescale the design values to get a representative result. • Even if the main purpose of the incineration of HW is to eliminate the hazardous substances contained within them, high-temperature flue-gas is available for the production of steam or hot water. • For existing plants it is not necessary to carry out a new performance test to check their energy efficiency: in theory, existing plants should have the results of the performance test with the plant operated at full load when the plant was commissioned. If this information is not available, design values can be used. • EN 12952-15 "Water-tube boilers and auxiliary installations - Part 15: Acceptance tests" excludes waste as a fuel. • Only EN standards are broadly accepted. In order to be cited in the BAT conclusions, other standards should be already used in most EU countries. • It is considered clearer to keep all descriptions in the General considerations section and the monitoring related to the BAT-AE(P)L in the monitoring section, without mixing them. This is also an established practice in other BAT conclusions. 2. <u>Footnote</u> • The cases where the gross electrical efficiency or the gross heat efficiency are to be determined has been clarified in the General considerations section. • Following the changes proposed in the energy efficiency part of the General considerations section, footnote (1) can be deleted. • It can be specified that where for technical reasons a performance test at full load cannot be carried out, the design data can be taken into account to determine the energy efficiency. When doing so, there are cases in which it is important to rescale the design values to get a representative result.
EIPPCB proposal:	1. <u>General</u> • Change the term "gross total heat efficiency" to "gross heat efficiency" as in the Definitions. • Change the term "incineration plant" to "incineration plant as a whole or all of the relevant parts of an incineration plant". • Modify the BAT statement to clarify that only one of the energy efficiency parameters (gross electrical efficiency, gross heat efficiency, or boiler efficiency) is determined for each part of the plant (or for the plant as a whole). • Do not exclude the incineration of HW from the applicability of this BAT conclusion. • Where for technical reasons the performance test at full load cannot be carried out, specify that the design values can be used to determine the energy efficiency. • For existing plants that did not carry out a performance test, specify that the design values can be used to determine the energy efficiency. • Do not specify standards that are not EN, and delete the reference to EN standards in the BAT statement. • Keep the energy efficiency section of the General considerations separate from BAT 3. 2. <u>Footnote</u> • Delete footnote (1).

1.3.2 Emissions to air: monitoring frequency and standards

<table>
<tr><td>Location in D1:</td><td>P. 685-687 – Section 5.1.2</td></tr>
<tr><td>Current text in D1:</td><td>
BAT 5. BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
<table>
<tr><th>Substance/ Parameter</th><th>Process</th><th>Standard(s) (1)</th><th>Minimum monitoring frequency</th><th>Monitoring associated with</th></tr>
<tr><td>NO_X</td><td>Incineration</td><td>Generic EN standards</td><td>Continuous</td><td>BAT 29</td></tr>
<tr><td>NH_3</td><td>When SNCR and/or SCR is used</td><td>Generic EN standards</td><td>Continuous</td><td>BAT 29</td></tr>
<tr><td>N_2O</td><td>• Incineration in fluidised bed furnaces
• When SNCR is operated with urea</td><td>EN 21258</td><td>Once every year</td><td>BAT 29</td></tr>
<tr><td>CO</td><td>Incineration</td><td>Generic EN standards</td><td>Continuous</td><td>BAT 29</td></tr>
<tr><td>SO_2</td><td>Incineration</td><td>Generic EN standards</td><td>Continuous</td><td>BAT 28</td></tr>
<tr><td>HCl</td><td>Incineration</td><td>Generic EN standards</td><td>Continuous</td><td>BAT 28</td></tr>
<tr><td>HF</td><td>Incineration</td><td>Generic EN standards</td><td>Continuous (2)</td><td>BAT 28</td></tr>
<tr><td rowspan="2">Dust</td><td>Bottom ash treatment</td><td>EN 13284-1</td><td>Once every year</td><td>BAT 27</td></tr>
<tr><td>Incineration</td><td>Generic EN standards and EN 13284-2</td><td>Continuous</td><td>BAT 26</td></tr>
<tr><td>Metals and metalloids except mercury (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Sb, Tl, V)</td><td>Incineration</td><td>EN 14385</td><td>Once every six months</td><td>BAT 26</td></tr>
<tr><td>Hg</td><td>Incineration</td><td>Generic EN standards and EN 14884</td><td>Continuous (3)</td><td>BAT 31</td></tr>
<tr><td>TVOC</td><td>Incineration</td><td>Generic EN standards</td><td>Continuous</td><td>BAT 30</td></tr>
<tr><td>PCDD/F</td><td>Incineration</td><td>No EN standard available for long-term sampling, EN 1948-2, EN 1948-3</td><td>Once every month (4)</td><td>BAT 30</td></tr>
<tr><td>Dioxin-like PCBs</td><td>Incineration</td><td>No EN standard available for long-term sampling, EN 1948-2, EN 1948-4</td><td>Once every month (5)(6)</td><td>BAT 30</td></tr>
</table>
</td></tr>
</table>

Benzo[a]pyrene	Incineration	No EN standard available	Once every year	BAT 30

(1) Generic EN standards for continuous measurements are EN 15267-1, EN 15267-2, EN 15267-3, and EN 14181. EN standards for periodic measurements are given in the table or in the footnotes.

(2) The continuous measurement of HF may be replaced by periodic measurements with a minimum frequency of once every six months if the HCl emission levels are proven to be sufficiently stable. No EN standard is available for the periodic measurement of HF.

(3) For incineration plants with a capacity of < 100 000 tonnes/year incinerating exclusively non-hazardous waste, and for plants incinerating wastes with intrinsically low and constant mercury content (e.g. sewage sludge, mono-streams of waste of controlled composition), the continuous monitoring of emissions can be replaced by long-term sampling or periodic monitoring with a minimum frequency of once every six months. In the latter case the relevant standard is EN 13211.

(4) The monitoring frequency of once every month refers to monitoring carried out by long-term sampling. For incineration plants incinerating exclusively non-hazardous waste and for incineration plants where PCCD/F emission levels are proven to be sufficiently stable, the monthly long-term sampling of PCDD/F emissions can be replaced by periodic measurements with a minimum monitoring frequency of once every six months. In this case the relevant standard for sampling is EN 1948-1.

(5) The monitoring frequency of once every month refers to monitoring carried out by long-term sampling. For incineration plants burning exclusively non-hazardous waste and for incineration plants where PCB emission levels are proven to be sufficiently stable, the monthly long-term sampling of PCB emissions can be replaced by periodic measurements with a minimum monitoring frequency of once every six months. In this case the relevant standard for sampling is EN 1948-1.

(6) Where emissions of dioxin-like PCBs are demonstrated to represent less than 20 % of the toxic equivalent of PCDD/F expressed as WHO-TEQ, the monitoring of PCBs does not apply.

Summary of comments:

1. General
   - For the following parameters: NO_x, NH_3, N_2O, CO, SO_2, HCl, HF, Dust and TVOC, add a footnote stating that Part 6 of Annex VI of the IED is taken into account (HWE-17, HWE-18, HU-21, Eurits-14), and that Part 3 and Part 8 of Annex VI of the IED do not apply when BAT 5 applies (HU-20).
   - For footnotes 2, 4 and 5, define stability of the levels of emissions as: "a level of emission is proven to be sufficiently stable when it has been demonstrated on a period of one year that the variation of the levels of emission as a daily average is low and the yearly average is below 50% of the permitted level of emission" (HU-13).

2. Substances / Parameters
   - Add a footnote to specify that only those pollutants which are present in the input waste or are expected to be formed in the overall incineration process have to be monitored (PT-6).
   - Include the monitoring of brominated dioxins and furans (PBDD/F) and mixed bromo/chloro dioxins and dibenzofurans (PXDD/F (X= Br,Cl)), with a minimum monitoring frequency of once every sixth months. Applicable when incinerating waste containing brominated flame-retardants (NO-5) or other bromine sources (SE-87).
   - Include the monitoring of brominated dioxins and furans PBDD/F) only when BAT31 technique “b” is implemented. No EN standard available, with minimum monitoring frequency of once every month (FR-747).
   - Include the monitoring of PM_{10} and $PM_{2.5}$, with a minimum monitoring frequency of once every 3 years (EEB-58, EEB-59).
   - Implement a programme to monitor the impact of the installation on the environment. This programme shall cover at least the deposition of PCDD/F and metals (EEB-114).

3. Standards
   - Add a footnote to specify that the requirements of the standard on AMS quality assurance exclude the data acquisition and handling system (DAH) from the calculation of the measurement uncertainty (FEAD-235, CEWEP-ESWET-604).
   - Add a footnote to specify that the standards have limitations. When used

outside the limitations of application, the results should be interpreted with caution (E&P-15).

- Add a footnote to specify that uncertainties requested by the standards are in general not achievable with available monitoring techniques at most BAT-AELs (CEWEP-ESWET-605, CEWEP-ESWET-606, FEAD-240, FEAD-762), or at low concentration levels. (FR-722).
- Add that the performances of monitoring instruments available on the market often do not allow meeting the uncertainty requirements of the standards with the ELVs of IED annex VI. Problems will increase with lower ELVs (FEAD-241, CEWEP-ESWET-607).
- Check with experts of CEN and competent authorities if any values of the proposed BAT-AEL ranges comply with the standards (FEAD-133, CEWEP-ESWET-603).
- Add a generic footnote to specify that many QAL2 tests have problems with the variability test or provide unrealistic calibration functions, although they successfully passed the variability test. These problems will increase with lower ELVs (FEAD-240, CEWEP-ESWET-606).
- Add standard EN 14792 for NO_X (AT-8).
- Add standard EN 15058 for CO (AT-9).
- Add standard EN 14791 for SO_2 (AT-10).
- Add standard EN 1911 for HCl (AT-11).
- Add standard EN 12619 for TVOC (AT-12).

4. Minimum monitoring frequency
    - Add a footnote for all parameters to reduce the monitoring frequency to once per year in the cases where the emission levels are proven to be low and stable (PT-7) or in the absence of widely fluctuating loads (CEFIC-32, CEFIC-33).
    - Add a footnote stating that the monitoring frequency does not apply when plant operation would be for the sole purpose of performing an emission measurement (Eurelectric-22).

5. N_2O
    - Delete the monitoring of this pollutant (CEWEP-ESWET-594), or if it is not deleted include the generic EN standards in the column "Standard(s)" (Eurelectric-30).
    - Add the continuous measurement of this pollutant and refer to the related generic EN standards (FI-4).

6. HCl, SO_2, HF, NH_3
    - Add a footnote for continuous monitoring of SO_2, HCl, HF and NH_3, containing the same exceptions as in IED chapter IV and annex VI, if the operator can prove that the emissions of those pollutants can under no circumstances be higher than the BAT-AELs (E&P-9, SE-72, SE-73, SE-74, SE-75).
    - Add a footnote for continuous monitoring of SO_2, HCl and HF containing the same exceptions as in IED chapter IV (Articles 45(1)(e), 48(3)) and annex VI Part 6, points 2.3, 2.5 and Part 8, Point 1.3 of the IED (NO-4).
    - Add a footnote for SO_2 to allow periodic measurement once every year instead of continuous monitoring, if the operator can prove that the emissions can under no circumstances be higher than the prescribed emission limit values (Eurelectric-24).
    - Add a footnote for NH_3 to allow plants equipped with SCR to replace the continuous monitoring by periodic monitoring with a minimum frequency of once every six months (AT-7, FEAD-236), or once every year if the emission levels are proven to be sufficiently stable (Eurelectric-23).
    - Apply footnote ([2]) also to HCl (Eurelectric-25, Eurelectric-26) and lower the minimum monitoring frequency to once every year (CEFIC-28).
    - Modify footnote ([2]) to add for the condition to derogate from continuous monitoring of HF should be both stable HCl emissions, and the use of calcium-based FGC, (IMA Europe-17).
    - Delete footnote ([2]) because the term "sufficiently stable" is very subjective and does not give any clarity to operators or permitting authorities (Eurits-10).

7. Dust
   - Include the monitoring of diffuse dust emissions at bottom ash treatment plants, and add a footnote with the details of the measuring points (FEAD-238, FR-512, CEWEP-ESWET-596).
   - For bottom ash treatment, reduce the monitoring frequency from once every year to once every three years (FIR-14) if the emission levels are proven to be sufficiently stable (CEFIC-30).
   - In the second column of the table, replace "Bottom ash treatment" by "Bottom ash treatment channelled emissions" (FEAD-238, FR-512, CEWEP-ESWET-596).

8. Metals
   - Allow reducing the monitoring frequency to once every year if the emission levels are proven to be sufficiently stable (Eurelectric-31, CEFIC-31).

9. Hg
   - In the column "standards", specify that there is no available EN standard for long-term sampling (IT-12).
   - Delete footnote (3) so that no exemption from continuous monitoring is allowed (EEB-55).
   - Modify footnote (3) in order to:
     - Change the capacity threshold from 100 000 t/year to 6 t/hour (Eurits-11), or delete the capacity threshold (FEAD-11) or delete the capacity threshold and the exclusively non-HW (SE-79), or change the "and" after capacity threshold with "or" CEWEP-ESWET-608).
     - Allow periodic measurement only when Hg emissions are verifiably below 20% of the BAT AEL. (AT-13).
     - Do not link the exemption from continuous monitoring to the size of the plant. The quality of the waste input and the design of the gas cleaning system have to be taken into account instead (DE-28).
     - Delete the words "exclusively non-hazardous waste" (PT-8, CEFIC-29).
     - Include in the conditions of the footnote the regular verification of the low and constant mercury content in the waste (Eurits-12).
     - Allow periodic measurements instead of continuous monitoring when the emission levels are proven to be sufficiently stable (CZ-7, E&P-10, UK-58), or lower than 90 % of the BAT-AEL (PL-2), or below 20% of the BAT-AEL (AT-13, CEFIC-29), or when the mercury emission levels are significantly lower than the applicable limit value and predominantly close to the lower end of the applicable BAT-AEL (Eurelectric-32).
     - Allow the frequent analysis of time-integrated samples, as an alternative to continuous measurement, upon request by the operator (CZ-8, CZ-31, E&P-11, Eurelectric-28).

10. PCDD/F and Dioxin-like PCBs
    - Delete the long-term sampling of PCDD/F and replace it by periodic sampling according to EN 1948-1 (AT-14), and with a monitoring frequency of every six months. If not, introduce reference to CEN/TS 1948-5:2015 (CEWEP-ESWET-601, CEWEP-ESWET-602).
    - Keep the monitoring frequency set in Annex VI, Part 6, Point 2.1 c. of the IED (DE-29, DE-30).
    - To be consistent with the BAT-AELs set in BAT 30, add in the column of Minimum monitoring frequency "Once every six months or once every month" (IT-13, IT-14).
    - In footnotes (4) and (5), change "exclusively non-hazardous waste" by "predominantly non-hazardous waste" (Eurelectric-33, Eurelectric-34), or delete the words "exclusively non-hazardous waste" (CEFIC-29, PT-9, PT-11).
    - Change the wording of footnotes (4) and (5) as follows: "..incineration plants which do not incinerate municipal waste but exclusively waste with intrinsically low and constant amounts of copper, chloride and chlorinated substances.." in order not to exclude MSW from the obligation to use long term sampling of PCDD/F and dioxin-like PCB´s (SE-91, SE-92).

	• Modify footnote (4) in order to: o Delete the exemption to monitor by periodic measurements (FR-723). o Delete footnote (4) or clarify the meaning of "sufficiently stable" (Eurits-13). o As a condition to allow the replacement of long-term sampling by periodic monitoring, require checking that the emission levels are sufficiently stable by analysing long-term samples with at least monthly frequency during one year. This procedure shall be repeated every 5 years (EEB-82). o Allow periodic monitoring when the emission levels are proven to be sufficiently stable, with a sample to be required each time there is a relevant change of the fuel and/or on the characteristics of the waste, but at least once every six months (CZ-9, E&P-12). • For dioxin-like PCBs: o Delete the monitoring of dioxin-like PCBs (PT-10). o Add a footnote specifying that when the BAT-AEL does not apply, the monitoring does not apply (FI-5, CZ-30, Eurelectric-27). o Delete footnote (6) (Eurits-15, HWE-15, FR-648). o Add a footnote to modify the monitoring from monthly long-term sampling to periodic measurements each time that a change of the fuel/waste characteristics may have an impact on the emissions, and in any case at least once every six months when the emission levels are proven to be sufficiently stable (CZ-10, E&P-13, Eurelectric-29) 11. Benzo(*a*)pyrene: • Delete monitoring requirement (FEAD-136, CEWEP-ESWET-595, CZ-32, Eurelectric-35) • Include a footnote to provide flexibility on this monitoring requirement, and specify in which specific situations Benzo(a)pyrene should be monitored in addition to PCDD/F, which is the critical substance (PT-12).
EIPPCB assessment:	1. General • The averaging period for each BAT-AEL is shown in the same table where the corresponding BAT-AEL is set. • BREFs or BAT conclusions cannot establish exemptions for the IED. The setting of national general binding rules and/or permit-level ELVs based on the BAT-AELs is an implementation issue. • For the definition of "Stability of the levels of emissions" see Section 1.1.3.1. This is an implementation issue. 2. Substances / Parameters • Because of the heterogeneity of the waste, it is unlikely that the presence of pollutants in the input waste can be excluded, unless in specific cases such as, for instance, plants where only mono-streams of waste of a well-known elemental composition are incinerated. • No data have been collected via the questionnaires for emissions of brominated dioxins and furans, or of mixed bromo/chloro dioxins and dibenzofurans. However, since PCDD/F and PXDD/F (X= Br,Cl) follow the same or similar formation pathways, it is expected that the techniques that control PCDD/F also control brominated dioxins and furans, and mixed bromo/chloro dioxins and dibenzofurans. Low emissions of PCDD/F should therefore be associated with low emissions of PXDD/F too. • PM_{10} and $PM_{2.5}$ were not considered a KEI at the KoM, so no data were collected through the questionnaires. The report attached to the comments EEB-58 and EEB-59 "Air Pollution from Waste Disposal: Not for Public Breath. From Zero Waste Europe-November 2015" shows five cases of cement plants and MSW plants where some ELVs have not been complied with, but no specific justification for the monitoring of PM_{10} and $PM_{2.5}$ is provided therein. Furthermore, it is not clear whether the comment applies to channelled or diffuse emissions to air. • Consideration of the environmental impacts from the eventual decommissioning of the plant, at the stage of plant design and throughout its operating life, is included as a part of the environmental management system in BAT 1.

3. Standards
   - The range in which each standard has been tested is described in its scope or in a specific section. As these limitations are clearly identified in each standard, there is no reason to repeat them in the BAT conclusions.
   - Among the reference lines that were part of the 2016 data collection, a significant number already have in their permit an ELV equal to or below the higher end of the BAT-AEL range proposed in D1: 14% of the reference lines for HCl, 17% for dust, 34% for NO_X, 70% for NH_3, 15% for Hg and 19% for SO_2. Moreover, test laboratories (responsible for implementing QAL 2) have to fulfil all the requirements set in the standards, including the uncertainty levels, to be accredited for a specific standard. Therefore, with the available monitoring techniques, the setting of permit ELVs within the ranges of the proposed BAT-AEL ranges is considered an implementation issue that has already been addressed in practice at the level of several Member States.
   - Standards EN 14792, EN 15058, EN 14791, EN 1911 and EN 12619 are for periodic measurements, not for continuous measurements.

4. Minimum monitoring frequency
   - For the assessment of comments regarding exemptions from the minimum monitoring frequency, see the following pollutant-specific points.
   - If a plant is not operating, there is indeed no reason to monitor any channelled emissions to air.

5. N_2O
   - The environmental objective of BAT 29 is to reduce NO_X emissions to air while limiting the emissions of CO and N_2O. Even if no BAT-AELs are set for N_2O emissions, ensuring that the emissions of this pollutant are limited requires an appropriate monitoring.
   - Continuous measurement fulfils the minimum monitoring frequency of once every year.
6. HCl, SO_2, HF, NH_3
   - The 2016 data collection shows that the continuous monitoring of HCl and SO_2 is performed in nearly all cases (97% and 98% of the reference lines for HCl and SO_2, respectively). Around 63% of the reference lines measure NH_3 continuously; NH_3 is both an important parameter for the correct functioning of the de-NO_X system and considered a KEI for the WI sector, as concluded by the KoM of this BREF review. Only 37% of the reference lines of the 2016 data collection measure HF continuously; HF emissions are usually low when HCl emissions are well controlled, and this pollutant was not considered a key environmental issue for the WI sector by the KoM of this BREF review.
   - NH_3 emissions are linked to NO_X emissions when SNCR and/or SCR is used, to the good mixing of the two compounds within the reactive temperature window, and to the activity of the catalyst. Increased NH_3 emissions can for instance provide a useful indication of catalyst deactivation. It is therefore considered appropriate to monitor both NH_3 and NO_X emissions continuously. While SCR usually achieves low NH_3 slip levels, the 2016 data collection also shows examples of reference lines fitted with SCR and with NH_3 emission levels above the proposed BAT-AEL range (see for instance DE76-3, FR27, FR77, FR083-1, FR084-2).
7. Dust
   - BAT is to avoid or reduce diffuse dust emissions coming from the treatment of bottom ashes by including in the EMS the diffuse dust emissions management features of BAT 23 bis and by applying the techniques listed in BAT 23 ter. There is an EN standard (15445) for the qualification of fugitive emission rates of diffuse fine and coarse dust sources of industrial plants or areas. To properly address diffuse dust emissions from IBA treatment, the principles set for the NFM sector can be used.
   - Dust is the main pollutant released to air at bottom ash treatment plants, and dust emission levels are an indication of the adequacy of the emission reduction techniques installed in the plant. No specific rationale was provided to support the reduction of the monitoring frequency to once every three years.
   - It could be clarified in the BAT statement that BAT 5 applies to channelled emissions to air.

8. Metals
   - 91% of the reference lines that reported data in the 2016 data collection measured metals more than twice during the reference year.

9. Hg
   - The table under BAT 5 specifies the monitoring standards for the main monitoring option considered. The monitoring standards applying where a lower monitoring frequency may be applicable are reported in footnotes.
   - The continuous monitoring for Hg is nowadays commercially available and supported by considerable operational experience. It is recognised however that the continuous monitoring of mercury is not standard practice everywhere (around 28% of the reference lines of the 2016 data collection reported monitoring mercury continuously), and that it comes with additional costs and operational complexity, justifying the consideration of flexibility in cases where the likelihood of mercury peaks is intrinsically very low.
   - A threshold of 100 000 tonnes/year was proposed in order to provide some flexibility for smaller incineration plants which incinerate exclusively non-hazardous waste, for which the economic and operational effort required for investing in continuous mercury monitoring could be more onerous, and taking into account the lower annual emission load that can be expected compared to larger plants. However, it is also to be taken into consideration that continuous mercury monitoring is key to enabling the implementation of operational protocols to prevent or limit the consequences of mercury breakthrough, and that mercury peaks at MSWI plants can be related to e.g. illegal waste deliveries, the risk of which is not necessarily related to any specific plant size.
   - Plants incinerating hazardous waste are not excluded from the application of footnote (3), as long as they incinerate wastes with low and constant mercury content. The example of mono-streams of waste with a known composition may for instance be representative of the situation of certain plants incinerating specific types of HW at chemical sites.
   - The exact definition of, and the specific way to verify, the low and constant mercury content are implementation issues.
   - Footnote (3) allows the long-term sampling or periodic monitoring of mercury instead of continuous measurement, based on the intrinsic mercury content of the waste. This ensures that the likelihood that an emission peak occurs is low. Applying the same footnote on the basis of the emission levels measured at the stack by periodic monitoring, however, does not provide a comparable assurance in view of the heterogeneity of the waste.
   - The alternatives set in footnote (3) to continuous monitoring are long-term sampling and periodic monitoring, with preference for those methods that have EN standards. According to Article 14.2 of the IED, other alternative monitoring could be possible under the responsibility of the competent authority.

10. PCDD/F and Dioxin-like PCBs
   - Article 48.5 of the IED makes clear reference to the objective to measure PCDD/F emissions continuously as soon as appropriate measurement techniques are available.
   - The method proposed is long-term sampling, since it enables a better accounting of the total emitted loads. However, when the conditions of footnote (4) are fulfilled, the same monitoring frequency set in Annex VI, Part 6, Point 2.1 c, of the IED for periodic measurements has been kept.
   - The minimum monitoring frequency associated with alternative methods is indicated in a footnote where the alternative method and the conditions for its application are also reported.
   - Considering that the long-term sampling of PCDD/F entails some additional costs compared with periodic monitoring, it could be appropriate to provide some flexibility for plants demonstrating stable emissions of PCDD/F.
   - Plants incinerating hazardous waste are not excluded from footnotes (4) and (5), as long as their PCDD/F and/or dioxin-like PCB emission levels are proven to be sufficiently stable.
   - Indeed the problem of dioxin formation is not an issue associated only with hazardous wastes.

	• Considering that the process of dioxin formation is highly dependent on the conditions in the furnace, in the boiler, and in the higher temperature section of the FGC system, it seems practically difficult to demonstrate where the metal and chlorine input levels in the waste are sufficiently low to ensure low PCDD/F emissions. In any case, the condition of emission levels being sufficiently stable is broad enough to also encompass the cases where the waste composition is narrow enough to provide such assurance. • The procedure to demonstrate that the emission levels are "sufficiently stable" is an implementation issue. Considering that footnotes (4) and (5) already provide flexibility for the monitoring frequency in the case of sufficiently stable emissions, the added value of a monitoring frequency condition based on a change of the fuel/waste characteristics is not clear. • At the kick-off meeting it was agreed by the TWG that the emission of dioxin-like PCBs was to be considered a potential KEI. Footnote (6) provides for the flexibility to omit this measurement, if it is demonstrated that the emitted levels are of minor relevance compared with the emissions of PCDD/F; until this is demonstrated, the measurement of dioxin-like PCBs should be carried out. • Footnote (6) provides that the monitoring of PCBs does not apply when their overall contribution to the WHO-TEQ is below 20 %. This is to avoid the additional burden of a more complex sample preparation and analysis where not justified on environmental grounds. • Footnotes (4) and (5) are equivalent and can be merged into one by avoiding mentioning the specific pollutant. 11. Benzo(*a*)pyrene • An associated monitoring is proposed in each case where a BAT-AEL is set, and also for parameters that could be considered relevant environmental issues but for which the data collected do not yet allow BAT-AELs to be set.
EIPPCB proposal:	1. General • Clarify in the BAT statement that the scope of BAT 5 is the monitoring of channelled emissions to air. • As a minor editorial, align the text with the definitions of the BAT conclusions. 2. Substances / Parameters • In the BREF chapter on concluding remarks and recommendations for future work, mention the collection of information on channelled emissions to air of brominated dioxins and furans, and mixed bromo/chloro dioxins and dibenzofurans, for the next BREF review. 3. Standards • Keep the reference to standard methods unchanged. 4. Minimum monitoring frequency • Add a footnote specifying that the monitoring frequency does not apply when plant operation would be for the sole purpose of performing an emission measurement. 5. N_2O • Add a footnote to mention the standard that is applicable in the case of continuous monitoring. 6. HCl, SO_2, HF, NH_3 • Keep the monitoring unchanged. 7. Dust • No changes to BAT 5, but add a new BAT 23bis for the reduction of diffuse dust emissions from bottom ash treatment through the inclusion in the EMS of diffuse dust emission management features. 8. Metals • Keep the monitoring unchanged.

	9. Hg - In footnote (3), delete the applicability to plants incinerating exclusively non-hazardous waste with a threshold of 100 000 t/year, and keep the applicability of the footnote to those waste incineration plants incinerating wastes with a low and constant mercury content. - In footnote (3), add that there is no EN standard available for the long-term sampling of mercury. 10. PCDD/F and Dioxin-like PCBs - Modify footnotes (4) and (5), so that the replacement of long-term sampling with periodic measurements is based only on the emission levels being proven to be sufficiently stable, and remove the condition related to incinerating exclusively non-hazardous waste. - Merge footnotes (4) and (5). 11. Benzo(*a*)pyrene - Keep the monitoring unchanged.

1.3.3 Emissions during OTNOC

Location in D1:	*P. 687 – Section 5.1.2*
Current text in D1:	**BAT 6. BAT is to appropriately monitor emissions from the incineration plant during OTNOC.** **Description** The monitoring can be carried out by direct emission measurements or by monitoring of surrogate parameters if this proves to be of equivalent or better scientific quality than direct emission measurements. Emissions during start-up and shutdown while no waste is being incinerated may be estimated based on at least one measurement campaign per year carried out during a planned start-up/shutdown operation.
Summary of comments:	1. General - Delete BAT 6 in order to align the document with WT BREF and other BREFs (ES-8), or because of the existing requirements in Chapter IV in the IED (Eurits-16, HWE-19, HU-23), or because measurements in the period excluded from EOT by IED Annex VI (start-up and shut-down without combustion of waste) will not provide anything else than natural gas or fuel oil emissions (FEAD-139). - Clarify the definition of OTNOC and the scope of monitoring during OTNOC to avoid ambiguity (PL-18). 2. Description: - Clarify which measurements and surrogate parameters have to be monitored and delete the demand to monitor during start-up and shut-down periods (FI-6). - Add the option to monitor the air emissions of pollutants continuously measured in accordance with BAT 5 by direct emission measurements or by monitoring of surrogate parameters if this proves to be of equivalent or better scientific quality than direct emission measurements (Eurelectric-36). - Include that measurements could be estimated based on one measurement campaign after commissioning or after relevant retrofits (CEWEP-ESWET-609) and describe the measures adopted to limit emissions during start-up without waste (DE-33). - Delete the sentence linked to the monitoring during start-up and shutdown operations, or include that monitoring during these periods does not imply measurements (CZ-33, Eurelectric-37). - Delete the option to carry out discontinuous measurements during OTNOC (AT-15, CEFIC-34, CEWEP-ESWET-609).

	• For the measurement campaign, clarify which are the relevant pollutants and how to monitor them (DK-5). • Add the following parameters for monitoring during the periodic campaign: TOC, CO, NO_x, dust, PCDD/F and PCB (EEB-56), and the parameters for which there are BAT-AELs in this BAT conclusion and specially TOC, CO and PCDD/F during OTNOC when waste is being incinerated (SE-80).
EIPPCB assessment:	1. General: • The monitoring of emissions to air during OTNOC is part of the OTNOC management plan to gather information of emissions during OTNOC, in order to assess the emission loads associated with these operating conditions and enable the improvement of the overall environmental performance. This BAT is already in the LCP BAT conclusions. • The EIPPCB has tried to propose a list of possible OTNOC. But the experience brought by the WI TWG members made it clear that the definition of OTNOC is case-specific and it is not possible to compile a complete list of possible cases. Moreover, an "OTNOC subgroup" was created after the informal meeting of the WI TWG which took place on 4-5 December 2017, to propose a non-exhaustive list of plant operations specific to the waste incineration sector that are considered OTNOC. This subgroup included different members of the WI TWG representing Member States, industry and NGO. The subgroup only unanimously agreed on two situations that should be considered OTNOC (start-up and shutdown, if no waste is being incinerated). 2. Description • The pollutants to be measured during OTNOC are appropriately determined by the competent authority. Measuring the pollutants that are monitored continuously should in general be possible. Measuring the re-emission of PCDD/F emissions at start-up is also considered of high relevance from the environmental point of view. • Surrogate parameters can be used where there are technical challenges to performing direct emission measurements. The description of BAT 6 gives the option to monitor by direct emission measurements or by surrogate parameters. • The purpose of BAT 6 is to monitor channelled emissions during OTNOC to gather relevant emission data in order to potentially reduce emissions to air during OTNOC. • Techniques to reduce emissions during OTNOC are addressed in BAT 19. • Indeed, some pollutants cannot be measured by continuous measurements (e.g. metals, PCDD/F). Therefore, it is an option to coordinate a periodic monitoring campaign to measure those pollutants during a planned start-up and shutdown period.
EIPPCB proposal:	1. General • Refer to channelled emissions to air. 2. Description • Indicate example parameters that are monitored during OTNOC.

1.3.4 Emissions to water: monitoring frequency and standards

<table>
<tr><td>Location in D1:</td><td>P. 687 – Section 5.1.2</td></tr>
<tr><td>Current text in D1:</td><td>
BAT 7. BAT is to monitor emissions to water from FGC and/or bottom ash treatment with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.
<table>
<tr><th>Substance/Parameter</th><th>Process</th><th>Standard(s)</th><th>Minimum monitoring frequency</th><th>Monitoring associated with</th></tr>
<tr><td>Total organic carbon (TOC)</td><td>FGC
Bottom ash treatment</td><td>EN 1484</td><td>Once every month</td><td>BAT 34</td></tr>
<tr><td>Total suspended solids (TSS)</td><td>FGC
Bottom ash treatment</td><td>EN 872</td><td></td><td></td></tr>
<tr><td>As</td><td>FGC</td><td>Various EN standards available (e.g. EN ISO 11885 or EN ISO 17294-2)</td><td></td><td></td></tr>
<tr><td>Cd</td><td>FGC</td><td></td><td></td><td></td></tr>
<tr><td>Cr</td><td>FGC</td><td></td><td></td><td></td></tr>
<tr><td>Cu</td><td>FGC</td><td></td><td></td><td></td></tr>
<tr><td>Mo</td><td>FGC</td><td></td><td></td><td></td></tr>
<tr><td>Ni</td><td>FGC</td><td></td><td></td><td></td></tr>
<tr><td>Pb</td><td>FGC
Bottom ash treatment</td><td></td><td></td><td></td></tr>
<tr><td>Sb</td><td>FGC</td><td></td><td></td><td></td></tr>
<tr><td>Tl</td><td>FGC</td><td></td><td></td><td></td></tr>
<tr><td>Zn</td><td>FGC</td><td></td><td></td><td></td></tr>
<tr><td>Hg</td><td>FGC</td><td>Various EN standards available (e.g. EN ISO 12846 or EN ISO 17852)</td><td></td><td></td></tr>
<tr><td>NH_4-N</td><td>Bottom ash treatment</td><td>Various EN standards available (i.e. EN ISO 11732, EN ISO 14911)</td><td></td><td></td></tr>
<tr><td>Chloride (Cl^-)</td><td>Bottom ash treatment</td><td>Various EN standards (i.e. EN ISO 10304-1, EN ISO 15682)</td><td></td><td></td></tr>
<tr><td>SO_4^{2-}</td><td>Bottom ash treatment</td><td>EN ISO 10304-1</td><td></td><td></td></tr>
<tr><td>PCDD/F</td><td>FGC
Bottom ash treatment</td><td>No EN standard available</td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>
1. <u>General</u>
• Clarify the applicability of BAT 7 to direct or indirect discharges (PT-13, CEFIC-35, Eurelectric-39, CEWEP-ESWET-617).
• Delete BAT 7 because emissions to water are not a KEI for the WI sector (FEAD-207).
2. <u>Standard methods</u>
• Introduce a general footnote to the table indicating that the standards have
</td></tr>
</table>

	limitations. When used outside these limitations, the results should be interpreted with caution (Eurelectric-41, SE-53, CEWEP-ESWET-610). 3. Monitoring frequency • Use the "4 out of 5 method" as an alternative to the monitoring frequency (Eurelectric-39, CEWEP-ESWET-618). • Reduce the monitoring frequency to once a year, in the cases where the emission levels are low and stable and/or when the amount of liquid effluent generated is low (PT-15, CEFIC-36). For the following parameters reduce the monitoring frequency to once every three months: TSS, As, Pb, Cd, Cr, Cu, Ni, Hg, Tl and Zn (AT-84). • Only require the monitoring of the pollutants that are present in the input waste or are expected to be formed in the incineration process (PT-14). • Delete the monitoring requirement for bottom ash treatment plants if no discharge is made during the time period (UK-141). • Reduce the monitoring frequency for PCDD/F in waste water to the frequency set in Part 6 of Annex VI of IED (CEWEP-ESWET-611) or to once every six months, if the emission levels are proven to be sufficiently stable (AT-84). 4. TOC • Limit the measurement of TOC to bottom ash treatment plants. Do not include the measurement of TOC for FGC because it is not in IED Annex VI (CZ-34, Eurelectric-38). 5. Metals/metalloids • Require the monitoring of metals from FGC only for those metals for which BAT-AELs are set, i.e. those listed in Table 5.8 (Eurelectric-40, E&P-14, CEWEP-ESWET-613, CEWEP-ESWET-614). 6. Bottom ash treatment • Clarify that bottom ash treatment plants treat both slags and/or bottom ashes (DK-14). • Add that the applicability is restricted to water directly emitted to a receiving water body and coming from the treatment and storage zone, once treated according to BAT 34 (CEWEP-ESWET-612). • Cover the monitoring of emissions to water from bottom ash treatment under BAT 8 (DE-39). • Add all the metals monitored in the waste water from FGC also for bottom ash treatment (Eurits-17). Add the monitoring of the following pollutants: As, Al, Cr (VI), Cu, Mo, Ni, Pb, Sn, Tl, Zn, Hg, Na and F (UK-129). • Do not require the monitoring of chloride since no BAT-AEL is set in Table 5.8 (CEWEP-ESWET-615). • Delete the monitoring of PCDD/F because of insufficient data availability (FIR-7, CEWEP-ESWET-616, CEWEP-ESWET-617, UK-129, DE-40).
EIPPCB assessment:	1. General • Article 46.4 of the IED already requires the measurement of emissions to water from FGC both in the case of direct and indirect discharges. • BAT 7 sets the monitoring frequency and preferred standard methods associated to the BAT-AELs of BAT 34. 2. Standard methods • The limitations for each standard are described in its scope or in a specific section. The way in which results outside the boundaries of the standards are interpreted is an implementation issue. 3. Monitoring frequency • The proposal to change the monitoring frequency using the "4 out of 5 method" refers in fact to a compliance assessment method. This is an implementation issue. • For PCDD/F and for emissions from IBA treatment plants, analogously to other BAT conclusions, flexibility in the monitoring frequency could be considered when the emission levels are proven to be sufficiently stable. For WI plants, however, Annex VI to the IED already sets minimum (monthly) monitoring frequencies for most pollutants from the incineration of waste. • Because of the heterogeneity of the waste, it is unlikely that the presence of pollutants in the input waste can be excluded, unless in specific cases such as plants where only mono-streams of waste of a well-known elemental composition are incinerated.

	• A measurement is not needed when no water is discharged and therefore there are no emissions to water. This is an implementation issue. • Annex VI to the IED already requires daily measurements of TSS, leaving the possibility to carry them out as daily spot sample measurements, 4. TOC • At the KoM, the TWG concluded to collect data for TOC in waste water. TOC is a relevant parameter for the water discharged, and is an indicator for the incineration process. 5. Metals/metalloids • The TWG subgroup on questionnaire development decided to include the collection of data on Mo and Sb because this subgroup considered Mo and Sb relevant for the WI sector. However, due to the limited available data, no BAT-AEL is proposed for Mo. This pollutant is included in the list of pollutants to be monitored, also with a view to improving the data situation at the next BREF review. • EN ISO 15586 is an additional standard method for the analysis of metal/metalloid concentrations in water, which has been mentioned in other BAT conclusions (e.g. WT). 6. Bottom ash treatment • The definition of bottom ash treatment plant in the Definitions section clearly also includes plants treating slags. • The relevant sources of waste water from bottom ash treatment are the treatment and storage areas. • It is appropriate to group all the standards and monitoring frequencies for emissions to water in the same table, as in the case of emissions to air. • The WI TWG subgroup on residues concluded to collect emission data from bottom ash treatment plants only for lead, not for other metals. • One of the objectives of wet bottom ash treatment techniques is the reduction of the salt content in the bottom ashes, by transferring the salts to the water phase. The chloride concentration is a meaningful parameter to evaluate the content of salts transferred to waste water and is usually monitored. • PCDD/F are priority substances under the Water Framework Directive. The monitoring of PCDD/F emissions to water from IBA treatment is related to the PCDD/F BAT-AEL set. The PCDD/F emissions reported in the data collection are in the range 0.017 – 0.03 ng I-TEQ/l, which is generally in the same range as PCDD/F emissions reported from wet FGC systems' wastewater.
EIPPCB proposal:	1. General • Keep BAT 7 with the improvements mentioned below. 2. Standard methods • Keep the reference to standard methods unchanged. 3. Monitoring frequency • Change the minimum monitoring frequency for TSS to daily, with a footnote allowing the use of spot sampling. • Add a footnote to adapt the monitoring frequency for IBA treatment plants and for emissions of PCDD/F to the stability of emissions over time. 4. TOC • Keep the parameter unchanged. 5. Metals/metalloids • Keep the parameters unchanged. • Add EN ISO 15586 to the list of standard methods. 6. Bottom ash treatment • In the BREF chapter on concluding remarks and recommendations for future work, mention the collection of data on the presence of metals in waste water from bottom ash treatment.

