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Working Group on Strategies and Review

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Item 3 of the provisional agenda

OPTIONS FOR REVISING THE GOTHENBURG PROTOCOL

TECHNO-ECONOMIC ISSUES

Report by the Co-Chairs of the Expert Group on Techno-economic Issues

1. This report presents the results of the seventeenth meeting of the Expert Group on Techno-economic Issues, held on 6 and 7 May 2010 in Rome in accordance with item 1.7 of the 2010 workplan for the implementation of the Convention (ECE/EB.AIR/99/Add.2) adopted by the Executive Body at its twenty-seventh session. It also presents progress in the work of the Expert Group's subgroup on small combustion installations, including the results of its meeting held on 6 May 2010.[1]

[1] Presentations made at the meetings are available at http://www.citepa.org/forums/egtei/egtei_meetings.htm.

A. Attendance

2. Experts from the following Parties to the Convention attended the meeting of the Expert Group: Austria, Belarus, Belgium, Finland, France, Germany, Italy, the Netherlands, Norway, Poland, the Russian Federation, Spain, Sweden, Switzerland and the United Kingdom of Great Britain and Northern Ireland. The participation of experts from Belarus and the Russian Federation was financially supported by Sweden and France. Also present were industry experts from the oil companies' European association for environment, health and safety in refining (CONCAWE), Electricité de France (EDF), the European Confederation of Iron and Steel Industries (EUROFER), the European Association of Internal Combustion Engine Manufacturers (EUROMOT), the European Solvents Industry Group (ESIG) and the European Tyre and Rubber Manufaturers' Association (ETRMA). The French-German Institute for Environmental Research (IFARE), the Interprofessional Technical Centre for Studies on Atmospheric Pollution (CITEPA), the French Agency of Environment and Energy Management (ADEME) and the International Institute for Applied Systems Analysis (IIASA) also attended the meeting.

B. Organization of work

3. Mr. J.-G. Bartaire (France) and Mr. T. Pignatelli (Italy) co-chaired the meeting, which was hosted by the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA). Simultaneous interpretation was provided during the main session of 7 June to facilitate active participation of the Russian-speaking experts.

I. INTRODUCTORY REMARKS AND OBJECTIVES

4. The Co-Chairs introduced the main topics covered at the meeting: (a) the results of the work on the draft revised technical annexes to the 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol) carried out by the ad hoc group of technical experts in parallel to the forty-sixth session of the Working Group on Strategies and Review in April 2010, as well as the further work to be undertaken at the forty-seventh session of the Working Group in September 2011; (b) the cooperation of the Expert Group with a number of European industry associations; and (c) the draft workplan for 2011.

5. Mr. Pignatelli highlighted the main outcomes of the work of the ad hoc group of technical experts, which had aimed at clarifying technical aspects related to the emission limit values (ELVs) proposed by the Expert Group for the revised annexes with respect to a number of sectors, including large combustion plants; refineries; Claus plants; sulphur content of gas oil; sinter plants; steel plants; and pulp and waste incineration; as well as at collecting preliminary views from experts about technical preferences among the three options on ELVs suggested by the Expert Group.

6. The Director General of the Russian Scientific Research Institute of Atmospheric Air Protection (SRI Atmosphere) proposed cooperation between the Expert Group and the Coordinating Group for countries in Eastern Europe, the Caucasus and Central Asia that was established by the Executive Body at its twenty-seventh session in 2009 involving:

(a) Joint implementation of integrated techno-economic analysis at the national level;

(b) A study on tentative costs and technical aspects of implementation of technical standards that were based on best available technologies (BAT) in Belarus, the Russian Federation and Ukraine, in compliance with the three most recent protocols to the Convention;

(c) Contributions to the project on "Facilitating the implementation and ratification of the three most recent protocols to the Convention in Eastern Europe, the Caucasus and Central Asia", including on cost-benefit issues in the field of national air quality management in Belarus, Kazakhstan and the Russian Federation;

(d) Possible adaptation of the Expert Group's techno-economic database (ECODAT) tool to collect data for the countries in Eastern Europe, the Caucasus and Central Asia, with the addition of a Russian language module.

