

Presentation of annex VI on VOC emissions of the Gothenburg Protocol and corresponding guidance. Emissions limit values TFTEI technical secretariat

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Assessment and measurement of emissions of volatile organic compounds: Requirements, monitoring, best available techniques Integrated environmental permits: Improvement of permitting procedures in Belarus International Workshop – Minsk, October 11th and 12th 2019





Agenda

□ The UNECE Convention

- □ The Gothenburg Protocol and annex VI
- □ The guidelines and information available





CONVENTION OF THE LONG RANGE TRANSBOUNDARY AIR POLLUTION OR AIR CONVENTION (UNECE (United Nations Economic Commission for Europe)



- Signed in Geneva in 1979, entered into force in 1983
- 40th anniversary in 2019
- Dealing with air pollution on a broad regional basis – covering the UNECE region
- 8 Protocols to complete the framework Convention – 3 active

- Emissions reduction targets for key air pollutants
- Close cooperation between science and policy
- Multi-pollutant, multi-effect approach
- Effects- and evidence-based approach





CONVENTION OF THE LONG-RANGE TRANSBOUNDARY AIR POLLUTION - **AREAS OF WORK**

Policy: international agreements to reduce transboundary air pollution

• Protocols set targets and goals to reduce key pollutants that cause acid rain, eutrophisation, smog and ozone, heavy metals and persistent organic pollutants (POPs) and have serious health and environmental impacts

Science underpinning policy: key tenet

 The Cooperative Programme for Monitoring and Evaluation of the Longrange Transmission of Air Pollutants in Europe (EMEP) and the Working Group on Effects

Monitoring of compliance and implementation of obligations

Capacity-building and awareness-raising





CONVENTION OF THE LONG-RANGE TRANSBOUNDARY AIR POLLUTION - ACHIEVEMENTS

- ✓ POPs, Heavy Metals and Gothenburg Protocols amended in recent years
- ✓ 2012 amendments to Gothenburg Protocol update commitments (for 2020), added PM (including black carbon)
 - ✓ First international treaty to include a short-lived climate pollutant (black carbon)
 - ✓ Amended Protocol entered into force on October 7th, 2019







In 2014, the EB decided to upgrade the Expert Group on Techno-economic Issues to the status of task force, recognizing the ongoing need for the work of the task force

At the same time, experts involved in the discontinued Task Force on Heavy Metals and Task Force on POPs joined the new Task Force TFTEI, which began its work in 2015

Basic mandate:

- Update, assess and provide information on emissions abatement technologies to reduce SO2, NOx, VOC, PM (including black carbon), heavy metals and POPs from stationary and mobile sources, including costs
- Provide techno-scientific assistance to countries in Eastern Europe, the Caucuses and Central Asia
- Assist the Implementation Committee and cooperate with other technical bodies of the Convention as well as outside of it, as needed





Mandate revised in 2018 to be consistent with amended protocols and take account of recommendations and strategic priorities for the Convention put forward in its recent work (SAR, PRG, LTS)

The TFTEI will continue to examine, assess, validate and provide information on, emission abatement technologies for stationary and mobile sources

The functions are to:

(a) Update and assess on a regular basis the information on emission abatement technologies for the reduction of atmospheric emissions of SO2, NOx, VOCs, PM, including black carbon, heavy metals and POPs from stationary and mobile sources including the costs of these technologies;

(b) Initiate work to assess information on emissions abatement technologies and measures for the reduction of the methane emissions from key sources (except agriculture);

(c) Initiate work to assess information on emission abatement technologies for the reduction of air pollutant shipping emissions;





(d) Investigate co-benefits and trade-offs between emission abatement technologies and policies under consideration to address air pollution, climate change and biodiversity;

(e) Create, maintain and keep updated, a regional clearing house of information on control technologies for emissions of SO2, NOx, VOCs, PM (including black carbon), heavy metals and persistent organic pollutants

aim of having single point of reference for validated information to Parties including control technology information for *emissions of methane; and shipping emissions, and for ammonia in a dedicated section of the clearing house*