1.3.5 POP destruction efficiency for the incineration of HW

Location in D1:	*P. 688 – Section 5.1.2*
Current text in D1:	**BAT 9. For the incineration of hazardous waste containing POPs, BAT is to monitor the POP destruction efficiency at least once every year in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.** **Description** The POP destruction efficiency is determined by analysing the POP content in: • waste prior to incineration; • incineration slags and bottom ashes; • fly ashes and dry FGC residues; • waste water from FGC and in the related waste water treatment sludge; • flue-gas. **Applicability** Only applicable if the POP levels in the wastes prior to incineration exceed the concentration limits defined in Annex IV to Regulation (EC) No 850/2004 as amended by Commission Regulation (EU) No 756/2010.
Summary of comments:	1. <u>General statement</u> • Delete BAT 9 because: o The determination of the destruction efficiency is purely theoretical (DE-1). o There are no feasible and reliable methods to determine POPs in all the required media (FI-8, Eurelectric-42, CEWEP-ESWET-621, FEAD-48, CEFIC-38). o The list of POPs is continuously changing (CEWEP-ESWET-621, FEAD-48). o It is not possible to study the continuous feeding of a POP into a kiln for POPs in non-liquid waste (CEWEP-ESWET-621, FEAD-48). o There is no protocol to comply with such a BAT (CEWEP-ESWET-621, FEAD-48). o The destruction efficiency is ensured by design of the incinerator in accordance with the requirements of the IED (PT-17, CEFIC-38). o The system of test-run and destruction removal efficiency measurements has shown to be expensive while being difficult to manage in term of lab results (FEAD-48). o Lack of data to set this BAT conclusion (CEFIC-38). • Delete BAT 9 and amend the description of the design and operation of the plant in BAT 10 with references to guidelines under the Basel Convention. (E&P-17). • Replace the monitoring of the POP destruction efficiency by the monitoring of the POP content in the output streams at least once every three years, and to thoroughly monitor only in a small number of installations (AT-16, SE-107), or at least once every month and if the POP concentration values in the output streams exceed the respective limits of detection, the operator should conduct an investigation to ensure the installation is fit-for-purpose for the received waste (EEB-98). • Require the monitoring of POPs not only for HW but also for the rest of waste incineration plants (NO-6), and make a computational fluid dynamic analysis to show that temperature, residence time and turbulence are as required (DK-88). • Exclude clinical waste from the scope of this BAT conclusion, because of the dangers linked to the analysis of this sort of waste (CEWEP-ESWET-620). • Modify the BAT conclusion for the regular, long-term measurements of the destruction efficiency and destruction removal efficiency only where hazardous waste is thermally treated in a plant not specifically designed for that waste, in

	order to verify that the destruction efficiency is the same as the level ensured by a dedicated plant (Eurits-52). 2. Applicability - Delete the whole section on applicability because only the performance of incineration processes which are not intended for the destruction of POPs (such as MSWI) needs to be checked, and not the performance of processes which are deliberately built for POP destruction such as high-temperature rotary kilns equipped with a post-combustion chamber (Eurits-20). - Correct the reference to the POPs legislation taking into account the subsequent amendments to Regulation (EC) No 850/2004. (NO-8, SE-104) - Add that certain POPs can be excluded from the monitoring if their content in the output streams from the plant are proven to be sufficiently low and stable (NO-7). 3. Other - Delete in the description section the bullet point "waste prior to incineration" (NO-7) - Propose a recommendation for future work or create a small task force among the TWG members in a limited time in order to propose a complete rewording of the BAT 9 (HWE-22, HU-26) or conduct a study on the knowledge of circumstances where POPs are efficiently destroyed and the *de novo* synthesis is limited (DK-90).
EIPPCB assessment:	1. General statement - The UNEP technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants (version 29 June 2017) make reference to several examples of destruction efficiency determination, not only theoretical but also experimental. One of the most recent ones is a study of the German Federal Environmental Agency of 2015. Also, Germany provided the report "Destruction of the flame retardant hexabromocyclododecane in a full-scale municipal solid waste incinerator". - The UNEP guidelines recalled above also recognise that the destruction efficiency is an important criterion to assess the performance of technologies for the destruction and irreversible transformation of POPs, but that it can be challenging to measure it in a reproducible and comparable manner. - Since the destruction efficiency depends on plant design, it can be determined when the plant is put into operation and when changes occur that can affect it. For reasons of proportionality, the focus of this BAT conclusion is the incineration of hazardous waste and in particular the proper destruction of the POPs that can be contained therein. - Computational fluid dynamics is one of several possible tools available to achieve the objectives of BAT 15 c (optimisation of the incineration process). - The definition of hazardous waste in these BAT conclusions excludes clinical wastes. - The UNEP guidelines already provide design criteria for plants incinerating POPs. Where these criteria are met, the achievement of the destruction efficiency levels set in the UNEP guidelines could be assumed to be ensured. 2. Applicability. - Plants meeting the design criteria of the UNEP guidelines can be assumed to reach high levels of destruction efficiency. - Amendments to the POP regulation have resulted in updates of the list of POPs and are worth mentioning. - The adjustment of the monitoring frequency on the condition of a low and stable concentration of POPs is not relevant if the monitoring is carried out only at the commissioning of the plant and after a significant change. 3. Other - The description section is a repetition of the General considerations section and is therefore not needed.

	• UNEP is the body in charge of collecting information and updating guidelines on the treatment of waste containing POPs. In this context, several studies have been conducted (see e.g. the German Federal Environmental Agency 2015 report mentioned above).
EIPPCB proposal:	1. General statement • Determine the destruction efficiency only when the plant is put into operation and when changes are made that may affect the destruction efficiency. 2. Applicability • Restrict the monitoring of destruction efficiency to plants that do not meet the UNEP HWI plant design criteria. 3. Other • Delete the description section proposed in D1. • Amend the description to provide flexibility in the determination of the destruction efficiency taking into account the studies already performed, e.g. by basing it on a single incineration-recalcitrant POP or by the use of indirect methods.

1.4 General environmental and combustion performance

1.4.1 Waste stream management plan for WI plants

<table>
<tr><td>Location in D1:</td><td><i>P. 688-689 – Section 5.1.3</i></td></tr>
<tr><td>Current text in D1:</td><td>BAT 10. In order to improve the overall environmental performance of the incineration plant, as part of the waste stream management plan (see BAT 1), BAT is to use all of the techniques (a) to (d) given below, and, where relevant, also techniques (e) and (f).
<table>
<tr><th></th><th>Technique</th><th>Description</th></tr>
<tr><td>a.</td><td>Determination of the types of waste that can be incinerated</td><td>Based on the characteristics of the incineration plant, identification of the types of waste which can be incinerated in terms of, for example, the physical state and the acceptable ranges of calorific value, humidity, ash content, size.</td></tr>
<tr><td>b.</td><td>Set-up and implementation of waste characterisation and pre-acceptance procedures</td><td>These procedures aim to ensure the technical (and legal) suitability of waste treatment operations for a particular waste prior to the arrival of the waste at the plant. They include procedures to collect information about the waste input and may include waste sampling and characterisation to achieve sufficient knowledge of the waste composition. Waste pre-acceptance procedures are risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).</td></tr>
<tr><td>c.</td><td>Set-up and implementation of waste acceptance procedures</td><td>Acceptance procedures aim to confirm the characteristics of the waste, as identified in the pre-acceptance stage. These procedures define the elements to be verified upon the delivery of the waste at the plant as well as the waste acceptance and rejection criteria. They may include waste sampling, inspection and analysis. Waste acceptance procedures are risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s). The elements to be monitored for each type of waste are detailed in BAT 12.</td></tr>
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</table>

<table>
<tr><td></td><td>d.</td><td>Set-up and implementation a waste tracking system and inventory</td><td>A waste tracking system and inventory aim to track the location and quantity of waste in the plant. It holds all the information generated during waste pre-acceptance procedures (e.g. date of arrival at the plant and unique reference number of the waste, information on the previous waste holder(s), pre-acceptance and acceptance analysis results, nature and quantity of waste held on site including all identified hazards), acceptance, storage, treatment and/or transfer off site. The waste tracking system is risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).
The waste tracking system includes clear labelling of wastes that are stored in places other than the waste bunker or sludge storage tank (e.g. in containers, drums, bales or other forms of packaging) such that they can be identified at all times.</td></tr>
<tr><td></td><td>e.</td><td>Waste segregation</td><td>Wastes are kept separated depending on their properties in order to enable easier and environmentally safer storage and incineration. Waste segregation relies on the physical separation of different wastes and on procedures that identify when and where wastes are stored.</td></tr>
<tr><td></td><td>f.</td><td>Verification of waste compatibility prior to mixing or blending of waste</td><td>Compatibility is ensured by a set of verification measures and tests in order to detect any unwanted and/or potentially dangerous chemical reactions between wastes (e.g. polymerisation, gas evolution, exothermal reaction, decomposition) upon mixing or blending. The compatibility tests are risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).</td></tr>
<tr><td>Summary of comments:</td><td colspan="3">1. BAT statement
• Modify the BAT statement to reflect that BAT is to apply the techniques (e) and (f) in addition to the techniques (a) to (d) only for the incineration of HW (HU-28, HWE-24).
• Allow the use of one or a combination of techniques rather than all of the techniques (DE-69, CEFIC-39, CEWEP-ESWET-628, Eurelectric-44).
2. Technique (a)
• In the description, extend the examples by adding the hazardous properties of wastes (NO-9), or the European Waste Codes (ES-10), or hazardous properties and POP content, making reference to the Guidelines under the Basel convention (E&P-18).
3. Technique (b)
• Add an applicability restriction for plants incinerating "constant, defined waste" (e.g. waste water treatment sludge) (CEFIC-41).
4. Technique (c)
• Add to the description that the acceptance procedures may include the review of the necessary documents and that the samples taken are kept at least one month after the incineration (BE-10).
• Specify in the description that waste sampling, inspection and analysis apply only to HW (CEWEP-ESWET-627).
• Restrict the applicability to the incineration of HW only (FEAD-141).
5. Technique (d)
• Restrict the applicability to the incineration of HW only (FEAD-141), or make it not applicable to the incineration of MSW (AT-72, CEWEP-ESWET-622).
• In the description of technique (d), replace in the 4th sentence “sludge storage</td></tr>
</table>

	tank” with “tank” (CEFIC-40) or add liquid waste tanks (AT-72, CEWEP-ESWET-622). 6. Technique (e) • Add at the end of the description that MSW and HW (including infectious CW) are kept separated (HU-29, HWE-25). • Add that technique (e) does not apply to wastes that are mixed inside the waste bunker (AT-73, FEAD-242, CEWEP-ESWET-626). • Restrict the applicability to the incineration of HW and CW (CEWEP-ESWET-624). 7. Technique (f) • Delete the word "any" in the first sentence of the description, as it would imply an enormous variety of physical and chemical testing (AT-74, CEWEP-ESWET-625). 8. New techniques • Add a new technique on the selection of the appropriate incineration technology, focusing on the requirements for the incineration of POPs (SE-108). • Add a new technique on minimum temperature requirement (850 °C) for the incineration of HW (HU-27, HWE-23).
EIPPCB assessment:	1. BAT statement • Techniques (a) to (d) address issues common to the incineration of all types of waste. What may change is the complexity of the procedures to put in place when applying them to different types of waste. • Technique (e) can be necessary for the incineration of HW but also for the incineration of non-HW. For example, SS are kept separated from ONHW in order to feed the right mix to the furnace depending on the process parameters. Technique (f), though, is related to the mixing of wastes with hazardous proprieties; this can be clarified in the name of technique (f). 2. Technique (a) • It could be better clarified that, when determining the types of waste that can be incinerated, the concentration and hazardousness of polluting substances contained therein is one of the characteristics to take into account. • The European Waste Codes give some information on the physical state, the range of calorific values and the hazardous properties of the waste, but they do not give all the information needed for the correct operation of the plant (e.g. humidity, ash content, size, quantity of hazardous substances contained). • POPs are part of the broader category of hazardous substances; see also BAT 9 on the monitoring of the POP destruction efficiency; a further link could be established with BAT 12. 3. Technique (b) • Even if there is only one waste supplier (e.g. a waste water treatment plant that conveys the SS to the incinerator by pipeline), the incineration plant has an agreement with the waste provider on the characteristics that the waste has to meet. Moreover, specifying that the pre-acceptance procedure is risk-based provides sufficient flexibility. 4. Technique (c) • How to verify that the waste acceptance procedure is well implemented (e.g. which documents and samples need to be available to the competent authority for inspection) is an implementation issue. • There are also procedures in place to accept the incoming waste in the case of MSW, as also confirmed during the 2017 site visits in France and Germany. Stating that the procedure is risk-based means that it can be adjusted depending on the characteristics of the waste to be incinerated. 5. Technique (d) • The waste tracking system and inventory is risk-based, which leaves flexibility for its application to different types of waste. Moreover, the text acknowledges that labelling the waste stored in the waste bunker is not needed, which excludes MSWI. • The type of waste stored in a tank is labelled in order to avoid any mistake in its handling and treatment (e.g. organic solvents, aqueous waste). 6. Technique (e) • The proposed BAT statement already specifies that this technique is applied

	where relevant. • Waste blending and mixing is already addressed in BAT 15, and waste compatibility in BAT 10 (f). 7. Technique (f) • Deleting “any” would not alter the meaning of the description of this technique. For consistency with the WT BAT conclusions, it seems preferable to keep the text as proposed. 8. New techniques • Technique BAT 10 (a) already addresses the concept of incinerating the right waste in the right plant. • Requirements on the minimum incineration temperature are already in the IED, Article 50. No data were gathered to support setting BAT on a minimum incineration temperature.
EIPPCB proposal:	1. BAT statement • Keep the substance of the BAT statement unchanged, but align the reference to waste stream management to the changes in the wording of BAT 1. 2. Technique (a) • Add to the description, as an example of the waste characteristics, the hazardous properties. • In BAT 12, add POPs to the periodic sampling of MSW and ONHW and to the key substances to be analysed in the case of HW. 3. Technique (b) • Keep technique (b) unchanged. 4. Technique (c) • Keep technique (c) unchanged. 5. Technique (d) • Keep technique (d) unchanged. 6. Technique (e) • Keep technique (e) unchanged. 7. Technique (f) • Change the name of technique (f) to clarify that it applies to HW. 8. New techniques • Do not add the new techniques proposed.

1.4.2 Waste deliveries

<table>
<tr><td>Location in D1:</td><td><i>P. 690 –Section 5.1.3</i></td></tr>
<tr><td>Current text in D1:</td><td>BAT 12. In order to improve the overall environmental performance, BAT is to monitor the waste deliveries as part of the waste acceptance procedures (see BAT 10) including the elements given below.
<table>
<tr><th>Waste type</th><th>Monitoring</th></tr>
<tr><td>Municipal solid waste and other non-hazardous waste</td><td>• Radioactivity detection
• Weighing of the waste deliveries
• Visual inspection
• Periodic sampling of individual deliveries and analysis of key properties/substances (e.g. calorific value, content of halogens and metals/metalloids). For municipal solid waste, this involves separate unloading</td></tr>
<tr><td>Sewage sludge</td><td>• Weighing of the waste deliveries
• Visual inspection
• Periodic sampling and analysis of key properties/substances (e.g. calorific value, water and ash content)</td></tr>
</table>
</td></tr>
</table>

	Hazardous waste	• Radioactivity detection • Weighing of the waste deliveries • Visual inspection • Unpacking and visual inspection of baled waste deliveries • Control and comparison of individual waste deliveries with the declaration of the waste producer • Sampling of the content of: ○ all bulk tankers ○ randomly selected drums/bales in drummed and other packaged waste deliveries and analysis of: ○ combustion parameters (including calorific value and flashpoint) ○ waste compatibility, to detect possible hazardous reactions upon blending or mixing wastes, prior to storage ○ key substances including PCBs, halogens and sulphur, metals/metalloids
	Clinical waste	• Radioactivity detection • Weighing of the waste deliveries

Summary of comments:

1. <u>BAT statement</u>
   - Allow the use of an appropriate combination rather than all the elements listed in the table (CZ-35, DE-101, ES-11, CEFIC-42, CEWEP-ESWET-630, CEWEP-ESWET-631, Eurelectric-47).
   - Add the risk-based approach to the listed requirements (PT-18, CEFIC-42).
2. <u>Applicability</u>
   - Specify that this BAT conclusion does not apply to IBA treatment plants (CEWEP-ESWET-630, CEWEP-ESWET-637, FIR-3).
3. <u>MSW and other non-HW</u>
   - Delete the point on radioactivity detection (FI-9, UK-38, Eurelectric-48).
   - Make the use of radioactivity detection discretionary. (FEAD-14).
   - Radioactivity detection is not needed for municipal waste incineration plants which mainly burn domestic / bulky waste (CEWEP-ESWET-636).
   - Delete the point on periodic sampling (AT-17, CZ-12, CZ-47, FI-10, CEWEP-ESWET-632, Eurelectric-51, E&P-20, FEAD-142).
   - Change the last bullet in: "Periodic sampling of individual deliveries or bulk samples and analysis of key properties/substances" (CZ-36).
   - Add a frequency of each 2.000 tonnes for the periodic sampling of the individual deliveries. (EEB-83).
   - Add POPs to the list of substances to be monitored. (SE-111).
4. <u>SS</u>
   - Delete the visual inspection (FEAD-244, CEWEP-ESWET-634), or add an applicability restriction for SS directly discharged or pumped from the enclosed transport container into the storage deposit (DE-101, Eurelectric-46).
   - Delete the point on periodic sampling (AT-17).
   - Add that in case of pipeline transportation, only the mass determination is possible (AT-112).
5. <u>HW</u>
   - Specify that this section does not apply to CW (CEWEP-ESWET-633, FEAD-243).
   - Add that hazardous waste shall be analysed for all aspects relevant for the incineration process. Specific attention shall be paid to the mass flow analysis of the hazardous components present in the hazardous waste (this analysis may vary depending on the knowledge of the waste composition). Risk-based approach combined with knowledge of the incoming waste to sampling of the waste content (Eurits-62).
   - Visual inspection is not applicable in the chemical industry (CEFIC-43).
   - Delete the point on radioactivity detection (UK-38, CEFIC-47, Eurits-62).
   - Delete the point on unpacking and visual inspection of baled waste deliveries. (ES-36, HU-30, CEFIC-43, Eurits-62, HWE-26).
   - Delete "bales" from the last point referring to sampling. (HU-31, Eurits-62,

	HWE-27). • Add trailers to the point referring to sampling of bulk tankers (ES-37, HU-32, HWE-28). • Add solids/pasty wastes to the list of waste deliveries to be sampled (Eurits-62). • Add that the analysis is done by an internal laboratory (ES-38, HU-33, Eurits-62, HWE-29). • Add “periodically” at the point on sampling of content (CEFIC-45), and change “all” with “selected” in the point on sampling of bulk tankers (CEFIC-45). • Change the point on random sampling to: "all drums/IBCs. The sampling is carried out randomly when the drums/IBCs contain the same waste. For smaller packed waste (<200 l), sampling is adapted (ES-39, HU-34, HWE-30, HWE-58). • Present the listed parameters as an example, because the combustion parameters to be analysed depend on the type of waste (CEFIC-46). • Present the listed substances as an example (FR-650, HU-35, HWE-31) or state that they are at the discretion of the operator (CEWEP-ESWET-635), because the substances to be analysed depend on the type of waste. • Change the bullet points on analysis by requiring the analysis of the physical and, as far as practicable, chemical composition of the waste, and all other information necessary to evaluate its suitability for the intended incineration process (AT-113). • Change the point on waste compatibility with the determination of environmental or safety issues for manipulating or storing the wastes (CEWEP-ESWET-635). • Delete the analysis of key substances (CEFIC-44). • Specify that for HW incinerated in a plant treating predominantly non-HW the applied monitoring is the one for MSW (Eurelectric-50) 6. CW • Delete the radioactivity detection (UK-38). • Add the visual inspection of the integrity of the packaging (Eurits-61). 7. New waste types • Add requirements for wood waste (DE-101, Eurelectric-49).
EIPPCB assessment:	1. BAT statement • The elements listed in the table, specific for each waste type treated, are the minimum elements to be included in the acceptance procedure. The specific elements that apply to each waste type are addressed below. • The risk-based approach is already described in BAT 10 (c). It can be also specified in the BAT 12 statement. 2. Applicability • This BAT applies to incineration plants. 3. MSW and other non-HW • Most of the incineration plants burning MSW have a radioactivity detector installed. • The radioactivity detection is beneficial for identifying mistakenly delivered radioactive materials used for measurement, diagnostic or therapeutic purposes. If accidentally incinerated, there is a risk of contaminating the whole plant with the radioactive material, and this material could be spread into the surroundings with the dust emitted. In any case, the inclusion of specific elements in the waste acceptance procedure is risk-based. • It can be further clarified that the sampling protocol is risk-based, keeping flexibility for the operator and/or the competent authority to decide the appropriate frequency. • It is also appropriate for the scope of such analysis to be flexible depending on the waste type and on the origin of the waste. • The analysis of POPs can be added as another example. • In the case of MSW the separate unloading is necessary, as it would otherwise be impossible to take a sample from the bunker and associate it with a given delivery. 4. SS

	• Visual inspection is performed to quickly check the incoming sewage sludge (e.g. impurities and water content). This should also be possible for sewage sludge directly pumped from the waste water treatment plant to the incineration plant. • The point on periodic sampling does not specify the frequency. Most of the sewage sludge plants taking part in the data collection exercise perform an analysis of the incoming sewage sludge. 5. HW • For clarity, it can be made more explicit in the definition of HW that for the purposes of the BAT conclusions CW is not part of HW. • The risk-based approach is already described in BAT 10 (c). It can also be specified in the BAT 12 statement. • There are several examples of plants using radioactivity detectors. In any case, the inclusion of specific elements in the waste acceptance procedures is risk-based. • Specifying or not that the waste is baled does not change the substance of the point. Indeed, “baled” can be deleted. • The point on the sampling of waste deliveries takes the perspective of how the wastes are delivered rather than their physical state (solid or pasty). Hence there is no added value in adding additional specifications for the sampling of solid/pasty waste. For consistency, the sampling of trailers can be added to the sampling of all tankers. • Whether the laboratory needs to be internal or can also be external is a site-specific issue. • Rather than specifying the random selection of packages, a risk-based sampling protocol for packed waste seems appropriate. Intermediate bulk containers and smaller packaging can be added as examples of packed waste. • The determination of environmental and/or safety issues for manipulating or storing wastes does not take into account that contact with different types of waste could occur even accidentally during the handling, storage or treatment. The safe handling and storage of waste is addressed in BAT 10 (d). • The elements that are included in the waste acceptance procedures are risk-based and depend on the type of waste and not on the type of plant. 6. CW • The radioactivity detection is beneficial for identifying mistakenly delivered radioactive materials used for diagnostic or therapeutic purposes. • All the elements of the waste acceptance procedure are risk-based. • The visual inspection of the integrity of the packaging can be useful to avoid environmental risks during waste handling and storage. 7. New waste types • Wood wastes are already addressed in the BAT conclusions, as other non-hazardous waste or as hazardous waste depending on their possible content of hazardous substances. In any case, the inclusion of specific elements in the waste acceptance procedures is risk-based.
EIPPCB proposal:	1. BAT statement • Specify in the BAT statement that the elements included in the waste acceptance procedure are risk-based. 2. Applicability • Specify in the BAT statement that this BAT refers to incineration plants. 3. MSW and other non-HW • Keep the radioactivity detection unchanged. • Specify that the sampling protocol is risk-based. • Add POPs as a further example of substances to monitor. • Keep the separate unloading for MSW. 4. SS • Keep the point on SS unchanged. 5. HW • Specify in the HW definition that for the purposes of the BAT conclusions CW is not included in the HW category. • Keep the weighing of the waste deliveries unchanged. • Keep the visual inspection unchanged.

	• Streamline the point on the sampling of packed waste, add examples of packed waste and specify that the sampling protocol is risk-based. • Keep the points on the analysis of combustion parameters, waste compatibility and key substances unchanged. 6. <u>CW</u> • Keep the radioactivity detection unchanged. • Add the visual inspection of the packaging integrity. 7. <u>New waste types</u> • Do not add wood waste as a separate waste type.

1.4.3 Waste reception, handling and storage

<table>
<tr><td>Location in D1:</td><td><i>P. 691 – Section 5.1.3</i></td></tr>
<tr><td>Current text in D1:</td><td>BAT 13. In order to reduce the environmental risks associated with the reception, handling and storage of waste, BAT is to use both of the techniques given below.
<table>
<tr><th></th><th>Technique</th><th>Description</th></tr>
<tr><td>a.</td><td>Impermeable surfaces and segregated drainage</td><td>Depending on the risks posed by the waste in terms of soil or water contamination, the surface of the waste reception, handling and storage areas is concrete-based or made impermeable to the liquids concerned, and fitted with segregated drainage</td></tr>
<tr><td>b.</td><td>Adequate storage capacity</td><td>Measures are taken to avoid accumulation of waste, such as:
• the maximum waste storage capacity is clearly established and not exceeded, taking into account the characteristics of the wastes (e.g. regarding the risk of fire) and the treatment capacity;
• the quantity of waste stored is regularly monitored against the maximum allowed storage capacity;
• the maximum residence time of waste is clearly established</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>1. <u>BAT statement</u>
• Set as BAT the use of one or an appropriate combination rather than of all the techniques listed in the table (Eurelectric-52), or specify that the listed techniques are examples (CEWEP-ESWET-640).
• Link this BAT Conclusion with BAT 32 on segregated drainage and separate treatment of waste water streams (BE-15).
• Cover also the emission of dust from the handling and storage of the solid residues produced by the incineration plant (DK-16).
2. <u>Technique a</u>
• Split the technique in two separate techniques: impermeable surface, and segregated drainage (Eurolelectric-52).
• Specify that the segregated drainage does not apply to the storage in a bunker of municipal solid waste and other non-hazardous waste (ES-12, FI-12, CEWEP-ESWET-638, Eurelectric-52)
• Specify that the segregated drainage is not applicable where the bunker is below the ground water level (FEAD-245).
• Add to the description that, for waste stored in a bunker, a control system is in place to guarantee that the bunker floor is impermeable (EEB-84).
3. <u>Technique b</u>
• Delete the three bullet points in the description because, in case of a technical stop of the plant for planned maintenance, an accumulation of the waste in the bunker is unavoidable (FEAD-42, CEWEP-ESWET-639).
• The maximum residence time of waste cannot be established for bulk solid and liquid wastes. It can be established only for packed waste (AT-114), or for</td></tr>
</table>

	infectious clinical waste (IT-16).
EIPPCB assessment:	1. BAT statement • The General considerations section already states that the techniques listed and described are neither prescriptive nor exhaustive. • The two techniques deal with different issues (they are complements rather than substitutes) and both are important to address the environmental objective of BAT 13. • The segregation of waste water streams is already addressed in BAT 32. A cross reference to this BAT could be added. • The problem of dust emissions from handling, transport and storage of residues from incineration has not been raised or discussed at the WI TWG KoM as a key environmental issue for this sector. Consequently, no information on the techniques applied for their prevention or reduction have been collected during this WI BREF review. 2. Technique a • Consistently with the WT BAT conclusions, the wording "segregated drainage" can be replaced with "adequate drainage infrastructure"; a cross-reference to BAT 32 for the segregation of waste water streams can be included to better specify the concept. • Controlling the floor´s surface integrity is a general issue that can be applied also to other areas besides the waste bunker. 3. Technique b • The definition of the maximum quantity of waste that can be stored in an area including a bunker is a design characteristic of the area/bunker. The design of the environmental/security features (e.g. fire prevention system, odour emissions) is based on a maximum amount of waste in storage, and that amount should therefore not be exceeded. • The control to ensure that the maximum storage capacity is not exceeded is intended to keep the storage area within the design specifications. • If the wastes are mixed in the storage area (e.g. liquid wastes stored in a tank or solid wastes stored in a bunker), the maximum residence time cannot be established.
EIPPCB proposal:	1. BAT statement • Keep the BAT statement unchanged. • Add in the description of BAT 13 (a) a cross-reference to BAT 32. 2. Technique a • Change "segregated drainage" to "adequate drainage infrastructure". • Add to the description of the technique that the verification of the integrity of the surface is carried out periodically. 3. Technique b • Keep the first two bullet points of the description unchanged. • Change the last bullet point to clarify that it does not apply when the wastes are mixed in the storage area.

1.4.4 Storage and handling of clinical waste

<table>
<tr><td>Location in D1:</td><td><i>P. 691 – Chapter 5– Section 5.1.3</i></td></tr>
<tr><td>Current text in D1:</td><td>BAT 14. In order to reduce the environmental risk associated with the storage and handling of clinical waste, BAT is to use technique (a) and either technique (b) or (c)-given below.
<table>
<tr><th></th><th>Technique</th><th>Description</th></tr>
<tr><td>a.</td><td>Automated waste handling</td><td>The use of non-manual waste handling and loading systems</td></tr>
<tr><td>b.</td><td>Use of sealed, puncture-resistant containers</td><td>Clinical waste is delivered in sealed and robust, puncture-resistant combustible containers that are never opened throughout storage and handling operations</td></tr>
<tr><td>c.</td><td>Cleaning and disinfection of containers</td><td>Waste containers that are to be reused are cleaned in a designated cleaning area and disinfected in a facility specifically designed for disinfection. Any solid residues from the cleaning operations are incinerated</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>1. <u>BAT statement</u>
• Change the BAT statement with: "BAT is to use one or more techniques listed in order to eliminate the risk to workers". (Eurits-63)
2. <u>Technique a</u>
• Change the name of the technique to "semi-automated waste handling" (CEWEP-ESWET-641, FEAD-143)
• State that in the case of existing plants, the applicability of automated waste handling might be restricted by lack of space. (IT-17)
• Change the description of the technique to: "The use of non-manual waste loading systems (Eurits-63), and where necessary to control risk, the use of non-manual waste handling systems". (UK-21)
• Clarify that the non-manual waste handling and loading systems can be used only after the first loading operation from the truck to the incineration feeding system. (HU-36, HWE-32)
• Delete this technique (CEFIC-48) or give a practicable description. (DE-102)
3. <u>Technique b</u>
• Change the description to take into account that not all clinical wastes are stored in puncture-resistant containers (AT-115, CEWEP-ESWET-642)</td></tr>
<tr><td>EIPPCB assessment:</td><td>1. <u>BAT statement</u>
• Risk to workers is not an environmental objective and as such is not pertinent to the BAT statement.
• The BAT statement proposed in D1 mentions the use of technique a and either technique b or technique c. However, it could be made clearer that techniques b and c do not apply to the same waste delivery; rather, techniques b and c apply when waste is delivered in non-reusable and reusable containers, respectively. At the incineration plant, both techniques are therefore applied and used depending on how the CW is delivered.
2. <u>Technique a</u>
• Some manual handling may be needed, e.g. in the unloading of clinical waste.
3. <u>Technique b</u>
• Not all containers used for clinical wastes are puncture-resistant.
• The name of the technique could be modified to more clearly reflect what is done at the waste incineration plant, rather than at the healthcare facility where the CW is produced.
4. <u>Technique c</u>
• It could be clarified in the name and description that, contrary to technique b, technique c applies to reusable containers.</td></tr>
</table>

EIPPCB proposal:	1. BAT statement • Change the BAT statement to set as BAT the use of all of the techniques given. 2. Technique a • Add to the name of the technique the case of "semi-automated waste handling". • Change the description to reflect the fact that some manual handling is needed. 3. Technique b • Delete puncture-resistant from the name of the technique. • Change the description to reflect that the containers do not always need to be puncture-proof but when needles and sharps are disposed in them. 4. Technique c • State in the name and description that technique c applies to reusable containers.

1.4.5 Unburnt substances

<table>
<tr><td>Location in D1:</td><td>P. 691 and 692 – Section 5.1.3</td></tr>
<tr><td>Current text in D1:</td><td>
BAT 15. In order to improve the overall environmental performance, to reduce the content of unburnt substances in slags and bottom ashes, and to reduce emissions to air from the incineration of waste, BAT is to use an appropriate combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Waste blending and mixing</td><td>See Section 5.2.1</td><td>Not applicable to infectious clinical waste.
Blending and mixing is not applicable where undesired reactions may occur between different types of waste.</td></tr>
<tr><td>b.</td><td>Advanced control system</td><td>See Section 5.2.1</td><td>Generally applicable</td></tr>
<tr><td>c.</td><td>Optimisation of the incineration process</td><td>See Section 5.2.1</td><td>Optimisation of the design of the incineration chamber is not applicable to existing furnaces</td></tr>
</table>
BAT-associated environmental performance levels
The TOC content in slags and bottom ashes associated with BAT is 1–3 wt-%.
The loss on ignition of slags and bottom ashes associated with BAT is 1–5 wt-%.
</td></tr>
<tr><td>Summary of comments:</td><td>
1. BAT statement
• Add a cross-reference in BAT 15 to BAT 35 on material efficiency of the bottom ash treatment process (BE-16).
• Split this BAT into two parts, one on the content of unburnt substances in slags/bottom ashes and one on the emissions to air (Eurits-64).
• Specify that the listed techniques are examples (DE-103, CEWEP-ESWET-645).
• Add the possibility to use only one of the listed techniques (FEAD-144).
2. Technique a
• Change the technique name in "Homogenisation of waste preparation" and make a cross-reference to BAT 10 (Eurits-42).
• Add to the applicability that waste blending and mixing is not applicable when direct feeding is required (e.g. for process or occupational safety or waste specific characteristics (eg. odours)) (ES-40, HU-37, Eurits-42, Eurits-43, HWE-33).
3. New techniques
• Add technique "Improve overall environmental performance", with the following description: "Optimise the 3 T's (temperature, turbulence and residence time) by using the correct incineration technique and during
</td></tr>
</table>

	operation, feed the correct type of waste in a homogeneous and/or controlled way, adapt the throughput of the installation to the optimal capacity" (Eurits-65). 4. BAT-AEPLs • Change the TOC BAT-AEPL to < 3% (CZ-13, CEWEP-ESWET-644, E&P-21, FEAD-144). • Change the loss on ignition BAT-AEPL to < 5% (CEWEP-ESWET-644, FEAD-144). • Specify that the two BAT-AEPLs are alternative (FI-11, FR-530, PT-26, CEWEP-ESWET-646). • Specify that the BAT-AEPLs refer to the treated slags and bottom ashes (DE-103, CEWEP-ESWET-643). • Add a footnote specifying that the lower end of the range is usually achieved by fluidised bed (AT-118). • Specify that the BAT-AEPLs are expressed as dry % (Eurits-41) • Add the following parameters for the assessment of the burn-out quality of the incineration of HW (Eurits-66): o dissolvable organic components (DOC) for water dissolvable components (for polar organic components) and solvent (for apolar organic components) dissolvable components o unburnt or partly burnt fractions in the slags or bottom ashes originating from the waste, e.g. visually recognizable unburnt fractions (e.g. paper or plastic) in relation to the input o when incinerating hazardous wastes in plants not specifically designed for those wastes then the non-dedicated plant demonstrates that the level of burn-out performance of the substances e.g. PCBs, POPs is the same as at a dedicated plant. The assessment of the different parameters of the burn-out quality is done by different techniques based on visual control, analysis and knowledge of the input.
EIPPCB assessment:	1. BAT statement • As mentioned in the statement, this BAT conclusion is related to the incineration of waste, while BAT 35 is related to the treatment of bottom ashes. • The listed techniques, by improving the combustion performance, reduce both the unburnt content of the slags/bottom ashes and the pollutants in the flue-gas. For this reason, and to avoid repetition, it is advisable keep them in one BAT conclusion. • As stated in the General considerations section of the BAT conclusions, the listed techniques are neither prescriptive nor exhaustive. • The optimisation of the incineration process can always be done in combination with an advanced control system and/or with waste blending and mixing. 2. Technique a • "Blending and mixing" provides clearer information than "Homogenisation of waste preparation" on what the technique is about. These terms are also used in the WT BAT conclusions. Homogenisation is not possible when solid wastes, such as MSW, are mixed. A cross-reference to BAT 10 (f) could be introduced. • The applicability restriction for infectious clinical waste is one example of a case when direct feeding is advisable. More examples could be added. 3. New techniques • The concepts underlying the suggested technique ("Improve overall environmental performance") are already addressed by the advanced control system, by the optimisation of the incineration process and by BAT 16 on plant setting adjustment. The description of the optimisation of the incineration process can be improved with elements on the flue-gas turbulence and on the waste feeding rate and composition. 4. BAT-AEPLs • According to the BREF Guidance, the environmental performance levels associated with BAT will be expressed as ranges, rather than as single values. It is preferable to use a true range rather than an expression of the type '< X',

	because this gives less information. • The fact that the two BAT-AEPLs are alternatives is already written in the General considerations section of the BAT conclusions. For clarity, it can also be stated in BAT 15. • The BAT-AEPLs refer to the slags/bottom ashes as generated by the incineration process before any other treatment. • Fluidised bed and rotary kiln processes should have better burnout performance than the grate process. This is confirmed by the data collected in terms of unburnt substances. Indeed, the share of plants that reported a TOC content in the bottom ashes lower than or equal to 1% is: above 35% of the grate-fired plants, 50% of the rotary kilns, and up to 60% of the fluidised beds. • In the General considerations section of the BAT conclusions it is already stated that TOC and LOI are on dry bases. For clarity, it can also be stated in BAT 15. • The questionnaire asked to report the level of PAHs, PCBs and PCDD/F in the slags/bottom ashes, but these data have not been provided. The questionnaire also asked for the dissolvable organic components, but the data gathered for plants incinerating predominantly HW are not comparable with each other, and it is not possible for the EIPPCB to propose a BAT-AEPL. • The unburnt fraction is already addressed by the TOC/LOI content. Visual inspection is less accurate. • The potential presence of residual or newly formed hazardous components is already addressed by the distraction efficiency. • No specific information has been provided to substantiate how to assess the burnout quality with the new parameters proposed by Eurits-66.
EIPPCB proposal:	1. <u>BAT statement</u> • Clarify in the statement that this BAT refers to the incineration of waste. 2. <u>Technique a</u> • Streamline the descriptive part of BAT 15 (a) for better clarity; this does not imply substantive changes. • Add to the description that when hazardous wastes are mixed prior to incineration, this is carried out without loss of information on the composition and process of origin. See EIPPCB assessment in Section 1.9.1. • Extend the applicability restriction for infectious clinical waste to other types of waste for which direct furnace feeding is needed. • Add a cross-reference to BAT 10 (f) (verification of waste compatibility) to the applicability restriction related to possible undesired reactions between wastes. 3. <u>New techniques</u> • Do not add the new technique by Eurits-65 but improve the description of the optimisation of the incineration process with elements on flue-gas turbulence and waste feeding rate and composition. 4. <u>BAT-AEPLs</u> • Keep the BAT-AEPLs unchanged. • Specify that the two BAT-AEPLs are alternatives. • Specify that the lower end of the BAT-AEPL ranges can be achieved when using fluidised bed furnaces or rotary kilns. • Specify that the BAT-AEPLs are expressed as dry wt-%.

1.4.6 OTNOC

Location in D1:	*P. 692 – Section 5.1.3*
Current text in D1:	**BAT 19. In order to reduce the frequency of the occurrence of OTNOC and to reduce emissions to air and/or to water from the incineration plant during OTNOC, BAT is to set up and implement a risk-based OTNOC management plan as part of the environmental management system (see BAT 1) that includes all of the following elements:** • identification of potential OTNOC, of their root causes (e.g. failure of emission abatement systems, including identification of equipment critical to the protection of the environment ('critical equipment')) and of their potential consequences, and regular review and update of the list of identified OTNOC following the periodic assessment below; • appropriate design of critical equipment (e.g. compartmentalisation of the bag filter, supplementary burners to heat up the flue-gas and obviate the need to bypass the bag filter on start-up, etc.); • set-up and implementation of a preventive maintenance plan for critical equipment; • monitoring and recording of emissions during OTNOC and associated circumstances (see BAT 6); • periodic assessment of the emissions occurring during OTNOC (e.g. frequency of events, duration, amount of pollutants emitted) and implementation of corrective actions if necessary.
Summary of comments:	1. <u>BAT statement</u> • Merge BAT 6 on monitoring emissions during OTNOC and BAT 19 (CZ-37, Eurelectric-55). • Delete this BAT (DE-107, ES-13, HU-38, CEWEP-ESWET-649, FEAD-146, HWE-34) or set up a working group to laydown action points for further activities by the plant operator (DE-107). 2. <u>Identification of OTNOC</u> • Specify that BAT is to ensure that the circumstances constituting OTNOC are defined and that for each circumstance, recovery, personnel and environmental safety procedures are set out and published as part of BAT 1 section iv (EEB-49). 3. <u>Appropriate design of the critical equipment</u> • Indicate that the burner to heat up the flue-gas is only applicable for new plants (CZ-14, Eurelectric-56, E&P-22). • Add a new BAT conclusion on the design of the FGC to be designed to prevent bypassing (of parts) of the FGC system such that it is at least in full operation during start-up and shutdown. The use of bypass is not BAT (NL-3). 4. <u>Monitoring of emissions during OTNOC</u> • Add that above a certain value, the emission level measured by AMS is no longer quantifiable (AT-19, AT-117). 5. <u>Other</u> • Agree on the definitions of NOC and OTNOC with the TWG, then revise this BAT as necessary (Eurits-40). • Add a new bullet point on the recording and publishing (as part of BAT 1 Point iv) of each OTNOC occurrence and of the recovery, personnel and environmental and safety procedures implemented by the operator to address the OTNOC occurrence. (EEB-103). • Propose a standard list of OTNOC for approval by the IED Article 13 Forum (or Industrial Emissions Expert Group). If that is not possible, include the list as part of the WI BAT conclusions (e.g. in BAT 19, or under General considerations) (SE-110).

EIPPCB assessment:	1. BAT statement • Being about the monitoring of emissions, BAT 6 is in the BAT conclusions section related to monitoring. BAT 19, conversely, details the OTNOC management plan mentioned in BAT 1. • This BAT complements the point of BAT 1 on OTNOC, and BAT 6. In order to prevent the occurrence of unplanned OTNOC, it is fundamental to collect information on when the plant is operating in OTNOC, understand the causes, and act so as to prevent the situation from occurring again. 2. Identification of OTNOC • BAT 19 already contains most of the elements of the proposal EEB-49. A link could be established between the preventive maintenance of critical equipment of the OTNOC management plan and Point iv g. of BAT 1. • The D1 text seems to contain some redundant parts and could be simplified. 3. Appropriate design of the critical equipment • The use of bypass of (part of) the FGC system to deal with dangerous operational situations (e.g. an unexpected pressure increase in the flue-gas duct) does not prevent the installation of a burner in existing plants to heat up the flue-gas in order to avoid bypassing the bag filter in the event that the flue-gas temperature is too low. • Bypassing (parts of) the FGC system could contribute non-negligibly to the yearly emission load of a waste incineration plant. The minimisation of the use of bypass can be considered key to the overall environmental performance of WI plants. • Some additional clarifications on the minimisation of bypass use, based on the text proposed by NL-3, could be added. 4. Monitoring of emissions during OTNOC • The measurement range of the instruments has to be taken into account in all circumstances; the text of BAT 6 (measurement of emissions during OTNOC) already makes reference to the possibility to use alternatives to direct emission measurements in certain cases. This is considered an implementation issue. 5. Other • The EIPPCB tried to propose a list of possible OTNOC in the initial part of the WI BREF review, and a further attempt was made by the WI TWG by setting up a specific OTNOC subgroup after the informal TWG meeting in Seville in December 2017. However, the experience brought in by the WI TWG members made it clear that the definition of the OTNOC is case-specific, and that it is not possible to compile a complete and general list of the possible cases. It is an iterative approach already addressed by BAT 19. • BAT 19 already contains the recording of OTNOC occurrences. No information has been provided to substantiate the environmental objective of the part of the EEB proposal referring to the publication of each OTNOC occurrence.
EIPPCB proposal:	1. BAT statement • Clarify in the statement that emissions to water are not always relevant. 2. Identification of OTNOC • Streamline the text for better legibility. • Link the preventive maintenance of critical equipment of the OTNOC management plan with Point iv g. of BAT 1. 3. Appropriate design of the critical equipment • Include additional text to clearly indicate that the OTNOC management plan includes the design of the FGC such that it is in full operation at start-up/shutdown. 4. Monitoring of emissions during OTNOC • Keep this bullet point unchanged. 5. Other • No changes.

