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DRAFT 2006 REVIEW OF STRATEGIES AND POLICIES FOR AIR POLLUTION ABATEMENT

Note from the Secretariat*

Addendum

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* The present document was submitted late due to resources constraints.

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V. IMPLEMENTATION OF PROTOCOLS AND PROGRESS ON NATIONAL STRATEGIES AND POLICIES

A. The 1988 Protocol Concerning the Control of Emissions of Nitrogen Oxides or Their Transboundary Fluxes

Thirty-one Parties (as of 22 June 2006):

Austria, Belarus, Belgium, Bulgaria, Canada, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Liechtenstein, Lithuania, Luxembourg, the Netherlands, Norway, the Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, the United Kingdom, the United States and the European Community.

1. Overview

1. The 1988 Sofia Protocol, which entered into force in 1991, requires that Parties should, as soon as possible and as a first step, take effective measures to control and/or reduce their national annual emissions of nitrogen oxides (NOx) or their transboundary fluxes. The target set by the Protocol is for national annual emissions not to exceed by 31 December 1994 their 1987 level (with the exception of the United States that chose 1978 as its base year). Parties also agreed to introduce emissions standards and control measures to reduce NOx emissions from both stationary and mobile sources no later than two years after the Protocol's entry into force.

2. The Protocol also requires Parties to, as soon as possible and no later than two years after the date of its entry into force, make unleaded fuel sufficiently available to facilitate the circulation of vehicles equipped with catalytic converters.

3. In order to support a scientifically approved method to reduce NOx emissions, high priority is given to research and monitoring. An annex to the Protocol provides guidance to the Parties in identifying NOx control options and techniques in the implementation of the obligations under the Protocol.

2. Progress in implementation of the Protocol

4. Officially reported emission data for 2004 indicated that 23 Parties to the Protocol had achieved their emission reduction obligations, while two Parties had failed to meet their targets. Four Parties had not provided 2004 data but previously reported data from them indicated that they had met their emission reduction obligations.

5. *Austria* reported that its NOx emissions from stationary sources dropped by almost one third between 1987 and 2004 (though total emissions in 2004 remained the same as in 1997 due to an increase in emissions from mobile sources). *Cyprus's* emissions fell from 21.65 kilotonnes in 2000 to 18.36 kilotonnes in 2004 (a 15% drop). *Finland* reported a 30% drop in NOx emissions from stationary sources since 1980. *France* reported a drop in emissions of 37% between 1980 and 2004 (33% between 1990 and 2004); it had planned a reduction of 30% between 1980 and 1998, although this target was only achieved in 2001. In *Germany*, NOx emissions decreased from 3,350 kilotonnes in 1987 to 2,055 kilotonnes (a 38% drop) in 1994, the target year of the Protocol; this was more than that required by the Protocol and emissions have continued to decrease (e.g. to 1,584 kilo tonnes in 2000). *Hungary* reported that it had met its basic target under the Protocol, while *the Netherlands* indicated it had achieved a reduction in NOx emissions of more than 35% over the period 1980 to 2004. In the European Territory of *Russia* (ETR) NOx emissions dropped by 17.3% between 1987 and 2004, while they increased slightly (by 0.2%) between 2003 and 2004. *The United Kingdom* reduced emissions of nitrogen dioxide from 2,737 kilo tonnes in 1980 to 1,621 kilo tonnes in 2004, indicating a reduction of 41%. *The United States'* described its Acid Rain Programme that had a NOx component with a target to achieve and maintain a 2 million tonne reduction from coal-fired electric utility units relative to the NOx emission levels projected for 2000. This target was achieved in 2000 with the total NOx emissions from those units reduced to 4.5 million tonnes.

3. Measures to reduce NOx emissions from mobile sources

6. The transport sector was identified as a main source of NOx emissions in most countries. It accounted for up to 46% of national NOx emissions in *Cyprus* in 2004 (with a total of 18.36 kilo tonnes) and *the United Kingdom* reported that road transport represented 40% of NOx emissions, with this figure reaching 55% in urban areas like London.

7. Measures promoted in *Cyprus* to address road transport NOx emissions included enforcement of speed limits and efficient traffic management. *The Czech Republic* was subsidising improvements to the public transport system. *Denmark* and *Finland* both reported the importance of catalytic converters for passenger cars. *Italy* emphasized a modal shift, from road to rail transport and the improvement in vehicle fuel efficiency. *Spain* introduced, in 2005, "The Strategic Infrastructure And Transport Plan (PEIT)". This plan promoted intermodality, improved accessibility and an open public transport system. One specific measure was promoting, through fiscal incentives, the substitution of older, more polluting vehicles, with newer, cleaner ones (both private cars and heavy duty vehicles).

8. In *the United States*, new tailpipe emissions and low-sulphur fuel standards for light duty vehicles took effect in 2004. These new standards required passenger vehicles to be 77 to

95% cleaner. The programme was expected to reduce annual emissions of NOx by 2.6 kilotonnes and non-methane hydrocarbons by 115,000 tonnes by 2030 (95% below current levels).

9. Since 2000 *Norway* has introduced a differentiated annual tax for heavy road vehicles according to emission levels (including NOx). Nonetheless, it identified ship and boat traffic, including fishing vessels, as the largest mobile source category, with emissions from coastal traffic and fishing vessels totalling 40% of national NOx emissions in 2004. Consequently, *Norway* ratified Annex VI on air pollution from ships to the MARPOL Convention of the International Maritime Organisation.

10. The European Union Directive 1999/96/EC introduced different stages of emission standards that are applicable to new types of heavy-duty vehicles and engines. These are commonly known as EURO 1, 2, 3, 4 and 5 and are applicable from 1994, 1997, 2001, 2006 and 2009 respectively. Since 2004, *the Russian Federation* follows the EURO 2 and EURO 3 norms while it is planning to implement EURO 4 norms from 2008. *Spain* also reported changing its limit values for both cars and heavy-duty vehicles based on the EURO standards; over the last decades it moved to EURO 3 for heavy-duty vehicles and EURO 4 for cars and other light vehicles. In addition, *Spain* reported that it had identified steps to improve its standards to EURO 4 and 5. *Switzerland* noted that it had adopted a series of Ordinances relating to the Laws on Road Transport, Navigation and Aviation that set emission standards similar to EURO norms 2, 3, 4 and 5.

