EXECUTIVE BODY FOR THE CONVENTION ON
LONG-RANGE TRANSBOUNDARY AIR POLLUTION

THE 2000 REVIEW ON STRATEGIES AND POLICIES FOR AIR POLLUTION ABATEMENT

THE 1988 PROTOCOL CONCERNING THE CONTROL OF EMISSIONS OF NITROGEN OXIDES OR THEIR TRANSBOUNDARY FLUXES

REPLIES TO QUESTIONS 2 – 8 OF THE 2000 QUESTIONNAIRE

Prepared by the secretariat from submissions by the Parties

Introduction

1. This document is the basis for part of the 2000 Review of Policies and Strategies requested by the Executive Body at its seventeenth session in December 1999. It provides the answers as received from Parties in response to the questionnaire circulated in January 2000. It is in English only, non-English submissions were passed to the UN translation services, and are incorporated as translated. Answers have been reformatted for the document but have been subjected to minimal editing. Indication is given where responses have been altered, e.g. moved where an answer appears to be for a different question.

2. The document is intended as a reference for the summary to be found in the 2000 Review of Strategies and Policies (EB.AIR/2000/1) and will be provided to the Executive Body, the Implementation Committee and will be made available through the Executive Body document Web site. The document groups questions in accordance with the sections of the questionnaire.

3. This section summarizes the answers received to questions 2 to 8 of the questionnaire. Responses to the questions are mandatory for the Parties to the Protocols: Austria, Belarus, Bulgaria Canada, Czech Republic, Denmark, Finland, *France*, Germany, Greece, Hungary, Ireland, Italy, *Liechtenstein*, *Luxembourg*, Netherlands, Norway, Russian Federation, Slovakia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, United States and European Community. However, those Parties in italics failed to provide a response to the Secretariat. In addition responses were received from 6 others Parties to the Convention: Belgium, Croatia, Georgia, Latvia, Lithuania and Poland (identified with* below)

4. **Question 2**: **Provide information, as required by article 8, paragraph 1, on national strategies, policies and programmes developed in accordance with article 7 that specifically address the control and reduction of emissions of nitrogen oxides or their transboundary fluxes, including progress achieved under them and any changes made to them.**

5. **Austria.** Awareness of the problems resulting from air emissions has influenced legal regulations in Austria for a long time. The 1992 Ozone Law stipulates a reduction of NO_x emissions by 70 per cent between 1985 and 2006. As a consequence, the Nationalrat (First Chamber of Parliament) adopted two resolutions (1992, 1996) on the reduction of ozone precursors and requested the federal government to implement a list of measures.

6. According to the Industrial Code and the Clean Air Act for Steam Boilers, a license for each new or modified installation is required. The determination of emission limit values and/or measures according to best available technology is carried out in the licensing procedure; these provisions have been introduced in the 80ies. For several categories of (new and existing) stationary emission sources explicit emission limit values and BAT requirements have been set by ordinance (see Q.3, Q.3 and Q.5). After early introduction of strict national emission standards for cars in the 1980ies, emission standards for vehicles have been improved and extended on EU-level. As a consequence, emissions of NO_x have dropped by 22 % between 1985 and 1998.

7. **Belarus.** The policies, national programmes and measures referred to in the reply to question 1 fully apply also with regard to limiting and reducing emissions of nitrogen oxides (NO_x) primarily through the use of natural gas and local fuels (peat, wood) and reducing the proportion of fuel oil and coal consumed. One of the main lines being followed is to build steam-gas plants and gas turbines. Two 28 MW_e combined-cycle plants have been brought into use in orsha, and gas turbine of 15 MW and 12 MW capacity, respectively, are being operated in Mozyr and Novopolotsk. For energy-saving purposes, a 5 MW_e turboexpander plant making use of reduced natural gas is being operated in Novolukoml. There are also 1.5 MW_e wind-generator units and 7.9 MW_e small hydropower stations in operation.

8. **Belgium*** With regard to large combustion installations, nitrogen oxide reduction targets have been set for existing installations, in accordance with directive 88/609/EEC, of 30 % for 1998, by comparison with 1980, and limit values established for new installations (target met and exceeded). The emissions reductions to be met in Belgium by Belgian electricity producers have been laid down in a sectoral agreement between the electricity sector and the competent authorities (Federal Government of Belgium and the governments of the Flemish region, the Walloon region and Brussels capital region), signed on 18 October 1991. The electricity producers' obligations *vis-à-vis* nitrogen oxides are as follows:

(a) To reduce total emissions from existing and new plants by comparison with 1980 by 30% in 1993, 40% in 1998 et 40% in 2003. The 2003 targets had already been reached in 1999;

(b) To set in place NOx reduction measures for existing and new installations, as set out in the "NOx control" research programme developed by the electricity producers;

(c) Ongoing measures in all units above 300 MW.

9. Flemish region: The general strategy of the air pollution control policy has been fixed in the Flemish Environmental Policy Plan 1997-2001 (MINA-plan 2). In relation to this Protocol, the themes acidification, photochemical pollution, eutrophication and climate change are important. For each of these themes short term and long term objectives have been set and a strategy was developed to reach these objectives. The thematic strategies have been worked out into a number of specific actions. Concrete actions are :

(a) the elaboration and implementation of emission reduction programmes for NOx for the industry;

(b) the strengthening of emission limit values for combustion processes;

(c) actions for the efficient replacement and maintenance of central heating systems;

(d) improvement of monitoring networks and emission inventories;

(e) cost-benefit analyses for the reduction of acidifying pollutants and ozone precursors;

(f) establishing an action program to promote ecological transport vehicles;

(g) establishing an action program to influence driver's behaviour;
(h) establishing an action program to reduce the amount of road transport;
(i) developing a module to predict the impact of traffic measures on the environment.

This Environmental Policy Plan is complementary to the more classical approach that has been followed in the past : air quality standards and emission limit values for different types of industrial installations in the Flemish legislation Vlarem 2 and additional exploitation conditions for individual plants in permits.

10. Walloon region: In the Walloon region the nitrogen oxide reduction policy hinges primarily on the implementation of directive 84/360/EEC and the granting to enterprises of operating permits which establish operating conditions and individual standards on the basis of the General Regulations on Occupational Safety and the German "TA-Luft". These regulations are currently being revised with a view to establishing general, sectoral and individual operating standards for the Walloon region which are more stringent and which incorporate the BATs. Besides the Belgian sectoral agreement with electricity producers, there is also a sectoral agreement with Walloon glass manufacturers (May 1995)

(a) which does not set emission ceilings but does set limit values depending on the type of glass and the process involved;
(b) which promotes the rational use of energy (RUE) and combustion controls;
(c) which sets out research and development programmes.

11. Air quality standards have been established by directive 85/203/EEC and these have posed no problems. The new directive 1999/30 sets maximum standards for 2010 which at the current time have already been partially met (there are no instances in the Walloon region of the 200 $\mu g/m^3$ hourly limit value for health protection having been exceeded, or of the annual average been exceeded by urban or industrial stations, while the annual threshold for health protection (40 $\mu g/m^3$) has been exceeded by only one station (41 $\mu g/m^3$)). A general air quality plan, establishing reduction targets and measures for all pollutants and for the industry, housing, transport and other sectors, is currently being drafted in the Walloon region and will be finalized in 2002.

12. Brussels capital region: Nitrogen oxide emissions dropped in the Brussels capital region by 15% between 1990 and 1997. In 1996, they represented 6% of Belgium's total emissions. The great majority of these emissions come from motor vehicles (58%), the remainder primarily from housing (19%) and the incineration of household and similar waste (10%). The aim of the Protocol, namely to control and reduce emissions of nitrogen oxides, has therefore been attained. All in all, it can be said that the limit values and guide values set under European regulations have not been exceeded in light road traffic areas but are regularly exceeded in heavy traffic areas. Air quality improvement measures should therefore be implemented.

13. An additional reduction in nitrogen oxide emissions could be achieved by applying new emission standards to fixed and mobile sources. The regional authority has jurisdiction over fixed sources (through regulations relating to environment permits) and the federal authority over mobile sources (through regulations on fuels and the technical performance of vehicles). Both authorities have responsibility for the management of transport, which remains an inherent part of any nitrogen oxide reduction policy. The installation, in the Neder-Over-Heembeek incinerator, of an additional de-Nox scrubber should also reduce emissions from this source. Work is under

way on preparation of an air pollution control plan in Brussels capital region, which should be finalized before the end of the year.

14. Federal Government: At Federal Government level, the control of nitrogen oxide emissions is part of the ozone plan (1996). This plan includes 14 measures in such areas as research and development, transport, energy, products etc. A new plan is under preparation and will be finalized in 2000.

15. **Bulgaria**. Bulgaria is Party to the Protocol since 1989.03.30, setting up a National Programme in compliance with Article 7. The main objective is to retain nitrogen oxide emissions, as the following measures were aimed at:

(a) Use of technologies, ensuring low temperature burning (combustion) regimen and reduction of the secondary nitrogen oxides;

(b) Performance with limited oxygen admission;

(c) Installations for catalytic reduction of nitrogen oxide emissions in nitrogen acid production.

The production drop after 1989 caused also the reduction of nitrogen oxide emissions.
As a result the total annual emission levels decreased, as in 1994 they were 230 thousand tonnes, lower than those in 1987 (416 thousand tonnes). They were not only kept at the same levels, an emission reduction was actually achieved. In the past few years, Bulgaria updated its nitrogen oxide emissions reduction strategy. This gave us the opportunity to sign in 1999 in Gothenburg, Sweden the new Protocol, undertaking the obligation to further reduce total annual emissions down to 266 thousand tonnes in 2010 (- 26%), in full compliance with G5/2, the revised by IIASA former RAINS model.

16. **Canada.** In Canada, jurisdiction for emissions control is shared between the federal (national) and provincial governments. Shared strategies, policies and programs for NOx control generally involve the federal government negotiating international agreements on transboundary fluxes, regulating emissions from new mobile sources and leading in the development of national emission standards for new stationary sources and national air quality and environmental quality (e.g. acid deposition) standards. Provinces implement standards for new and existing stationary sources and requirements for existing mobile sources, with the objective of meeting air quality and environmental quality standards.

17. Recent programs that have resulted in progress on emissions control have included the 1990 NOx/VOC Management Plan adopted by federal and provincial Ministers of the Environment. Under this plan, a large number of national emission standards were developed for new sources, and provinces initiated implementation of these standards. Additional regional remedial measures were initiated in areas where the need for improvement in air quality was identified. (see details under response to Q.3). In November 1999, federal and provincial Ministers of the Environment agreed on Canada-Wide Standards (CWS) for particulate matter and ozone, and agreed to develop implementation plans for meeting these standards. As part of this agreement, multi-pollutant emission reduction strategies will be developed for major source categories for ozone and particulate precursors. It is anticipated that these will result in NOx emission reductions in the order of 50% or greater in some regions and sectors. The federal government's implementation plan for the CWS for Ozone and PM will be Phase 3 of the Federal Smog Management Plan which will be released in Summer, 2000. Under Phase 3 government will

engage industries in a multi-pollutant emissions reduction approach, addressing smog precursor emissions while taking into account climate change, acid rain and hazardous air pollutants. Sectors specifically targeted for NOx reductions will likely include vehicles, rail, marine transportation, electric power and pulp and paper. In general, Canada will harmonize vehicle requirements with those of the United States.

18. The Canada-Wide Acid Rain Strategy for Post-2000 is a national strategy signed by all federal, provincial and territorial Energy and Environment Ministers to deal with the continuing problem of acid rain. While The Strategy more specifically addresses the control of SO_2 emissions, it also contains commitments to limit growth in emissions of both SO_2 and NOx, to review compliance with international commitments on SO_2 and NOx emissions, to pursue research on the role of nitrogen in acidification, and to report annually on SO_2 and NOx emissions and forecasts.

19. **Croatia***. Current state Air Pollutant Emissions in the Period from 1990 – 1998. Determination of air pollutant emissions represents the first step in solving systematically the air protection issues. The necessity to prepare the emission calculation has arisen from the ratified Convention on Long-range Transboundary Air Pollution (LRTAP), the UN Framework Convention on Climate Change and the Law on Air Quality Protection. In accordance with the European programme for elaboration of emission calculation for the Republic of Croatia, the calculation prepared included eight pollutants: SO_2, NO_x, NMVOC (non-methane volatile organic compounds), CH_4, CO, CO_2, NH_3 and N_2O. The emission was determined for the period between 1990 and 1998 and for the years of 1990, 1995, 1996, 1997 and 1998 the emissions of heavy metal, lead and cadmium, including the emission estimate for certain persistent organic compounds were prepared.

20. Since 1990, air emissions of the main pollutants from stationary and mobile sources in Croatia have decreased as a consequence of the overall economic recession, the economic reform, and the war. Gross energy consumption dropped 22 per cent between 1990 and 1995, but is picking up again. Similar trends are evident also in the emissions of the main pollutants: a significant drop between 1990 and 1995 followed by a slow increase. The emissions of all pollutants were nevertheless lower in 1997 and 1998 than in 1990. SO_2 emissions decreased by 50 per cent, NO_x by 13 per cent, NMVOC by 25 per cent, CO by 47 per cent, CH_4 by 27 per cent, NH_3 by 37 per cent and CO_2 by 13 per cent compared to the year1990.

21. Some 40 per cent of nitrogen oxide (NO_x) emissions are traffic-related, so there was a decrease during the war. Emissions from combustion processes (35 per cent of total) also decreased slightly until 1995, but are on the increase again. Traffic-related emissions are increasing, but the 13 per cent increase in the number of registered cars in 1997 compared with 1990 was partly compensated by the growing share of cars equipped with catalysers (2.6 per cent in 1990 compared to 42.2 per cent in 1997). Also the already mentioned shutdown of some plants using obsolete, heavily polluting technologies contributed to the decrease in NO_x emissions.

22. The most polluting sectors are combustion processes and traffic .88 per cent of SO_2 emissions, 63 per cent of CO_2 emissions and 32 per cent of NO_x emissions come from combustion processes, while 64 per cent of NO_x emissions, 25 per cent of CO_2 emissions and 10 per cent of SO_2 emissions are traffic-related. In 1998 the share of traffic-related pollution increased on

average by 20 per cent compared to 1990, while that of combustion process pollution decreased by 11 per cent on average.

23. This trend indicates that in the future the heaviest pressure may come from the transport sector. The total number of registered vehicles increased by 13 per cent in the period 1990-1997. The growing share of unleaded petrol may lead to a decrease in lead emissions, but to a simultaneous increase in emissions of organic matter such as benzene and polyaromatics, mainly if unleaded petrol is used in cars with a defective catalyser. Croatia is a transit country from western Europe to south-east Europe. The road network has not kept up with the geo- political changes in recent years. The Strategy for Transport Development was reviewed by the Parliament.

24. Compared to other European countries, Croatia has relatively low per capita emissions. Its Nox and CO2 emisisons per capita are about 70 per cent below the OECD average. Its SOx emissions per capita are 70 per cent below the OECD average and more than 80 per cent below those of Slovenia, Poland or Hungary. In transboundary terms, Croatia is a net importer of SOx and Nox. More than 90 per cent of its total oxidized S and N deposition comes from abroad. 56 per cent of its reduced nitrogen deposition is also imported. The main contributors are Italy, Germany, and Poland.

25. Policies and measures. Main instruments of the air quality protection policy are the Law on Air Quality Protection, By-Law on Limit Values of Pollutant Emissions from Stationary Sources (ELV By-Law) and By-Law on Recommended and Limit Ambient Air Quality Values (RV and LV By-Law). Law on Air Quality Protection of the Republic of Croatia came into force in July 1995 following the basic Law on Environmental Protection passed in 1994. According to the Law the basic purpose of the air quality protection and improvement is: to preserve human health, plant and animal life, cultural and material goods; to achieve the best practicable air quality, to prevent or at least to reduce the pollution causing the change of climate and to establish, maintain and improve an integral air quality management on the territory of Croatia without endangering other sections of environment, other areas, or the quality of life of future generations.

26. For surveillance of air quality a National Monitoring Network is being established by the Ministry of Environmental Protection and Physical Planning as a part of the Environmental Monitoring Network. It comprises monitoring stations for background pollution and long-range transboundary transport, stations participating in international networks, stations for measuring air pollution in protected areas and selected stations in residential and industrial areas. Local and regional air quality monitoring networks are being established by local self-government units. The measurement and data processing methods should be the same as those applied in the National Monitoring Network, based on generally accepted methods (EU, ISO, HRN, WHO, OECD) or equivalent methods.

27. In addition to continuous measurements within National and Regional Air Monitoring Networks special purpose measurements of limited duration are carried out in compliance with the environmental impact assessment of a pollution source or in a case of a grounded suspicion of excessive air pollution or of citizens' complaints against it. Based on measurement data over at least one year, areas will be classified by air pollution level in three categories:

(a) First category air quality: clean or slightly polluted air (below recommended values)

(b) Second category air quality: moderately polluted air (above recommended, but below limit values)

(c) Third category air quality: excessive air pollution (above limit values).

The administrative supervision of enforcing the Law on Air Quality Protection is in the authority of the Ministry of Environmental Protection and Physical Planning, while the implementation of regulations is carried out by the environmental inspector.

28. The recommended values (RV) and limit values (LV), recently laid down by the Government, are based on EU guide and limit values, WHO guidelines, Swiss Ambient Air Quality standards and German imission values. For pollutants coming from motor vehicles exhaust (NO_2, CO, Pb) more tolerant RV and LV are given for concentrations measured at street level. RV and LV for limitation of some carcinogenic substances coming from fuel combustion are based on recommended UK Air Quality standards (benzene, 1,3-butadiene), and German practice (3,4-benz-pyrene). The local self-government unit in agreement with the Ministry of Environmental Protection and Physical Planning is entitled to lay down stricter air quality limit values for its area because of the sensitivity of the ecosystem or specific land use - if approved by the Government. In places where under unfavourable weather conditions critical air pollution levels might be reached, with possible acute adverse effects on human health and environment, local authorities will order application of special measures.

29. Table 1: Selected ambient air quality standards (related to health effects) (mg/Nm^3)

Short term		Medium term		Long term		Comments
Standard	Average time	Standard	Average time	Standard	Average time	
SULPHUR DIOXIDE						
0.350	1 hour	0.125	24 hour	0.050	24 hour	RV
-	-	0.250	24 hour	0.080	24 hour	LV
NITROGEN DIOXIDE						
-	-	0.060	24 hour	0.040	24 hour	RV
0.200	1 hour	0.120	24 hour	-	-	LV
0.400	1 hour	0.080	8 hour			LV (related to NOx originating from vehicle engines at road level
		0.050	8 hour			RV (“)
OZONE						
-	-	0.110	24 hour	-	-	LV
0.180	1 hour	0.150	24 hour	-	-	RV
PARTICULATES (SPM - Suspended Particulate Matters)						
-	-	0.120	24 hour	0.075	24 hour	LV
-	-	0.350	24 hour	0.150	24 hour	RV
LEAD IN SPM						
-	-	-	-	0.001	24 hour	LV

				0.002	24 hour	RV
CARBON MONOXIDE						
-	-	5	24 hour	1	24 hour	LV
15	1 hour	8	24 hour	2	24 hour	RV
AMMONIA						
-	-	0.1	24 hour	0.030	24 hour	RV
1	1 hour	0.250	24 hour	0.070	24 hour	LV
1,3- BUTADIENE						
		0.0001	8 hour			RV
		0.001	8 hour			LV
3,4-BENZ-PYRENE						
				$0.2x10^{-3}$	24 hour	RV
				0.002	24 hour	LV
BENZENE						
-	-	0.005	8 hour	0.002	8 hour	RV
-	-	0.010	8 hour	0.005	8 hour	LV

30. One of the principal air quality protection and improvement instruments is the obligation to prevent air pollution sources from emitting pollutants above the prescribed emission limit values (ELVs By-law). The principal purpose of enacting this By-Law is to protect and enhance the air quality on the local level and thus provide conditions for a healthy living and improvement of activities which are directly linked with the clean environment. The limitation of emissions and, consequently, the improvement of power supply efficiency contribute, at the same time, to reduction of the share in regional and global pollution. Apart from ecological reasons this By-Law has a considerable political significance. It follows the directives of the European Community and obligations arising from the ratified international agreements. The enactment of the Ordinance demonstrates clearly the willingness to fulfil all obligations assumed and to cooperate in reaching the common goal - to reduce the emission of hazardous substances into the atmosphere. The By-Law is based on the principle of applying the best available technologies not entailing excessive costs (BATNEEC). In this regard BATNEEC are proposed, which has been accepted at the level of the EU countries and those limit values which arise as an obligation under the Protocol on Further Reduction on Sulphur Emissions. In the part where there are no common EU standards available, the regualations of other countries were consulted.

