CIMAC

THE INTERNATIONAL COUNCIL ON COMBUSTION ENGINES

WG 5 - Reports on Regulary Developments – Stationary Power Plants

Rostock / Germany

List of Contents:

Abbreviations I:

AAQ	Ambient Air Quality
AEL	Associated Emission Limit
BAT	Best Available Techniques
BREF	Best Available Techniques Reference
BP	Background Paper
CEMS	Continuos Emission Monitoring System
DA	Degraded (Air-Shed)
EHS	Environment Health and Safety
EU	European Union
FAQ	Frequently asked Questions
GIIP	Good International Industry Practice
HFO	Heavy Fuel Oil
IED	Industrial Emissions Directive 2010/75/EU

Abbreviations II:

IFC	International Finance Corporation (branch of World Bank)
LCP	Large Combustion Plant
MCPD	Medium Combustion Plant Directive 2015/2193
MIS	Micro Isolated Systems
MWth	Thermal MegaWatt (fuel input)
NDA	Non Degraded (Air-Shed)
PM	Particulate (as dry dust)
SCR	Selective Catalytic Reduction
SG	Spark Ignited Gas Engine (ignition e.g. with a spark plug)
SIS	Small Isolated Systems
THC	Total Hydrocarbons
TVOC	Total Volatile Organic Compounds
TWG	Technical Working Group
UNECE	United Nations Economic Commission for Europe

EU LCP (Large Combustion Plant) BREF (Best Available Techniques Reference)

≥ 50 MWth plant

Reference point for engines 15 vol-% O_2

http://eippcb.jrc.ec.europa.eu/reference/BREF/LCP/JRC107769_LCP_bref2017.pdf

BREF list of content:

- Main Events
- Heavy Fuel (HFO)/Gas Oil Engine Emission Limits
- Gas Engine Emission Limits

Main Events I:

- Activation in January and Meeting October of TWG 2011
- First LCP BREF Draft published June 2013
- Background Paper (BP) published April 2015
- Final TWG (Technical Working Group) Meeting June 2015
- Pre-Final LCP BREF Draft published February 2016
- Final LCP BREF Draft published June 2016

Main Events II:

- Article 13 Forum Meeting October 2016
- IED Article 75 Committee Meeting April 2017
- **LCP BREF EU Official Journal Publishing 17.08 2017**
- Final Version Revised LCP BREF published December 2017

HFO and/or gas-oil-fired engines chapter 10.3.2

As regards HFO- and/or gas-oil-fired engines, secondary abatement techniques for NOx, SO2 and dust may not be applicable to engines in islands that are part of a small isolated system (1) or a micro isolated system (2), due to technical, economic and logistical/infrastructure constraints, pending their interconnection to the mainland electricity grid or access to a natural gas supply. *The BAT-AELs for such engines shall therefore only apply in small isolated system and micro isolated system as from 1 January 2025 for new engines, and as from 1 January 2030 for existing engines*.

1) As defined in point 26 of Article 2 of Directive 2009/72/EC.
(2) As defined in point 27 of Article 2 of Directive 2009/72/EC.

LCP BREF Best Available Techniques (BAT) conclusions - HFO/gas oil in engines NOx as NO_2 (CO, TVOC indicative)

15 vol-% O_2

Table 10.18: BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of HFO and/or gas oil in reciprocating engines

Combustion plant total rated thermal input (MW_{th})	BAT-AELs (mg/Nm^3)			
	Yearly average		Daily average or average over the sampling period	
	New plant	Existing plant (1)	New plant	Existing plant (2)(3)
≥ 50	115–190(4)	125–625	145–300	150–750

(1) These BAT-AELs do not apply to plants operated < 1 500 h/yr or to plants that cannot be fitted with secondary abatement techniques.
(2) The BAT-AEL range is 1 150–1 900 mg/Nm^3 for plants operated < 1 500 h/yr and for plants that cannot be fitted with secondary abatement techniques.
(3) For plants operated < 500 h/yr, these levels are indicative.
(4) For plants including units of < 20MW_{th} combusting HFO, the higher end of the BAT-AEL range applying to those units is 225 mg/Nm^3.