(f) Develop techno-economic data for estimating the costs of implementation of best available technologies and compliance with requirements of the Gothenburg Protocol in different sectors, and promote such tools, especially in Eastern Europe, the Caucasus and Central Asia;





((g) Disseminate and promote information on abatement technologies, such as the guidance documents on best available techniques and technical annexes to the protocols to the Convention;

- (h) Carry out tasks specified for it in its approved biennial workplans and (i) other tasks requested by the EB or the WGSR
- (j) Support the Convention's capacity-building activities in countries in Eastern Europe, the Caucasus and Central Asia; and
- (k) Provide assistance to the Implementation Committee





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Gothenburg Protocol, amended in 2012 : objectives

 Multi pollutants – multi effects : reduce impacts of SO2, NOx, PM2,5, NH3 and VOC emissions to reduce impacts of pollutants on health and the environment, natural ecosystems, materials, crops, and the climate in the short and long term due to acidification eutrophisation, particulate matter and ozone as a result of transboundary atmospheric transport (art 2.1)





Gothenburg Protocol, amended in 2012 : main charactristics

- emission reduction of sulphur, NOx, VOCs, NH3 and PM (targets for 2020)
- ✓ ELVs/BATs to stationary and new mobile sources (*Guidance docs*)
- \checkmark LVs for the motor fuels and VOCs in products
- ✓ specific NH3control measures
- \checkmark emission inventories and projections





Gothenburg Protocol, amended in 2012 : Basic obligations

 Reduce and maintain emissions in accordance with emission reduction commitments for a number of Parties (annex II) to be achieved in a given time scale (Annex VII)

Table 3

Emission reduction commitments for nitrogen oxides for 2020 and beyond^a

	Convention Party	<i>Emission levels 2005 in thousands of tonnes of</i> NO_2	Reduction from 2005 level (%)
1	Austria	231	37
2	Belarus	171	25
3	Belgium	291	41
4	Bulgaria	154	41
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Belarus (%/2005): NOx: -25% SO2: -20% PM2,5: -10% VOC: -15% NH3: -3%





Gothenburg Protocol, amended in 2012 : Basic obligations (art 3.3 to 3.6)

- Shall apply the limit values of annex IV (SO2), V (NOx), VI (VOC) and X (PM) insofar as it is technically and economically feasible and taking into consideration the costs and advantages (art 3.3)
 - As alternative, may apply different emission reduction strategies that achieve equivalent overall emission levels (art 3.3)
- Shall apply the limit values for fuels and new mobile sources of annex VIII (art 3.5)
- Should apply best available techniques and as it considered appropriate, measures to control black carbon taking into account guidance adopted (art 3.6)





Gothenburg Protocol, amended in 2012 : Basic obligations (art 3.7 and 3.8)

- Shall apply the limit values of annex XI (VOC in products), insofar as it is technically and economically feasible and taking into consideration the costs and advantages (art 3.7)
- **apply as a minimum NH3 control measures** of annex IX (art 3.8a)
- Consider best available techniques for NH3 taking into account guidance adopted (art 3.8b)
- Timescales in annex VII





Gothenburg Protocol, amended in 2012 : time scales

For Party to the Convention that becomes a Party to the present Protocol between 1 January 2013 and 31 December 2019 may declare upon ratification, acceptance, approval of, or accession to, the present Protocol that it will extend any or all of the timescales for application of the limit values referred to in article 3, paragraphs 2, 3, 5 and 7, as follows:

(a) For existing stationary sources, up to 15 years after the date of entry into force of the present Protocol for the Party in question;

(b) For fuels and new mobile sources, up to 5 years after the date of entry into force of the present Protocol for the Party in question; and

(c) For VOCs in products, up to 5 years after the date of entry into force of the present Protocol for the Party in question.