1.5 Energy efficiency

1.5.1 Techniques to increase energy efficiency

<table>
<tr><td>Location in D1:</td><td>P. 693 and 694 – Section 5.1.3</td></tr>
<tr><td>Current text in D1:</td><td>
BAT 21. In order to increase the energy efficiency of the incineration plant, BAT is to use a combination of the techniques given below.
<table>
<tr><th></th><th>Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Thermal drying of sewage sludge</td><td>After mechanical dewatering, sewage sludge is further dried using low-grade heat prior to incineration</td><td>Applicable within the constraints associated with the availability of low-grade heat</td></tr>
<tr><td>b.</td><td>Reduction of the flue-gas flow</td><td>The flue-gas flow is reduced through, e.g.:
• improving the primary and secondary air distribution;
• recirculation of raw flue-gas (extracted before the FGC); see Section 5.2.2;
• oxygen-enriched combustion air.
A smaller flue-gas volume reduces the energy demand of the plant (e.g. for induced draft fans).</td><td>Generally applicable</td></tr>
<tr><td>c.</td><td>Minimisation of heat losses</td><td>Heat losses are minimised through:
• thermal insulation of furnaces and boilers;
• recovery of heat from the cooling of slags and bottom ashes</td><td>Generally applicable</td></tr>
<tr><td>d.</td><td>Optimisation of the boiler design</td><td>The heat transfer in the boiler is improved by optimising, for example, the:
• flue-gas velocity and distribution;
• water/steam circulation;
• convection bundles;
• cleaning devices for the convection bundles.</td><td>Applicable to new plants and to major retrofits of existing plants</td></tr>
<tr><td>e.</td><td>Low flue-gas temperature at boiler exit</td><td>Special corrosion-resistant heat exchangers are used to recover additional energy from the flue-gas, reducing its temperature at the boiler exit</td><td>Applicable within the constraints of the operating temperature of the downstream FGC system</td></tr>
</table>
</td></tr>
</table>

f.	High steam conditions	The higher the steam conditions (temperature and pressure), the higher the electricity conversion efficiency allowed by the steam cycle. Working at increased steam conditions (e.g. above 45 bar, 400 °C) requires the use of special steel alloy or refractory cladding to protect the boiler sections that are exposed to the highest temperatures.	Applicable to new plants and to major retrofits of existing plants, where the plant is mainly oriented towards the generation of electricity. The applicability may be limited by: • the stickiness of the fly ashes; • the corrosiveness of the flue-gas.
g.	Cogeneration	Cogeneration of heat and electricity where the heat (mainly from the steam system) is used for producing hot water/steam to be used in industrial processes/activities or in a public network for district heating/cooling	Applicable within the constraints associated with the local heat and power demand
h.	Flue-gas condenser	A heat exchanger where the water vapour contained in the flue-gas condenses, transferring the latent heat to water at a sufficiently low temperature (e.g. return flow of a district heating network). The flue-gas condenser also provides co-benefits by reducing emissions to air (e.g. of dust and acid gases). The use of heat pumps can increase the amount of energy recovered from flue-gas condensation	Applicability may be limited by the demand for low-temperature heat, e.g. by the availability of a district heating network with a sufficiently low return temperature

Summary of comments:

1. BAT statement
   - Specify that BAT is to use an "appropriate" combination of the listed techniques (CEFIC-54)
   - Specify that BAT is to use one or a combination of the listed techniques. (Eurits-22)
   - Add the consideration of cross-media effects (including economics). (FEAD-522)
2. Technique a
   - Delete this technique: without thermal drying, SS cannot be ignited at all with water contents of 75% or more (FEAD-148)
   - Change the technique to highlight that the SS is fed dry, because SS can be thermally dried at the waste water treatment plant or at the incineration plant (IT-18)
   - In the description of the technique put the use of low grade heat as example since there are other ways to further dry the SS (e.g. solar drying). (AT-80, ES-14)
   - Add to the applicability that for existing plants the applicability of the technique may be limited by design constraints (e.g. where the incineration feeding system requires pumpable SS (CEFIC-55)
   - Add applicability constraint associated with the required combustion conditions with a view to maintaining an optimal performance of the boiler. (CEWEP-ESWET-651, Eurelectric-59)
   - Add to the applicability that the thermal drying may not be necessary for co-incineration with MSW, depending on the SS moisture and waste share. (FEAD-149)

3. Technique b
   - Rename the BAT as "Optimisation of the flue-gas". (CEFIC-56)
   - Delete from the description the example of oxygen enrichment. (SE-57, CEWEP-ESWET-652, Eurelectric-57, E&P-23)
   - Add that the oxygen-enriched combustion air is BAT provided that the net electricity production is increased. (NL-5)
   - In the description, change “flue-gas extracted before the FGC” to “flue-gas extracted after the FGC”. (FEAD-150)
   - In the description, change “primary and secondary air” to “under-fire and over-fire air distribution”. (CEWEP-ESWET-654)
   - Specify that the applicability of flue-gas recirculation and oxygen enrichment will depend on the technical characteristics of the plant. (UK-143)
   - Restrict the applicability to new plants only (CEWEP-ESWET-653, Eurelectric-57, E&P-24, FEAD-148), or to new plants and to major retrofits of existing plants. (ES-15)
4. Technique c
   - In the description, delete the second bullet point on energy recovery from the bottom ashes. (ES-16, CEWEP-ESWET-655, FEAD-17, FEAD-148)
   - In the description, add that the two listed ways to minimise heat losses are examples. (CEFIC-57)
   - Change the applicability of this technique to "Generally applicable to new plants, and where there is an on-site use for the heat". (UK-139)
   - Add that this technique is not applicable to rotary kilns. (ES-16, HU-40, HWE-36)
5. Technique d
   - In the description, delete “for the convection bundles” in the last bullet point. (CEFIC-58)
   - Restrict applicability to new plants only. (CEWEP-ESWET-660, Eurelectric-60, FEAD-148)
   - Add that this technique is not applicable for lines <20 MW”. (CEFIC-59)
6. Technique e
   - In the description, add that the special corrosion heat exchanger can be placed before or after the FGC system. (CEWEP-ESWET-656, FEAD-248)
   - In the description, add that the special corrosion heat exchanger is an example. (AT-81)
   - Add applicability restriction due to space requirements. (CEWEP-ESWET-663, FEAD-148)
   - Add applicability restriction due to the stickiness of the fly ash. (FEAD-151)
7. Technique f
   - Specify that special alloys may be needed for medium steam conditions as well. (FEAD-148)
   - Specify in the description that the higher steam conditions increase the overall energy efficiency (electricity conversion, heat supply). (AT-179)
   - Change “the applicability may be limited by…” to “the applicability is limited by…” (CEWEP-ESWET-661, FEAD-152)
   - Specify that high steam conditions are only applicable to new plants. (CEWEP-ESWET-661, FEAD-148, FEAD-154)
   - Delete the second bullet point under the column restricting the applicability in the case of corrosive flue-gas. (FEAD-148)
     Add that "The applicability may also be limited in case of low electricity demand and/or low prices not paying back Capex". (FEAD-152)
8. Technique g
   - Change the name of the technique to: "Cogeneration/Trigeneration". (AT-82, FEAD-247)
   - Delete "public" from the description of the technique. (UK-144)
   - Add the following text to the description of the technique. "In the case of low temperature sources, ORC (Organic Rankine Cycle) modules for electricity production are recommended. (PL-17)
   - Change applicability to "Applicable within the constraints associated with the local heat and power demand as well as the availability of distribution networks for power, heat and cooling. (CEWEP-ESWET-659, Eurelectric-61, E&P-25)

	9. Technique h • Make clear in the description of the technique that scrubbers are used to condensate the flue-gas water content (SE-15) and that another technique to increase the energy recovery is the humidification of combustion air. (CEWEP-ESWET-657, FEAD-249) • Change “the applicability may be limited by…” to “the applicability is limited by…”. (CEWEP-ESWET-662, FEAD-153) • Specify that the applicability is limited by the demand for low-temperature heat. (FEAD-148) 10. New techniques • Add technique: "appropriate design and selection of the cooling system and of the FGC system". (UK-143). • Add technique: "flue-gas heat exchanger downstream of the dry FGC system". (CEWEP-ESWET-658, FEAD-250). • Add the dry bottom ash discharger. (EIPPCB based on information provided by ESWET and uploaded in BATIS)
EIPPCB assessment:	1. BAT statement • The term "appropriate" can be added to the combination of the techniques as in the case of other BAT conclusions. • At least two of the techniques are commonly applied (the improvement of the primary and secondary air distribution, and the minimisation of heat losses). • According to the BREF Guidance, the information included in the chapter of the BREF entitled ‘Techniques to consider in the determination of BAT’, especially information under the ‘Technical considerations relevant to applicability’, ‘Economics’ and ‘Cross-media effects’ headings, should provide the basis for indicating applicability issues in the BAT conclusions. The proposals included in the TWG comments have been assessed and the applicability restrictions of the listed techniques can be amended where deemed justified. 2. Technique a • SS has a high water content. The energy needed to evaporate and to increase the temperature of such a large amount of water up to the set incineration temperature (e.g. > 850 °C) can be reduced when the SS is pre-dried with low-grade heat. This also reduces the flue-gas volume, thereby saving further energy. • SS drying can also be performed off site, e.g. at the waste water treatment plant. This can be reflected in the technique description by highlighting that the drying operation is conducted prior to feeding to the furnace (in fact, once the SS is fed to the furnace, drying always occurs as a first step). • Solar energy can be considered a low-grade heat source. • The dewatering grade should take into account the feeding system used to introduce SS into the furnace (which may include mixing with other waste in the bunker). 3. Technique b • Technique (b) focuses on reducing energy losses through the reduction of the flue-gas flow. • Oxygen enrichment, while reducing the amount of flue-gas generated, also improves the combustion performance. This can be better clarified in the description. • The description of flue-gas recirculation clarifies that the overall flue-gas flow is reduced when part of the secondary combustion air is replaced by the flue-gas. Even more energy is saved when the raw flue-gas (extracted before the FGC system) is recirculated. This can be added to the description of the technique in Section 5.2.2. • Under-fire and over-fire air are terms specific to grate incineration. Primary and secondary air is a more general and broadly applicable terminology. • There are technical constraints to the application to existing plants of flue-gas recirculation and of oxygen enrichment, which are appropriate to mention. 4. Technique c • Dry bottom ash discharger with the recovery of energy is a technique applied by several plants in Italy and Switzerland. The retrofitting of existing plants previously equipped with a wet bottom ash discharger has also been reported.

- Other techniques can be applied to reduce heat losses, such as flue-gas recirculation or the use of an integral furnace-boiler. These two techniques can be added to the examples already included.
- Integral furnace-boiler systems are not applicable to rotary kilns. An appropriate degree of insulation is always needed to protect the structure of the kiln and ensure the required incineration conditions are maintained.

5. Technique d
   - The terminology “online and offline boiler cleaning systems” expresses more clearly than “cleaning devices” the importance of having in place a system to control the deterioration of the boiler efficiency due to fouling.
   - The scope of a major retrofit of an existing plant can include the complete redesign of the boiler. In such cases, this technique can be applied to a major retrofit of an existing plant.
   - See assessment of a similar point raised by CEFIC-52 on BAT 20.
6. Technique e
   - According to comment FEAD-747 on Section 4.4.14, the special corrosion-resistant heat exchanger to recover the heat from low-temperature flue-gas can also be placed after an ESP and before the scrubber. The name and description of the technique can be changed to take this solution into account.
   - The amendments to the technique name and description proposed by the EIPPCB should address the issue raised by AT-81.
   - At existing plants, the availability of space to install an additional heat exchanger may be an issue.
   - No specific information has been provided to substantiate the fact that the fly ash stickiness can limit the applicability of low-temperature heat exchangers. This issue has not been raised regarding Section 4.4.15 of the WI BREF, and fly ash stickiness is usually considered a high-temperature issue.
7. Technique f
   - The technique is about designing the system for high steam conditions. Details of boiler designs for medium steam conditions can be added in the BREF.
   - High steam conditions increase the efficiency of the Rankine cycle, whereas the quantity of heat that can be produced by a boiler depends only on its efficiency. Superheated steam at a pressure above 45 bar is generally used only to produce electricity.
   - The word "may" is used because the applicability restriction requires a case-by-case approach. Indeed, there are several plants using this technique, while the fly ash stickiness and flue-gas corrosiveness at high temperatures are challenges faced by all the incinerators that work at high steam conditions.
   - Section 4.4.8 of the BREF provides an example of the application of this technique to a major retrofit of an existing plant. A major retrofit of an existing plant can for instance be the construction of a new boiler including changing the steam turbine, or the erection of a new line.
   - No specific information has been provided to substantiate the fact that the corrosiveness of the flue-gas is not an issue to take into account for the applicability of high steam conditions.
   - The case of low electricity demand is already covered by specifying in the applicability that the plant is oriented to the generation of electricity. Low market price / no Capex payback are general issues applying to all techniques. The techniques listed are not prescriptive, and in general a case-by-case approach is needed.
8. Technique g
   - Cooling systems can be run using the heat and/or the electricity produced by the plant. Trigeneration can therefore be considered to be already included in the general concept of cogeneration of heat and electricity. Whether the heat is further used to drive an absorption chiller is a specific feature of the district heating/cooling network rather than of the waste incineration plant.
   - The word "public" in the description of the technique can be deleted, as whether the heat is sent to a public or a private network is not relevant.
   - The list of techniques is not exhaustive. The ORC can be used to increase the energy efficiency by recovering heat from low-grade heat sources, but the application to the WI sector has not been substantiated by the exchange of information for the WI BREF review.

	• The availability of a distribution network can be added as an applicability restriction. 9. Technique h • The description of the technique can be improved to better reflect the case of systems incorporating a scrubber. • The applicability can be rephrased to better take into account that there should be a demand for low-temperature heat. • No specific information has been provided to substantiate the fact that the humidification of the combustion air increases the energy efficiency of the plant. Not all the energy spent to evaporate and heat up the water contained in the combustion air will be entirely recovered by the flue-gas condensation. 10. New techniques • The appropriate design and selection of the cooling system is driven most of the time by external factors (e.g. water availability and temperature). The same also applies for the FGC system (quantity and type of pollutants in the flue-gas, required environmental performance, water availability). • The description of technique (e) can be amended to take into account that a heat exchanger can also be placed after a dry FGC system before the stack. • Dry bottom ash dischargers are applied at several WI plants, and the technique is also BAT for LCP.
EIPPCB proposal:	1. BAT statement • Specify that BAT is to apply an appropriate combination of the techniques listed. 2. Technique a • Clarify in the description that the technique refers to drying the SS before it is fed to the furnace. • Add to the description that the dewatering grade depends on the furnace feeding system. 3. Technique b • Change "recirculation of raw flue-gas" to "flue-gas recirculation", and do not limit the technique solely to the recirculation of the raw flue-gas. • Add that oxygen enrichment is usually used to improve the combustion performance. • Add to the applicability that for existing plants the applicability of the flue-gas recirculation and of oxygen-enriched combustion air may be limited due to technical constraints. 4. Technique c • In the description, specify that the techniques listed are examples. • Add “integral furnace-boiler” and “flue-gas recirculation” to the examples. • Add an applicability restriction for rotary kilns for the use of integral furnace-boilers. 5. Technique d • In the description, change the bullet point referring to cleaning devices for the convection bundles to “online and offline boiler cleaning systems”. • Keep the applicability of the technique unchanged. 6. Technique e • Change the name and the description of the technique to take into account the recovery of heat from flue-gas at low temperature after the boiler. • Add that in existing plants the applicability may be restricted by lack of space. 7. Technique f • Adjust the description for consistency with the technique´s name; otherwise, keep the technique unchanged. 8. Technique g • Delete the word "public" from the description. • Add as an applicability restriction the availability of a heat/power network. 9. Technique h • Amend the description to better take into account the scrubber features. • Change the applicability to better emphasise the need for low-temperature heat demand. 10. New techniques • Add the technique “dry bottom ash discharger”.

1.5.2 BAT-AEELs

<table>
<tr><td>Location in D1:</td><td><i>P. 694 – Section 5.1.3</i></td></tr>
<tr><td>Current text in D1:</td><td>
Table 1.1: BAT-associated energy efficiency levels (BAT-AEELs) for incineration
<table>
<tr><th rowspan="3">Type of waste incinerated</th><th colspan="3">BAT-AEELs</th></tr>
<tr><th colspan="2">Gross electrical efficiency (%) (1) (2)</th><th>Gross heat efficiency (%) (3)</th></tr>
<tr><th>New plant</th><th>Existing plant</th><th>New or existing plant</th></tr>
<tr><td>Municipal solid waste and other non-hazardous waste</td><td>25–35</td><td>20–35</td><td>72–91(4)</td></tr>
<tr><td>Sewage sludge</td><td>15– > 21(5)</td><td>12–21</td><td>60–70 (5)</td></tr>
<tr><td>Hazardous waste (6)</td><td>16–32</td><td>14–32</td><td>65–89</td></tr>
<tr><td colspan="4">(1) The BAT-AEELs for gross electrical efficiency apply to plants producing only electricity and to cogeneration plants mainly oriented towards the production of electricity.
(2) The higher end of the BAT-AEEL range can be achieved with high steam conditions (pressure, temperature).
(3) The BAT-AEELs for gross heat efficiency apply to plants producing only heat (steam and/or hot water) and to cogeneration plants mainly oriented towards the production of heat.
(4) A gross heat efficiency exceeding the higher end of the BAT-AEEL range (even above 100 %) can be achieved where a flue-gas condenser is used.
(5) For the incineration of sewage sludge, the gross electrical efficiency is highly dependent on the water content.
(6) The BAT-AEELs do not apply if a heat recovery boiler is not applicable.</td></tr>
</table>

The associated monitoring is in BAT 3.
</td></tr>
<tr><td>Summary of comments:</td><td>
1. <u>General</u>

Clarify that BAT-AEELs for gross electrical efficiency and gross total heat efficiency are alternative (FI-13).
Add a description on how to determine the gross heat efficiency and the gross electrical efficiency (CEWEP-ESWET-664, PL-16).
Define the energy efficiency when plants are working in condensation mode (e.g. summer) and when they are working in cogeneration mode (e.g. winter) (PL-1, Eurits-24).
Provide an appropriate reference and/or indication in case of plants treating different types of wastes (ES-17, FI-14, IT-19).
Change the headings of the first column of the BAT-AEELs table with: (SE-5)

Type of incineration
Municipal solid waste incinerator with temperature/residence time exceeding 2 seconds and 850 degrees
Plant for incineration of sewage sludge with temperature/residence time exceeding 2 seconds and 850 degrees
Plant with temperature/residence time exceeding 2 seconds and 1100 degrees

Quantify in footnotes (1) and (3) “mainly oriented” as a percentage of the heat/electricity produced (BE-18).
Replace footnote (1) by: "The BAT-AEELs for gross electrical efficiency apply to plants or parts of plants mainly oriented towards the production of electricity as described in section xxx (case 1)" (CEWEP-EWSET-665).
Delete footnote (2) or replace it by: "The higher end of the BAT-AEEL range may be achieved with high steam conditions (pressure, temperature) and other additional cycle improvements which may significantly increase Capex" (CEWEP-EWSET-666, FEAD-251).
Replace footnote (3) by: "The BAT-AEELs for gross heat efficiency apply to plants or parts of plants mainly oriented towards the production of heat as described in section xxx (case 2)" (CEWEP-EWSET-665).
Add a footnote stating that for small plants the profitability of improving energy efficiency is rarely ensured (CEWEP-ESWET-667).

</td></tr>
</table>

	2. MSW and ONHW BAT-AEELs • Decrease the lower end of the gross heat efficiency BAT-AEEL range to 65 (PL-1). • Decrease the higher end of the electrical efficiency BAT-AEEL range to 32 (Eurelectric-62). • Decrease the lower end of the electrical efficiency BAT-AEEL range to 17 (Eurelectric-62). • Decrease the lower end of the BAT-AEEL range for new plants. (CEWEP-ESWET-671) • Add a footnote saying that the higher ends of BAT-AEELs may be particularly relevant for existing plants. (FR-740) 3. SS BAT-AEELs • Delete the BAT-AEELs for the incineration of SS (CEWEP-ESWET-668, FEAD-148, FEAD-156, FEAD-252). • Perform an additional data collection to set the BAT-AEELs (CEFIC-18). • Apply footnote (5) also to gross heat efficiency (FR-741, FR-742, PL13). • Add to footnote (5) that if SS drying is not possible due to the plant design (e.g. feeding of pumpable SS), the energy efficiency is lower than the given BAT-AEELs (CEFIC-60). • Add to footnote (5) that the gross electrical efficiency also depend on the pre-treatment of the sewage sludge (e.g. raw/untreated or rotten/digested) and the nature and share of auxiliary fuel and other complementary waste fuels used. Include also that the BAT-AEELs are only indicative (Eurelectric-63). • Change footnote (5) to "…the gross electrical or heat efficiency is highly dependent on the residual water content and the TOC content in the dewatered sewage sludge. Energy demand for dewatering and/or drying the sewage sludge is not considered when calculating gross electrical or gross heat efficiency" (AT-157). 4. HW BAT-AEELs • Specify the type of installation and the type of waste to which the BAT-AEELs refer (DE-110, Eurits-68). • Delete the BAT-AEELs for existing plant (CEFIC-60). • Delete the BAT-AEELs for the incineration of HW (CEWEP-ESWET-669, FEAD-49, FEAD-148, FEAD-156), or add a footnote to give flexibility for the incineration in chemical installation or for small plants (PT-20). • Delete the gross electrical efficiency BAT-AEELs (DE-110, Eurits-69, HWE-37). • Give indication on which plants specific data has been used to set the electrical efficiency upper end of the BAT-AEEL of 32% (BE-17). • Decrease the lower end of the gross electrical efficiency BAT-AEEL range for new plants to 12 (Eurits-23). • Decrease the higher end of the gross electrical efficiency BAT-AEEL range for new and existing plants to 18 (Eurits-23), or to 25 (Eurelectric-62). • Set the BAT-AEEL, as ratio between the energy available at the boiler and the gross heat output (DE-110), for new and existing plants to 60-80%. (Eurits-23), or to >25% as the energy available after the boiler (Eurits-69, HWE-37). • Clarify if footnote (6) applies also in the case of a steam cycle and take into account that ORC has lower efficiency (BE-19). 5. Wood waste BAT-AEELs • Set BAT-AEELs for the incineration of wood waste, with a range of 25-35 for new and existing plants (Eurelectric-62).
EIPPCB assessment:	1. General • Footnotes (1) and (3) already specify when the gross heat efficiency BAT-AEEL and when the gross electrical efficiency BAT-AEEL apply. For further clarity, it can be added that the gross electrical efficiency BAT-AEELs are related to the use of condensing turbines and that the gross heat efficiency BAT-AEELs are related to the use of back-pressure turbines with heat recovery from the steam leaving the turbine. • How the gross heat efficiency and the gross electrical efficiency are determined is specified in the General considerations section of the BAT conclusions.

- Which BAT-AEEL is applicable depends on whether the plant design is oriented towards electricity production (using a condensing turbine) or towards heat production (e.g. using a back-pressure turbine), in the conditions of the performance test. Since the performance test generally addresses the generation of electricity wherever the system is designed to be able to produce electricity, this implies that, for a plant designed to switch from the production of only electricity (summer mode) to the production of mainly heat (winter mode), its performance can be represented by the electrical efficiency BAT-AEEL.
- The BAT-AEELs refer to plant design as determined from the performance test at full load. From the data reported in WIQ Annex II, at performance test conditions only one waste type is used in general.
- At the kick-off meeting it was concluded that the BAT conclusions would be based on the nature of the waste processed and not on the type of plant.
- From the data gathered, it is not possible to set a threshold to quantify the concept of plants “mainly oriented” towards electricity or heat generation. Plants mainly oriented towards electricity production generally use a condensing turbine.
- The BAT conclusions are a self-standing document where no references to other documents are made.
- To take into account complex plant energy recovery configurations, it is better to refer the BAT-AEELs to a plant or to a part of a plant.
- Considerations on the economic restrictions to the use of the techniques are addressed in the applicability of the techniques.

2. <u>MSW and ONHW BAT-AEELs</u>
    - No specific information has been provided to substantiate the fact that the lower end of the heat efficiency BAT-AEEL range should be 65.
    - No specific information has been provided to substantiate the fact that the upper end of the electrical efficiency BAT-AEEL range for existing plants should be 32.
    - No specific information has been provided to substantiate the fact that the lower end of the electrical efficiency BAT-AEEL range for existing plants should be 17.
    - No specific information has been provided to substantiate the fact that the lower end of the electrical efficiency BAT-AEEL range for new plants should be lower than 25.
    - The proposed BAT-AEELs, including the higher ends of the ranges, are based on the performance reported by plants that were in operation in the year 2014 and that in many cases have been in operation for several decades.
    - The proposed BAT-AEELs are also consistent with the recent literature data, e.g. “Circular economy: Energy and fuels”, study carried out in 2017 by Ramboll for the International Solid Waste Association (ISWA).
3. <u>SS BAT-AEELs</u>
    - The heat produced by the incineration of SS that is used internally (e.g. steam used to dry the SS before it is fed to the furnace) can be considered a useful use of the heat comparable to heat exported. It is therefore appropriate for this heat to be accounted as heat produced by the plant for the purpose of determining its energy efficiency, similarly to e.g. the heat used for flue-gas reheating.
    - Plants incinerating SS, like other WI plants, generate flue-gases at temperatures around 850 °C from which steam or hot water can be produced in a heat recovery boiler. Among the plants participating in the data collection exercise, only two plants do not have a heat recovery boiler installed.
    - The TWG was already asked to provide data on the energy performance of the plants incinerating SS several times: first when the WIQ was released; a second time when the EIPPCB highlighted some inconsistencies in the filled-in questionnaires and asked the TWG to check and if possible revise the questionnaires; and a third time when issuing D1. At the informal TWG meeting in Seville (December 2017), the data situation was discussed again, and the TWG could not commit to improving the data availability within the remaining time. At this late stage of the WI BREF review, there is no other realistic option than for the TWG to decide based on the available information

and on expert judgment.

- WIQ Annex II provides information on the heat export capacity in terms of capacity of the heat exchangers. However, from this information, it is not possible to take into due account cases where the heat exchangers may be oversized. An alternative way to estimate the plant's efficiency in producing steam (the so-called boiler efficiency) from the available information could be by the ratio between the gross heat power output (WIQ, sheet 4, point 4.3.11) and the nominal thermal input (WIQ, sheet 4, point 4.3.11) see EIPPCB assessment at the following point 4. "HW BAT-AEELs". By doing so, the BAT-AEELs could be set on the basis of a broader data set. This gives results in the range between 60% and 70% for most of the sewage sludge incineration plants providing this information. This range could be taken as representative of well-performing sewage sludge incineration plants.
- The incineration of sewage sludge with a higher water content generates a higher amount of flue-gas due to the extra water that needs to be evaporated and the extra fuel needed. This implies that even if the flue-gas leaves the boiler at same temperature, the amount of heat lost is higher. Additional heat is also lost with the bottom and fly ashes: the higher the amount of inert material, the greater the amount of heat lost with the ashes.
- No specific information has been provided to quantify the energy efficiency levels lower than the given BAT-AEELs, that are achievable by plants where sewage sludge drying is not possible due to the plant design.
- The composition of waste in terms of water and organic content is not constant in general, not only for the incineration of sewage sludge. The BAT-AEELs are expressed as a range to take into account the variable characteristics of the plants and of the waste. In any case, BAT-AEELs refer to the results of the performance test when the operating conditions are better controlled than in typical operation.
- Footnote (5) can be amended to specify that it refers to the conditions at which the sewage sludge is fed into the furnace.

4. <u>HW BAT-AEELs</u>
    - The characteristics of plants burning wood waste are more similar to those of plants burning ONHW than to plants burning HW.
    - Most of the plants incinerating HW that took part in the data collection exercise (37 lines) have a heat recovery boiler installed.
    - There are very small plants (< 20 000 t_{waste}/year) (FR104, DE24, DE21.2) that have a heat recovery boiler installed. There are incineration lines that are inside a chemical installation that have a heat recovery boiler installed (DE17, DE20.2, DE21.2)
    - According to the IED, any heat generated by a waste incineration plant shall be recovered as far as practicable. Since the heat is generated in the furnace, the assessment of the plant´s energy performance takes into account the available energy content of the waste.
    - Plants incinerating hazardous waste or sewage sludge, due to their size (usually they are smaller than the waste-to-energy plants), their location (usually closer to where the waste is generated and possibly farther from the possible recovered energy users), their design (more oriented towards waste destruction than to the exploitation of the waste energy content) may face increased challenges in optimising the use of the energy recovered.
    - For the incineration of hazardous waste, the efficiency in producing steam or hot water (so-called boiler efficiency) can be an appropriate parameter to determine the energy efficiency performance.
    - The FDBR Guideline RL 7 reports an example for the determination of the boiler efficiency for the incineration of waste. According to this Guideline, the boiler efficiency is the ratio between the useful heat output and the total heat supplied. The useful heat output is the power of the steam outlet less the power of the feed water inlet.
    - The following elements can be used to estimate the boiler efficiency from the available information:
        - The power of the steam outlet is available, as the gross heat power output (WIQ, sheet 4, point 4.3.11);
        - The total heat supplied is available, as the nominal thermal input

	(WIQ, sheet 4, point 4.3.7); o The power of the feed water input (as a percentage of the power of the steam outlet) may be estimated on the basis of information from the WIQ Annex II , using the feed water temperature (WIQ Annex II, point A2.2.1 g), the steam/hot water pressure at boiler outlet (WIQ Annex II, point A2.2.1 i) and the steam/hot water flow rate (WIQ Annex II, point A2.2.3). This information is available for the plants for which a carefully filled-in WIQ Annex II was provided. • For most of the incineration plants that provided this information by the WIQ Annex II , it can be shown that the power of the feed water inlet is around 15% of the power of the steam outlet. • Taking this share of 15% as generally representative for plants incinerating predominantly hazardous waste or sewage sludge, the boiler efficiency can be estimated as ((WIQ, sheet 4, point 4.3.11) * (1-0.15)) / ((WIQ, sheet 4, point 4.3.7) • By doing so, the BAT-AEELs could be set on the basis of a broader data set. This gives results in the range between 60% and 80% for most of the HW lines providing this information. This range could be taken as representative of well-performing HW incineration plants • While in some cases the energy performance of HW plants working at higher temperatures (higher than 1 100 °C) may be lower than for other plants, the 2016 data collection confirms that these plants can also reach a boiler efficiency of 60%. • Former footnote (6) refers to cases where no energy is recovered because a heat recovery boiler cannot be installed. • The ORC can be used to increase the energy efficiency by recovering heat from low-grade heat sources. Its gross electrical power is added to the power generated using the steam turbine. 5. <u>Wood waste BAT-AEELs</u> • The energy performance of the incineration of wood waste is comparable to the energy performance of the incineration of ONHW and hazardous wood waste.
EIPPCB proposal:	1. <u>General</u> • Amend footnotes (1) and (3) to clarify the cases in which the gross electrical efficiency BAT-AEEL and the gross heat efficiency BAT-AEEL apply, respectively. • Add to footnotes (1) and (3) that the gross heat and/or gross electrical efficiency BAT-AEELs apply at the level of a plant or of a part of a plant. 2. <u>MSW, ONHW and hazardous wood waste BAT-AEELs</u> • Keep the BAT-AEEL ranges for the incineration of MWS and ONHW unchanged. • Add plants incinerating hazardous wood waste to the categories of plants for which the BAT-AEELs for MSW and ONHW are applicable. • Clarify that footnote (2) refers to the use of BAT 21 (f) (high steam conditions). 3. <u>SS BAT-AEELs</u> • Delete the gross electrical efficiency and the gross heat efficiency BAT-AEELs and introduce a BAT-AEEL for boiler efficiency. • Set the lower end of the boiler efficiency BAT-AEEL range to 60. • Set the higher end of the boiler efficiency BAT-AEEL range to 70. • Apply footnote (5) also to the BAT-AEEL range for boiler efficiency. • Change footnote (5) to clarify that the water content refers to the sewage sludge as fed into the furnace. 4. <u>HW BAT-AEELs</u> • Delete the gross electrical efficiency and the gross heat efficiency BAT-AEELs and introduce a BAT-AEEL for boiler efficiency. • Set the lower end of the boiler efficiency BAT-AEEL range to 60. • Set the higher end of the BAT-AEEL range for boiler efficiency to 80. • Simplify the wording of the former footnote (6), without substantive change. 5. <u>Wood waste BAT-AEELs</u> • Do not set separate BAT-AEELs for the incineration of wood waste.

1.6 Emissions to air

1.6.1 Diffuse emissions

1.6.1.1 Extraction of air from bulk storage areas

Location in D1:	*P. 697 – Section 5.1.5.1*
Current text in D1:	**BAT 22. In order to prevent or reduce diffuse emissions, including odour emissions, from bulk waste storage areas including tanks and bunkers and from waste pretreatment areas, BAT is to enclose those areas, keep them under negative pressure, and use the extracted air as combustion air for incineration. When the incinerator is not available (e.g. during maintenance), BAT is to minimise the amount of waste in storage and/or to use an alternative abatement technique (e.g. a wet scrubber).** **Description** Solid and pasty wastes are kept in enclosed buildings from which incineration air is drawn; liquid waste tank vents are ducted to the incineration air feed. During shutdown periods the amount of waste in storage is minimised, e.g. by interrupting or reducing waste deliveries, as part of the waste stream management plan (see BAT 1).
Summary of comments:	1. Abatement techniques alternative to combusting the extracted air • Delete the part of BAT referring to any alternative techniques when the incinerator is not available (FEAD-159) • Clarify that this only applies to complete shutdowns when all incineration lines are stopped (CEWEP-ESWET-676) • Include additional techniques besides wet scrubber, such as AC filter, chemical or biological odour filter, and/or venting through the stack (FI-15, AT-20, Eurelectric-68, FEAD-253) • Include as additional technique the coverage with a layer of wood chips or similar when the incinerator is not available (DK-22) 2. Waste storage, handling and transfer • Harmonise requirements with those of WT pre-FD BAT 23 (storage of waste) and BAT 24 (handling and transfer of waste) (SE-60, Eurelectric-67, E&P-26) 3. Applicability of BAT 22 • Clarify that BAT 22 only applies to incineration plants (and not to IBA treatment plants) (FIR-10, UK-136, DE-111) • Introduce applicability restriction for existing plants due to constraints associated with plant configuration (IT-20) • Introduce applicability restriction for the storage of wood waste, as this type of waste is not prone to release significant odour emissions (Eurelectric-65, DE-111) • Introduce applicability restriction for the storage of baled waste with no leakage stored for a maximum of three weeks (NO-10) • Introduce applicability restriction for HW due to the risk of explosion (FR-653, ES-42, HU-43, HWE-40) • Introduce applicability restriction where the extracted air contains pollutants that may damage the equipment (e.g. H_2S from sewage sludge) (CEWEP-ESWET-675) • Limit applicability in the case of tanks and bunkers to those that are open to the environment (PT-21, CEFIC-61) and where suitable based on the properties of the waste (CEFIC-61), excluding non-vented closed containers (CEFIC-62) • Limit applicability to exclusively the bunker that is part of the incineration plant (FEAD-159, CEWEP-ESWET-672)

	4. Inclusion in the scope of waste pre-treatment areas • Delete reference to waste pre-treatment areas, as waste pre-treatment is not covered by the WI BREF and is/may be covered by the WT BREF (HWE-38, Eurits-25, FR-651, HU-41, FEAD-528) • Limit applicability to the case of pre-treatment areas next to the incinerator, for feasibility (CEWP-ESWET-674) 5. Specification of pressure of the enclosed storage areas • Replace “negative pressure” with vacuum/sub-atmospheric pressure, for precision of the technical term (DE-111, CEWEP-ESWET-673) • Replace “negative pressure” with controlled/adequate/vacuum pressure, as not always the air can be routed to the incinerator (Eurits-26, HWE-39, ES-41, FR-652, HU-42, FEAD-528) 6. Minimisation of the amount of waste in storage during shutdowns • Replace minimisation with management (FEAD-528, UK-43, CEWEP-ESWET-673), or by optimisation and clarify that this applies to scheduled shutdowns and is done by e.g. interrupting, reducing, or dispatching waste deliveries/emptying storage (HWE-41, FR-654, HU-44)
EIPPCB assessment:	1. Abatement techniques alternative to combusting the extracted air • A range of techniques are reported to be used to prevent or reduce diffuse emissions when the incinerator is not available. • The techniques are indicated only as examples and are not meant to be exhaustive. It is appropriate to include in the description more than a single example, as long as their applicability is general enough and sufficiently documented. • The use of alternative techniques is only relevant when no incineration capacity is available. As long as at least one of several incineration lines is available, the extracted air can be routed to that line. The description needs to be sufficiently general to also cover the case of single line incineration plants without overly complicating the text. 2. Waste storage, handling and transfer • BAT 22 deals with the prevention or reduction of diffuse emissions from bulk storage areas specific to waste incineration plants, not to the storage of waste in general. This is addressed in Section 5.1.3 of the BAT conclusions. 3. Applicability of BAT 22 • The content of volatiles in bottom ashes is not expected to be significant. The use of BAT 22 is therefore not relevant for bottom ashes/slags. • Likewise, different types of waste may have substantially different properties in terms of their propensity to emit volatile/odorous substances. • Depending on the chemical composition of the air extracted from areas where different types of waste are stored, different treatment techniques may be appropriate. However, the incineration of air vented from sewage sludge storage areas is a common practice; possible corrosion problems can be avoided, e.g. by ensuring that the extracted air reaches the air distribution equipment at a temperature above the acid dew point, or by using corrosion-resistant materials. • No specific information has been provided to substantiate the types of hazardous waste and the specific conditions that may lead to explosion risks, and the alternative approaches that are the most appropriate in those cases for the prevention or reduction of diffuse emissions. • Closed non-vented tanks do not have any release to the environment for which extraction and treatment would be relevant. • The plant configuration may constrain the degree to which some areas can be covered by air extraction and by abatement techniques alternative to incineration. However, there are elements, such as the drawing of combustion air from the waste bunker in MSWIs, which are very commonly applied. • BAT 22 refers to incineration plants. Constructions that are not part of the incineration plant are outside the scope of this BAT conclusion. 4. Inclusion in the scope of waste pre-treatment areas • Waste pre-treatment is not covered by the WI BREF. The incorporation of relevant pre-treatment areas in a common vent ducting system of the incineration plant may be appropriately decided case by case on the basis of the technical characteristics of the installation and of the waste pre-treatment

	operations concerned. 5. Specification of pressure of the enclosed storage areas • "Negative pressure" could be replaced by an alternative term that is more technically precise. • This BAT conclusion refers to the extraction of air for combustion (or routing to an alternative abatement technique). Cases where wastes are stored without any exposure to ambient air, e.g. in sealed tanks, are excluded. 6. Minimisation of the amount of waste in storage during shutdowns • There may be cases where the amount of waste in storage cannot be minimised, such as sewage sludge incinerators that are too large for spare backup capacity to be available. The BAT statement, however, includes alternatives to minimisation of waste in storage. • More examples of possible ways to manage the amount of waste in storage can be included in the description. Keeping minimisation rather than management is broad enough while making it clearer that the volume in storage should be limited.
EIPPCB proposal:	1. Abatement techniques alternative to combusting the extracted air • Include a broader list of example alternative techniques, besides the use of a wet scrubber. • Add in the description that shutdown in this context refers to complete shutdown when no incineration capacity is available. 2. Waste storage, transfer and handling • No changes. 3. Applicability of BAT 22 • Clarify that the BAT concerns diffuse emissions at the incineration plant. • Add in the description that the BAT applies to the storage of wastes that are odorous and/or prone to the release of volatile substances, thereby excluding waste wood, properly baled waste stored for limited time, etc. 4. Inclusion in the scope of waste pre-treatment areas • Delete reference to waste pre-treatment areas. 5. Specification of pressure of the enclosed storage areas • Replace "negative pressure" with "controlled sub-atmospheric pressure" for solid and pasty wastes, and "appropriate controlled pressure" for liquid wastes in tanks. 6. Minimisation of the amount of waste in storage during shutdowns • Include that waste in storage can also be minimised by transferring deliveries.

1.6.2 Channelled emissions

1.6.2.1 Emissions of dust, metals and metalloids

1.6.2.1.1 Techniques to reduce the emissions of dust, metals and metalloids from incineration

<table>
<tr><td>Location in D1:</td><td><i>P. 698 – Section 5.1.5.2.1</i></td></tr>
<tr><td>Current text in D1:</td><td>BAT 26. In order to reduce emissions to air of dust, metals and metalloids from the incineration of waste, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th></th><th>Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Bag filter</td><td>See Section 5.2</td><td>Applicable within the constraints associated with the overall pressure drop and the operating temperature profile of the FGC system configuration</td></tr>
<tr><td>b.</td><td>Electrostatic precipitator</td><td>See Section 5.2</td><td>Generally applicable</td></tr>
<tr><td>c.</td><td>Dry sorbent injection</td><td>See Section 5.2.
Not relevant for the reduction of dust emissions.
Adsorption of metals by injection of activated carbon or other reagents</td><td>Generally applicable</td></tr>
<tr><td>d.</td><td>Wet scrubber</td><td>See Section 5.2
Wet scrubbers are not used to remove the main dust load but, installed after other abatement techniques, to further reduce the concentrations of dust, metals and metalloids in the flue-gas</td><td>There may be economic restrictions to retrofitting existing plants burning non-hazardous waste with a capacity of < 250 000 tonnes/year</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>1. <u>Technique (a)</u>
• Limit the applicability restriction only to existing plants and only due to the operating temperature profile (NL-6).
• Add an applicability restriction in the case of cold climate due to the risk of clogging (FI-20).
2. <u>Technique (d)</u>
• Remove the applicability restriction due to economic factors (SE-14, AT-64).
• Add an applicability restriction due to water consumption coupled with either waste water generation or additional energy use for water evaporation (FEAD-254, CEWEP-ESWET-685).
3. <u>New techniques</u>
• Add Cyclones as an alternative to bag filters where cold climate prevents their use (FI-20).
• Add Semi-dry or semi-wet scrubbers in addition to DSI to remove metals (ES-19).
• Add Wet ESP as polishing removal stage (SE-13).
• Add Fixed-bed adsorption as polishing removal stage (AT-181).</td></tr>
<tr><td>EIPPCB assessment:</td><td>1. <u>Technique (a)</u>
• The pressure drop is an issue to be considered at the stage of plant design; for instance, within an FGC system that also includes a multistage wet scrubber and a static adsorption bed (e.g. a coke filter), an ESP may in general be sufficient to achieve very low dust emission levels while limiting the overall</td></tr>
</table>

	pressure drop. This is a cross-media effect to be taken into consideration at the design stage, but is not to be considered a general applicability restriction. Increasing the fan capacity is possible within a retrofit. • The operating temperature profile is an issue for existing plants. For new builds, the plant design can be adapted to include a bag filter. • The risk of clogging due to cold climate can be overcome, the flue-gas temperature being the key relevant temperature. Among the WI plants that participated in the 2016 data collection, the majority of plants located in FI, NO and SE include a bag filter in their FGC system. 2. Technique (d) • While the capital and operating costs (other than reagent costs) associated to wet scrubbing systems are substantially higher than for dry techniques, the evidence from the data collection is that wet scrubbing systems are in use at WI plants of a broad range of sizes. • While the implementation of wet scrubbing with flue-gas condensation opens up the possibility for additional economic returns, this will depend on the available demand for low-temperature heat (which in general requires a district heating network with a low return temperature). In situations where these conditions are not met, the wet scrubbing systems are generally more costly than dry systems. • The availability of water could be considered a limiting factor to the applicability of wet scrubbers, e.g. in arid areas. • The generation of waste water or alternatively the energy needed for water evaporation are cross-media effects to be taken into consideration at the design stage, but are not a general applicability restriction that would prevent the use of the technique. 3. New techniques • In the 2016 data collection there are no examples of plants where cyclones are effectively used as the only technique to remove dust. The list of techniques is neither exhaustive nor prescriptive, and combinations of techniques including cyclones as a pre-dedusting stage are possible. • The technique DSI refers in this case to the injection of activated carbon. While this can and is also done with semi-dry and semi-wet systems, activated carbon is generally injected, in the duct before the reactor or inside it, in dry form separately from the alkaline reagent slurry. The description of technique (c) can however be extended to clarify that it can also be implemented in systems based on a semi-wet absorber for the reduction of acid gas emissions. • The BAT statement specifies that BAT is to use the techniques mentioned either alone or in combination. Some of the techniques are more suitable to be used at the polishing stage rather than for the reduction of the main pollutant load; while this can also depend on the specific design of the FGC system, general indications can be included in the description of the techniques. • Wet ESPs are typically used at the polishing stage to remove residual dust and droplets after wet scrubbing. The description of ESP in Section 5.2.2 could be amended accordingly. • Fixed-bed adsorption, while mainly aimed at the removal of other pollutants, can also be effective for dust removal at the polishing stage.
EIPPCB proposal:	1. Technique (a) • Change the applicability restriction so that it affects existing plants only, and is only due to the operating temperature profile of the FGC system. 2. Technique (d) • Remove the applicability restriction for smaller existing plants due to economic reasons. • Add an applicability restriction due to water availability. 3. New techniques • Add to the description of DSI (technique c) that the technique can also be implemented in combination with semi-wet absorbers. • Amend the description of ESP in Section 5.2.2 to cover wet ESPs, specifying that they are especially used as polishing removal stage. • Add fixed-bed adsorption to the list of techniques.