31. The By-Law, entered into force on January 1, 1998, prescribes general ELVs for total particulate matter, inorganic and organic compounds and carcinogenic substances. Each substance is associated with the I-IV risk category depending on the toxicity, permanence, accumulation properties and technological possibilities for emission abatement. The general ELVs, by types of hazardous substances, define limit values which, when exceeded, require emission measurements. For determine the measurement methods (continuous, discontinuous, indirect values) the approach in the Dutch legislation was selected. For the pollutants from stationary sources, like the production of non-metal mineral raw-materials, metals production and processing, chemical industry, foodstuffs industry, heating installations, gas turbines, internal combustion engines, waste incinerators, ELVs are prescribed for certain process-specific pollutants. Fire-boxes are divided into four groups: very small, small, medium and large. Continuous emission monitoring is

prescribed for large fire-boxes, whereas with other monitoring is based on periodical measurements. When prescribing emission monitoring the equipment costs, personnel costs and available staff and measurement institutions were taken into consideration. Since January 1, 1998, neither new stationary sources nor sources under reconstruction should emit pollutants into the air above the prescribed limit values, and should provide for emission measuring in accordance with the provisions on the ELV By-Law.

32. According to the provisions of the By-Law on Pollutant Emission Limit Values from Stationary Sources, the existing industrial plants will have to reconstruct their facilities within the specified time frame, but not after 2004, so as to comply with the prescribed ELVs. This By-Law also prescribes a two-year period for the establishment of continuous monitoring of pollutant emissions into the atmosphere for the major existent stationary sources. In this transitory period the existing stationary sources may emit pollutants into the air in levels three times higher that the prescribed limit values. The reconstruction and adjustment of Croatian industry to the provisions of the By-Law will be predominantly financed by internal funds, according to the "polluter pays" principle.

33. The By-Law on Requirements for Issuing Permits for performing Expert Environmental Protection Activities prescribes that emission and air quality measuring in the State territory shall be performed exclusively by companies that were granted the approval by the Ministry of Environmental Protection and Physical Planning.

34. Strategies. In 2000 the elaboration of the Proposal for Air Quality Protection and Improvement Strategy is currently underway within the framework of Environmental Protection Strategy.

35. Croatia's air quality standards are based on recommendations of the World Health Organization. Limit values are set as average annual, 24-hour and hourly concentrations. Toxicologic studies performed on animals indicate that short-term high concentrations are more harmful than longtime exposure to elevated concentrations. Therefore, for monitoring the environmental state in areas and sites where peak concentrations are expected, automatic devices should be used that are able to record short-term high concentrations. It is also necessary to locate air quality monitoring stations at the sites with the expected high concentrations which particularly refers to roads. Beside measuring NO_2 that is currently carried out, it is also necessary to start measuring NO, at the first stage only in selected characteristic locations.

36. The highest share in Croatia's emission has the road traffic (46 per cent), followed by other mobile sources and machines (18 per cent). The stationary energy sources are producing 32 per cent of the total emission. Of the total emission as much as 76 per cent of NO_x emission come from liquid fuels. <u>The share of ten major energy and industrial sources in the 1997 emission was 13.7 per cent.</u>

37. The 1997 emission was 73,200 tons which is 16 per cent lower than the 1990 emission. Since 1992 the NO_x emission has been constantly rising. It should be noted that in Croatia the application of emission reduction measures has only just started. Some new plants have introduced primary measures for emission reduction (for example, thermal power plant Plomin 2), but only one has secondary measures for emission reduction by means of a catalyser (PUTO –

mobile plant for incineration of production wastes). The only element that is at present considerably contributing to NOx emission reduction is the increase in the number of vehicles equipped with catalysers. This is the result of increasingly strict measures in the markets from which the vehicles are imported. The three-way catalyser reduces the NO_x emission by 70 to 80 per cent, while with the use of oxidizing catalysers the NO_x emission grows. The sulphur content of the fuel should be below 0.05 per cent, otherwise the catalyser efficiency tends to fall. In 1997 42 per cent of the total number of kilometers of passenger cars were covered by cars equipped with catalysers. In Croatia the sulphur content in fuels is limited to 0.1 per cent. It should be noted that cars equipped with catalysers cause a higher emission of the greenhouse gas N_2O, but this is of no major significance for the overall problem of greehouse gases emission in Croatia.

38. Strategy's objectives for the protection of ambient air (related to the NOx emissions) are as following:

(a) To prevent air quality deterioration from the aspect of NO_x in settlements and in the long run to achieve values not considered harmful for health.

(b) To maintain the existing air quality outside inhabited areas.

(c) To reduce the NO_2 emission to 80,000 t/year till the year 2010.

The decisive role in the reduction of nitrogen oxides emission will be played by road traffic. Since Croatia has no car manufacturing industry, the achievement of the objective defined will to a great extent depend on the implementation of measures in Europe and on the proportion of old and new imported vehicles.

39. For combustion plants the NO_x emissions are limited by the By-Law on Limit Values of Pollutant Emission from Stationary Sources which lays down the standards mostly on the level valid in the majority of EU countries. Regulations of the emission are to be continuously harmonized with the status of technologies for emission abatement which means the application of the best available technologies not entailing excessive costs (BATNEEC). The BATNEEC are first of all to comply with the UNECE guidelines and then, if required, with slightly more stringent guidelines of the European Union.

40. From the aspect of road vehicles it is important that in Croatia vehicles are on average 10 years old, which means that this is the minimum span of time for the achievement of the same objectives that Europe is achieving. The air protection in Europe has at present focused on the traffic-related emissions. After initial auto-oil programmes the EU adopted a number of guidelines and announced to intensify the strictness by 2005. The first group of guidelines appeared in the period between 1992 and 1994 ("EURO I"), the second one between 1996 and 1997 ("EURO II") and the adoption of the third one is scheduled for 2000. Since 1993 all vehicles using motor petrol produced in the EU must be equipped with a catalyser, after that additional technical requirements for the reduction of NO_x emissions are set. In 1997, according to the consumption of unleaded petrol in Croatia, 47 per cent of kilometers were covered by vehicles equipped with a catalyser. This is a very high percentage, but, in relation to developed countries of the European Union and some transition countries, the Republic of Croatia belongs among countries with a high share of consumption of leaded petrol.

41. When analysing the possibilities of the reduction of NO_x emissions, four scenarios which differ by traffic-related emissions were taken into consideration. For new stationary sources, among which the construction of two new power generating plants on gas is the most important,

the assumption was the application of BATNEEC measures to all three scenarios. It has been also assumed that the existing facilities will follow the By-Law on LV Emission. According to these scenarios in 2010 the NO_x emission will be by 23 to 25 per cent lower than the 1990 emission. This means that the requirements of the "multi effect – multi pollutant" Protocol might be fulfilled. This Protocol prescribes for Croatia the reduction of 87,000 t/year by 2010.

42. It is stressed that the NO_x emission assumed for coal-fired thermal power plants (over 300 mWth) amounts to 200 mg/m^3 of which implies the application of seondary measures (DENOX plants) and for gas turbines burning gas fuel the emission of 50 mg/m^3 (reduced to 15 per cent of O_2). In some coal-fired and gas plants in Croatia lower values are achieved already now. Nevertheless, with emission restrictions valid at present for coal-fired and combined gas power plants in the Republic of Croatia the 2010 emission would be by some 4 per cent higher than that in 1990, which means that it is necessary to adopt new stricter regulations in a very short time. For more information see Q.18

43. **Czech Republic**. Practical implementation of the protocol on decreasing emissions of nitrogen oxides and their transboundary fluxes is currently provided for in the legislation by Law No. 309/1991 Coll., on protection of the air against pollutants, as amended, and implementing Decree 117/1997 Coll., laying down emission limits and other conditions for the operation of stationary pollution sources and air protection. The key document of the national policy for air pollution abatement was the Concept of the National Environmental Protection Policy drafted by the Ministry for the Environment of the CR and approved by the Government of the CR on August 23, 1995. The Concept reflected the targets and plans, and various measures of the national policy for reducing NOx emissions in accordance with the protocol to the CLRTAP. The baseline for the strategy of reducing emissions from mobile sources were UN/ECE regulations which lay down the permissible levels of pollutants in exhaust fumes and permissible exhaust levels from engines.

44. The new document of the national policy is The State Environmental Policy approved by Government of the Czech Republic on April 14, 1999. This document includes national policies and strategies, and selected targets and measures for further reduction of NOx, with the respect to the obligations under the protocol to the CLRTAP. The principal targets and measures for reduction of NOx emissions are lowering of NOx emission standards for large power stations with compliance to EU requirements, and lowering of specific NOx emissions from mobile sources. At the latest by January 1, 1999, all the operators of large and medium-sized air pollution sources were obliged to comply with the emission limits laid down in Decree No. 117/1997 Coll., replacing the emission limits laid down for the previous period by the air protection administrative authority. The Decree came into effect on June 1, 1997. Full legislative compliance with the protocol will be achieved after passing of the new Law on air protection and protection of the ozone layer of the Earth, including the regulations for implementation, which is expected by November 1, 2001.

45. **Denmark**. Emissions of nitrogen oxides are considered to be one of the most significant regional air pollution problems in Denmark. Reduction of nitrogen oxides is one of the main goals of the Danish energy policy. The general Danish effort to stabilise the total energy consumption, the reinforcement of Combined Heat and Power and the replacement of coal and oil based production by renewable energy and natural gas are expected to reduce the emissions of nitrogen

oxides. Also Catalytic Converters on cars have been important tools to reduce NOx emission. For motor vehicles (passenger cars, light commercial cars, heavy duty vehicles, motor cycles, non-road mobile machinery etc.) Denmark implements emission standards according to the relevant EU-directive.

46. **Finland**. National strategies and policies were prepared in adHOC Committees. Regulations for passanger cars equivalent with the US-83 regulation came into force in 1990 in Finland. Unleaded petrol was made available in whole country and its market share rose to 60 per cent already in 1990 with the aid of economic incentives. Since leaded gasoline was totally banned in 1993, reformulated gasoline and sulpur-free diesel oil have benefitted from a lower rate of basic excise tax. EU exhaust standards replaced domestic regulations in 1996. Emission standards for major power stations were given in 1991. The emissions from stationary sources have decreased more than 30 per cent from the 1980 level. On the other hand, the reduction of emissions from road transport has been slower than was anticipated when the emission regulations just before the 1991-1993 economic recession were introduced.

47. **Germany**. National strategies, policies and programmes developed for air pollution abatement cover the various stages of the generation of air pollution and a large spectrum of environmental policy instruments. Ambient air quality standards and emission control requirements for plants and products are of most practical relevance. A point to be highlighted is the independent function of emission limits for installations and of corresponding requirements for products. This means that all emission sources are subject to the statutory requirements of emission avoidance at source according to the state-of-the-art. The establishment and operation of installations particularly liable to cause harmful effects on the environment is subject to licensing. The plants concerned are listed in the Ordinance on Installations Subject to Licensing (4th BImSchV). Detailed provisions relating to the licensing procedure are laid down in the Ordinance on the Licensing Procedure (9th BImSchV). Requirements concerning emission reduction requirements are laid down in particular in the following regulations:

(a) Technical Instructions on Air Quality Control (1st BImSchVwV);
(b) Ordinance on Large Firing Installations (13th BimSchV);
(c) Ordinance on Small Firing Installations (1st BImSchV);
(d) Ordinance on Waste Incinerators (17th BImSchV).

48. **Greece**.

(a) Application of Community standards concerning vehicle exhaust gas;
(b) Encouragement for consumption of less polluting fuels and use of renewable energy sources;
(c) Legislative framework for reduction of energy losses from buildings;
(d) Widespread introduction of natural gas in the country's energy balance;
(e) Building of the Athens underground railway system (now partly open) and other action in Athens to reduce traffic flows (use of public transport; building -- in progress -- of outer ring roads; introduction of staggered working hours).

49. **Hungary.** Ministerial Decree 22/1998. (VI. 26.) KTM came into force on 11th July 1998. This piece of legislation reflects the national policies and stipulates the emission limit values for large combustion plants (including gas turbines).

50. **Ireland.** National strategies, policies and programmes: NOx emissions have increased by 6% between 1990 and 1995. In the early 1990s the main source of emissions was the power generation and industrial sectors, primarily the former. These emissions have now been greatly reduced. However, the mid to late 1990s has seen a major growth in the transport sector particularly the passenger car market. This is a result of increased economic activity and greater prosperity coming out of a period of economic depression in the 1980s. Transport emissions now account for 43% of total NOx emissions (1998 data). In 1997, the Environmental Protection Agency estimated that vehicle emissions would continue to increase over the following five years before corrective measures, such as the mandatory fitting of catalytic convertors since 1993 will bring about significant improvements. The strategies, policies and programmes to reduce emissions are set out on a sectoral basis below.

51. Stationary Sources (Industrial/power generation). Legislation:The Environmental Protection Agency Act, 1992 requires an integrated pollution control (IPC) license regulating, inter alia, air emissions to be obtained from the Environmental Protection Agency for scheduled activities. The IPC licensing of new large combustion plants (LCPs) with a rated thermal input of 50 MW or more commenced in mid-1994 and the licensing of existing plant is scheduled to commence in September, 2000 and be concluded by January, 2002. Amendments to the Environmental Protection Agency Act, 1992 are being prepared to transpose the requirements of EU Directive 96/61/EC concerning integrated pollution prevention and control (IPPC). The ELVs for NOx under Directive 88/609/EEC have applied to LCPs with a rated thermal input of 50 MW or more since 1992. Ireland continues to be in compliance through the operation of the IPC licensing system with its NOx emission limit for this sector of 50 kt as set by Directive 88/609/EEC.

52. Stationary Sources (Industrial/power generation). Voluntary Agreements:Since 1995, the then monopoly supplier of electricity, the State-owned Electricity Supply Board (ESB), has complied with a voluntary agreement entered into with Government to achieve an emission ceiling of 42 kt (i.e. lower than the sectoral requirement under the LCP Directive); this agreement is still in force to date. The sectoral ceilings for the new liberalised (since 19/2/00) electricity supply industry as a whole is being reviewed in the context of, inter alia, Ireland's signature in December 1999 of the Gothenburg Protocol (under which Ireland is committing to achieving a NOx national emission ceiling of 65 kt by 2010) and the implementation of the EU IPPC Directive (96/61/EC); consideration is being given to the application of general binding rules in this regard.

53. Stationary Sources (Industrial/power generation). Technological Measures:A progressive programme of retrofitting of low NOx burners in existing ESB power plants commenced in 1992 costing in the region of 16.5m (10.2 m alone at the largest plant at Moneypoint) which considerably reduced emissions; other power generation sector measures to meet national emission targets under the Sofia Protocol include demand side management and improved efficiency. Since 1990 the ESB has carried out a demand side management and energy efficiency promotion programme in support of commercial and Government energy/environment policy objectives. Demand reduction measures have been applied to ESB facilities. House load reduction at generating plants results in a small increase in generation efficiency (efficiency maintenance and enhancement is a normal part of plant operation for commercial reasons).

54. Emissions from the energy and transformation industries fell from 47 kt in 1990 to 40 kt. in 1998.

55. Mobile Sources. Vehicle Emission Standards: Since 1970 Ireland has transposed into national law all EU vehicle emission standards and is currently finalising the transposition of the latest EU Auto Oil Programme directives. However, significant increases in vehicle numbers (49% between 1987 – 1997), particularly passenger cars (84% increase) and vehicle kilometres travelled in recent years are offsetting improved vehicle technologies such as the marketing of vehicles with mandatory catalytic convertor technologies since 1993.

56. Mobile Sources. Fuel Quality: Ireland phased out leaded petrol completely from 1st January, 2000 and introduced the new EU environmental specifications for cleaner petrol and automotive diesel fuel under the EU Auto Oil Programme (Directive 98/70/EC) between that date and 1st April, 2000.

57. Mobile Sources. Vehicle Testing: On 4 January 2000 mandatory road worthiness testing of passenger cars commenced on a phased basis relating to the age of the vehicles with older vehicles to be tested first. The test parameters include age-related emissions standards for air pollutants; a tax disc may not be issued for a liable vehicle in the absence of a valid test certificate. Preliminary figures show that approximately 20% of cars that initially fail the test have emission defects. However, approximately 75% of cars which initially fail, succeed in passing subsequently as a result of having repairs carried out. Roadworthiness testing of light and heavy goods vehicles and buses has been carried out since 1982

58. Mobile Sources. Budgetary Measures: In order to improve the age profile and efficiency of the vehicle fleet the 1995 Budget introduced an incentive of a €1,270 rebate in Vehicle Registration Tax on a new car if a car at least 10 years old was scrapped. The scrappage scheme operated in 1996 and 1997 and in total some 60,000 cars were scrapped; there is evidence that the scheme skewed the market towards smaller cars, accentuating the benefits of fleet replacement. In 1998 as a move towards "greening" of motor tax rates, changes in motor tax rates for public service vehicles came into effect providing for substantial reduction in motor tax for categories of vehicle used as public transport vehicles. The Irish motor tax base is already highly differentiated, in that cars with a higher cubic capacity, which, in general use more fuel and have higher emissions, pay a higher pro-rata rate of motor tax. The 1999 Budget further differentiated the Vehicle Registration Tax payable upon first registration of a vehicle in the State to encourage consumers to purchase smaller cars. The 1999 Budget also reduced the VAT inclusive excise duty on Liquefied Petroleum Gas by €.0023 per litre. LPG fuelled vehicles emit c. five times less NOx than petrol, and c. 10 times less than diesel, fuelled vehicles.

59. Mobile Sources. Sustainable Transport Strategy: In 1997 the Government published "Sustainable Development: a Strategy for Ireland". The action programme towards sustainable transport includes:

(a) Improved vehicle technology implemented in type approval and vehicle emission standards;
(b) Greater investment in, and use of, public transport;
(c) Better integration of public and private transport;

(d) Better integration between transportation and land-use planning (e.g the 1999 Strategic Planning Guidelines for Greater Dublin Area which set out the proposed land use strategy for the region to the year 2011);

(e) Better traffic management and management of the demand for road-use;

(f) Promotion of cycling and walking.

60. Additional national transport emission related policies include infrastructural development to remove HGVs from major urban areas, traffic management schemes, air quality management plans, integrated public transport investment (including the provision of additional bus and suburban railway stock and a new electric powered light rail system) etc. to facilitate significant emission reductions and ambient levels of, inter alia, NOx over time. A range of measures to manage traffic demand are being implemented with the overall objectives of reducing the relative attraction of commuting by car, reducing congestion and making public transport more attractive. The Government is actively examining the feasibility of the Dublin bus fleet using more alternative fuelled (LPG/CNG) vehicles.