4. Abatement measures for NOx from stationary sources

11. Technical measures used by Parties to reduce NOx emissions from stationary sources include: selective catalytic reduction units retrofitted on existing coal- and gas-fired electric utility boilers in *Canada*; low NOx burners retrofitted to a large number of combustion units in *Canada, France, the Netherlands, Norway, Slovenia and Spain*; and, a cap-and-trade programme for large electric generating units and large industrial boilers and turbines adopted by some States in *the United States*. Emissions from large stationary sources were controlled through permits and licences in *Norway* and *Germany*.

12. Several initiatives align *Canada's* smog-forming emission standards with those of the United States Environmental Protection Agency. In 2005, the Canadian provinces of Nova Scotia, Quebec and Ontario promulgated emissions standards and caps for different sectors and monitoring measures to prevent, eliminate or reduce the release of NOx and other contaminants into the atmosphere. *Canada* and the *United States* signed the Ozone Annex (2000) to the Canada–United States Air Quality Agreement. The measures in the Annex were estimated to

reduce annual NOx emissions in the region of *Canada* defined in the Annex as the Pollutant Emission Management Area (PEMA) by 39% from 1990 to 2010. As part of the Canada-Wide Acid Rain Strategy for Post-2000, *Canada* recently developed critical loads for nitrogen to protect forest soils; this will serve to guide development of further measures to limit and reduce national NOx emissions.

13. *The United States* noted its Clean Air Act was the main measure for controlling and reducing NOx emissions. Specific programmes were implemented which achieved emission reductions from mobile sources and fuels, and required the installation of best available control technologies on new and existing major stationary sources of NOx. Its Environmental Protection Agency finalized a rule in 1998 that, upon implementation, would reduce summertime NOx emissions by 23% (900,000 tonnes) from 1996 levels in the east of the country.

14. Some Parties reported economic measures to encourage a reduction in high NOx emitting fuels or to promote a switch to cleaner technologies. For instance, *Italy* noted that it levied a specific tax on large combustion plants producing NOx emissions. *The Netherlands* promoted renewable energy use by, for example, implementing fiscal incentives and subsidies. It had also set up, since 2005, a NOx emission trading system.

B. The 1991 Protocol Concerning the Control of Emissions of Volatile Organic Compounds or Their Transboundary Fluxes

Twenty-one Parties (as of 22 June 2006):

Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Liechtenstein, Luxembourg, Monaco, the Netherlands, Norway, Slovakia, Spain, Sweden, Switzerland and the United Kingdom

1. Overview

15. The Protocol on the Control of Emissions of Volatile Organic Compounds or Their Transboundary Fluxes entered into force on in 29 September 1997. It states that Parties shall control and reduce their emissions of non-methane volatile organic compounds (NMVOCs) in order to reduce their transboundary fluxes, and the fluxes of the resulting secondary photochemical oxidant products, so as to protect human health and the environment from adverse effects. The Protocol identifies three ways to do this:

(a) Take measures to reduce national annual emissions of VOCs by at least 30 per cent by the year 1999, using 1988 levels (or other specified year levels between 1984 and 1990) levels as a basis). This option was chosen by *Austria, Belgium, Estonia, Finland, France, Germany, the Netherlands, Portugal, Spain, Sweden and the United Kingdom* with 1988 as a base year, by *Denmark* with 1985, by *Liechtenstein, Switzerland* and *the United States* with 1984, and by *the Czech Republic, Italy, Luxembourg, Monaco* and *Slovakia* with 1990 as a base year;

(b) The same reduction as above within a Tropospheric Ozone Management Area (TOMA) and ensuring that by 1999 total national emissions did not exceed 1988 levels. Annex I of the Protocol specifies TOMAs in *Norway* (base year 1989) and *Canada* (base year 1988);

(c) Countries where national annual emissions of VOCs in 1988 were lower than 500,000 tonnes and 20 kg/inhabitant and 5 tonnes/km^2, shall, as soon as possible and as a first step, take effective measures to ensure at least that, at the latest by the year 1999, their national annual emissions of VOCs did not exceed the 1988 levels. This option was chosen by *Bulgaria, Greece,* and *Hungary*.

16. The major sources of VOCs from stationary sources identified in the Protocol in order of importance are: use of solvents, petroleum industry including petroleum-product handling, organic chemical industry, small-scale combustion sources (e.g. domestic heating and small industrial boilers), food industry, iron and steel industry, handling and treatment of wastes and agriculture.

2. Progress in implementation of the Protocol

17. By 2004, 16 Parties had met the emission levels required by the Protocol. Two Parties had failed to achieve their targets. While no 2004 data were available for the other three Parties, previously data reported by them suggested they had met their emission reduction obligations.

18. *Austria's* NMVOCs dropped by more than 50% between 1988 and 2004. In *Cyprus*, VOC emissions fell from 15.94 kilotonnes in 2000 to 12.31 kilotonnes in 2004, through implementing successful mitigation measures. In *Denmark*, a voluntary agreement with the Confederation of Danish Industries in 1995 helped reduce VOC emissions by 40% in 1999 compared to 1988. In *Finland*, total NMVOC emissions fell from 225,000 tonnes in 1988 to 166,000 tonnes in 1999. NMVOC emissions in *Germany* have decreased from 3,256 kilotonnes in 1988 to 1,663 kilotonnes in 1999, the target year of the Protocol, which is more than the 30% required; they continued to fall to 1,605 kilotonnes in 2000. In *Hungary*, total national emissions fell from 205 kilotonnes in 1988 to 170 kilotonnes in 1999. *The Netherlands* reported a 50% reduction in emissions from stationary sources between 1981 and 2000. *Norway* achieved reductions of 64 kilotonnes in 2004 and about 73 kilotonnes in 2005 by installing NMVOC

reduction units in 15 shuttle tankers and five storage facilities. *Slovakia* reported a 30% reduction of total VOC emissions in the first reporting phase of the Protocol. *The United Kingdom* reported a 39% drop in VOC emissions between 1988 (2,439 kilotonnes) and 1999 (1,480 kilotonnes).