II. PROGRESS OF THE EXPERT GROUP

7. The representative of Switzerland presented work on the effects on climate change and human health of black carbon and brown carbon. He highlighted that biomass combustion led to three types of primary aerosols— salts (from ash constituents); soot, found as black carbon in the atmosphere; and condensable organic compounds (COC). In addition, volatile organic compounds (VOCs) could lead to secondary organic aerosols (SOA) and nitrogen oxide (NOx) could form nitrates. COC and SOA were found as brown carbon in the atmosphere. Depending on the combustion conditions (temperature, oxygen, and other parameters), the ratio of black carbon to brown carbon could vary widely. As to their effects, black carbon strongly and directly contributed to global warming and had health effects. Brown carbon's contribution to global temperature was unclear and smaller, but its negative health effects could be clearly demonstrated. When assessing the overall impact on global temperature, one had to take into account that all particles acted as cloud condensation nuclei contributing to indirect global cooling, which, according to the Intergovernmental Panel on Climate Change (IPCC), was dominating the net effect. The Swiss representative concluded that due to its negative effect on health and partially also on climate, the first priority for biomass combustion was to reduce products from incomplete combustion.

8. The representative of Belgium presented a comparative analysis between the provisions in the current European Union (EU) legislation and the ELVs proposed by the Expert Group in the draft revised annexes, highlighting a number of items to be taken into consideration when comparing values (e.g., binding character of the values, flexibilities, dates of application of the ELVs, etc.). He concluded that the comparison was not straightforward, due to the different degree of flexibility of the provisions in the Gothenburg Protocol and the EU Directives. In addition, he noted that the ELVs in the Protocol's technical annexes were currently less binding, and he cautioned that the inclusion of detailed boundary provisions to the ELVs should be avoided so as not to create further obstacles for countries wishing to ratify the Protocol.

9. The representative of CONCAWE delivered a presentation on costs for NO_x, sulphur dioxide (SO_2) and particulate matter (PM) reduction in refinery plants, based upon data from CONCAWE, the Expert Group and IIASA. For NO_x abatement measures, in some cases the

Expert Group's cost data were in line with CONCAWE and oil company data, while in other cases (e.g., Selective Catalytic Reduction (SCR)), costs estimated by companies were 10 to 15 times higher than the Expert Group data. Furthermore, with regard to sulphur oxide (SO_x) abatement measures, the costs estimated by companies were significantly higher than those by the Expert Group and IIASA.

10. The representative from Italy presented an overview of the current activities concerning carbon capture and storage (CCS) carried out by ENEA, including in cooperation with other Italian electrical utilities, such as the national Italian energy provider, Ente Nazionale per l'Energia eLettrica (ENEL) and private companies (the oil, gas and petrochemicals company ENI and Società Tecnologie Avanzate Carbone (SOTACARBO)). The research and development activities, carried out through experimental facilities and demonstration plants, aimed mainly at: lowering the cost of the carbon dioxide (CO_2) stored underground to values less than €25–30/t CO_2; reducing the investment and running costs of CCS installation; reducing the added energy required by CCS technologies; completing the mapping of geological sites suitable for CO_2 storage in Europe and in Italy; starting CCS demonstration projects on an industrial scale; and supporting EU member States in implementing the EU Directive on CO_2 Geological Storage. Futhermore, a number of additional research activities were carried out under the auspices of the Italian Ministry of Education, Universities and Research concerning coal gasification; syngas treatment and CO_2 capture with solid sorbents; hydrogen (H2) production and burning for power generation; production of hydrogen and clean fuel gas (high temperature desulfurization) from coal; and CO_2 capture from syngas using solvents, small power generation systems based on syngas and hydrogen.

11. The representative of ENEL presented activities related to a CCS demonstration project on an existing plant in Porto Tolle in Northern Italy involving retrofitting that 660 megawatt electrical (MWe) coal-fired unit power station with CO_2 post combustion capture equipment and starting CO_2 underground storage in an offshore saline aquifer by 2015. Other research and development supporting activities in progress involved a CO_2 capture pilot plant (a coal-fired power station in Brindisi) for CO_2 separation via amine scrubbing. The plant consisted of a flue gas pretreatment section — which was able to remove completely the PM and the sulphur trioxide (SO_3) and to reduce the SO_2 level below 20 mg/Nm3 — and of a CO_2 separation unit. Its capturing capacity was about 2,5 t/h of CO_2. ENI contributed to the integrated project on storage aspects.

12. The French Co-Chair of the Expert Group reported on a bilateral meeting with IIASA, held in Laxenburg, Austria, on 8 March 2010, to improve the coordination of the work by IIASA and the Expert Group in relating to abatement technologies and costs of implementation. In addition, ad hoc meetings with industrial associations had been envisaged for better characterization of the related abatement technologies and costs. Finally, in early June 2010 another meeting was planned at IIASA among experts representing EUROELECTRIC, EUROFER and the Expert Group.

13. A representative of Belarus presented an overview of the small combustion installations in Belarus, providing details about their fuel characteristics and distribution by capacity and monitored emissions by pollutant, as well as the ELVs according to the current legislation in

Belarus. He proposed setting a tentative 15-year phase-out time limit for the existing plants that had entered into service by 1985, but without setting ELVs for such plants.

