v2

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

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ANNEX 2.a

The NOC/OTNOC/R-EOT issue

Table of content

ANNEX 2.a – The NOC/OTNOC/R-EOT issue

Abbreviations

Please see Annex 1 to this E&G-d.

1 IED requires compliance with most ELVs in NOC and with some within the R-EOT

The IED defines BATAELs (see Art. 3(13)) as *"the range of emission levels obtained **under normal operating conditions** using a best available technique or a combination of best available techniques, as described in BAT conclusions, expressed as an average over a given period of time, under specified reference conditions".* It also requires, in article 15.3, that *"the competent authority shall set emission limit values that ensure that, **under normal operating conditions**, emissions do not exceed the emission levels associated with the best available techniques as laid down in the decisions on BAT conclusions"*.

On the other hand, the incineration sector is the only industrial sector for which the IED requires compliance with the current ELVs (the ones mentioned in IED Chapter IV and laid down in IED Annex VI) of the continuously measured emissions *"within the Effective Operating Time (excluding the start-up and shut-down periods if no waste is being incinerated)".* The Effective Operating Time (EOT) is not explicitly defined in the IED but, from the sentence where the requirement is made, it can be understood that compliance with the continuous IED Annex VI ELVs is required as soon as and as long as waste is burning in the furnace (see IED Annex VI, Part 8, §1.2). From this implicit definition of EOT, we can identify the Relevant EOT (R-EOT), when compliance with IED Annex VI ELVs is required, and Non-Relevant EOT (NR-EOT) when no waste is burning (i.e. when only the burner is in operation). See below Tables 2.a-1 and Figures 2.a-1 and 2.a-2.

However, the ELVs for periodically monitored substances, which are under the general regime in IED Annex VI (since its Part 8 does not apply to periodic monitoring), will remain applicable only in NOC.

Therefore, by 4 years from the publication of the reviewed WI BAT Conclusions, the overall framework for setting emission limit values for incineration plant will include BATAEL-based ELVs referring to NOC for all substances and, in addition, the IED Annex VI ELVs referring to the R-EOT for daily averages as well as for ½-hr averages.

In summary, for future requirements regarding ELVs, the legal picture will become twofold. Tables 2.a-2 and 2.a-3 below summarise the periods of compliance required by the IED for the different ELVs (in NOC and/or within the R-EOT).

IED, chapters I and II	IED, Chapter IV and Annex VI
General rule (for all sectors covered by IED) - Article 3(13) : ***BATAELs*** **defined in NOC** - Article 15.3 : set **ELVs** ensuring that: **Emissions do not exceed BATAELs in NOC**	**Specific rule for incineration** for substances **continuously monitored** - Annex VI, Part 8 1.2 : **ELV** to comply with within the **R-EOT** (except when burner is in operation and no waste is combusted) NB: For **periodic measurement**: compliance only in **NOC**
Consequences	
- EIPPCB required the operators to **report the OTNOC** situations **on 17,520 Excel rows** (½-hr values over 1 year) for each continuously monitored substance, - This was done by hand **since the information was not available** (because useless up to now) - EIPPCB **filtered out** the values in **OTNOC** 1) Reported by the operators 2) Supposed by EIPPCB (using miscellaneous filters)	**2 sets of ELVs necessary for continuous measurements:** - **BATAEL-based ELVs for NOC s**ituations - **IED Annex VI ELVs** for **R-EOT (NOC & some OTNOC) s**ituations **Need to distinguish NOC from OTNOC situations** **Risk of confusion:** Some stakeholders may seek for compliance with BATAELs-based ELVs also in OTNOC (i.e. within R-EOT).

Table 2.a-1: *NOC, OTNOC and R-EOT in the IED.*

Monitoring regime	Period	Substances	BATAEL-based ELVs	IED Annex VI ELVs
Continuous	Daily average	Dust, HCl, HF, SO_2, NOx, TOC, CO	**In NOC**	**In R-EOT (NOC & OTNOC when waste burning)**
		Hg*, NH_3	**In NOC**	-
	½-hr average	Dust, HCl, HF*, SO_2, NOx, TOC, CO**	-	**In R-EOT (NOC & OTNOC when waste burning)**
	10-min average	CO**	-	**In R-EOT (NOC & OTNOC when waste burning)**
Long term sampling	2 to 4 weeks, 1 month	PCDD/F + DL-PCB*	**In NOC**	-
		*PCDD/F**	**In NOC**	-
		*Hg**	**In NOC**	-
Periodic	Every 6 months	*Hg**	**In NOC**	**In NOC**
		Heavy metals, PCDD/F	**In NOC**	**In NOC**
		*PCDD/F + DL-PCB**	**In NOC**	
: Conditional/Optional (See BATAELs in Table 3 of the Main document of this E&G-d)* * CO: IED Annex IV either ½-hr or 10-min*				

Table 2.a-2: *Regulatory requirements on compliance either in NOC or within the R-EOT for the different air ELVs required by the IED for air emissions at stack. The NOC and R-EOT situations in this Table refers to the status of the incineration line. See Section 2 below.*

NB: This Table 2.a-2 is also shown as Table 2 in the Main E&G document

Process	Substances	Monitoring regime	BATAEL-based ELVs	IED Annex VI ELVs
FGC and IBA treatment	TOC and TSS	Periodic	**In NOC**	**In NOC**
FGC	Metals			
IBA treatment	Pb			
	NH_4-N, SO_4^{2-}			
FGC	PCDD/F			

Table 2.a-3: *Summary of the field of compliance of the different ELVs required by the IED for water emissions from FGC residue treatment and IBA treatment plant. The NOC situation in this Table refer to the Waste Water Treatment (WWT) plant status. See Sections 4.5 and 6.3 below.*

2 Definitions of NOC/OTNOC/EOT

2.1 NOC/OTNOC/EOT in IED and Guidance document to draw up BREFs

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

The following Table 2.a-4 gives a non-exhaustive list of OTNOCs elaborated from these examples. Figure 2.a.1 combines the outcome of Tables 2.a-2 and 2.a-4

Reference	OTNOCs (compliance not required for continuous BATAEL-based ELVs and for all periodic ELVs)	R-EOT (with waste burning) (compliance required for continuous IED Annex VI ELVs)	Non-Relevant EOT (no waste burning) (no compliance required)	N-EOT (Non-EOT, Outside EOT)
IED, Article 14.1.f	***Start-up operations***	2nd phase (when waste burning) included	1st phase (no waste burning)	
	Shut-down operations	1st phase (when waste burning) included	2nd phase (no waste burning)	
	Leaks	Included		
	Malfunctions *(of process equipment including abatement system)*	Included		
	Malfunctions *(of measuring equipment)*	Included	Up to 5 ½-hr/ day and 10 days per year (IED Anx VI, Part 6,1.2)	
	Momentary stoppages	-		Outside EOT
	Definitive cessation of operations	-		Outside EOT
IED, Article 47	***Breakdown***	Included (if waste burning)		Included (no waste burn)
Guidance (Decision 2012/119/EU) in § 4.6.2.2.3.ii and & 5.4.7.2.6	***Bypassing of abatement systems***	Included (if waste burning)		Included (no waste burn)
	Regular maintenance *(during operation time)*	Included (if waste burning)	Up to 5 ½-hr/ day and 10 days av. per year for *malfunction or maintenance of the continuous measurement system* (IED Anx VI, Part 6,1.2)	
	Regular maintenance *(when plant stopped)*	-		Included (no waste burn)
	Exceptional conditions *(standard)*	Included (if waste burning)		
	Exceptional conditions *(Specific, e.g. abnormal pollutant input)*	Included (if waste burning)	Included (no waste burn	)