1.6.2.1.2 BAT-AELs for dust, metals and metalloids from incineration

<table>
<tr><td>Location in D1:</td><td><i>P. 699 – Section 5.1.5.2.1</i></td></tr>
<tr><td>Current text in D1:</td><td>
Table 5.2: BAT-associated emission levels (BAT-AELs) for emissions to air of dust, metals and metalloids from incineration
<table>
<tr><th>Parameter</th><th>BAT-AEL (mg/Nm^3)</th><th>Averaging period</th></tr>
<tr><td>Dust</td><td>2–5 (1)</td><td>Daily average</td></tr>
<tr><td>Cd + Tl</td><td>0.01–0.02</td><td>Average over the sampling period</td></tr>
<tr><td>Sb + As + Pb + Cr + Co + Cu+ Mn + Ni + V</td><td>0.05–0.3</td><td>Average over the sampling period</td></tr>
<tr><td colspan="3">(1) The higher end of the BAT-AEL range is 7 mg/Nm^3 for existing plants where a bag filter is not applicable.</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>
1. <u>BAT-AEL range for dust</u>

Decrease the higher end of the BAT-AEL range to 4 mg/Nm^3 (EEB-61, SE-97), or keep it at 5 mg/Nm^3 without any footnote exceptions (NL-7).
Increase the higher end of the BAT-AEL range to: 7 mg/Nm^3 for all existing plants (CZ-38, Eurelectric-71); 7 mg/Nm^3 for existing plants below a capacity threshold of 12 t/h except HWI (Eurelectric-72); 10 mg/Nm^3 for the plants covered by footnote (1) (CEFIC-67, CEWEP-ESWET-683); 10 mg/Nm^3 for all plants, without range (E&P-28, UK-46, CEWEP-ESWET-686).
Decrease the lower end of the BAT-AEL range to 1 mg/Nm^3 (SE-97, AT-22, NL-7) or 0.5 mg/Nm^3 (EEB-61).
Increase the lower end of the BAT-AEL range to 3 mg/Nm^3 (FI-17).
If the proposed BAT-AEL range is kept, allow compliance to be demonstrated on the basis of indicative monitoring (UK-46).
Change the formulation of footnote (1) to limit its applicability to until the next filter upgrade/reconstruction (AT-23).
Introduce half-hourly BAT-AELs for dust (NO-11, EEB-60, AT-24), as the following ranges: 1-8 mg/Nm^3 (EEB-60); or as 1-5 mg/Nm^3 (97%) and <10 mg/Nm^3 (100%) (AT-24)

2. <u>BAT-AEL range for Cd + Tl</u>

Decrease the higher end of the BAT-AEL range to 0.01 mg/Nm^3 (EEB-62)
Decrease the lower end of the BAT-AEL range to 0.005 mg/Nm^3 (SE-99, NL-8, AT-26, EEB-62).
Increase the lower end of the BAT-AEL range to: <0.02 mg/Nm^3 (use expression less or equal to the higher end rather than specifying the lower end) (IT-22)

3. <u>BAT-AEL range for Sb + As + Pb + Cr + Co + Cu+ Mn + Ni + V</u>

Decrease the higher end of the BAT-AEL range to 0.2 mg/Nm^3 (NL-9) or to 0.1 mg/Nm^3 (EEB-63)
Increase the higher end of the BAT-AEL range to 0.5 mg/Nm^3 (CEWEP-ESWET-683)
Decrease the lower end of the BAT-AEL range to 0.02 mg/Nm3 (NL-9) or to 0.005 mg/Nm^3 (AT-28, EEB-63)
Increase the lower end of the BAT-AEL range to 0.17 mg/Nm^3 (IT-23)

</td></tr>
<tr><td>EIPPCB assessment:</td><td>
1. <u>BAT-AEL range for dust</u>

While a large share of the reference lines achieve maximum emission levels below 5 mg/Nm^3 and also below 4 mg/Nm^3, the BAT-AEL range has been proposed based not only on the OP,OC1,ELV,43 filter but also considering the performance levels evaluated with less stringent data filters. An upper level of 5 mg/Nm^3 is also consistent with the bag filter performance level that has been considered appropriate by other TWGs. Plants fitted with ESP are normally also fitted with a wet scrubbing system, which contributes to reducing dust emissions to levels usually well within the same range. Some more variability

</td></tr>
</table>

over time in the emission levels is however observed in a number of plants fitted with ESP compared to plants using a well-maintained bag filter, which justifies the footnote level.

- Increasing the higher end of the range for all existing plants is not justified in view of the performance levels achieved by well-maintained bag filters. Higher emission levels tend to be related to failing or deteriorated filter bags, or to the bypassing of the bag filter.
- The fact that some of the reference lines reported emission levels higher than the proposed higher end of the BAT-AEL range is not per se a justification for an increased higher end of the range. The technical reasons why the proposed levels could not be achieved are not provided.
- While the measurement uncertainty could increase as a percentage at emission levels lower than the ELVs set in IED Annex VI, the proposed BAT-AEL ranges do take into account the data uncertainty and the intrinsic variability of the incineration process in a pragmatic way: it should be noted that a substantial number of plants have reported dust emission levels well below 1 mg/Nm^3 as yearly maximum of the daily averages (irrespective of the application of data filters). A level of 2 mg/Nm^3 for the lower end of the BAT-AEL range provides a substantial safety margin compared to the LoQ of the measurement methods and is also consistent with the performance level that has been considered appropriate by other TWGs.
- It is also stated in EN 13284-1 that increasing the “sampling time to 60 min or to 90 min would naturally improve significantly the reproducibility of measurements”.
- The overall dust emission levels depend not only on a single piece of equipment but on the overall combination of techniques that make up the FGC system. This is especially true for plants not fitted with bag filters, as a wet scrubbing system (and possibly a fixed adsorption bed too) is often used in combination. It is therefore not straightforward to link the environmental performance with the rebuild of the ESP only. The decision on the most appropriate emission requirements for a plant undergoing a major rebuild is an implementation issue.
- 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. See also Section 2.12.

2. <u>BAT-AEL range for Cd + Tl</u>
    - While the majority of the reference lines reported Cd+Tl emission levels well below 0.01 mg/Nm^3 as yearly maximum of the averages over the sampling period, the range up to 0.02 mg/Nm^3 is proposed to pragmatically take into account the intrinsic variability of the pollutant content in certain types of waste.
    - While a large share of the reference lines reported Cd+Tl emission levels even well below 0.005 mg/Nm^3, a lower end of the range of 0.01 mg/Nm^3 is proposed to pragmatically take into account the intrinsic variability of the pollutant content in certain types of waste.
    - The fact that there are examples of plants that apply BAT but do not meet the lower end of the proposed BAT-AEL range is not per se a reason to change the lower end of the range. The appropriateness of the lower end of the range for individual plants depends e.g. on the techniques in place and on the types of waste accepted.
3. <u>BAT-AEL range for Sb + As + Pb + Cr + Co + Cu+ Mn + Ni + V</u>
    - While the majority of the reference lines reported “sum metals” emission levels well below 0.2 mg/Nm^3 as yearly maximum of the averages over the sampling period, the range up to 0.3 mg/Nm^3 is proposed to pragmatically take into account the intrinsic variability of the pollutant content in certain types of waste.
    - While a large share of the reference lines reported “sum metals” emission levels even well below 0.002 mg/Nm^3, a lower end of the range of 0.05 mg/Nm^3 is proposed to pragmatically take into account the intrinsic variability of the pollutant content in certain types of waste.

	- The fact that there are examples of plants that apply BAT but do not meet the lower end of the proposed BAT-AEL range is not per se a reason to change the lower end of the range. The appropriateness of the lower end of the range for individual plants depends e.g. on the techniques in place and on the types of waste accepted.
EIPPCB proposal:	1. BAT-AEL range for dust - Keep the BAT-AEL range unchanged. - Keep the higher end of the BAT-AEL range mentioned in footnote (1) unchanged. - Do not change the condition of footnote (1). 2. BAT-AEL range for Cd + Tl - Keep the BAT-AEL range unchanged. 3. BAT-AEL range for Sb + As + Pb + Cr + Co + Cu+ Mn + Ni + V - Keep the BAT-AEL range unchanged.

1.6.2.1.3 Techniques to reduce the emissions of dust, metals and metalloids from IBA treatment

Location in D1:	*P. 699 – Section 5.1.5.2.1*
Current text in D1:	**BAT 27. In order to reduce dust emissions to air from the treatment of slags and bottom ashes, BAT is to carry out these activities in enclosed equipment under negative pressure and to treat the extracted air with a bag filter (see Section 5.2.2).**
Summary of comments:	1) Applicability of equipment enclosure and alternative techniques to control diffuse dust emissions - Clarify that the enclosure only applies to bottom ash treatment plants, and not to storage and loading of material on site and to storage areas (FI-18, ES-21), nor to bottom ash/slag treatment taking place immediately after the wet deslagger (e.g. in the boiler house) (AT-29, FEAD-255) - Include as BAT also other techniques alternative to equipment enclosure: for plants operating discontinuously less than 60 days per year (FI-19); for smaller plants and in cold climate (E&P-29); in all cases, and make the applicability of operation under sub-atmospheric pressure limited to specific cases such as very dry bottom ashes or local air quality concerns (FIR-11, PT-28, EURITS-28, FEAD-33, Eurelectric-74 UK-102, DE-108, FEAD-33, FEAD-529, FR-563, SE-82, CEWEP-ESWET-689). The alternative techniques proposed include the following: a. Enclose and Cover equipment b. Limiting height of discharge c. Protect stockpiles against main winds d. Ensure humidification of stockpiles, charging and discharging points e. Control moisture content f. Use water spray g. Road wetting and housekeeping h. Operate under sub-atmospheric pressure (applicable to dry bottom ashes or in exceptional circumstances) 2) Alternative treatment techniques to bag filter - Include as BAT other techniques, e.g. cyclone (Eurelectric-74, DE-108).
EIPPCB assessment:	1) Applicability of equipment enclosure and alternative techniques to control diffuse dust emissions - More clarity regarding the activities covered by the BAT can be achieved by further specification in the BAT statement and by separating current BAT 27 into two parts, one focusing on the reduction of diffuse emissions and the other on the treatment of channelled emissions limited to the cases where channelled emissions occur following the application of enclosed equipment with air

	extraction. • The dustiness of bottom ash treatment operations can vary substantially depending on several factors that may include the moisture content required by the treatment process, the climatic conditions, the type of bottom ash treatment process, and the type of bottom ash discharger. • Local air quality concerns are local conditions that could affect the applicability of the technique for an individual plant and are not meant to be addressed in BREFs (BREF Guidance Section 2.3.4.2.6). • Taking into consideration the techniques proposed by the TWG and the differences in bottom ash treatment processes and external factors, it is considered appropriate to complement BAT 27 with a set of techniques to reduce diffuse emissions, in a separate BAT. 2) Alternative treatment techniques to bag filter • All the IBA treatment plants that apply dust control techniques for extracted air (CZ.B-01, DE.B-05, DE.B-06, DE.B-07, DE.B-09, DE.B-12, IT.B-01, IT.B-02, NL.B-01) report the use of bag filter.
EIPPCB proposal:	Complement BAT 27 with BAT 23 ter, and amend BAT 27 as follows: • BAT 23 ter, in Section 5.1.5.1 on diffuse emissions to air, addresses the prevention or reduction of diffuse emissions from the treatment of slags and bottom ashes by setting as BAT the use of an appropriate combination of the following techniques: a. Enclose and cover equipment b. Limit height of discharge c. Protect stockpiles against prevailing winds d. Use water sprays e. Optimise moisture content f. Operate under sub-atmospheric pressure (applicable to dry bottom ashes) • BAT 27, in Section 5.1.5.2 on channelled emissions to air, only addresses the reduction of channelled dust emissions to air from the enclosed treatment of slags and bottom ashes with extraction of air, by setting as BAT the use of bag filter.

1.6.2.1.4 BAT-AELs for dust, metals and metalloids from IBA treatment

<table>
<tr><td>Location in D1:</td><td><i>P. 699 – Section 5.1.5.2.1</i></td></tr>
<tr><td>Current text in D1:</td><td>Table 5.3: BAT-associated emission levels (BAT-AELs) for dust emissions to air from the treatment of slags and bottom ashes
<table>
<tr><th>Parameter</th><th>BAT-AEL (mg/Nm^3)</th><th>Averaging period</th></tr>
<tr><td>Dust</td><td>2–5</td><td>Average over the sampling period</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>1. General
• Clarify that the BAT-AELs only apply to channelled emissions (SE-83, FR-564)
• Delete table 5.3 to be consistent with the proposal to change BAT 27 by including as BAT alternatives to operate IBA equipment under enclosure and with air extraction (Eurits-29)
2. BAT-AEL range
• Increase the higher end of the BAT-AEL range to 10 mg/Nm^3 either in general (CEWEP-ESWET-690) or where a bag filter is not applicable (DE-108)
• For smaller plants, express the BAT-AEL as g/m^3 per month (NO-12)</td></tr>
<tr><td>EIPPCB assessment:</td><td>1. General
• The entire Section 5.1.5.2 of the BAT conclusions only applies to channelled emissions. It can also be repeated in each BAT.
• Even if the levels may be applicable only where equipment is enclosed and air is extracted, the emission levels are still relevant in that case.</td></tr>
</table>

	2. <u>BAT-AEL range</u> - The proposal to increase the general level to 10 mg/Nm^3 is not accompanied by any rationale. The proposal to link it to the limited applicability of bag filters is not supported by the data collection, as all the IBA treatment plants that apply dust control techniques for extracted air (CZ.B-01, DE.B-05, DE.B-06, DE.B-07, DE.B-09, DE.B-12, IT.B-01, IT.B-02, NL.B-01) report the use of bag filter. - The revised proposal on BAT 27 and BAT 23 bis provides sufficient flexibility for bottom ash treatment plants irrespective of their size.
EIPPCB proposal:	1. <u>General</u> - State that the BAT-AELs apply to channelled emissions. - Keep Table 5.3 and change its heading to “BAT-associated emission levels (BAT-AELs) for dust emissions to air from the enclosed treatment of slags and bottom ashes with extraction of air”. 2. <u>BAT-AEL range</u> - Keep the range of 2-5 mg/Nm^3, expressed as average over the sampling period, unchanged.

1.6.2.2 Emissions of HCl, HF and SO$_2$

1.6.2.2.1 Techniques to reduce the emissions of HCl, HF and SO$_2$ from incineration

Location in D1:	*P. 699 – Section 5.1.5.2.2*
Current text in D1:	**BAT 28. In order to reduce emissions of HCl, HF and SO$_2$ to air from the incineration of waste, BAT is to use one or a combination of the techniques given below.** **Technique / Description / Applicability** a. Wet scrubber / See Section 5.2 / There may be economic restrictions to retrofitting existing plants burning non-hazardous waste with a capacity of < 250 000 tonnes/year b. Semi-wet absorber / See Section 5.2 / Generally applicable c. Dry sorbent injection / See Section 5.2 / Generally applicable d. Direct desulphurisation / See Section 5.2 / Only applicable to fluidised bed furnaces e. Boiler sorbent injection / See Section 5.2 / Generally applicable
Summary of comments:	1. <u>Technique a.</u> - Remove applicability restriction and make the technique generally applicable (SE-12, AT-65, NL-10) - Include additional applicability restriction due to cross-media effects in terms of water use and water emissions or energy use for water evaporation (ES-20, FEAD-256, CEWEP/ESWET-692, IMA Europe-18) 2. <u>Technique d.</u> - Change applicability restriction to “Generally applicable to fluidised bed furnaces and possibly to some other furnaces types” (FEAD-167, CEWEP/ESWET-696) 3. <u>Technique e.</u> - Remove this technique from being BAT because of high reagent consumption and negative effects on boiler efficiency (DK-9) - Include applicability restriction, only for fluidised bed boilers (Eurelectric-75) - Clarify that the technique is generally applicable but not sufficient alone (CEWEP/ESWET-697)
EIPPCB assessment:	1. <u>Technique a.</u> - While the capital and operating costs (other than reagent costs) associated to wet scrubbing systems are substantially higher than for dry techniques, the

	evidence from the data collection is that wet scrubbing systems are in use at WI plants of a broad range of sizes. • While the implementation of wet scrubbing with flue-gas condensation opens up the possibility for additional economic returns, this will depend on the available demand for low-temperature heat (which in general requires a district heating network with a low return temperature). In situations where these conditions are not met, the wet scrubbing systems are generally more costly than dry systems. • The availability of water could be considered a limiting factor to the applicability of wet scrubbers, e.g. in arid areas. • The generation of waste water, or alternatively the energy needed for water evaporation, are cross-media effects to be taken into consideration at the design stage, but are not a general applicability restriction that would prevent the use of the technique in general. 2. Technique d. • Although it may be possible to also apply direct desulphurisation to processes different from fluidised bed combustion, the efficiency may be substantially lower than in the case of fluidised bed furnaces and result in high stoichiometric excess. No specific information has been provided to substantiate the use of this technique with grate-fired systems and to clarify under which circumstances its use in grate-fired incineration plants may be considered BAT. 3. Technique e. • This technique is not to be confused with technique d. While technique d refers to the addition of alkaline adsorbents to the bed of the furnace, technique e refers to the injection of alkaline reagents into the boiler at high temperature in the boiler post-combustion area. • The description of the technique makes it clear that the technique is used for partial abatement of the acid gases, and in particular of SO_2 and HF. For clarity, this can be recalled in the description column of this table. The same applies to technique d. • No specific information has been provided to substantiate the extent of the cross-media effects of this technique, in particular when it is used, as intended in this BAT description, not to remove the entire/main load of emissions but only for partial abatement of acid gases.
EIPPCB proposal:	1. Technique a. • Remove the applicability restriction for smaller existing plants due to economic reasons. • Add an applicability restriction due to water availability. 2. Technique d. • Add to the description that the technique is used for the partial abatement of acid gas emissions upstream of other techniques. 3. Technique e. • Add to the description that the technique is used for the partial abatement of acid gas emissions upstream of other techniques.

1.6.2.2.2 BAT-AELs for HCl, HF and SO_2 from incineration

Location in D1:

P. 700 – Section 5.1.5.2.2

Current text in D1:

Table 5.4: BAT-associated emission levels (BAT-AELs) for emissions to air of HCl, HF and SO_2 from incineration

Parameter	BAT-AEL (mg/Nm^3)		Averaging period
	New plant	Existing plant	
HCl	2–6 (1)	2–8 (1)	Daily average
HF	< 1	< 1	Daily average or average over the sampling period
SO_2	10–30	10–40	Daily average

(1) The lower end of the BAT-AEL range can be achieved when using a wet scrubber; the higher end of the range may be associated with the use of dry sorbent injection.

Summary of comments:

1. General
   - Consider deleting the BAT-AELs for HF and HCl because these pollutants are not KEI in the WI BREF review (Eurelectric-3); delete the BAT-AELs for HF (FI-21, CEFIC-70)
   - Introduce half-hourly BAT-AELs (NO-13, EEB-67, AT-32, AT-34, AT-36)
2. BAT-AEL range for HCl
   - Decrease the higher end of the BAT-AEL range to 3 mg/Nm^3 for new plants (EEB-64) and to 6 mg/Nm^3 for existing plants (NL-11, EEB-66).
   - Increase the higher end of the BAT-AEL range to: 10 mg/Nm^3 for all plants (FEAD-21, DE-113), for existing plants applying dry techniques such as direct desulphurisation (in boiler), boiler sorbent injection or dry sorbent injection (CZ-39), or without range for all plants applying continuous monitoring (E&P-31); or to 20 mg/Nm^3 for plants combusting fuels with high chlorine content (CEWP-ESWET-780)
   - Decrease the lower end of the BAT-AEL range to 1 mg/Nm^3 (AT-31, EEB-64, EEB-66).
   - Increase the lower end of the BAT-AEL range to: 3 mg/Nm^3 (IT-24).
   - Delete footnote (1) (CEFIC-68, CZ-40), or change “the lower end… can be achieved when using wet scrubber” into “the lower end… has been observed when using wet scrubber” in footnote (1) (FEAD-170, CEWEP/ESWET-694). A further proposal (IMA Europe-19) is to include in the footnote reference to the cross-media effects of wet techniques and to BAT 33.
   - Introduce half-hourly BAT-AELs for HCl as the following ranges: 1-7 mg/Nm^3 (97%) and <15 mg/Nm^3 (100%) (AT-32).
   - Change the averaging period for the proposed BAT-AEL range (2-6 mg/Nm^3 for new plants and 2-8 mg/Nm^3 for existing plants to “average over the sampling period” (E&P-31), or to “daily average or average over the sampling period” (Eurelectric-76).
3. BAT-AEL range for HF
   - Decrease the BAT-AEL range to <0.3 mg/Nm^3 (AT-33), or to 0.05 to 0.4 mg/Nm^3 (EEB-68).
   - Remove the “<” symbol preceding the value of 1 mg/Nm^3 for reasons of clarity (CEWEP-ESWET-680).
   - Include additional footnote setting the higher end of the BAT-AEL range at 7 mg/Nm^3 in the case of co-incineration plants fitted with wet FGD with a downstream gas-gas heater, for consistency with BAT 21 of the BAT conclusions for LCP (Eurelectric-79).
   - Introduce half-hourly BAT-AELs for HF as the following ranges: <0.3 mg/Nm^3 (97%) and <1 mg/Nm^3 (100%) (AT-34).
4. BAT-AEL range for SO_2
   - Decrease the higher end of the BAT-AEL range for existing plants to 30 mg/Nm^3 (NL-12).
   - Increase the higher end of the BAT-AEL range to 50 mg/Nm^3 in the following cases: incineration of sludges from industrial waste water treatment that contain

	(iron) sulphate from flocculation/coagulation/ other WWT techniques (CEFIC-69); existing plants in general, where the levels of the BAT-AEL range apply only if achievable by FG condensation or if additional FG cleaning techniques are needed to achieve the BAT-AEL for Hg (DK-87); plants commissioned up to 7 January 2014 and plants with a high sulphur input (CEWEP-ESWET-780); all plants (DE-113). • Decrease the lower end of the BAT-AEL range to 1 mg/Nm^3 (EEB-69, EEB-70). • Introduce half-hourly BAT-AELs for SO_2 as the following ranges: 1-40 mg/Nm^3 (97%) and 1-80 mg/Nm^3 (100%) (AT-36). • Include a footnote associated to the BAT-AEL range for SO_2: "The lower end of the BAT-AEL range has been observed when using a wet scrubber; the higher end of the range may be associated with the use of dry sorbent injection" (FEAD-257).
EIPPCB assessment:	1. General • As explained in the "WI D1 EIPPCB reflections on some key issues" document uploaded in BATIS together with D1, HCl is considered a KEI for the WI BREF review, in view of the availability of techniques that can reliably achieve emission levels substantially lower than the ELVs set out in IED Annex VI. This covers not only wet abatement techniques but also (combinations of) dry and/or intermediate techniques that achieve low emissions of HCl while maintaining a low stoichiometric excess of reagent used per unit of pollutant removed. • Regarding HF, although techniques are available to reduce them even further, the emission levels achieved are generally already very low. For this reason, the higher end of the BAT-AEL range for HF is proposed to be set at the IED Annex VI´s ELV. • 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. See also Section 2.12. 2. BAT-AEL range for HCl • While a large share of the reference lines achieve maximum emission levels below 6 mg/Nm^3 and also below 3 mg/Nm^3, the BAT-AEL range has been proposed based not only on the OP,OC1,ELV,43 filter but also considering the performance levels evaluated with less stringent data filters. • An upper level of 8 mg/Nm^3 is considered achievable with a broad range of techniques including wet, semi-wet/semi-dry and dry techniques. For new plants, an upper level of 6 mg/Nm^3 is considered achievable with the same range of techniques including dry techniques; the process optimisation that may be necessary to reach such a level with techniques other than the wet scrubber is generally feasible for new plants. • HCl is considered a KEI for the WI sector. No specific information has been provided to quantify the cross-media effects associated with lowering HCl emission levels from 10 mg/Nm^3 to 8 mg/Nm^3 as a daily average. • There are many plants in the data collection that achieve emission levels within the proposed BAT-AEL range and apply dry techniques. • There are many plants in the data collection that measure HCl continuously and comply with ELVs within the proposed BAT-AEL range. • A higher end of the BAT-AEL range of 20 mg/Nm^3 as a daily average for plants combusting fuels with a high chlorine content is neither justified by any specific information in the data collection nor consistent with the existing IED requirements. • While the measurement uncertainty could increase as a percentage at emission levels lower than the ELVs set in IED Annex VI, the proposed BAT-AEL ranges do take into account the data uncertainty and the intrinsic variability of the incineration process in a pragmatic way: while it should be noted that a substantial number of plants have reported HCl emission levels well below 1 mg/Nm^3 as a yearly maximum of the daily averages (irrespective of the applied data filters), a level of 2 mg/Nm^3 for the lower end of the BAT-AEL range also

provides a substantial margin over the limit of quantification of the measurement methods.

- The data collection confirms that levels in the region of the lower end of the proposed BAT-AEL range are consistently achieved by many reference lines fitted with a wet scrubber. Footnote (^{1}) is intended to provide information on the performance differences among the techniques that are considered BAT, and to be fully consistent with the evidence provided by the data collection. In fact, 44% of the reference lines fitted with a wet scrubber show a maximum of the daily average HCl emissions below 2 mg/Nm^3 (with daily averages based on the OP,OC1,ELV,43 filter). By comparison, this share goes down to 7% in the case of reference lines that are not fitted with a wet scrubber.
- The formulation of footnote (^{1}) does not suggest that wet scrubbers are generally applicable (nor does it suggest the contrary). Cross-media effects are only mentioned in the BAT conclusions in the cases where they result in applicability restrictions. In those cases, they are mentioned when listing the techniques, not in the BAT-AEL table.
- The continuous measurement of HCl is carried out by almost all of the reference lines participating in the 2016 data collection, with only very few examples of reference lines that reported measuring HCl discontinuously.

3. <u>BAT-AEL range for HF</u>
    - While a large share of the reference lines achieve maximum emission levels below 0.4 mg/Nm^3 or 0.3 mg/Nm^3, the EIPPCB has proposed to set the higher end of the BAT-AEL range at the level of the IED Annex VI ELV consistently with the categorisation of HF as a non-KEI pollutant. For the lower end of the range, the definition of a precise value is challenging in view of the LoD of ~0.1 mg/Nm^3 given in ISO 15713:2006.
    - While a true range is preferable, the BREF Guidance accepts the use of expressions of the type "< X" 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.
    - A higher end of the BAT-AEL range of 7 mg/Nm^3 as a daily average for co-incineration plants fitted with wet FGD with a downstream gas-gas heater is neither justified by any specific information in the data collection nor consistent with the existing IED requirements.
4. <u>BAT-AEL range for SO_2</u>
    - While a large share of the reference lines achieve maximum emission levels below 30 mg/Nm^3, the BAT-AEL range has been proposed based not only on the OP,OC1,ELV,43 filter but also considering the performance levels evaluated with less stringent data filters.
    - An upper level of 40 mg/Nm^3 is considered achievable with a broad range of techniques including wet, semi-wet/semi-dry and dry techniques. For new plants, an upper level of 30 mg/Nm^3 is considered achievable with the same range of techniques including dry techniques; the process optimisation that may be necessary to reach such a level is generally feasible for new plants.
    - A higher end of the BAT-AEL range of 50 mg/Nm^3 as a daily average for the incineration of sludges from industrial WWT containing iron sulphate from flocculation is not justified on the basis of any specific information from the data collection.
    - The economic feasibility considerations proposed by DK regarding plants that may need to implement additional FGC are general to every case where an existing plant may need to be retrofitted. If related to the possible local conditions of specific plants, they may be relevant at the implementation stage.
    - No specific information has been provided to substantiate a higher end of the BAT-AEL range of 50 mg/Nm^3 as a daily average for plants commissioned before 7 January 2014 or with a high sulphur input.
    - The fact that some of the reference lines reported emission levels higher than the proposed higher end of the BAT-AEL range is not per se a justification for an increased higher end of the range. Technical reasons why the proposed levels could not be generally achieved are not provided.
    - Regarding the lower end of the BAT-AEL range, a substantial number of plants demonstrate emission levels not only below 10 mg/Nm^3 but also below 5 mg/Nm^3 as a daily average, irrespective of the specific data filtering used to

	derive the daily averages. While a level of 1 mg/Nm^3 is close to the limit of quantification for the measurement techniques, a level of 5 mg/Nm^3 would still provide a substantial margin above the LoQ. • In the case of SO_2 emissions, the environmental performance levels reported in the 2016 data collection offer much less evidence of a different performance of wet scrubber compared to DSI than in the case of HCl emissions.
EIPPCB proposal:	1. BAT-AEL range for HCl • No change. 2. BAT-AEL range for HF • No change. 3. BAT-AEL range for SO_2 • Decrease the lower end of the BAT-AEL range to 5 mg/Nm^3 for new and existing plants.

1.6.2.3 Emissions of NO_X, N_2O, CO and NH_3

1.6.2.3.1 Techniques to reduce the emissions of NO_X, N_2O, CO and NH_3 from incineration

<table>
<tr><td>Location in D1:</td><td><i>P. 700 – Section 5.1.5.2.3</i></td></tr>
<tr><td>Current text in D1:</td><td>
BAT 29. In order to reduce NO_X emissions to air while limiting the emissions of CO and N_2O from the incineration of waste and the emissions of NH_3 from the use of SNCR and/or SCR, BAT is to use a combination of the techniques given below.
<table>
<tr><th></th><th>Technique</th><th>Description</th><th>Applicability (1)</th></tr>
<tr><td>a.</td><td>Optimisation of the incineration process</td><td>See Section 5.2</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Flue-gas recirculation</td><td>See Section 5.2</td><td>Generally applicable</td></tr>
<tr><td>c.</td><td>Low-NO_X burners</td><td>See Section 5.2</td><td>Only applicable to liquid waste</td></tr>
<tr><td>d.</td><td>Selective non-catalytic reduction (SNCR)</td><td>See Section 5.2</td><td>Generally applicable</td></tr>
<tr><td>e.</td><td>Selective catalytic reduction (SCR)</td><td>See Section 5.2</td><td>There may be economic restrictions to retrofitting existing plants</td></tr>
<tr><td>f.</td><td>Catalytic filter bags</td><td>See Section 5.2</td><td>Not applicable to existing plants that are not fitted with a bag filter</td></tr>
<tr><td>g.</td><td>Optimisation of the SNCR/SCR design and operation</td><td>Optimisation of the reagent to NO_X ratio, of the homogeneity of reagent distribution and of the size of reagent drops</td><td>Only applicable where SNCR and/or SCR is used for the reduction of NO_X emissions</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>1. <u>BAT statement</u>
• Change the statement “BAT is to use a combination of the techniques given below” into “BAT is to use one or a combination of the techniques given below” (FEAD-23, Eurits-30, HWE-43, CEFIC-71, ES-23, CEWEP-ESWET-707, HU-46)
2. <u>Technique b.</u>
• Introduce applicability restriction depending on the specific flue-gas process and required energy efficiency (FEAD-108, CEWEP-ESWET-700, UK-49)
3. <u>Technique e.</u></td></tr>
</table>

	• Add a technical applicability restriction associated with the availability of sufficient space (FI-22, HWE-44, Eurelectric-84) • Remove applicability restriction due to economic factors (AT-66) 4. Technique f. • Broaden the description of the technique by replacing “catalytic filter bags” by “catalytic filter” (CEWEP-ESWET-701, FEAD-171) 5. Techniques not mentioned in BAT 29 • Add the use of wet scrubber as BAT for the removal of NH_3 emissions, typically where SNCR is used (SE-11, AT-29)
EIPPCB assessment:	1. BAT statement • The BAT statement refers to a combination of techniques because the optimisation of the incineration process should be used in all cases, combined with the appropriate additional techniques. 2. Technique b. • While the implementation of the technique may be associated with more or less technical challenges depending on the specific FGC system in place, no specific information is provided to substantiate the non-applicability of flue-gas recirculation to certain plant types in general. • Depending on the specific implementation of the technique (e.g. extraction of raw instead of clean flue-gas to be recirculated), flue-gas recirculation may result in the reduction of energy losses. 3. Technique e. • An SCR system built as an independent unit (but less so when SCR is implemented as slip catalyst) requires significant space. When retrofitting existing plants, in certain cases this may result in constraints. • The implementation of SCR is significantly more expensive than alternative techniques such as SNCR, in terms both of capital costs and of energy consumption when flue-gas reheating is needed. However, the 2016 data collection includes many examples of waste incineration plants that have been retrofitted with SCR. 4. Technique f. • Little information is provided to describe the exact technique that corresponds to the suggested change, or to substantiate it with example plants. Technique (f) refers to filter bags that can be incorporated in an existing bag filter with minimal modifications. The description suggested by FEAD and CEWEP-ESWET seems to refer instead to in-duct SCR, which is included as a possible implementation option for the SCR techniques (see description in Section 5.2.2 of the BAT conclusions). • The wording of the applicability restriction may be simplified by eliminating the double negative. 5. Techniques not mentioned in BAT 29 • When using SNCR, the use of a wet scrubber allows for reducing the ammonia slip and also for improving the overall efficiency of the de-NO_X process by allowing the recycling of the stripped ammonia as SNCR reagent.
EIPPCB proposal:	1. BAT statement • For consistency with other BAT conclusions, refer to channelled emissions to air and set as BAT the use of an appropriate combination of the techniques. 2. Technique b. • Keep technique b unchanged. 3. Technique e. • Include an applicability restriction for existing plants based on space availability. • Remove the applicability restriction based on cost. 4. Technique f. • Rephrase the applicability restriction in order to avoid a double negative. 5. Techniques not mentioned in BAT 29 • Add the use of wet scrubber, where this technique is used for acid gas removal, as BAT for the removal of NH_3 emissions, in particular with SNCR.

1.6.2.3.2 BAT-AELs for NO_X, N_2O, CO and NH_3 from incineration

<table>
<tr><td>Location in D1:</td><td><i>P. 700 – Section 5.1.5.2.3</i></td></tr>
<tr><td>Current text in D1:</td><td>
Table 5.5: BAT-associated emission levels (BAT-AELs) for NO_X and CO emissions to air from incineration and for NH_3 emissions from the use of SNCR and/or SCR
<table>
<tr><th rowspan="2">Parameter</th><th colspan="2">BAT-AEL (mg/Nm^3)</th><th rowspan="2">Averaging period</th></tr>
<tr><th>New plant</th><th>Existing plant</th></tr>
<tr><td>NO_X</td><td>50–120 (1)</td><td>50–150 (1) (2)</td><td rowspan="3">Daily average</td></tr>
<tr><td>CO</td><td>10–50</td><td>10–50</td></tr>
<tr><td>NH_3</td><td>3–10 (3)</td><td>3–10 (3) (4)</td></tr>
<tr><td colspan="4">(1) The lower end of the BAT-AEL range can be achieved when using SCR.
(2) The higher end of the BAT-AEL range is 180 mg/Nm^3 where SCR is not applicable.
(3) The lower end of the BAT-AEL range can be achieved when using SCR.
(4) For existing plants fitted with SNCR without wet abatement techniques, the higher end of the BAT-AEL range is 15 mg/Nm^3.</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>
1. <u>General</u>
• Consider deleting the BAT-AEL for CO because this pollutant is not a KEI in the WI BREF review (Eurelectric-3, FI-23)
• Move CO to a separate BAT to clearly distinguish it from the nitrogen based emissions, and add a footnote stating that the incineration of HW requires the incineration of drummed/packaged material, which can lead to CO peaks with no other adverse impacts (Eurits-32).
• Keep current limits for NO_X and NH_3 in consideration of cross-media effects (FEAD-24)
• Introduce half-hourly BAT-AELs for NO_X, NH_3 and CO (NO-14, AT-41, AT-43, AT-48, EEB-71)

2. <u>BAT-AEL range for NO_X</u>
• Decrease the higher end of the BAT-AEL range to 70 mg/Nm^3 (AT-39) or to 100 mg/Nm^3 (EEB-72, SE-95) for all new plants, and to 100 mg/Nm^3 (AT-39, EEB-72) or to 110 mg/Nm^3 (SE-96) for all existing plants.
• Increase the higher end of the BAT-AEL range to: 200 mg/Nm^3 for lines of < 20 MW (CEFIC-73); 150 mg/Nm3 for new and 180 mg/Nm3 for existing plants with a nominal capacity below 12 t/hr (Eurelectric-80); 150 mg/Nm^3 for new plants (CEWEP-ESWET-702, FEAD-172); 300 mg/Nm^3 (ES-24) or 400 mg/Nm^3 (CEWEP-ESWET-703) for plants with a capacity below 6 t/hr; 350 mg/Nm^3 (Eurits-31, HWE-102) when SCR and SNCR are not applicable due to the use of a quench from 1100°C or more to 75-80°C.
• Decrease the lower end of the BAT-AEL range to 30 mg/Nm^3 (SE-95, SE-96) or 40 mg/Nm^3 (NL-13, NL-14, AT-38) for both new and existing plants.
• Increase the lower end of the BAT-AEL range to: 65 mg/Nm^3 for existing plants (Eurelectric-82); 120 mg/Nm^3 for existing waste incineration plants with a nominal capacity below 6 t/hr, as defined in IED Annex VI, Part 1, Point (a) (E&P-33). A generic increase of the lower end of the range is also proposed by CEWEP-ESWET-708.
• Modify footnote (1) by stating that the lower end of the range corresponds to the use of “most advanced SCR systems design” (Eurelectric-82), or by stating that the lower end of the range “may be observed when using SCR and when it is not requested to comply with the lower end of the BAT-AEL range for NH_3 too” (FEAD-25).
• Modify footnote (2) by restricting the increase of the higher end of the BAT-AEL range to 180 mg/Nm^3 only to the case where neither SCR nor SNCR are applicable (NL-15), or further specify that the level is only applicable to existing plants until the next upgrade/reconstruction of the de-NO_X system (AT-40).
• Modify footnote (2) by associating a higher end of the range of 180 mg/Nm^3 to the case “where SNCR is the chosen technology” (FEAD-25)
</td></tr>
</table>

	• Introduce half-hourly BAT-AELs for NO$_X$ as the following ranges: 40-70 mg/Nm^3 (97%, new plants), 40-100 mg/Nm^3 (97%, existing plants), and <180 mg/Nm^3 (100%, all plants) (AT-41). • Introduce a yearly BAT-AEL of <85 mg/Nm^3 (EEB-91). • State that the BAT-AELs for NO$_X$ do not apply to waste incineration plants with a nominal capacity below 6 t/h and defined as existing by IED Annex VI, Part 1, Point (a) (DK-20, FR-743). • Delete footnote (1) and include additional footnote stating: "the efficiency depends on the aging of the catalyst. The applicability may be limited by the nitrogen content of the fuel or waste input" (CEFIC-72). 3. <u>BAT-AEL range for NH$_3$</u> • Decrease the higher end of the BAT-AEL range to 3 mg/Nm^3 (AT-47, EEB-74). • Increase the higher end of the BAT-AEL range to 30 mg/Nm^3 in the case of wet sewage sludge incineration (PL-14), or to 50 mg/Nm^3 (without range) for all plants applying continuous monitoring (E&P-32). • Decrease the lower end of the BAT-AEL range to 2 mg/Nm^3 (NL-16, NL-17) or 1 mg/Nm^3 (AT-46, EEB-74) for both new and existing plants. • Delete footnote (4), thereby setting the same level of 10 mg/Nm^3 for the higher end of the BAT-AEL range for plants fitted with SCR and with SNCR (EEB-92, AT-45, NL-18), or associate the level of 15 mg/Nm^3 for the higher end of the BAT-AEL range only to plants fitted with SNCR and achieving the lowest NO$_X$ emission levels (DK-32). • Change footnote (4) to extend the applicability of the level of 15 mg/Nm^3 for the higher end of the BAT-AEL range also to plants fitted with SCR and no wet abatement techniques (FI-24, Eurelectric-85) • Introduce half-hourly BAT-AELs for NH$_3$ as the following ranges: 1-5 mg/Nm^3 (97%), and <10 mg/Nm^3 (100%) (AT-48). • Change the averaging period to "daily average or average over the sampling period", as continuous monitoring of NH$_3$ is not needed when using SCR (AT-37, Eurelectric-83), or to "average over the sampling period" for the proposed BAT-AEL range (3-10 mg/Nm^3) (E&P-32). • Change in footnote (3) "the lower end… can be achieved when using SCR" into "the lower end… has been observed when using SCR" (CEWEP-ESWET-706) or into "the lower end… has been observed when using SCR and when it is not requested to comply with the lower end of the BAT-AEL range for NO$_X$ too" (FEAD-25) 4. <u>BAT-AEL range for CO</u> • Decrease the higher end of the BAT-AEL range to 30 mg/Nm^3 (EEB-73). • Set the CO levels as indicative for existing co-incineration plants, for consistency with the LCP BREF (Eurelectric-81) • Introduce half-hourly BAT-AELs for NH$_3$ as the following range: 10-50 mg/Nm^3 (97%) (AT-43).
EIPPCB assessment:	1. <u>General</u> • As explained in the "WI D1 EIPPCB reflections on some key issues" document uploaded in BATIS together with D1, for non-KEI pollutants which are subject to ELVs in Annex VI to the IED, BAT-AELs are proposed with the higher end of the BAT-AEL range set at the IED Annex VI´s ELV. • Regarding cross-media effects, the 2016 data collection includes numerous examples of plants that achieve at the same time low NO$_X$ and NH$_3$ emissions, well within the proposed BAT-AEL ranges. • CO is addressed in the same BAT together with NO$_X$ in view of the known trade-offs between the two pollutants. This approach is also consistent with other BAT conclusions such as those for large combustion plants. • 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 to limit emission peaks. See also Section 2.12.