- Definitions (art 3)
- Control of emissions (art 4)
- Specific limit values for substances harmful to human health (art 5)
- Emission Limit Values (ELVs) for different activities (art 7 to 22)
- Establishment of solvent management plans for activities using solvents (appendix)





Definitions (art 3)

- "Volatile organic compound" (VOC) means any organic compound as well as the fraction of creosote, having at 293.15 K a vapour pressure of 0.01 kPa or more, or having a corresponding volatility under the particular conditions of use;
- Organic solvent" means any VOC which is used alone or in combination with other agents, and without undergoing a chemical change, to dissolve raw material, products or waste materials, or is used as a cleaning agent to dissolve contaminants, or as a dissolver, or as a dispersion medium, or as a viscosity adjuster, or as a surface tension adjuster, or a plasticizer, or as a preservative;





Definitions (art 3.x)

- "Emission limit value" (ELV) means the maximum quantity of VOC (except methane) emitted from an installation which is not to be exceeded during normal operation.
- For waste gases, it is expressed in terms of mass of VOC per volume of waste gases (expressed as mg C/m3 unless specified otherwise), assuming standard conditions for temperature and pressure for dry gas.
- Gas volumes that are added to the waste gas for cooling or dilution purposes shall not be considered when determining the mass concentration of the pollutant in the waste gases.
- Emission limit values for waste gases are indicated as ELVc
- Emission limit values for fugitive emissions are indicated as ELVf





ANNEX VI OF THE PROTOCOL

Emission limit values (ELV) for substances harmful for human health (art 5)

(a) halogenated VOCs, which are assigned the following risk phrases:"suspected of causing cancer" and/or "suspected of causing genetic defects":

if the mass flow of the sum of the considered compounds is greater than or equal to 100 g/h

20 mg/m3 (expressed as the mass sum of individual compounds)

(b) VOCs, which are assigned the following risk phrases: "may cause cancer", "may cause genetic defects", "may cause cancer by inhalation", "may damage fertility", "may damage the unborn child"

If the mass flow of the sum of the considered compounds is greater than or equal to 10 g/h.

2 mg/m3 (expressed as the mass sum of individual compounds)



ANNEX VI OF THE PROTOCOL



Activities covered (art 8 to 22):

- Storage and distribution of petrol
- A series of activities using organic solvents such as
 - Adhesive coating
 - Wood and plastic lamination
 - Coating of cars, trucks, buses
 - Coating in various industrial sectors (metal, plastic, wood, paper)
 - Coil coating
 - Dry cleaning
 - Manufacture of coatings, varnishes, inks and adhesives

- Manufacture of coatings, varnishes, inks and adhesives
- Printing activities
- Pharmaceutical products
- Rubber processing
- Surface cleaning
- Animal fat and vegetable oils
- Vehicles refinishing









Type of ELVs implemented (art 8 to 22):

- ELVs expressed as total organic carbon (TOC), concentration of carbon in the gas stream, usually expressed in mg C per cubic meter (mg C/m3), in the standard conditions (STP), methane can be included or not,
- ELVs related to one or several substances which are assigned to specific risk phrases : expressed in mg of substances per cubic meter (mg VOC/m3) in the standard conditions (Article 5 of annex VI),
- ELVs expressed as a total VOC emissions, expressed in % of solvent input, or g VOC/unit of activity (g VOC/m², g VOC/kg dry extract, ...) for some activities using solvents or % of petrol throughput for activities related to storage and handling of petrol,
- Fugitive emission of VOC expressed in % of solvent input or in other units





ANNEX VI OF THE PROTOCOL

12. Coating activities (metal, textile, fabric, film, plastic, paper and wooden surfaces coating):

Table 6Limit values for coating activities in various industrial sectors

Activity and threshold	ELV for VOC (daily for ELVc and yearly for ELVf and total ELV)
Wood coating	ELVc = 100^{a} mg C/m ³
(solvent consumption	ELVf = 25 wt-% or less of the solvent input
15 Mg/year–25 Mg/year)	<i>Or</i> total ELV of 1.6 kg or less of VOC/kg of solid input
Wood coating	ELVc = 50 mg C/m ³ for drying and 75 mg C/m ³ for coating
(solvent consumption	ELVf = 20 wt-% or less of the solvent input
25 Mg/year–200 Mg/year)	<i>Or</i> total ELV of 1 kg or less of VOC/kg of solid input
Wood coating	ELVc = 50 mg C/m ³ for drying and 75 mg C/m ³ for coating
(solvent consumption	ELVf = 15 wt-% or less of the solvent input
> 200 Mg/year)	<i>Or</i> total ELV of 0.75 kg or less of VOC/kg of solid input