61. Mobile Sources. National Development Plan: A total investment programme of 2.838bn in public transport improvements and upgrading is envisaged under the National Development Plan 2000 – 2006 (NDP, published November 1999). This has significant potential to reduce reliance on the private car for transport needs, especially in urban areas, with reductions in congestion and emissions, particularly in the Dublin area. 546 million is being provided for a light rail network (LUAS) in the Dublin region with a contingency of 635 million for the underground element. 279 million is being provided for an expansion of the bus network and 825 million is being made available for investment in regional public transport improvements, including mainline rail investment in safety and renewal (635m), bus and rail improvements in the Greater Cork area and bus developments in Limerick, Galway and Waterford. A total of 5.97 bn is planned in investment in national roads. This investment should help to remove delays in inter-urban journeys and thus increase efficiencies in fuel use due to improved journey times and reduced congestion.

62. Air Quality Management Planning: The Government has co-financed a regional air quality management plan for the Dublin region incorporating air quality and emission reduction policies and measures from stationary and mobile sources at local/regional levels. The plan was made in January 2000 by the four local authorities in the Dublin region following a public consultation process.

63. Air Quality Framework Directive: The Environmental Protection Agency was designated in 1999 as the responsible body for ambient air quality assessment and management as required by the EU framework Directive (96/62/EC). A series of subsidiary EU Directives have begun to set new and more stringent limit values to be achieved in the period 2005-2010 for individual pollutants. The Agency now has overall responsibility for nationwiding out a preliminary assessment of national air quality as the first step in planning the measures necessary to maintain and improve ambient air quality so as to meet the requirements of the air quality framework and subsidiary directives.

64. **Italy.** Italian policy to control and reduce nitrogen oxides emissions and or their transboundary fluxes is mainly inspired by the twin principles that the polluter pays and user pays, applied through a mix of command and control measures and economic instruments. Programmes

and measures to reduce nitrogen oxides emissions are based on a regulation framework: air quality standards, limit values and target values for air concentration of nitrogen oxides, attention and warning levels for the population, emission limits for combustion plants, emission standards for new vehicle were introduced in order to reduce nitrogen oxides emissions. Also with the aim to reduce nitrogen oxides emissions, programmes were also developed in the sectors that are principally responsible of such emissions, that is energy and transport sectors. In the energy sector, programmes were developed in order to promote the use of renewable energies and energy saving and the efficient use of energy resources in all the end-use sectors.

65. In the transport sector, programmes were developed in order to expand railway and marine networks and urban underground transport systems, facilitate the diffusion of less pollutant vehicles through incentives for the renewal of car fleet and public transport fleet, supply limited amounts of less pollutant alternative fuels such as for instance biofuel to urban transport systems. During the nineties it occurred an increase of mobility demand and fuels consumption in transport sector; to compensate the consequent increase of nitrogen oxides emissions, further programmes and measures have been developed since the last years, particularly with regard to urban mobility and infrastructure. Local authorities are introducing many measures in order to improve urban air quality reducing emissions of nitrogen oxides from traffic, such as payment parking, incentives and funding to purchase private and public transport low emissions vehicles, urban pedestrian areas, the so called “blue label”, that is the label that driver have to expose in order to demonstrate annual control of exhaust gas (local authorities can prohibit the circulation to cars without the “blue label”), cycle-paths, low circulation zones, car free days, mobility managers, car sharing. Scrappage incentives aimed at accelerating the renewal of the existing car fleet were introduced in 1997 and extended until 1998. A new regulation lays down reduced frequencies for vehicle inspection and maintenance: the first test is after 4 years, and subsequently every two years.

66. **Latvia*.** Emission ceilings for nitrogen oxides for Latvia are 10 per cent emission reduction for the year 2010 to compare the year 1990 emission level.
Figures are:
year 1990: 93 thousand tonnes of NO_2 per year,
year 2010: 84 thousand tonnes of NO_2 per year.
Figures are included in Annex II, Table 2. of the Protocol to the 1979 Convention on Long-range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground-level Ozone.

67. **Netherlands.** See question 1 for national strategies. *National policies for reduction of nitrogen oxides emissions.*Also for nitrogen oxides new emission targets are expected to emerge in 2000 after the review which is currently in progress. The review will also include the risk levels for nitrogen oxides. The current risk levels for nitrogen oxides concentrations in ambient air, the emission standards and emission limits are identical to in the latest review. The NOx emission have decreased slightly from 588 kton/year in 1980 to 514 kton/year in 1995. In 1990 the emission topped at 596 kton/year.

68. **Norway.** Norway’s obligation to the 1988 Nitrogen Oxides Protocol is to stabilise national annual NO_x emissions by 1994 using 1987 as a base year. Emissions of NO_x declined by 6 per cent in the period 1987-1994, and increased by 5% in the period 1995-1998. Hence, during the period 1987-1998 there has been an overall reduction of approximately 1%. The stabilisation of NO_x emissions after 1987 is attributed primarily to the application of new emission standards for

passenger cars, restrictions on flaring in the North Sea and measures to limit NO_x emissions in fertiliser production.

69. Emissions of nitrogen oxides from large stationary sources are mainly controlled through permits issued by the Norwegian Pollution Control Authority (SFT) in pursuance of the Pollution Control Act of 1981. Emissions from smaller plants (smaller than 50MW), which burn gas and oil fuels, have until now been regulated by individual emission permits. However, SFT is now finalising national regulations of emissions from these plants, which will include emissions of particles, SO_2, NO_X, CO and other pollutants of importance, as well as residue handling, plant operation and control measurements.

70. In addition to the Large Combustion Plants (LCP) directive (see response to Q.1), Norway has also implemented the EU directive (96/61/EC) of 24 September 1996 concerning Integrated Pollution Prevention and Control (IPPC directive), which entered into force on 1 January 2000. Furthermore, Norway implemented the EU-directives 80/779/EEC, 82/884/EEC and 85/203/EEC on air quality through national regulations on limit values for air pollutants and noise, which entered into force in 1997.

71. Mobile sources in Norway must fulfil the emission standards set by the Ministry of Transport in pursuance of the Road Traffic Act of 1965. They also comply with the EU directives concerning mobile sources, which have been implemented over the years. Norway has fiscal taxes on petrol and diesel. In 1998 the tax on unleaded petrol was 4.11 NOK/l, while the tax on diesel was 3.43 NOK/l. The Norwegian fiscal taxes for the acquisition of vehicles and the yearly vehicle fees also contribute to the reduction of air pollution. Electrically driven cars cause no air pollution due to the hydroelectric power supply, and are exempted from the normal purchase tax for cars of approximately 100% in order to encourage their use.

72. A review of possible NO_x policy instruments for different sectors was presented in a report to the Storting, (the Norwegian Parliament) submitted by the Norwegian Government in 1995. According to an analysis prepared by the Norwegian Pollution Control Authority (SFT) in co-operation with several national agencies in 1999, the most cost-effective measures to reduce emissions of NOx are considered to be technical motor changes and catalytic cleansing in ships, installation of low-NO_x technology in gas turbines in the petroleum industry, NO_x cleansing in the ferro-alloy industry, as well as increased efficiency in freight transport using heavy duty vehicles. Subsidies are now offered to release measures on coastal ship traffic. In the national budget for 2000, the Storting decided to introduce an environmentally differentiated tonnage-tax in order to abate emissions from shipping (SO_2, NO_x etc). In the offshore sector, low-NO_x technology is installed in new gas turbines. In the national budget for 2000 the Storting also implemented a differentiation in the annual tax for heavy road vehicles according to the emissions of pollutants (including NO_x), in compliance with the standards in the so-called EURO I and II directives for heavy duty vehicles (see response to Q.4).

73. To encourage research and development in the field of alternative fuels in the transport sector, funds have been allocated to projects on the use of natural gas in buses and the development and testing of electric and hybrid vehicles. Funds have also been allocated for research on the tests of several alternative fuels. Tests on the use of natural gas in ferries are being conducted. The first gas driven ferry started operating in 2000.

74. **Poland***. The long-term objectives of the NO_x reduction policy are defined in the "National programme for nitrogen emission reduction" accepted by the government of Poland. According to them a gradual emission reduction of NO_x is foreseen with reference to the Protocol obligations. Poland has fulfilled all the major Protocol obligations reducing in 1989 the nitrogen oxides emission to the level reported in 1987. Furthermore:

(a) NO_x emission standards have been brought into effect for new and existing stationary energy production installations with the energy output of 50 MW;

(b) a constant supply of unleaded petrol has been provided;

(c) an access to the best available technologies has been enabled by liberalisation of the technical equipment market.

Lots of research is done in Poland to improve the monitoring of NO_x emission, to develop the modelling techniques for air pollution transport and the assessment of health and ecological effects of air pollutants including nitrogen oxides.

75. **Russian Federation.** On 28 April 1989 the USSR Council of Ministers adopted Decision No. 256 concerning the adoption by the USSR of the Nitrogen Oxides Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution. Pursuant to that decision, a plan of concrete measures was drawn up with a view to fulfilment of the USSR's obligations under the Nitrogen Oxides Protocol. Those measures included: making an inventory of nitrogen oxide emissions at enterprises in the European part of the USSR; formulation of specific targets to reduce nitrogen oxide emissions for ministries whose enterprises are major sources of such emissions. These targets were set out in the draft State programme on environmental protection and rational use of the natural resources of the USSR for the period covered by the thirteenth five-year plan and up to the year 2000.

(a) USSR Ministry of Energy Reduce nitrogen oxide emissions by 500,000 t in the European part of the USSR by 2005; increase the percentage of collection or treatment for nitrogen oxide off-gases in the sector as a whole to 20% during the period covered by the thirteenth five-year plan and to 39% by 2005; provide for the construction of 15 installations for the collection of nitrogen oxides; reconstruction of 630 boilers by 1995 to reduce nitrogen oxide emissions by 25-30% in the European part of the USSR.

(b) USSR Ministry of Ferrous Metallurgy Reduce nitrogen oxide emissions by 57.5% (relative to the 1986 level) in the USSR (and by 127,700 t in the European part) by 2005; provide for the use of flat-flame burners to suppress nitrogen oxide emissions at boiler plants.

(c) USSR Ministry of Building Materials Reduce nitrogen oxide emissions by 30,000 t (relative to the 1986 level) in the European part of the USSR by 2005.

(d) USSR Ministry of Timber and Paper Production Reduce nitrogen oxide emissions by 24,600 t (relative to the 1986 level) in the European part of the USSR by 2005.

(e) Transport sector Reduce nitrogen oxide emissions by 8.5% (relative to the 1986 level) by 2005 while increasing the number of motor vehicles to meet the demands of the national economy and the public as a whole.

76. The main priority measures planned to reduce nitrogen oxide emissions were:

(a) making an inventory of emissions at enterprises and the main sources of nitrogen oxide emissions in the European part of the USSR;

(b) review of NO_x emission standards for boiler plants of various capacities;

(c) devising methods to suppress nitrogen oxide emissions.

77. A new State standard “Boiler plants. Heat process section. General technical requirements” approved in 1995 sets specific NO_x emission standards for boiler plants of various capacities and with different types of fuel.

78. An agreement was signed in 1995 for cooperation between the Ministry of the Environment of the Russian Federation and the Main State Inspectorate for supervising the technical status of self-propelled machinery and other types of equipment of the Ministry of Agriculture and Food of the Russian Federation.

79. **Slovakia**. The National Environmental Policy, approved by the Government and National Council of the Slovak Republic in 1993 sets as one of long-term strategic objectives 80% reduction in SO_2, NO_x, and dust emissions, reduce emissions of VOCs, POP, heavy metals, CO_2 and other greenhouse gases emissions, in accordance with international conventions, and as medium term objective in air protection reduction of NO_x emissions by more than 35% (from 233 000 tons in 1991 to 152 000 tons in the year 2000). The total emissions of NO_x in 1998 were 130 000 tons (66% of the 1987 years´s emissions). These objectives are going to be reached by means of several pieces of legislation (e.g. Act Nr. 309/1991 on air protection against polluting substances (the Act on Air), as amended by the acts 218/1992, 148/1994, 256/1995 and 393/1998. this act sets inter alia opportunity for the Ministry of the Environment to set emission quotas for certain pollutants_ Governmental Order Nr.92/1996 by means of which the Act No. 309/1991 on the protection of the ambient air against the pollutants (Act on Air) is implemented, which sets emission limit values for different types of sources, fuels and technologies_ Regulation Nr.208/1996 of the Ministry of Environment of the Slovak Republic on July 3, 1996, on the programme of emissions reduction, etc.). The amendment of the Act on Air in 1999 allows to set quotas on emissions of certain pollutants.

80. **Spain**. Spain follows the policy of the European Union to combat acidification , which was approved by their Executive Body dated 16 December 1997, and Spain is engaged in abiding by their directives with reference to Strategies and Policies as well as to the participation of the European Union and their member countries in the work of the Convention on Long-range Transboundary Air pollution and its Protocols. Consequently, the reply to the questions 2, 3, 4, 5, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27 is "According to the European Union legislation and strategies".

81. **Sweden.** National strategies, policies and programmes to reduce NO_x-emissions: There are five major tools to reduce NOx-emissions. They are described in more detail below:

(a) The general energy policy to reduce the consumption of fossil fuels;
(b) Charges for emissions of NO_x from stationary sources;
(c) EU-emission standards for on-road vehicles;
(d) Environmental classification of fuels and vehicles;
(e) EU-emission standards for off-road vehicles.

82. **Switzerland.** Information on national strategies, policies and programmes that specifically address the control and reduction of nitrogen oxides emissions or their transboundary fluxes. In

1986 the Government adopted an overall Air Pollution Control Strategy covering sulphur dioxide, nitrogen oxides and volatile organic compounds (VOCs). For nitrogen oxides, the minimum target is to reduce emissions to 1960 levels (i.e. a 64% reduction compared to 1985 levels). The 1985 Federal Law relating to the Protection of the Environment and its implementing ordinances, in particular the 1986 Ordinance on Air Pollution Control (OAPC) set the legal framework of a comprehensive air pollution control programme.

83. The 1986 OAPC, amended in 1992, 1997 and 1999, regulates emissions from stationary sources. It contains emission standards for about 150 individual inorganic, including nitrogen oxides and organic pollutants. Moreover, the Ordinance contains fuel and petrol requirements as well as effect-oriented ambient air quality standards. As regards pollution caused by motor vehicles, emission standards are laid down in the Ordinances relating to the Laws on Road Transport, Navigation and Aviation.

	1960	1980	1985	1990	1995	1998
Emission level (in 1000 t. NO_2)	64.0	170.0	179.0	166.0	136.0	123.4

84. **Ukraine**. There is no special national programme, policy or strategy to implement the Protocol which specifically aims to reduce nitrogen oxide emissions in Ukraine.

85. **United Kingdom**. The UK has met its commitments under the first UNECE NO_x Protocol to return emissions to 1987 levels by 1994. UK emissions in 1994 were 11% lower than in 1987 and fell by a further 10% between 1994 and 1996. Part 1 of The Environmental Protection Act 1990 (EPA90), supplemented by regulations, is the main legislative instrument for the control of air pollution (including NO_x) from industrial sources. Regulations under EPA90 prescribe industrial processes for which an authorisation to operate is required from the relevant regulator. In granting authorisations, the enforcing authority must ensure that the Best Available Techniques Not Entailing Excessive Cost (BATNEEC) are employed to prevent or, where that is not practicable, to minimise and render harmless, releases of certain prescribed substances into any environmental medium. Authorisations may also require compliance with any limits or requirements of any European Community quality standards, and directions issued by the Secretary of State for compliance with international and European obligations. Conditions set out in authorisations must be reviewed at least every four years, in line with developing technology and awareness of risk. These arrangements will be continued under the pollution control regime to be set up under the Pollution and Prevention Control Act 1999, which will implement the EC Integrated Pollution Prevention and Control Directive (96/61/EC) and eventually supersede the 1990 Act regimes.

86. **United States**. The national strategies and programmes in the United States for environmental protection from air pollution are expressed in the specific pieces of environmental legislation that have been enacted, most importantly, the Clean Air Act (CAA) and regulatory programmes authorized by that legislation. Specific programmes have been and are being implemented which continue to push for further emission reductions from mobile sources and the fuels used in them, to install best available control technologies on new and existing major stationary sources of nitrogen oxides (NO_x), and to bring all areas of the country into compliance with the national ambient air quality standard (NAAQS) for ozone.

87. The U.S. programmes contains an enforceable, built-in trigger for improving air quality over time. As required by its CAA, the U.S. has established mandatory NAAQS for ozone. The Environmental Protection Agency (EPA) periodically reviews and updates these standards based on the latest health and environmental information. In addition, EPA finalized a rule in September 1998 that, upon implementation, will reduce summertime NO_x emissions from power plants and other industrial sources by over 60 percent in the eastern U.S.-- that portion of the country that affects air quality and the environment in Canada. In addition, under the Title IV Acid Rain Programme, the U.S. has reduced NO_x by 2 million tons from controls on electric utilities.

88. The EPA also finalized a rule in December 1999 to strengthen even further NO_x and hydrocarbon emission standards for passenger vehicles in the next several years and to phase in stringent new emission standards for the growing segment of light-duty trucks and sport utility vehicles, so that their NO_x and hydrocarbon emissions will be as low as those for automobiles. At the same time, the U.S. intends to develop another generation of even cleaner gasoline by substantially cutting sulphur levels which will also reduce NO_x emissions. Other smaller sources like off road engines (e.g. lawn mowers and recreational boats) are becoming a larger portion of the remaining U.S. inventory. The EPA is moving to cut emissions from these smaller sources over the next decade. The CAA also includes specific deadlines for meeting the standards and specific stringent emissions control requirements that become more stringent with the severity of the ozone problem. State and local governments must implement these emission control programmes by a specific deadline and submit plans that demonstrate how the cities within their State will attain the N

89. **European Community.** The Auto-Oil II Programme (AOPII) was launched in spring 1997 and will be finalised soon. Its purpose has been to assess projected air quality in 2010 and to establish a consistent framework within which different policy options to reduce emissions can be assessed using the principles of cost-effectiveness, sound science and transparency. It has also been intended to provide a foundation (in terms of data and modelling tools) for the transition towards longer term air quality studies covering all emission sources. The overall approach has included identification of environmental objectives, the forecasting of base case trends in emissions and future air quality, the establishment of emission reduction targets, the collection of input data on costs and effects on emission reduction measures followed by an optimisation analysis or ranking of the measures, and finally the dissemination of results including data, modelling tools and reports. Both nitrogen dioxide (NO2) and nitrogen oxides (NOx) are among the pollutants selected for study. The following conclusions expected to come out of the programme are of particular relevance for NOx:

(a) Road transport is expected to take up a diminishing share of total emissions, with the share of NOx emissions falling from about 50% in 1995 to around 25% in 2010;

(b) Closing the gap between the AOPII base case emissions projections and the proposed national emission ceilings for NOx and VOCs is one of the principal remaining air quality challenges;

The evaluation of national NOx and VOC reductions made use of the RAINS database.

90. **Question 3: Provide information, as required by article 8, paragraph 1 (b), and article 2, paragraph 2 (a), on progress made in applying national emission standards to the**

new and substantially modified stationary sources. In your reply, list the source categories in your country that are considered to be major stationary source categories under the Protocol, taking into account its technical annex and article 1 (Definitions). For each source category, state the national emission standards applied or to be applied, the units and statistical treatment, and the pollution control measures applied. For standards to be applied, please indicate when they will come into effect. In your response, you may wish to use the table format suggested.