Table 2.a-4: *Examples of OTNOC given by IED and Decision 2012/119/EU (in bold). Precisions in light-faced type.*

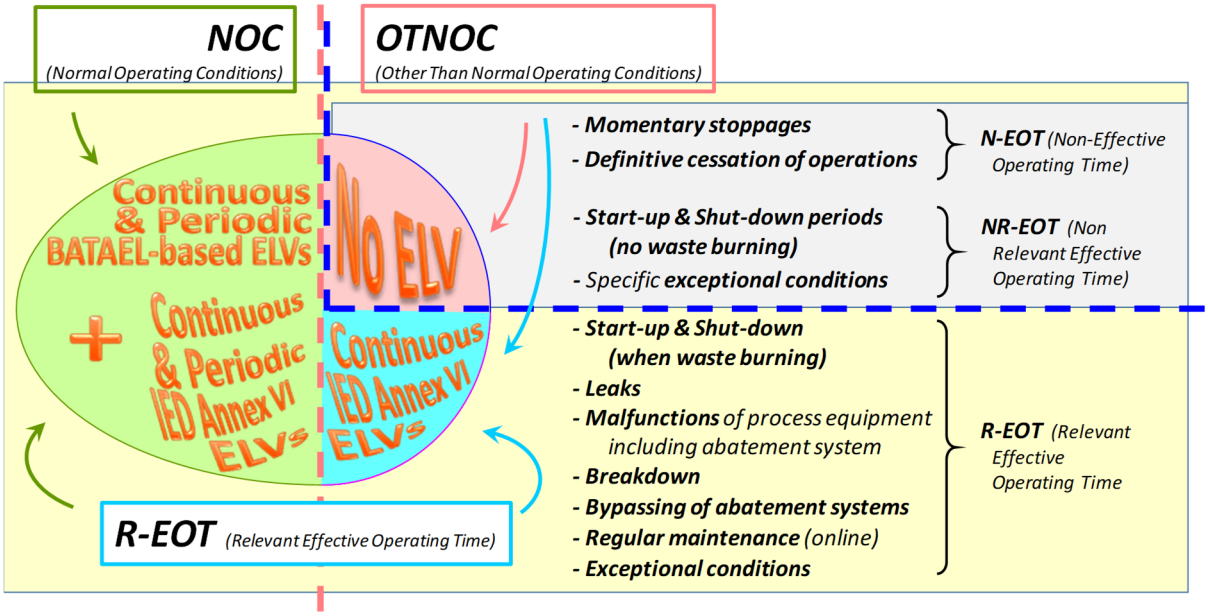


Figure 2.a-1: *The R-EOT includes NOC and some OTNOC situations. BATAEL-based ELVs are applicable in NOC as well as IED Annex VI periodic ELVs. IED Annex VI continuous ELVs are applicable within the R-EOT.*

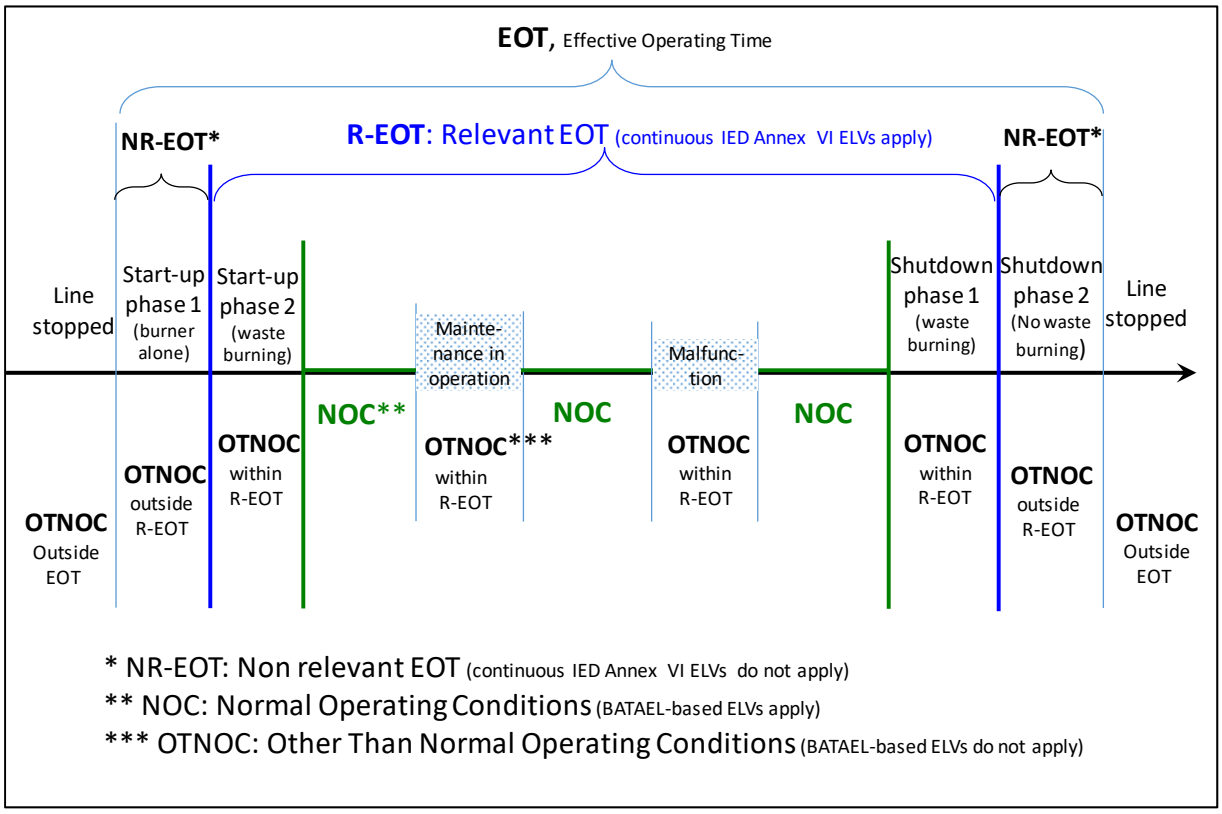


Figure 2.a.2*: Example of successive OTNOC and NOC situations within the EOT of an incineration line (chronological representation).*

2.2 NOC/OTNOC in the WI BREF

The IED does not define NOCs nor OTNOCs for incineration and co-incineration plants, although the Guidance 2012/119 (Decision 2012/119/EU) stipulates (§4.6.2.2) that:

"The kick-off meeting will in particular address and reach conclusions on the items listed below. (…)
3. A process for the TWG to identify where relevant and make clear in the BREF:
(i) what are considered 'normal' and 'other than normal' operating conditions for the activities under the scope of the BREF; (…)"

Nevertheless, other BREFs give clues on how to understand the examples of OTNOCs above. Moreover, more specifically, information provided by the EIPPCB to the TWG during the WI BREF drawing-up period as well as the explanations given in Chapter 3 of the WI BREF indicate how OTNOCs were determined and the corresponding emission data excluded to set up the BATAEL ranges.