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CONTEXT OF THE GUIDELINES



Why to develop Guidelines

- VOC a complex pollutant : group of substances with different chemical properties, stack emissions and fugitive emissions, complex measurement...
- There were needs expressed for providing assistance and guidance to the EECCA experts on estimation and measurement of VOCs emissions

Develop guidelines to facilitate the ratification of the Protocol by EECCA



Economic Commission for Europe

Executive Body for the Convention on Long-range Transboundary Air Pollution

Working Group on Strategies and Review

Fifty-fourth session Geneva, 13 and 14 December 2016 Item 3 of the provisional agenda Progress in the implementation of the 2016–2017 workplan

Draft guidelines for estimation and measurement of emissions of volatile organic compounds"

Prepared by the Task Force on Techno-economic issues





TFTEI

GUIDELINES FOR ESTIMATION AND MEASUREMENT OF EMISSIONS OF VOC

- Context and aim of the guidelines
- Types of ELVs implemented in annex VI
- VOC measurement techniques
- Solvent management plan
- Control of ELVs for selected activities (other than solvents)
- Summary of measurement methods for the different activities covered by annex VI
- Example of development of a solvent management plan





INFORMATION ON VOC MEASUREMENT TECHNIQUES

- ✓ Total VOC concentration measurement techniques
 - Flame ionisation detector (FID)
 - Catalytic oxidation and non dispersive infrared absorption
 - Photoionisation detection (PID)
- ✓ Individual VOC substance concentration measurement techniques
 - Sampling, gas chromatography and analysis by FID
 - Non Dispersive Infrared Spectrometry (NDIR)
 - Fourier Transform Infrared absorption (FTIR)





INFORMATION ON HOW TO DEVELOP A SOLVENT MANAGEMENT PLAN







OTHER ACTIVITIES

Loading /unloading of mobile containers at terminals (excluding loading of seagoing ships)

Emissions from loading and unloading of mobile containers at terminals can be estimated through equations developed by API and translated in several guidances from CONCAWE and US EPA.

The ELV implemented requires measurement in the vent of the loading and unloading platform. If equipped with a recovery unit, the measurement devices have to be installed on the vent to the atmosphere of this recovery unit.





OTHER ACTIVITIES

Storage of petrol at service-stations (Stage I)

Measurement of emissions is not required if a vapour balancing unit is present. The VOC vapours exit the tank through a return line to the mobile container.







Web site:

http://www.unece.org/fileadmin/DAM/env/documents/2016/AIR/WGSR/Docs_ December/E_ECE_EBAIR_WG5_2016_4.pdf



Ground-level Ozone (Gottlenburg Protocol) to the Convention on Long-range Emission of volume of the Convention on Long-range Transboundary Air Pollution not only introduce commitments for Parties to reduce emissions of volumile organic compounds (VUCS), but also madatory emission limit values for different activities in annexes VI and XI to the Protocol and the establishment of solvent management plans for activities using solvent covered by annex VI. The present document provides guidelines to measure VOCs emissions, develop solvent management plans and calculate emissions. It corresponds to the requirement in annex VI to the annexed Protocol that "methods of calculation will be reflected in the guidance adopted by the Executive Body".

The draft guidelines are being presented to the Working Group in accordance with the mandate provided by the Executive Body (see ECEB ARI 13); a muery. The Working Group considered an earlier version of the guidelines at its thirty-third session (Genera, 15–17 December 2015). They have subsequently been updated, following comments received from Belans and the ad hoc during group established at the request of the Working Group at that vession. It is expected that a final dark, incorporating any comments made by the Working Group at the present session, will then be submitted to the Executive Body for the Convention for adoption at its thirty-sixth session (Genera, 15–16 December 2016).

** The present document is being issued without formal editing.







Thank you very much for your attention! Questions?

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MINISTÈRE DE LA TRANSITION ÉCOLOGIQUE ET SOLIDAIRE