As an **indication**, for existing combustion plants burning only HFO and operated ≥ 1 500 h/yr or new combustion plants burning **only HFO**,
- the yearly average CO emission levels will generally be 50–175 mg/Nm3;
- the average over the sampling period for TVOC emission levels will generally be 10–40 mg/Nm3

LCP BREF Best Available Techniques (BAT) conclusions – HFO/gas oil in engines SO_2

15 vol-% O_2

Table 10.19: BAT-associated emission levels (BAT-AELs) for SO_2 emissions to air from the combustion of HFO and/or gas oil in reciprocating engines

Combustion plant total rated thermal input (MW_{th})	BAT-AELs for SO_2 (mg/Nm^3)			
	Yearly average		Daily average or average over the sampling period	
	New plant	Existing plant (1)	New plant	Existing plant (2)
All sizes	45–100	100–200 (3)	60–110	105–235 (3)

(1) These BAT-AELs do not apply to plants operated < 1 500 h/yr.
(2) For plants operated < 500 h/yr, these levels are indicative.
(3) The higher end of the BAT-AEL range is 280 mg/Nm^3 if no secondary abatement technique can be applied. This corresponds to a sulphur content of the fuel of 0.5 wt-% (dry).

LCP BREF Best Available Techniques (BAT) conclusions – HFO/gas oil in engines Dust

15 vol-% O_2

Table 10.20: BAT-associated emission levels (BAT-AELs) for dust emissions to air from the combustion of HFO and/or gas oil in reciprocating engines

Combustion plant total rated thermal input (MW_{th})	BAT-AELs for dust (mg/Nm^3)			
	Yearly average		Daily average or average over the sampling period	
	New plant	Existing plant (1)	New plant	Existing plant (2)
≥ 50	5–10	5–35	10–20	10–45

(1) These BAT-AELs do not apply to plants operated < 1 500 h/yr.
(2) For plants operated < 500 h/yr, these levels are indicative.

LCP BREF Best Available Techniques (BAT) conclusions – Natural gas fired engines NOx as NO_2 (CO indicative)

Table 10.25: BAT-associated emission levels (BAT-AELs) for NO_X emissions to air from the combustion of natural gas in boilers and engines

15 vol-% O_2

Type of combustion plant	BAT-AELs (mg/Nm^3)			
	Yearly average (1)		Daily average or average over the sampling period	
	New plant	Existing plant (2)	New plant	Existing plant (3)
Boiler	10–60	50–100	30–85	85–110
Engine (4)	20–75	20–100	55–85	55–110 (5)

(1) Optimising the functioning of an existing technique to reduce NO_X emissions further may lead to levels of CO emissions at the higher end of the indicative range for CO emissions given after this table.
(2) These BAT-AELs do not apply to plants operated < 1 500 h/yr.
(3) For plants operated < 500 h/yr, these levels are indicative.
(4) These BAT-AELs only apply to spark-ignited and dual-fuel engines. They do not apply to gas-diesel engines.
(5) In the case of engines for emergency use operated < 500 h/yr that could not apply the lean-burn concept or use SCR, the higher end of the indicative range is 175 mg/Nm^3.

As an indication, the yearly average CO emission levels will generally be:

- < 5–40 mg/Nm^3 for existing boilers operated ≥ 1 500 h/yr;
- < 5–15 mg/Nm^3 for new boilers;
- 30–100 mg/Nm^3 for existing engines operated ≥ 1 500 h/yr and for new engines.

LCP BREF Best Available Techniques (BAT) conclusions – Natural gas fired SG type engine HC

15 vol-% O_2

Table 10.26: BAT-associated emission levels (BAT-AELs) for formaldehyde and CH_4 emissions to air from the combustion of natural gas in a spark-ignited lean-burn gas engine

Combustion plant total rated thermal input (MW_{th})	BAT-AELs (mg/Nm^3)		
	Formaldehyde	CH_4	
	Average over the sampling period		
	New or existing plant	New plant	Existing plant
≥ 50	5–15 ([1])	215–500 ([2])	215–560 ([1])([2])

([1]) For existing plants operated < 500 h/yr, these levels are indicative.
([2]) This BAT-AEL is expressed as C at full load operation.

Further steps:

- **Frequently Asked Questions (FAQ) at:**
  http://ec.europa.eu/environment/industry/stationary/ied/faq.htm

item "**IED II.3 - When should BAT conclusions adopted under Article 13(5) be complied with? REVISED VERSION OF JANUARY 2014.":**

"According to the first subparagraph of Article 21(3):

*"**Within 4 years of publication of decisions on BAT conclusions** in accordance with Article 13(5) relating to the main activity of an installation, the competent authority shall ensure that:*

(a) all the permit conditions for the installation concerned are reconsidered and, if necessary, updated to ensure compliance with this Directive, in particular, with Article 15(3) and (4),where applicable;

(b) the installation complies with those permit conditions."