2.3 NOC/OTNOC in the LCP BREF

The LCP BREF, which addresses the sector with the most similarities to the WI BREF sector, provides details on OTNOC for LCPs (see LCP BREF § 3.1.16 pp. 132 &133):

Start-up and shutdown periods are determined by Commission Implementing Decision 2012/249/EU of 7/5/2012, which, in summary, considers that the determination of start-up and shut-down periods shall be based on conditions allowing a stable generation process safeguarding health and safety.

The LCP BREF gives also details on other OTNOCs: "*The following situations are examples of conditions that may be considered OTNOC:*

- *periods related to malfunction or breakdown of the abatement techniques;*
- *testing periods (e.g. commissioning periods, periods after modifications to the combustion chamber, or testing periods of new/repaired abatement techniques or of the combustion of a new fuel);*
- *periods corresponding to the use of emergency fuels for a very short period due to the lack of availability of normally used fuels (serious shortage or sudden interruption) or to disturbances in fuel feeding;*
- *periods of exceptional low-load operations due to unplanned malfunction of plant system(s);*
- *periods related to sudden major combustion failures;*
- *periods related to malfunction of the auxiliary or monitoring systems (e.g. malfunctioning of the analysis instrument or data transfer related to the process control);*
- *periods of calibration of monitoring systems requiring measurement points outside the range corresponding to normal operating conditions;*
- *extraordinary/unforeseeable variations in fuel quality whereby the installation/equipment performance cannot be guaranteed by the manufacturer (outside design specifications)and/or where there is a failure in the application of the fuel quality check procedures;*
- *in the case of bypass of control equipment or a process, when the bypass is unavoidable, e.g. to prevent loss of life or personal injury."*

See also (LCP BREF p. 630) problems on desulphurisation plant recognised as OTNOCs.

3 EIPPCB considerations on NOC/OTNOC/EOT during WI BREF drawing up

3.1 Data collection with reporting of OTNOCs

During the months following the WI BREF Kick-off meeting in January 2015, the question of the conditions (Normal/Other than Normal) to take into account to draw up BATAELs (and to use them to set up BATAEL-based ELVs) was discussed as well as how to determine the limit between NOC and OTNOC if needed.

In the 6th document accompanying WI BREF Draft 1, dated 24/5/2017, *"EIPPCB reflexions on some Key issues raised within the WI TWG in the period preceding the release of the 1st Draft of the revised WI BREF (D1)"*, the EIPPCB summarised discussions on the NOC/OTNOC/EOT and provided information on connected issues, namely the approach it used on:

- key environmental issues (see E&G-d Main document, Section 4.2)
- measurement uncertainties (see Annex 3 to this E&G-d)
- derivation of BAT-AELs from operating data for the WI BREF review (Addressed in this Section 3)

In this 6th WI BREF D1 accompanying document, the EIPPCB reminds that, at the subgroup meeting of 23-24/9/2015, the TWG was divided on the question of defining BATAELs:

- either in NOC as requested by the IED Chapter II (general regime, see IED Article 3.13); this was the position of EIPPCB and of a few TWG members),
- or, by derogation (based on the principle that specific rules take precedence over general rules), for continuously monitored substances in EOT (Effective Operating Time) whenever waste is being incinerated, as requested by IED only for incineration plants in Chapter IV for ELVs defined in Annex VI; this was the position of the Industry and of a number of other TWG members.

3.2 Instruction to the operators for filling-in the questionnaire

3.2.1 Instructions for periodically monitored substances

As very clearly stated in the questionnaire sent in 2016 by the EIPPCB to operators of 'well-performing lines', exclusively values in NOC were to be reported for the periodically (or discontinuously) monitored substances. See Table 2.a-5 below. This, in fact, was not a stringent requirement since, under IED Annex VI, substances that must be periodically monitored are already measured only in NOC.

(56)	The data reported here should refer only to the normal operating conditions of one reference waste incineration line (see 'Glossary' for definition of reference waste incineration line) during 2014. If less than 6 measurements have been performed in 2014, you can also report measurements of previous years. Note however that values previous to 2014 are not complemented by the necessary contextual information and should therefore be considered less representative of real plant performance. If, conversely, more than 12 measurements have been taken in 2014, please report 12 values representative of the overall distribution. You may explain your selection criteria in the Comments field.	back to Air emissions

***Table 2.a-5**: Endnote (56) referring to the heading 'values obtained in 2014' in sheet 7b 'Air Emission discontinuous measurements' of the Main template of the questionnaire sent in 2016 to operators*

3.2.2 Instructions for continuously monitored substances

For continuously monitored substances, the EIPPCB questionnaire did not request the daily average values that were available to the operators because these are only calculated in R-EOT for compliance reason. In contrary, the EIPPCB requested the ½-hr values[1] in order to be able to recalculate daily average values after filtering out the ½-hr averages in OTNOC. As no NOC or OTNOC flag was attached to the operating data, it was agreed to collect the entire yearly series of half-hourly averages complemented by as much contextual information on NOC/OTNOC/EOT status as possible.

The operators of the 'well-performing lines' identified by the Member States were required when filling in the questionnaires for year 2014 to manually indicate on the 17,520 half-hourly rows of the spreadsheet if the line was in OTNOC and if yes in which one according to the descriptors code given in the following Table. The EIPPCB stated that if none of them were reported, the reference line was *"considered to be in normal operation".*

[1] The ½-hr values were to be reported corrected to standard pressure and temperature, dry, 11% O_2, but without subtraction of the measurement uncertainty. See Section 4 below.