14. The Italian Co-Chair informed the Expert Group about a test being carried out, in cooperation with IIASA, attempting to correlate the Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) output emissions with the ELVs proposed by the Expert Group for the revised annexes to the Gothenburg Protocol. The test, carried out using the GAINS-Italy model on Italy's scenarios, aimed at developing emission scenarios comparable with the three options that had been suggested by the Expert Group. Preliminary results of the test would be presented at the thirty-eighth meeting of the Task Force on Integrated Assessment Modeling, which would be held in Dublin from 17 to 19 June 2010.

III. PROGRESS IN THE WORK OF THE SUBGROUP ON SMALL COMBUSTION INSTALLATIONS — PROPOSALS FOR REDUCING DUST EMISSIONS

15. The Chair of the Expert Group's subgroup on small combustion installations (SCIs) reported on the progress made by the subgroup. At its forty-fifth session, the Working Group on Strategies and Review had invited the Expert Group to explore possibilities of establishing ELVs for dust for SCIs, i.e., installations with a thermal input of less than 50 megawatts (MW). At its sixteenth meeting, the Expert Group had delegated that task to its newly established subgroup on SCIs, led by Switzerland, and also mandated to consider black carbon emissions from SCIs. The subgroup had held two meetings in Zurich (on 3 February and 26 March 2010) and a third one back to back with the Expert Group's meeting on 6 May 2010. Experts from Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Sweden and Switzerland had participated at the meetings of the subgroup.

16. Switzerland had commissioned a report on the state of the art of biomass combustion and achievable emission levels for PM with a view to providing technical background information for the subgroup with a focus on fuelwood combustion. The report, prepared by a professor from the Lucerne University of Applied Sciences, also included considerations on black carbon emissions from SCIs (referred to in para. 7 above). The report would be finalized in June 2010 and made available on the website of the Expert Group.

17. Proposed options for reducing dust emissions from SCIs were also presented (see section A below).[2] The subgroup had yet to further substantiate the options in a report to be finalized in June 2010. The proposed options for ELVs were supported by a majority of the experts, although some experts advocated different ways of categorizing SCIs, different sampling and measurement methods or different oxygen reference contents. It was also argued that the suggested options for ELVs were too ambitious for many countries in Eastern Europe, the Caucasus and Central Asia, especially as regarded the existing installations. However, that issue, being of a policy nature, was left to the Working Group on Strategies and Review to tackle during the negotiation process, when discussing the technical opportunities for introducing more flexibility into the revised Gothenburg Protocol for those countries.

[2] Suggested options for ELVs refer to solid particles collected by outstack filtration on heated filters at 160°C.

A. Options for reducing dust emissions from small combustion installations

1. Combustion installations with a thermal input smaller than [300]/[400]/[500] kW

18. The experts suggested that dust emissions from new residential combustion stoves and boilers with a thermal input less than [300]/[400]/[500] kW be regulated by means of product standards that were in accordance with European Committee for Standardization (CEN) standards (e.g., Standard EN 303-5) or with equivalent product standards in the United States and Canada.[3] Countries applying such product standards would be allowed to define additional national requirements, e.g., ELVs. Table 1 below presents options for additional ELVs for dust.

Table 1: Suggested options for limit values for dust emissions released from new small biomass combustion installations with a thermal input < [300]/[400]/[500] kW to be used with product standards (dioxygen (O_2) reference content: 13 per cent)

	Suggested ELV for dust (mg/m_n^3)		
	ELV 1[4]	**ELV 2**[5]	**ELV 3**[6]
Open/closed fireplaces	40	75	110
Wood stoves	40	75	110
Log wood boilers (with heat storage tank)	20	40	110
Pellet stoves and boilers	20	40	110
Automatic combustion plant	20	60	110

19. The experts also proposed the primary measures for reducing emissions from existing residential combustion stoves and boilers, including public information and awareness-raising programmes (for example, on proper operation of stoves and boilers and on the use of only dry and untreated wood); and programmes to promote the replacement of the eldest existing boilers and stoves by modern appliances and/or obligations to exchange or to retrofit old appliances.

2. Combustion installations with a thermal input [50]/[70]/[100] kW–1 MW

20. It was suggested to amend the draft technical annex VII to the revised Gothenburg Protocol with the options for ELVs for combustion installations with a thermal input [50]/[70]/[100] kW–1 MW (see table 2 below). Corresponding abatement technologies

[3] This is in line with chapter V.D of the draft Guidance document on best available techniques to control emissions of persistent organic pollutants from stationary sources (ECE/EB/AIR/2009/14).

[4] ELV 1 is analogous to a future German regulation (1. BImSchV, tier 2, entry into force after 31 January 2014), except for open fireplaces.

