



Emissions Regulation within the European Union

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Industrial Emissions Directive (IED)

Objectives

- protection of human health and the environment
- improvement of environmental quality

By

- controlling the emissions from industrial activities
(minimising emissions during all phases of operation)

Taking

- an integrated approach to the prevention and control of emissions to air, water and land ...and incorporating
- waste management, energy efficiency and accident prevention

IED Key Concepts (I)

- Best Available Techniques (BATs) must be used for emissions control as defined by
- BAT Reference Documents (BREFs) - produced for each industrial activity following an information exchange between Member States, Industry, NGOs and the Commission (to guidelines approved by the BAT Forum)
- BAT Conclusions summarise the BREF, **form the basis of Permit conditions**, and are adopted by the Commission
- Emission Limit Values (ELV) are set by the Competent Authority to meet BAT Conclusions unless this would lead to disproportionately higher costs compared to the environmental benefit - taking into account local factors and the technical characteristics of the plant but....

IED Key Concepts (II)

- Emission Limit Values (ELV) shall not exceed minimum requirements defined in **Annex V for LCPs** and **Annex VI for incineration plants** during normal operation
- Integrated Pollution Prevention and Control (IPPC) applies to emissions to air, water & land for a range of industrial activities (Annex I) in various industries:
 - **Energy (combustion > 50MW thermal input)**
 - Metals
 - Minerals
 - Chemicals
 - Waste management (disposal or recovery)
 - Other (includes Carbon Capture & Storage)