AUX	Auxiliary fuel operation: when only auxiliary fuels are burned, as no waste is fed into the furnace or is being burned in the furnace
WSTART	Waste feeding start: period of time when waste is fed into the furnace but the energy provided by the waste is not yet enough to sustain the minimum load for stable conditions
WSHUT	Waste feeding shutdown: period of time when waste is not anymore fed into the furnace, but waste is still burning in the furnace
BREAK	Breakdown (as per IED Art. 47)
BYP	Bypassing of abatement system
FAILABA	Failure, malfunction or leaks of abatement system
FAILPRO	Failure, malfunction or leaks of process equipment
FAILMON	Failure or malfunction of monitoring devices. FAILMON is used also when the malfunctioning affects the measurement of some but not all the parameters. In this case please leave a blank the cell of the parameter(s) affected and specify which device is not working in the additional information column.
MAINT	Regular maintenance
TEST	Testing of new fuels/techniques/reagents
STOP	Line not in operation
OTH	Other exceptional conditions
If none of the conditions of the list above are selected, the reference line is considered to be in normal operation	

***Table 2.a-6**: List of not normal operations that EIPPCB requested operators to identify for each 1/2-hr period when filling in the Questionnaire (See Instructions in Annex III of the revised Questionnaire dated January 2016 and circulated by JRC-EIPPCB on 24/2/2016)*

3.3 Continuously monitored data compilation by EIPPCB

3.3.1 EIPPCB filters

The 7th document accompanying WI BREF Draft 1, also dated 24/5/2017, *"Compilation and presentation of plant-specific WI data in D1 of the revised WI BREF"* provides detailed information on data collection and data compilation. In its Annex I, the list of OTNOC descriptors of the questionnaire (see Table 2.a-6 above) is repeated as well as the final statement that: *"normal operation is assumed when nothing is reported"*. Then the EIPPCB describes the filters it defined and applied to the reported continuously monitored data (see Table 2.a-7 below),

Filters	
Operating parameters	
OP	Half-hourly periods discarded if flue gas temperature less than required (850°C or other) or flow rate too low. This filter aims at discarding values when plant is out of operation
Operating conditions	
OC1	Half hourly periods discarded when AUX, WSTART, WSHUT, BREAK, BYP, FAILABA, FAILPRO, FAILMON, MAINT, TEST, STOP or OTH is reported
OC2	Half hourly periods discarded when AUX, BREAK, FAILMON, MAINT or STOP is reported
Exceedances of half-hourly ELVs	
ELV	Half-hourly periods are discarded when a half-hourly ELV as set in the permit is exceeded.
Minimum number of valid half-hourly periods in the day	
43	Days are discarded when less than 43 valid half-hourly periods are counted. For this purpose, a period is considered invalid when filtered out by any of the defined half-hourly filters that are in use for the specific filtering combination
Statistical outliers	
030	The 60 half-hourly periods corresponding to the 30 hours of the year with the highest emissions of each pollutant are discarded

Table 2.a-7: *Summary of the main filters developed and used by the EIPPCB, as described p. 29/33 of the 7th document accompanying WI BREF Draft 1, dated 24/5/2017 "Compilation and presentation of plant-specific WI data in D1 of the revised WI BREF". Two other filters considered by the EIPPCB, O10 and O60, were not eventually used by them.*

About filters *'OC1'* and *'OC2'*, the EIPPCB explains the following: *"Note OC1 provides a stricter filter than OC2, as OC2 does not discard the following: the part of the start-up period in which waste is already burning; the part of the shutdown period in which waste is not yet eliminated from the furnace; periods of malfunction of the abatement system or process equipment; bypassing of abatement system; testing new fuels, reagents, techniques; or other exceptional conditions."*

About the filter named *'ELV'*, the EIPPCB explains that *"Half-hourly periods are discarded when a half-hourly ELV as set in the permit is exceeded."* The daily averages are therefore calculated without the ½-hr average values corresponding to periods when one of the ½-hr ELVs on the different continuously monitored substances is exceeded.

3.3.2 Minimum number of valid half-hourly periods

As said in the description of filter *'43'*, when it is applied, days are discarded when more than 5 half hourly averages are discarded by other selected filters: "*Days are discarded when less than 43 valid half-hourly periods are counted. For this purpose, a period is considered invalid when filtered out by any of the defined half-hourly filters that are in use for the specific filtering combination."*

The EIPPCB provides then useful explanations*: "With the exception of the filter "43", all other data filters act at the level of individual half-hourly periods: if the condition of the filter is fulfilled, that half-hourly period is discarded for the purpose of calculating the day´s daily average or that day´s maximum half-hourly average."*[2]

NB: The definitions of 'valid half hourly average' and of 'Continuous daily average' in the Sections 'Definitions' and 'General considerations' of the WI BAT conclusions are inspired from the ones

[2] The EIPPCB questionnaire did not request the operators to report the daily averages of year 2014, since they recalculated daily averages from remaining ½-hr average values after excluding the ones filtered out by their combinations of filters.

implicitly given in IED Annex VI Part 8. The notion of 'valid' ½-hr average is complementary to the one used by the EIPPCB to filter out the ½-hr averages in OTNOC.

Indeed, IED Annex VI Part 2 says:

- *"1.2. The half-hourly average values and the 10-minute averages shall be determined within the effective operating time (excluding the start-up and shut-down periods if no waste is being incinerated) from the measured values after having subtracted the value of the confidence interval specified in point 1.3 of Part 6. The daily average values shall be determined from those validated average values.*
  To obtain a valid daily average value no more than five half-hourly average values in any day shall be 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."

Otherwise, the WI BAT conclusions provides the following definitions:

- *"Valid half-hourly average": "A half-hourly average is considered valid when there is no maintenance or malfunction of the automated measuring system."*
- *"Continuous Daily average": "*Average over a period of one day based on valid half-hourly averages."

As it is required by the IED for daily averages within the R-EOT, the half-hourly average values for BATAELs are taken into consideration when there is no maintenance or malfunction of the online instrument during the period of 30 minutes[3].

However, the minimum number of valid ½-hr averages for a valid daily average and the manner to take into account the ½-hr averages that occurred partly in OTNOC is not indicated by the WI BREF. As many other implementation issues, it is left open. See the proposal in Section 5 below.

3.3.3 Combination of filters

The EIPPCB used the above mentioned filters to draw several possible combinations with the objective of being able to derive the performance of the plants under different assumptions. In the WI BREF Final Draft, only 2 of these combinations are described (see WI BREF draft Chapter 3, Section 3.2.2) and used to draw the graphs shown in WI BREF Annex 8.7 for all the continuously measured pollutants in daily average[4].

The two combinations used for daily average values are the following:

- *'OC2', 'OP'*: corresponding to "Daily Base";
- *'OC1', 'OP', 'ELV', '43'*: corresponding to "Daily Fine"

Both filter sets exclude from the questionnaires reported data the half-hourly values obtained during periods in which the plant is considered to be out of operation (the *'OP'* filter). Additionally, the 'base' filter set excludes only some of the OTNOC situations, in which the plant is not running or there is no waste in the furnace (*'OC2'* filter), i.e. the OTNOC situations excluded from the R-EOT. The 'fine' filter set instead is stricter, and excludes all the half-hourly values collected during any OTNOC situation

[3] In practice, it is generally admitted that the half hourly period is valid when 20 minutes out of thirty are valid. This gives to the instrument supplier and the operator the possibility to use 10 minutes for zero setting and/or QAL-3 check without losing ½ hourly measuring values (e.g. zero setting twice a day). This rule is now included in the new standards on DAHS. See Annex 3.d to this E&G-d.

[4] The yearly average presented in graphs in WI BREF Annex 8.6 were made with filters OP, OC2.