91. **Austria**. Major stationary source categories according to the Technical Annex of the NOx-Protocol are „Commercial, institutional and residental combustion plants“ (12 % of the natl. emissions) and „Industrial combustion plants and processes with combustion“ (18 % of the natl. emissions). For several new stationary sources categories (construction or substantial modification were commenced after February 1993) emission standards have been set:

Source category	Emission standards*)	Units & statistical treatment 1/	Pollution control measures applied / Annotations
Steam boilers – solid fuels: 0.35 – 10 MW_{th} 10 – 50 MW_{th} > 50 MW_{th}	 400 350 200	mg/m^3, half hour mean value	
Steam boilers – wood combustions: 0,35 – 10 MW_{th} 10 – 50 MW_{th} > 50 MW_{th}	 250–500 200–500 200	mg/m^3, half hour mean value	
Steam boilers –fuel oil: 0,35 – 10 MW_{th} 10 – 50 MW_{th} > 50 MW_{th}	 150–450 150–350 100	mg/m^3, half hour mean value	
Steam boilers – natural gas: 0,35 – 10 MW_{th} 10 – 50 MW_{th} > 50 MW_{th}	 100–125 100 100	mg/m^3, half hour mean value	
Steam boilers for waste combustion (> 750 kg waste /h)	100–300	mg/m^3, half hour mean value	
Installations for the combusion of hazardous waste: flue gas ≤ 5000 m^3/h flue gas > 5000 m^3/h flue gas > 10000 m^3/h	 400 300 100–150	mg/m^3, half hour (daily) mean value	Installations which were licensed before Feb. 1999 have to comply until July 2000.
Industrial boilers (except steam boilers) – solid fuels: 0.35 – 10 MW_{th} 10 – 50 MW_{th} > 50 MW_{th}	 400 350 100–200	mg/m^3, half hour (daily) mean value	Installations which were licensed before June 1998 have to comply (until June 2003) only if > 50 MW_{th}.
Industrial boilers (except steam			Installations which

boilers) – wood combustions: 0,35 – 10 MW_{th} 10 – 50 MW_{th} > 50 MW_{th}	 250–500 200–500 200–350	mg/m^3, half hour (daily) mean value	were licensed before June 1998 have to comply (until June 2003) only if > 50 MW_{th}.
Industrial boilers (except steam boilers) – fuel oil: 0,35 – 10 MW_{th} 10 – 50 MW_{th} > 50 MW_{th}	 150–600 150–350 100–250	mg/m^3, half hour (daily) mean value	Installations which were licensed before June 1998 have to comply (until June 2003) only if > 50 MW_{th}.
Industrial boilers (except steam boilers) – natural gas/LPG: 0,35 – 10 MW_{th} 10 – 50 MW_{th} > 50 MW_{th}	 120–260 100–260 100–260	mg/m^3, half hour (daily) mean value	Installations which were licensed before June 1998 have to comply (until June 2003) only if > 50 MW_{th}.
Production and processing of iron and steel in general: Gaseous fuels liquid fuels solid fuels; special processes (melting of raw iron, steel converters, reheating ovens, pickling)	 250 350 500 500–750	mg/m^3, half hour (daily) mean value	Installations which were licensed before July 1997 have to comply until July 2002
Sintering plants	400	mg/m^3, half hour (daily) mean value	Installations which were licensed before July 1997 have to comply until July 2002
Non-ferrous metals production in general: Gaseous fuels liquid fuels solid fuels; melting/recycling of Al	 250 350 500 300–500	mg/m^3, half hour (daily) mean value	Installations which were licensed before Jan. 1998 have to comply until Jan. 2003
Casting of metals in general: Gaseous fuels liquid fuels solid fuels; reheating furnaces (< 800°C) reheating furnaces (> 800°C)	 250–500 350–500 500 500–750	mg/m^3, half hour (daily) mean value	 primary measures
Production of bricks when emis. of NO_x > 5 kg/h	200–300	mg/m^3, half hour mean val.	
Production of gypsum	250–500	mg/m^3, half hour mean val.	primary measures requ.
Production of cement	500	mg/m^3, daily mean value	
Production of glass when emis. of NO_x > 2.5 kg/h	500–1500	mg/m^3, half hour mean val.	
Residential space heating: gaseous fuels	 30–80	 mg/MJ	These are limit values for the type approval of

liquid fuels wood - fossile solid fuels	35 150 100		geysers, stoves and heaters

*) A range indicates that standards are differentiated according to specific subcategories

92. For other industrial sources individual emission standards and/or measures according to best available technology have to be set in the licensing procedure for each installation.

93. **Belarus**. The major sources of NO_x emissions in the Republic of Belarus are divided into the following categories:

(a) Utility power stations, electricity and thermal power generating plants, and district heating plants with boilers and internal combustion turbines for existing stationary sources having a unit capacity of ≥ 100 MW;
(b) Commercial boiler plants with a unit capacity of no less than in (a);
(c) Industrial combustion plants and combustion-related processes; process heaters (with no contact between flue gas and product); production of cement, lime, glass and steel; unit capacity of no less than in (a);
(d) Nitric acid production of ≥ 200,000 t/year.

For boilers at thermal electric power stations and district heating plants, in the commercial and administrative sectors and at industrial facilities, the national standards are given in the annexed table.

Stationary source categories	**National emission standards for NO_x (in NO_2 equivalent)**		**Units and statistical treatment**	**Pollution control measures applied**
	gas	fuel oil		
Boilers for power generation, manufactured before 1.07.90 Output less than 420 t/h Output more than 420 t/h	 0.086 (255) 0.10 (290)	 0.10 (290) 0.12 (350)	kg/GJ (mg/m^3) dry gas with α = 1.40, t = 0 °C, 101.3 kPa	flue gas recycling, multi-stage combustion
Boilers for power generation, manufactured after 1.07.90 Output less than 420 t/h Output more than 420 t/h	 0.07 (200) 0.08 (240)	 1.10 (290) 1.12 (250)	kg/GJ (mg/m^3) dry gas with α = 1.40, t = 0 °C, 101.3 kPa	flue gas recycling, multi-stage combustion
Steam boilers, stationary, manufactured before 1.07.90 Output 4-25 t/h Output 35-75 t/h Output 100-160 t/h	 0.12 0.15 0.30	 0.15 0.20 0.30	kg/kJ dry gas with α = 1.40, t = 0 °C, 101.3 kPa	flue gas recycling, multi-stage combustion for boilers with output of more than 20 t/h

Stationary source categories	National emission standards for NO_x (in NO_2 equivalent)		Units and statistical treatment	Pollution control measures applied
	gas	fuel oil		
Steam boilers, stationary, manufactured after 1.07.90			kg/kJ dry gas with α = 1.40, t = 0 °C, 101.3 kPa	flue gas recycling, multi-stage combustion for boilers with output of more than 20 t/h
Output 4-25 t/h	0.11	0.14		
Output 35-75 t/h	0.14	0.18		
Output 100-160 t/h	0.22	0.27		
Boilers for district heating, water-heating, from 1.01.89 to 1.01.96			kg/kJ (mg/m^3) dry gas with α = 1.40, t = 0 °C, 101.3 kPa	
Output 30 (35) Gcal/h (MW)	0.09 (230)	0.13 (340)		not applied
Output 50 (58) Gcal/h (MW)	0.12 (300)	0.15 (380)		not applied
Output 100 (116) Gcal/h (MW)	0.12 (300)	0.15 (380)		flue gas recycling, multi-stage combustion
Output 180 (209) Gcal/h (MW)	0.12 (300)	0.15 (380)		
Boilers for district heating, water-heating, from 1.01.96 to 2006				
Output 100 kW	240/150	230*	mg/m^3 dry gas with α = 1.40, t = 0 °C, 101.3 kPa	not applied
Output 30 (35) Gcal/h (MW)	0.08 (200)	0.10 (250)	kg/kJ (mg/m^3) dry gas with α = 1.40, t = 0 °C, 101.3 kPa	not applied
Output 50 (58) Gcal/h (MW)	0.08 (200)	0.10 (250)		not applied
Output 100 (116) Gcal/h (MW)	0.08 (200)	0.10 (250)		flue gas recycling, multi-stage combustion, heaters with low NO_x output
Output 180 (209) Gcal/h (MW)	0.08 (200)	0.10 (250)		

94. Light petroleum fuel used.

Mobile source categories	National emission standards for NO_x (in NO_2 equivalent)	Units and statistical treatment	Pollution control measures applied
Diesels for ships, locomotives and industrial uses with average effective pressure under test of $\leq$ 0.3 Mpa	120	g/kg fuel	
with average effective pressure under test of > 0.3 Mpa and specific fuel consumption, g/kWh: up to 214 214 to 226 226 to 238 238 to 252 252 to 268 Over 268 **Diesels for agricultural and industrial tractors** **Combine diesels** **Diesels for tractors to be used in places with limited air exchange**	 29 25 21 17 14 11 22.0 25.0 13.0	 g/kWh " " " " " g/kWh g/kWh g/kWh	

95. **Belgium*.** Flemish region

Source category	National emission standards (for installations authorised from 01/07/87 until 31/12/95)	National emission standards (for installations authorised from 01/01/96)	Pollution control measures applied 2/
Power plants and industrial Combustion Plants			
1. Solid fuels	650 mg/Nm^3	50-100 MW: 400 mg/Nm^3 100-300 MW: 200 mg/Nm^3	No new installations
2. Liquid fuels	50-300 MW : 450 mg/Nm^3 >300 MW: 200 mg/Nm^3	50-100 MW: 400 mg/Nm^3 (target value 150) 100-300 MW: - up to 31/12/99: 400 mg/Nm^3 - from 1/1/2000 on: 300 mg/Nm^3 (target value 150) >300 MW: 200 mg/Nm^3 (target value 150)	No new installations
3. Gaseous fuels	350 mg/Nm^3	Blast-furnace gas: 350 mg/Nm^3 Natural gas and biogas : -50-300MW: 150 mg/Nm^3 ->300 MW: 100 mg/Nm^3 Other gas: 200 mg/Nm3 (target value 100)	Process and combustion modification: low NOx burners

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
2./ Use the technical annex to the Nitrogen Oxides Protocol relating to best available technologies (BAT) as a reference.

Statistical treatment:

Measuring frequency	Compliance
Discontinuously	any measured value < or = emission limit value
Continuously	a) any daily average < or = emission limit value, and b) 97% of the half hour averages < or = 6/5 times emission limit value, and c) any half hour average < 2 times emission limit value

Source category	National emission standards	Statistical treatment	Pollution control measures applied 2/
Oil refineries	Overall (bubble) emission limit values From 01/01/94 until 31/12/97 : 900 mg/Nm^3 From 01/01/98 : 450 mg/Nm^3	Advancing 30-days average < emission limit value	low NOx burners (limited) Switch to gas
Non-combustion processes - **nitric acid production** - **other processes**	450 mg/Nm^3 500 mg/Nm^3	statistical treatment (see table below*)	SCR or NSCR on all installations for nitric acid production
Waste combustion	400 mg/Nm^3	Hazardous waste 97% of all half hour averages < or = emission limit value all daily averages < emission limit value Municipal waste 7 day average < emission limit value all daily averages < 1.3 times emission limit value	Flue gas treatment + deNOx

***Statistical treatment**

Measuring frequency	Compliance
Discontinuous measurements, Frequency < monthly	Any measured value < or = emission limit value
Discontinuous measurements, frequency > or = monthly	a) any measured value < or = emission limit value, or b) i) any daily average from hour values < or = emission limit value and ii) not more than about 5% exceedings of hour values in function of the number of samples**, and iii) any hour average < 2 times emission limit value
Continuous measurements	a) any daily average < or = emission limit value, and b) 97% of the half hour averages < or = 6/5 times emission limit value, and c) any half hour average < 2 times emission limit value

**The allowed number of samples not meeting the emission limiting values - as a function of the number of samples - is prescribed in art. 4.4.4 of Vlarem II.

96. Walloon region**:** The standards listed below apply to the following large combustion

installations:

(a) power stations;
(b) sugar refineries;
(c) iron and steel plants;
(d) chemical processing plants;
(e) wood pulp plants.

Source category	**Walloon region emissions standards applied between 1987 and 1995**	**Walloon region emissions standards applied after 31.12.95**	**Units and statistical treatment[1]**	**Pollution control measures applied[2]**
Solid fuels: **< 100 MWt** **> 100 MWt**	800 mg/Nm^3 650 mg/Nm^3	400 mg/Nm^3 200 mg/Nm^3	daily average + 97% of average values per ? hour not greater than 6/5 of the limit values and no average value per ? hour exceeding twice the limit values	- replacement by gas - burners out of service
Liquid fuels	450 mg/Nm^3	150 mg/Nm^3	daily average + 97% of average values per ? hour not greater than 6/5 of the limit values and no average value per ? hour exceeding twice the limit values	- OFA (Over Fire Air) - low excess air operation - regulating air flow and controlling air speed - replacement by gas - regulating oxygen - RUE - cogeneration
Gaseous fuels: **except blast furnace gases**	350 mg/Nm^3	100 mg/Nm^3	daily average + 97% of average values per ? hour not greater than 6/5 of the limit values and no average value per ? hour exceeding twice the limit values	- smoke recirculation - primary measures - gas/steam turbines - cogeneration
blast furnace gases	350 mg/Nm^3	350 mg/Nm^3		
Wood pulp production: waste heat and bark waste boiler	250 mg/Nm^3 (as from 1992)	250 mg/Nm^3	daily average	

Household waste incinerators	as per operating permit			DeNOx

[1] The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
[2] Use the technical annex to the Nitrogen Oxides Protocol relating to best available technologies (BAT) as a reference.

97. **Bulgaria**. Until 1991 national emission standards for the maximum allowable content of pollutants in the gases released in the atmosphere were based on the height of the chimneys (Regulation 1/1986, State Gazette ISSN 7/86), the dispersion (fluxes?) and ensuring air quality of the breathing zone (1.5 m above surface layer). This policy lead to the construction of 100-m high chimneys, and in some large combustion installations and metallurgical plants reached no less than 325 m.

98. There are new national emission standards since 1991 regarding allowable emissions (flute gas concentrations) of pollutants, released in the atmosphere (State Gazette ISSN 81/91). The standards are based on not allowing exceeding set pollutant concentrations in the flute gases after passing through the last purification facility and before releasing in the chimney. Emission standards applicable to new stationary sources were adopted on 1993.01.01. Substantially modified existing installations are treated as new stationary sources and the same standards applied.

Table 1: Nitrogen Oxides National Emission Standards for New Combustion Stationary Sources in mg/m^3

Source category	Fuel type	Power in MW		
	(a)Local coal			600
	Imported coal			
	Liquid fuels	450		
	Gaseous fuels	200	200	

Table 2: Nitrogen Oxides National Emission Standards for Stationary Sources in mg/m^3

Source category	National emission standards	Pollution control measures applied
Cement production	1500	O_2 B 90 % for stationary sources, functioning after 1993.01.01
Production (baking) of lime	(a) 1800 (b)1500	(a) rotating furnace (b)other types of furnace
Production of nitrogen acid	500	at mass flow exceeding 5 kg/h

In 1998 above Regulation was replaced by a new one (SG 51/98). National emission standards became mandatory for all stationary sources, given a positive decision of the environmental impact assessment after 1st July 1998.

Table 3: Nitrogen Oxides National Emission Standards for New Combustion Stationary Sources in mg/m^3

Source category		**Power in MW**			
Combustion					
Stationary sources					

The same emission standards for nitrogen oxides as in Table 2 apply to stationary production sources.

From 1st January 2000 emission standards for nitrogen oxides applicable to large new combustion installations are in force (SG ISSN 73/99). These national emission standards Regulation has been harmonized with EEC Directive 88/609/EEC and concerns large combustion plants of thermal power exceeding 50 MW.

Table 4: Nitrogen Oxides National Emission Standards for Large New Combustion Stationary Sources in mg/m^3

Fuel type	**National emission standards**
Solid fuel	650
Solid fuel with less than 10% volatile compounds	1300
Liquid fuel	450
Gaseous fuel	350

For large combustion plants, designed to burn domestic lignite coal, which is the main source for such installations, exceeding of emission standards is allowed, provided the best available technology (BAT) to limit the emissions has been employed, without involving unreasonably high expenses.

99. In compliance with Regulation 6 on the terms and conditions of measuring emissions, released into the atmosphere by stationary sources (SG 31/99), the new ones should employ automatic measuring devices (AMD). AMDs should detect and consecutively record the emissions, evaluate and process the acquired data in accordance with Directive 88/609/EEC requirements. Emission standards are not exceeded whenever, for a period of one calendar year, the following conditions are met:

(a) none of the average monthly values (calculated as average daily values for the period the installation has been in operation) has exceeded set standards;

(b) 95 % of all half-hour average values of nitrogen oxides for a randomly chosen 48-hour period should not exceed 11 % of the allowable emission standards.

100. Canada**.** National NOx emission standards have been developed for the following major new stationary sources (effective dates in brackets):

(a) Coal, oil and gas-fired electric utility boilers (revised standards effective January 1995)
(b) Commercial/industrial boilers and process heaters (March 2000)
(c) Cement kilns (March 2000)
(d) Combustion turbines (November 1994)

101. Provinces have implemented the guidelines for all new and substantially modified electric utility boilers commissioned since 1993 (3 units and 2 units respectively). The province of Ontario has adopted and applied the combustion turbine guidelines as a regulation and is in the process of adopting the commercial/industrial boiler guidelines as the basis for permitting new sources. There has been little activity to date on cement kilns.

Source category	**National emission standards**	**Units & statistical treatment 1/**	**Pollution control measures applied 2/**
Coal electric utility boilers	600 mg/m^3 or 170 ng/J heat input	see note 1	see note 2
Oil electric utility boilers	410 mg/m^3 or 110 ng/J heat input		
Gas electric utility boilers (>73 MW thermal)	190 mg/m^3 or 50 ng/J heat input		
Cement kilns	2.3 kg NOx/tonne of clinker production		
Commercial/industrial boilers (see chart below)			

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
2/ Use the technical annex to the Nitrogen Oxides Protocol relating to best available technologies (BAT) as a reference

Note 1: mg/m^3 values at 3% oxygen
Note 2: applied by Canadian provinces at time of permitting new installations and major modifications to existing installations

Commercial/Industrial boilers
NOx Emission Limit in g/GJ (or mg/m^3 in brackets)

Capacity (GJ/hr) (MMBtu/hr)	Gaseous Fuel	Distillate Fuel	Residual Oil <0.35% Nitrogen	Residual Oil equal to and >.35% Nitrogen
10.5-105 10-100	26 (100)	40 (150)	90 (335)	110 (410)
>105 >100	40 (152)	50 (186)	90 (335)	125 (465)

Note 1: mg/m^3 values at 3% oxygen
Note 2: applied by Canadian provinces at time of permitting new installations and major modifications to existing installations

National Emission Guidelines for New Stationary Combustion Turbines

	NO_x Emission Limit (g/GJ output)	
Capacity (MW)	Natural Gas	Liquid Fuel

<3	500	1250
3 - 20	240	460
>20	140	380

Note: The guideline contains allowances for additional NO_x emitted if useful energy is demonstrated to be recovered from the facility's exhaust thermal energy.