*The above provision implies not only that permit conditions are reconsidered and, if necessary, updated to ensure compliance with the BAT conclusions **within 4 years of** the publication thereof, but also that the operation of the installation complies with those updated permit conditions. "*

EU MCPD (Medium Combustion Plant Directive) 2015/2193

< 50 MWth plant

Reference point for engines 15 vol-% O_2

http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L2193&from=EN

MCPD List of Contents:

- General

- SIS/MIS (Small / Micro Isolated Systems)
  - Greece, UK (United Kingdom)

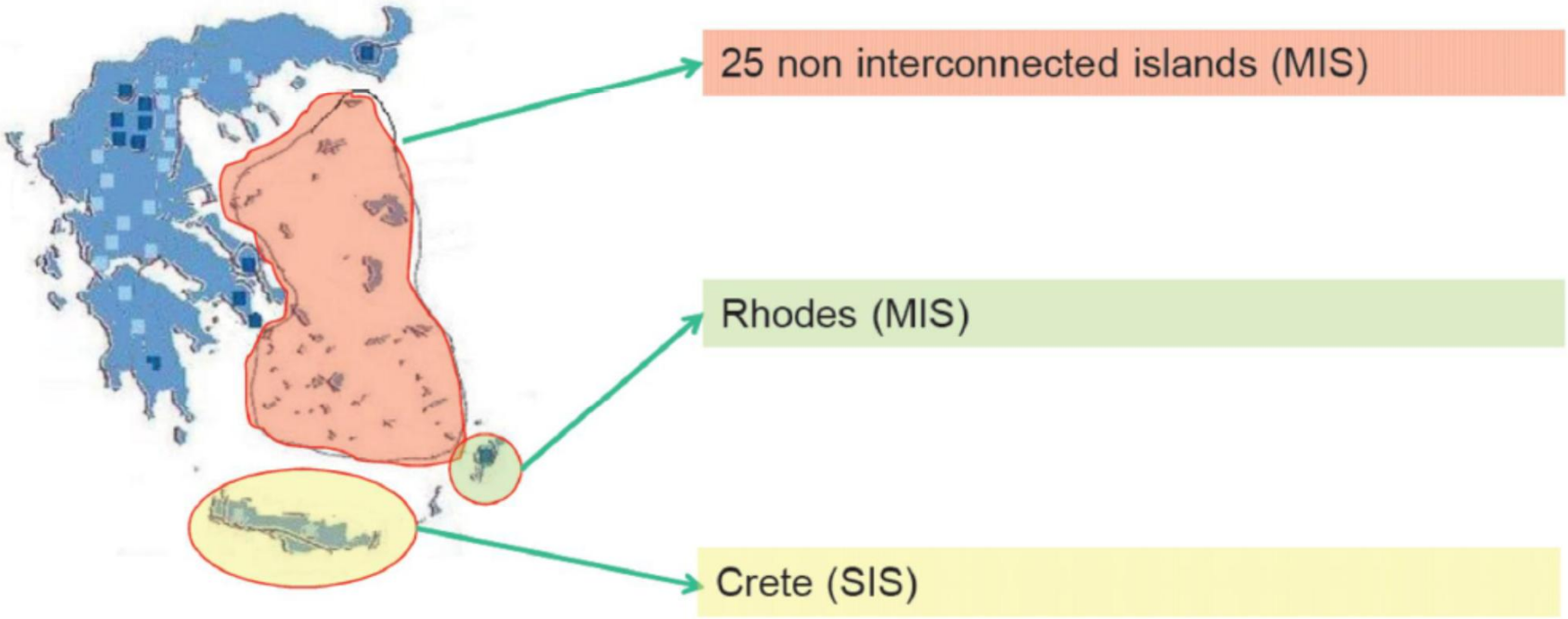
- National Example Cases:
  - Finland, Denmark
  - Holland

- National Transposition Status 23.04 2018

General:

- Finalized 25 November 2015 (started up in autumn 2012)
- MCPD to be implemented by 19 December 2017 into national law
- **New** plant to comply with MCPD from 20 December 2018,existing from 01.01 2025/2030(>/≤ 5 MW_{th})
  - Excluded Areas: Canary Islands, French Overseas Departments, Azores, Madeira
  - SIS / MIS time derogated exception with own limits for a new plant until 01.01 2025
- **N.B. !**
  - A plant consisting of < 15 MWth units with a total plant size ≥ 50 MWth is regulated by MCPD
  - Member States can make emission limits stricter & add new limits when implementing MCPD therefore ***always a country check is needed*** **!**
- National transposition situation, see web: http://eur-lex.europa.eu/legal-content/EN/NIM/?uri=uriserv:OJ.L_.2015.313.01.0001.01.ENG

Hellenic SIS/MIS



Shetland  (UK SIS besides Isle of Man)

Case Finland & Denmark

Finland implemented the MCPD for (new) engine plants more or less "as is", e.g.:

- Emission concentration reference point 15 vol-% O_2
- In Finland no SIS/MIS; plant operation 500..1500h/year NOx flexibility adopted
- Gas oil operation only NOx (no SO_2, nor particulate) limit, ditto NOx limit only for natural gas
- Liquid/gas plant operated < 500 h/year (three year average value) no emission limits
- Sudden interruption in gas supply to gas fired plant back up fuel emission derogation implemented

Denmark, emission concentration point 15 vol-% O_2 but some changes made such as (new engines):

- CO limit added (for all fuels); stricter NOx limits for oil mode (if unit > 5 MWth)
- NOx CEMS (Continuous Monitoring Systems) for > 10 MWth engine unit
- DF engine not recognised as "own type" but sudden gas interruption back up fuel derogation impl.
- Liquid/gas fired emergency plant operating max 500 h/year (3 years average) excluded

Case Holland

Emission concentration point 15 vol-% O_2 but some changes made such as (new engines):

- ≥ 2.5 MWth natural gas engine (N.B.! Emissions measured at full load of engine unit)
  - strict NOx limit (35 mg/Nm^3) – SCR needed (!) and THC limit (500 mg/Nm^3) set

- Also NOx limit in liquid mode set stricter than in MCPD – 150 mg/Nm^3 (15 % O_2)

- Gas oil mode to fulfill SO_2, particulate limits (e.g. > 5 MWth plant 10 mg/Nm^3 (15 % O_2) dust) !

- Sudden interuption of gas supply for gas plant back up fuel derogation (MCPD) text **not** introduced !

- < 500 h/year peak engines in diesel mode to comply with emission limits ! Emergency exempted.

MCPD National Transposition

Status 23.04 2018

http://eur-lex.europa.eu/legal-content/EN/NIM/?uri=uriserv:OJ.L_.2015.313.01.0001.01.ENG

National transpositions by Member State

Collapse all / Expand all	Transposition deadline(s)	Number of measures
Belgium	19/12/2017	7
Bulgaria	19/12/2017	1
Czech Republic	19/12/2017	8
Denmark	19/12/2017	6
Germany		0
Estonia	19/12/2017	5
Ireland	19/12/2017	1
Greece	19/12/2017	1
Spain	19/12/2017	2
France		0
Croatia	19/12/2017	4
Italy	19/12/2017	1
Cyprus		0
Latvia	19/12/2017	2
Lithuania	19/12/2017	29
Luxembourg		0
Hungary	19/12/2017	11
Malta	19/12/2017	1
Netherlands	19/12/2017	2
Austria	19/12/2017	5
Poland	19/12/2017	2
Portugal		0
Romania		0
Slovenia	19/12/2017	7
Slovakia	19/12/2017	8
Finland	19/12/2017	7
Sweden		0
United Kingdom	19/12/2017	3