(*'OC1'* filter), as well as any half-hour during which any ½-hr ELV set in the permit is exceeded[5] (*'ELV'* filter) (and no daily average is calculated if more than 5 half-hours are not kept (*'43'* filter).

In addition, to the fine filter combination, another filter (*'O30'*) is used for the half-hourly average indicative value for mercury. (See below Section 4.2.2).

3.4 Presentation of several options by the EIPPCB

In the 6th WI BREF D1 accompanying document, the EIPPCB explains that at the 24-25/11/2016 webinar the TWG expressed dissenting opinions. Indeed, for instance, TWG members could not agree on how to define the end of the start-up period and the beginning of the shutdown period, some of them wanting these periods to be much shorter than the corresponding periods for LCPs. (See above Section 2.3 on LCPs and reference to the Commission Implementing Decision 2012/249/EU of 7/5/2012). As a consequence of this lack of consensus, the EIPPCB considered it was *"not in the position to make any new technical proposal"*. In addition, it said, "*it will be up to the competent authority to decide when a plant is operating under NOC or OTNOC"*. The EIPPCB justified its position by stating that "*BAT conclusions are essentially technical documents that refrain from entering into the territory of compliance assessment, or from attempting to interpret the IED."*

Moreover, in this 6th WI BREF D1 accompanying document, after reminding that *"the IED makes it clear that BAT-AELs refer to NOC"*, the EIPPCB explains why it did not simply exclude all OTNOC half hourly averages: *"However, this does not prevent the TWG from also examining data representing EOT when determining BAT/BAT-AELs, as the BREF process allows a wealth of data to be taken into consideration to set BAT and BAT-AELs. This may also include evaluating the performance of plants under some circumstances that would fit within EOT but that are not strictly considered NOC."*

Then the EIPPCB provides precisions. *"In any case, the EIPPCB is of the view that the presentation of data needs to include more than one single option for determining the environmental performance levels associated with BAT. Even if there was one preferred metric to be considered as the most appropriate, in principle, to establish the relevant plant performance in the case of an ideal data collection, it is useful to present a broader data set to allow:*

- *better comparability in the case of plants that submitted less complete information;*
- *better understanding of the variability of plant performances (two plants may both record a maximum of 10 mg/Nm^3 as a daily average but in one case this could be the result of stable emissions around 10 mg, in the other case the usual level could be 2 mg and the maximum be determined by a single peak);*
- *insights into the impact of specific conditions, e.g. start-ups, and how this may be related to the design of the plants and to how they are operated."*

An additional reason for EIPPCB to present more than the single option of data in NOC is that the IED requires that the permit to operate includes measures relating to OTNOCs (See IED Article 14.1.(f)).

[5] The values discarded are the ½-hr averages when one of the ½-hr ELVs of the different substances is exceeded. These values are discarded by the filter named *'ELV'* for the calculation of the daily average values. But this does not mean that some daily average values cannot mathematically be above the daily ELVs of the plant since daily ELVs are usually much lower than ½-hr ELVs. Indeed, graphs in Annex 8.6 of the WI BREF draft show a few values above the daily ELV.
On the other hand the *'ELV'* filter was not part of the "Half-hourly Fine" filter. Therefore, the graphs in WI BREF draft Annex 8.7 showing the maximum ½-h values of the year include some values above the ½-h ELV.

The measures identified by the EIPPCB for WI are listed in WI BAT conclusion n°18, which includes the *"monitoring and recording of emissions during OTNOC and associated circumstances."*

In answer to a comment, the EIPPCB gave in the Background paper of 23/2/2018 sent to the TWG before the Final meeting in Seville (see p. 35) another clue of the use of the 'base' filter set : "*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".* The "base filter" set is thus corresponding to the R-EOT situations.

3.5 No precise delineation between NOC and OTNOC in the WI BREF

As reported in the Background paper of 23/2/2018 sent to TWG before the Final meeting in Seville (see p. 35), a ultimate effort was made to set a delimitation between NOC and OTNOC, but no agreement was found at the workshop in Seville on 4-5/12/2017, nor during the following period of exchange (up to 6/12/2018):

"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)."

Start-up and shut-down if no waste is incinerated being already excluded from the relevant part of EOT according to IED Annex VI, Part 8 (see Section 1 above), it meant that certain TWG members wanted to consider that NOC periods equal the relevant EOT (i.e. except when no waste is burning) without taking into account that, in accordance with IED and Guidance 2012/119 (see Section 2 above), the EIPPCB had filtered out data reported in OTNOC to set up the BATAELs as seen above.

It should be noted as well that during the above mentioned subgroup discussions, some TWG members wanted to set 2 different lists of OTNOCs:

- The first one as exhaustive as possible for operators to investigate and report as requested by BAT conclusion n°18;
- The second one as limited as possible, for OTNOCs when BATAEL-based ELVs do not apply (e.g., as said above, to start-up and shutdown periods when no waste is combusted).

No indication of such a dual approach can be found in the IED and it was not accepted by the EIPPCB.

4 Information delivered in the WI BREF final draft by the EIPPCB on data selection when setting up the WI BREF BATAELs

The continuously and the periodically monitored air emissions data are presented for each individual line in the form of graphs in Annexes 8.6, 8.7 and 8.8. Explanations as well as graphs presenting the data in condensed form are given in Chapter 3, in particular in Section 3.2.2 p.147 and following.

As said in WI BREF final draft pp. 149 and 150 for daily and ½-hr continuously monitored data as well as for periodically monitored data, *"All emission data are corrected for standard pressure and*

temperature conditions and normalised for a reference oxygen level of 11 %, but otherwise are presented as measured, without adding or subtracting the measurement uncertainty or taking into account the specific rules applied for compliance."

4.1 Daily air emission levels for continuously monitored data

4.1.1 General

In Chapter 3 of the WI BREF, "Current emission and consumption levels" (see final draft p. 149), the EIPPCB sums up as follows the filtering they achieved for daily emission levels on the continuously monitored data reported by the operators of the 355 lines who filled in the questionnaire. It confirms what is said in Section 3 above.

"The graphs in Annex 8.6 show emissions as yearly averages and as yearly maxima of daily averages calculated on the basis of the reported 17 520 half-hourly averages measured in 2014 and obtained using a 'base' and a 'fine' data filtering option. Data filtering is used to exclude from a daily average the emissions measured during half-hourly periods that are associated with some specific operating conditions. In particular:

- *The 'base' data filter excludes the emissions measured when:*
  - *the furnace temperature is below the minimum incineration temperature required, and/or the measured flow rate is very low;*
  - *the plant is undergoing maintenance, in breakdown, or in stoppage;*
  - *the plant is only combusting support fuels (preheating before the first waste is introduced into the furnace or shutdown operation after the last of the waste remaining in the furnace has been incinerated);*
  - *the automated monitoring system is undergoing maintenance or malfunctioning.*
- *Additionally, the 'fine' data filter also excludes 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 abatement system is being bypassed;*
  - *there is a failure, malfunction or leak in the abatement system or in the process;*
  - *one of the half-hourly ELVs established in the plant's permit is being exceeded;*
  - *other exceptional conditions reported by the plant operator.*

Furthermore, with the 'fine' data filter the daily average is discounted when more than 5 half-hourly periods are filtered out by any of the conditions above.

