

Technical Annex prepared by EGTEI

## **Suggested Technical Annex V to the Gothenburg Protocol**

**The technical annexes have been delivered to WGS&R 44, as first release, in electronic and printed form, with the purpose of receiving preliminary comments and further guidance from the Parties, in view of the official submission of these annexes, along with the guidance documents, to WGS&R 45, September 2009.**

[Tapez un texte]

## Annex V

### LIMIT VALUES FOR EMISSIONS OF NITROGEN OXIDES FROM STATIONARY SOURCES

1. Section A applies to Parties other than Canada and the United States of America, section B applies to Canada and section C applies to the United States of America.

#### A. Parties other than Canada and the United States of America

2. For the purpose of section A, limit value means the quantity of a gaseous substance contained in the waste gases from an installation that is not to be exceeded. Unless otherwise specified, it shall be calculated in terms of mass of pollutant per volume of the waste gases (expressed as mg/m<sup>3</sup>), assuming standard conditions for temperature and pressure for dry gas (volume at 273.15 K, 101.3 kPa). With regard to the oxygen content of exhaust gas, the values given in the tables below for each source category shall apply. Dilution for the purpose of lowering concentrations of pollutants in waste gases is not permitted. Limit values generally address NO together with NO<sub>2</sub>, commonly named NO<sub>x</sub>, expressed as NO<sub>2</sub>. Start-up, shutdown and maintenance of equipment are excluded.

~~3. Emissions shall be monitored 1/ in all cases. Compliance with limit values shall be verified. The methods of verification can include continuous or discontinuous measurements, type approval, or any other technically sound method.<sup>1</sup>~~

~~4.3. Sampling and analysis of pollutants—relevant polluting substances and measurements of process parameters, as well as the quality assurance of automated measuring systems and the reference measurement methods to calibrate those systems any measurement system, shall be carried out in accordance with CEN standards. If CEN standards are not available, ISO standards, national or international standards which will ensure the provision of data of an equivalent scientific quality shall apply the standards laid down by the European Committee for Standardization (CEN) or by the International Organization for Standardization (ISO). While awaiting the development of CEN or ISO standards, national standards shall apply.~~

~~5. Measurements of emissions should be carried out continuously when emissions of NO<sub>x</sub> exceed 75 kg/h.~~

~~6. In the case of continuous measurements, except for existing combustion plant covered in table 1, compliance with the emission standards is achieved if the calculated daily mean values do not exceed the limit value and if no hourly value exceeds the limit value by 100%.~~

~~7. In the case of continuous measurements for existing combustion plant covered in table 1, compliance with the emission standards is achieved if (a) none of the monthly mean values exceeds the emission limit values; and (b) 95% of all the 48-hour mean values do not exceed 110% of the emission limit values.~~

~~8. In the case of discontinuous measurements, as a minimum requirement, compliance with the emission standards is achieved if the mean value based on an appropriate number of measurements under representative conditions does not exceed the value of the emission standard.<sup>2</sup>~~

#### 4. Special provision for combustion plants:

<sup>1</sup> Former paragraph 3 on monitoring was deleted to let maximum flexibility to the Parties.

<sup>2</sup> Former paragraphs 5 to 8 on measurements were also deleted to let maximum flexibility to the Parties. Measurements and ELV-compliance requirements could be an issue of implementation in national legislation, while international standardization has to be taken into account. Therefore, former paragraph 4 is kept.

On request of the WGSR EGTEI could come back on these issues and suggest some paragraphs to include provisions on monitoring, measurements and compliance with ELV.

[Tapez un texte]

4.1 For combustion plants larger than 50 MW<sub>th</sub>, the competent authority may grant derogation from the obligation to comply with the emission limit values provided for in paragraph 5 in the following cases:

[a] for combustion plants using only gaseous fuel who have to resort exceptionally to the use of other fuels because of a sudden interruption in the supply of gas and for this reason would need to be equipped with a waste gas purification facility]

[b] for old existing plants that will close down before a certain date]

[c] for emergency and/or peak plants with less than a certain number of operational hours per year]

4.2 Where a combustion plant is extended by at least 50MW, the emission limit value specified in paragraph 5 for new installation shall apply to the extensional part and to the part of the plant affected by the change.

4.3 Parties shall ensure that provisions are made in the permits for procedures relating to malfunction or breakdown of the abatement equipment.

4.4 In the case of a multi-fuel firing combustion plant involving the simultaneous use of two or more fuels, the competent authority shall provide rules for setting the emission limit values

[5. An alternative emission reduction strategy for mineral oil refineries (like the use of the bubble concept) is currently being investigated and could be proposed in the next draft of this TA. The bubble concept, allowing flexibility but at the same time aiming at equivalent reductions, could be restricted to combustion plants above 50 MW (as it is in the current protocol) or could relate to the whole refinery to allow maximum flexibility.]