2. BAT-AEL range for NO_X
   - A substantial share of the reference lines achieve maximum emission levels below 100 mg/Nm^3 and also below 70 mg/Nm^3, and there are plants that achieve emission levels in the range between 30 mg/Nm^3 and 40 mg/Nm^3. However, the BAT-AEL range has been proposed based not only on the OP,OC1,ELV,43 filter but also considering the performance levels evaluated with less stringent data filters.
   - For existing plants, an upper level of 150 mg/Nm^3 is achievable with a broad range of techniques including not only SCR but also SNCR as well as, in the case of certain fluidised bed furnaces incinerating sewage sludge, primary techniques only. The footnote level of 180 mg/Nm^3 may be representative of the performance levels that can be generally achieved by existing SNCR systems while ensuring that the NH_3 slip can be kept within the proposed BAT-AEL range.
   - For new plants, an upper level of 120 mg/Nm^3 is considered achievable not only with SCR but also with advanced SNCR designs; the process optimisation that may be necessary to reach such a level is generally feasible for new plants; the 2016 data collection includes several examples of such advanced designs that demonstrate the achievability of this emission level. While most of these examples are plants fitted with a wet scrubber, these levels are also achieved by some plants fitted with SNCR and dry or semi-dry techniques (e.g. DE-68, FR-19). Additional options to achieve this emission level cost-effectively while limiting NH_3 slip include the use of catalytic filter bags or a slip catalyst downstream of the SNCR system.
   - The achievability of the lower end of the range is demonstrated by several reference lines of the 2016 data collection fitted with SCR. One plant (PL-07) even achieves a NO_X emission level substantially lower than 50 mg/Nm^3 with SNCR, but the associated NH_3 slip is very high.
   - No specific technical justification is provided for the increase in the higher end of the BAT-AEL range to 200 mg/Nm^3 for lines of < 20 MW$_{th}$, besides the emission levels achieved by some example reference lines. The 2016 data collection includes numerous examples of reference lines of a similar size that achieve emission levels well within the proposed BAT-AEL range.
   - The justification for the proposal to increase the higher end of the BAT-AEL range to 150 mg/Nm^3 for new and 180 mg/Nm^3 for existing plants with a nominal capacity of < 12 t/hr is based on considering the cost of SCR excessive. However, the 2016 data collection demonstrates that advanced SNCR designs are more than capable of achieving levels lower than 120 mg/Nm^3; the case of existing plants that may not be able to retrofit SCR is already covered by footnote (2).
   - No specific information is provided to support the level of 300 mg/Nm^3 or 400 mg/Nm^3 for plants with a capacity below 6 t/hr. The fact that Annex VI to the IED sets a higher emission level for pre-2002 plants below this capacity limit is not per se a technical argument to justify a different BAT-AEL. The few plants of the 2016 data collection having an ELV reaching 400 mg/Nm^3 generally report emissions that are significantly lower than this level. Furthermore, the 2016 data collection includes a number of plants with a capacity below 6 t/hr and that use similar techniques to other plants and achieve NO_X emission levels in the same range as other plants: BE-12, FR-10, FR-15 and IT-16 are examples of plants with a capacity between 4 t/hr and 6 t/hr, first commissioned between 1976 and 2001, and equipped with SNCR or with SCR.
   - The justification for a BAT-AEL range of up to 350 mg/Nm^3 when SCR and SNCR are not applicable due to the use of a quench from 1 100 °C or more to 75-80 °C takes as examples plant UK-02 and plant FR-108. However, no NO_X emission data are available for plant FR-108, and plant UK-02 reported emissions substantially lower than 350 mg/Nm^3. Besides, plant UK-01 is also a plant without a recovery boiler and incinerating waste at high temperature (most of the time > 1 100 °C) and using a quench system; this plant uses SNCR, meets a daily ELV of 200 mg/Nm^3, and achieves NO_X levels in the range of 100 mg/Nm^3. Furthermore, the use of a quench does not preclude the possibility to use SCR as long as the flue-gas is reheated to the required temperature, which is general practice where SCR is installed downstream of a

	wet scrubber. • No specific technical arguments are provided to support the proposal to raise to 120 mg/Nm^3 the lower end of the BAT-AEL range for existing waste incineration plants with a nominal capacity below 6 t/hr as defined in IED Annex VI, Part 1, Point (a). • Achieving emission levels at the lower end of the proposed BAT-AEL range is possible with a well-maintained SCR system with a sufficient catalyst volume and the required NH_3 injection rate. No specific information has been provided to support the need for an especially advanced design. • The 2016 data collection includes several examples of plants that achieve emission levels at the lower end of the proposed BAT-AEL range for NO_X and for NH_3 at the same time. • SNCR is considered generally applicable. The footnote level of 180 mg/Nm^3 for existing plants takes into account the case of some existing waste incineration plants not fitted with wet abatement techniques and that may face challenges in reducing NO_X emissions while maintaining the NH_3 slip level low. • The decision on the most appropriate emission levels for a plant undergoing a major change, such as the upgrade/reconstruction of the de-NO_X system, is an implementation issue. • It is the established practice for BAT conclusions developed under the IED to not set separate BAT-AELs for different techniques. The BAT-AEL range sets the range of emission levels considered achievable with (a combination of) the techniques set as BAT. Specific (higher) levels may be set to take into account cases where the choice of techniques may be restricted by the technical characteristics of certain types of plants. • No specific technical justification is provided to support the proposal to introduce a yearly BAT-AEL of < 85 mg/Nm^3. • Footnote (^{1}) provides useful information by indicating which of the techniques that are set as BAT for the reduction of NO_X emissions is the best-performing one. The fact that the performance of the techniques also depends on how they are maintained is a generic issue, and catalyst aging is a well-known aspect of SCR operation in general. No specific information is provided in relation to the nitrogen content of the input. • No technical demonstration is provided to substantiate that waste incineration plants with a nominal capacity of < 6 t/hr and defined as existing by IED Annex VI, Part 1, Point (a) cannot achieve emission levels within the proposed BAT-AELs for NO_X. 3. BAT-AEL range for NH_3 • While a substantial share of the reference lines achieve maximum emission levels below 3 mg/Nm^3, the BAT-AEL range has been proposed based not only on the OP,OC1,ELV,43 filter but also considering the performance levels evaluated with less stringent data filters. Additionally, the proposed BAT-AEL range takes into account the full range of techniques that are considered BAT for the reduction of NO_X emissions, thereby including not only SCR but also well-performing SNCR, with or without a downstream wet scrubber or slip catalyst. • The justification to support a level of 50 mg/Nm^3 for all plants applying continuous monitoring is based on measurement uncertainty considerations. This is considered an implementation issue, and has been addressed by several Member States, with a number of plants of the 2016 data collection already implementing permit levels within the proposed BAT-AEL range based on continuous monitoring. See also Section 2.13 of this BP. • The justification provided to support a level of 30 mg/Nm^3 for wet sewage sludge incineration makes reference to plants PL01 and PL02. However, no NH_3 emission data are reported for plant PL01, and plant PL02 reports levels of NH_3 emissions that are much higher than 30 mg/Nm^3 and are not considered to represent BAT. Additionally, other plants combusting mechanically dewatered sewage sludge achieve NH_3 emissions that are much lower than 30 mg/Nm^3 and within the proposed BAT-AEL range. It is also important to note that Table 5.5 sets BAT-AELs for NH_3 emissions only from the use of SCR and/or SNCR.

	• A reassessment of the lower end of the proposed BAT-AEL range could support reducing this level to 2 mg/Nm^3, considering that this level is achieved, as a yearly maximum of the daily averages, by a number of reference lines irrespective of the specific data filtering and also including reference lines that report NO_X emissions at the lower end of the proposed BAT-AEL range. This level is also reasonable when taking into consideration the LoQ requirements of the automated measurement systems with the lowest certified measurement ranges (i.e. ≤ 0.8 mg/Nm^3, see Annex A.1 of the revised final draft of the ROM). • While most plants fitted with SNCR and without wet abatement techniques demonstrate the achievement of NH_3 slip levels below 10 mg/Nm^3, the 2016 data collection includes some examples of plants with this kind of FGC system that achieve NO_X emission levels in the range of 90-150 mg/Nm^3 with NH_3 emissions close to 15 mg/Nm^3. Footnote (^{4}) allows therefore for additional flexibility for using the whole BAT-AEL range when setting plant-specific permit conditions. The specific NO_X level for which the application of an NH_3 level of up to 15 mg/Nm^3 is appropriate, however, is a plant-specific implementation issue. • Also in the BAT conclusions for LCPs, the higher end of the BAT-AEL range for NH_3 has been associated with plants without wet abatement techniques and fitted with SNCR only. A well-performing and well-maintained SCR system is capable of keeping NH_3 slip levels below 10 mg/Nm^3 without the need for a downstream wet scrubber. This is confirmed by a large number of example plants in the 2016 data collection. • Regarding the proposal to change the averaging period in the heading by including the average over the sampling period, see the assessment in Section 1.3.2 of this BP. • Footnote (^{3}) provides useful information by indicating which of the techniques that are set as BAT for the reduction of NO_X emissions is the best-performing one in terms of NH_3 slip. • The 2016 data collection includes several examples of plants that achieve emission levels at the lower end of the proposed BAT-AEL range for NO_X and for NH_3 at the same time. • Footnote (^{3}) and footnote (^{1}) could be merged since the texts are identical. 4. <u>BAT-AEL range for CO</u> • As explained in the “WI D1 EIPPCB reflections on some key issues” document uploaded in BATIS together with D1, for non-KEI pollutants which are subject to ELVs in Annex VI to the IED, BAT-AELs are proposed with the higher end of the BAT-AEL range set at the IED Annex VI´s ELV. • Setting an indicative emission level range for CO emissions would not provide more flexibility, considering that mandatory ELVs are already set in Annex VI to the IED for the plant types covered by the WI BAT conclusions. • The LCP BREF and the WI BREF do not cover the same co-incineration activities.
EIPPCB proposal:	1. <u>General</u> • As a purely editorial change, merge footnote (^{3}) and footnote (^{1}). 2. <u>BAT-AEL range for NO_X</u> • Keep the BAT-AEL range unchanged. 3. <u>BAT-AEL range for NH_3</u> • Reduce the lower end of the BAT-AEL range to 2 mg/Nm^3**.** 4. <u>BAT-AEL range for CO</u> • Keep the BAT-AEL range unchanged.

1.6.2.4 Emissions of organic compounds

1.6.2.4.1 Techniques to reduce the emissions of organic compounds from incineration

<table>
<tr><td>Location in D1:</td><td><i>P. 701 – Section 5.1.5.2.4</i></td></tr>
<tr><td>Current text in D1:</td><td>
BAT 30. In order to reduce emissions to air of organic compounds including PCDD/F and PCBs from the incineration of waste, BAT is to use techniques (a), (b), (c), (d), and one or a combination of techniques (e) to (i) given below.
<table>
<tr><th></th><th>Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Optimisation of the incineration process</td><td>See Section 5.2.
Optimisation of incineration parameters to promote the oxidation of organic compounds including PCDD/F and PCBs present in the waste, and to prevent their and their precursors' (re)formation</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Control of waste feed</td><td>Knowledge and control of the specifications of the waste being fed into the incineration chamber, including their combustion characteristics, to ensure homogeneous, stable and optimal incineration conditions</td><td></td></tr>
<tr><td>c.</td><td>On-line and off-line boiler cleaning</td><td>Efficient cleaning of the boiler bundles to reduce the dust residence time and accumulation in the boiler, thus reducing PCDD/F formation in the boiler.
A combination of on-line and off-line boiler cleaning techniques is used</td><td></td></tr>
<tr><td>d.</td><td>Flue-gas quenching</td><td>Use of a quench system for the rapid cooling of the flue-gas from temperatures above 400 °C to below 250 °C before dust abatement to prevent the <i>de novo</i> synthesis of PCDD/F</td><td></td></tr>
<tr><td>e.</td><td>Dry sorbent injection</td><td>See Section 5.2.
Adsorption by injection of activated carbon or other reagents, generally combined with a bag filter where a reaction layer is created in the filter cake and the solids generated are removed</td><td></td></tr>
<tr><td>f.</td><td>Fixed-bed adsorption</td><td>Adsorption by passing the flue-gas through a fixed-bed filter where activated coke or activated lignite is used as the adsorbent</td><td>The applicability may be limited by the overall pressure drop associated with the flue-gas cleaning system configuration</td></tr>
<tr><td>g.</td><td>Multi-layer SCR</td><td>Where SCR is used for NO_X abatement, the adequate sizing of a multi-layer SCR system provides for effective PCDD/F and PCB control</td><td>There may be economic restrictions to retrofitting existing plants</td></tr>
<tr><td>h.</td><td>Catalytic filter bags</td><td>See Section 5.2</td><td>Not applicable to existing plants that are not fitted with a bag filter</td></tr>
</table>
</td></tr>
</table>

i.	Carbon adsorption in wet scrubber	PCDD/F and PCBs are adsorbed by carbon sorbent added to the wet scrubber, either in the scrubbing liquor or in the form of impregnated packing elements. The technique is particularly used to prevent and/or reduce the re-emission of PCDD/F accumulated in the scrubber (the so-called memory effect) occurring especially during shutdown and start-up periods	Not applicable to existing plants that are not fitted with a wet scrubber

Summary of comments:

1. General and BAT statement
   - Add a new BAT conclusion on avoiding PCDD/F emissions at start-up and shut down by the use of techniques that ensure the full operation of the FGC system during start-up and shut down (SE-77, EEB-52).
   - Do not prescribe any specific technique and rewrite the statement as "…BAT is to use an appropriate combination of techniques (a) to (i)…" (CZ-42, Eurelectric-86, DE-115, CEWEP-ESWET-722).
   - Move technique (d) from the list of techniques to be always applied to the list of optional techniques (NL-19, Eurits-33, HWE-46, FR-656, HU-47, ES-25).
2. Technique a.
   - Change applicability to "might be generally applicable" (FEAD-176).
3. Technique b.
   - Change description, by removing reference to "control of the specifications" of waste (E&P-35, Eurelectric-87, FEAD-176) and to "homogeneous" combustion (E&P-35, Eurelectric-87, FEAD-176, NO-16), to "Knowledge and control of the wastes being fed into the incineration chamber, including their combustion characteristics, to ensure stable and optimal incineration conditions" (E&P-35, Eurelectric-87, FEAD-176)
   - Change description by rewording "ensure homogeneous, stable and optimal incineration conditions" into "ensure optimal incineration conditions by promoting homogeneous and stable incineration" (SE-106)
   - Change applicability to "might be generally applicable" (FEAD-176), or to "not applicable to MSW and similar waste" (CEWEP-ESWET-716).
4. Technique c.
   - Delete technique (c) as dust is not involved in the formation of PCDD/F (CEFIC-74).
   - Change the description by changing "A combination of on-line and off-line … techniques" to "A combination of on-line *and/or* off-line … techniques" (CEFIC-76).
   - Change applicability to "might be generally applicable" (FEAD-176).
   - Clarify that offline cleaning means cleaning during scheduled stoppages for maintenance (FEAD-176, CEWEP-ESWET-714).
5. Technique d.
   - Replace technique (d) with a more general "Design" technique described as the "use of a design that certifies a quick passage through the critical temperature window" (DK-25, E&P-36, Eurelectric-88); or change the name to a more general "rapid flue-gas cooling" or similar (AT-49, SE-67, UK-140), and the description to "Use of an appropriate boiler design to cool the flue-gas from above 400 °C to below 250 °C as rapidly as possible" (UK-140).
   - Change the applicability from generally applicable to: applicable only to the incineration of HW and especially of HW with high chlorine content such as PCB (ES-25, CEWEP-ESWET-713); or –in the case of existing plants- applicable to incinerators not aimed at energy recovery (IT-25); or applicable to incineration lines without PCDD/F abatement system in the FGC system (CEFIC-75); or applicable to new plants only (Eurelectric-88).
   - Delete technique (d) (CEFIC-74, FEAD-176, CEWEP-ESWET-715).
6. Technique f.
   - Modify the description to also include the case of fixed adsorption beds made of carbon-impregnated polymers (SE-10).
   - Include additional applicability restriction due to the safety requirements stemming from the explosion risks associated with activated carbon fixed beds

	(FEAD-258, CEWEP-ESWET-717). 7. Technique g. • Remove reference to “multi-layer” from the name and description of the technique, as the key parameter is the catalyst volume rather than the number of layer (CEWEP-ESWET-718) • Include additional applicability restriction for existing plants, associated with the availability of sufficient space (HWE-47). 8. Technique h. • Broaden the description of the technique by replacing “catalytic filter bags” by “catalytic filter”, as the catalytic filter could be elsewhere than in the bags of the bag filter, e.g. at the top of the baghouse filter or in an ESP. (FEAD-177, CEWEP-ESWET-719). 9. Technique i. • Modify the description to reflect that the purpose of the technique is not only related to preventing the memory effect but can also be the main technique for removal of PCDD/F in general (SE-8). • Modify applicability to generally applicable since an existing dry or semi-dry FGC system can be complemented with a wet scrubber (SE-9).
EIPPCB assessment:	1. General and BAT statement • The avoidance of PCDD/F emissions at start-up and shutdown is considered an important issue in limiting the overall load of PCDD/F emitted by the waste incineration plant. BAT 19 addresses this issue and a modification of the text of BAT 19 is proposed to more clearly reflect the issue of full FGC operation at start-up and shutdown. • Techniques a. to d. are preventive and can always be applied in combination: they are complements and not alternatives; technique b., however, is relevant for the waste types that are subject to characterisation. Techniques e. to i. are end-of-pipe, and at least one of them is needed to further complement the preventive techniques. • Technique d. is a preventive technique and refers to the rapid flue-gas cooling across the de-novo synthesis temperature window. The name of the techniques could be changed to clarify that it does not refer only to quenching by water injection. 2. Technique a. • “Generally applicable” is the standard BAT conclusions text where there are no generalised applicability restrictions. 3. Technique b. • The focus of this technique is on controlling the feeding of those wastes for which the specifications are known. • While absolute homogeneity and stability of incineration may be difficult to achieve especially with certain types of waste (e.g. when directly feeding drummed wastes) and incineration techniques, improvement options exist, e.g. by appropriately controlling the waste mix feed. • The specifications of the waste fed into the combustion chamber are usually known for hazardous waste but not for CW or for MSW. 4. Technique c. • De-novo synthesis at the dust adhered to the boiler surfaces (e.g. at the superheater) is a well-known dioxin formation route. • The combination of online and off-line cleaning techniques does not suggest that they are used simultaneously. Online techniques are useful to limit deposit accumulation during plant operation, and offline techniques are used for deeper cleaning when the plant is out of operation. • “Generally applicable” is the standard BAT conclusions text where there are no generalised applicability restrictions. • Off-line cleaning is generally carried out during scheduled maintenance; in any case, the description of the technique does not include any prescription regarding the frequency of off-line cleaning, which depends on the effectiveness of the on-line cleaning methods in place, on the boiler design, on the nature of the waste being incinerated, etc. 5. Technique d. • The technique is meant to represent not only quench systems that operate with water injection but also other systems that ensure a rapid cooling of the flue-gas

	through the temperature window relevant for the de-novo synthesis of dioxins and at the same time allow energy to be recovered from the flue-gas. The name and description of the technique could be adapted to better reflect this, and the specific case of quench by water injection mentioned as a technique generally used when incinerating highly chlorinated wastes. • With the proposed clarification in terms of technique name and description, the technique is understood to be generally applicable. 6. Technique f. • Polymer-based fixed adsorption beds to capture PCDD/F and/or mercury are available on the market and have been successfully applied at a number of waste incineration plants. • The safety requirements associated with activated carbon fixed beds are taken into account when choosing the appropriate flue-gas cleaning systems and in plant operation, but are not considered a general applicability restriction that prevents specific categories of plants from applying the technique. 7. Technique g. • The key parameter for the adequacy of an SCR system to provide effective PCDD/F control is the overall catalyst volume. • Adding an SCR system with enough catalyst volume to provide for effective PCDD/F destruction requires significant space. When retrofitting existing plants, in certain cases this may result in constraints. • See also the assessment of comments on SCR in Section 1.6.2.3.1 of this document, in particular on the economics of retrofitting the technique to existing plants. 8. Technique h. • Little information is provided to describe the exact technique that corresponds to the suggested change, or to substantiate it with example plants. Technique h. refers to filter bags that can be incorporated in an existing bag filter with minimal modifications. The description suggested by FEAD and CEWEP-ESWET seems to refer instead to in-duct SCR, in which case it is unclear that the catalyst volume would be enough to effectively control PCDD/F. • The wording of the applicability restriction may be simplified by eliminating the double negative. 9. Technique i. • When the installed volume of carbon sorbent is sufficient, the removal rate achievable with technique i. is high enough for it to also be used as the main technique for the removal of PCDD/F. • The applicability restriction does not imply that a wet scrubber cannot be retrofitted to a plant that is not already equipped with it; it merely remarks that the technique requires the presence of a wet scrubber. The reference to existing plants could be removed, as there may also be some applicability restrictions for wet scrubbers for new plants. • The wording of the applicability restriction may be simplified by eliminating the double negative.
EIPPCB proposal:	1. General and BAT statement • No changes in the BAT statement besides clarifying that this BAT refers to channelled emissions, but see changes in the applicability of technique b. and in the description of technique d. See also the text modifications proposed in BAT 19. 2. Technique a. • Keep technique a unchanged. 3. Technique b. • Change the description to reflect the limitations to the degree of homogeneity and stability of incineration conditions that can be achieved. • Streamline the description to clarify that the waste characteristics relevant for this technique are the combustion characteristics, and to better align the wording to the rest of the BAT conclusions. • Change the applicability to not applicable to clinical waste or to municipal solid waste. 4. Technique c. • Keep technique c unchanged. 5. Technique d.

<table>
<tr><td></td><td>• Change the name of the technique to "Rapid flue-gas cooling" and adapt the description to clearly also include the case of systems that do not use water injection.
6. <u>Technique f.</u>
• In the description, include the case where a carbon-impregnated polymer is used as the adsorbent; move the description to Section 5.2.2.
7. <u>Technique g.</u>
• Remove "multi-layer" from the name of the technique and refer to the adequate catalyst volume instead of the multi-layer structure in the description of the technique.
• Include an applicability restriction for existing plants based on space availability.
• Remove the applicability restriction based on cost.
8. <u>Technique h.</u>
• Rephrase the applicability restriction in order to avoid a double negative.
9. <u>Technique i.</u>
• In the description of technique (i), include that its purpose can also be the general removal of PCDD/F as a main technique.
• Remove the reference to existing plants in the applicability.
• Rephrase the applicability restriction in order to avoid a double negative.</td></tr>
</table>

1.6.2.4.2 BAT-AELs for organic compounds from incineration

<table>
<tr><td>Location in D1:</td><td><i>P. 702 – Section 5.1.5.2.4</i></td></tr>
<tr><td>Current text in D1:</td><td>Table 5.6: BAT-associated emission levels (BAT-AELs) for emissions to air of TVOC, PCDD/F and dioxin-like PCBs from incineration
<table>
<tr><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="2">BAT-AEL</th><th rowspan="2">Averaging period</th></tr>
<tr><th>New plant</th><th>Existing plant</th></tr>
<tr><td>TVOC</td><td>mg/Nm^3</td><td>3–10</td><td>3–10</td><td>Daily average</td></tr>
<tr><td>PCDD/F (1)</td><td>ng I-TEQ/Nm^3</td><td>< 0.01–0.04</td><td>< 0.01–0.06</td><td>Average over the sampling period or long-term sampling average</td></tr>
<tr><td>PCDD/F + dioxin-like PCBs (1)</td><td>ng WHO-TEQ/Nm^3</td><td>< 0.01–0.06</td><td>< 0.01–0.08</td><td>Average over the sampling period or long-term sampling average</td></tr>
<tr><td colspan="5">(1) Either the BAT-AEL for PCDD/F or the BAT-AEL for PCDD/F + dioxin-like PCBs applies.</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>1. <u>General</u>
• Determine the equivalence factors between I-TEQ and WHO-TEQ according to EN1948-4:2010, Annex A (AT-53, CEWEP-ESWET-712).
• Delete row on PCDD/F + dioxin-like PCBs, as PCBs are usually in very low amounts (FEAD-181, PT-24).
• Introduce half-hourly BAT-AELs for TVOC (NO-15, AT-52, EEB-75).
• Delete the BAT-AELs for TVOC because this pollutant is not a KEI in the WI BREF review (FI-25).
• Specify in the table that the BAT-AELs apply only to channelled emissions (CEFIC-77).
2. <u>Averaging period for PCDD/F and for PCDD/F + dioxin-like PCBs</u>
• Delete "long-term sampling" and only require monitoring according to EN1948-1 (AT-56, AT-57, CEWEP-ESWET-711, FEAD-180).
• Delete "average over the sampling period" and require long-term sampling in all cases (SE-93, SE-94).
• Replace the expression "long-term sampling average" with "long-term sampling period" (IT-27, IT-29).</td></tr>
</table>

	3. BAT-AEL range for TVOC • Decrease the higher end of the BAT-AEL range to 5 mg/Nm^3 (NL-20, NL-21) or to 2 mg/Nm^3 (EEB-76) for both new and existing plants. • Decrease the lower end of the BAT-AEL range to 1 mg/Nm^3 (AT-51, NL-20, NL-21, EEB-76). • Introduce half-hourly BAT-AELs for TVOC as the following ranges: 1-10 mg/Nm^3 (97%), and <20 mg/Nm^3 (100%) (AT-52). 4. BAT-AEL range for PCDD/F • Decrease the higher end of the BAT-AEL range to 0.04 ng I-TEQ/Nm^3 for existing plants (SE-102). • Increase the higher end of the BAT-AEL range to: 0.1 ng I-TEQ/Nm^3 (CZ-17, E&P-34, HWE-61, FEAD-259, CEWEP-ESWET-721) for new and existing plants. • Increase the lower end of the BAT-AEL range to: 0.03 ng I-TEQ/Nm^3 (IT-26), or to 0.06 ng I-TEQ/Nm^3 (FEAD-259, CEWEP-ESWET-721), or remove the "<" symbol before the value (CEFIC-77). • Provide for the following differentiated BAT-AELs for PCDD/F where they are measured by long-term sampling: <0.1 ng I-TEQ/Nm^3 for existing plants and <0.06 ng I-TEQ/Nm^3 for new plants (FR-725). 5. BAT-AEL range for PCDD/F + dioxin-like PCBs • Decrease the higher end of the BAT-AEL range to 0.06 WHO-TEQ/Nm^3 for existing plants (SE-103). • Increase the higher end of the BAT-AEL range to: 0.12 ng WHO-TEQ/Nm^3 (FEAD-259, CEWEP-ESWET-721) for new and existing plants. • Increase the lower end of the BAT-AEL range to: 0.03 ng WHO-TEQ/Nm^3 (IT-28), or to 0.08 ng WHO-TEQ/Nm^3 (FEAD-259, CEWEP-ESWET-721). • Provide for the following differentiated BAT-AELs for PCDD/F + dioxin-like PCBs where they are measured by long-term sampling: <0.1 ng WHO-TEQ/Nm^3 for existing plants and <0.08 ng WHO-TEQ/Nm^3 for new plants (FR-725).
EIPPCB assessment:	1. General • As discussed at the December 2017 informal TWG meeting in Seville, the determination of equivalence factors between I-TEQ and WHO-TEQ according to EN1948-4:2010, Annex A could be done based on a sufficient number of detailed measurement results including the dioxin congener profile. A report authored by K. Scheidl was provided by Austria and uploaded in BATIS ("Vergleich der PCDD/PCDF-aequivalenzfaktoren I-TEF und WHO-TEF anhand der emissionsdaten der WAV und der RVL im jahr 2017"), where 16 measurements from three Austrian plants are analysed. For the data included in the report, it can be seen that the toxic equivalents expressed as I-TEQ and as WHO-TEQ are very similar, their ratio being in all cases between 0.826 and 1, and always lower when expressed as WHO-TEQ than when expressed as I-TEQ. This suggests that a BAT-AEL expressed in ng I-TEQ/Nm^3 would also be meaningful if the emission levels were measured as WHO-TEQ/Nm^3, and that this would not entail an additional difficulty in complying with the BAT-AEL. • Dioxin-like PCBs are usually present in lower amounts than PCDD/F, but the 2016 data collection shows that this conclusion cannot be generalised a priori. Footnote (^{1}) of Table 5.6 and footnote (^{6}) of the table in BAT 5 provide adequate flexibility for the cases where dioxin-like PCB emissions are not a concern. • 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. See also Section 2.12. • As explained in the "WI D1 EIPPCB reflections on some key issues" document uploaded in BATIS together with D1, for non-KEI pollutants which are subject to ELVs in Annex VI to the IED, BAT-AELs are proposed with the higher end of the BAT-AEL range set at the IED Annex VI´s ELV. • The entire Section 5.1.5.2 of the BAT conclusions only applies to channelled emissions. It can also be repeated in each BAT.

2. Averaging period for PCDD/F and for PCDD/F + dioxin-like PCBs
   - Long-term sampling of PCDD/F enables a better accounting of the total emitted dioxin loads than periodic monitoring with a minimum frequency of twice per year. It also represents an important step towards the continuous measurement of dioxins and furans mentioned in Article 48.5 of the IED.
   - Considering the additional cost entailed by implementing long-term sampling of PCDD/F, it is considered appropriate to provide some flexibility for the plant categories for which the emissions of PCDD/F can be expected to be intrinsically low.
   - The term “average” in “long term sampling average” is intended to refer to the (long) averaging period, not to making any averages between a possible set of discrete measurements. The term long-term sampling average could be changed to remove the possible ambiguity.

3. BAT-AEL range for TVOC
   - As explained in the “WI D1 EIPPCB reflections on some key issues” document uploaded in BATIS together with D1, for non-KEI pollutants which are subject to ELVs in Annex VI to the IED, BAT-AELs are proposed with the higher end of the BAT-AEL range set at the IED Annex VI´s ELV.
   - While a substantial number of reference lines achieve emission levels below this value, the proposed lower end of the BAT-AEL range of 3 mg/Nm^3 also takes into consideration the LoQ requirements of the automated measurement systems with the lowest certified measurement ranges (i.e. ≤ 1.2 mg/Nm^3, see Annex A.1 of the revised final draft of the ROM).

4. BAT-AEL range for PCDD/F
   - While a large proportion of the reference lines of the 2016 data collection (around 83%) achieve PCDD/F emissions below 0.04 ng I-TEQ/Nm^3, a level of 0.06 ng I-TEQ/Nm^3 is considered to provide a reasonable level of flexibility for existing plants in particular having in mind plants using PAC injection in view of the cross-media effects.
   - The level of uncertainty of PCDD/F measurements is an issue for implementation and is not a sufficient reason to set the higher end of the BAT-AEL range at 0.1 ng I-TEQ/Nm^3 or the lower end of the BAT-AEL range at 0.06 ng I-TEQ/Nm^3. In several Member States, permit levels much lower than this have already been implemented. It was agreed at the KoM of the WI BREF review that BAT-AELs would be derived based on measured data without subtraction or addition of the measurement uncertainty.
   - While a true range is preferable, the BREF Guidance accepts the use of expressions of the type “< X” where the lower end of the range cannot be accurately defined, e.g. when the data reported in the information exchange are close to the detection limit.
   - The higher and lower ends of the BAT-AEL range are proposed based on the available measurement data based essentially on short-term sampling. The December 2017 informal TWG meeting in Seville clarified that almost no PCDD/F emission data based on long-term sampling was reported in the 2016 data collection, and that the initial count of a substantial number of measurements based on long-term sampling was the result of misreported averaging period units.
   - The initial assessment based on a 2017 ADEME and RDC Environnement report («Equipements de mesure de dioxines en semi continu: bilan des opérations subventionnées par l’ADEME») suggested that the same levels could be achieved when measuring PCDD/F based on long-term or short-term sampling (see EIPPCB presentation to the December 2017 informal TWG meeting in Seville, available in BATIS). Several members of the TWG (CEWEP-FNADE, HWE, BE, SE) offered to provide additional data to improve the data basis and review the initial conclusion.
   - An analysis of the data provided by BE (17 reference lines), HWE (22 reference lines) and CEWEP-FNADE (103 reference lines) shows, cumulatively, the following:
     - No significant difference is observed between the number of measurements below the proposed lower end of the BAT-AEL ranges

	of < 0.01 ng I-TEQ/Nm^3 (48% of the short-term measurements and 49% of the long-term measurements are above this level). o A higher number of long-term measurements exceed the proposed higher ends of the BAT-AEL ranges, compared to the short-term measurements: i. While 8% of the short-term measurements are above a level of 0.04 ng I-TEQ/Nm^3, in the case of long-term sampling 15% of the measurements are above the same level, and 9% are above 0.06 ng I-TEQ/Nm^3. ii. While 4% of the short-term measurements are above a level of 0.06 ng I-TEQ/Nm^3, in the case of long-term sampling 9% of the measurements are above the same level, and 5% are above 0.08 ng I-TEQ/Nm^3. iii. It should also be noted that about 3% of the long-term measurements are above 0.1 ng I-TEQ/Nm^3, including several measurements in the range of 0.3–0.6 ng I-TEQ/Nm^3. These measurements seem to be related to operating conditions outside the current compliance assessment regime and have the effect of skewing the distribution of long-term measurements towards high emission values. iv. Overall, the additional data submission by BE, HWE, and CEWEP-FNADE suggests the following equivalence in terms of PCDD/F emission performance of the WI plants: a level of 0.01 ng I-TEQ/Nm^3 measured by short-term sampling may be equivalent to 0.01 ng I-TEQ/Nm^3 measured by long-term sampling; a level of 0.04 ng I-TEQ/Nm^3 measured by short-term sampling may be equivalent to 0.06 ng I-TEQ/Nm^3 measured by long-term sampling; a level of 0.06 ng I-TEQ/Nm^3 measured by short-term sampling is equivalent to 0.08 ng I-TEQ/Nm^3 measured by long-term sampling. • Some differences are observed in the relationship between the long-term sampling and periodic measurements results in the data submitted by Belgium and the data submitted by CEWEP-FNADE and by HWE, which may be related to differences in implementing the long-term sampling method in France and in Belgium. For the plant data submitted by CEWEP-FNADE, for instance, 83% of the periodic measurements, but only 72% of the long-term sampling measurements, are below 0.02 ng I-TEQ/Nm^3. Conversely, for the Belgian plants the measured long-term sampling values are generally lower than the periodic measurements, with 95% of the long-term sampling measurements, compared with 79% of the periodic measurements, below 0.02 ng I-TEQ/Nm^3. However, it is also noted that 4 of the long-term sampling measurements of the Belgian Plants report values between 0.04 and 0.08 ng I-TEQ/Nm^3, whereas all the periodic measurements for the same plants are below 0.04 ng I-TEQ/Nm^3. • Regarding the implementation of the long-term sampling method, it is noted that the long-term sampling equipment can be switched off during certain (even short) periods when needed. The AMESA Manual (provided by Sweden after the December 2017 informal TWG meeting in Seville and available in BATIS) confirms in fact that the sampling is automatically switched off and on, by means of the flue-gas suction pump, by a series of input signals that can include, among others: "Furnace Off", flue gas temperature below a certain level, oxygen content above a certain level, or also a manual signal. This is also in line with Technical Specification CEN TS 1948:5. 5. BAT-AEL range for PCDD/F + dioxin-like PCBs • See the assessment for the BAT-AEL range for PCDD/F above.
EIPPCB proposal:	1. General • Determine the equivalence factors between I-TEQ and WHO-TEQ according to EN1948-4:2010, Annex A. • State that the BAT-AELs apply to channelled emissions 2. Averaging period for PCDD/F and for PCDD/F + dioxin-like PCBs • Replace the expression "long-term sampling average" with "long-term

	sampling period" in Table 5.6. 3. BAT-AEL range for TVOC • No changes. 4. BAT-AEL range for PCDD/F • Differentiate the BAT-AELs for short-term and long-term sampling. For the long-term sampling period, increase the higher end of the BAT-AEL ranges for new and existing plants for PCDD/F by 0.02 ng I-TEQ/Nm^3. 5. BAT-AEL range for PCDD/F + dioxin-like PCBs • Differentiate the BAT-AELs for short-term and long-term sampling. For the long-term sampling period, increase the higher end of the BAT-AEL ranges for new and existing plants for PCDD/F + dioxin-like PCBs by 0.02 ng WHO-TEQ/Nm^3 where they are measured on the basis of long-term sampling.

1.6.2.5 Emissions of mercury

1.6.2.5.1 Techniques to reduce the emissions of mercury from incineration

<table>
<tr><td>Location in D1:</td><td><i>P. 701 – Section 5.1.5.2.5</i></td></tr>
<tr><td>Current text in D1:</td><td>BAT 31. In order to reduce mercury emissions to air from the incineration of waste, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th></th><th>Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Wet scrubber (low pH)</td><td>See Section 5.2.

A wet scrubber operated at a pH value below 1.

The mercury removal rate of the technique can be enhanced by adding reagents and/or adsorbents to the scrubbing liquor, e.g.:
• oxidants such as hydrogen peroxide to transform metallic mercury to a water-soluble oxidised form
• sulphur compounds
• carbon sorbent to adsorb metallic mercury</td><td>There may be economic restrictions to retrofitting existing plants burning non-hazardous waste with a capacity of < 250 000 tonnes/year</td></tr>
<tr><td>b.</td><td>Boiler bromine addition</td><td>Bromide added to the waste or injected into the furnace is dissociated at high temperatures into elemental bromine to enhance the oxidisation of mercury while the flue-gas passes through the boiler, thereby promoting the transformation of elemental gaseous mercury to $HgBr_2$, which is water-soluble and highly adsorbable.