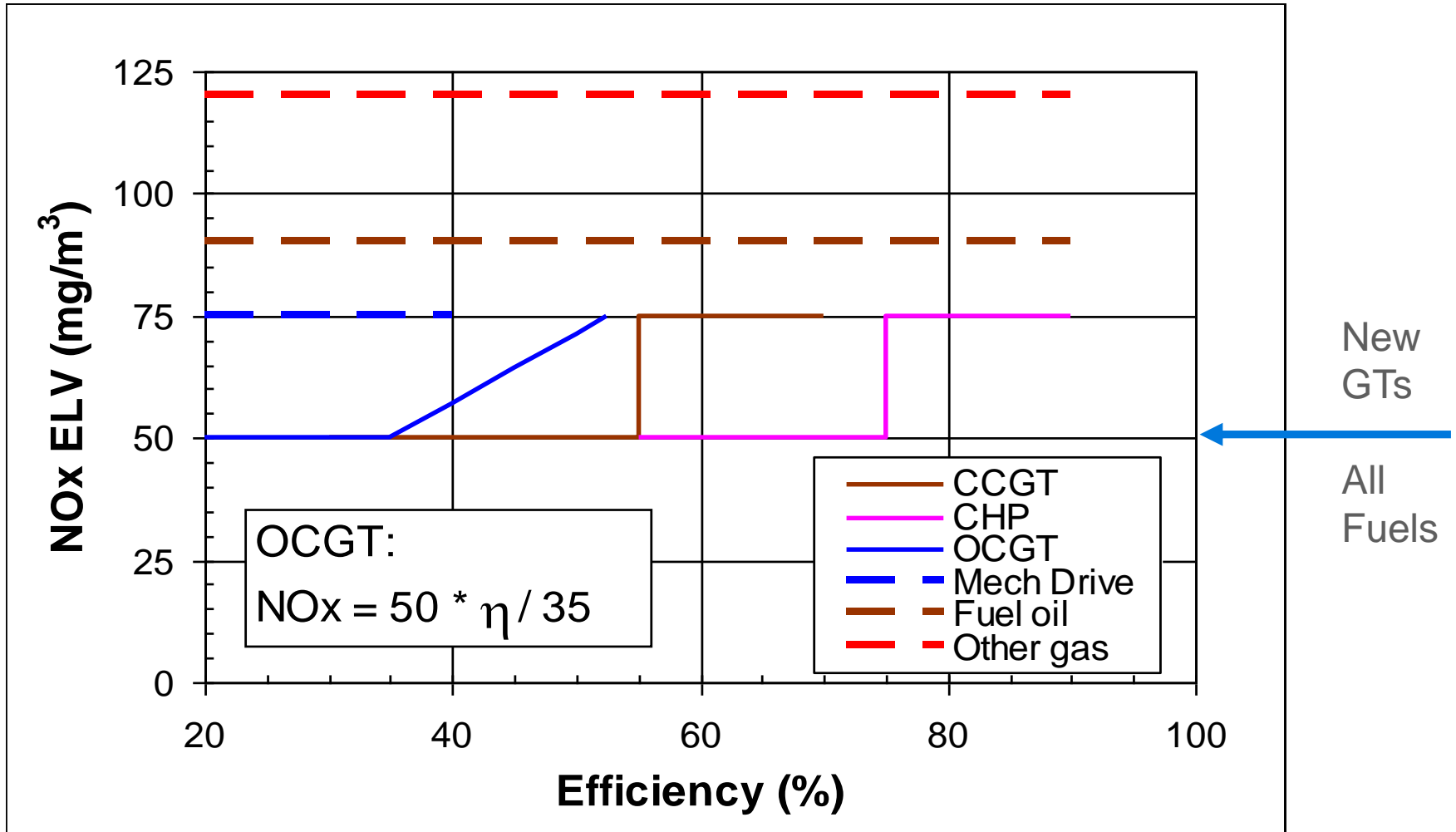
Large Combustion Plants

- Combustion plant: in which any fuel is oxidised to produce useful heat (excluding directly fired processes)
- Existing plants – permitted before 7 Jan 2013
- Large Combustion Plants (Chapter III and Annex V):
 - ≥ 50 MW_{th} - single unit with one stack
 - ≥ 50 MW_{th} - multiple units with a common stack (containing one or more flues)
 - ≥ 50 MW_{th} - multiple units with single stacks which could have been flued together in the judgement of the competent authority (Post 1987)

Note: LCP aggregation excludes units < 15 MW_{th}

- Emission Limit Values (ELVs) defined for NO_x, SO₂, Dust and CO (gas firing only) for different: plant technologies & vintages; fuelling; operating hours... during normal operation
- Combined Cycle Gas Turbine (CCGT) is used as an

IED: Emission Limit Values for Existing Gas Turbines (Applicable > 70% ISO Base Load)



- CO 100 mg/m³ at 15 % O₂ dry, 273K, 101.3 kPa
- Derogations for low load factor plant (<1500 h/yr)

IED: Harmonised compliance approach

- Based on validated hourly averages
- For a given calendar year:
 - no Monthly average exceeds ELV
 - no Daily average exceeds 110% ELV → QA of AMS (CEMS)
 - 95% of Hourly averages do not exceed 200% ELV
- Confidence intervals:

Same approach for new and existing plants
Lower ELV → Stricter QA: Certification; Calibration and Control

Species	Confidence interval (95%)
SO ₂	20%
NO _x	20%
Dust	30%
CO	10%

LCP BREF Conclusions (17-08-2017)

- BAT Associated Emission Levels (BAT-AELs) are defined as **concentration ranges** from which Member States define Emission Limit values (ELVs)
- Measurement uncertainty issues at bottom end of range
- BAT-AELs defined for **Annual** averaging periods and often Daily averaging periods (not the same as IED Annex V)
- BAT-AELs are defined for different:
 - Plant/process types: boilers; gas turbines & reciprocating engines; co-incineration; IGCC
 - Fuels: coal; lignite; biomass; peat; gas oil; heavy fuel oil; natural gas; process gases
 - Operating hours (Annual BAT-AELs generally not required for plants operating < 1500 h/a)

LCP BREF – CCGT NO_x example

		NO _x BAT-AELs (mg/m ³ at 15% O ₂ dry, 0°C, 1 atm) Applicable to Natural Gas & Dual-fuel firing (when DLN operation is effective as applicable)		
Plant type	MW _{th}	Annual average <small>Not applicable to existing plant <1500h/a NO_x optimisation may result in higher CO</small>	Daily average	Alternative BAT-AEL or Adjustment factor
OCGT <small>Excluding mech. drive & plant < 500h/a</small>		Lo - Hi	Lo - Hi	AEL * η /39 (ISO Base Load efficiency) Applied to Hi end of range
New	≥ 50	15 - 35	25 - 50	
Existing	≥ 50	15 - 50	25 - 55	Up to 80 mg/m ³ Daily for 500-1500h/a plant put into operation no later than 27 Nov 2003
CCGT <small>Excluding mech. drive & plant < 500h/a</small>		Lo - Hi	Lo - Hi	AEL * η /55 (ISO Base Load efficiency) Applied to Hi end of range
New	≥ 50	10 - 30	15 - 40	
Existing (η < 75%)	≥ 600	10 - 40	18 - 50	-
Existing (η ≥ 75%)	≥ 600	10 - 50	18 - 55	Up to 65 mg/m ³ Daily for plant put into operation no later than 7 Jan 2014
Existing (η < 75%)	50 - 600	10 - 45	35 - 55	-
Existing (η ≥ 75%)	50 - 600	25 - 50	35 - 55	Up to 55 Annual & 80 mg/m ³ Daily for plant put into operation no later than 7 Jan 2014
OCGT & CCGT <small>Mechanical drive & plant < 500h/a</small>		Lo - Hi	Lo - Hi	
Existing (Mech. Drive)	≥ 50	15 - 50	25 - 55	Up to 60 Annual & 65 mg/m ³ Daily for plant put into operation no later than 7 Jan 2014
Existing (<500h/a)	≥ 50	No BAT AEL	Indicative BAT-AEL 60 - 140	Lower end of the range is achievable with DLN. Plant put into operation no later than 27-11-2003 and emergency plant, operating for <500h/a.