102. **Croatia***. Emission standards for nitrogen oxides prescribed by By-Law on LV Emissions in Croatia

Power generation	Emission limit value (unit: mg/Nm^3)
Small plants (up to 1 MWth)	200 for liquid fuel and 150 for gas fuels)
Medium plants (1MWth to 5 MWth)	500 (for solid fuel) 350 (for liquid fuels) 200 (for gas fuels)
Large plants (over 50 MWth)	650 (for solid fuels) 450 (for liquid fuels) 350 (for gas fuels9
Gas combustion turbines liguid fuel natural gas	 200 for thermal input up to 100 MW 150 for thermal input over 199 MW 150 for thermal input up to 100 MW 0 for thermal input over 100 MW
Industrial processes In general For selected processes: - Smelters - Refineries - Iron and steel plants - Cement plants - Cellulose plants - Gas plants - Glass plants - Non-ferrous metals - Aluminium oxides production - Ammonia production - Thermal treatment of waste - Fertilizers production - Carbon-black plants	 500 500 500 400 500 for new and 1300 for existing plants 400 500 500 500 1800 150 200 700 500

For new stationary sources ELVs given in above table came into effect on January 1, 1998 and for existing stationary sources will come into effect on July 1, 2004.
Major stationary sources of NOx emissions in Croatia are: thermal power plant Sisak, thermal power plant Rijeka, thermal power plant Plomin (two units), Thermal power plant Zagreb (two units), thermal power plant Osijek, Petrochemical industry Kutina, Oil Refinery Rijeka, Oil Refinery Sisak, Cement plant Split (three units), Cement plant Našice, Cement plant Koromačno and Cement plant Pula.

103. **Czech Republic**. The categorization of sources and emission limits for NO_x set forth in

Annex No. 2 and Annex No. 3 to Decree No. 117/1997 Coll. applies to new, significantly modified and existing stationary sources from January 1, 1999. It should be pointed out that the current legislation (Law No. 309/1991 Coll. in the valid wording) contains three categories of sources,, the category of large air pollution sources (larger than 5 MW thermal output), the category of medium-sized air pollution sources (0.2 MW to 5 MW thermal output) and the category of small air pollution sources (less than 0.2 MW thermal output). Specific emission limits are laid down for selected large and medium-sized pollution sources, i.e. selected combustion installations and fuels, and for selected technological processes; the generally valid emission limits apply to emissions from other sources. For detailed information see Annex - Table Q.3. At the present time, a new Law on protection of the air and protection of the ozone layer of the Earth is being prepared and is expected to come into effect by November 1, 2001, along with the pertinent regulations for implementation (see also Q.52).

104. **Denmark.**

Source category	**National emission standards**	**Units & statistical treatment 1/**	**Pollution control measures applied 2/**
Industrial plants e.g. Nitric acid plants and fertilizers. Power plants, >50 MW_{th}	500 mg NO_2/Nm^3 Solid: 200 mg NO_2/Nm^3 Liquid: 225 Mg NO_2/Nm^3 Natural Gas: 225 mg NO_2/Nm^3	95% percentile of daily averages over a calendar year 95% percentile of daily averages over a calendar year	Process modification Low NOx burners and fluegas treatment: SCR

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
2/ Use the technical annex to the Nitrogen Oxides Protocol relating to best available technologies (BAT) as a reference.

105. **Finland.**

Source category	**National emission standards**	**Units & statistical treatment 1/**	**Pollution control measures applied 2/**
Power generation gas turbines gas turbines Power Stations 50... 300 MW >300 MW 50... 100 MW 100...3000 MW	fuel type oil 67 gas 72 solid 428 solid 143 liquid 418	mg/m3(n)	

>300 MW	liquid 278 liquid 174		

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
2/ Use the technical annex to the Nitrogen Oxides Protocol relating to best available technologies (BAT) as a reference.

106. NOx emission standards in Finland have been given as annual average values and the exact figures are given in milligrammes per Mega joule of energy input. The figures in the table above have been calculated from the limits presented in mg NO2/MJ.

107. **Germany.**

Source category	National emission standards	Units & statistical treatment 1/	Pollution control measures applied 2/
Power generation	according to typs of fuel	mg/m^3 daily average, related oxygen content	
Small plants 1-50 MW	solid 300 – 500, depending on type of plant and fuel liquid 450 natural gas 200	7 – 11% O_2 3% O_2 3% O_2	primary measures: flue gas circulation, low NO_x-burners
Medium-sized plants > 50-300 MW	solid 400 liquid 300 natural gas 200	5 –7% O_2 3% O_2 3% O_2	primary measures, SNCR, SCR depending on plant size and fuel type
Large plants > 300 MW	solid 200 liquid 150 natural gas100	5 –7% O_2 3% O_2 3% O_2	
Gas Turbines	new: 100 MW: 100-150 < 100 MW: 150-200 (depending on fuel) existing:> 100 MW: 100-150 < 100 MW: 300-350 (depending on fuel and size)	15% O_2	primary measures
stationary engines	compression ignition (diesel engines): 500-1000 (depending on fuel)	5% O_2	Waste-gas recirculation, SCR
	spark ignition (Otto engines): 500-800 (depending on type)	5% O_2	primary measures
Industrial processes (selection)		mg/m^3 daily average, sector specific related oxygen content	
Nitric acid plants	450		SCR, NSCR
Fertilizers	500		
Pulp Mills	300 new		Primary measures,

	450 existing		optimised combustion techniques
Iron & Steel	400-500		low NO_x-burner
Cement	500 new 800 existing		primary measures, staged combustion, SNCR, SCR
Glass	500 new 800 existing		Primary measures, 3R, SCR, SNCR

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
2/ Use the technical annex to the Nitrogen Oxides Protocol relating to best available technologies (BAT) as a reference.

108. **Greece**. Conventional thermal stations and combined heat and power plants on the one hand and industrial processes on the other are the only major source categories under the Protocol. At present, every large combustion plant in the country belongs to the category of existing plants pursuant to Directive 88/609/EEC. It should be noted that Directive 96/61/EC (IPPC) will also be applied to all new large combustion plants with effect from October 2000.

Source category	National emission standards	Units and statistical treatment 1/	Pollution control measures applied 2/
Conventional thermal plants and cogeneration plants	The provisions of Directive 88/609/EEC for all large combustion plants (>50 MWth)	The provisions of Directive 88/609/EEC for all large combustion plants (>50 MWth)	
Industrial processes	5 kg NO_2/t nitric acid		

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
2/ Use the technical annex to the Nitrogen Oxides Protocol relating to best available technologies (BAT) as a reference.

109. **Hungary**.

Source category	National emission standards	Units & statistical treatment 1/	Pollution control measures applied 2/
Power plants $\geq$50 MW_{th}	650 mg/m^3		
solid fuel	450 mg/m^3		
liquid fuel	350 mg/m^3		
gaseous fuel	200 mg/m^3		
oil firing gas turbines $50 \leq P_{th} < 300$	170 mg/m^3		
i)$P_{th} \geq 300$	150 mg/m^3		
gas firing gas turbines ii)$50 \leq P_{th} < 300$	90 mg/m^3		
$P_{th} \geq 300$	400 mg/m^3		

Waste incinerators			

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
2/ Use the technical annex to the Nitrogen Oxides Protocol relating to best available technologies (BAT) as a reference.

110. **Ireland**. New stationary sources: Major source category: (Large Combustion Plants with a rated thermal input of 50 MW or more - EU Directive 88/609/EEC). New Large Combustion Plants are required to obtain an Integrated Pollution Control license under Irish legislation (see question 2). The IPC licensing of scheduled activities under Part IV of the Environmental Protection Agency Act, 1992 requires that a license shall not be granted unless, inter alia, the best available technology not entailing excessive cost (BATNEEC) is used to prevent or eliminate or, where that is not practicable, to limit, abate or reduce an emission from an activity. The Agency has issued a range of BATNEEC guidance notes for relevant sectors. Since 1992 Irish law requires the following ELVs to apply to all new power generation plant with a rated thermal input of 50 MW or more giving effect to EU Directive 88/609/EEC.

Type of Fuel	**Limit Value (mg/Nm^3)**
Solid in general	650
Solid with less than 10% volatile compounds	1300
Liquid	450
Gaseous	350

Since ratification of the Protocol by Ireland in 1994 only 3 new LCPs (all power generation plants) have been granted IPC licenses.

111. **Italy**. With the Ministerial Decree of 8/5/89 Italy implemented the 88/609/EEC Directive regarding emissions from new large combustion plants. Nevertheless, regional authorities can impose more stringent standards if it is justified by the environmental conditions. With the Ministerial Decree of 19/11/97 Italy introduced emission limits for new incineration plant

Emission standards for NOx from new stationary sources

Source	**Value (mg/Nm^3)**
Combustion Plants < 500 MWth	650/450/350 (solid/liquid/gas)
Combustion Plants > 500 MWth	200/200/200 (solid/liquid/gas)
Incineration	200 (daily mean value) 400 (hourly mean value)
Gas Turbines < 15 MWth Gas Turbines 15 - 50 MWth Gas Turbines > 50 MWth	100 80 50

112. **Latvia***.

Source category	National emission standards	Units & statistical treatment 1/	Pollution control measures applied 2/
Small plants: Gaseous fuels Liquid fuels Solid fuels **Medium-sized plants:** Gaseous fuels Liquid fuels Solid fuels **Large plants:** Gaseous fuels Liquid fuels Solid fuels	350 mg/m^3 (3% O_2 in flue gas) 450 mg/m^3 400[a] mg/m^3 (3% O_2 in flue gas) 650 mg/m^3 (6% O_2 in flue gas) 350 mg/m^3 (3% O_2 in flue gas) 450 mg/m^3 400[a] mg/m^3 (3% O_2 in flue gas) 650 mg/m^3 (6% O_2 in flue gas) 400 mg/m^3 350[a] mg/m^3 (3% O_2 in flue gas) 450 mg/m^3 400[a] mg/m^3 (3% O_2 in flue gas) 650 mg/m^3 (6% O_2 in flue gas)	95 percentile during 48 hours should be limit values	BAT for NO_2 emission reduction according technical annex article 9

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
2/ Use the technical annex to the Nitrogen Oxides Protocol relating to best available technologies (BAT) as a reference.
[a] will be introduced for new combustion plants from 01.07.2000; will be introduced for existing combustion plants from 01.01.2006

113. **Netherlands**. The following emission standards for nitrogen oxides are presently applied for new, substantially modified and for existing major stationary sources in the Netherlands:

Source category	National emission standards	Units & statistical treatment 1/	Pollution control measures applied 2/
1.Combustion installations boilers <300 MW 84. >30 MW gasturbines stat. engines	 100 -650 mg/m3 200 - 400 mg/m3 65g/GJ / 200g/GJ 400-/200mg/m3	 95% of 48 hour average 95% of 48 hour average 95% of 48 hour average	 Primary + SCR SCR SCR
2. Mineral oil refineries	see 1	95% of 48 hour average	SCR

3. Coke oven furnaces	70 - 150 mg/m3	95% of 48 hour average	Primary +SCR
Production/Processing metals			
metal ore roasting/sintering prod. frig iron/steel hot rolling	200 mg/m3 200 mg/m3 200 mg/m3	half hour average	Primary +SCR
5. Cement (permit standard)	1300 mg/m3	daily average	Primary
6. Glass	1 kg NOx/tonne glass	year average	Primary + oxyfuel
7. Nitric acid 8. Municipal waste incineration	200-600 ppm 70 mg/m3	hour average 24 hours average	SCR SCR SNCR

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
2/ Use the technical annex to the Nitrogen Oxides Protocol relating to best available technologies (BAT) as a reference.

Primary: Process oriented measures
Secondairy: End of pipe technologies
SCR: Selective Catalytic Reduction
SNCR: Selective Non-Catalytic Reduction

114. **Norway**. The major source category in Norway is oil and gas extraction, which constituted 21% of the total in 1998. Industrial combustion and process industries contributed with less than 10% to the total in 1998. The pollution control measures imposed to such source categories by SFT are determined on a plant-by-plant basis in pursuance with the Pollution Control Act of 1981, and in such a way that they comply with the LCP and IPPC directives. The use of Best Available Techniques (BAT) is a requirement for new plants, where BAT is defined nationally or in an international framework (EU and OSPARCOM). Emissions must not result in exceeding the established ambient air quality standards. The air quality limit values in the Norwegian regulations along with values recommended by SFT are listed in Tables 1 and 2 (pp.17-18). Moreover, low-NO_x burners have been installed in several new stationary sources.

115. **Poland***. By the decree of the Minister of Environmental Protection Natural Resources and Forestry new emission standards for air pollutants from technological processes have been put in force. Emission standards for new major stationary combustion sources, launched after 28 March 1990

1. Solid fuels

Thermal power MW_{th}	**National emission standards**		**Units**	**Pollution control measures applied**
	Hard coal	**Brown coal & coke**		
< 50	400	400	(mg NO_2/m^3) Based on 6 per cent oxygen in flue gas	
= 50	460	400		

2. Liquid and gaseous fuels

Thermal power MW_{th}	National emission standards		Units	Pollution control measures applied
	Liquid fuels	Gaseous fuels		
<5	-	150	(mg NO_2/m^3) Based on 3 per cent oxygen in flue gas	
= 5-50	400	300		
= 50	460	350		

116. The following pollution control measures for the new stationary combustion sources have been established:

(a) Low-NO_x emission burners;
(b) Fluidised bed combustion;
(c) Integrated gasification combined cycle (under development).

117. **Russian Federation**.. The national emission standards applicable to certain new or substantially modernized stationary power-generating plants were changed in line with the new State standards for boiler plants. The category of major stationary NO_x sources in Russia includes sources from which the annual mass of NO_x emissions is more than 500 t.

Source category	National emission standards		Units	Pollution control measures applied
	until 01.01.2001	after 01.01.2001		
Power-generating boilers 80-299 MW Gas Fuel oil Coal (brown)	 125 250 320-350	 125 250 300	mg/m^3	
> 300 MW Gas Fuel oil Coal (brown)	 125 250 370	 125 250 300		

118. **Slovakia**. The source categories are defined in the Governmental Order Nr. 92/1996 as described in Annex I.

119. **Spain**. See answer to question 2. According to the European Union legislation and strategies.

120. **Sweden**.Q.3 and Q.5: National emission standards for new and existing stationary sources: New and existing plants, >500 MWth 0,03 g NO_x /MJth , SCR technology. The NO_x charge system leads to low emission levels. The average NO_x emission for boilers above 1 0 MW but less than 500 MW is 0,06 g NO_x/MJth

121. **Switzerland**. List of the source categories that are considered as major stationary source category taking into account the technical annex and article 1 (definitions), paragraph 10. Major source category are responsible for more than 10% of the total national emissions one year after

the entry into force of the Protocol (EIF 14.2.1991) and every 4 years thereafter i.e. 1992, respectively 1996). Following these criteria: "Commercial, institutional and residential combustion plants" have to be considered as major stationary source category for NOx emissions in Switzerland.

122. Information, as required by article 8, paragraph 1 (b), and article 2, paragraph 2 (a), on progress made in applying national emission standards for the new stationary sources:

Source category	**National emission standards for NO_x**	**Units & statistical treatment**
In general (OAPC Annex 1, § 61)	250 mg/m^3	Mass flow of 2500 g/h or more
Combustion installations run on "extra light" fuel oil (with a heat input of over 350 kW) (OAPC Annex 3)	120 mg/m^{3}150 mg/m^3	With a temp. of the heat carrier fluid of up to 110°C with heat carrier fluid of over 110°C Reference value 3% vol (oxygen content in flue gas)
Comb. Installations run on "medium" and "heavy" fuel oil with a heat input: of 5 - 50 MW 50 – 100 MW over 100 MW (OAPC Annex 3)	450 mg/m^{3}300 mg/m^{3}150 mg/m^3	Reference value 3% vol (oxygen content in flue gas)
Wood burning (OAPC Annex 3)	250 mg/m^3	Reference value 13% vol (oxygen content in flue gas)
Combustion installations run on gas fuels (with a heat input of over 350 kW) (OAPC Annex 3)	80 mg/m^3 110 mg/m^3	With a temp. of the heat carrier fluid of up to 110°C with heat carrier fluid of over 110°C Reference value 3% vol (oxygen content in flue gas)

123. Emission limit values and best available techniques:In Switzerland, the emission limitations are in principle strived for by prescription of emission limit values (maximum value not to be exceeded) without prescribing the techniques to be applied.Emission standards are usually based on the state of the art (best available techniques). Emissions shall be limited as much as technology and operating conditions allow, provided this is economically feasible. A medium-sized and economically sound industrial plant is used as the criterion for assessing the economic feasibility of emission limitation. Emission limitation, therefore, is not governed by the weakest economic sector.

124. **Ukraine**. The following table contains information on the application of national emissions standards in respect of stationary sources:

Source category	**National emission standards**	**Units and statistical treatment**	**Pollution control measures applied**
(a) Utility power stations, electricity and thermal power generating plants,	None		

and district heating boilers			
(i) Boiler plants	Coal – 750 mg/m^3 Light fuel oil – 300 mg/m^3 Heavy fuel oil - 300 mg/m^3 Natural gas – 250 mg/m^3	Unit of measurement - mg/m^3 (sampling interval 20 min.). Yearly emissions determined by calculation	Energy conservation; combination of different energy resources; modification of processes and combustion
(b) Commercial, administrative and residential combustion plants	None		
(i) Commercial boiler plants	Light fuel oil – 230 mg/m^3 Natural gas combusted in Atmospheric burners – 240 g/m^3 in forced-draught burners – 150 mg/m^3	Unit of measurement - mg/m^3 (sampling interval 20 min.). Yearly emissions determined by calculation	Energy conservation; combination of different energy resources; modification of processes and combustion
(c) Extraction, processing and distribution of fossil fuels	Gas turbine units: Without heat regeneration – 150 mg/m^3 With heat regeneration – 200 mg/m^3 in exhaust gases (at O^o C and O.1013 Mpa, assuming oxygen concentration of 15%)	Unit of measurement - mg/m^3	
Major stationary sources	None		

125. "Major existing stationary source" means any existing stationary source with a heat output of at least 100 MW. "Major new stationary source" means any stationary source with a heat output of at least 50 MW. Plans are being made to establish technical standards in 2002 for emission sources using best available technologies.

126. **United Kingdom.**

Source category	National emission standards	Units &statistical treatment 1/	Pollution control measures applied 2/
Large Combustion Plants (>50MWth)	Solid fuel in general 650mg/Nm^3	These emission standards are regarded as having been complied with if:	

	Solid fuel with less than 10% volatile organic compounds 1300mg/Nm^3 Liquid fuel 450mg/Nm^3 Gaseous fuel 350mg/Nm^3 (all are standards in the Large Combustion Plant Directive (88/609/EC)	in the case of continuous monitoring, 100% of the monthly mean values do not exceed the emission standard and 95% of all 48 hourly mean values do not exceed 110% of the emission standard in cases where only discontinuous measurements are required, each of the series of measurements do not exceed the emission standard	

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
2/ Use the technical annex to the Nitrogen Oxides Protocol relating to best available technologies (BAT) as a reference.

127. List of major stationary source categories in the UK (defined in the Protocol as a source category which emits at least 10% of national NOx emissions): Power Plants. Emission standards for new large combustion plant (those licensed after I July 1987 and > 50MWth) have been set as required under the Large Combustion Plant Directive (88/609/EC). However, in general, emissions standards for processes regulated under Part 1 of the Environmental Protection Act (such as new power plants) are set on a process- and site-specific basis(see answer to question 2 above). Operators of these processes are required to employ Best Available Techniques Not Entailing Excessive Cost (BATNEEC). Guidance is issued by the competent authorities on BATNEEC standards for the various types of processes, including the technology which is generally envisaged for pollution abatement. In future, NOx emissions from new power plants will be controlled through the pollution control regime to be set up under the Pollution Prevention and Control Act 1999, which will implement the EC Integrated Pollution Prevention and Control Directive.