3. Strategies and policies for reducing VOCs

19. Information on VOC emissions was given for a number of sectors. For instance, *Finland* identified its main sources of VOCs as solvents, the transport sector and residential combustion, while *Norway* noted that the largest quantities of VOCs (nearly 50%) resulted from the loading and storage of crude oil. With VOC emissions cutting across many sectors, Parties have tackled implementation of this Protocol through a number of strategies.

20. *Austria* has a specific Ozone Law, passed in 1992, which targets reductions in VOC emissions. *Cyprus* highlighted the transport sector as the highest emitter of VOCs, with 45% of the national total in 2004; it had introduced legislation in 2004 to equip all imported vehicles with catalytic converters. *The Czech Republic* addressed VOC emissions in its 2005–2013 Transport Policy and in its 2004 State Environmental Policy. In *Finland* the Environmental Permit Act required installations using more than 10 tonnes organic solvents per year to apply for a special permit.

21. While *Canada* did not have regulations at the federal level concerning VOC emissions from stationary sources, a number of guidelines had been developed and these were used as a basis for control measures at the provincial levels. *Canada's* third largest VOC source, solvent emissions, was being tackled by a "Federal Agenda for the Reduction of VOC Emissions from Consumer and Commercial Products"; this detailed actions to be undertaken by the Federal Government over the period 2004 to 2010.

22. EU Directive 99/13/EC on the limitation of emissions of VOCs due to the use of organic solvents in certain activities and installations was applied at the national level in *Cyprus, Denmark, Estonia, Germany, Hungary, Norway, Slovakia, Spain,* and *the United Kingdom*. A complementary EU directive (2004/42/EC) on the limitation of emissions of VOCs due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products and amending directive 1999/13/EC, required additional labelling on products to show the sub-categories and the relevant limit values. It also required labelling of the maximum VOC content in products. Depending on the type of coating material, EU directive 2004/42/EC set different limit values for the content of VOCs, taking effect in two steps in 2007 and 2010. *Austria, Cyprus, the Czech Republic, Finland, Germany, Hungary, Italy, the Netherlands, Norway, Slovakia, Spain* and *the UK* indicated that they were implementing this directive.

4. Best available techniques for reducing VOCs

23. According to article 2, paragraph 3 (b) (i), of the Protocol, Parties have to adopt best available techniques (BAT) to control and reduce VOC emissions from existing stationary sources in major source categories. Parties have made use of the following techniques: leak repairs, operating and performance standards, biofiltration, vapour processing at tank loading, end-of-pipe technology, low-solvent alternatives, new drying technology, less volatile cleaning agents, incineration and closed moulding in polyester processing and recycling.

24. *Canada* was developing three specific VOC content regulations for consumer products, architectural industrial maintenance coatings, and automotive refinishing products. The *Czech Republic* required that all products containing VOCs be clearly labelled; in addition, in order to encourage the further reductions, grants could be provided for activities and facilities employing organic solvents. *Spain* noted its application of the European Ecolabel, a voluntary instrument to encourage the development of greener products, which includes VOC criteria for certain products. *Switzerland* introduced, in January 2000, a VOC incentive tax on products containing solvents.

5. Measures to reduce VOC emissions from the use of petrol

25. In accordance with article 2, paragraph 3 (b)(ii), Parties need to undertake measures to reduce VOC emissions from petrol distribution and motor vehicle refuelling operations and to reduce the volatility of petrol. *Canada* reported that federal regulations from 1997 ensured that new light-duty vehicles and light-duty trucks were designed to limit hydrocarbon emissions during refuelling. A national regulation was adopted in 2000 to limit the dispensing flow rate of petrol and petrol blends to a maximum of 38 litres per minute. Regulations also effectively limited benzene in gasoline to 1% volume since 1999.

26. Vapour recovery systems were reported in place at nearly all petrol stations in *Cyprus* and at all terminals in *Finland* (since 2001), *Italy* (since July 2000) and the *Netherlands*. *Cyprus* also reported a range of measures, notably that all new stations must install underground pipes for refuelling; so far about 30% of service stations have complied with this requirement.

27. In *the Czech Republic*, approximately 98% of public petrol stations are already equipped with stage I and stage II vapour recovery systems. In *Denmark*, stations with throughput of more than 500 m^3/year have vapour recovery systems and fiscal incentives have been in force since 1995 to promote the installation of such systems. *The Netherlands* highlighted a number of measures employed such as: internal floating roofs and efficient seals for tanks, vapour return systems for loading, checks/maintenance on diffuse process sources, vapour return systems at

petrol distribution and filling station. As of January 2006, *the Netherlands* prohibits degassing of petrol vapours into the open air by inland vessels.

28. *Estonia, Italy, the Netherlands, Norway, Slovakia, Spain* and *the United Kingdom* referred to the European Parliament and Council Directive 94/63/EC of 20 December 1994 on the control of volatile organic compound (VOC) emissions resulting from the storage of petrol and its distribution from terminals to service stations. They noted this directive was particularly relevant to article 2, paragraph 3 (b) (ii) of the Protocol in which Parties commit to apply techniques to reduce VOC emissions from petrol distribution and motor vehicle refuelling operations, and to reduce volatility of petrol.