LCP BREF – MONITORING REQUIREMENTS

POWER PLANTS $\geq 300 \text{ MW}_{\text{th}}$

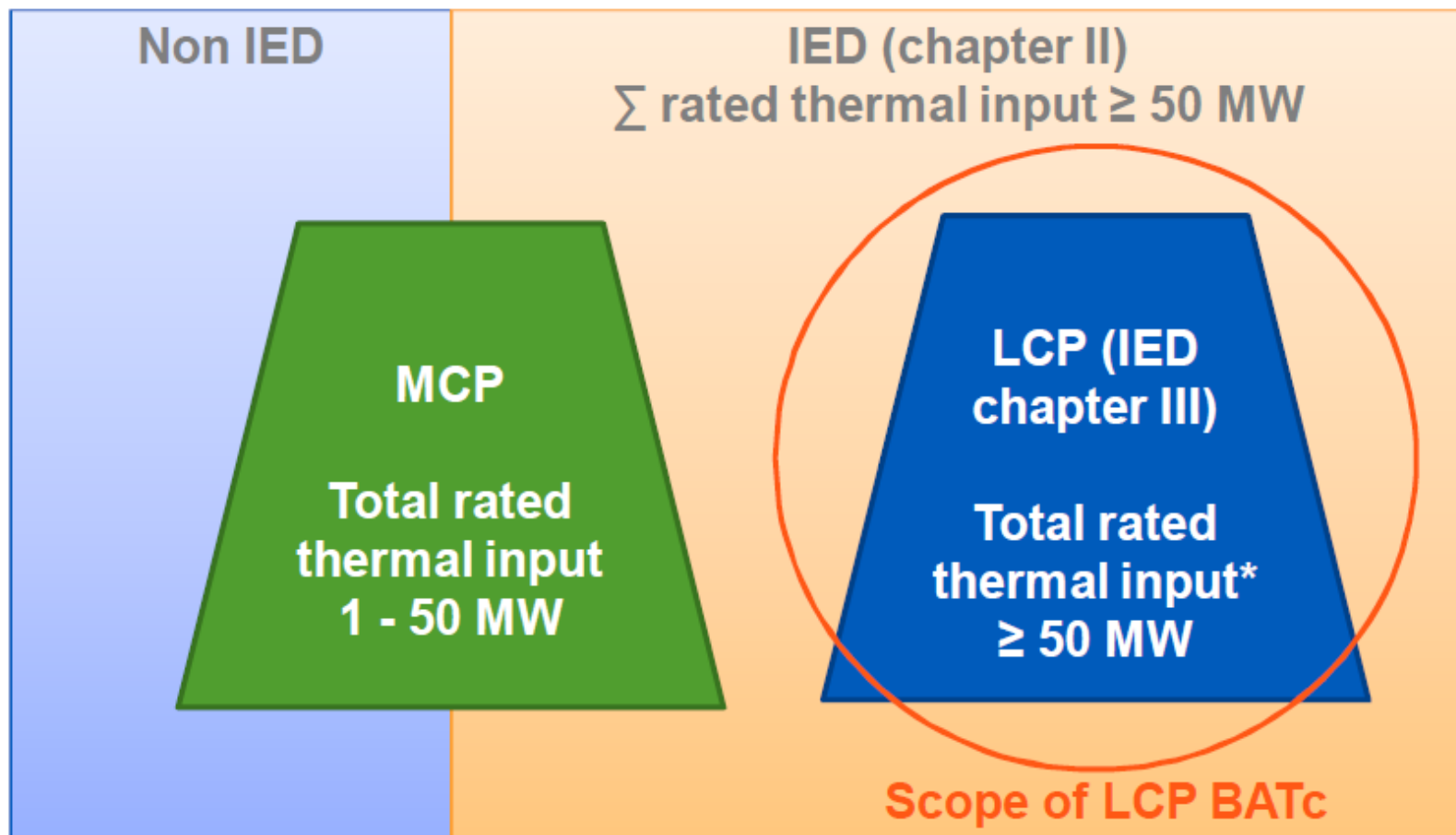
Species	Applies to	Monitoring	Unless	Then
BAT-AELs defined				
NO_x	All fuels	Continuous	-	-
CO	All fuels		-	-
SO₂	Coal, Biomass, HFO, Gas Oil		-	-
Dust	Coal, Biomass, HFO, Gas Oil		-	-
HCl	Coal	Periodic (3m)	Emissions 'sufficiently stable'	Periodic (12m)
	Biomass	Continuous	Emissions 'sufficiently stable'	Periodic (6m)
HF	Coal	Periodic (3m)	Emissions 'sufficiently stable'	Periodic (12m)
	Biomass	Periodic (12m)	-	-
Hg	Coal	Continuous*	Emissions 'sufficiently stable'	Periodic (6m)
	Biomass	Periodic (12m)	Emissions 'sufficiently stable'	No monitoring
NH₃	All fuels with SCR/SNCR	Continuous	Emissions 'sufficiently stable' (SCR)	Periodic (12m)
BAT-AELs not defined				
SO₃	All fuels with SCR	Periodic (12m)	-	-
Metals	Coal, Biomass, HFO, Gas Oil	Periodic (12m)	Emissions are deemed insignificant	Less frequent