[5] ELV 2 is analogous to future Swiss-type approval standards (Ordinance on Air Pollution Control, tier 2, entry into force after 1 January 2011).

[6] ELV 3 is analogous to European Standard EN 303-5, class 3, values converted from 10 per cent O_2 reference content to 13 per cent.

(electrostatic precipitator (ESP), fabric filter (FF), cyclone) are shown for information only, but not intended for inclusion in the technical annex.

Table 2: Suggested options for limit values for dust emissions released from boilers [and process heaters] with a thermal input of [50]/[70]/[100] kW–1 MW (O_2 reference content: wood, other solid biomass and peat: 13 per cent; coal, lignite and other fossil solid fuels: 6 per cent)

		Suggested ELV for dust (mg/m_n^3)		
		ELV 1	**ELV 2**	**ELV 3**
Solid fuels [50][70][100]–500 kW	New installations	30 Simple ESP	50 Simple ESP	150 cyclone
	Existing installations	100 cyclone	150 cyclone	150 cyclone
Solid fuels 500 kW–1 MW	New installations	20 Improved ESP, FF	50 Simple ESP	150 cyclone
	Existing installations	30 Simple ESP	150 cyclone	150 cyclone

3. Combustion installations with a thermal input 1–50 MW

21. It was suggested to amend the draft technical annex VII to the revised Gothenburg Protocol with the options for ELVs for combustion installations with a thermal input 1–50 MW, as presented in table 3 below. Again, corresponding abatement technologies (electrostatic precipitator (ESP), fabric filter (FF), cyclone) are shown for information only, but not intended for inclusion in the technical annex.

Table 3: Suggested options for limit values for dust emissions released from boilers [and process heaters] with a thermal input of 1–50 MW (O_2 reference content: wood, other solid biomass and peat: 11 per cent; coal, lignite and other fossil solid fuels: 6 per cent; liquid fuels, including liquid biofuels: 3 per cent)

		Suggested ELV for dust (mg/m_n^3)		
		ELV1	**ELV2**	**ELV3**
Solid fuels 1–5 MW	New installations	10 Improved ESP, FF	20 Improved ESP, FF	150 cyclone
	Existing installations	20 Improved ESP	50 Simple ESP	150 cyclone
Solid fuels 5–50 MW	New Installations	10 Improved ESP, FF	20 Improved ESP, FF	50 Simple ESP
	Existing installations	20 Improved ESP, FF	30 Simple ESP	50 Simple ESP
Liquid fuels 1–5 MW	New installations	10 Improved ESP, FF	20 Improved ESP, FF	150 cyclone
	Existing installations	20 Improved ESP	50 Simple ESP	150 cyclone
Liquid fuels 5–50 MW	New installations	10 Improved ESP, FF	20 Improved ESP, FF	50 Simple ESP
	Existing installations	20 Improved ESP, FF	30 Simple ESP	50 Simple ESP

22. The Expert Group took note of the above proposals for reducing dust emissions from SCIs and decided to submit them to the Working Group on Strategies and Review for further consideration at its forty-seventh session, in September 2010.

IV. FURTHER WORK

23. The Expert Group proposed items for its 2011 workplan as follows:

(a) Provide further technical explanations on the draft revised annexes to the Gothenburg Protocol, including on the new annex on PM, taking into account the outcome of the work of the subgroup on SCIs, meeting in parallel to the forty-seventh session of the Working Group in September 2010;

(b) Carry out a work aimed at estimating the costs of reduction techniques associated with the options proposed by the Expert Group in the draft revised annexes;

(c) Continue to cooperate with the Centre for Integrated Assessment Modelling (CIAM) on improving the representation of large combustion plants (LCP) and steel industry sectors in GAINS. Explore the possibility of case studies in the United Kingdom of Great Britain and Northern Ireland, France, Germany and Italy;

(d) Make progress on the update of the Expert Group's methodology for LCP;

(e) Continue to cooperate with the European Integrated Pollution Prevention and Control Bureau, including for updating cost data of BAT reference documents for some industry sectors such as steel, cement and glass;

(f) Explore possibilities for cooperating with the Coordinating Group for Eastern Europe, the Caucasus and Central Asia and submit proposals for a work programme at the forty-seventh session of the Working Group;

(g) In cooperation with ADEME, continue the work on emerging technologies for combustion plants lower than 500 MW;

(h) Cooperate with the Expert Group on Black Carbon;

(i) Continue the cooperation with the Institute of Prospective Technological Studies in Seville;

(j) Report on progress to the sessions of the Working Group on Strategies and Review.

V. NEXT MEETING

24. The Expert Group decided to hold its eighteenth meeting, tentatively scheduled for mid-October 2010, in France (date and venue to be specified).