128. **United States**. The CAA requires new source performance standards (NSPS) or emission limit standards for major industrial sources of several pollutants including CO, Pb, NO_x, O_3, PM_{10}, and SO_2. The NSPS are technology-based emission standards based on best demonstrated technology for a particular source category or process that is economically feasible. The NSPS have been established for over 60 categories of major sources. The CAA also requires EPA to periodically update and revise these emissions standards as new technologies are developed. For example, EPA issued new source performance standards for NO_x emissions from utility boilers in 1979 and industrial boilers in 1986. In September 1998, EPA revised and substantially tightened those standards. The new limits will reduce the projected increase in new source NO_x emissions by approximately 42 percent (45,800 tons/year) over the next several years. Six of these categories address NO_x. See Attachment A for a table of the NSPS for NO_x .

129. **Question 4: Provide information, as required by article 8, paragraph 1 (b), and article 2, paragraph 2 (b), on the progress made in applying national emission standards to new mobile sources. In your reply, list the new mobile source categories in your country that are considered to be major source categories under the Protocol, taking into consideration its technical annex and article 1 (definitions). For each category, state the standards applied or to be applied, the units and statistical treatment, and the pollution control measures applied. For standards to be applied, please indicate when they will come into effect. In your response, you may wish to use the table format suggested below.**

Mobile source category	National emission standards	Units & statistical treatment 1/	Pollution control measures applied 2/

130. **Austria**. Major mobile source categories according to the Technical Annex of the NOx-Protocol are „passenger cars“ (21 % of the natl. emissions) and „heavy-duty vehicles“ (27 % of the natl. emissions). Emission standards for mobile sources according to EC legislation are applied.

131. **Belarus.** National standards for NO_x emissions relating to particular mobile source categories are given in the annexed table. Emission standards have not as yet been established for new mobile sources. Following the Government decision on the country's participation in European integration processes, an inter-agency commission has been set up to make proposals in 2000 for the phased application of EU environmental standards to vehicles produced in Belarus.

132. **Belgium***. Federal Government**:** European Union emissions standards apply in Belgium for new mobile sources.

133. **Bulgaria**. A limited number of internal-combustion engines are produced in the Republic of Bulgaria. Demand is met through import, the pre-requisite being, that bus and truck diesel engines meet EURO I and EURO II requirements. In accordance with the new road traffic law (SG ISSN 20/99), which has been in force since 1999.09.01, the rules for correct use of the vehicles given by the manufacturer in the instructions manual must comply with the conditions for standard approval of EC. The Republic of Bulgaria ratified by law the Agreement for adopting unified technical recommendations for vehicles, equipment and spares (Geneva, 1958), which entered into force on 2000.01.21, thus adopting 21 IKE/UN rules, including rule 24-03, 49-02 and 83-03. A Regulation, determining the terms and conditions for standard approval and the establishment of a national laboratory will be adopted in the near future.

134. **Canada.**

Mobile source category 1/	National NOx emission standards 2/	Units	Pollution control measures applied
Light-Duty Vehicles Gasoline Diesel	 0.6 1.25	 g/mile g/mile	
Light Light-Duty Trucks (GVWR up to 6000 lb.)			

LVW of 0-3750 lb. Gasoline Diesel LVW of 3751-5750 lb. Gasoline Diesel	 0.6 1.25 0.97 0.97	 g/mile g/mile g/mile g/mile	
Heavy Light-Duty Trucks (GVWR 6001-8500 lb.) LVW of 3751-5750 lb. Gasoline Diesel LVW > 5750 lb. Gasoline Diesel	 0.98 0.98 1.53 1.53	 g/mile g/mile g/mile g/mile	
Heavy-duty Vehicles Gasoline Diesel	 4.0 4.0	 g/bhp-hr g/bhp-hr	

1/ GVWR is the gross vehicle weight rating and LVW is the loaded vehicle weight.

2/ These are performance standards that apply at the full useful life of the vehicle classes when measured in accordance with US federal test procedures.

135. Canada's new vehicle emission standards were brought into alignment with the regulatory requirements under the United States Environmental Protection Agency's federal program, effective with the 1998 model year. The amendments tightened Canada's national exhaust and evaporative emission standards for new light-duty vehicles, light-duty trucks, heavy-duty vehicles and motorcycles. For the first time, the new standards also require that light-duty vehicles and trucks be equipped with on-board diagnostic systems to monitor the operation of emission control systems and that new technology be phased in to control emissions that occur during the refuelling process.

136. **Croatia*** Croatia does not have a car manufacturing industry and therefore the only thing it can do is to control the import of vehicles. The average age of vehicles in Croatia is 11 years which means that by the year 2010 it may be expected that the fleet of cars will be completely renewed. In 2010 it should be achieved that all cars in Croatia contain catalysers with a triple effect that would result in an 89-90 per cent reduction of NOx, CO and NMVOC emissions. The regulation prohibiting import of vehicles (new and used) without catalysers into Croatia, effective from 1 October 1999 has ensured conditions for accomplishment of the objective that in 2010 all vehicles should will follow the trend of changes in the EU, so it is expected that a part of vehicles will show better characteristics in compliance with new and stricter EU regulations on emissions (EURO II) and with guidelines laid down for the forthcoming decade (EURO III):

137. Regulatory and technical measures concerning transport consist of vehicle emission standards, vehicle inspection and maintenance programmes, fuel quality and fuel efficiency standards.

(a) Vehicle emissions standards (exhaust gases and noise). Vehicles registered for the first time in Croatia are subject to a list of ECE rules and EEC guidelines that address noise pollution and exhaust gas emissions for different vehicle categories. Administrative inspection of homolotaion compliance precedes export clearance and first registration;

(b) Provisions for periodic vehicle inspections (exhaust emissions safety). Two kinds of technical inspections are carried out: regular and periodic. All motor vehicles and trilers are subject to regular annual technical inspections, except new vehicles, which undergo their mandatory first regular technical inspectionm in the second year only. Light trailers (trailer vehicles with a maximum permitted weight up to 750 kg) are subject to regular three yearly technical inspections. All technical inspections primarily concern safety requirements. At present, there is no regular testing of exhaust gases, of the kind undertaken at the European level (although emission limit values for exhaust gases are prescribed by Ordinance).

(c) Croatia has fuel quality standards, in particular regarding sulphur, lead and benzene content (see Q 23). To increase the consumption of unleaded petrol, a tax differentiation scheme has been in force in Croatia throughout the 1990s. In 1997 42 per cent of the total number of kilometers of passenger cars were covered by cars equipped with catalysers.

138. **Czech Republic**. The main source of NO_x emissions in the category of mobile emission sources consists mainly of road vehicles and non-road mobile sources. The Czech Republic applies emission limits for motor vehicles following from the UN/ECE regulations. Emission standards for non-roads will be stipulated and implemented by the end of 2002. CR has adopted UN/ECE regulations 49/1982, 83/1990 and 96/1996. All vehicles newly brought into operation in the Czech Republic as a type must comply with the above regulations. Measurement of NO_x or the sum of HC + NO_x is part of emission measurements pursuant to these regulations.

NO_x Standards for mobile sources

Mobile source category	**National emission standards**	**Units and statistical treatment**	**Pollution control measures applied**
vehicles with diesel motors	UN ECE 49/1982	7 g/kWh	homologation test of the product
vehicles with spark-ignition motors	UN ECE 83/1990	0.5 to 1.2 g/km (HC + NO_x) in dependence on category, reference weight and vehicle class	homologation test of the product

139. Decreasing of NO_x emissions is one of the tasks following from the Transportation Policy and Medium-Term Strategy of the transportation sector of CR. Favourable trends in NO_x emissions in the Czech Republic are occurring primarily as a consequence of rapid changes in the fraction of passenger cars with catalytic converters in the total number of cars. In 1990, this fraction equalled 0.8%, in 1997, 20.6% and in 1998, 24.1%. Expected trends in the production of emissions of nitrogen oxides from mobile sources are:

Year	**1997**	**1998**	**1999**	**2000**	**2005**	**2010**
missions of NO_x, t	92 674	91 184	92 133	91 919	84 981	66 124

140. Emission limits for mobile sources for other kinds of transportation are given by the pertinent international regulations and recommendations (UIC, ICAO).

141. **Denmark**.

Mobile source category	National emission standards	Units & statistical treatment 1/	Pollution control measures applied 2/
Passenger cars and light commercial cars Heavy duty trucks Non road mobile machinery Motorcycles	EU-directive 98/69 EU-directive 91/542 (1999/96) EU-directive 97/68 EU-directive 97/24		EU-directive 1999/52 (92/55)

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average etc.
2/ Take into account the technical annex to the Protocol.

142. **Finland**.

Mobile source category	National emission standards	Units & statistical treatment 1/	Pollution control measures applied 2/
passanger cars light duty vehicles heavy duty vehicles motorcycles	EURO II, from 2000 EURO III EURO II, from 2000 EURO III EURO II, from 2000 EURO III and EEV stage 1		

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average etc.
2/ Take into account the technical annex to the Protocol.

The emission standards referred in the table are those of EU, Finland has also implemented the EU Directive (97/68/EC) on measures to reduce emissions of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery by giving a Council of State Decision on the matter in June 1998.

143. **Germany**.

Mobile source category	Standard applied	Units & statistical treatment 1/	Pollution control measures applied 2/

passenger cars	EURO II, From 2000 EURO III	/km	closed loop catalyst for petrol fuelled cars
light duty vehicles	EURO II, from 2000 EURO III	g/km	closed loop catalyst for petrol fuelled cars
heavy duty vehicles	EURO II, from 2000 EURO III and EEV	g/kWh, g/km	internal engine improvement up to EURO III, EEV has been demonstrated so far in natural gas fuelled vehicles only
motorcycles	stage 1;	g/km	internal engine improvements

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
2/ Refer to annex III to the Protocol relating to the control techniques.

144. Germany applies the emission limit values for NO_x and HC imposed in the EU on passenger cars, light and heavy duty vehicles, motorcycles and other vehicles:

(a) For passenger cars applies EC Directives 91/441/EEC (Euro I, 1993) and 94/12/EEC (Euro II, 1996) and Directive 98/69/EU (Euro III from 2000 and EURO IV from 2005);

(b) For light duty vehicles, Directive 93/59/EEC and Directive 98/69/EU (Euro III from 2000 and EURO IV from 2005);

(c) For heavy duty vehicles Euro I and II limit values are set in Directive 91/542/EEC, Euro III, IV and V standards will follow after 2000/2005/2008 and EEV (enhanced environmentally friendly vehicle) from 2000 according to Directive 99/96/EU;

(d) For motorcycles limit values are set in Directive 97/24/EEC. From 1999 the emission limit values are 4 g/km HC and 0.1 g/km NO_x for two stroke engines and 3 g/km HC and 0.3 g/km NO_x for four stroke engines. EURO II for motorcycles is under discussion.

145. **Greece**. The new mobile source categories in the country that are considered to be major source categories under the Protocol are:

(a) Road vehicles (particularly petrol-engined private cars and commercial vehicles, and heavy vehicles);

(b) Other mobile sources (agriculture and shipping).

All provisions of Community legislation concerning emission standards and, generally speaking, exhaust gases are applied.

Mobile source category	National emission standards	Units and statistical treatment 1/	Pollution control measures applied 2/

- Road vehicles Shipping	The provisions of the relevant community Directives		

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average etc.
2/ Take into account the technical annex to the Protocol.

146. **Hungary**. In Hungary the licensing procedure and emission standards of road vehicles (mobile sources) are in full compliance with UN/ECE regulation. There are type approval requirements for vehicle types. Vehicles can be put into operation if they meet these requirements.

147. **Ireland.** New Mobile sources: Since 1970 Ireland has transposed into national law all EU vehicle emission standards and is currently finalising the transposition of the EU Auto Oil Programme directives. Ireland does not have indigenous vehicle manufacturing industries and is a technology taker in this regard. It is the practice to transpose the EU standards specified in the relevant Directives in full.In December 1999, EU Directive 97/68/EC on measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery was transposed into Irish law. The directive requires the type approval of new engines, including specified NOx emission standards. The national regulations establish procedures for type approval and make it an offence to place new engines on the market not in conformity with the Directive.

148. **Italy**. New vehicles have to meet emission standards set in EEC Directives. Requirements for type-approval and conformity of production of motor vehicles must be satisfied for registration, sale and entry into service of any motor vehicles.Emission standards for NOx from new mobile sources (They are applied for type approval of new vehicles) are:

Source	**Value (mg/km)**	**Comments**	**To be applied from:**
petrol passenger cars	50	NOx	1.1.2001
diesel passenger cars	00	NOx	1.1.2001
diesel passenger cars	60	HC + NOx	1.1.2001
petrol-fuel: light-duty vehicles: RW <1305	50	NOx	1.1.2001
petrol-fuel vehicles: light-duty vehicles: RW 1305 - 1760	80	NOx	1.1.2002
petrol-fuel vehicles: light-duty vehicles: RW >1760	10	NOx	1.1.2002
diesel-fuel vehicles: light-duty vehicles: RW <1305	00	NOx	1.2001
diesel-fuel vehicles: light-duty vehicles: RW 1305 - 1760	50	Ox	1.2002
diesel-fuel vehicles: light-duty vehicles: RW >1760	80	Ox	1.2002
diesel-fuel vehicles: light-duty vehicles: RW <1305	60	C + NOx	1.2001
diesel-fuel vehicles: light-duty vehicles: RW 1305 - 1760	20	C + NOx	1.2002
diesel-fuel vehicles: light-duty vehicles: RW >1760	60	C + NOx	1.2002
heavy-duty vehicles	000 mg/kWh)	Ox	10.2001
Mopeds	000	C + NOx	7.6.1999
2 stroke motorcycle	00	Ox	7.6.1999
4 stroke motorcycle	00	Ox	7.6.1999

Off-road vehicles (Stage I):	**g/kWth)**		
130 ≤ P ≤ 560	,2	NOx	20/06/2000
75 ≤ P < 130	,2	NOx	20/06/2000
37 ≤ P < 75	,2	NOx	20/09/2000
Off-road vehicles (Stage II):	,0		31/12/2001
130 ≤ P ≤ 560	,0	NOx	31/12/2002
75 ≤ P < 130	,0	NOx	31/12/2003
37 ≤ P < 75	,0	NOx	31/12/2000
18 ≤ P < 37		NOx	

149. **Lithuania***. At present, draft standards on NO_x emissions for mobile sources according to the requirements of the EEC directives are under preparation.

150. **Netherlands**. There are no changes from the latest reviews in national emission standards to new mobile sources. In the case of national emission standards to new mobile sources the Dutch legislation follows the legislation of the EU.

151. **Norway**. The largest mobile source category in Norway is ship and boat traffic, including fishing vessels, which represented 42% of the national total in 1998, with coastal traffic being the major contributor. Emissions from road traffic constituted a 25% of the total in 1998 and are attributed primarily to diesel and petrol driven vehicles.

152. On-road vehicles must fulfil the emission standards set by the Ministry of Transport in pursuance of the Road Traffic Act of 1965. Since the mid-1970s, a series of vehicle emission standards have been implemented. From January 1989, US-83 vehicle emission standards were made compulsory for petrol fuelled passenger cars. This resulted in the introduction of three-way-catalyst equipped cars. Stricter requirements were imposed through the implementation of the US-97 and US-90 vehicle emission standards for petrol and diesel vehicles in 1991 and 1992, respectively. Since 1993, regulations on vehicles have been compliant with the corresponding EU directives. Namely, emissions from light passenger and duty vehicles have been regulated through the EU directives 93/59/EEC, 94/12/EC and 96/69/EC, which entered into force in 1995, 1997 and 1998, respectively, and directive 98/69/EC which will enter into force in 2001. The directive 91/542 IEEC A-level vehicle emission standards (EURO I) became compulsory for heavy duty vehicles in 1993, while the EEC directive 91/542 B-level (EURO II) came into force in 1996. Norway has also implemented the directives EURO III and IV for heavy-duty vehicles that enter into force in 2001 and 2006, respectively. EURO V on further restrictions to NOx emissions from heavy duty vehicles is not yet fully implemented by EU. In 1998, so-called EU-control of all vehicles became compulsory according to regulations founded in the Road Traffic Act based on the provisions of EU Directive 96/96/EC on the approximation of the laws of the Member States relating to roadworthiness tests for motor vehicles and their trailers.

153. **Poland***. In Poland road transport is the second major source of anthropogenic NO_x emission. Sets of decrees regulate the admission of vehicles to traffic. It includes:

(a) ban for registration of double-stroke engine vehicles;

(b) ban for import of more then 3 years old heavy-duty vehicles and more then 10 years old passenger cars;

(c) obligation to equip new spark-ignited petrol engines with open- and closed-loop catalysts since 1997.

154. In compliance with the Act on Road Traffic vehicles registered in Poland for the first time must fulfil certain requirements concerning emission of exhaust gases which are included in the UN ECE Regulation No. 49 - the second series of amendments and Regulation No. 83 - the third series of amendments. The requirements are equivalent to the solutions adopted in the existing EU Directive in this field. A certificate of international homologation has become obligatory.

155. **Russian Federation**. Three new standards were developed in Russia in 1995 to reduce environmental stress in towns and cities by making wider use of natural gas in the transport sector. These standards concern:

(a) Compressed-gas equipment for motor vehicles;

(b) Safety requirements concerning the design of gas equipment for motor vehicles fuelled by liquefied petroleum gas;

(c) High-pressure fuel tanks for gas-fuelled motor vehicles.

The conversion of some motor vehicles from petrol or diesel to gaseous fuel will help to reduce emissions of pollutants in exhaust gases to 25%.

156. Existing standards for emissions and smoke content were reviewed in 1998. These include:

(a) "Diesel engines, tractors and self-propelled agricultural machinery. Emissions of harmful substances in exhaust gases. Standards and methods of determination".

(b) "Diesel engines, tractors and agricultural machinery. Smoke content of exhaust gases. Standards and methods of determination".

(c) A new standard - GOST R 51249-99 "Ship diesels, locomotive diesels and industrial diesels. Emissions of harmful substances in exhaust gases. Standards and methods of determination" - was issued by the Moscow standards publishing office in 1999.

157. These standards help to harmonize test methods and emission standards with UN/ECE rules Nos. 4901 and 2303, and ISO 789/4, and reduce the previously established standards on emissions and smoke content by 12-20%.

158. The mobile source categories in Russia are as follows:

Mobile source Category	National emission standards	Units and statistical treatment	Pollution control measures applied
Light passenger vehicles Trucks Buses and coaches	No standards for nitrogen oxides No standards for nitrogen oxides No standards for nitrogen oxides		

159. **Slovakia**. New mobile sources have to comply with the ECE regulations 9, 24, 40, 41, 47, 49, 51, 63, 83, and 96, concerning the emissions. The emission limits for car equipped with ignition engine without catalytic converters, the values for CO and HC are as follows:

(a) 6,0 % CO and 2 000 ppm of HC for cars produced before 1 January, 1973;

(b) 6,0 % CO and 1 200 ppm of HC for cars produced before 1 January, 1986;

(c) 3,5 % CO and 800 ppm of HC for cars produced after 1 January, 1986;

(d) The period for regular testing of those cars id 12 months.

160. **Spain.** See answer to question 2. According to the European Union legislation and strategies.