*Sorbent traps allowed

Medium Combustion Plant Directive

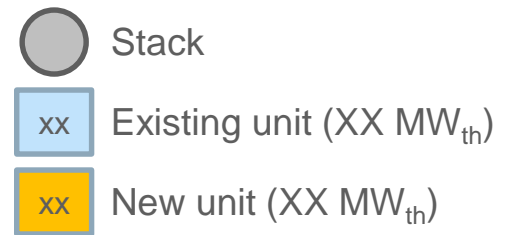
- New European Directive to control emissions from Medium Combustion Plants ($\geq 1\text{MW}_{\text{th}}$ to $< 50\text{MW}_{\text{th}}$)
- Entered into force on 19 Dec 2015
- Sets Emission Limit Values (ELVs) for:
 - New combustion plants $\geq 1\text{MW}_{\text{th}}$ (aggregated) from the start of operations (post 20 Dec 2018)
 - Existing combustion plants of $>5\text{MW}_{\text{th}}$ to $< 50\text{MW}_{\text{th}}$ from 1 January 2025 (individual units)
 - Existing combustion plants of $\geq 1\text{MW}_{\text{th}}$ to 5MW_{th} from 1 January 2030 (individual units)
- Out of scope: IED Ch III (LCP) and Ch IV (WI); directly fired plants; propulsion (vehicles); Non-Road Mobile Machinery; research, development and testing activities

Overlap with IED Chapter II for new plants



* For the purpose of LCP capacity calculation, units below 15 MW shall not be considered

Aggregation Examples



Plant	Regulated as	Notes
	2 x 20 MW _{th} MCPs Both existing	<i>No aggregation of existing plants</i>
	2 x 20 MW _{th} MCPs 1 existing, 1 new	<i>No aggregation of existing with new plants</i>
	1 x 40 MW _{th} MCP New	<i>Aggregation rule applies for new plants</i>
	1x10 MW _{th} & 1x 45 MW _{th} MCP Both existing	<i>Below IED Ch III threshold of 50 MW_{th} due to 15MW_{th} minimum for IED aggregation. Subject to IED Ch II as above site threshold of 50MW_{th}.</i>
	1 x 55 MW _{th} MCP New	<i>As above, but subject to MCPD new plant aggregation rule.</i>
	1 x 55 MW _{th} LCP & 1x10 MW _{th} MCP	<i>1 unit above IED Ch III threshold. 1 unit below 15MW_{th} minimum for IED aggregation</i>
	1 x 60 MW _{th} LCP	Aggregated value > IED Ch III threshold, so regulated as LCP