C. The 1994 Oslo Protocol on Further Reductions of Sulphur Emissions

Twenty-seven Parties (as of 22 June 2006):

Austria, Belgium, Bulgaria, Canada, Croatia, Cyprus, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Liechtenstein, Luxembourg, Monaco, the Netherlands, Norway, Slovakia, Slovenia, Spain, Sweden, Switzerland, the United Kingdom and the European Community.

1. Overview

29. Concerned that emissions of sulphur continued to be transported across international boundaries in parts of Europe and North America, and that they were causing widespread damage to forests, soils and waters, as well as to historic monuments, and had harmful effects on human health, 28 Parties to the Convention signed the Oslo Protocol in 1994. The Protocol, which entered into force on 5 August 1998, currently has 27 Parties.

30. The Protocol was the first effects-based instrument under the Convention and used critical loads and integrated assessment models to set country-specific emission ceilings based upon the effects of emissions and the costs for their abatement. The ceilings are listed in an annex to the Protocol.

31. The Protocol requires Parties to take the most effective measures to reduce emissions. It cites controlling the sulphur content of fuel, energy efficiency measures, the promotion of renewable energy and the application of BAT. This Protocol is the first requiring the mandatory application of emission limits, specified in the Protocol itself. There are mandatory limits on the sulphur content of gas oil. There is also a provision encouraging economic instruments for

reducing SO_2 emissions cost-effectively and guidance for controlling sulphur emissions from stationary sources, particularly from fossil fuel combustion processes.

2. Progress in implementation of the Second Protocol on Sulphur

32. Officially submitted emission data for 2004 suggest that 20 of the 25 Parties, to which the obligation to reduce emissions applied, had met their national emission reduction obligations. No data for 2004 were available for five Parties, although data previously reported by them suggested they had met their emission reduction obligations.

33. *Austria* reported a drop of about 60% in sulphur emissions between 1990 and 2004. *Cyprus*, that only acceded to the Protocol in 2006, has effectively implemented sulphur reduction strategies and policies to enable it to reduce SO_2 emissions from 53.02 kilo tonnes in 2000 to 45.37 kilo tonnes in 2004. It reduced the sulphur content of diesel fuel used in the road transport sector from 1% to 0.035% in 2004 and to 0.005% in 2005; in 2009, will be brought down to 0.001%. For petrol in the road transport sector in *Cyprus*, the sulphur content of leaded petrol was 0.2% in 2004, for unleaded petrol it was 0.005% in 2004, with plans for further cuts to 0.001% by 2009. *Hungary*, with SO_2 emissions of 486 kilotonnes in 2000 is already close to 50% below its agreed emissions' ceiling as specified in the Protocol. *Slovenia* reduced sulphur dioxide emissions by 72% between 1990 and 2004. The *United Kingdom* has already achieved the interim ceilings for 2000 and 2005 as required under the Protocol and is committed to an 87% reduction of SO_2 by 2010, compared to 1980 levels, under the Gothenburg Protocol and the European Union National Emission Ceilings (NEC) Directive.

3. Strategies and policies for reducing sulphur emissions

34. A number of national programmes, policies and strategies have been adopted by Parties to implement obligations under article 2 of the Oslo Protocol. These include: *Canada's* "Sulphur in Diesel Fuel Regulation" which has reduced the level of sulphur in on-road diesel to 15mg/kg as of June 2006; *Finland's* Air Pollution Control Act which has enabled the country to reach already in 1994 its sulphur emission ceiling for 2000 and *Norway's* Air Pollution Control Act which required specific emission permits. In *Germany* a number of ordinances specify SO_2 emission control requirements.

35. The Canada-Wide Acid Rain Strategy adopted in 1998 by the State, provinces and territories, for the period after 2000, aimed to ensure that critical loads for acid deposition were achieved across *Canada*. The Strategy encouraged innovation, new technology development and demonstration projects as well as collaboration between provincial and territorial governments and industry. *Canada's* sulphur in diesel fuel regulations would reduce the level of sulphur in

on-road diesel to 15mg/kg, effective in 2006 and the regulations amending this would reduce the level of sulphur in off-road, rail and marine diesel fuel to 500 mg/kg commencing in 2007, down to 15mg/kg commencing 2010 for off-road and 2012 for rail and marine. *Spain* adopted a Renewable Energy Promotion Plan (2005-2010) in 2005 and a National Energy Efficiency strategy (2004-2012). In *the United Kingdom*, an Air Quality Strategy for England, Scotland, Wales and Northern Ireland was published in January 2000; the Strategy and its Addendum of 2003 set objectives for nine main air pollutants, including sulphur dioxide, to protect public health, vegetation and ecosystems.

4. Sulphur abatement measures

36. Approaches to reduce sulphur emissions were two-fold: on the one hand Parties sought to encourage alternative energy, while on the other, they were applying technological measures to reduce the amount of emissions. *Canada*, *Cyprus* and *Denmark* reported that they were investing in wind power generation to reduce dependence on sulphur-emitting fossil fuels. *Finland* was promoting renewable energy sources more broadly, with already 30% of its electricity coming from renewable sources, essentially hydropower and biomass. The latter was also a major source of renewable energy in *Hungary* while *Italy* was encouraging the use of natural gas in large industrial plants. *Slovenia's* Energy Act promoted renewable energy and energy efficiency through a number of market-based incentives such as tax incentives, subsidies and eco-labelling. *Spain* reported that, through investments and support for renewable energy, 17% of electricity generated in 2000 came from renewable sources.

37. In order to limit sulphur emissions, *Denmark* had established a quota system for large combustion plants. Both *Germany* and *Italy* promoted the use of a combination of sulphur and sulphur-free (or low sulphur) fuels in its combustion plants. *Hungary*, *the Netherlands* and *Slovenia* on the other hand, promoted flue gas desulphurisation installations. *Slovenia* also applied additive injection and wet scrubbing desulphurization on major sources.