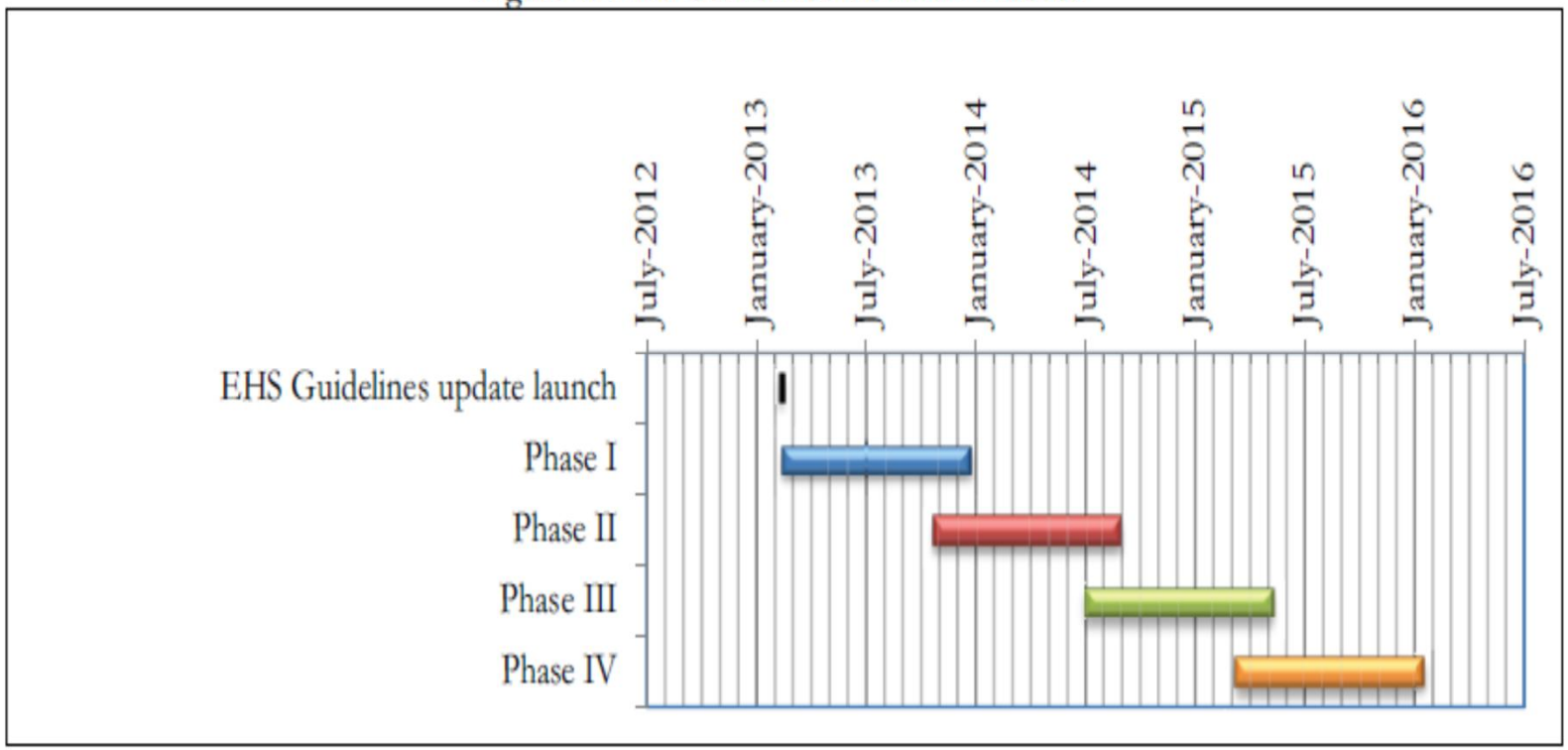
IFC (International Finance Company) EHS (Environment Health and Safety) Guidelines Revision Process

IFC List of Contents:

- Original Time Table
- Status April 23rd 2018
- General Thermal Power Plant EHS Guidelines Proposal May 2017
- Euromot Main Feedback June 28th 2017

EHS Guidelines Revision ("original") Timetable:

Figure 1. EHS Guidelines Revision Process



Status (April 23rd 2018) of the revision process:

- The first phase/second phase "first consultation" on 20 Guidelines ended March 22nd / November 15th 2013.

- "Second consultation" of phases 1 and 2 are heavily delayed. Currently second consultation done/ in progress of following "first/second phase" EHS Guidelines:
  - **Done ("finalized" 8 EHS Guidelines):**
    - Offshore Oil & Gas Development, Vegetable Oil Processing , Wind Energy, Plantation (Perennial) Crop Production**,** Annual Crop Production**,** Petroleum Refining**,** Ports, Harbours and Terminals (**February 2017**), Liquefied Natural Gas LNG Facilities (**April 2017**)

  - **In process:**
    - On Shore Oil and Gas Development, **Second** Consultation **04.04 – 05.05 2017**
    - ***Thermal Power, Second*** *Consultation* ***31.05 – 30.06 2017 ; >= 50 MWth plant !***

    - Water and Sanitaton, **First** Consultation **11.01 – 09.02 2018**

- N.B.! Updated versions of updated Guidelines becomes publicly available on a "rolling basis".