Permitting / Registration requirements

- Member States set up the appropriate permitting or registration regime to ensure MCPD compliance
- Operators are obliged to inform the Competent Authority of the operation, or intention to operate, any MCP providing a defined list of information (MCPD Annex I)
- MCPs covered by the IED will not need a separate permit. Where the Annex I information is not covered by the existing IED permit, this will need to be provided

MCP Registration or Permitting

Operators must provide the following information

- Rated thermal input (MW) of the MCP
- Type of MCP: diesel engine; gas turbine; dual fuel engine; other engine or other medium combustion plant
- Type and share of fuels used by fuel category: solid biomass; other solid fuels; gas oil; other liquid fuels; natural gas; other gaseous fuels
- Date of the start of the operation
- Activity sector of the MCP or the facility in which it is applied (NACE code)

<https://siccode.com/en/pages/what-is-a-nace-code>

- Expected number of annual operating hours and average load in use
- Signed declaration that the MCP will not be operated > 500h/a (as applicable)
- Name and registered office of the operator and the address where the plant is located.

Emission Limit Values

- The MCPD sets out ELVs for SO₂, NO_x and Dust in Annex II for Existing and New plants
- ELVs are defined by technology, thermal rating and fuel type
- For boilers, ELV tables are split into 1 – 5 MW_{th} and 5 – 50 MW_{th} size ranges for Existing plants only
- For engines and gas turbines a single ELV table applies for 1 - 50MW_{th}
- Footnotes set different ELVs for specific circumstances
- Stricter ELVs may be set when air quality limit values are exceeded

Emission Limit Values - Gas Turbine example

- mg/m³ at 273K, 101.3 kPa, 15% O₂ for gas turbines
- NEW plants

	Natural Gas	Other Gaseous	Gas Oil	Other Liquid
NO _x	50	75	75	75
SO ₂	-	15	-	120
Dust	-	-	-	10

- EXISTING plants

	Natural Gas	Other Gaseous	Gas Oil	Other Liquid
NO _x	150	200	200	200
SO ₂	-	15	-	120
Dust	-	-	-	10

Emission Limit Value - optional derogations

- The following plants can be excluded from ELV compliance:
 - Existing MCPs which do not operate more than 500 hours per year as a 5 year rolling average (a dust ELV still applies for biomass and other solid fuels)
 - New MCPs which do not operate more than 500 hours per year as a 3 year rolling average (a dust ELV still applies for biomass and other solid fuels)
- Temporary derogation from ELV compliance may be granted:
 - For up to 6 months where an MCP using low sulphur fuel cannot comply with the SO₂ ELV due to an interruption in supply resulting from a serious shortage
 - For up to 10 days where an MCP using gaseous fuels has to resort exceptionally to the use of other fuels due to a sudden interruption in supply

Monitoring Requirements (MCPD Annex III)

- Periodic manual monitoring - yearly or 3-yearly
- First measurement within 4 months of permit/registration or within 4 months of the start of operations
- Every 3 years for 1 - 20MW_{th}
- Every year for >20MW_{th}
- For all pollutants for which an ELV is set out by the MCPD and for CO
- For plants utilising the 500 hour exemptions, alternative frequencies may be applied
- Periodic measurements must not exceed the ELV in order to demonstrate compliance

Monitoring Requirements

- Monitoring methods must enable reliable, representative and comparable results –harmonised EN standards are presumed to meet this requirement
- The plant must be operating under stable conditions at a representative even load (excluding start-up and shut-down)
- Other procedures verified and approved by the Competent Authority may be used to determine SO₂ emissions (*e.g. calculations based on fuel sulphur content*)
- In the event of non-compliance, operators must ensure that compliance is restored within the shortest possible time
- Where non-compliance causes a significant degradation of local air quality, operation must be suspended

Conclusions

- IED + LCP BREF define lower ELVs for an extended range of pollutants for plants $\geq 50 \text{ MW}_{\text{th}}$ requiring continuous and periodic monitoring depending on plant size and species
- Key issues associated with lower concentrations:
 - tighter QA for AMS (Certification and Control)
 - suitability/re-validation of manual Standard Reference Methods (SRMs used for AMS calibration)
 - measurement uncertainty and compliance assessment
- MCPD defines ELVs for NO_x , SO_2 and Dust for plants in the size range ≥ 1 to $50 \text{ MW}_{\text{th}}$ (operating for $>500\text{h}/\text{year}$)
- Legislative overlap between IED and MCPD
- MCPD requires periodic monitoring (also for CO) within 4 months of permitting/registration \rightarrow scheduling difficulties

Thank you!

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