5. Emission limit values (ELVs) for sulphur

38. For existing major stationary combustion sources with a thermal input above 500 MW, annex V of the Protocol sets an emissions limit value of 400mg SO_2/Nm^3. To this effect *Cyprus*, *the Czech Republic* and *Norway* reported that they did not have major stationary combustion sources of such a capacity. *Finland*, *Germany*, *Hungary*, *Italy* and *Slovakia* met the emissions' limit value or were below it. The *Netherlands* reported limit values that complied with the Protocol except for those of refineries, which were of 600 mg SO_2/Nm^3 as of 2002 (down from 1000 mg SO_2/Nm^3). *Slovenia* reported values over 400 but did not specify by how much.

Lithuania reported much higher limit values (between 1,700 and 2,000 mg SO_2/Nm^3) but noted that these were expected to fall to 400mg SO_2/Nm^3 by 2008.

39. For existing major stationary combustion sources with a thermal input between 50 and 500 MW, annex V of the Protocol provides limits of between 1700 mg SO_2/Nm^3 and 2000 mg SO_2/Nm^3 with a linear decrease to 400mg SO_2/Nm^3. *The Czech Republic, Finland, Germany, Hungary, Lithuania, the Netherlands, Norway, Slovakia, Slovenia,* and *Switzerland* all reported values within or below these SO_2 emission limits. *Cyprus* reported values above these limits while *Italy* reported the application of the limit of 1,700mg/Nm^3 taking into account technical feasibility and application of BAT.

40. With respect to the national standards applied for the sulphur content of gas oil, *Austria, Canada, the Czech Republic, Denmark, Finland, Germany, Lithuania, the Netherlands, Norway, Slovakia, Slovenia* and *Switzerland* reported the following information, summarized in table 1:

Table 1: **Sulphur content of gas oil (% or ppm)**

Party	Diesel for on-road vehicles	Diesel for off-road vehicles and engines	Gas oil for inland navigation	Gas oil for heating
Austria	≤ 50 ppm (≤ 10 ppm as of 2009)	≤ 0.005–0.1%		0.10 / 0.20%
Canada	15 ppm (2006)	500 ppm (2007) 15 ppm (2010)	500 ppm (2007) 15 ppm (2012)	5,000 ppm – commercial standard
Czech Republic	50 ppm (10ppm from January 2008)	50 ppm (10ppm from January 2008)	0.2% (0.1% after January 2008)	0.2% (0.1% after January 2008)
Denmark	0.2%	0.2%	0.2%	0.2%
Finland	50 (10) ppm	50 ppm	0.1%	0.1%
Germany	50 ppm January 2005	50 ppm January 2005	0.1% S January 2008	0.1% S January 2008
Lithuania (2006)	50 ppm	2,000 ppm	0.2%	0.2%
Lithuania (post 2008)	10 ppm after January 2009	1,000 ppm after January 2008	0.1% after 1 January 2008	0.1% after 1 January 2008
Netherlands	0.005%	0.2 (gasoil: 0.1 from 2008)	0.2 (0.1 from 2008)	0.2 (0.1 from 2008)
Norway	0.005%		NA	

Party	Diesel for on-road vehicles	Diesel for off-road vehicles and engines	Gas oil for inland navigation	Gas oil for heating
Slovakia	50 ppm	50 ppm	50 ppm	0.2% since 1 July 2000 (0.1% since January 2008)
Slovenia	50 ppm (10 ppm after January 2009)	0.20% (0.10% after January 2008)	0.20% 0.10% (after January 2008)	0.20% 0.10% (after January 2008)
Switzerland	50 mg/kg	0.2%	0.2%	0.2%

41. In addition, Germany, Hungary, the Netherlands, Norway, Slovenia, Spain, and the United Kingdom indicated that they applied some or all of the following EU directives: Directive 93/12/EEC relating to the sulphur content of certain liquid fuels, Directive 98/70/EC relating to the quality of petrol and diesel fuels, Directive 99/32/EC on the sulphur content on liquid fuels, Directive 2003/17/EC relating to the quality of petrol and diesel fuels and Directive 2005/33/EC relating to the sulphur content of marine fuels.

D. The 1998 Protocol on Heavy Metals

Twenty-eight Parties (as of 22 June 2006):
Austria, Belgium, Bulgaria, Canada, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, the Netherlands, Norway, the Republic of Moldova, Romania, Slovakia, Slovenia, Sweden, Switzerland, the United Kingdom, the United States and the European Community

1. Overview

42. The 1998 Protocol on Heavy Metals entered into force on 29 December 2003. It targets three particularly harmful metals that are listed in an annex to the Protocol: cadmium, lead and mercury. Parties to the Protocol agree to reduce their total annual emissions to the atmosphere for these three metals below their 1990 levels (or an alternative year between 1985 and 1995). The Protocol provides detailed guidance based on BAT including dust-cleaning devices, “bio-treatment”, fabric filters and scrubbers to reduce emissions, particularly focusing on the iron and steel industry, the non-ferrous metal industry, power generation, road transport and waste incineration.

43. The Protocol also provides specific targets for reducing the use of leaded petrol, and introduces measures to lower the mercury content in batteries, thermostats, switches, thermometers, fluorescent lamps, dental amalgam, pesticides and paint.

2. Progress in implementing the Protocol on Heavy Metals

44. *Austria* used 1985 as its reference year for this Protocol and reported reductions for cadmium, lead and mercury of 65%, 96% and 75% respectively. In *Finland*, lead emissions decreased rapidly in the 1990s from the level of 326,000 tonnes in 1990 to 35,000 tonnes in 1996, an 89% reduction. Between 1985 and 2004, *Hungary* reported a 61% drop in cadmium emissions, a 55% drop in mercury emissions and a 95% drop in lead emissions. In *Norway* between 1995 and 2003 lead emissions were cut by approximately 24%, while cadmium and mercury were reduced by about 70% and 60% respectively. By implementing tough measures in line with the Protocol, by 1994 *Slovenia* had reduced emissions of lead by 96.9%, cadmium by 6.2% and mercury by 15.6% compared with 1990 levels. *The United Kingdom* reported that it has already met the main requirement of the Protocol to reduce annual emissions of cadmium, lead and mercury to below 1990 levels; emissions of cadmium to air in 1990 were 25.9 tonnes and 5.4 tonnes in 2002, a fall of 79%, for lead, emissions fell by 95% by 2004, while for mercury emissions fell by 73% to 10.3 tonnes in 2004.