Thermal Power Second Public Consultation Draft Proposed Emission Limits for Reciprocating Engines

Table 6 (A) - Emission Guidelines (in mg/Nm³ or as indicated) for Reciprocating Engine

Note:

- Guideline values are applicable for new facilities
- Nationally legislated limits should be applied if they are more stringent
- EA may justify more stringent or less stringent guideline values due to environmental, community health, technical and economic considerations, whilst not exceeding nationally legislated limits In all cases, the EA should demonstrate that ambient impacts from emissions are in compliance with the requirements of Section 1.1 of the General EHS Guidelines.
- For fuels other than those specified below, the EA should justify the required emission guidelines taking account of environmental, community health, technical and economic considerations
- For projects to rehabilitate existing facilities, emission guidelines should be established by the EA considering (i) the existing emission levels and impacts on the environment and community health, and (ii) economic and technical feasibility of ensuring the existing emission levels meet the Guideline values for new facilities.

Combustion Technology / Fuel	Particulate Matter (PM)		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)		Dry Ggas O_2 Content (%)
Reciprocating Engine	NDA	DA	NDA	DA	NDA	DA	
Natural Gas	N/A	N/A	N/A	N/A	200 (Spark Ignition) 400 (Dual Fuel) [a]	200 (Spark Ignition) 400 (Dual Fuel)	15
Liquid Fuels (Plant ≥50MWth to <300MWth)	50	30	1,170 or use of 2% or less S fuel	0.5% S	1,460 (Compression Ignition, bore size diameter [mm] < 400) 1,850 (Compression Ignition, bore size diameter [mm] ≥ 400)	400	15
Liquid Fuels (Plant ≥300MWth)	50	30	585 or use of 1% or less S fuel	0.2% S	740	400	15
Biofuels / Gaseous Fuels other than Natural Gas	50	30	N/A	N/A	30% higher limits than those provided above for Natural Gas and Liquid Fuels.	200 (Spark Ignition), 400 (other)	15

Euromot Selected Main Feedback I:

Euromot response sent to IFC 28.06 2017

- **Table 6 (A) ”Emission Guidelines ..”**
  - ”NDA, 50 ... 300 MWth liquid fired plant:
    - Euromot requested re-installation of own NOx limit for DF type

    - Technical description given showing DF is not comparable to a pure modern diesel engine and shall thus have an own NOx-limit e.g. case in the UNECE Gothenburgh Protocol 2012.

  - Text to be inserted for amongst sudden gas interruption (case in e.g. IED 2010/75/EU, MCPD 2015/2193).

Euromot Selected Main Feedback II:

Table 7 ”Typical Air Emission Monitoring Parameters/Frequency ..”

- IFC proposed to lower threshold to 100 MWth (**from** 300 MWth) for NOx and also include PM CEMS (liquid mode) for stack CEMS

  - Euromot response : Re-install old threshold for stack NOx CEMS 300 MWth in NDA (Non Degraded Air-Shed) and for DA 100 MWth. No PM CEMS but more frequent monitoring every 6th month for liquid > 300 MWth plant in NDA and for > 100 MWth plant in DA.

- IFC proposal Ambient Air Quality (AAQ) mandatory CEMS for > 100 MWth liquid plant

  - Euromot response: Proposal not according to GIIP (e.g. stricter approach than in EU) – re-install old IFC approach: if short term plant impact > 25 % of short term AAQ limit then CEMS.

Euromot Selected Main Feedback III:

- According to IFC proposed definition only in-situ stack sampling CEMS allowed
  - Euromot requested also ex-situ to be accepted and measurement frequency to such that also US EPA approach is accepted (measurent every 15th minute).
  - IFC ”New facilities should be aimed to be in the top quartile efficiency for the country/region average plant of same type and capacity”
    - Euromot response: until reliable statistics/literature available for all areas target to be less ambitious and comparison to the average level preferred.
  - For more details, please see:

”Euromot Position
IFC Thermal Power Plants EHS Guidelines Draft Proposal June 2017”, dated 30 June 2017”

Disclaimer

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