161. **Sweden.** National emission standards for new mobile sources NO_x and VOC: The EU-regulations

162. **Switzerland**. List of the new mobile sources that are considered as major source categories under the Protocol, taking into consideration the technical annex and article 1 (definitions) of the Protocol. "Road transport" and "Other mobile sources and machinery" have to be considered as major source categories in Switzerland. Information, as required by article 8, paragraph 1(b), and article 2, paragraph 2 (b), on the progress made by applying national emission standards to the new mobile sources in the categories listed under question 5, including standards applied or to be applied.

Mobile source category	**National emission standards**
Light duty vehicles	Similar to the directive 94/12/EC (EURO 2) and 98/69/EC (EURO 3) and (EURO 4)
Heavy duty vehicles	Similar to the directive 91/542/EC (EURO II) and will be similar to the new directive 99/96/EC (EURO III and IV)
Motorcycles	Similar to the directive 97/24/EC (EURO 1)
Off-road vehicle and machinery	Will be similar to the directive 97/68/EC

163. **Ukraine**. The following table contains information on the application of national emissions standards in respect of new mobile sources:

Mobile source category	**National emission standards**	**Unit and statistical treatment**	**Pollution control measures applied**
Test vehicle, engine capacity: >2 litres (with catalytic converter) >2 litres (without catalytic converter) 1.4-2.0 litres (without catalytic converter) <1.4 litres (without catalytic converter)	 3.5 g/test 6.0 g/test 6.0 g/test 6.0 g/test	Unit of measurement – g/test	
Standard vehicle, engine capacity: >2 litres (with catalytic converter) >2 litres (without	 4.2 g/test 7.2 g/test	Unit of measurement – g/test	

catalytic converter) 1.4-2.0 litres (without catalytic converter) <1.4 litres (without catalytic converter)	7.2 g/test 7.2 g/test		
Diesel engines	18 g/kWh	Unit of measurement – g/kWh	
Diesel engines, tractors and self-propelled farm machinery: unrestricted air exchange restricted air exchange	18 g/kWh 9 g/kWh	Unit of measurement – g/kWh	

164. **United Kingdom**.

Mobile source category	National emission standards	Units & statistical treatment 1/	Pollution control measures applied 2/
Cars (Under Directive 94/12/EC) Light Vans (Under Directive 96/69/EC)	All standards are combined Hydrocarbon and NO_x limits <u>Petrol</u> - 0.5g per km Diesel 0.7g per km for indirect injection engines 0.9g per km for direct injection engines Hydrocarbon + NO_x limit <u>Lightest Vans (Class 1)</u> Petrol - 0.5g per km Diesel – 0.7g per km **No direct or indirect injection engines** <u>Medium Sized Vans (Class 2)</u> Petrol - 0.6g per km Diesel - 1.0g per km Heaviest Vans (Class 3) eg. Transit vans Petrol - 0.7g per km **Diesel - 1.2g per km**		

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average etc.
2/ Take into account the technical annex to the Protocol.

Mobile source category	National emission standards	Units & statistical treatment 1/	Pollution control measures applied 2/
Heavy Diesel Emissions Directive (Euro 2) (91/542/EC) Directive 97/68/EC Note: These limits have been developed through the use of different testing cycles compared to cars / light vans and heavy duty diesel engines. Therefore a comparison cannot be made.	NO_x limit is 7g per kWh (kilowatt hour) **Stage I** For the whole range of engines from 37 kW to 560 kW power, the NO_x limit is 9.2g per kWh **Stage II** For engines of 18 kW to 37 kW, NO_x limit is 8.0g per kWh For engines of 37 kW to 75 kW, NO_x limit is 7.0g per kWh For engines of 75 kW to 560 kW, NO_x limit is 6.0g per kWh		

1/ The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average etc.
2/ Take into account the technical annex to the Protocol.

165. List of major mobile source categories in the UK (defined in the Protocol as a source category which emits at least 10% of national NOx emissions): Road Transport. European Union Directives require UK vehicles to meet emission standards covering cars (94/12/EC), light vans (96/69/EC) and heavy duty diesel vehicles (96/1/EC). These standards are also included in UNECE regulations 49 and 83. In addition, Directive 97/68/EC contains provisions to reduce gaseous and particulate emissions from both large and small diesel engined non-road mobile machinery in two stages by 2003. This is the first time that this market sector has been subject to such requirements. A type-approval system for these engines has been established in the UK and other Member States incorporating the mandatory emission limit values to be attained. Since 1 January 1993 all new petrol-driven cars in the UK have been required to have catalytic converters fitted. A vehicle equipped with a catalyst in good condition will reduce its emissions of NO_x by over 75%. Fuel standards in the UK are in line with those set down in EC Directive 93/12 and European Norms EN228:1995 for petrol and EN590:1997 for diesel.

166. **United States**. The United States has had emission control standards for motor vehicles since 1968. Over the years, the stringency of these standards has increased, and sophisticated emission control technologies have evolved which enable manufacturers to reduce more than 98 percent of the emissions that would come from the tailpipe or evaporate off the fuel system. Since 1990, with the passage of the most recent CAA Amendments, attention has focused on additional

categories of mobile equipment, such as engines used in farm and construction equipment, as well as on the composition of the fuel which is used to power vehicles and engines.

167. The most recent light duty vehicle requirements were phased-in over the 1994-96 model years, with an additional round occurring in 1999-2001. In December 1999, further reductions were finalized to take effect beginning in 2004. These latest reductions are intended to occur in conjunction with new standards designed to bring emissions of NO_x and hydrocarbons from light-duty trucks and sport utility vehicles -- a growing component of the U.S. fleet -- down to levels equivalent to the 98-99 percent control that will be achieved by new vehicles. Combined with a rule to cut sulphur in gasoline by an average of over 90 percent, these new standards will result in the equivalent of 166 million, or over two-thirds of the total number of vehicles in the U.S., being taken off the road by the year 2020.

168. The EPA has also implemented stringent requirements that substantially cut emissions that occur from fuel evaporation from the vehicle or when a vehicle is refueled. For example, EPA has required manufacturers to install on-board systems that will reduce emissions that occur when refueling a car by 95 percent. These requirements are being phased in beginning in 1998 for passenger vehicles and 2001 for light-duty trucks.

169. The U.S. is focusing on heavy-duty, as well as light-duty vehicles. The EPA is continuing to phase in NO_x emission controls for new diesel truck and bus engines. Pre-1988 levels have already been reduced by two-thirds. Standards scheduled to go into place in 2004 will further cut those emissions by one-half (or about 83 percent from pre-1988 levels).

170. In 1995, federal law required U.S. cities with the worst ozone problems to begin using cleaner reformulated gasoline, cutting VOC emissions by 15 percent. A second phase of that programme will reduce emissions of NO_x by 7 percent and VOCs by 20-25 percent beginning in the year 2000. In the 1970's, the U.S. began substantially phasing out lead in gasoline sold for use in on-road vehicles and completely eliminated it in the early 1990's. Also, all gasoline sold in the U.S. must meet stringent minimum volatility standards.

171. Vehicle inspection and maintenance programmes are required in 34 States plus the District of Columbia. Programmes exist in 144 urban areas with current or former ozone problems. Federal and State laws require vehicle owners to make repairs to correct problems. Failure to do so results in fines and other penalties. Several States also have mandatory inspection and maintenance programmes for heavy-duty diesel and gasoline engines.

172. Motor Vehicle Standard: EPA has established a number of emission standards for motor vehicles. EPA=s most recently adopted standards for passenger cars and light trucks, is designed to bring sport utility vehicles and vans to an equivalent standard with passenger cars and to reduce gasoline fuel sulphur levels to enable the most sophisticated emission control strategies. The following tables show the applicable standards (vehicle standards are in grams/mile unless otherwise indicated):

Pollutant	Durability	MY 94+ Tier 1	MY 2001 NLEV	MY 2004 Tier 2[1]
HC NMHC	50,000 50,000 100,000	0.41 0.25 0.31	0.075[2] 0.090[2]	0.075 0.090
CO	50,000 100,000	3.4 4.2	3.4 4.2	3.4 4.2
CO (cold)	50,000	10.0	10.0	10.0
NOx	50,000 100,000	0.4 0.6	0.2 0.3	0.06 0.07
PM	50,000 100,000	0.08 0.10	0.08[3]	0.01
Evap[4]		2.0	2.0	0.095

[1] Full useful life is defined as 120,000 miles
[2] NMOG measurement instead of NMHC
[3] Diesel vehicles only
[4] Emissions are measured in grams per test. Different tests apply in different years

	Fuel Sulphur Limit	Date
Cap	300 ppm	2004
Corporate Average	120 ppm	2004
	90 ppm	2005
	80 ppm	2006
Refinery Average	30 ppm	2005

173. Engine Standards: A summary of the standards which have been adopted for heavy duty engines used in trucks and buses, as well as engines used in nonroad applications. Work continues on further control for diesel engines and fuels. Examples of the types of equipment included in some of the source categories are shown in the following table:

Category	Types of equipment
Nonroad CI	Tractors, bulldozers, generators, backhoes, forklifts, pumps
Nonroad SI less than or equal to 25 horsepower	Augers, chainsaws, lawn mowers, leaf blowers, brush cutters, edgers, tillers, trimmers
Marine SI	Gasoline outboards, personal watercraft, commercial diesel marine engines,
Nonroad recreational vehicles and engines	Specialty vehicles, go-karts, off-road motorcycles and all-terrain vehicles, golf carts

174. **Question 5: Provide information, as required by article 8, paragraph 1 (c), and**

article 2, paragraph 2 (c), on progress made in introducing pollution control measures for the existing sources in the major stationary source categories, including measures introduced or to be introduced, taking into account the technical annex to the Protocol. In your reply, list the source categories in your country that are considered to be major stationary source categories under the Protocol, taking into account its technical annex and article 1 (Definitions) and the measures applied to each source category. For planned measures, please indicate the year they will be introduced.

175. **Austria**. Major stationary source categories – see Q.3. For several existing stationary source categories (construction or substantial modification were commenced before February 1993) emission standards have been set:

Source category	Emission standards*)	Units & statistical treatment 1/	Pollution control measures applied / Annotations
Steam boilers – solid fuels licensed before 1989: 50 – 150 MW_{th} 150 – 300 MW_{th} 300 – 500 MW_{th} 500 MW_{th} licensed in/after 1989 0.35 – 10 MW_{th} 10 – 50 MW_{th} > 50 MW_{th}	600 450 300 200 400 350 200	mg/m^3, half hour mean value	
Steam boilers – wood combustions: licensed before 1989: 50 – 150 MW_{th} 150 MW_{th} licensed in/after 1989 0,35 – 10 MW_{th} 10 – 50 MW_{th} > 50 MW_{th}	 300 200 250–500 200–500 200	mg/m^3, half hour mean value	
Steam boilers –fuel oil: licensed before 1989: 50 – 150 MW_{th} 150 – 300 MW_{th} 300 – 500 MW_{th} 500 MW_{th} licensed in/after 1989 0,35 – 10 MW_{th} 10 – 50 MW_{th} > 50 MW_{th}	 450 300 200 150 150–450 150–350 100	mg/m^3, half hour mean value	
Steam boilers – natural gas: licensed before 1989: 50 – 150 MW_{th} 150 – 300 MW_{th}	 300 200	mg/m^3, half hour mean value	

300 MW_{th} licensed in/after 1989 0,35 – 10 MW_{th} 10 – 50 MW_{th} > 50 MW_{th}	150 100–125 100 100		
Steam boilers for waste combustion < 750 kg fuel /h >750 kg fuel /h	100–300	mg/m^3, half hour mean val.	primary measures requ.
Installations for the combusion of hazardous waste: flue gas ≤ 5000 m^3/h flue gas > 5000 m^3/h flue gas > 10000 m^3/h	400 300 100–150	mg/m^3, half hour (daily) mean value	Installations have to comply until July 2000.
Industrial boilers (except steam boilers) – solid fuels: > 50 MW_{th}	100–200	mg/m^3, half hour (daily) mean value	Installations have to comply until June 2003
Industrial boilers (except steam boilers) – wood combustions: > 50 MW_{th}	200–350	mg/m^3, half hour (daily) mean value	Installations have to comply until June 2003
Industrial boilers (except steam boilers) – fuel oil: > 50 MW_{th}	100–250	mg/m^3, half hour (daily) mean value	Installations have to comply until June 2003
Industrial boilers (except steam boilers) – natural gas/LPG: > 50 MW_{th}	100–260	mg/m^3, half hour (daily) mean value	Installations have to comply until June 2003
Production and processing of iron and steel in general: gaseous fuels liquid fuels solid fuels; special processes (melting of raw iron, steel converters, reheating ovens, pickling)	250 350 500 500–750	mg/m^3, half hour (daily) mean value	Installations have to comply until July 2002
Sintering plants	400	mg/m^3, half hour (daily) mean value	Installations have to comply until July 2002
Non-ferrous metals production in general: gaseous fuels liquid fuels solid fuels; melting/recycling of Al	250 350 500 300–500	mg/m^3, half hour (daily) mean value	Installations have to comply until Jan. 2003
Casting of metals in general: gaseous fuels liquid fuels	250–500 350–500	mg/m^3, half hour (daily) mean value	

solid fuels; reheating furnaces (< 800°C) reheating furnaces (> 800°C)	500 500–750		primary measures
Production of bricks when emis. of NO_x > 5 kg/h	200–300	mg/m^3, half hour mean val.	
Production of gypsum	250–500	mg/m^3, half hour mean val.	primary measures requ.
Production of cement	1000	mg/m^3, daily mean value	
Production of glass when emis. of NO_x > 2.5 kg/h	500–1500	mg/m^3, half hour mean val.	

*) A range indicates that standards are differentiated according to specific subcategories

176. **Belarus**. Recycling of some flue gases (15-30%) and multi-stage combustion are practices employed in power-generating, steam and water-heating boiler units fired by fuel oil and natural gas to limit NO_x emissions from existing sources in power generation, industry and the utilities sector. As of 2000 such measures are being applied to boiler units with a total capacity of 100,000 MW_e. By 2010 measures are planned to limit NO_x emissions on further units with a total capacity of 10,000 MW_e. Combining flue gas recycling and multi-stage combustion helps to reduce emissions on average by 30%. A catalytic process is being used for nitric acid production (4 bar pressure) in Grodno to ensure an NO_x content in emissions of up to 210 mg/nm^3.

177. As one means of reducing NO_x emissions by 2010 it is planned to use wood in an amount of as much as 2,400,000 tons in standard fuel equivalent (sfe = 29.3 MJ/kg). For this purpose arrangements have been made to produce boilers of 0.2 to 7 MW capacity, chopping machines to prepare the wood for burning and gas generators of the "Pinga" type and other designs. The number of steam-gas turbines to be built by 2005 and 2010 for electricity and thermal power generation has yet to be specified. Wind-power units are expected to be at the 325 MW_e level by 2010, while small hydropower plants should reach up to 120 MW_e.

178. **Belgium*.** Walloon region: For installations whose operating permit was granted after 1 July 1987, see Q.3. The following standards apply only to installations in operation before 1 July 1987. The following installations are covered:

(a) power stations;
(b) sugar refineries;
(c) iron and steel plants;
(d) wood pulp plants;
(e) chemical processing plants.

Source category	National emissions standards	Unites and statistical treatment[1]	Pollution control measures applied[2]
Solid fuels	950 mg/Nm^3	daily average + 97% of average values per ? hour not to exceed 6/5 of the limit values and no average value per ? hour to exceed	- replacement by gas - burners out of service

		double	
Liquid fuels	575 mg/Nm^3	daily average + 97% of average values per ? hour not to exceed 6/5 of the limit values and no average value per ? hour to exceed double	- OFA (Over Fire Air) - operating at low air excess levels - air flow regulation and air speed control - replacement by gas - regulation of oxygen - RUE
Gaseous fuels	425 mg/Nm^3	daily average + 97% of average values per ? hour not to exceed 6/5 of the limit values and no average value per ? hour to exceed double	- smoke recirculation - primary measures
Household waste incinerators	as per operating permit	in accordance with permit	deNOx

[1] The statistical treatment can be a percentile (e.g. 95 percentile), a daily average, a monthly average, etc.
[2] Use the technical annex to the Nitrogen Oxides Protocol relating to best available technologies (BAT) as a reference.

179. Flemish region: Reduction measures are enforced by imposing emission standards in the Flemish legislation Vlarem. For existing installations (authorised before 01/01/93), the same emission limit values as for new installations are applicable, however, a period of transition is foreseen for some sectors. For the main part of the existing sources, the emission limit values will be valid from 01/01/99. For the production of nitric acid, the emission limit values for existing installations will become in force on 01/01/2003, for municipal waste combustion on 01/12/95. For refineries the regulation (including transition period) is identical for new and existing installations. For power plants and industrial combustion plants the regulation is deviant. Following table is valid.

Source category	National emission standards	Statistical treatment	Pollution control measures applied 2/
Power plants and industrial combustion plants Plants authorised before 01/07/87 Solid fuels Liquid fuels Gaseous fuels Originally use of liquid fuels and after 01/01/80 solid fuels	 Following standards are valid from 01/01/95 950 mg/Nm^3 575 mg/Nm^3 425 mg/Nm^3 1100 mg/Nm^3	*For power plants and industrial combustion plants in general*: 1. Discontinuous measurements: Any measured value < or = emission limit value 2. Continuous measurements: any daily average < or = emission limit value, and 97% of the half hour averages < or = 6/5 times emission limit value, and	*In case of use of solid fuels* Switch to gas Process and Combustion modifications: a.o. OFA=Oven Fire Air, Adaptation of the feed system, burners out of service. Flue gas treatment, deNOx *In case of use of liquid*

		any half hour average < 2 times emission limit value	*fuels*
Plants authorised after 01/07/87 and before 01/01/96			Switch to gas Process and Combustion modification: low NOx burner and burners out of service Flue gas treatment: NSCR (limited)
Solid fuels	650 mg/Nm^3		
Liquid fuels	50-300 MW : 450 mg/Nm^3 > 300 MW: 200 mg/Nm^3		
Gaseous fuels	350 mg/Nm^3		*In case of gaseous fuels* Process and Combustion modification: low NOx burners and burners out of service

180. **Bulgaria**. Bulgaria has set emission standards for the existing stationary sources (SG ISSN. 81/91). For plants, put into operation before the end of 1992 those emission standards were valid till 1995.12.31. After this date, the emission standards for new stationary sources were in force. Nitrogen Oxides National Emission Standards for Existing Stationary Sources in mg/m^3 are:

Source category	Fuel type	Power in MW		
				more than 50
Combustion installations	Local coal	00	500	
	Imported coal	500		
	Liquid fuels	50	450	700
	Gaseous fuels	200	200	

181. In the Clean Air Act, adopted in 1996 (SG ISSN. 45/96) there are provisions, allowing existing stationary sources to acquire permission from the competent authorities to be accountable for emission standards, different from the ones mandatory for new stationary sources, but are obliged to develop and implement programmes ensuring their ability to conform to the national standards for new sources. Endorsing annual emission ceilings will not only result in phased emission decrease and reduction nationwide, in compliance with undertaken obligations under international agreements, but will allow alternative decisions to be taken, as well

182. **Canada**. The province of Ontario is currently developing emission regulations for existing coal and oil-fired electric utility boilers and is proposing a standard of 2.0 kg NOx/MWh of electricity output. This is approximately equivalent to the emission limit in the national emission guideline for new sources, but expressed on an output basis. The province of British Columbia has placed NOx control standards more stringent than those in the national emission guideline on a 900 MW gas-fired generating station, and this has resulted in the retrofit of selective catalytic reduction (SCR) technology on this plant. Another means of controlling NOx emissions from stationary sources is the use of an emissions cap. This is potentially more cost-

effective than applying emission standards to individual stationary sources. It is a method adopted in the past by federal and provincial governments and is currently being proposed for further NOx control by the province of Ontario.