3. Emission limit values for heavy metals

45. Annex V of the Protocol on Heavy Metals sets specific emission limit values (ELVs) for major stationary sources. These apply to the solid and gaseous forms of the metals and their compounds. The annex also contains detailed guidance on how to measure the limit values, including, for instance, the fact that measurements should be taken regularly over a 24-hour period.

46. A number of Parties reported values well below the limits set in the Protocol. For example, limit values for mercury emissions from hazardous and medical waste are 10mg/m3. In *the Czech Republic, Denmark and the Netherlands*, limits for mercury emissions from new waste management plants (municipal, medical and hazardous) were 0.05mg/m^3 and *Norway* reported an even lower figure, 0.03 mg/m^3.

47. The limit value specified in annex V for all particulate matter from fossil fuel combustion plants is 50mg/m^3. Most Parties showed that they applied this figure, or a lower one. In addition, some Parties provided more specific values for individual heavy metals. For instance, while *the Czech Republic* and *Switzerland* reported complying with the 50mg/m^3 for

combustion plants (of between 50 and 100 MW), *Denmark* specified a limit value for cadmium and mercury emissions at 0.1 mg/m^3 for its heavy oil combustion plants.

48. The *United States* reported a national programme that established emission standards for over 170 stationary source categories, including all the categories identified in annex II of the Protocol. These standards applied to "major" sources and some "area" sources. The *United States* reported that this programme has already achieved significant cuts in the overall emission of heavy metals since the reference year and further reductions were expected in the future.

4. Lead

49. Leaded petrol was no longer used in on-road vehicles in *Canada* since 1990 and in the *United States* since 1996. It had been phased out in *Finland* since 1993, *Germany* and *the Netherlands* since 1997, *France, Switzerland* and *the United Kingdom* since 2000, *Armenia, the Czech Republic* and *Slovenia* since 2001, *Ukraine* since 2003, *Cyprus* since 2004 and *Austria* since 1993. The *Russian Federation* reported plans to phase out leaded petrol by 2005. Some Parties noted that the phasing out of leaded petrol demonstrated alignment with EU directive 98/70/EC on the quality of petrol and diesel fuels, which set a date of January 2000 for EC Member States to stop marketing leaded petrol. In *Hungary*, lead content in petrol had been decreased and was now below 0.013 g/litre of petrol while in *Lithuania* this limit was of between 0.005 and 0.15 g/litre.

50. *The Netherlands* reported it had been implementing a subsidy scheme since 2003 to accelerate the replacement of lead in water pipes.

5. Mercury

51. Austria reported that mercury content was limited to 0.0005% in batteries and to 2% in button cells. Furthermore, capture of wastewater from dental surgeries was compulsory. In *the Netherlands*, the production and import of goods containing mercury had been banned since 2000. The use of products containing mercury was banned three years later (2003), except for fluorescent lamps, films and some specific professional products for which specific limits applied.

52. In the *Czech Republic*, the Ministry of the Environment and Czech Dental Chamber signed a voluntary agreement in 2001 (the Czech association of drinking water and waste water companies joined in 2004) to facilitate the removal of mercury from their clinics. By the end of 2004, more than half of the 6,500 dental clinics had installed mercury separators with above 95%

efficiency rates for mercury removal. In 2002, 1.1 tonnes of dental amalgam waste containing mercury was collected and by 2003 this figure had risen to more than 34 tonnes.

53. In *the United Kingdom*, a burden-sharing scheme had been implemented by the crematoria industry to achieve a 50% reduction in mercury from gas emissions by 2012 as per the UK Pollution Prevention and Control Act (1999). This scheme will allow greater choice to the industry in deciding how to meet the national 50% mercury emission reduction target. Operators will be able to meet the industry's target by either fitting abatement mechanisms, sharing the cost of abatement fitted by other crematoria (whether or not owned by the same operator) or a combination of both.

6. Cadmium and other metals

54. The Protocol specifically covers the metals lead, mercury and cadmium as listed in annex I to the Protocol. However, Parties reported less information on cadmium than on lead and mercury. Some Parties mentioned the European Directive on Cadmium (91/338/EC) and indicated it was being implemented. The directive prohibited the sale, import, production or stocking of products containing cadmium. Through this legislation, pigments, colours, stabilisers and surface treatments containing cadmium were all banned.

55. In addition to the three metals listed in the Protocol, some countries reported on other heavy metals. For instance, *the Netherlands* noted it had been operating a national emissions registration office since 1974 which made annual emission inventories for up to 170 substances, including lead, mercury and cadmium but also arsenic, copper, chromium, nickel, selenium and zinc. *The United Kingdom* indicated that it reported annually on 10 heavy metals and was carrying out an extensive research programme on heavy metals. *The European Community* was looking into controlling emissions of arsenic, cadmium and nickel through a Daughter Directive on Heavy Metals.

Table 2: Selected measures for reducing lead, mercury and cadmium emissions, by sector	
Sector	Measure (country)
Press and Blown Glass and Glassware Manufacturing	Electrostatic precipitators (ESPs) are the most common control used. Fabric filters (FFs) with acid and temperature resistant filters, in series with other controls, are also sometimes used. (*the United States*)
Cement	Available information indicates FFs are the control for PM on all process sources except kilns. The kilns are controlled with ESPs or FFs. (*the United States*) Bag filters (*Cyprus*)
Iron and Steel Production	FFs are required for new sources (*the United States*)
Medical waste	Wet scrubbers, dry sorbent injection with FF, or combination wet/dry systems are usually employed (*the United States*)
Waste incineration	Wet flue gas treatment (*Denmark*)
Power Plants	ESP or FF (*Slovenia*)

E. The 1998 Protocol on Persistent Organic Pollutants

Twenty-eight Parties (as of 22 June 2006):

Austria, Belgium, Bulgaria, Canada, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, the Netherlands, Norway, the Republic of Moldova, Romania, Slovakia, Slovenia, Sweden, Switzerland, the United Kingdom and the European Community.