The technique is used in combination with a downstream abatement technique such as a wet scrubber or an activated carbon injection system</td><td>Generally applicable</td></tr>
<tr><td>c.</td><td>Dry sorbent</td><td>See Section 5.2.
Adsorption by injection of activated</td><td>Generally applicable</td></tr>
</table>
</td></tr>
</table>

	injection	carbon or other reagents, generally combined with a bag filter where a reaction layer is created in the filter cake and the solids generated are removed	
d.	Fixed-bed adsorption	Adsorption by passing the flue-gas through a fixed-bed filter where activated coke or activated lignite is used as the adsorbent	The applicability may be limited by the overall pressure drop associated with the flue-gas cleaning system configuration

Summary of comments:	1. General • Add a new BAT Conclusion on avoiding or reducing mercury peaks by using either or both of the following techniques: a. Fixed bed adsorption, b. continuous measurement of mercury in the raw gas combined with injection of highly efficient activated carbon (SE-78, EEB-53). • Add a new BAT Conclusion on the minimum frequency of maintenance (every 4 months) and calibration (weekly) of the Hg measurement equipment (EEB-113). 2. BAT statement • Specify in the statements that the BAT apply only to channelled emissions (CEFIC-78) 3. Technique a. • Change the pH value from below 1 to approximately 1 (FEAD-182, FEAD-135, E&P-38, SE-68, Eurelectric-89, CEWEP-ESWET-723), or low and typically below 1.5 (CEFIC-79), or between 1 and 3 in the case of sewage sludge incineration (FEAD-261). • Change applicability to generally applicable (AT-67, SE-7). 4. Technique b. • Delete technique, or change applicability to only rotary kilns and fluidised beds, take into account the cross-media effects and specify that it is not relevant in the case of burning wastes with high chlorine content (E&P-39, SE-69, Eurelectric-90, DK-28, CZ-43, NO-17); or change applicability to only the case of low halogen content in the waste feed (EEB-80). • Change the description to reflect that the technique is usually not used with continuous injection but limited to the occurrence of mercury emission peaks (FEAD-260, CEWEP-ESWET-724). • Add in BAT 5 a requirement to monitor PBDD/PBDF in case of using $CaBr_2$ for reducing mercury emissions (FR-733).
EIPPCB assessment:	1. General • The techniques to reduce mercury emissions can be divided into general techniques that are used for emission control during normal operation of the plant, and techniques that are used to control peak emissions. Some of the techniques used for general emission control may also obviate the need for specific peak emission control techniques, in particular where the general technique has a large buffer capacity; this category includes fixed-bed adsorption as well as oxidiser-enhanced wet scrubber. • Proper maintenance and calibration of the AMS equipment is an issue of general importance and not only limited to mercury measurement. While this may be even more crucial for mercury than for some other pollutants, the precise maintenance requirements are specific to the instrument and to the pollutant load to which the instrument is exposed, and are considered an implementation issue to be established taking into account the instrument specifications provided by the manufacturer and other relevant information. 2. BAT statement • The entire Section 5.1.5.2 of the BAT conclusions only applies to channelled emissions. This can also be repeated in the BAT statement. 3. Technique a. • The pH of the wet scrubber needs to be kept low to enable the separation of oxidised mercury as a stable chloro-complex and to avoid the unwanted reducing effect of the scrubbing of SO_2. A pH of approximately 1 may be considered sufficiently low for this. In the case of sewage sludge incineration, the pH of the acidic scrubber may raise due to low chlorine content of the

	waste. However, in this case a substantial fraction of the mercury may be in metallic form, making the overall mercury removal efficiency of the wet scrubber low and possibly not sufficient. • For the applicability of wet scrubber, see the EIPPCB assessment in Section 1.6.2.2.1. 4. <u>Technique b.</u> • The site visit to the HWI plant in Limay in June 2017 confirmed that this technique is used in combination with the continuous measurement of metallic mercury in the raw flue-gas to control the mercury peaks. • The use of this technique for the avoidance of occasional mercury breakthrough rather than in continuous injection mode is also suitable in plants where the halogen content may be relatively high as an average level, since in the case of unusually high mercury input the chlorine content may well not be enough to ensure its complete oxidisation. In these cases, the injection of bromine is a proven option to reduce the consequences in terms of mercury emissions and of contamination of the flue-gas cleaning system with mercury. The bromine addition being limited to modest amounts and to short time periods, the risk in terms of potential PBDD/PBDF or Br_2 emissions and of damage to the bag filter is limited. • This technique being relevant for the control of mercury peaks and not for continuous use, it is not relevant for waste types for which the occurrence of mercury peaks is very low, such as sewage sludge. 5. <u>Technique d.</u> • See the EIPPCB assessment regarding this technique in Section 1.6.2.4.1 of this document.
EIPPCB proposal:	1. <u>General</u> • Clarify in the descriptions of the techniques which of them are general techniques for the reduction of mercury emissions, which are specific techniques that are aimed at controlling mercury peak emissions (usually in combination with the continuous monitoring of mercury in the raw flue-gas), and which are techniques that are able to effectively prevent the occurrence of mercury peaks by ensuring a large buffer capacity. 2. <u>BAT statement</u> • Clarify that the BAT-AELs apply to channelled emissions to air. • Clarify that BAT 31 addresses mercury emissions, including peaks. 3. <u>Technique a.</u> • Change the pH value from below 1 to approximately 1. • Add a clarification on the function of sulphur compounds as additives to a wet scrubber. • Clarify that carbon sorbent does not only adsorb mercury when it is in the elemental state. • Specify that, when designed for a sufficiently high buffer capacity for mercury capture, the technique effectively prevents the occurrence of mercury emission peaks. • Remove the applicability restriction for smaller existing plants due to economic reasons. • Add an applicability restriction due to water availability. 4. <u>Technique b.</u> • Modify the description of the technique to reflect its use in combination with the continuous measurement of elemental mercury in the raw flue-gas to control mercury peaks. • Simplify the existing text for better readability. • Set the applicability as not applicable to the incineration of sewage sludge. 5. <u>Technique d.</u> • In the description, include the case of carbon-impregnated polymers among the examples of adsorbents used. • Move the main description to Section 5.2. • Specify that, when designed for a sufficiently high mercury adsorption capacity, the technique effectively prevents the occurrence of mercury emission peaks. 6. <u>New techniques</u>

<table>
<tr><td></td><td>Add new technique: “injection of special, highly reactive activated carbon” as a specific technique to control mercury peaks; reflect its use in combination with the continuous measurement of elemental mercury in the raw flue-gas, and set its applicability to not applicable to the incineration of sewage sludge.</td></tr>
</table>

1.6.2.5.2 BAT-AELs and indicative emission levels for mercury from incineration

<table>
<tr><td>Location in D1:</td><td><i>P. 703 – Section 5.1.5.2.5</i></td></tr>
<tr><td>Current text in D1:</td><td>
Table 5.7: BAT-associated emission levels (BAT-AELs) for emissions of mercury to air from incineration
<table>
<tr><th rowspan="2">Parameter</th><th colspan="2">BAT-AEL (µg/Nm³)</th><th rowspan="2">Averaging period</th></tr>
<tr><th>New plant</th><th>Existing plant</th></tr>
<tr><td>Hg</td><td>5–20</td><td>5–25</td><td>Daily average,
Long-term sampling average, or
Average over the sampling period</td></tr>
<tr><td colspan="4">NB: The lower end of the BAT-AEL ranges can be achieved when using fixed-bed adsorption or a wet scrubber enhanced with the use of oxidants; the higher end of the BAT-AEL ranges can be achieved when using dry sorbent injection.</td></tr>
</table>
As an indication, the half-hourly average mercury emission levels will generally be:
15–40 µg/Nm³ for existing plants
15–35 µg/Nm³ for new plants.
</td></tr>
<tr><td>Summary of comments:</td><td>

<u>General</u>
Assess whether the BAT-AELs have been proposed based on continuous or discontinuous measurements and if necessary differentiate the levels for the two types of monitoring (Eurits-70).
<u>Averaging period</u>

Delete “long-term sampling” and only require either continuous monitoring or a sampling period of 0.5 to 8 hours (AT-61).
Replace the expression “long-term sampling average” with “long-term sampling period” (IT-31).
Delete the indicative half-hourly levels (CZ-31, ES-28, Eurits-34, E&P-37, Eurelectric-91, CEWEP-ESWET-729, FEAD-182, FEAD-185, FR-657, HU-48).
Replace the indicative half-hourly levels by BAT-AELs (AT-60).
Clarify that the indicative half-hourly levels are not binding BAT-AELs (DK-80).
Add yearly BAT-AEL (EEB-78, SE-84).

<u>BAT-AEL range for mercury</u>

Decrease the higher end of the BAT-AEL range for existing plants to 20 µg/Nm³ (SE-100, NL-23).
Decrease the lower end of the BAT-AEL range to 1 µg/Nm³ (NL-22, NL-23, SE-98, SE-100, AT-59), or to <1 µg/Nm³ (EEB-65)
Reassess the lower end of the BAT-AEL range taking into account the performance fluctuations occurring at plant level, as well as the data obtained with the different type of monitoring regimes in place in incineration plants across the EU (IT-30)
Delete the NB note associating the lower end of the range to specific techniques, or replace it by the following: "NB: The lower end of the BAT-AEL ranges can be (apparently) achieved by installing one of the blind certified instruments on the market". (CEWEP-ESWET-726, FEAD-184)
Change the NB note associating the lower end of the range to specific techniques in order to broaden the set of techniques that are able to achieve the lower end of the range, as follows: “… can be achieved with a variety of

</td></tr>
</table>

	techniques e.g. when using fixed-bed adsorption or a wet scrubber enhanced with the use of oxidants or by employing technique b in combination with one or more of the techniques included in BAT 31…”. (EEB-79) • Add a footnote stating that in the case of unrecognized Hg-containing inputs in the waste the higher end of the BAT-AEL range is higher for existing plants. (CEWEP-ESWET-776) • Set yearly BAT-AELs with the following range: <0.5-1 μg/Nm^3 (EEB-78), or <10 μg/Nm^3 (SE-84). • Set half-hourly BAT-AELs as the following ranges: 1-25 μg/Nm^3 (97%), and <50 μg/Nm^3 (100%) (AT-60).
EIPPCB assessment:	1. General • The BAT-AELs have been proposed based on the assessment of Hg emission levels measured continuously by 90 reference lines and measured periodically by 250 reference lines. 85% of the reference lines that measured mercury reported a maximum mercury emission level below the higher end of the proposed BAT-AEL range. Among the reference lines that measured mercury continuously, emission levels below the higher end of the proposed BAT-AEL range are achieved by 89% of the reference lines based on the yearly maximum of the daily averages derived using the OP,OC1,ELV,43 (fine) data filter, and by 78% of the reference lines based on the OP,OC2 (base) data filter. The achievability of the proposed BAT-AEL range is therefore considered equivalent with respect to the averaging period (i.e. daily average for continuous measurements or average over the sampling period for periodic measurements). • To check the appropriateness of the proposed BAT-AELs when using long-term sampling, monthly averages of continuously measured emission levels have been calculated. 2. Averaging period • Continuous mercury monitoring is generally considered BAT as it allows optimising the operation of the waste incineration plant. In the case of plants incinerating waste with intrinsically low and constant mercury content, such optimisation of plant operation may not be necessary because the occurrence of significant emission peaks is not expected; in these cases, the long-term sampling still enables a better accounting of the total emitted mercury loads than periodic short-term measurements with a minimum frequency of twice per year. • The term “average” in “long-term sampling average” is intended to refer to the (long) averaging period, not to any averaging between a possible set of discrete measurements. The term long-term sampling average can be changed to remove the possible ambiguity. • The specific approach, for mercury, to set indicative half-hourly emission levels is proposed in view of the absence of half-hourly ELVs for this pollutant in Annex VI to the IED. The indicative half-hourly levels are emission levels generally consistent with the daily BAT-AELs that are proposed in Table 5.7. In view of the known dependency of short-term mercury emissions on the mercury input, and of the possible consequences that specific compliance assessment rules may have on the achievability of such short-term emission levels, half-hourly emission performance levels are proposed as indicative instead of BAT-AELs. This approach has also been used in other cases such as for CO emissions from Large Combustion Plants in Commission Implementing Decision (EU) 2017/1442, and provides relevant information to the competent authorities while at the same time allowing for broad implementation flexibility. • Taking into account that in the case of mercury emissions a substantial part of the yearly load emitted may be related to a single peak emission episode, the control of mercury emissions in waste incineration plants over an averaging period as long as the yearly average may have limited added value. 3. BAT-AEL range for mercury • A large proportion of the reference lines of the 2016 data collection (around 83%) achieve mercury emission levels below 20 μg/Nm^3 as a daily average. However, the BAT-AEL range has been proposed based not only on the OP,OC1,ELV,43 filter but also considering the performance levels evaluated

with less stringent data filters.

- A level of 25 μg/N^{m3} is considered to provide a reasonable level of flexibility for existing plants in particular having in mind plants using PAC injection in view of the cross-media effects.
- The revised draft BAT conclusions propose the long-term sampling (or periodic measurements) of mercury as an alternative to continuous measurement in the case of plants incinerating wastes with an intrinsically low and constant mercury content, which in the 2016 data collection may be identified with plants incinerating sewage sludge. Reference lines PL02, DE16, DE87-1R, DE87-2R and DE87-3R incinerate predominantly sewage sludge and reported continuous monitoring data for mercury. In all cases, the maximum of the monthly average is below 10 μg/Nm^3. Taking into account also the reference lines that incinerate different types of waste, depending on the data filter used, 88% to 94% (79 to 85 out of 90) of the reference lines that measure mercury continuously achieve a maximum of the monthly average below 10 μg/Nm^3.
- While the measurement uncertainty could increase as a percentage at emission levels lower than the ELVs set in IED Annex VI, the proposed BAT-AEL ranges do take into account the data uncertainty and the intrinsic variability of the pollutant content of the input (mercury being a case where this is particularly relevant) in a pragmatic way: while it should be noted that a substantial number of plants have reported mercury emission levels well below 1 μg/Nm^3 as a yearly maximum of the daily averages (irrespective of the applied data filters), a level of 5 μg/Nm^3 for the lower end of the BAT-AEL range also provides a substantial margin over the limit of quantification of the measurement methods. For the long-term sampling of mercury, the limit of quantification of the measurement method is however substantially lower (the typical analytical range of the US EPA- M30B method, for instance is down to 0.1 μg/Nm^3); in this case 1 μg/Nm^3 could be an appropriate lower end of the BAT-AEL range.
- Poor maintenance and calibration of the AMS equipment cannot be considered to be BAT.
- In the majority of waste incineration plants, mercury is not emitted continuously in substantial amounts. Conversely, most often it is emitted in peaks when present in the waste in amounts that exceed the buffer capacity of the FGC system. Better control of such peaks allows for the achievement of lower overall emission levels also when expressed as daily averages. The NB could therefore be expressed in a generalised way by mentioning the conditions that in general allow the achievement of the lower end of the BAT-AEL range. This includes the use of specific techniques for the prevention or reduction of mercury peak emissions, and the case of incinerating waste with low and constant mercury content, e.g. sewage sludge. The majority of sewage sludge incineration plants of the 2016 data collection achieve low levels of Hg emissions.
- Cases of unrecognised Hg-containing inputs in the waste are implementation issues linked to compliance assessment which is under the responsibility of the competent authorities of the Member States.
- A yearly BAT-AEL for mercury of 10 μg/Nm^3 would be achievable for almost all of the reference lines of the 2016 data collection, but it may be redundant. Among the 90 reference lines that reported AMS mercury data, only one shows a yearly average mercury emission level that is appreciably above 10 μg/Nm^3 (FR110). This reference line also exceeds the proposed higher end of the BAT-AEL range of 25 μg/Nm^3. When considering lower levels for a possible yearly average BAT-AEL, and taking into account that in the case of mercury emissions a substantial part of the yearly load emitted may be related to a single peak emission episode, the control of mercury emissions in waste incineration plants over an averaging period as long as the yearly average may have limited added value.
- The evaluation of the environmental performance of the reference lines in terms of half-hourly average mercury emission levels shows a much stronger dependence on data filtering than in the case of daily average emission levels. This is suggestive of the challenges in deriving BAT-AELs that would be representative of the performance of the techniques in use without a substantial

	dependence on any specific compliance assessment framework that there could be in place. The setting of half-hourly environmental performance levels as indicative addresses this challenge by allowing for a broader flexibility in implementation.
EIPPCB proposal:	1. General • Keep the table structure unchanged. 2. Averaging period • Replace the expression "long-term sampling average" with "long-term sampling period" in Table 5.7. 3. BAT-AEL range for mercury • For consistency with other BAT-AEL tables, turn the NB into a footnote. Generalise it by associating the lower end of the BAT-AEL range with: either the incineration of waste with constant and low mercury input, or the use of specific techniques for the prevention or reduction of mercury peak emissions. • Provide a differentiated mercury BAT-AEL range for the long-term sampling period, with the following range: 1-10 µg/Nm^3.

1.7 Emissions to water

1.7.1 Water usage and discharge of pollutants to water

<table>
<tr><td>Location in D1:</td><td>P. 702 – Section 5.1.6</td></tr>
<tr><td>Current text in D1:</td><td>BAT 33. In order to reduce water usage and to prevent or reduce the generation of waste water from the incineration plant, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th></th><th>Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Waste-water-free FGC techniques</td><td>Use of FGC techniques that do not generate waste water (e.g. dry sorbent injection or semi-wet absorber, see Section 5.2.2)</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Recycling of boiler drain water</td><td>Recycling of boiler drain water (e.g. for its use in a wet scrubber, or a quench system)</td><td>Generally applicable</td></tr>
<tr><td>c.</td><td>Recycling of waste water from the wet scrubber</td><td>The waste water originating from the wet scrubber is treated and recycled to the wet scrubber</td><td>Only applicable to plants fitted with a wet scrubber</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>1. <u>BAT statement</u>
• Modify the BAT statement to allow for other measures achieving a comparable level of environmental protection (CZ-45, Eurelectric-94) and delete the applicability column (E&P-40).
• Clarify that these techniques are only BAT for waste water reduction but could compromise the flue gas cleaning efficiency (DK-10).
2. <u>Technique a</u>
• Delete technique "a", as it contradicts BAT 28 and BAT 31 (FEAD-262).
• Set applicability as “not applicable to existing plants with wet flue-gas cleaning systems” (DK-79).
3. <u>Technique c</u>
• Delete the technique since the high salt content makes the water recycling not feasible (FEAD-263).
• Change the term “recycling” to “re-use” (CEFIC-80).
• Specify that the water originating from the wet scrubber could be used not only in the same unit, but also in other equipment such as boiler or district heating make-up water, or even discharged to the sea (SE-39).
4. <u>New techniques</u>
• Add the technique: “supplying waste water to an external waste water treatment plant” (CZ-44, Eurelectric-93).
• Add the technique: “recycling waste water in the combustion process” (FEAD-186, FR-594, CEWEP-ESWET-731).</td></tr>
<tr><td>EIPPCB assessment:</td><td>1. <u>BAT statement</u>
• As stated in the General considerations section of the BAT conclusions, the techniques listed and described are neither prescriptive nor exhaustive. Other techniques may be used that ensure at least an equivalent level of environmental protection.
• The applicability of the listed techniques reflects the information reported in the paragraphs: “Technical considerations relevant to applicability”, “Economics” and “Cross-media effects” in Sections 4.6.3, 4.6.6 and 4.6.8 of D1 of the WI BREF.
2. <u>Technique a</u>
• Wet scrubber is not the only technique listed in BAT 28 and BAT 31.
• Waste incineration plants with wet FGC systems are addressed by technique b. and by technique c. with its applicability restriction.
3. <u>Technique c</u>
• The description of technique c. clarifies that water is treated before being recycled</td></tr>
</table>

	to the following use. This reflects the need to apply the treatment required (e.g. neutralisation, chemical precipitation, coagulation and flocculation, filtration) for the water to fulfil the applicable quality criteria before being recycled. • The description of the BAT conclusion states that the waste water is treated before being used in the wet scrubber or other unit. Since there is a treatment step, recycling is a more precise term than reuse. • Waste water originating from the wet scrubber could be recycled in the scrubber, boiler or district heating make-up water. Discharging water to the sea does not fulfil the environmental objectives of BAT 33. 4. New techniques • Delivering the waste water to an external waste water treatment plant does not fulfil the environmental objectives of BAT 33. • The proposed new technique "recycling waste water in the combustion process" is very similar to technique c, where it is proposed to extend the possible uses of the recycled water to other uses besides the wet scrubber, as long as they constitute the replacement of fresh water and not simply waste water disposal. • Information on the technique "dry bottom ash discharger" has been provided by ESWET. This technique is already a described BAT for LCP and is applied also in WI plants.
EIPPCB proposal:	1. BAT statement • Keep the BAT statement unchanged. 2. Technique a • Keep technique a unchanged. 3. Technique c • Add that the recycled waste water could be used not only in the wet scrubber but also in other equipment. • Specify that the recycling of waste water is applicable within the constraints of the quality requirements of the intended use. 4. New techniques • Modify the description of technique c. to take into account that the recycled waste water could be used to replace fresh water not only in the wet scrubber but also for other uses. • Add the technique "dry bottom ash discharger".

1.7.2 Techniques to reduce emissions to water from FGC and/or treatment of slags and bottom ashes

<table>
<tr><td>Location in D1:</td><td>*P. 702 – Section 5.1.6*</td></tr>
<tr><td>Current text in D1:</td><td>**BAT 34. In order to reduce emissions to water from flue-gas cleaning and/or from the treatment of slags and bottom ashes, BAT is to use an appropriate combination of the techniques given below, and to use secondary techniques as close as possible to the source in order to avoid dilution.**
<table>
<tr><th></th><th>Technique</th><th>Typical pollutants prevented/abated</th></tr>
<tr><th colspan="3">Primary techniques</th></tr>
<tr><td>a.</td><td>Optimisation of the incineration process (see BAT 15) and/or of flue-gas treatment systems (e.g. SNCR/SCR, see BAT 29 (g))</td><td>Organic compounds including PCDD/F, ammonia</td></tr>
<tr><td>b.</td><td>Separate treatment of waste water arising from different wet scrubbing stages (acidic and alkaline)</td><td>Acids, alkalis, sulphate</td></tr>
<tr><th colspan="3">Secondary techniques (1)</th></tr>
<tr><td colspan="3">***Preliminary and primary treatment***</td></tr>
<tr><td>c.</td><td>Equalisation</td><td>All pollutants</td></tr>
</table>
</td></tr>
</table>

d.	Neutralisation	Acids, alkalis
e.	Physical separation, e.g. screens, sieves, grit separators, primary settlement tanks	Gross solids, suspended solids
Physico-chemical treatment		
f.	Adsorption on activated carbon	Organic compounds including PCDD/F, mercury
g.	Chemical precipitation	Dissolved metals/metalloids, sulphate
h.	Oxidation	Sulphide, sulphite, organic compounds
i.	Ion exchange	Dissolved metals/metalloids
j.	Stripping	Ammonia/ammonium
k.	Reverse osmosis	Ammonia/ammonium
Final solids removal		
l.	Coagulation and flocculation	Suspended solids, particulate-bound metals/metalloids
m.	Sedimentation	Suspended solids, particulate-bound metals/metalloids
n.	Filtration	Suspended solids, particulate-bound metals/metalloids
o.	Flotation	Suspended solids, particulate-bound metals/metalloids

(1) The descriptions of the techniques are given in Section 5.2.3.

Summary of comments:

1. General
   - Clarify whether the techniques described apply to direct emissions to water or to direct and indirect emissions to water (PT-25, CEFIC-81, FEAD-355).
   - Add a new footnote applicable for indirect discharges through a municipal waste water treatment plant, specifying that in this case the same techniques as for direct discharges need to be used, except for reducing NH_4-N and TOC emissions (NL-24).
   - Add in the description that waste water pre-treatment is carried out as part of an integrated waste water management, and allow mixing when the purpose is to join treatments (CEFIC-81).
   - Include the option to use alkaline waste water from bottom ash treatment to neutralize acidic waste water if both waste water flows are treated in a waste water treatment plant (CEWEP-ESWET-777).

2. Secondary techniques
   - Specify that, in the case of bottom ash treatment plants, techniques “c” to “o” are applicable to waste water coming from the treatment and storage areas (CEWEP-ESWET-738).

3. Final solids removal
   - Add new technique based on centrifugation e.g.: decanter centrifuges or hydrocyclones (CEWEP-ESWET-734).

4. Techniques a and b
   - Delete techniques “a” (FEAD-187, CEWEP-ESWET-732) and “b” (FEAD-188, CEWEP-ESWET-733).

5. Technique k
   - Add to the column "Typical pollutant prevented/abated" the following pollutants: metals/metalloids, sulphates, chlorides, and organic compounds (SE-40).

EIPPCB assessment:

1. General
   - The techniques described are commonly used to reduce emissions to water in general and are applicable independently of whether the water discharge is direct or indirect. As in other BAT conclusions (e.g. LCP), the BAT statement already specifies that BAT is to use the secondary techniques as close as possible to the source to avoid dilution.
   - Integrated waste water management is part of the CWW BAT conclusions, where streams with different characteristics are treated.

	• Equalisation already includes the possibility to balance flows and pollutant loads. • As specified in other BAT conclusions, stripping can remove not only ammonia but also other purgeable pollutants. 2. <u>Secondary techniques</u> • The relevant sources of waste water from bottom ash treatment are the treatment and storage areas and can be clarified in the BAT statement. 3. <u>Final solids removal</u> • Centrifugation is a technique commonly used to concentrate sludge. 4. <u>Techniques a and b</u> • Section 4.6 of D1 states that: *"an optimal incineration process is an important condition for the effective control of emissions to water. Incomplete incineration has a negative effect on flue-gas and fly ash composition, by the increased presence of organic compounds with a polluting and/or toxic character. These in turn can impact on the content of the scrubber effluent"*. • The environmental advantages to using technique b are described in D1, Section 4.6.14: *"Separate treatment of effluents arising from different wet scrubbing stages"*, and are more related to resource efficiency than to the reduction of emissions to water. 5. <u>Technique k</u> • Reverse osmosis can also remove metals/metalloids, sulphates, chlorides and organic compounds. It has also been reported in other BAT conclusions (NFM, CWW, WT).
EIPPCB proposal:	1. <u>General</u> • No changes. 2. <u>Secondary techniques</u> • Add in the BAT statement a reference to the storage and treatment of slags and bottom ashes. 3. <u>Final solids removal</u> • Keep techniques associated to final solids removal unchanged. 4. <u>Techniques a and b</u> • Keep technique a. unchanged besides minor editorial improvements. • Delete technique b. and include its principles in the statement and description of BAT 32. 5. <u>Technique k</u> • Add metals/metalloids, sulphates, chlorides and organic compounds to the list of typical pollutants abated. 6. <u>Technique j</u> • Amend the list of targeted pollutants to purgeable pollutants in general.

1.7.3 BAT-AELs for emissions to water

Location in D1: *P. 703 – Section 5.1.6*

Current text in D1:

Table 5.8: BAT-AELs for direct emissions to a receiving water body

Parameter		**Process**	**Unit**	**BAT-AEL (daily average)**
Total suspended solids (TSS)		FGC Bottom ash treatment	mg/l	10–30
Total organic carbon (TOC)		FGC Bottom ash treatment		15–40
Metals and metalloids	As	FGC		0.01–0.05
	Cd	FGC		0.005–0.03
	Cr	FGC		0.02–0.08
	Cu	FGC		0.03–0.15
	Hg	FGC		0.001–0.01
	Ni	FGC		0.03–0.15
	Pb	FGC Bottom ash treatment		0.02–0.08
	Tl	FGC		0.005–0.03
	Zn	FGC		0.01–0.5
NH_4-N		Bottom ash treatment		10–30
SO_4^{2-}		Bottom ash treatment		400–1000
PCDD/F		FGC Bottom ash treatment	ng I-TEQ/l	0.01–0.1

Summary of comments:

1. General
   - Set BAT-AELs for indirect discharges for selected pollutants (i.e. bioaccumulative pollutants) (IT-32).
   - Clarify whether BAT-AELs for water emissions apply to direct or indirect discharges. The General considerations section states that the BAT-AELs apply at the point where the emission leaves the installation, but the title of table 5.8 refers to direct emissions (CEWEP-ESWET-741).
   - Change heading of the fourth column to: "BAT-AEL (daily average or 4 out of 5 measuring method)" (Eurelectric-92).
   - Change averaging period to monthly average (FEAD-357).
   - Modify the heading of the fourth column to take into account that the sampling time must be limited to the requirements of current standards (CEWEP-ESWET-777).
   - Harmonise Table 5.8. with BAT 7, in order to have the same pollutants in both (CEWEP-ESWET-777, E&P-41).
   - Set BAT-AELs for bottom ash treatment for all metals (Eurits-35).
   - Set the same BAT-AELs agreed in the WT BREF for water-based liquid waste (WBLW) (Eurits-71, HWE-103, FR-744).
   - Do not set BAT-AELs more stringent than the ones given in WI BREF 2006 (FEAD-358, CEWEP-ESWET-778).
   - Add a footnote stating that Part 5 of Annex VI of the IED does not apply when BAT 34 applies (HWE-20, HU-24).
   - Add a column with LoQ information (Eurits-35).
   - Add in the table the relevant EN standards for the determination of the various parameters (AT-122, AT-124, AT-125, AT-126, AT-128, AT-130, AT-132, AT-135. AT-137, AT-140, AT-144, AT-148)

2. BAT-AEL range for As
   - Decrease the lower end of the BAT-AEL range to 0.003 mg/l (EEB-109)
   - Increase the higher end of the BAT-AEL range to 0.1 mg/l (AT-127).

3. BAT-AEL range for Cd

	- Set the BAT-AEL for Cd to 0.001 – 0.02 mg/l (EEB-106). - Increase the lower end of the BAT-AEL range to 0.01 mg/l (AT-133). 4. BAT-AEL range for Cr - Set the BAT-AEL for Cr to 0.003 – 0.02 mg/l (EEB-110). - Set the BAT-AEL for Cr to 0.01 – 0.1 mg/l (AT-131). - Increase the higher end of the BAT-AEL range to 0.1 mg/l (CEWEP-ESWET-735). 5. BAT-AEL range for Cu, Pb and Zn - Increase the higher end of the BAT-AEL range for Cu to 0.25 mg/l (CEWEP-ESWET-735). - Increase the higher end of the BAT-AEL range for Pb to 0.1 mg/l (CEWEP-ESWET-735). - Increase the higher end of the BAT-AEL range for Zn to 0.8 mg/l (CEWEP-ESWET-735). 6. BAT-AEL range for Hg - Decrease the higher end of the BAT-AEL range to 0.0075 mg/l (EEB-105, AT-123). - Increase the higher end of the BAT-AEL range to Hg: 0.025 mg/l (CEWEP-ESWET-735). 7. BAT-AEL range for Ni - Decrease the lower end of the BAT-AEL range to 0.003 mg/l (EEB-111). - Add a footnote to take into account the ambient geological situation, so that depending on the background concentrations the upper BAT-AEL for nickel is increased to 0.5 mg/l (AT-139). 8. BAT-AEL range for Tl - Increase the lower end of the BAT-AEL range to 0.01 mg/l (AT-134). - Increase the higher end of the BAT-AEL range to 0.05 mg/l (CEWEP-ESWET-735). 9. PCDD/F - Change the name of the parameter to dioxins and dioxin-like compounds (AT-143). - Change the unit to ng I–TEQ WHO/l (FEAD-359, CEWEP-ESWET-736). 10. SO_4^{2-} - Delete the parameter (FEAD-360, CEWEP-ESWET-737). 11. TOC - Delete reference to FGC, establish BAT-AEL for TOC only for bottom ash treatment (CZ-46, Eurelectric-95). 12. BAT-AELs for new parameters - Add BAT-AELs for Co as 0.005 – 0.05 mg/l (EEB-108), or as 0.005 – 0.2 mg/l (AT-149). - Add BAT-AELs for Mn as 0.02 – 0.2 mg/l (EEB-108), or as 0.02 – 0.8 mg/l (AT-149). - Add BAT-AELs for V as 0.01 – 0.1 mg/l (EEB-108), or as 0.03 – 0.5 mg/l (AT-149). - Add BAT-AELs for Sn as 0.02 – 0.1 mg/l (EEB-108), or as 0.02 – 0.5 mg/l (AT-149). - Set the BAT-AEL for Sb to 0.005 – 0.1 mg/l (EEB-107), or to 0.005 – 0.2 mg/l (AT-145).
EIPPCB assessment :	1. General - At the WI TWG KoM it was concluded (see KOM report, Conclusion 26) that emissions to water are generally not a key environmental issue of the WI sector.

Article 46(4) of the IED, furthermore, already contains provisions for the case of indirect waste water discharges. For these reasons, in D1 the EIPPCB only proposed BAT-AELs for direct emissions to water, using only data from plants reporting direct discharges.

- However, the environmental objective of BAT 34 concerns emissions to water in general.
- In some of the most recent BREF reviews (Waste Treatment in particular), the relevant TWG has taken the decision to set BAT-AELs both for direct and indirect discharges. At the November 2017 Berlin workshop on BAT for industrial waste water treatment, several break-out groups called for the setting of BAT-AELs for indirect discharges, where appropriate. Calls were also made for additional guidance on the handling of indirect discharges in permitting.
- The data collected in 2016 for the review of the WI BREF include water emission data associated both to direct and to indirect discharges. For emission data related to the treatment of waste water from wet flue-gas cleaning, roughly as much data are available for direct and for indirect discharges. It is therefore possible to check if the BAT-AELs derived on the basis of direct discharges are in principle also representative of the plant performance in the case of indirect discharges. Such a check, described below pollutant by pollutant, shows that essentially the same emission levels are achieved in the case of direct and indirect discharges.
- The “4 out of 5 method” refers to a compliance assessment method used in Germany. Rules for compliance are implementation issues beyond the technical scope of the BAT conclusions.
- The definition of BAT-AELs for emissions to water is in the General considerations section of the BAT conclusions.
- IED Annex VI, Part 6, Point 3.1 stipulates that the waste water is sampled with a flow-proportional representative sample over a period of 24 hours. The data gathered were obtained using this sampling method.
- The monitored pollutants are not always linked to the BAT-AELs set. The TWG may consider it useful to monitor a pollutant in order to collect data, or to check the environmental performance of a technique or of a combination of techniques. The EIPPCB has proposed to set BAT-AELs for pollutants for which representative data were available.
- For bottom ash treatment, lead is the only metal for which data have been collected through the questionnaire.
- Waste water from the FGC systems of waste incineration plants are not covered under the scope of water-based liquid waste in the WT BREF. Although the techniques may be similar, BAT-AELs do not need to be the same as they are related to different processes. The proposed BAT-AELs are based on the assessment of data reported for the review of the WI BREF.
- One of the purposes of a BREF review is to reflect the changes and the consequences for BAT of the evolution of R&D. It is a reasonable consequence that the BAT-AELs may be lower than those set more than a decade ago.
- BREFs or BAT conclusions cannot establish exemptions from the IED. The setting of national general binding rules and/or permit-level ELVs based on the BAT-AELs is an implementation issue.
- Similarly to other BREFs, the LoQ of the standard methods is not presented in the WI BREF and BAT conclusions. Relevant LoQs are comprehensively presented in the horizontal ROM.
- The standards for the determination of metals are related to the monitoring. Accordingly, they are included in BAT 7 on the monitoring of emissions to water.

2. <u>BAT-AEL range for As</u>
   - While a number of plants report maximum As emission levels, both for direct and for indirect discharges, below the proposed lower end of the range of 0.01 mg/l, this level is considered appropriate as it also provides a reasonable margin over the limit of quantification of the analytical standards.
   - 71% (20 out of 28) of the waste incineration plants of the 2016 data collection with direct waste water discharges reported a maximum level below 0.05 mg/l. Of the 8 plants that reported a maximum As level above 0.05 mg/l, AT04 reported only the average of the performed measurements; DE80.1R, FR108, SE20, DK06 and FR109 reported maximum emissions higher than the IED ELVs; and the

values reported by SE03 and UK02 seem to be misreported.
- 76% (13 out of 17) of the plants with indirect discharges reported a maximum level below 0.05 mg/l. The achievability of the proposed BAT-AEL range is therefore considered equivalent with respect to the point of release (i.e. for direct and for indirect discharges).

3. BAT-AEL range for Cd
   - No specific information has been provided to substantiate the proposal to change the lower end of the Cd BAT-AEL range to 0.001 mg/l.
   - Cd levels of 0.005 mg/l can be measured with several standard methods. EN ISO 11885:2009 (Inductively coupled plasma optical emission spectrometry (ICP-OES)) has a LoQ of ~ 0.2 μg/l. EN ISO 15586:2003 (Atomic absorption spectrometry (AAS) with graphite furnace) has a LoD of ~ 0.1 μg/l, and the LoQ of EN ISO 17294-2:2016 (Inductively coupled plasma mass spectrometry (ICP-MS)) is around 0.5 μg/l.
   - Plants SE09 and FR76 monitor their Cd emissions to water once every two months and once a month respectively, and reported maximum Cd emissions to water higher than 0.02 mg/l. These two plants can be taken as references to set the higher end of the BAT-AEL for Cd considering that they also show a good performance regarding the emissions of other water pollutants.
   - Plant UK01 can be taken as a reference for the lower end of the BAT-AEL range considering that its data are based on a substantial number of measurements (12) and that it incinerates predominantly hazardous waste. This level (0.005 mg/l) also provides a reasonable margin over the limit of quantification of the analytical standards.
   - 59% (17 out of 29) of the plants with direct discharges reported a maximum level below 0.03 mg/l. 71% (15 out of 21) of the plants with indirect discharges reported a maximum level below 0.03 mg/l. The achievability of the proposed BAT-AEL range is therefore considered equivalent with respect to the point of release (i.e. for direct and for indirect discharges).

4. BAT-AEL range for Cr
   - Among the plants that reported direct emissions to water, two plants (DK01, PL06) report maximum levels below 0.003 mg/l. Both reported emission values close to the LoQ of the measurement techniques.
   - 0.01 mg/l is the lower end of the BAT-AEL range for Cr for LCP and WT plants. Plants such as SE06, DK02 and BE13, apply several techniques for the abatement of metals and are able to achieve maximum Cr emissions to water lower than or equal to 0.01 mg/l.
   - Considering also the plants' performance in terms of average emissions, there are plants with rather low average emissions that reported a maximum close or equal to 0.1 mg/l (e.g. NL06, AT11, FR76).
   - 79% (22 out of 28) of the plants with direct discharges reported a maximum level below 0.1 mg/l. 78% (18 out of 23) of the plants with indirect discharges reported a maximum level below 0.1 mg/l. The achievability of the proposed BAT-AEL range is therefore considered equivalent with respect to the point of release (i.e. for direct and for indirect discharges).

5. BAT-AEL range for Cu, Pb and Zn
   - No technical information has been provided to substantiate the proposed increase of the higher end of the BAT-AEL ranges for Cu, Pb and Zn. Furthermore, the units seem to have been misreported by several of the plants reporting the highest emission levels.
   - For Cu, 63% (19 out of 30) of the plants with direct discharges reported a maximum level below 0.15 mg/l. 83% (19 out of 23) of the plants with indirect discharges reported a maximum level below 0.15 mg/l.
   - For Pb, 72% (21 out of 29) of the plants with direct discharges reported a maximum level below 0.08 mg/l. 59% (13 out of 22) of the plants with indirect discharges reported a maximum level below 0.08 mg/l.
   - For Zn, 61% (17 out of 28) of the plants with direct discharges reported a maximum level below 0.5 mg/l. 55% (12 out of 22) of the plants with indirect discharges reported a maximum level below 0.5 mg/l.

- The achievability of the proposed BAT-AEL ranges is therefore considered equivalent with respect to the point of release (i.e. for direct and for indirect discharges).

6. BAT-AEL range for Hg
   - Among the data collected for direct waste water discharges, there are three plants incinerating predominantly hazardous waste (UK01, FR111 and PL06) that report maximum Hg emissions below 0.01 mg/l. Considering that, among these plants, PL06 provided only the emissions' average and UK-01 reports emissions of about 0.01 mg/l, lowering the higher end of the BAT-AEL range to 0.007 mg/l would leave only one HWI plant within the BAT-AEL range. 0.01 mg/l seems therefore appropriate as the higher end of a BAT-AEL range intended to take into account the performance of plants incinerating different types of waste.
   - No technical information has been provided to justify increasing the higher end of the BAT-AEL range for Hg to 0.25 mg/l. Furthermore, the units seem to have been misreported by the two plants reporting the highest emission levels.
   - 66% (19 out of 29) of the plants with direct discharges reported a maximum level below 0.01 mg/l. 66% (14 out of 21) of the plants with indirect discharges reported a maximum level below 0.01 mg/l. The achievability of the proposed BAT-AEL range is therefore considered equivalent with respect to the point of release (i.e. for direct and for indirect discharges).

7. BAT-AEL range for Ni
   - Among the data collected for direct waste water discharges, none of the plants of the 2016 data collection reported a maximum level below 0.003 mg/l.
   - Intake loads of pollutants are only relevant for some parameters and largely depend on the local conditions. Emission data used to derive BAT-AELs have been reported without reference to any intake loads. A potential increase of the concentrations of some pollutants due to a local geological situation is a generic issue beyond the scope of BREFs and is related to implementation.
   - 74% (20 out of 27) of the plants with direct discharges reported a maximum level below 0.15 mg/l. 74% (17 out of 23) of the plants with indirect discharges reported a maximum level below 0.15 mg/l. The achievability of the proposed BAT-AEL range is therefore considered equivalent with respect to the point of release (i.e. for direct and for indirect discharges).

8. BAT-AEL range for Tl
   - The standard EN ISO 17294-2:2016 reports that the Tl LoQ is 0.0002 mg/l. Using this standard, the proposed BAT-AEL of 0.005 mg/l can be measured.
   - While a number of plants report maximum Tl emission levels, both for direct and for indirect discharges, below the proposed lower end of the range of 0.005 mg/l, this level is considered appropriate as it also provides a reasonable margin over the limit of quantification of the analytical standards.
   - No rationale has been provided to justify increasing the higher end of the range from 0.03 mg/l to 0.05 mg/l.
   - 73% (19 out of 26) of the plants with direct waste water discharges reported a maximum level below 0.03 mg/l. 66% (6 out of 9) of the plants with indirect discharges reported a maximum level below 0.03 mg/l. The achievability of the proposed BAT-AEL range is therefore considered equivalent with respect to the point of release (i.e. for direct and for indirect discharges).

9. PCDD/F
   - PCDD/F is the term used in other BREFs, and also in the E-PRTR. Furthermore, the proposed BAT-AEL range is based on data reported for PCDD/F and expressed as I-TEQ. Changing the name to dioxin-like compounds would add more substances and the BAT-AEL range should consequently be changed.
   - The toxic equivalents of PCDD/F are usually expressed either as I-TEQ or as WHO-TEQ. Even if the WHO-TEQ scheme is updated and well accepted worldwide, I-TEQ is the one used in the IED and is the basis of the reported data.
   - 92% (22 out of 24) of the plants with direct waste water discharges reported a maximum level below 0.1 ng I-TEQ/l. 93% (14 out of 15) of the plants with indirect discharges reported a maximum level below 0.1 ng I-TEQ/l. The

	achievability of the proposed BAT-AEL range is therefore considered equivalent with respect to the point of release (i.e. for direct and for indirect discharges). 10. SO_4^{2-} - Although sulphate is not considered very toxic, the WI TWG residues subgroup decided to collect data on sulphate emissions. The sulphate concentration is a meaningful parameter for the transfer of salts to waste water (cross-media effect) when using wet bottom ash treatment techniques to reduce the salt content in the bottom ashes. 11. TOC - KoM conclusion 27 was to collect data also on TOC emissions to water. 15 plants with direct water discharges have reported data on TOC emissions to water. TOC loads in waste water can be reduced by optimised design and operation of the incineration process and of the FGC techniques. TOC is also partially co-precipitated during the precipitation of metals. 12. BAT-AEL range for new parameters - The 2006 WI BREF set a BAT-AEL range for Sb emissions from FGC waste water of 0.005–0.85 mg/l. Even though Sb is not a priority substance or priority hazardous substance in the field of water policy, Sb and its compounds are generally considered toxic to aquatic life. The 2016 data collection includes 13 emission points with direct discharge which report Sb emissions to water. The maximum measure Sb concentrations range from 0.01 mg/l to 44.3 mg/l. - Among the plants reporting Sb emissions below 0.2 mg/l, Plants AT01, AT04 and DK01 reported only the average values. AT11 and AT15 reported the same value for the maximum, the average and the minimum. - Among the plants reporting Sb emissions higher than 0.9 mg/l, the units seem to have been misreported by FR108 and SE03. BE13 reports maximum emissions exceeding the permit ELV. - For Sb, 69% (9 out of 13) of the plants with direct discharges reported a maximum level below 0.8 mg/l. Only one of the three plants with indirect waste water discharges reported a maximum level above 0.8 mg/l. The achievability of the proposed BAT-AEL range is therefore considered equivalent with respect to the point of release (i.e. for direct and for indirect discharges). - No data were reported for Co, Mn, Sn or V. - Very few data points were reported for Mo emissions to water.
EIPPCB proposal:	1. General - For metals and metalloids, and for PCDD/F, include a table for indirect emissions to a receiving water body. As in the case of the WT BAT conclusions, include a footnote stating that the BAT-AELs may not apply if the downstream WWT plant abates the pollutant concerned, as long as the same level of protection of the environment is ensured. 2. BAT-AEL ranges - Change the BAT-AEL range for Cr emissions to water to 0.01–0.1 mg/l. - Set a BAT-AEL for Sb emissions to water with the following range: 0.02–0.9 mg/l. - Keep the other BAT-AELs unchanged.