96. Boilers and process heaters with a rated thermal input exceeding 50 MW<sub>th</sub>:

**Table 1. Suggested options for limit values for NO<sub>x</sub> emissions released from boilers [and process heater] a/**

	Limit value (mg/Nm <sup>3</sup> ) <sup>b/</sup>
<del>Solid fuels, new installations:</del>	<del>=</del>
<del>Boilers 50 – 100 MW<sub>th</sub></del>	<del>400</del>
<del>Boilers 100 – 300 MW<sub>th</sub></del>	<del>300</del>
<del>Boilers &gt;300 MW<sub>th</sub></del>	<del>200</del>
<del>Solid fuels, existing installations:</del>	<del>=</del>
<del>Solid in general</del>	<del>650</del>
<del>Solid with less than 10% volatile compounds</del>	<del>1300</del>
<del>Liquid fuels, new installations:</del>	<del>=</del>
<del>Boilers 50 – 100 MW<sub>th</sub></del>	<del>400</del>
<del>Boilers 100 – 300 MW<sub>th</sub></del>	<del>300</del>
<del>Boilers &gt;300 MW<sub>th</sub></del>	<del>200</del>
<del>Liquid fuels, existing installations</del>	<del>450</del>
<del>Gaseous fuels, new installations:</del>	<del>=</del>
<del>Fuel: natural gas</del>	<del>=</del>
<del>Boilers 50 – 300 MW<sub>th</sub></del>	<del>150</del>
<del>Boilers &gt; 300 MW<sub>th</sub></del>	<del>100</del>

[Tapez un texte]

Fuel: all other gases	200
Gaseous fuels, existing installations	350

Fuel type	Thermal input [MWth]	Suggested ELV for NO <sub>x</sub> [mg/Nm <sup>3</sup> ] <sup>b/</sup> [hourly, monthly, daily] <sup>2/</sup>		
		Option 1 <sup>1/</sup>	Option 2 <sup>1/</sup>	Option 3 <sup>1/</sup>
Solid fuels	50-100	New plants: [250] (coal, lignite) [200] (biomass, peat)	New plants: [300] (coal, lignite) (pulverised lignite: [400]) [250] (biomass, peat)	New plants: [400] (coal, lignite) [400] (biomass, peat)
		Existing plants: [250] (coal, lignite) [250] (biomass, peat)	Existing plants: [300] (coal, lignite) (pulverised lignite: [450]) [300] (biomass, peat)	Existing plants: [600] (coal, lignite) [600] (biomass, peat)
	100-300	New plants: [150] (coal, lignite) [150] (biomass, peat)	New plants: [200] (coal, lignite) [200] (biomass, peat)	New plants: [200] (coal, lignite) [300] (biomass, peat)
		Existing plants: [200] (coal, lignite) [200] (biomass, peat)	Existing plants: [200] (coal, lignite) [250] (biomass, peat)	Existing plants: [600] (coal, lignite) [600] (biomass, peat)
	>300	New plants: [100] (coal, lignite) [100] (biomass, peat)	New plants: [150] (coal, lignite) [150] (biomass, peat)	New plants: [200] (coal, lignite) [200] (biomass, peat)
		Existing plants: [100] (coal, lignite) [100] (biomass, peat)	Existing plants: [200] (coal, lignite) [200] (biomass, peat)	Existing plants: [200] (coal, lignite) [200] (biomass, peat)
Liquid fuels	50-100	New plants: [250]	New plants: [300]	New plants: [400]
		Existing plants: [300]	Existing plants: [450]	Existing plants: [450]
	100-300	New plants: [100]	New plants: [150]	New plants: [200]
		Existing plants: [150]	Existing plants: [200]	Existing plants: [450]
	>300	New plants: [80]	New plants: [100]	New plants: [200]
		Existing plants: [100]	Existing plants: [150]	Existing plants: [400]
Natural gas	50-300	New plants: [80]	New plants: [100]	New plants: [150]
		Existing plants: [80]	Existing plants: [100]	Existing plants: [300]
	>300	New plants: [60]	New plants: [80]	New plants: [100]
		Existing plants: [80]	Existing plants: [100]	Existing plants: [200]
Other gaseous fuels	>50	New plants: [200]	New plants: [200]	New plants: [200]
		Existing plants: [300]	Existing plants: [300]	Existing plants: [300]

[Tapez un texte]

a/ In particular, the limit values shall not apply to:

- Plant where the combustion process is an integrated part of a specific production, for example the coke oven used in the Iron and Steel industry and glass and ceramics production plants;
- Plant in which the products of combustion are used for direct heating, drying, or any other treatment of objects or materials, e.g. reheating furnaces, furnaces for heat treatment;
- Post-combustion plant, i.e. any technical apparatus designed to purify the waste gases by combustion that is not operated as an independent combustion plant;
- Facilities for the regeneration of catalytic cracking catalysts;
- Facilities for the conversion of hydrogen sulphide into sulphur;
- Reactors used in the chemical industry;
- Coke battery furnaces;
- Cowpers;
- Waste incinerators; and
- Plant powered by diesel, petrol or gas engines or by combustion turbines, irrespective of the fuel used.

b/ These values do not apply to boilers running less than 500 hours a year. The O<sub>2</sub> reference content is 6% for solid fuels and 3% for others.

~~107.~~ Onshore combustion turbines with a rated thermal input exceeding 50MW<sub>th</sub>: the NO<sub>x</sub> limit values expressed in mg/Nm<sup>3</sup> (with an O<sub>2</sub> content of 15%) are to be applied to a single turbine. The limit values in table 2 apply only above 70% load.

**Table 2. Suggested options for limit values for NO<sub>x</sub> emissions released from onshore combustion turbines (including CCGT)**

<del>&gt; 50 MW<sub>th</sub> (Thermal input at ISO conditions)</del>	<del>Limit value (mg/Nm<sup>3</sup>)</del>
<del>New installations, natural gas<sup>a/</sup></del>	<del>50<sup>b/</sup></del>
<del>New installations, liquid fuels<sup>a/</sup></del>	<del>120</del>
<del>Existing installations, all fuels<sup>a/</sup></del>	<del>=</del>
<del>Natural gas</del>	<del>150</del>
<del>Liquid</del>	<del>200</del>

Fuel type	Thermal input [MW <sub>th</sub> ]	Suggested ELV for NO <sub>x</sub> [mg/Nm <sup>3</sup> ] <sup>a/</sup> [hourly, monthly, daily] <sup>2/</sup>		
		Option 1 <sup>1/</sup>	Option 2 <sup>1/</sup>	Option 3 <sup>1/</sup>
Liquid fuels (light and medium distillates)	>50	New plants: [50]	New plants: [100]	New plants: [120]
		Existing plants: [90]	Existing plants: [120]	Existing plants: [120]
Natural gas <sup>b/</sup>	>50	New plants: [50]	New plants: [50]	New plants: [50]
		Existing plants: [50]	Existing plants: [90]	Existing plants: [120]
Other gases		[to be filled in later]	[to be filled in later]	[to be filled in later]

a/ O<sub>2</sub> content of 15%. Gas turbines for emergency use that operate less than 500 hours per year are not covered. The ELVs apply only above 70% load

b/ Natural gas is naturally occurring methane with not more than 20% (by volume) of inerts and other constituents.

[Tapez un texte]

~~118.~~ Cement production:

**Table 3. Suggested options for limit values for NO<sub>x</sub> emissions released from cement production a/**

	Limit value (mg/Nm <sup>3</sup> )
<del>New installations (10% O<sub>2</sub>)</del>	
<del>— Dry kilns</del>	<del>500</del>
<del>— Other kilns</del>	<del>800</del>
<del>Existing installations (10% O<sub>2</sub>)</del>	<del>1200</del>

	Suggested ELV for NO <sub>x</sub> [mg/Nm <sup>3</sup> ] [hourly, monthly, daily] <sup>2/</sup>		
	Option 1 <sup>1/</sup>	Option 2 <sup>1/</sup>	Option 3 <sup>1/</sup>
<b>New installations</b>			
— preheater kilns	[300]	[400]	[500]
— Other kilns	[400]	[800]	[800]
<b>Existing installations</b>	[400]	[800]	[1200]

a/ Installations for the production of cement clinker in rotary kilns with a capacity >500 Mg/day or in other furnaces with a capacity >50 Mg/day. The O<sub>2</sub> reference content is 10%.