1. Overview

56. The objective of the 1998 Protocol on Persistent Organic Pollutants (POPs), which entered into force on 23 October 2003, is to control, reduce or eliminate discharges, emissions and losses of POPs. It currently recogniz§es a list of 16 POPs, listed in the annexes to the Protocol, that resist degradation under natural conditions and that have been associated with adverse effects on human health and the environment, particularly, though not exclusively, in the Arctic where they accumulate in Arctic fish and mammals which indigenous people depend upon. The substances in the annexes comprise eleven pesticides, two industrial chemicals and three by-products/contaminants.

The 1998 Protocol on Persistent Organic Pollutants controls emissions of 16 POPs: *aldrin, chlordane, chlordecone, DDT, dieldrin, dioxins and furans, endrin, heptachlor, hexachlorobenzene, hexachlorocyclohexane (HCH), hexabromobiphenyl, mirex, polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and toxaphene.*

2. Progress in implementing the Protocol on POPs

57. Under the Protocol, Parties are to eliminate the production and use of the substances listed in annex I. The substances listed in annex II are those that Parties are committed to restricting.

58. The production and use of all annex I substances are now banned in *Cyprus, the Czech Republic* (since 1989), *Denmark* (since 1995), *Germany, Hungary* (since 1996), *the Netherlands*, *Norway* (since 2002), *Slovakia, Slovenia* (since 1988), *Switzerland* (since 1986) and *Ukraine*. *Austria* reported that all substances in annexes I and II had been virtually completely eliminated. *Canada* reported not producing any of the 12 substances listed in annex I and that none were registered for pesticide use. There was no intentional production or sale of the substances listed in annexes I and II in *Canada, Cyprus, Denmark, Estonia, Finland, Germany, Hungary, the Netherlands, Norway, Slovakia,* and *Slovenia*. *Switzerland* reported no intentional production or sale of substances in annexes I and II with the exception of lindane, which was used in some pharmaceuticals. *The United Kingdom* indicated that it had implemented EC regulation 850/2004 on POPs.

59. Concerning the transboundary movement of substances listed in annex I, most Parties follow requirements under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (*Canada, Cyprus, Finland, Germany, Norway, Slovenia, Switzerland and the United Kingdom). Canada* also specified that it had an agreement with the *United States* on the Transboundary Movement of Hazardous Waste across their common border. *Germany, Slovenia and Switzerland* specified that the export of waste for final disposal in non-EU and non- EFTA countries was banned and that export for recovery/ recycling to non-OECD countries was also banned.

60. Under article 4, paragraph 2 of the Protocol, a Party may grant an exemption on the elimination of the production and use of substances listed in annex I and also on the restriction of substances listed in annex II. However, all 15 respondents to the questionnaire reported that they did not apply any such exemptions.

3. Strategies and policies for reducing or eliminating POPs

61. Given that the Protocol entered into force relatively recently, a number of Parties, such as *Estonia*, reported that they had only just begun to develop relevant legislation. Equally, *Finland* had prepared a national POPs background document in 2005 covering all 16 POPs. *Hungary* was preparing a detailed POPs emission inventory for stationary source categories. *Slovakia* had a new Act on POPs since April 2006. *Slovenia* was preparing a National Implementation Plan for the management of POPs and an Operational Programme on reducing PAH, PCDD/F and HCB. *Ukraine*, while not a party, had made initial assessments of POPs and concluded that PCBs would need to be phased out by 2015. The *Russian Federation* reported a number of preliminary actions to address POPs including: the development of a legal basis for dealing with POPs, a survey of POP sources, monitoring of POPs in the most polluted areas and scientific studies to better understand the impact of POPs pollution.

62. Other Parties already had some plans and policies in place targeting POPs. In *Canada*, for instance, legislation dealing with POPs was split between the federal, provincial/territorial and regional/ecosystem levels. The Federal Government had the authority to set requirements for transboundary movements of hazardous waste, including hazardous recyclable material, and hazardous waste management on federal land. Legislation at the federal level included the Toxic Substances Management Policy and the Canadian Council of Ministers of the Environment Policy for the Management of Toxic Substances, which required the virtual elimination from the environment of toxic substances that were persistent, bioaccumulative and predominantly anthropogenic. The provincial/territorial governments had established requirements and authorized waste management facilities within their jurisdictions. Regional and ecosystem strategies included the Northern Contaminants Programme, the North American Regional Action Plans, the Great Lakes Water Quality Agreement, and the Great Lakes Binational Toxics Strategy targeting persistent, bioaccumulative and toxic substances.

4. Measures to reduce POPs

63. *Cyprus* reported it used financial incentives such as grants to encourage industrial sources to implement Best Available Technology (BAT) to minimize POPs emissions. *The Czech Republic* had prioritized the need to address high emissions of benzene and PAHs, as well as to manage better toxic waste; it was implementing a national emissions reduction programme. *Denmark* regulated emissions from waste incineration plants through its Air Pollution Control Guidelines for waste incineration plants. In *Germany*, POP emissions were regulated through a system of ordinances and technical instructions under the Federal Emission Control Act while in the *Netherlands* measures were embedded in the Environmental Protection Act (1993) and the Hazardous Substances Act (1985). *Switzerland's* Ordinance of 1986 on Environmentally

Hazardous Substances regulated the import, production, supply, use and export of substances that might present a hazard to the environment.