1.8 Material efficiency

1.8.1 Recovery of useful materials

<table>
<tr><td>Location in D1:</td><td><i>P. 703 – Section 5.1.7</i></td></tr>
<tr><td>Current text in D1:</td><td>BAT 35. In order to increase resource efficiency and improve the recovery of useful materials from the incineration residues, BAT is to handle and treat bottom ashes separately from fly ashes and from other FGC residues, and to use a combination of the techniques given below.
<table>
<tr><th></th><th>Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Screening and sieving</td><td>Oscillating screens, vibrating screens and rotary screens are used for an initial classification by size before further treatment</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Aeraulic separation</td><td>Aeraulic separation uses differences in density, particle size and particle shape to sort commingled materials.
A narrow range of particle sizes is needed for effective separation.</td><td>Generally applicable</td></tr>
<tr><td>c.</td><td>Recovery of ferrous and non-ferrous metals</td><td>Different techniques are used, including:
• magnetic separation for ferrous metals
• eddy current separation non-ferrous metals
• induction all-metal separation</td><td>Generally applicable</td></tr>
<tr><td>d.</td><td>Ageing</td><td>The ageing process stabilises the mineral fraction of the bottom ashes by uptake of atmospheric CO2, draining of excess water and oxidation.
Bottom ashes, after metal separation, are stored in open air or in covered buildings for several weeks, generally on a concrete floor allowing for drainage and run-off water to be collected for treatment.
The stockpiles may be wetted, if required, to prevent dust emissions and to favour the leaching of salts and the carbonisation if the bottom ashes are not sufficiently wet.</td><td>Generally applicable</td></tr>
<tr><td>e.</td><td>Washing</td><td>Washing of bottom ashes enables the production of a material for recycling with minimal leachability of metals and anions (e.g. salts).</td><td>Generally applicable</td></tr>
<tr><td>f.</td><td>Crushing</td><td>Mechanical treatment operations intended to prepare materials for subsequent use, e.g. road and earthworks construction.</td><td>Generally applicable</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>1. <u>General</u>
• Remove from the title of the BAT the handling and treatment of bottom ashes separately from fly ashes and from other FGC, and consider this operation as another technique (CZ-19, E&P-42, Eurelectric-96).
• Specify in the applicability column that the listed techniques are generally applicable except for hazardous waste plants (FEAD-53), and de-ironing is the only technique which is used at hazardous waste plants (HWE-49, HWE-50, HU-</td></tr>
</table>

	49, HU-50, Eurits-37, ES-43). • Do not require the segregation of boiler ashes from bottom ashes for their handling and treatment (FIR-13, FEAD-191, CEWEP-ESWET-739). • Add that bottom ashes should be kept separately from boiler ashes (DK-17). • Clarify that this BAT applies to bottom ash treatment techniques on site, and not to WI plants having a simple storage (IT-33, AT-62, CEWEP-ESWET-779). • Clarify where these techniques can be done: on-site at the waste-to-energy plant site or offsite (FEAD-265, CEWEP-ESWET-739). • Take into account that in some countries the legal situation does not allow to use bottom ashes as a product (AT-121, FEAD-190). 2. Technique a • Add finger screens to the description of technique a. (UK-105) 3. Technique c • Split technique c. into two different techniques the recovery of ferrous metals and the recovery of non-ferrous metals (ES-44, HWE-51, CEFIC-83, HU-51). 4. Technique f • Specify that crushing is also used as a preparation step for the following recovering of metals (AT-63, FEAD-264, CEWEP-ESWET-742)
EIPPCB assessment :	1. General • It is more difficult to process a mixed stream of bottom ash and FGC residue to produce materials suitable for recovery. Since the mixing of bottom ashes and FGC residues leaves no other option for the whole residue stream but landfilling, it is not considered BAT. • The statement can be changed to specify that the techniques listed refer to the treatment of slag/bottom ashes. • No specific information has been provided to support the treatment of boiler ashes together with bottom ashes. • The techniques listed in BAT 35 refer to the process carried out in a bottom ash treatment plant, independently of whether this plant is at the same site of the WI plant or elsewhere. • The fact that treated bottom ashes cannot be used as a product does not prevent their treatment to recover useful materials (e.g. ferrous and non-ferrous metals). • For consistency with BAT 13, concrete flooring could be changed to impermeable flooring. • For consistency with other BAT conclusions, the BAT statement could refer to the use of an appropriate combination of techniques. 2. Technique a • A finger screen is a type of oscillating screen. 3. Technique b • The description of technique b. could better reflect the functioning and use of the technique. 4. Technique c • In the absence of non-ferrous metals, their recovery will not be relevant. 5. Technique d • The wetting of stockpiles, while it also reduces dust emissions, in the context of BAT 35 is to be firstly seen from the perspective of the optimisation of the moisture content to a level favourable for the ageing process. • Minor amendments to the text could be made to improve readability and alignment with the names of other techniques. 6. Technique e • Washing reduces the leachability of soluble substances in general.

	7. <u>Technique f</u> • Indeed, crushers can also be used to reduce the size of the waste as a preliminary step for the subsequent recovery of metals.
EIPPCB proposal:	1. <u>General</u> • Add in the BAT statement that the techniques listed in BAT 35 apply for the treatment of slags/ bottom ashes. • Set as BAT the use of an appropriate combination of the given techniques. 2. <u>Technique a</u> • Keep technique a. unchanged, besides clarifying that the initial classification refers to the bottom ashes. 3. <u>Technique b</u> • Clarify the description of technique b based on the information contained in the study submitted by BE: “Flemish BAT-study on treatment of bottom ashes from waste incineration – translation of relevant chapters for the BREF WI Review”, VITO 2007. 4. <u>Technique c</u> • Keep technique c. unchanged. 5. <u>Technique d</u> • Clarify that an impermeable floor is generally used for the drainage and treatment of run-off water. • Amend the text referring to the wetting of stockpiles so as to highlight the optimal moisture content to favour the ageing process. • Edit the text for minor clarifications. 6. <u>Technique e</u> • Clarify that the process achieves minimum leachability of soluble substances in general. 7. <u>Technique f</u> • Add that the technique can be used as a preliminary step for the subsequent recovery of metals.

1.9 Descriptions of techniques

1.9.1 General techniques

<table>
<tr><td>Location in D1:</td><td>*P. 705 – Section 5.2.1*</td></tr>
<tr><td>Current text in D1:</td><td>
<table>
<tr><th>Technique</th><th>Description</th></tr>
<tr><td>Advanced control system</td><td>The use of a computer-based automatic system to control the combustion efficiency and support the prevention and/or reduction of emissions. This also includes the use of high-performance monitoring of operating parameters and of emissions.</td></tr>
<tr><td>Optimisation of the incineration process</td><td>Optimisation of the temperature, flow rates and points of injection of the primary and secondary combustion air to effectively oxidise the organic compounds while reducing the generation of NO_X.
Optimisation of the design and operation of the combustion chamber (e.g. flue-gas temperature, flue-gas and waste residence time, oxygen level, waste agitation).</td></tr>
<tr><td>Waste blending and mixing</td><td>Wastes are blended and/or mixed prior to incineration, e.g. by:
- bunker crane mixing;
- a feed equalisation system;
- blending of compatible liquid and pasty wastes (subject to prior compatibility testing as required);
in order to ensure stable combustion conditions, to increase the burnout and the destruction efficiency, and/or to reduce pollutant emissions. In some cases, solid wastes are shredded prior to mixing.</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>1. Waste blending and mixing
- Add the following considerations (Eurits-39, Eurits-72):
  ○ On site waste blending and mixing of waste streams which individually are accepted by the incinerator and comply with the permit waste acceptance criteria of the installation.
  ○ The mixing of hazardous waste with other waste or products, prior to incineration, shall only be done with aim of process optimization. Process optimization means: stabilizing waste feed and process conditions, increasing burn-out and destruction performance, improving safe disposal of residues, increasing quality of recovered waste fractions.
  ○ The mixing of hazardous waste with other waste or products, prior to incineration (off-site or on-site), shall not lead to a decrease of waste composition knowledge, and/or loss of knowledge of the process of origin of the hazardous waste. Specific attention shall be paid to those components relevant for knowledge of the mass flow analysis of the hazardous components present in the hazardous waste.
  ○ Clarify that in practice this means hazardous waste codes like 190204*, 190304* and 191211* cannot be treated in an incineration installation not dedicated to the treatment of hazardous waste.</td></tr>
<tr><td>EIPPCB assessment:</td><td>1. Waste blending and mixing
- According to the BREF Guidance, the description of the technique will be short but informative enough. Aspects related to the types of waste that can be accepted before incineration, or to the verification of waste compatibility prior to mixing or blending, are already covered under BAT 10 (waste stream management).
- The aim of waste blending and mixing is already specified in the BAT 15 statement.
- Waste blending and mixing is used only once in the BAT conclusions (in BAT 15).
- The BAT conclusions for the WI sector cannot deal with techniques outside the</td></tr>
</table>

	control of plant operators. 2. Optimisation of the incineration process - The description of the technique could be improved to reflect the relevance of the waste feeding rate and composition, and of the turbulence inside the furnace. See the EIPCCB assessment under Section2.4.5.
EIPPCB proposal:	1. Waste blending and mixing - Add that the mixing of hazardous waste, prior to incineration does not lead to a decrease in waste composition knowledge, and/or loss of knowledge of the process of origin of the hazardous waste. - Move this description to BAT 15. 2. Optimisation of the incineration process - Include in the description the optimisation of the waste feeding rate and composition, and the turbulence inside the furnace as an example of furnace design optimisation. - Minor editing of the terminology for harmonisation with the rest of the BAT conclusions.

1.9.2 Techniques to reduce emissions to air

<table>
<tr><td>Location in D1:</td><td><i>P. 706 – Section 5.2.2</i></td></tr>
<tr><td>Current text in D1:</td><td>
<table>
<tr><th>Technique</th><th>Description</th></tr>
<tr><td>Bag filter</td><td>Bag or fabric filters are constructed from porous woven or felted fabric through which gases are passed to remove particles. The use of a bag filter requires the selection of a fabric suitable for the characteristics of the flue-gas and the maximum operating temperature.</td></tr>
<tr><td>Boiler sorbent injection</td><td>Direct injection of dedicated alkaline reagents into the boiler at a high temperature, in the boiler post-combustion area, to achieve partial abatement of the acid gases. The technique is highly effective for the removal of SO_2 and HF, and provides additional benefits in terms of flattening emission peaks.</td></tr>
<tr><td>Catalytic filter bags</td><td>Filter bags are either impregnated with a catalyst, or the catalyst is directly mixed with organic material in the production of the fibres used for the filter medium. Such filters can be used to reduce PCDD/F emissions as well as, in combination with a source of NH_3, to reduce NO_X emissions.</td></tr>
<tr><td>Direct desulphurisation</td><td>The addition of magnesium- or calcium-based adsorbents to the bed of a fluidised bed furnace. The surface of the sorbent particles reacts with the SO_2 in the fluidised bed boiler.</td></tr>
<tr><td>Dry sorbent injection</td><td>The injection and dispersion of a dry powder sorbent in the flue-gas stream. Alkaline sorbents (e.g. sodium carbonate, sodium bicarbonate, hydrated lime) are injected to react with acid gases (HCl, HF and SO_2). Activated carbon is injected or co-injected to adsorb in particular PCDD/F and mercury. The resulting solids are removed, most often with a bag filter.</td></tr>
<tr><td>Electrostatic precipitator</td><td>Electrostatic precipitators operate such that particles are charged and separated under the influence of an electrical field. Electrostatic precipitators are capable of operating under a wide range of conditions. Abatement efficiency may depend on the number of fields, residence time (size), and upstream particle removal devices. They generally include between two and five fields.</td></tr>
<tr><td>Flue-gas recirculation</td><td>Recirculation of part of the flue-gas to the combustion chamber to replace part of the fresh combustion air, with the dual effect of cooling the temperature and limiting the O_2 content for nitrogen oxidation, thus limiting the NO_X generation. It implies the supply of flue-gas from the furnace into the flame to reduce</td></tr>
</table>
</td></tr>
</table>

	the oxygen content and therefore the temperature of the flame.
Low-NO_X burners	The technique is based on the principles of reducing peak flame temperatures; low-NO_X burners are designed such as to delay but improve the combustion and increase the heat transfer (increased emissivity of the flame). The air/fuel mixing reduces the availability of oxygen and reduces the peak flame temperature, thus retarding the conversion of fuel-bound nitrogen to NO_X and the formation of thermal NO_X, while maintaining high combustion efficiency.
Selective catalytic reduction (SCR)	Selective reduction of nitrogen oxides with ammonia or urea in the presence of a catalyst. The technique is based on the reduction of NO_X to nitrogen in a catalytic bed by reaction with ammonia (in general, aqueous solution; the ammonia source can also be anhydrous ammonia or a urea solution) at an optimum operating temperature of around 300–450 °C. Several layers of catalyst may be applied. A higher NO_X reduction is achieved with the use of several layers of catalyst. 'In-duct' or 'slip' SCR combines SNCR with downstream SCR which reduces ammonia slip from SNCR.
Selective non-catalytic reduction (SNCR)	Selective reduction of nitrogen oxides to nitrogen with ammonia or urea at high temperatures and without catalyst. The operating temperature window is maintained between 800 °C and 1000 °C for optimal reaction.
Semi-wet absorber	Also called semi-dry. An alkaline aqueous solution or suspension (e.g. lime milk) is added to the flue-gas stream to capture the acidic compounds from the flue-gas. The water evaporates and the reaction products are dry. The residue may be recirculated to improve reagent utilisation. This technique includes a range of different designs, including *flash-dry* processes which consist of injecting water (providing for fast gas cooling) and reagent at the filter inlet.
Wet scrubber	Use of a liquid, typically water or an aqueous solution/suspension, to capture pollutants from the flue-gas, in particular acidic compounds by absorption, as well as other soluble compounds and solids. Different types of scrubber designs are used, e.g. jet scrubbers, rotation scrubbers, Venturi scrubbers, spray scrubbers and packed tower scrubbers.

Summary of comments:

1. Catalytic filter bags
   - Delete from the title of the technique the word "bags", because the catalytic filter could be also on the top of the baghouse filter or in an electrostatic precipitator (FEAD-194, CEWEP-ESWET-744).
2. Direct desulphurisation
   - Change the description to take into account that a partial direct desulphurisation is also used on some grate furnaces (FEAD-195, CEWEP-ESWET-745).
3. Dry sorbent injection
   - Add that often the reactive agents in excess are reinjected in the flue gas to decrease their consumption via e.g. a recirculation of these residues, downstream their reactivation after maturation or steam injection (FEAD-196, CEWEP-ESWET-746).
4. Flue-gas recirculation
   - Add that this technique is only possible in new plants (FEAD-192).
5. Low-NO_X burners
   - Add that this technique may be possible in new plants, but effect in existing plants may be limited (FEAD-192).
6. Selective catalytic reduction (SCR)
   - Change the lower end of the temperature range to 180°C (AT-176).
   - Change the temperature range to 250 – 300 ºC with periodic temperature raise to 300°C for cleaning/improving efficiency (FEAD-192), or to 150 – 300 ºC (FEAD-197, CEWEP-ESWET-747).

	• Add that higher NO_X reduction is achieved with the use of a higher volume of catalyst (FEAD-198, CEWEP-ESWET-748). 7. Selective non-catalytic reduction (SNCR) • Add that the temperature window can be supported/controlled with a (fast reacting) acoustic or infrared temperature measurement system (FEAD-192, CEWEP-ESWET-750). 8. Wet scrubber • Add in the description the use of carbon adsorption (as slurry or as carbon impregnated plastic packing) (SE-18). 9. New techniques • Add techniques to reduce NH_3 emissions to air (PL-15). • Add fixed-bed adsorption, which is mentioned in BAT 30 (SE-17, AT-182). • Add cyclone (CEWEP-ESWET-749).
EIPPCB assessment:	1. Catalytic filter bags • Little information is provided to describe the exact technique that corresponds to the suggested change, or to substantiate it with example plants. Technique (h) refers to filter bags that can be incorporated in an existing bag filter with minimal modifications. The description suggested by FEAD and CEWEP-ESWET seems to refer instead to in-duct SCR, which is included as a possible implementation option for the SCR techniques. 2. Direct desulphurisation • Although it may be possible to also apply direct desulphurisation to processes other than fluidised bed combustion, the efficiency may be substantially lower than in the case of fluidised bed furnaces. No specific information has been provided to substantiate the use of this technique with grate-fired systems or to clarify under which circumstances its use in grate-fired waste incineration plants may be considered BAT. • Part of the text on the functioning mechanism seems unnecessary and could be omitted. 3. Dry sorbent injection • The reinjection of excess reagents is a relevant aspect to be covered in the description of the technique, also considering BAT 25. 4. Flue-gas recirculation • Section 5.2 of the BAT conclusions deals with the description of techniques, not with the restrictions to their applicability. • Flue-gas recirculation is mentioned in the BAT conclusions not only for NO_X reduction but also in the context of energy efficiency. 5. Low-NO_X burners • No specific information is provided to support the proposal to state that the effect in existing plants may be limited. 6. Selective catalytic reduction (SCR) • The temperature range mentioned in D1 of the WI BAT conclusions is higher than the operating temperature range typical of the tail-end configuration that is most often in use in WI plants. • The volume of catalyst is a relevant design parameter to achieve the desired NO_X reduction while keeping NH_3 slip low. 7. Selective non-catalytic reduction (SNCR) • It is relevant to cover in the description the more advanced type of SNCR. 8. Wet scrubber • The use of carbon adsorption can be added to the description of wet scrubber to cover cases relevant for BAT 30 and BAT 31. 9. New techniques • No specific proposal is made for additional techniques to reduce NH_3 emissions to air; the BAT conclusions cover NH_3 emissions limited to the emissions originating from the use of SNCR or SCR. • It is appropriate to add to the list of techniques fixed-bed adsorption, as it is mentioned in several BAT. • Cyclones are not part of the list of techniques because they are not mentioned in any of the BAT. 10. Boiler sorbent injection

	• The reagent types that are normally used with this technique are magnesium- or calcium-based. 11. ESP • The description could be improved by also mentioning wet ESPs. 12. Semi-wet absorber • The recirculation of reagents is linked to BAT 25b.
EIPPCB proposal:	1. Catalytic filter bags • No changes. 2. Direct desulphurisation • Simplify the text by deleting part of the technical description. 3. Dry sorbent injection • Add to the description that the reactive agents in excess may be recirculated to decrease their consumption after reactivation by maturation or steam injection. • Add a link to BAT 25b. 4. Flue-gas recirculation • Add to the description the aspects of the technique that are relevant for energy efficiency. • Minor text edits for consistency with the rest of the BAT conclusions. 5. Low-NO_X burners • No changes. 6. Selective catalytic reduction (SCR) • Change the temperature range to 200–260 °C (typical), with possible extension to the 150– 300 °C range. • Modify the description to associate a higher NO_X reduction rate to a higher volume of catalyst. • Minor text edits for clarity. 7. Selective non-catalytic reduction (SNCR) • Include in the description the case of advanced SNCR relying on multiple injection layers and controlled with the support of a (fast reacting) acoustic or infrared temperature measurement system. 8. Wet scrubber • Add in the description the use of carbon adsorption for mercury and/or PCDD/F. • Minor text edits for clarity. 9. New techniques • Add fixed-bed adsorption. 10. Boiler sorbent injection • Mention in the description the reagent types that are used with this technique. • Minor text edits for clarity. 11. ESP • Include in the description the case of wet ESPs. 12. Semi-wet absorber • Add a link to BAT 25b. • Minor text edits for clarity.

2 ITEMS NOT PROPOSED FOR DISCUSSION AT THE FINAL TWG MEETING FOR THE REVIEW OF THE WI BREF

2.1 Acronyms

<table>
<tr><td>Location in D1:</td><td>P. 680 – Chapter 5</td></tr>
<tr><td>Current text in D1:</td><td>For the purposes of these BAT conclusions, the following acronyms apply:
<table>
<tr><th>Acronym</th><th>Definition</th></tr>
<tr><td>EMS</td><td>Environmental management system</td></tr>
<tr><td>FGC</td><td>Flue-gas cleaning</td></tr>
<tr><td>OTNOC</td><td>Other than normal operating conditions</td></tr>
<tr><td>SCR</td><td>Selective catalytic reduction</td></tr>
<tr><td>SNCR</td><td>Selective non-catalytic reduction</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>1. General
• Merge in one list the acronyms put it in Chapter 5 and those included in Point VII of the Glossary of the WI BREF (FEAD-209, CEWEP-ESWET-567).
2. New acronyms
• Add the following acronyms:
• NOC, EOT (FEAD-123) and OTNOC (CEWEP-ESWET-566).
• I-TEQ and WHO-TEQ (Eurelectric-12).</td></tr>
<tr><td>EIPPCB assessment:</td><td>1. General
• The BAT conclusions chapter of the BREF is a stand-alone chapter and for this reason needs its own acronyms section. The BREF has its own acronyms section under the Glossary and usually contains more definitions than those necessary in the BAT conclusions.
2. New acronyms
• OTNOC appears in the acronyms; neither EOT nor NOC are used in the BAT conclusions.
• The acronyms I-TEQ and WHO-TEQ are used in the BAT conclusions and can also be added in the list of the BAT conclusions.</td></tr>
<tr><td>EIPPCB proposal:</td><td>1. General
• No changes.
2. New acronyms
• Add acronyms and definitions for I-TEQ and WHO-TEQ.</td></tr>
</table>

2.2 Environmental Management System

2.2.1 Accident management plan

Location in D1:	*P. 684-685 – Section 5.1.1*
Current text in D1:	**BAT 2. In order to prevent the occurrence of accidents and to reduce the environmental consequences when accidents occur, BAT is to set up and implement an accident management plan (see BAT 1).** **Description** An accident management plan is part of the EMS (see BAT 1) and identifies hazards posed by the installation and the associated risks and defines measures to address these risks. It considers the inventory of pollutants present or likely to be present which could have environmental consequences if they escape. The accident management plan includes the setting up and implementation of a fire prevention, detection and control plan, which is risk-based and includes the use of automatic fire detection and warning systems, and of manual and/or automatic fire intervention and control systems. The fire prevention, detection and control plan is relevant in particular for: • waste storage and pretreatment areas; • furnace loading areas; • electrical control systems; • bag filters; • fixed adsorption beds. The accident management plan also includes, in particular in the case of installations where hazardous wastes are received, personnel training programmes regarding: • explosion and fire prevention; • fire extinguishing; • knowledge of chemical risks (labelling, carcinogenic substances, toxicity, corrosion, fire) and transportation.
Summary of comments:	1. General • Delete BAT 2 or add that this BAT conclusion only applies to those plants which are not covered by the Seveso III directive (CEFIC-25) 2. Applicability • Add the following applicability restriction: "Only applicable for plants subject to Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances and for plants treating or incinerating predominantly HWs or for other plants where relevant accident hazards involving dangerous substances are expected and/or have been substantiated." (DE-7, Eurelectric-18) • Apply only to plants treating predominantly HW (CEWEP-ESWET-588) 3. Description • Add to the description that the fire prevention, detection and control plan is risks and consequences based (EEB-57) • Delete the bullet points related to "electrical control systems", "bag filters" (FEAD-234) and "fixed adsorption beds" (CZ-4, E&P-5) • Add that the requirements given in BAT 2 are fulfilled when ISO 14001:2015 is applied. (CEWEP-ESWET-587, FEAD-130) • Add a reference to existing tools for the elaboration of the accident management plan like FMEA (Failure Mode Effect Analysis) and/or FMECA (Failure Mode Effect Criticality Analysis) (DK-4)

	• For HW add the implementation of an occupational health control programme consisting of workplace monitoring and biomonitoring of personnel together with an effective PPE programme and the use by the personnel of appropriate equipment. (Eurits-6) • Add a bullet point for an on-site laboratory for rapid analysis of incoming waste (Eurits-5) • Move the description to Section 5.2 "Description of techniques" (ES.-4, CEWEP-ESWET-589)
EIPPCB assessment:	1. <u>General</u> • The fact that incineration plants can be subject to Directive 2012/18/EC (Seveso III Directive), which requires a major accident prevention policy (MAPP) and a safety management system (SMS) designed for the protection of human health and the environment, is not in contradiction with this BAT conclusion. • The BAT conclusions could be streamlined, without loss of information, by moving the description of BAT 2 to the description of a management technique rather than keeping it as a separate BAT. 2. <u>Applicability</u> • The risks described in the description of the technique are generic for the incineration of waste and are not only linked to the applicability of the Seveso III Directive or to the incineration of HW. 3. <u>Description</u> • Consequences are already taken into account when assessing the risks of accidents. Indeed the risk is determined by the probability and the magnitude of the accident. • Bag filters, control systems and fixed adsorption beds are pieces of equipment at risk of fire and it is advisable that they are part of the fire detection and control plan. • Whether or not the adoption of a certified EMS fulfils BAT 2 is an implementation issue. • References to existing tools to draw up the accident management plan can be useful to better clarify the principles of this BAT conclusion. • Occupational health is not within the scope of this BREF. • The need or not for an on-site chemical laboratory for rapid responses is to be established as a result of the analysis performed for the drawing up of the accident management plan and is site-specific. • In general, Section 5.2 of the BAT conclusions describes the techniques that are either recurrent (quoted more than once, e.g. techniques to reduce emissions to air) or standard rather than specific to the WI sector (e.g. techniques to reduce emissions to water).
EIPPCB proposal:	1. <u>General</u> • Delete BAT 2 and move its content to the description of Accident management plan in Section 5.2.4 of the BAT conclusions. 2. <u>Applicability</u> • No changes. 3. <u>Description</u> • Add to the description the use of FMEA (Failure Mode and Effects Analysis) and/or FMECA (Failure Mode, Effects and Criticality Analysis) as examples of tools that are used for the drawing up of the plan.

2.3 Monitoring

2.3.1 Key process parameters

<table>
<tr><td>Location in D1:</td><td>P. 685 –Section 5.1.2</td></tr>
<tr><td>Current text in D1:</td><td>BAT 4. BAT is to monitor key process parameters relevant for emissions to air and water including those given below.
<table>
<tr><th>Stream</th><th>Parameter(s)</th><th>Monitoring</th></tr>
<tr><td>Flue-gas from incineration</td><td>Flow, oxygen content, temperature, pressure, water vapour content (1)</td><td>Continuous measurement</td></tr>
<tr><td>Waste water from flue-gas treatment</td><td>Flow, pH, temperature</td><td></td></tr>
<tr><td>Waste water from bottom ash treatment</td><td>Flow, pH, conductivity</td><td></td></tr>
<tr><td colspan="3">(1) The continuous measurement of the water vapour content of the flue-gas is not necessary if the sampled flue-gas is dried before analysis.</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>1. Key process parameters for flue-gas streams
• Replace the continuous measurement of the flow rate by “periodic or continuous determination”, as the stoichiometric calculation based on periodic analysis of the fuel can be an effective method to monitor the flue-gas flow (Eurelectric-21).
• Add continuous measurement of temperature in the combustion chamber (AT-6).
• Replace pressure by flue-gas velocity (CEWEP-ESWET-598, FEAD-523).
• Delete footnote (1), because drying the flue gas alters the sample by capturing some of the water-soluble pollutants that are to be measured (E&P 8, SE-47).
2. Key process parameters for waste water streams
• Add a footnote to indicate that continuous measurement of waste water parameters is only relevant for direct discharges to a receiving water body (CZ-6, E&P 7, CEFIC-27).
• Change the monitoring frequency from continuous to discontinuous for pH, temperature and conductivity (CEFIC-27).
• Adapt the monitoring frequency in the case of discontinuous water discharge, e.g. batch discharge (PT-4, FIR-6, DE-23, CEWEP-ESWET-600, FEAD-9, UK-56, FR-508).
• Restrict the applicability to wet flue-gas treatment and wet bottom ash treatment (ES-6, ES-7, CEWEP-ESWET-599).
• Clarify that the waste water from bottom ash treatment does not include water used for quenching (Eurits-8).</td></tr>
<tr><td>EIPPCB assessment:</td><td>1. Key process parameters for flue-gas streams
• Taking into account the variability in the waste composition, the stoichiometric calculation of the flow rate is not equivalent to its continuous measurement, as it does not provide information on the flow rate variability.
• The temperature in the combustion chamber has a significant impact on the emissions and is thus considered a key process parameter. Its continuous measurement allows optimising the use of abatement techniques (e.g. SNCR).
• Pressure is a peripheral parameter. Besides being a process parameter, it is needed to convert the measured concentration to standard conditions.
• The measurement of the water vapour content is not relevant for pollutants measured in previously dried samples. However, in WI plants it is generally necessary to continuously measure at least some pollutants without drying the flue-gas. The footnote is therefore of no practical relevance.
2. Key process parameters for waste water streams
• The continuous measurement of key process parameters is relevant independently of whether the waste water discharge is direct or indirect, since</td></tr>
</table>

	these parameters are monitored on most of the sites as indicators of correct plant operation. • In the absence of a continuous waste water discharge, the continuous monitoring of some of the process parameters may not be relevant. However, the continuous measurement of the same parameters listed in this BAT conclusion is already required by Annex VI to the IED; this is therefore considered an already known implementation issue. • The only FGC systems for which it is relevant to monitor waste water discharges (and associated process parameters) are wet FGC systems. This can be further clarified in the table. • In the case of bottom ash treatment plants using dry processes, water discharges occur via the run-off water coming from the storage area. • The definition of bottom ash treatment plant in these BAT conclusions does not include the bottom ash quenching at the furnace´s wet bottom ash discharger. More clarity could be achieved by explicitly referring to the bottom ash treatment plant rather than to bottom ash treatment.
EIPPCB proposal:	1. Key parameters for the flue-gas • Add the continuous measurement of the temperature in the combustion chamber. • As a minor editorial, align the text with the definitions of the BAT conclusions. • Delete footnote (1). 2. Key parameters for waste water • For flue-gas treatment, specify that the waste water originates from wet FGC. • For bottom ash treatment, specify that the waste water originates from the bottom ash treatment plant.

2.3.2 TOC/LOI in bottom ashes/slags

Location in D1:	*P. 688 – Section 5.1.2*
Current text in D1:	**BAT 8. BAT is to monitor the total organic carbon content of bottom ashes/slags and/or their loss on ignition in accordance with EN 13137 and/or EN 15169. The minimum monitoring frequency is once every three months.**
Summary of comments:	1. Standard methods • Define the sampling method (DK-2, DK-6). • Replace EN 13137 by EN 15936 (Eurits-18), or provide for the flexibility to analyse TOC either by EN 13137 or by EN 15936 (BE-25, Eurelectric-43). • Highlight in the description that EN 13137 overestimates the TOC level measured when the level of elemental carbon is significant (Eurits-18, HWE-21, BE-25, HU-25, DE-40). 2. Applicability • Clarify that the monitoring of TOC or LOI should be done at the waste incineration plant and not at the bottom ash treatment plant (FIR-8). 3. Monitoring frequency • Adapt the monitoring frequency taking into account the size of the waste incineration plant or the case of incineration plants in chemical installations where the ashes/slags are not removed continuously (PT-16). • Lower the monitoring frequency from once every three months to once per year, either in general (Eurelectric-45), or on the condition that the environmental performance levels are proven to be sufficiently stable (CEFIC-37). • Lower the monitoring frequency from once every three months to twice per year, either in general (FEAD-140), or on the condition that the bottom ashes/slags are not used but landfilled (AT-76). 4. Parameters • Clearly define which parameter has to be monitored, TOC and/or LOI (Eurelectric-43, CEWEP-ESWET-619, DE-40, FEAD-140).

	5. <u>Others</u> • Add a cross-reference to BAT 15 that aims at reducing the content of unburnt substances in slags and bottom ashes (Eurits-18).
EIPPCB assessment:	1. <u>Standard methods</u> • The EN Standard for sampling waste materials is EN 14899, which is accompanied by five informative technical reports: CEN/TR 15310-1, 2, 3, 4, 5. • Although EN 13137 and 15169 are the standard methods that are most commonly used in the EU for the determination of TOC and LOI, there are other standard methods for the determination of these parameters. • In its scope section, EN 13137 clearly points out the overestimation of TOC associated with a high level of elemental carbon in the bottom ash/slag. How this is recorded in the final report from the laboratory is an implementation issue. 2. <u>Applicability</u> • The content of unburnt substances is monitored at the waste incineration plant to check the performance of the incineration process. 3. <u>Monitoring frequency</u> • Of the 171 incineration lines which reported TOC data, 121 lines reported the sampling frequency: 15 lines measured more than one sample per month, 62 lines one sample per month, 13 lines one sample every two months and 18 lines one sample every 4 months. • Of the 145 incineration lines which reported LOI data, 92 lines reported the sampling frequency: 15 lines measured more than one sample per month, 37 lines one sample per month, 13 lines one sample every two months and 14 lines one sample every 4 months. • TOC or LOI are monitored to check the incineration performance of the plant. Since waste characteristics (e.g. size, carbon content, humidity) usually vary over time, the TOC/LOI should be monitored periodically, even if the slag/bottom ashes are landfilled. 4. <u>Parameters</u> • As stated in the General considerations section of the BAT conclusions, the content of unburnt substances can be expressed either as TOC or as LOI. 5. <u>Others</u> • For consistency, a cross-reference to BAT 15 can be added.
EIPPCB proposal:	1. <u>Standard methods</u> • Add references to the EN standard for the sampling of residues and to the two other EN standards available for analysing TOC and LOI. 2. <u>Applicability</u> • Add that BAT 8 applies to incineration plants. 3. <u>Monitoring frequency</u> • Keep the monitoring frequency unchanged. 4. <u>Parameters</u> • Clarify that either the monitoring of TOC or of LOI applies. 5. <u>Others</u> • Add a cross-reference to BAT 15. • Reshape the BAT statement in table format for improved clarity.

2.4 General environmental and combustion performance

2.4.1 Waste stream management plan for IBA treatment plants

Location in D1:	*P. 690 – Section 5.1.3*
Current text in D1:	**BAT 11. In order to improve the overall environmental performance of the bottom ash treatment plant, as part of the waste stream management plan (see BAT 1), BAT is to set up and implement an output quality management system.** **Description** Setting up and implementing an output quality management system, so as to ensure that the output of the bottom ash treatment is in line with expectations, using existing EN standards where available. This management system also allows the performance of the bottom ash treatment to be monitored and optimised.
Summary of comments:	1. BAT statement • Delete this BAT conclusion. At the KoM it was concluded not to set BAT-AEPLs for the composition of the residues after treatment. (CZ-11, DE-100, CEWEP-ESWET-629, E&P-19). • Change BAT 11 as follows: "In order to monitor improves the overall environmental performance of the bottom ash treatment plant, as part of the waste stream management plan, BAT is to record the necessary output quantities and quality of the bottom ash. Set up and implement an output quality management system. (DE-100). • Add the applicable EN standards. (BE-12). 2. Description • Specify the parameter to be monitored (BE-11). 3. Applicability • Specify that this BAT conclusion applies only if there is a bottom ash treatment plant (AT-111).
EIPPCB assessment:	1. BAT statement • The output quality management system has been recognised as BAT by the WT TWG. • Since the objective of the treatment is to recover materials it is necessary to define the quality of the resulting materials. Indeed, at the KoM the TWG concluded not to set BAT-AEPLs because the level of treatment is dictated by the end-user specification of the recovered material. The implementation of an output quality management system is needed to ensure that the end-user specifications are met. • Since the scope of BAT 11 is limited to output quality management, a broader reference to the waste stream management plan is not necessary. • The EIPPCB is not aware of an EN standard for the bottom ash treatment´s output quality. 2. Description • The parameters to be monitored depend on the treatment purpose and cannot be defined for the sector in general. 3. Applicability • The fact that the BAT applies to the bottom ash treatment plant is already specified in the statement. It would be redundant to write it again under applicability.
EIPPCB proposal:	1. BAT statement • Delete the reference to the waste stream management plan from the BAT statement. 2. Description • Keep the description unchanged. 3. Applicability • Do not add an applicability paragraph.

2.4.2 Advanced control system

Location in D1:	*P. 692 – Section 5.1.3*
Current text in D1:	**BAT 16. In order to improve the overall environmental performance of the incineration plant and to reduce emissions to air, BAT is to set up and implement procedures for the adjustment of the plant's settings, e.g. through the advanced control system (see description in Section 5.2.1), as and when needed and practicable, based on the characterisation and control of the input waste (see BAT 12).**
Summary of comments:	• Delete this BAT (AT-116, DE-104, Eurelectric-53, FEAD-145), or change the technique with: "set up and implement procedures for the adjustment of the plant's settings". (CEWEP-ESWET-647) • Add that to ensure a sound destruction of pollutants when hazardous waste are incinerated, the minimum conditions in terms of temperature are 850°C during 2 seconds in the post combustion chamber." (FR-479)
EIPPCB assessment:	• Due to the fact that incineration plants burn waste with a variable and uncontrollable composition, they have procedures in place to adjust the plant settings when the waste input characteristics change. • This BAT conclusion is not only related to the incineration of HW. How the minimum conditions set by Article 50 of the IED are applied is an implementation issue not addressed by the BAT conclusions.
EIPPCB proposal:	• Keep the BAT statement unchanged.

2.4.3 Shutdown and start-up operations

Location in D1:	*P. 692 – Section 5.1.3*
Current text in D1:	**BAT 17. In order to improve the overall environmental performance of the incineration plant, BAT is to set up and implement operational procedures (e.g. organisation of the supply chain, continuous rather than batch operation, preventive maintenance) to limit as far as practicable shutdown and start-up operations.**
Summary of comments:	• Delete this BAT (DE-105, Eurelectric-54).
EIPPCB assessment:	• There are several actions that the operator can take to conduct the incineration process as smoothly as possible, avoiding unnecessary start-ups and shutdowns. • Preventive maintenance is already covered in BAT 19. • The environmental objective could be harmonised with other BAT conclusions of Section 5.1.3.
EIPPCB proposal:	• Include the reduction of emissions to air in the environmental objective. • Delete the reference to preventive maintenance.

2.4.4 Flue-gas and waste water treatment systems

Location in D1:	*P. 692 – Section 5.1.3*
Current text in D1:	**BAT 18. In order to reduce emissions to air and water, BAT is to ensure, by appropriate design, operation and maintenance, that the flue-gas cleaning system and the waste water treatment plant are used at optimal capacity and availability.**
Summary of comments:	• Replace "…are used at optimal capacity and availability" by "…are used in the range of capacity they are designed for" (CEWEP-ESWET-648, FEAD-246). • Specify that the appropriate design refers to e.g. maximum flow rate and pollutant concentration (AT-18). • Delete this BAT (DE-106).
EIPPCB assessment:	• The wording "range of capacity they are designed for" is equivalent to optimal capacity, and does not include the concept of availability. The BAT statement can be reworded to ensure that the optimal capacity is not understood as nominal capacity. • The appropriate design concept can be better clarified using the example proposed in AT-18.
EIPPCB proposal:	• Improve the BAT statement to clarify the concepts of appropriate design, optimal capacity and availabilty.

2.4.5 New BAT conclusions

Location in D1:	*none*
Current text in D1:	none
Summary of comments:	1. Principles of HW incineration • BAT is to consider the three major goals for the incineration of hazardous waste (Eurits-57): • The efficient destruction of hazardous organic components which display hazardous characteristics, with minimal emissions to air and water and optimal residue composition • The transfer of hazardous inorganic components which display hazardous characteristics, to the residues acting as a sink allowing safe disposal • The recycling of materials (such as ferrous & non-ferrous metals) and energy (directly in energy carriers such as steam and electricity, or indirectly in materials resulting from the use of the recovered energy such as demineralized water,…) to a significant extent but respecting goals a. and b. 2. Determination of types of waste that can be incinerated • In order to improve environmental performance and ensure correct incineration of the waste, it is BAT to ensure that the waste is sent to an incinerator suitable for the particular type of waste. Factors to consider include: design of the installation (3Ts), operating conditions of the installation, the throughput of the installation and the type of waste. (Eurits-54) • The incineration of hazardous waste requires a specific design of the installation regarding destruction performance in accordance with the '3T'-principle, referring to the process conditions: Temperature, Turbulence and residence Time. The correct combination of these three parameters creates the right process conditions for a state-of-the-art burn-out of the gas phase and the solid/liquid phase resulting from the incineration process and a state-of-the-art destruction efficiency of hazardous components. (Eurits-58)

3. Treatment of HW in plants specifically dedicated to the treatment of HW

- The design of an incineration installation (incinerator) dedicated to the thermal treatment of hazardous waste is historically based on the rotary kiln technique, which has a proven performance regarding the ‘3T’-principle (from long term experience/practice). Alternative processes can be: static kiln, grate furnace and fluidized bed. The distinctive features of a RK in comparison to other techniques relate to the specific incineration conditions which apply to the solid/liquid phase (Eurtis-59):
  - Solid/liquid residence time: The kiln is completely closed and there is a guarantee that the hazardous waste stays in the fireplace till complete incineration. There is no chance for solids to by-pass the fireplace. This in contradiction with e.g. a grate furnace where this is not guaranteed for siftings fallen through the grid or a fluid bed where the solids can shortcut the sand bed to the sand extraction system. This is an important aspect for certain hazardous waste streams such as infectious waste, lab smalls
  - Solid/liquid temperature: The kiln and the waste have a guaranteed high temperature. All of the hazardous waste is in moving contact with the refractory lining of the furnace, which has a controlled (= guaranteed and monitored) temperature of more than 1000°C. This is in contradiction with e.g. a grate furnace where there is permanent cooling by the primary combustion air which is injected below the grid or a fluid bed incinerator with the sand bed operated at lower temperature than the freeboard. Due to this property, the rotary kiln can be operated in “slagging mode” generating a vitrified slag, if needed for a state-of-the-art burn-out.
  - Solid/liquid turbulence: the rotative movement of the rotary kiln technology forces an active revolvement of the burning waste and ashes in any spot of the fireplace during the full residence time of the kiln.
- Hazardous waste is usually treated in the most appropriate way in incinerators specifically dedicated to the treatment of hazardous waste (ie designed for, permitted and operationally capable of treating 100% capacity with a wide range of hazardous waste). If hazardous waste is treated in installations not dedicated to the treatment of hazardous waste (Eurtis-59):
  - the safety of the reception, storage and treatment of the hazardous waste shall be guaranteed, specifically regarding fire/explosion and prevention/remediation infrastructure, bund and spill response capabilities, knowledge and experience of the staff handling hazardous waste
  - the same level of environmental protection has to be guaranteed for emissions to air, water and land
  - the same level of environmental protection has to be guaranteed concerning the harmfulness and polluting potential of the residues (bottom ash and flue gas cleaning residues) for on-site of off-site treatment, specifically taking into account the further potential use of these residues
  - a same level of destruction efficiency of the hazardous components present in the hazardous waste and an equal level of burn-out of slags or bottom ashes shall be guaranteed
  - the emission factors for non-destructible hazardous components, e.g. heavy metals such as Hg and As, shall be the same as those obtained in incineration installations dedicated to the treatment of hazardous waste.