It should be noted that the data filtering relies on detailed information reported by the plant operators according to a harmonised questionnaire that included a common definition of operating conditions that may differ from the level of detail and form of the information recorded in the log files of the plant operators. The challenges for the operators to report this information accurately and to a high level of detail are fully acknowledged, and, where certain information was missing or inaccurately reported, may result in data that are not fully comparable across plant."

As seen in Section 3 above, the 'base' data filtering excludes ½-hr average emission values during few OTNOCs listed in the IED and Decision 2012/119/EU. The 'fine' data filtering excludes the emissions during all OTNOC situations clearly mentioned in these two legal documents.

In addition, the EIPPCB excluded from the 'fine' data filtering the ½ -hr average values reported above the ½-hr ELV set in the plant permit, probably considering that as a malfunction of the abatement system.

In the 'fine' data filtering, they also excluded daily averages when more than 5 of the ½-hr average values of the day were reported in OTNOC, i.e. when less than 43 ½-hr average value in NOC were available in a day (i.e. out of 48 ½-hr average values). It seems indeed reasonable not to calculate an average when the number of data in NOC is insufficient.

MSWI lines having reported data being more than 200 for most continuously monitored substances, the EIPPCB divided the graph into three Figures for readability of the details. See below Figure 2.a-3.

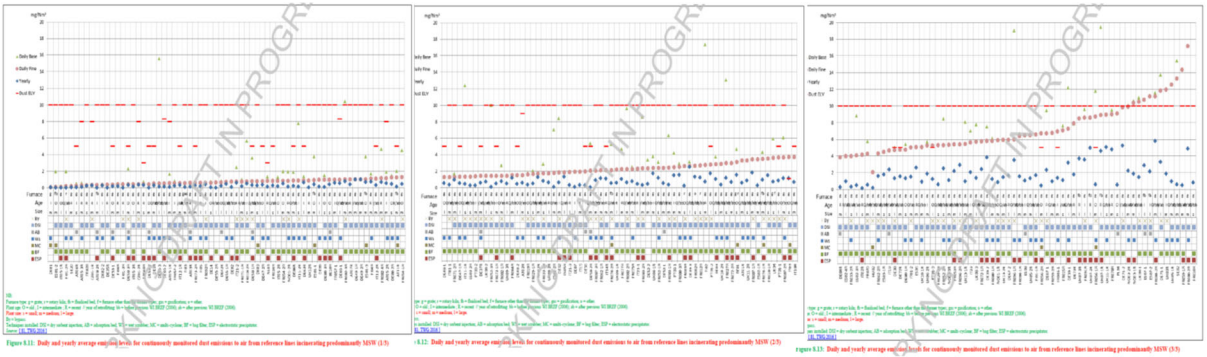


***Figure 2.a-3**: Dust maximum daily averages and yearly averages for MSWI (WI BREF draft Figures 8.11 to 8.13)*

Since it is difficult to have an overview with these 3 graphs, we drew a single graph displaying all the data by using the data sent by the EIPPCB to the TWG. See Figure 2.a-4 below.

In this graph, each vertical interval is dedicated to a waste incineration line.

- The grey triangle shows the maximum daily average value of the year further to 'Daily Base' filtering, i.e. the maximum daily average of the year in relevant EOT.
- The orange disc shows the maximum daily average value of the year further to 'Daily Fine' filtering, i.e. the maximum daily average of the year in NOC with, in addition, an application of filters '43' and 'ELV'. See above Section 3.3.3.
- The blue diamond shows the yearly average value of the year further to 'Daily Base' filtering, i.e. the yearly average in relevant EOT.

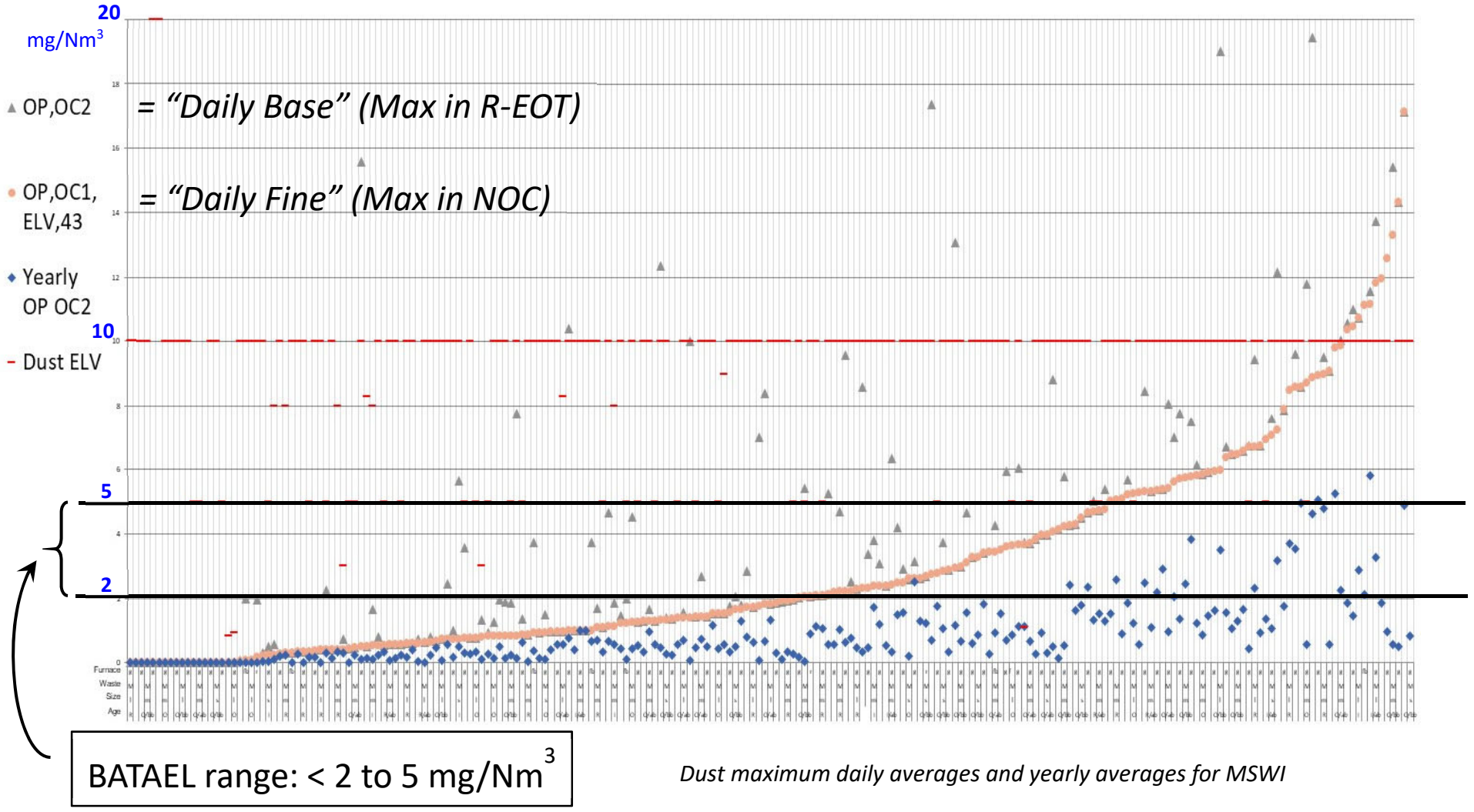
As it can be seen on the graph, the maximum daily averages of most of the lines are far below the ELVs. Lowering the ELV will therefore not reduce significantly the yearly emission flow but will make compliance checking much more difficult.