~~129.~~ Stationary engines: [still work in progress] [table with new ELVs to be inserted – To be completed with the work of the engine group ]

**Table 4. Suggested options for limit values for NO<sub>x</sub> emissions released from new stationary engines**

Capacity, technique, fuel specification	Limit value <sup>a/</sup> (mg/Nm <sup>3</sup> )
<del>Spark ignition (= Otto) engines, 4 stroke, &gt; 1 MW<sub>th</sub></del>	<del>=</del>
<del>— Lean burn engines</del>	<del>250</del>
<del>— All other engines</del>	<del>500</del>
<del>Compression ignition (= Diesel) engines, &gt; 5 MW<sub>th</sub></del>	<del>=</del>
<del>— Fuel: natural gas (jet ignition engines)</del>	<del>500</del>
<del>— Fuel: heavy fuel oil</del>	<del>600</del>
<del>— Fuel: diesel oil or gas oil</del>	<del>500</del>

~~a/ These values do not apply to engines running less than 500 hours a year. The O<sub>2</sub> reference content is 5%.~~

[Tapez un texte]

10. Production and processing of metals:

Table 5. Suggested options for limit values for NO<sub>x</sub> emissions released from primary iron and steel a/ production

Capacity, technique, fuel specification	Limit value (mg/Nm <sup>3</sup> )
New and existing sinter plant	400

Plant type	Suggested ELV for NO <sub>x</sub> [mg/Nm <sup>3</sup> ] [hourly, monthly, daily] <sup>2/</sup>		
	Option 1 <sup>1/</sup>	Option 2 <sup>1/</sup>	Option 3 <sup>1/</sup>
Sinter plants: New installation	[350]	[400]	[500]
Sinter plants: Existing installation	[350]	[400]	[500]

a/ Production and processing of metals: metal ore roasting or sintering installations, installations for the production of pig iron or steel (primary or secondary fusion) including continuous casting with a capacity exceeding 2.5 Mg/hour, installations for the processing of ferrous metals (hot rolling mills > 20 Mg/hour of crude steel).

11. Nitric acid production:

Table 6. Suggested options for limit values for NO<sub>x</sub> emissions from nitric acid production excluding acid concentration units

Capacity, technique, fuel specification	Limit value (mg/Nm <sup>3</sup> )
New installations	350
Existing installations	450

Type of installations	Suggested ELV for NO <sub>x</sub> [mg/Nm <sup>3</sup> ] [hourly, monthly, daily] <sup>2/</sup>		
	Option 1 <sup>1/</sup>	Option 2 <sup>1/</sup>	Option 3 <sup>1/</sup>
New installations	[40]	[154]	[200]
Existing installations	[100]	[185]	[200]

#### B. Canada<sup>3/</sup>

12. Limit values for controlling emissions of nitrogen oxides (NO<sub>x</sub>) from new stationary sources in the following stationary source categories will be determined on the basis of available information on control technology and levels including limit values applied in other countries and the following documents:

(a) Canadian Council of Ministers of the Environment (CCME). National Emission Guidelines for Stationary Combustion Turbines. December 1992. PN1072;

(b) Canada Gazette, Part I. Department of the Environment. Thermal Power Generation Emissions - National Guidelines for New Stationary Sources. May 15, 1993. pp. 1633-1638; and

(c) CME. National Emission Guidelines for Cement Kilns. March 1998. PN1284.

[Tapez un texte]

### C. United States of America<sup>3/</sup>

13. Limit values for controlling emissions of NO<sub>x</sub> from new stationary sources in the following stationary source categories are specified in the following documents:

- (a) Coal-fired Utility Units - 40 Code of Federal Regulations (C.F.R.) Part 76;
- (b) Electric Utility Steam Generating Units - 40 C.F.R. Part 60, Subpart D, and Subpart Da;
- (c) Industrial-Commercial-Institutional Steam Generating Units - 40 C.F.R. Part 60, Subpart Db;
- (d) Nitric Acid Plants - 40 C.F.R. Part 60, Subpart G;
- (e) Stationary Gas Turbines - 40 C.F.R. Part 60, Subpart GG;
- (f) Municipal Waste Combustors - 40 C.F.R. Part 60, Subpart Ea, and Subpart Eb; and
- (g) Hospital/Medical/Infectious Waste Incinerators - 40 C.F.R. Part 60, Subpart Ec.

#### Note

~~1/ Monitoring is to be understood as an overall activity, comprising measuring of emissions, mass balancing, etc. It can be carried out continuously or discontinuously.~~ The definitions of option 1, option 2 and option 3 are available in Informal document prepared by EGTEI for the 44th WGSR meeting. These options were designed to leave maximum flexibility for discussion at the WGSR.

2/ Proposed ELVs are based on BAT-AEL or current ELVs which usually are defined for a certain averaging period (mainly hourly, daily or monthly). The same averaging period could be also used for setting ELVs. See reference documents for more information. More specifics will be presented in the next drafts of the TA. Averaging periods normally relate to continuous measurements and can be made dependent to the height (ambition level) of the ELVs that will be finally selected. Higher (less strict) ELVs could be associated with shorter averaging periods and vice versa.

3/Up to now, no information has been provided by North America, then part B and C of the annex have not been modified yet.