64. Most Parties reported that the elimination of hazardous waste containing POPs was done at specially licensed waste management facilities. *Austria* reported that since it did not have any special landfills to deal with hazardous waste, it was all either burnt in special incineration plants fitted with BAT and operated under strict licences, or it was exported to countries that had the capacity to eliminate it in a suitable manner. In the latter case, special export permits were required. *Cyprus* was currently building sanitary landfills to address the problem of uncontrolled combustion of waste at open landfills as well as a waste management centre, which would be ready by 2007 and would be able to deal notably with PCBs. In *the Czech Republic* disposal of hazardous waste was possible only in facilities that had special authorization from the competent local authorities. In *Switzerland,* annex I POPs were classified as special wastes that could only be eliminated in plants specially licensed to deal with them. Licences were valid for a maximum of 5 years, after which the facility must re-apply for a permit.

65. *Estonia,* which did not currently have the capacity to deal with annex I POPs, collected them in special storage facilities and then periodically shipped them to be destroyed in *Finland* (at the Ekokhem plant which is fully equipped to deal with biological, physical and chemical hazardous waste). In *the Netherlands* a permit was needed for the collection and transport of waste oil and small hazardous wastes; these were registered on a special list ("VIHB list").

66. Some waste could be recycled: for instance, the *Netherlands* had identified that fly-ashes containing low concentration of dioxins and furans could be partly reused as filler material in asphalt without any negative consequences.

5. Emission limit values for POPs

67. Article 3, paragraph 5 (b)(ii) and annex IV specify the ELVs applied to each new stationary source within a category. Since 2000, *Denmark* has implemented the following limits: for waste oil with more than 50ppm: PCB should not be burnt and waste oil with more than 10 ppm PCB/PCT should be burnt for at least 2 seconds at a temperature above 1,200 degrees Celsius; PCBs must be removed from electrical and electronic equipment before scrapping. *Finland* reported that limit values for hazardous waste, including PCBs, was 50ppm. *Austria, the Czech Republic, Denmark, Finland, the Netherlands* and *Slovenia* all reported values of 0.1 ng TE/m^3 for emissions of dioxins/furans (PCDD/F) from the three main stationary sources: municipal solid waste, medical waste and hazardous waste. *Canada* reported slightly lower values at 0.08 ng I-TE/m^3. For all the countries mentioned here, values are equivalent or lower than those specified in annex IV of the Protocol.

6. PCBs

68. Most Parties responding to the questionnaire, while no longer producing goods with PCBs, still had to deal with old electronic and electrical equipment containing PCBs. For instance, in *Austria*, a ban on PCBs has been in place since the 1990s, although old products already containing PCBs might still be in use. In *Canada*, the manufacturing, processing, sale and import of PCBs was prohibited in 1992, under the Canadian Environmental Protection Act. Furthermore, current proposed legislation foresaw the destruction, by end 2009, of all PCBs material that were in storage. Specifically, the use of PCBs in concentrations of 500 ppm or more would end no later than 31 December 2009, and in concentrations of 50 ppm or more (but less than 500 ppm) no later than 31 December 2014.

69. In *Denmark* the sale and import of PCBs have been banned since October 1986, and since December 1998 the prohibition also included instruments containing the substances. *The Netherlands* noted that it had removed PCBs from electrical and electronic equipment by 2004; it had a special PCB cleaning facility that imported and dismantled transformers containing PCBs from developing countries.

70. Given that most wastes with PCBs in *Norway* emanated from reconstruction and demolition of buildings, a new law would be introduced in 2007 that would require the building and construction industry to give local authorities a waste management plan before starting any new construction. Wastes were considered hazardous in *Norway* when they contained more than 50 mg/kg of PCBs. Already in 1986 *Norway* had developed a strategy and an action plan for phasing out large capacitors containing PCBs; all PCB-containing large capacitors and transformers were collected and incinerated before 1995. A plan for identifying and collecting other products containing PCBs was developed during 1996 to 2000. A ban on use of small capacitors containing PCB in lighting fixtures was introduced in 2005 and these would be phased out by 1 January 2008 while the use of electrical bushings containing PCBs was prohibited from 2010.

71. In 1999 *Slovenia* undertook a study “A Concept for Handling PCB/PCT in Slovenia” and defined measures to eliminate electrical equipment contaminated with PCB from 2003 to 2006 with the aim to dispose of all material containing PCB/PCT by 2010. *Ukraine* reported that it intends to phase out PCBs by 2015.

7. Best available techniques for removal of POPs

72. The Protocol offers guidance on BAT to address POPs, which is contained in annex V. Many Parties do not specifically require the use of a given technology but rather set limits for emissions that can be reached using available technology. For instance, *Canada's* approach to the reduction of emissions from major stationary sources is to set an emission limit based on consideration of BAT, but not to specifically require the use of a given technology. It is the responsibility of facilities to meet these emission limits using any appropriate means at their disposal.

73. To optimize the combustion process in waste incineration, *the Czech Republic* reported the use of an approach that first reduces the amount of waste through recycling and suitable pre-treatment followed by optimal combustion to ensure that the resulting matter contains less than 3% total organic carbon. In order to effectively treat waste gas, incinerators are generally equipped with three-stage waste-gas treatment, including particulate matter separation (fabric filters), absorption of acidic pollutants (semi-dry or wet scrubbers) and dioxin filters.

74. *Denmark* noted it promotes flue gas cleaning. *Estonia, Finland, Germany, the Netherlands, Slovakia* and *Slovenia* placed a significant emphasis on permits as a means of controlling waste management facilities. Permits in *Finland, the Netherlands, Slovakia* and *Slovenia* indicated ELVs and standards rather than specific technology, while in *Germany* legal ordinances covered the different emission sources, such as crematoria and hazardous waste incinerators. *Switzerland* noted it had ELVs as well as control measures for benzo(a)pyrene, dibenzo(a,h)-anthracene, diesel soots, PCDD and PCDF. These ELVs were established on the basis of BAT but the control technology was not specified.

75. Wood-burning stoves have been identified as a main source of PAH emissions in *Norway* and *Denmark* and both are currently developing new requirements for such stoves.