On this graph, we have displayed the BATAEL range, which is for dust a daily average of:

$$< 2 \text{ to } 5 \text{ mg/Nm}^3$$

The meaning of the sign '<' is explained in Guidance 2012/119.

*"It is acceptable to use an expression of the type **'< X to Y'** (i.e. '< X' for the lower end of the range, Y for the upper end), **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."***



Dust maximum daily averages and yearly averages for MSWI

***Figure 2.a-4**: Dust maximum daily averages and yearly averages for MSWI (from WI BREF draft Figures 8.11 to 8.13)*

4.1.2 Continuous monitoring of mercury

Although named *"Daily and yearly average emission levels for continuously monitored Hg emissions to air from reference lines incinerating predominantly MSW", "-ONHW", "-SS", "-HW"*, the legends of graphs 8.31 (MSW), 8.32 (ONHW), 8.41 (SS) and 8.50 (HW) in WI BREF draft Annex 8.6 indicate that the displayed values are monthly and yearly averages. The legends saying it is monthly average seem plausible since for more than half of the plants the monthly value is the same as the yearly average and for the other ones it is only slightly higher. Moreover, the same graphs are presented as showing monthly averages in Annex 8.7: see graphs 8.83 (MSW), 8.84 (ONHW), 8.94 (SS) and 8.104 (HW).

As for other monitored substances, no information was delivered to the TWG on how the daily BATAELs on Hg were elaborated.

4.2 Half hourly air emission levels for continuously monitored data

In Chapter 3 of the WI BREF (see final draft pp. 149 & 150), *"Current emission and consumption levels (…)"*, the EIPPCB sums up as well the filtering they achieved for ½-hr emission levels on the continuously monitored data reported by the operators.

The combinations used (see WI BREF draft Chapter 3, Section 3.2.2) for ½-hr averages graphs presented in WI BREF draft Annex 8.7 are the following:

- 'OC2', 'OP' for "Half-hourly Base" (same filters as for "daily base");
- 'OC1', 'OP', 'O30' for "Half-hourly Fine".

'Half-hourly Fine' does not include filter 'ELV' nor, of course, filter '43', both filters used for 'Daily Fine' with filters 'OC1' and 'OP'. In place, 'Half-hourly Fine' includes 'O30', which filters out the 60 highest ½-hr averages of the year in addition to the filtering of OTNOC by 'OC1' and 'OP'.

Unlike the other filters, 'O30' is not linked to any requirement of the IED.

All 1/2-hr graphs are therefore showing the 61st maximum value of the year.

We shall not discuss in detail the consequences of this filtering in this document, except for mercury (see below Section4.2.2), since the EIPPCB decided not to set BATAELs on ½-hr average values.

4.2.1 No ½-hr BATAELS in the WI BREF

The rationale for the decision not to set BATAELs on ½-hr average values was given to the TWG in the 6th document accompanying WI BREF Draft 1, dated 24/5/2017,*"EIPPCB reflexions on some Key issues raised within the WI TWG in the period preceding the release of the 1s Draft of the revised WI BREF (D1)"*, (see p. 5): *"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 corroborates the position of the EIPPCB at the KoM (see KoM report 19-22/1/2015, Section 2.5.1): *"The EIPPCB pointed out that when the waste characteristics change drastically the waste gas cleaning devices may not be able to react as quickly, therefore a half-hourly average is not appropriate in order to represent the performance of the BAT under normal operating conditions."*

4.2.2 Indicative ½-hr value on mercury

The only trace of the 'Half hourly fine' combination of filters (see above Section 3.3) in the BAT conclusions is in BAT conclusion n° 31 where indicative half-hourly average mercury emission levels are given. As confirmed in Chapter 3, Section 3.2.2 of the WI BREF final draft (see p. 150), *"the half-hourly periods corresponding to the 60 highest half-hourly emission levels reported in the year for each pollutant are discounted."* This is the 'O30' filter. (See above the list of filters in Section 3.2) It excludes the 60 highest half-hourly average values of the year, which is surprising.

Indeed, this filtering is actually astonishing because, in waste incineration flue gas, mercury is nearly always emitted by peaks that result from the presence or not of mercury in individual pieces of waste. These peaks are most often not connected with OTNOC conditions. Therefore, excluding the 60 highest half hourly values of the year leads to most probably significantly underestimate the maximum half hourly average values in NOC (as well as in OTNOC).

Indeed, when looking at graphs 8.81 (MSW), 8.82 (ONHW), 8.93 (SS) and 8.103 (HW) where the ½-hr average values are shown, the values in 'Half-hourly Base' are often significantly higher than the ones reported as 'Half-hourly Fine'. Since, as already said, Hg is emitted by peaks, these differences are most likely due to the removal of the 60 highest ½-hr averages of the year by filter 'O30'.

4.3 Emissions to air, periodically monitored data and long term sampling

Both periodically monitored data and long-term sampling are subject to long response times. This means that certain cases of OTNOCs that are otherwise invisible may take some time to discover. On such a discovery, it is important to immediately alert relevant staff, form an opinion about the cause and about the environmental impact, make a plan to counter the disturbance and inform the competent authority about the situation. Decision of the next steps is made together with the authority

4.3.1 Periodically monitored data

Periodically monitored reported data were measured in NOC since the specific regime requiring compliance with ELVs within the R-EOT in Annex VI of the IED only applies to continuously monitored emissions (see above Section 1). Moreover, as said above (see Section 3.2.1), the EIPPCB instructed the operators to report exclusively data in NOC (in case they would have for some reason also periodically measured data in OTNOC).

It should be noted that, although the questionnaire allowed to report periodic data over more than one year, most operators only reported data collected in 2014, i.e. for most of them only two values per substance.

The detailed graphs for periodically monitored substances are given in WI BREF Final draft Annex 8.8. Explanations and condensed graphs showing the distribution are provided in WI BREF Chapter 3 Section 3.2.2, as for continuously monitored substances. For those substances that are both continuously and periodically monitored, information and graphs are given substance by substance, the periodic graph succeeding the continuous graph.