4. Minimum requirements for the incineration of HW

- In order to improve the overall environmental performance of the incineration plant, when hazardous waste are incinerated, the minimum condition of temperature and time residence are, at least, 850° C during 2 seconds after the last point of injection of air in the combustion chamber. (Eurits-60, HWE-104)
- In order to guarantee these conditions, BAT is to apply a post-combustion chamber (or secondary combustion chamber) in connection to the furnace or as part of the incineration installation. If no post combustion chamber is installed to guarantee the conditions, the complete destruction of hazardous components in the gas resulting from the incineration (after last injection of combustion air) has to be proven by long-term measurements of the Destruction Efficiency and Destruction Removal Efficiency. (Eurits-60)

5. Prevention of leaching of hazardous components from recovered bottom ashes/slags

- In order to prevent leaching of hazardous components from recovered bottom

	ashes/slags from the incineration of hazardous waste, BAT is to (Eurits-67): • ensure the complete destruction of hazardous organic components and the absence of products of incomplete combustion in the slags or bottom ashes have to be proven by measurements in order to avoid future environmental impact from known and/or unknown components resulting from the incineration process; • define hazardous waste acceptance criteria, based on Mass Flow Analysis, in such a way that the technical and/or environmental quality of bottom ash or slag remains unaffected. Furthermore the unburned fraction should be monitored and re-introduced to the incinerator. • use other residues different from slags or bottom ashes (like fly ashes, flue gas cleaning residues) as a sink for non-destructible hazardous components, such as heavy metals, and to safely dispose of these residues accordingly.
EIPPCB assessment:	1. <u>Principles of HW incineration</u> • The specific principles of the incineration of HW can be added to Section 1.1 “Purpose of incineration and basic theory” of the BREF. 2. <u>Determination of types of waste that can be incinerated</u> • The general principles of the incineration of waste and the determination of the types of waste that can be incinerated are already included in several conclusions and techniques described in these BAT conclusions (e.g. BAT 9, BAT 10, BAT 15, BAT 16, BAT 18). 3. <u>Treatment of HW in plants specifically dedicated to the treatment of HW</u> • See assessment of the previous point. Article 45 of the IED already provides for the types of hazardous waste that can be burnt, including their mass flow and the content of polluting substances, to be set in the permit. BAT 9 already addresses the importance of ensuring a high level of environmental protection when dealing with the incineration of waste containing POPs. 4. <u>Minimum requirements for the incineration of HW</u> • How the minimum conditions set by the IED are applied is an implementing issue not addressed by the BAT conclusions. 5. <u>Prevention of leaching of hazardous components from recovered bottom ashes/slags</u> • The burnout quality is addressed by BAT 9 and BAT 15. BAT 11 addresses the output quality management for the recovery of slags and bottom ashes, including the prevention of the leaching of hazardous substances.
EIPPCB proposal:	• Do not add a new BAT conclusion on the principles of HW incineration but insert them in Section 1.1 of the BREF. • Improve the description of the technique “Optimisation of the incineration process” based on the process conditions principles described.

2.5 Energy efficiency

2.5.1 Heat recovery boiler

Location in D1:	*P. 693 – Section 5.1.4*
Current text in D1:	**BAT 20. In order to increase resource efficiency and enable the recovery of energy from the incineration of waste, BAT is to use a heat recovery boiler.** **Description** The energy contained in the flue-gas is recovered in a heat recovery boiler producing hot water and/or steam, which may be exported, used internally, and/or used to produce electricity. **Applicability** In the case of plants dedicated to the incineration of hazardous waste, the applicability may be limited by: • the stickiness of the fly ashes; • the corrosiveness of the flue-gas.
Summary of comments:	1. BAT statement • BAT is to have a boiler, condensation and heat pumps. (DK-8) • BAT is to use a heat recovery boiler or any other system with at least an equivalent efficiency, in order not to hinder the future deployment of innovations (HU-39, HWE-35). • BAT is to use a heat recovery system (CEFIC-50), when appropriate (PT-19). • BAT is to use a heat recovery boiler, its design with regard to the possible water/steam parameters depending on the fly ash properties and on the corrosiveness of the flue-gas. It is generally applicable (AT-78, FEAD-147). 2. Description • Add that, in the case of the incineration of HW, priority is given to the destruction of substances and not to energy efficiency (CEFIC-51). • Add that the hot water and/or steam produced can be used for district heating and/or district cooling (AT-79). 3. Applicability • Add that in some cases, e.g. small incineration plants (<20 MW_{th} (CEFIC-52)), it may not be economically feasible to install/implement a heat recovery system (PT-19). • Add that the applicability may be limited in the case of small plants in remote areas (CEWEP-ESWET-650, FEAD-147). • Add that the applicability can be limited by the design of the plant (Eurits-21). • Add that the applicability can be limited by the treatment of mainly highly halogenated waste where the direct quench with water is needed to avoid the de-novo synthesis of dioxins (FR-659, Eurits-21, HWE-59). • Add that the efficiency increase is limited by the formation of deposits in the boiler (e.g. silicon dioxide) or creation of eutectic mixtures. This applies also for the incineration of non-HW (CEFIC-53). • Extend the applicability restriction to all types of waste (DE-109, Eurelectric-58). 4. Other • Add a footnote stating that in the case of the incineration of hazardous waste a heat recovery boiler is not BAT if a quench system is needed for the reduction of dioxin emissions according to BAT 30 d (NL-4).
EIPPCB assessment:	1. BAT statement • The BAT´s focus is on the techniques that enable the recovery of energy from the incineration of waste. Flue-gas condenser and heat pump are already in BAT

	21 and they are used to increase the amount of energy that can be recovered. - The list of techniques is not exhaustive. During this BREF review, no information has been gathered on other techniques (alternative to a boiler) that enable the recovery of energy from the incineration of waste. - Optimisation of the boiler design is already addressed in BAT 21. 2. Description - The issue of energy efficiency is address in BAT 21. - District heating/cooling is already addressed in the current description where it is stated that the produced steam/hot water can be exported. Whether the heat is further used to drive an absorption chiller is a specific feature of the district heating/cooling network rather than of the waste incineration plant. 3. Applicability - Most of the small plants included in the 2016 data collection have a recovery boiler (small plants being defined with a cut-off point of < 100 000 t/year when burning prevalently MSW, SS or ONHW, and of < 48 000 t/year when burning prevalently HW). For non-hazardous waste incinerators, the only exceptions are two plants burning SS, respectively of 7.8 MW_{th} and of 2.1 MW_{th}, that have no heat recovery boiler installed. For plants burning prevalently HW, three small plants are reported that have no heat recovery boiler: the first of these plants has a capacity of 19 MW_{th} and was commissioned in 1977, the second plant is composed of two lines with a capacity of 1.4 MW_{th}, and the third plant provided no information on its nominal thermal capacity. - No specific information has been provided to substantiate the fact that a heat recovery boiler cannot be applied to plants in remote areas. From the data gathered, it is not possible to qualify whether a plant is in a remote area. Plant PT-03 is located in Madeira; the island is a small isolated system, the plant has two incineration lines and produces electricity. - No specific information has been provided to substantiate the fact that a heat recovery boiler cannot be applied due to the design of the plant. - In high-temperature flue-gas containing chloride and chlorinated substances, the de-novo synthesis of dioxins occurs from about 400 °C to 250 °C. Highly halogenated hazardous wastes are usually burnt at temperatures above 1 100 °C, allowing for a substantial amount of energy to be recovered before reaching the high end of the temperature window where the de-novo synthesis occurs. The corrosiveness of the flue-gas is already taken into account by the current formulation of the BAT 21 applicability. - The issue of energy efficiency is addressed in BAT 21. - According to the data gathered, the only plants that do not have a heat recovery boiler installed are plants burning predominantly HW or SS. 4. Other - The description of BAT 30 (d) (see Section 1.6.2.4.1) can be amended to better reflect the fact that the quenching can also be done using a properly designed heat recovery boiler to allow the rapid cooling of the flue-gas from above 400 °C to less than 250 °C and thus prevent the de-novo synthesis of dioxins.
EIPPCB proposal:	1. BAT statement - Simplify the text of the BAT statement, without substantive changes. 2. Description - Keep the description unchanged. 3. Applicability - Keep the applicability unchanged. 4. Other - Improve the description of BAT 30 (d).

2.6 Emissions to air

2.6.1 Diffuse emissions

2.6.1.1 Direct feeding of liquid and gaseous waste

Location in D1:	*P. 697 – Section 5.1.5.1*
Current text in D1:	**BAT 23. In order to prevent diffuse emissions of volatile compounds from the handling of gaseous and liquid wastes, BAT is to feed them into the furnace by direct injection.** **Description** Direct injection is carried out by connecting the waste container to the furnace feeding line. The container is then emptied by pressurising it with nitrogen or, if the viscosity is low enough, by pumping the liquid.
Summary of comments:	1. Objective of BAT 23 • Clarify that the main objective of direct injection is safety of workers and of the environment rather than prevention of diffuse emissions (Eurits-27), extend the definition of direct feeding to relevant non-pumpable waste, and move to the General Environmental Performance Section (HWE-42, HU-45). 2. Applicability of BAT 23 • Introduce an applicability restriction for existing plants (IT-23) or general for all plants (PT-22, UK-44). • Limit applicability to only hazardous waste and clinical waste (CEWEP-ESWET-677, FEAD-29). • Make sure that the text does not prohibit the direct feeding of smaller containers of liquid or gaseous waste to the kiln without opening them (FEAD-29, FEAD-30, UK-44, CEFIC-63, AT-180) • Restrict the applicability in the case of sewage sludge (Eurelectric-66, FEAD-160, DE-112, CEWEP-ESWET-678)
EIPPCB assessment:	1. Objective of BAT 23 • While it can be an important additional benefit, the reduction of risk to workers is not an environmental objective, and as such is not befitting as the principal objective in the BAT statement. • The main environmental objective of this BAT is to prevent the release of diffuse emissions. • Direct feeding is also a relevant technique for specific wastes that are prone to emitting volatile substances and are not pumpable, such as certain hazardous wastes delivered in sealed drums suitable for incineration. 2. Applicability of BAT 23 • No specific information has been provided to support a generic applicability restriction for all plants or for existing plants beyond the possible need to adapt the technical installations, which is a general and site-specific issue. • The direct feeding of clinical waste without manual handling is addressed elsewhere (BAT 14) and its main objective does not fit with the reduction of diffuse emissions to air. • It is appropriate to clarify that the incineration of wastes directly in the containers in which they are delivered is also BAT. • In the case of sewage sludge, direct feeding may or may not be the most beneficial option depending on e.g. the water content and the possible need for pre-drying. However, there will be cases where the technique is also appropriate for sewage sludge.
EIPPCB proposal:	1. Objective of BAT 23 • Keep the prevention of diffuse emissions as the main environmental objective of BAT 23, and clarify that this BAT concerns incineration plants. • Clarify that the liquid wastes concerned by this BAT are those that are prone to the release of volatile substances.

	- Extend the BAT scope from direct injection to direct feeding to include the case of wastes that are odorous/prone to the release of volatile substances and are delivered in sealed containers suitable for direct incineration. 2. Applicability of BAT 23 - Do not restrict the applicability to specific waste types, but clarify in a new applicability paragraph that the technique may not be applicable to the incineration of sewage sludge depending e.g. on the water content and on the need for pre-drying or mixing with other wastes.

2.6.2 Channelled emissions

2.6.2.1 General

Location in D1:	*P. 697 – Section 5.1.5.2*
Current text in D1:	**None**
Summary of comments:	Add new BAT conclusion on the design of the FGC to be designed to prevent bypassing (of parts) of the FGC system such that it is at least in full operation during start-up and shutdown. The use of bypass is not BAT (NL-3).
EIPPCB assessment:	The minimisation of bypass use is already covered in BAT 19 (OTNOC management plan). See comment assessment under BAT 19.
EIPPCB proposal:	See proposal under BAT 19.

2.6.2.2 Use of flow modelling

Location in D1:	*P. 697 – Section 5.1.5.2*
Current text in D1:	**BAT 24. In order to improve the environmental performance of the incineration plant and to reduce emissions to air, BAT is to optimise the combustion performance, the flue-gas flow through the FGC system, and the injection of reagents by using flow modelling.** Applicability Generally applicable to new plants and to major retrofits of existing plants.
Summary of comments:	1. General - Delete BAT 24, as this is only one of many available techniques for plant design and optimisation (E&P-27, Eurelectric-70, FEAD-161). - Specify in the text that the use of this technique is not mandatory, to be used only if necessary (CEWEP-ESWET-680). 2. Applicability - Restrict general applicability to new plants only (Eurelectric-69, CEWEP-ESWET-679). - Clarify in the text that flow modelling is only applicable at the design stage (FI-16, HWE-60).
EIPPCB assessment:	1. General - Flow modelling is one of the techniques available to equipment suppliers to optimise plant design. Making a particular case for its use does not seem necessary, not least considering the limited use for permitting. 2. Applicability - The technique is applicable at the design stage. It can therefore be considered

<table>
<tr><td></td><td>applicable to the design of new plants and to retrofits involving the replacement of the furnace and/or of major components of the FGC system including for instance SNCR.</td></tr>
<tr><td>EIPPCB proposal:</td><td>• Delete BAT 24.</td></tr>
</table>

2.6.2.3 Peak emissions reduction and optimisation of reagent use

<table>
<tr><td>Location in D1:</td><td>P. 698 – Section 5.1.5.2</td></tr>
<tr><td>Current text in D1:</td><td>BAT 25. In order to reduce peak emissions to air from the incineration of waste while limiting the consumption of reagents and the amount of residues generated from dry sorbent injection and semi-wet absorbers, BAT is to use technique (a) and also, where appropriate, technique (b) given below.
<table>
<tr><th></th><th>Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Optimised and automated reagent dosage</td><td>The use of continuous HCl and/or SO_2 monitoring (or of other parameters that may prove useful for this purpose) upstream and/or downstream of the FGC system for the optimisation of the automated reagent dosage</td><td>Generally applicable</td></tr>
<tr><td>b.</td><td>Recirculation of reagents</td><td>The recirculation of a proportion of the collected FGC solids to reduce the amount of unreacted reagent(s) in the residues.
The technique is relevant in particular in the case of FGC techniques with a high stoichiometric ratio</td><td>Generally applicable to new plants.

Applicable to existing plants within the constraints of the size of the bag filter</td></tr>
</table></td></tr>
<tr><td>Summary of comments:</td><td>1. <u>General</u>
• No comments
2. <u>Technique a</u>
• Change technique description by replacing the monitoring of HCl and/or SO_2 with the monitoring of temperature and O_2 (CEFIC-65).
• Change technique description by supplementing the monitoring of HCl and/or SO_2 with the monitoring of HF or other suitable parameters (IMA Europe-22).
• Restrict applicability of technique (a) to FGC systems other than wet systems (CEFIC-64).
3. <u>Technique b</u>
• No comments.</td></tr>
<tr><td>EIPPCB assessment:</td><td>1. <u>General</u>
• This BAT is closely related to BAT 28 on the reduction of acid gas emissions. It could be visually clearer for BAT 25 to sit next to BAT 28.
2. <u>Technique a</u>
• Temperature and O_2 levels are not specifically related to emission peaks for pollutants that are controlled by injection of reagents.
• The continuous monitoring of HF to optimise reagent injection could be relevant in some cases but generally less than SO_2 and HCl in view of the lower concentration in the raw flue-gas. The BAT description already mentions the possibility to use other parameters that may prove useful.
• The BAT statement already specifies that the scope of application of this BAT covers DSI and semi-wet absorbers, thereby excluding wet systems. It is therefore already clear that wet systems are not covered by this BAT.</td></tr>
</table>

	3. Technique b • The stoichiometric ratio is determined by the chemistry; it is more precise to refer to the stoichiometric excess.
EIPPCB proposal:	1. General. • Move BAT 25 next to BAT 28. 2. Technique a. • Keep the parameters mentioned in the BAT statement as proposed. • Replace "(or of other parameters…" with "(and/or of other parameters…". 3. Technique b. • Change "high stoichiometric ratio" to "high stoichiometric excess".

2.7 Emissions to water

2.7.1 Segregation of waste water streams

Location in D1:	*P. 701 – Section 5.1.6*
Current text in D1:	**BAT 32. In order to prevent the contamination of uncontaminated water and to reduce emissions to water, BAT is to segregate waste water streams and to treat them separately, depending on the pollutant content.** **Description** Waste water streams (e.g. surface run-off water, cooling water, waste water from flue-gas treatment and from bottom ash treatment) are segregated to be treated separately based on their pollutant content and on the combination of treatment techniques required. Uncontaminated water streams are segregated from waste water streams that require treatment. **Applicability** Generally applicable to new plants. Applicable to existing plants within the constraints associated with the configuration of the water collection system.
Summary of comments:	• Add that segregation is useful when it is required by a receiving waste water treatment plant (FIR-12). • Segregate the streams depending not on the pollutant content but on their chemical-physical properties (CEWEP-ESWET-730). • Add to the description the following waste water stream example: drainage water collected from the waste reception, handling and storage area. Add a cross reference to BAT 13 (BE-22).
EIPPCB assessment:	• Irrespective of the technical characteristics of the waste water treatment plant, the segregation of waste water streams is useful as it avoids the unnecessary treatment of uncontaminated water. It also helps to identify the origin of emission peaks. • Waste water treatment plants are designed based on the pollutants they need to be capable of removing; the techniques are adapted to the characteristics of the waste water. • The description section includes examples of waste water streams to clarify the meaning. More examples could be included. The segregated drainage of the waste reception, handling and storage areas is already addressed in BAT 13. A cross-reference to this BAT could be added. • See the EIPPCB assessment of BAT 34 regarding the separate treatment of waste waters from the acidic and alkaline scrubber stages.
EIPPCB proposal:	• Set the characteristics of the waste waters as the basis for their segregation and separate treatment. • Add to the description the example of drainage water collected from the waste reception, handling and storage areas. • Add a cross-reference to technique (a) of BAT 13. • Add to the description that, when HCl and/or gypsum are recovered from the scrubber's effluent, the waste waters from the acidic and alkaline scrubber stages are treated separately.

2.8 Noise

2.8.1 Reduction of noise and vibration emissions

<table>
<tr><td>Location in D1:</td><td><i>P. 704 – Section 5.1.8</i></td></tr>
<tr><td>Current text in D1:</td><td>
BAT 36. In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to use one or a combination of the techniques given below.
<table>
<tr><th colspan="2">Technique</th><th>Description</th><th>Applicability</th></tr>
<tr><td>a.</td><td>Appropriate location of equipment and buildings</td><td>Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens</td><td>Generally applicable to new plants. In the case of existing plants, the relocation of equipment may be restricted by lack of space or by excessive costs</td></tr>
<tr><td>b.</td><td>Operational measures</td><td>These include:
improved inspection and maintenance of equipment
closing of doors and windows of enclosed areas, if possible
equipment operated by experienced staff
avoidance of noisy activities at night, if possible
provisions for noise control during maintenance activities</td><td>Generally applicable</td></tr>
<tr><td>c.</td><td>Low-noise equipment</td><td>This includes low-noise compressors, pumps and fans</td><td>Generally applicable when the equipment is new or replaced</td></tr>
<tr><td>d.</td><td>Noise attenuation</td><td>Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings</td><td>Generally applicable to new plants. In the case of existing plants, the insertion of obstacles may be restricted by lack of space</td></tr>
<tr><td>e.</td><td>Noise-control equipment/ infrastructure</td><td>This includes:
noise-reducers
equipment insulation
enclosure of noisy equipment
soundproofing of buildings</td><td>Generally applicable to new plants. In the case of existing plants, the applicability may be restricted by lack of space</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>Delete BAT 36 (CEFIC-84).</td></tr>
<tr><td>EIPPCB assessment:</td><td>It was concluded at the WI KoM to update information and cross-reference other BREFs.
Minor editorial corrections could be made for clarity, without substantive changes.
Vibration is not a significant environmental issue for the sector.</td></tr>
<tr><td>EIPPCB proposal:</td><td>Remove the reference to vibration from the BAT statement. Otherwise keep the BAT unchanged, besides minor editorial corrections.</td></tr>
</table>

2.9 Descriptions of techniques

2.9.1 Techniques to reduce emissions to water

<table>
<tr><td>Location in D1:</td><td><i>P. 707 – Section 5.2.3</i></td></tr>
<tr><td>Current text in D1:</td><td>
<table>
<tr><th>Technique</th><th>Description</th></tr>
<tr><td>Adsorption on activated carbon</td><td>The removal of soluble substances (solutes) from the waste water by transferring them to the surface of solid, highly porous particles (the adsorbent). Activated carbon is typically used for the adsorption of organic compounds and mercury.</td></tr>
<tr><td>Chemical precipitation</td><td>The conversion of dissolved pollutants into insoluble compounds by adding chemical precipitants. The precipitates are subsequently separated by sedimentation, flotation or filtration. If necessary, this may be followed by microfiltration or ultrafiltration. Typical chemicals used for metal precipitation are lime, dolomite, sodium hydroxide, sodium carbonate, sodium sulphide and organosulphides. Calcium salts (other than lime) are used to precipitate sulphate or fluoride.</td></tr>
<tr><td>Coagulation and flocculation</td><td>Coagulation and flocculation are used to separate suspended solids from waste water and are often carried out in successive steps. Coagulation is carried out by adding coagulants with charges opposite to those of the suspended solids. Flocculation is carried out by adding polymers, so that collisions of microfloc particles cause them to bond thereby producing larger flocs.</td></tr>
<tr><td>Equalisation</td><td>Balancing of flows and pollutant loads at the inlet of the final waste water treatment by using central tanks. Equalisation may also be decentralised or carried out using other management techniques.</td></tr>
<tr><td>Filtration</td><td>The separation of solids from waste water by passing it through a porous medium. It includes different types of techniques, e.g. sand filtration, microfiltration and ultrafiltration.</td></tr>
<tr><td>Flotation</td><td>The separation of solid or liquid particles from waste water by attaching them to fine gas bubbles, usually air. The buoyant particles accumulate at the water surface and are collected with skimmers.</td></tr>
<tr><td>Ion exchange</td><td>The removal of ionic pollutants from waste water and their replacement by more acceptable ions by transferring them to an ion exchange resin. The pollutants are temporarily retained and afterwards released into a regeneration or backwashing liquid.</td></tr>
<tr><td>Neutralisation</td><td>The adjustment of the pH of the waste water to neutral (approximately 7) by adding chemicals. Sodium hydroxide (NaOH) or calcium hydroxide ($Ca(OH)_2$) is generally used to increase the pH whereas sulphuric acid (H_2SO_4), hydrochloric acid (HCl) or carbon dioxide (CO_2) is used to decrease the pH. The precipitation of some substances may occur during neutralisation.</td></tr>
<tr><td>Oil-water separation</td><td>The removal of free oil from waste water by mechanical treatment using devices such as the American Petroleum Institute separator, a corrugated plate interceptor, or a parallel plate interceptor. Oil-water separation is normally followed by flotation, supported by coagulation/flocculation. In some cases, emulsion breaking may be needed prior to oil-water separation.</td></tr>
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<table>
<tr><td></td><td>
<table>
<tr><td>Oxidation</td><td>The conversion of pollutants by chemical oxidising agents to similar compounds that are less hazardous and/or easier to abate. In the case of waste water from the use of wet scrubbers, air may be used to oxidise sulphite (SO_3^{2-}) to sulphate (SO_4^{2-}).</td></tr>
<tr><td>Reverse osmosis</td><td>A membrane process in which a pressure difference applied between the compartments separated by the membrane causes water to flow from the more concentrated solution to the less concentrated one.</td></tr>
<tr><td>Sedimentation</td><td>The separation of suspended solids by gravitational settling.</td></tr>
<tr><td>Stripping</td><td>The removal of volatile pollutants (e.g. ammonia) from waste water by contact with a high flow of a gas current in order to transfer them to the gas phase. The pollutants are removed from the stripping gas in a downstream treatment and may potentially be reused.</td></tr>
</table>
</td></tr>
<tr><td>Summary of comments:</td><td>1. <u>Chemical precipitation</u>
• Add polysulphides as typical chemicals used for metal precipitation (FEAD-531, CEWEP-ESWET-751).
2. <u>New techniques</u>
• Add waste water free gas cleaning technology (EEB-93).
• Add the following techniques: Vacuum evaporation (FEAD-200, CEWEP-ESWET-581), aerobe reactor (FEAD-201), anaerobe reactor (FEAD-202, CEWEP-ESWET-582), Adsorption on iron oxide or iron chloride (FEAD-531, CEWEP-ESWET-751), decanter and hydro-cyclone (CEWEP-ESWET-753).</td></tr>
<tr><td>EIPPCB assessment:</td><td>1. <u>Chemical precipitation</u>
• The definition already includes the use of organosulphides as typical chemicals used for metal precipitation, which are the type of polysulphides commonly used for metal precipitation.
2. <u>New techniques</u>
• The description of waste-water-free flue-gas cleaning is already in BAT 33.
• Vacuum evaporation, aerobic reactor, anaerobic reactor, decanter and hydro-cyclone are not on the list of techniques described because they are not mentioned in any of the BAT conclusions.
• Adsorption on iron oxide is performed by adding an iron-containing material that promotes the formation of iron oxide in an acidic environment. In this condition heavy metal contaminants (e.g. As) form a ferric hydroxide floc. Data on the use of $FeCl_3$ have been gathered with the WIQ and the use of this reagent can be added to the description of "Coagulation".</td></tr>
<tr><td>EIPPCB proposal:</td><td>1. <u>Chemical precipitation</u>
• Streamline the technique's name and definition taking into consideration the text recently agreed for the WT BAT conclusions.
2. <u>New techniques</u>
• Add ferric chloride ($FeCl_3$) as an example of coagulant used, in the description of the technique "Coagulation and flocculation".
3. <u>Streamlining</u>
• Streamline, taking into consideration in particular the text recently agreed for the WT BAT conclusions, the wording of the descriptions of: precipitation; coagulation and flocculation; equalisation; ion exchange; neutralisation; and stripping.</td></tr>
</table>

2.10 NOC/EOT/OTNOC and other compliance and implementation issues

Location in D1:	*P. 681 – Chapter 5*
Current text in D1:	No text
Summary of comments:	1. <u>NOC/EOT/OTNOC</u> • State that BAT-AELs refer to NOC (DE-2, FR-738, FEAD-216, FEAD-222, FEAD-223, FEAD-232, FEAD-233, CEWEP-ESWET-550, CEWEP-ESWET-571). • Do not define OTNOC in the BREF, but leave it to be defined by the competent authorities (FEAD-213). • Specify that: "The half-hourly average values (and the 10-minute averages for CO) 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 of Annex VI to the IED. The daily average values shall be determined from those validated average values." (ES-32, HU-9, HWE-55, HWE-56). 2. <u>Other compliance and implementation issues</u> • Specify that a valid daily average value is obtained when no more than five half-hourly average values in any day are discarded due to malfunction or maintenance of the continuous measurement system. No more than ten daily average values per year shall be discarded due to malfunction or maintenance of the continuous measurement system (HU-10). • Include the text in the IED on confidence intervals (Eurits-51). • Include a table for the confidence interval for the higher ends of the BAT-AEL ranges (FR-750). • Add Section: "Stability of the levels of emissions" with the following wording: "A level of emission is proven to be sufficiently stable when it has been demonstrated on a period of one year that the variation of the levels of emission as a daily average is low and the yearly average is below 50% of the permitted level of emission." (HWE-57). • Include clarification on the application of BAT conclusions in the case of different waste types being incinerated. (Eurelectric-4). • Clarify how the different provisions (WI BAT conclusions provide daily BAT-AELs and IED Chapter IV-Annex VI provides half-hourly ELVs) will apply (PT-27).
EIPPCB assessment:	1. <u>NOC/EOT/OTNOC</u> • The definition of BAT-AEL is part of the IED, where a clear reference to NOC is made. It is an established practice not to copy IED provisions in BAT conclusions. • BAT 19 already deals with the OTNOC issue, giving operators and competent authorities the opportunity to identify them case by case. • BAT conclusions do not address implementation issues. • Data filters have been used for the purposes of data assessment and robust derivation of BAT-AELs by the TWG. The future assessment of compliance with the ELVs set in a permit is an implementation issue. It is for the Member States to establish compliance assessment conditions, as stated in IED Article 14(1)h, and to decide which operating conditions are to be taken into account for the purpose of assessing compliance. 2. <u>Other compliance and implementation issues</u> • Rules for compliance are implementation issues that are beyond the technical scope of the BAT conclusions. • BAT-AELs are the performance levels associated with the best available techniques. How the emissions data have been assessed is not part of the BAT conclusions chapter. See also Section 2.11, "Deriving BAT and BAT-AEPLs". • Concerning the confidence intervals, it is an established practice not to copy IED provisions in BAT conclusions.

	• Moreover, little information is available on the confidence intervals at emission levels other than those of the IED Annex VI ELVs. See also Section 2.13, "Measurement uncertainty". • The term "sufficiently stable emission level" has already been used in recent BAT conclusions (e.g. LCP) and it is rather an implementation issue. • The application of the BAT conclusions for the incineration of different waste types at the same time is an implementation issue.
EIPPCB proposal:	1. NOC/EOT/OTNOC • No changes. 2. Other compliance and implementation issues • No changes.

2.11 Deriving BAT and BAT-AEPLs

Location in D1:	*Whole Chapter 5*
Current text in D1:	No text
Summary of comments:	• Clarify the methodology for determining the BAT-AE(E)L (ES-1, FR-739, NL-2, CEWEP-ESWET-670, FEAD-155, FEAD-356) • Clarify if uncertainties associated to half-hourly measurements were subtracted before BAT-AELs derivation (FR-736). • Specify that BAT-AELs are as measured, without adding or subtracting the measurement uncertainty or taking into account the specific rules applied for compliance. (CEWEP-ESWET-572, CEWEP-ESWET-579, FEAD-224, FEAD-230). ○ Specify that: "BAT-AELs for continuously monitored data given in these BAT-conclusions refer to data filtered to exclude the emissions measured when: The plant is in start-up while waste is already being incinerated, or in shutdown while waste is still being incinerated; The daily average is discounted when more than 5 half-hourly periods are filtered out by any of the conditions above. All BAT-AELs are corrected for standard pressure and temperature conditions and normalised for a reference oxygen level of 11 %, in dry conditions, but otherwise are presented as measured, without adding or subtracting the measurement uncertainty or taking into account the specific rules applied for compliance." (CEWEP-ESWET-577, CEWEP-ESWET-578, CEWEP-ESWET-579, FEAD-228, FEAD-229, FEAD-230) or include in Tables 5.2, 5.3, 5.4, 5.5, 5.6, and 5.7 of Chapter 5 an explanatory note to clarify how BAT-AELs have been derived (ES-1). • Specify that: "It should be noted that the continuous BAT-AEL values were derived from operating values from which the 60 highest 1/2-hr average values of the year have been discarded". (FEAD-215, CEWEP-ESWET 551). • Specify that the BAT-AELs for water emissions were derived from operating values from which several highest values have been discarded assuming that they were probably reported in different units. (CEWEP-ESWET-552, FEAD-214).
EIPPCB assessment:	• The process for deriving BAT and BAT-AEPLs is described in the BREF Guidance (i.e. Commission Implementing Decision 2012/119/EU laying down the rules concerning guidance on the collection of data and on the drawing up of BAT reference documents) and the Preface of D1. The holding of the final TWG meeting is part of this process. • Clarifications on the issue were circulated to the TWG in the reflection paper and in the guide on data compilation and presentation dated 24.05.2017, especially on how the information/data provided were used to draw up D1. • Cross-relationships between pollutants, availability of data from proposed reference plants, availability of additional bulk information, climatic conditions, plant size, and techno-economic applicability have been reviewed and considered in the assessment, and, where deemed necessary, for making proposals in light of the detailed comments submitted. • Based on data/information provided since the beginning of the WI BREF review, elements for discussion are provided in the BP for each BAT conclusion. • BAT-AELs are the performance levels associated with the best available techniques. How the emission data have been assessed is not part of the BAT conclusions chapter. • The general approach taken by the EIPPCB for the BAT-AELs proposed in D1 and in the revised BAT conclusions has been to mainly consider the yearly maximum of the daily average emission levels achieved in the reporting year (mainly 2014), and to pragmatically take into consideration emission performance levels obtained by applying different ways of filtering the reported half-hourly emission data. This

	enables the comparison of the daily emission performance levels that are obtained by including or excluding certain operating conditions, as long and as far as those operating conditions have been reported by the operators. The yearly maxima of the daily average emission levels reported by the operators in the voluntary complementary questionnaires, which generally represent EOT data, have also been included as an additional element in the comparison of different ways to obtain daily average environmental performance levels. • An important consideration relevant for the waste incineration sector is that the variability of the waste input may result in emission peaks. Many incineration plants achieve extremely low “background” emission levels, above which some emission peaks are observed. Emission peaks, however, can also be related to other events such as failures of the abatement system or process breakdown. The proposed BAT-AELs do not only represent the very low “background” level performance, but to a certain extent accommodate peaks related to variability of input and of the FGC performance. However, emission levels related for example to evident malfunctions are not considered to be representative of the performance of well-designed, maintained and operated techniques that are adequate for the characteristics of the waste being incinerated. • In general, for the higher end of the proposed BAT-AEL ranges for emissions to air: o For pollutants that are considered key environmental issues (KEIs) for the sector, these are emission levels achievable with a definition of BAT that encompasses a broad set of techniques that are in use in the sector and allow achieving a high level of protection of the environment, for new and existing plants, also taking into account cross-media effects and economics. o For pollutants not considered KEIs, these emission levels confirm the ELVs of IED Annex VI. o For the lower end of the proposed BAT-AEL ranges for emissions to air, for the majority of pollutants, the lowest reported levels (as a yearly maximum) are often even below the LoQ of the methods. The EIPPCB has proposed pragmatic levels that are considered reliably achievable by the best performing plants irrespective of the compliance assessment regime in place.
EIPPCB proposal:	• Decide on each BAT and BAT-AEPL at the final TWG meeting, using the EIPPCB assessment and proposal as the starting point for discussion.

2.12 Setting BAT-AELs expressed as half-hourly averages

Location in D1:	*Whole Chapter 5*
Current text in D1:	No text
Summary of comments:	• Specify that: "The proposed BAT-AEL ranges are generally expressed as daily averages only; hourly or half-hourly averages are not used. The IED Annex VI half-hourly ELVs might be considered to already provide, in general, sufficient safety net levels for short-term emissions. The IPPCB-based BAT-AELs indicated in WI-BREF 2006 are not relevant under IED. (FEAD-212, CEWEP-ESWET-553) • Specify that: "Reliably relating the environmental performance of the techniques in use with the observed maxima of the emission levels becomes progressively more challenging when the averaging period that is used to express those emission levels becomes shorter, because the influence of specific situations that may affect the emission levels in the short term becomes proportionately larger." (FEAD-212, CEWEP-ESWET-553) • Introduce half-hourly BAT-AELs for: o dust (NO-11, EEB-60, AT-24) o HCl (NO-13, EEB-67, AT-32) o HF (NO-13, EEB-67, AT-34) o SO_2 (NO-13, EEB-67, AT-36) o NO_X (NO-14, AT-41, EEB-71) o NH_3 (NO-14, AT-43, EEB-71) o CO (NO-14, AT-48, EEB-71) o TVOC (NO-15, AT-52, EEB-75) o Hg (AT-60), replacing the indicative half-hourly levels by BAT-AELs
EIPPCB assessment:	• The justification and practicality of proposing half-hourly BAT-AELs were discussed at the informal TWG meeting held in Seville on 4 and 5 December 2017. • Reliably relating the environmental performance of the techniques in use with the observed maxima of the emission levels becomes progressively more challenging when the averaging period that is used to express those emission levels becomes shorter, because the influence of specific situations that may affect the emission levels in the short term becomes proportionately larger. This suggests that there is a substantial challenge in defining emission levels for a very short averaging period that are genuinely based on the characteristics and performance of the installed techniques rather than reflecting also the specificities of the compliance assessment regime that is enforced. • The IED Annex VI half-hourly ELVs might be considered to already provide, in general, sufficient safety net levels for short-term emissions at the half-hourly or shorter averaging period. • Focusing the improvement of the environmental performance of the incineration sector on the daily emission levels provides flexibility for the Member States to set appropriate compliance assessment conditions in line with IED Article 14.1(h).
EIPPCB proposal:	• Keep BAT-AELs expressed with the half-hourly averaging period only.

2.13 Measurement uncertainty

Location in D1:	*Whole Chapter 5*
Current text in D1:	No text
Summary of comments:	• Check lower and upper ranges of the BAT-AELs against the relevant measurement uncertainty. (CZ-22, Eurelectric-6). • Add a footnote to take into account that for generic EN standards for continuous measurements may not be complied with as regards uncertainties requirements at low concentration levels (FR-722). • Add a footnote to specify that the uncertainty levels requested by the standards are in general not achievable with available monitoring techniques for most BAT-AELs (CEWEP-ESWET-605, FEAD-762) and that therefore the requirements on uncertainty of the standards are usually not applicable. • Add that the performances of monitoring instruments available on the market often do not allow meeting the requirements of the standards in respect of uncertainty with the ELVs of IED annex VI. Problems will increase with lower ELVs (FEAD-241, CEWEP-ESWET-607). • Add a section about the monitoring issue to include the ILCs graphs and QAL 2 test graphs from the INERIS report. Values without associated accuracy/uncertainty are just meaningless. Especially when the levels are as low as in the incineration sector. Indeed the uncertainty of best available instruments at these levels is far above the levels required by the EU CEN monitoring standards (CEWEP-ESWET-121, FEAD-395). • Check with experts of CEN and competent authorities if any values of the proposed BATAEL ranges comply with the standards (FEAD-133, CEWEP-ESWET-603). • Add a footnote to specify that the requirements of the standards on AMS quality assurance exclude the data acquisition and handling system (FEAD-235, CEWEP-ESWET-604). • Add a generic footnote to specify that many QAL2 tests have problems with the variability test or provide absurd calibration functions, although they successfully passed the variability test. These problems will increase with lower ELVs (FEAD-240, CEWEP-ESWET-606). • If it is not absolutely certain that Best Available monitoring Techniques allow to comply with the requirements of the Standards, please add: "It is recommended that before setting ELVs from BATAEL values, competent authorities check the feasibility to comply with the Standards in particular in respect of monitoring." • Automated Monitoring Systems should not be rejected due to low BAT-AELs until proper monitoring methods for parallel measurements have been developed according to IED Annex IV, Part 6, Point 1.2. The problem can be addressed by keeping the acceptance of the continuous monitor separated from the acceptance of the monitored result. The acceptance of the monitor can still be conducted by following the method in the IED Annex IV, Part 6, Point 1.3 (documented in the yearly QAL2 or AST). Acceptance of Hg monitor and NH_3 monitor could follow the suggestion from INERIS of using an uncertainty of 40%. The assessing of compliance of the average of the monitored values compared with an ELV set on the basis of a BAT-AEL should be decided by the local authority. In this way the size of the confidence interval that can be subtracted from the monitored value before assessing if there is compliance with the BAT-AEL (according to IED Annex IV, Part 8, Point 1.2.) can be different from the confidence interval used to assess if the monitor is accepted. (DK-78) • Propose that the EIPPCB or the Commission suggests that the European Standardization, CEN, takes action to revise EN 14181, and if necessary other EN Standards, to reduce the difficulties encountered with quality assurance of low emissions (SE-109).

	• General comment for all pollutants. Include the minimum daily ELV to comply with the requirements of the standards on monitoring for each pollutant according to INERIS report. And the accuracy of data reported by the operators and shown on these graphs must be understood accordingly (CEWEP-ESWET-160, 161, 162, 164, 165, 166, 167, 171, 174, 175, 176, 189, 190, 289, 191, 192, 193, 194, 195, 199, 202, 203, 204; FEAD-428, 429, 430, 431, 433, 434, 435, 436, 440, 443, 444, 445, 453, 454, 455, 456, 457, 458, 459, 460, 464, 468, 469, 470). • General comment for the following pollutants: (Dust, metals and metalloids, TVOC, PCDD/F, mercury): Check the feasibility to comply with standards at the levels of the proposed BAT-AEL ranges in light of the measurement uncertainty, especially as regards the lower end of the ranges, adapt the levels accordingly, and state the need to assess the feasibility to comply with monitoring standards when setting ELVs (CZ-2; Eurelectric-73, 78; CZ-40; ES-22, 24, 26, 27; FEAD-165, 169, 173, 174, 178, 179; CEWEP/ESWET-686, 687, 688, 693, 704, 705, 709, 710; UK-145, E&P-43, 44) • If the proposed BAT-AEL range for dust is kept, allow compliance to be demonstrated on the basis of indicative monitoring (UK-46). • Add a footnote for dust BAT-AELs that states that the lower end of the range should be assessed considering EN standard for measurement. (Eurelectric-73) For dust, please see INERIS report nr. DRC-17-168319-02463B concludes that an ELV of 50 mg/Nm^3 would be necessary to comply with EU standards on SRM with currently available SRMs and therefore that the daily ELV must not be lowered below the current value of 10 mg/Nm^3. CEWEP-ESWET-686. • Raise the upper range of BAT-AELs for PCDD/F to 0,1 ng I-TEQ/m^3. Uncertainty level of periodic measurement of PCDD/F is around 30%. Going below current emission limits (according to IED) creates significant problems in identifying real emissions compared to uncertainty levels (CZ-17). • The graphs in BATIS for PCDD/F show that the upper level can be lowered, and hence, our proposed BAT-AEL range is well justified by data on BATIS. Furthermore we cannot see that measurement/analysis uncertainty is an argument against lower BAT-AELs. We base this on the fact that in the LCP BREF the BAT-AELs for PCDD/F emissions to air from the co-incineration of waste with biomass, peat, coal and/or lignite is the average over the sampling period set to < 0,01–0,03 ng I-TEQ/Nm^3 at 6 % O_2. Converted to 11% O_2 the range is <0.007-0.02, and hence, it is obvious that the uncertainty is not an issue for the LCP BREF and hence neither for the WI BREF) (SE-102).
EIPPCB assessment:	• The 2016 data collection evidenced that a substantial number of waste incineration plants across Europe already have permit ELVs within the range of the proposed BAT-AELs. • The discussion held at the December 2017 interim meeting of the WI TWG in Seville confirmed that the challenges related to measuring emission levels lower than the ELVs of the IED's Annex VI are an implementation issue that has already been dealt with over an extended number of years. • Measurement uncertainty was also discussed on 20 October 2016 by the IED Article 13 Forum, with the result of a broad consensus among the Member States for the measurement uncertainty to be considered an implementation issue. • Proposals on concrete amendments of the BAT conclusions are assessed by the EIPPCB and discussed at the final WI TWG meeting.
EIPPCB proposal:	• Decide on each BAT and BAT-AEPL at the final TWG meeting, using the EIPPCB assessment and proposal as the starting point for discussion.