4.3.2 Continuous (or Long-term) sampling of PCDD/F

All Belgian W-t-E plants perform continuous sampling of PCDD/F since 2008 (one sample every month). In France it is mandatory for all W-t-E lines since 1/7/2014 (13 samples a a year). In Italy most

plants are required by their permit to perform continuous sampling of PCDD/F (one sample every 15 to 30 days). In the UK it is done by one plant).

It should be noted that continuous sampling has been practiced up to now within the R-EOT and not in NOC. The data used to set the BATAEL values are therefore based on periods including OTNOC, which, according to the definitions of IED (See Section 1 above), makes them not applicable in NOC.

The questionnaire to operators did not specifically ask for long-term sampling of PCDD/F. Therefore, consolidated data were provided to the TWG afterwards from 3 sources.

In Annex 8.9 of the WI BREF Final draft, the EIPPCB provides a *"Comparison of PCDD/F emission levels measured by short-term and long-term sampling at 142 waste incineration reference lines in Belgium and France».* The comparison is essentially statistical. As such, it observes that:

- Belgian data are somewhat lower than the French ones (but does not highlight the fact that in France, sampling is made during start-up and shutdown periods as soon as and as long as waste is combusted, while in Belgium sampling begins at the end of start-up period. This is of course important because it is well known that PCDD/F emissions are higher during shutdown and start-up periods).
- Long-term sampling data are slightly higher than the short-term sampling ones.

The statistical approach did not allow to identify the impact of the number of start-ups during the long-term sampling periods, which of course can be significant. However, a warning was added at the end of Annex 8.9 in the WI BREF final draft: *"FNADE/SVDU reported a correlation between elevated values obtained by long-term sampling measurements and the number of start-ups/shut-downs occurring in the time period during which the sampling was performed."*

4.3.3 Continuous (or long-term) sampling of DL-PCB

No long-term sampling data on DL-PCB were reported to the TWG. According to Figures 8.115 and 8.116 in Annex 8.8 of WI BREF draft, 5 MSW lines and 7 ONHW lines reported data on DL-PCB from sampling longer than 8 hours but when looking at the questionnaires, these were not continuous sampling over 2 to 4 weeks. Indeed, Chapter 3 of the WI BREF draft, p. 172, refer to them as periodic measurements.

No information was delivered to the TWG on how the long-term sampling BATAELs on DL-PCB (associated to PCDD/F) were elaborated.

4.4 Emissions to air from the enclosed treatment of slags/bottom ash with extraction of air

There is half a page in WI BREF Chapter 3 (see Section 3.4.3.2, p. 255 in the draft) about emission of dust from IBA treatment plants. A Table shows emission data reported by 5 IBA treatment plants.

4.5 Emissions to water, periodically monitored data

Emissions to water are addressed in Section 3.3 of the WI BREF draft and reported emissions are shown in Figures 3.68 to 3.81 at the end of this Section 3.3.

It should be noted that for a number of the monitored substances, the EIPPCB indicated in this Section 3.3 that a number of plants (up to 12 for certain substances) reported values higher than the ones the EIPPCB considered as maximum to set BATAELs because *"possibly associated with other than normal operating conditions of the WWT plant"*.

Thus, for instance for Cd, it says:

"Figure 3.72 shows cadmium emissions to water measured in 2014.

The emission levels generally range between close to the limit of quantification and 0.025 mg/l as an average of all the measurements in 2014 and 0.05 mg/l as a maximum. A total of 11 plants reported higher maximum emissions, possibly associated with other than normal operating conditions of the WWT plant and, in some cases, with inconsistent use of the units when reporting the data."

Some OTNOCs situations possibly impacting WWT plants are given in Section 5.3 below.

5 Proposals for implementation

5.1 Conditions for proper handling of BATAELs

Since the BAT conclusions do not clarify the boundaries between NOC and OTNOC, nor how to calculate the values to check compliance with BATAEL-based ELVs, it seems natural and fair to do it in the same way as the EIPPCB/JRC did when processing the reported data to set up the BATAELs.

It is suggested for BATAEL-based ELVs to consider the same periods of time as used by the EIPPCB to set the BATAEL ranges, i.e. to refer to the following.

5.1.1 NOC/OTNOC identification

The **proposal** is to use the filters of the 'Daily Fine' data filtering. See Section 3.3 above.

In particular, this confirms the list of OTNOC periods to take into account to filter out data.

5.1.2 Conditions for valid ½ hr average values in NOC

The two conditions of validity for ½ hr average values in NOC are the following:

- Valid signal, i.e. no maintenance or malfunction of the automated measuring system (as said in Section on definitions of the WI BAT conclusions; see 3.3.2 above).
- Line in NOC (general condition for BATAEL application according to the IED; see Section 1 above).

The **proposal** is to use the two third rule which is the common practice today (see footnote in Section 3.3.2 above), and which is confirmed by the new standards on DAHS, EN 17255-1 (see Annex 3.d to this E&G-d). The rule is that a ½-hr average value is valid when at least 20 minutes are in NOC and valid (no malfunction or maintenance of the continuous measurement system). (See the paragraph above).

5.1.3 Calculation of the daily average in NOC

It is **proposed** to follow the EIPPCB approach in order to be consistent with the data comparison when calculating the daily averages.

The **proposal** is to apply the filters as the EIPPCB did, i.e. to not consider daily average values where less than 43 ½-hr average values were valid in NOC (filter '43').:

5.1.4 ½-hr indicative value benchmarking

If a benchmarking were to be done on ½-hr indicative value for Hg, the 60 highest values of the year in NOC should be filtered out at the end of the year as it was done for values reported by operators to EIPPCB.

5.2 List of OTNOCs potentially influencing air emissions

As said the EIPPCB (see 3.5 above) "*the definition of OTNOC is case-specific and it is not possible to compile a complete list of possible cases.*"

However, the control system of the Waste incineration plants is nowadays very developed and it is possible to use alarm signals as indicators to automatically identify switches from NOC to OTNOC and *vice versa*. Some Member States already started to work on this basis to define rules at national level.

Precisions on the limits between NOCs and OTNOCs are **proposed** in Annex 2.b of this E&G-d.

A list of signals corresponding to OTNOC situations with potential impact on air emissions is proposed in Annex 2.c. It can be adapted to the specificities of each plant/line.

5.3 List of OTNOCs potentially influencing water emissions

Some OTNOCs situation in the WWT plant may occur, e.g. in the following situations:

- Malfunction in preceding dust abatement
- Malfunction in media pumps
- Malfunction in dosing pumps for cleaning chemicals
- Malfunction in pH control
- Wrong quality in flocculation chemical due to unannounced quality change from supplier
- Plug in sludge draining valve
- Wrong quality in sulphide precipitator for mercury capture
- Plug in ion exchanger
- Channelled flow inside ion exchanger
- Wrong temperature in ion exchanger
- Safety shut down of the water treatment due to too high temperature of ingoing water
- Sintering of sand bed in sand filter due to malfunction in the decarbonisation process of ingoing water
- Disturbances due to bacterial growth inside process equipment
- Overload of the plant (flow rate or pollutant load)