183. **Croatia***. See Q.18, part "Cleaner technologies

184. **Czech Republic.** In the framework of the Environmental Program of the Czech Power Company (CEZ), installation of denitrification techniques was carried out (mostly primary NOx abatement measures and FBC installations) in 1994 -1998. A decrease in NOx emissions of power stations has been achieved through the installation of special new burners and computer control of thermal processes.

185. Together with the effect of FGD installation the national NO_x emissions from stationary sources decreased from 742 thous. tons in 1990 to 413 thous. tons in 1998, i.e. by 44.3 per cent. For detailed information about the program mentioned above see also Q.18. The chief source of NO_x in the production of construction materials consists in the calcination of portland clinker, requiring a high flame temperature for formation of cinder materials. The emission limits are met by the individual production lines. Decreasing of NO_x emissions in the production of cement is achieved by introduction of a precalcination step in the calcination process, where half of the fuel is burned at a temperature of about 1000 ^{o}C. Similarly, the combustion regime of the main burner is controlled so that the formation of NO_x is minimized (through decreasing the excess of air). Over the last ten years, emissions of NO_x from cement plants have been decreased by 39.2%.

186. **Denmark**. The emissions of nitrogen oxides from all stationary sources with an electrical output of more than 25 MW including existing sources are regulated through a quota system. The quota system states the yearly limit for emissions. The limit has gradually been reduced from 106,000 tons in 1992 to 35,000 tons in 2003.

187. **Finland**. The licencing procedure, where BAT principle is nowadays applied, is used in fixing the emission limit values for stationary sources. In addition, the following quidelines for existing power stations with termal input bigger than 100 megawatts were implemented after 1991:

gas turbines	**gas**	**120mg/m3**	**Annual average**
gas turbines	oil	167 "	"
power plants			
-wall fired	coal	656 "	"
-corner-fired	coal	514 "	"
-other technologies	coal	428 "	"
-peat fired		514 "	"
other domestic fuels		428 "	"

NOx emission standards in Finland have been given as annual average values and the exact limits are given in milligrammes per Mega joule of energy input. The figures in the table above have been calculated from the limits presented in mg NO2/MJ.

188. **Germany**. All existing stationary sources are in compliance with the technical annex of to

the Protocol. For the concrete emission limit values see Q.3. The principle is, that after a transition period , which is usually 5 years, the same requirements apply to both new and existing installations.

189. **Greece**. Conventional thermal plants and cogeneration plants on the one hand and industrial processes are the only major source categories under the Protocol. At present, every large combustion plant in the country belongs to the category of existing plants pursuant to Directive 88/609/EEC. To date, primary measures have, internal combustion engines excepted, been applied to a variety of large combustion plants (partial recirculation of combustion gases, use of off-gas heat to heat combustion air, etc.). The provision of Directive 88/609/EEC concerning large combustion plants (ceiling of 70 kt per year for total emissions) is applied. In the case of industrial processes, a limit value of 8 kg NO_2 per ton of product has been set for plants producing nitric acid. It should be noted that Directive 96/61/EC (IPPC) will be applied to relevant existing large combustion plants with effect from 2007. The same applies to major chemical industries. The measures to be put into effect have not yet been decided at the Community level.

190. **Hungary**. According to the new national clean air legislation for selected stationary source categories the following emission limit values of NOx may not be exceeded after 1 January 2001 (the authorities can permit longer deadline up to 31 October 2007):
Glass industry – 1200-1600 mg/m³
Cement industry – 800 mg/m³
Burning of lime-stone, bauxite… in rotary kiln – 1800 mg/m³, in other kiln – 1500 mg/m³
Producing of lime – 1300 mg/m³
Stationary diesel engines =3 MW_{th} – 2000 mg/m³, <3 MW_{th} - 4000 mg/m³, two-stroke petrol engine – 800 mg/m³, four-stroke petrol engine – 500 mg/m³

191. **Ireland**. Existing stationary sources:Integrated pollution control licensing system is being extended to cover existing stationary sources (LCPs) over the time frame 2000 – 2002 as follows:

Activity	**Fuel Used**	**Date on which IPC application is required**
The production of energy in combustion plant, the rated thermal input of which is equal to or greater than 50MW other than any such plant which makes direct use of the products of combustion in a manufacturing process	Gas Coal/Oil Peat	5/9/2000 2/3/2001 8/1/2002
The burning of any fuel in a boiler or furnace with a nominal heat output exceeding 50MW	Gas Coal/Oil Peat	5/9/2000 2/3/2001 8/1/2002

192. The largest industrial emitter of NOx is the Aughinish Alumina plant in Co. Limerick (15 kt of NOx emitted in 1998). In 1998 this existing plant came within the ambit of the EPA's integrated pollution control system. A condition of its integrated pollution control license is the

consideration of a Combined Heat and Power (CHP) option at the plant within 2 years of the grant of the license. The plant operator has identified partners to develop a CHP Plant on the site and hopes to have construction complete by 2002. Another LCP (Glanbia food processing plant at Ballyragget) emitting 500 tonnes of NOx annually is to move from Heavy Fuel Oil (HFO) firing to gas fired CHP by 2001 at latest. See also Q2 re. amendment of the Environmental Protection Agency Act, 1992 to transpose the IPPC Directive (96/61/EC). In summary, the extension of the national IPC and IPPC licensing system to existing LCP's, EU legislation requiring a maximum 1% sulphur HFO from 2003 and the increasing use of combined cycle gas turbines and renewable energy sources will ensure both SO_2 and NOx emissions are significantly reduced in the coming years.

193. **Italy**. The Ministerial Decree 12/7/90 established emission limits for all existing plant. It covers 289 pollutants and contains in an annex an indication on the abatement technologies for a broad range of plant types, which could be used to respect the emission values. The decree introduces emission standards and suggests a list of measures and technologies that could be used to reach these standards, giving flexibility in the choice of the more appropriate measure to apply. All existing plants must satisfy the standards no later than 31 December 1997. For large combustion plants the timetable is the following: for companies with several installations, at least 35% of installed power has to be adapted by 31 December 1997; at least 60% of installed power has to be adapted by 31 December 1999; retrofitting has to be completed by 31 December 2002. The Ministerial Decree of 19/11/97 modified emission limits for existing incineration plants. Furthermore, national glass industries signed a voluntary agreement to develop and introduce measures to reduce NOx emissions from glass production by 50% in the period 1998 – 2002. Emission standard for NOx from major existing stationary sources are:

Source	**Value (mg/Nm^3)**
Combustion Plants < 50 MWth 50 – 500 MWth > 500 MWth	650/500/350 (solid/liquid/gas) 650/650/650 (solid/liquid/gas) 200/200/200 (solid/liquid/gas)
Stationary engines: compression ignition > 3 MWth compression ignition < 3 MWth two-stroke four-stroke	 2000 4000 800 500
Gas Turbines	400 (> 60,000 m^3/h waste gas) 450 (< 60,000 m^3/h waste gas) 600 (liquid fuel)
Cement	1800 – 3000
Glass	1200 - 3000 (liquid fuels) 1200 - 3500 (gaseous fuels)
Refineries	500 (Average of all installations)
Incineration	600 (as SO_2 + NO_2: hourly mean value)
Coke Ovens	600
Sinter Plants	400
Acid Nitric	500

194. **Latvia***. Draft ARegulations on Reduction, Restriction and Control of Emissions of Air

Pollutants from Stationary Air Pollution Sources@ expected to be approved by the Cabinet of Ministers on 01.07.2000. Regulations will be introduced for new combustion plants from 01.07.2000; will be introduced for existing combustion plants from 01.01.2006. Regulations applies to combustion equipment in energy, industrial sectors and waste combustion. Regulations determine emission standards for sulphur and N oxides for different fuel types for small, medium-sized and large plants, and principles for licensing, monitoring, control, and terms for BAT options.

195. **Lithuania***. We have national methodology which almost comply with the most general requirements of the Protocol.

196. **Netherlands**. There are no changes from the data given in the latest review.

197. **Norway**. The major stationary sources in Norway are mentioned in the response to question Q.3. The emission permits issued by the Norwegian Pollution Control Authority to stationary sources are issued on a plant-by-plant basis. They are in pursuance with the Pollution Control Act and comply with the EU regulatory framework (LCP-, IPPC-, air quality-, hazardous waste- directives). Installation of low-NO_x technology in the offshore and onshore petroleum industry, as well as NO_x cleansing in land based process industry are considered to be the most cost-effective measures for the abatement of stationary NO_x emissions in Norway. To date, such measures have been applied only to a limited extent.

198. **Poland***. Emission standards for existing major stationary combustion launched before 28 March 1990:

Solid fuels

Thermal power MW_{th}	**National emission standards**		**Units**	**Pollution control measures applied**
	Hard coal	**Brown coal & coke**		
< 50	400	450	(mg NO_2/m^3) Based on 6 per cent oxygen in flue gas	
= 50	540	450		

Liquid and gaseous fuels

Thermal power MW_{th}	**National emission standards**		**Units**	**Pollution control measures applied**
	Liquid fuels	**Gaseous fuels**		
<5	450	150	(mg NO_2/m^3) Based on 3 per cent oxygen in flue gas	
= 5-50	450	300		
= 50	630	350		

Pollution control measures applied to the existing installations include:

(a) Over fire air combustion (OFA);
(b) Low NO_x emission burners;
(c) Flue gas recirculation;
(d) Zonal combustion.

199. **Russian Federation**. Evaluating progress made in introducing nitrogen oxide control measures for existing sources in the major stationary source categories, including measures introduced or to be introduced, taking into account the technical annex to the Protocol, is practically impossible because of the sharp fall and contraction of production in Russia between 1990 and the present. The reduction in nitrogen oxide emissions for the European part of Russia was 6.2% in 1998 as compared with 1987.

200. **Slovakia**. The Slovak legislation do not prescribe specific measures to be taken to reduce NO_x emissions. However, last amendment of the act Nr. 309/1991 of December 1999, (Act on Air) and approval of the new act on fees for air pollution (Nr. 401/1999) have introduced two categories for basic pollutants:

a) Polluting substances released into the atmosphere from individual polluting substance release locations from major or medium sources of pollution shall from January 1, 1999 be classified in class A or in class B according to whether the technical condition of the technology at the source allows adherence to the determined emission limits.

b) Polluting substances released from major and medium sources of pollution whose the technical condition of technology does not allow from January 1, 1999 adherence to determined emissions limits and where the operator shall submit an application may be classified in class B. The subject of classification in class B is always a specific polluting substance released from a specific release location from a pollution source.

c) All polluting substances released from their release locations from existing major and medium sources of pollution which are not classified in class B and all polluting substances from their release locations from new major and medium sources of pollution are classified in Class A.

201. The fees for pollutants in category B are calculated multiplying the base fee by the coefficient K_{ELB}, which progressively increases over the time:

Year	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
K_{ELB}	1,1	1,3	1,8	2,5	3,5	5,0	10,0	16,0	

This is intended to be an economic incentive for operator to plan its investments and economy of its behaviour concerning the emissions. New installations have to apply according to act on air best available techniques not exceeding excessive costs (BATNEEC).

202. **Spain.** See answer to question 2. According to the European Union legislation and strategies.

203. **Sweden**. See question 3

204. **Switzerland**. Information, as required by article 8, paragraph 1 (c), and article 2, paragraph 2 (c), on progress made in introducing pollution control measures for the existing

sources in the major stationary source categories listed under question 3.

205. The emission standards apply not only to new plants, but also to existing plants. As a general rule, the existing plants have to be retrofitted within a time period of five years after the entry into force of emission limitations.

206. **Ukraine**. Technical solutions are continuously being introduced in the "major stationary source" category to reduce emissions of nitrogen oxides. These involve introducing new combustion technologies and modifying processes and combustion.

207. **United Kingdom**. List of major stationary source categories in the UK (defined in the Protocol as a source category which emits above 10% of national NOx emissions): Power Plants. Under the EC Large Combustion Plant Directive (88/609/EC) the UK is committed to reducing NO_x emissions from existing large combustion plants (those licensed before I July 1987 and > 50MWth) by 30% from 1980 levels by 1998. In order to achieve these reductions, operators of combustion plants were set limits for NO_x emissions each year and a timetable for installing the new equipment required to meet the emission levels set for future years. 1997 figures showed that the UK had already met its targets under the Directive.

208. In general, emissions standards for processes regulated under Part 1 of the Environmental Protection Act (including existing power plants but also other processes) are set on a process- and site-specific basis(see answer to question 2 above). Operators of these processes are required to employ Best Available Techniques Not Entailing Excessive Cost (BATNEEC). Guidance is issued by the competent authorities on BATNEEC standards for the various types of processes, including the technology which is generally envisaged for pollution abatement.

209. In future, NOx emissions from existing power plants will be controlled through the pollution control regime to be set up under the Pollution Prevention and Control Act 1999, which will implement the EC Integrated Pollution Prevention and Control Directive.

210. **United States**. For existing stationary sources, the U.S. programme is based on achieving the mandatory NAAQS for ozone. To address the ozone problem in the U. S., significant emission reductions would also be necessary from existing stationary and mobile sources. Great success has been achieved in the United States in balancing economic growth and environmental protection by allowing States and cities to choose the most cost effective strategies to address the existing sources and by not mandating the same level of control on major existing sources as for new sources. This approach has been extremely successful in significantly reducing the costs of achieving U.S. environmental goals. Refer to Q.2 and see Attachment B for a list of our major stationary source categories for NO_x.

211. **Question 6: Provide information, as required by article 8, paragraph 1 (d), on progress made in making unleaded petrol available. Has your country phased out the use of leaded petrol for on-road vehicles?**
Yes _____ No _____
If not, when do you expect to phase out leaded petrol?

If not, please also report on the availability of unleaded petrol, in particular along the main international transit routes, and the percentage of total sales in terms of mass or volume of leaded and unleaded petrol.

212. **Austria**. Yes. Leaded petrol is banned since 1 November 1993

213. **Belarus**. Refineries in Belarus stopped producing leaded petrol in 1998. The Ministry of Statistics reports that leaded petrol was not used in 1999.

214. **Belgium*.** Yes. Federal Government**:** Belgium has discontinued the use of leaded petrol for road vehicles. Belgian petrol companies started distributing petrol with a lead substitute from 1 April 1999 on a voluntary basis and, as a result, leaded petrol has no longer been sold in Belgium since that date. In accordance with directive 98/70/EC, the marketing of leaded petrol has been prohibited in Belgium since 1 January 2000.

215. **Bulgaria**. Bulgaria is a producer of ethyl gasoline, with sufficient available capacity to produce MTBE. The petrol production Structure in Bulgaria1990-1996 in thousand tonnes is

Petrol type	1990	1991	1992	1993	1994	1995	1996
Ethyl (blended) gasoline	1341,8	1056,7	1131,3	1404,4	1144,3	1088,1	918,9
Clear gasoline	4,4	8,5	0,7	348,8	304,7	368,6	322,0
Total	1346,8	1065,2	1132,0	1753,2	1449,0	1456,7	1240,9

216. Blended gasoline production increased from 0,3% in 1990 to about 26% in 1996. By Government Decision 173/98 a National Programme was adopted for the phase out of petrol production and use, the deadline for complete phase out being 2003.12.31. During the fourth ministerial conference in Orhus, Denmark in 1998, held under the motto Environment for Europe, both the ministerial declaration on the phasing out of leaded petrol production and use and the Protocol on heavy metal emission reduction were signed. 80-85% of the clear gasoline produced in the country is still exported, domestic consumption being 6-10%. Currently a public awareness raising and explanatory campaign is on, promoting the use of clear gasoline. It is expected, that the chief refinery would ensure the production of only clear gasoline in the year 2000. All fuel stations around the country are stocked with sufficient quantities of clear gasoline.

217. **Canada.** Yes. Lead additives in gasoline for on-road vehicles were banned in December 1990. Lead additives are still allowed in aviation gasoline and competitive racing fuels.

218. **Croatia***. No. Till the year 2005. In 1997, there were 192 tank distribution lorries, 398 petrol stations and 8 LPG filling stations. Since 1992, all petrol stations have offered unleaded petrol with different pump nozzles for leaded and unleaded petrol. Only 4 stations have a vapour recovery installation for tank filling (VOC Stage i) and 1 station for car filling (VOC Stage II). Total petrol consumption declined between 1990 and 1993. From 1993 to 1997 energy consumption increased for transport (total +33 per cent) due to the growth in road transport (+39 per cent) and air transport (+27 per cent). The fourth RON grades of petrol are available on the Croatian market: unleaded 91, 95 and 98 RON and leaded 98 RON. For unleaded grades, 95 RON

has the biggest market share (78.7 per cent against 21.3 per cent for 91 RON). The market share of unleaded petrol increased from 2.5 per cent in 1990 to 30 per cent in 1996, while the consumption of leaded petrol has remained almost constant in recent years.

219. **Czech Republic**. Leaded petrol has not yet been taken out of use for highway vehicles in CR. Decree No. 244/1999 Coll., of the Ministry of Transport and Communications terminates the sales of leaded petrol on January 1, 2001. For the sake of information, the composition of the sales of automobile petrols in CR in 1999 and the fractions of unleaded and leaded petrols in the overall sales in percentage in 1997 - 1999 are given below:

Kind	%
SUPER BA 95	64.7
SUPER PLUS BA 98	0.8
NORMAL BA 91	4.9
Unleaded automobile petrol, total	70.4
SPECIAL BA 91	22.3
SUPER BA 96	7.3
Leaded automobile petrosl, total	29.6
Automobile petrols, total	100.0

	1997	1998	1999
Sales of Unleaded automobile petrols in 1997-99, total %	62.5	65.8	70.4
Sales of Leaded automobile petrols, in 1997-99, total %	7.5	34.2	29.6

220. In June of 1998, the Czech Republic adopted the "Pan-European Strategy of Gradual Phasing Out of Leaded Automobile Petrol", formulated by ECE in March of 1998 and entailing phasing-out of leaded petrol by January 1, 2005, at the latest. Pursuant to Law No. 38/1995 Coll. and its Decree for implementation, No. 102/1995 Coll., and its amendment No. 244/1999 Coll., the sales of leaded automobile petrol to end consumers in CR must be terminated at the latest by January 1, 2001.

221. **Denmark**. Yes, since 1994.

222. **Finland**. Yes

223. **Germany**. Yes.Three qualities of unleaded petrol are available everywhere in Germany. Leaded petrol has been voluntarily phased out by the producers. The remaining amounts of leaded petrol are imports only, with a market share probably below 0.01% in 1998. Lead replacement additives (e.g. potassium based) are sold at petrol stations in bottles to the end user.

224. **Georgia***. No. The Ministry of Environment of Georgia has been working on the preparation of lead phase out country programme, which will aim at lead phase out by 2005. The existing car park makes available to use unleaded petrol. The total consumption of petrol is assumed to be 1, 000, 000 – 1, 200, 000 tonnes per year. 95% of all petrol is imported from

Azerbaijan, Bulgaria, Greece, Rumania, Turkey, Russia and Italy. 50% of total amount is imported illegally and it is very difficult to identify the share of leaded and unleaded petrol.

225. **Greece**. No. If not, when do you expect to phase out leaded petrol?By 31 December 2001, pursuant to the relevant Community Directive (98/70/EC). If not, please also report on the availability of unleaded petrol, in particular along the main international transit routes, and the percentage of total sales in terms of mass or volume of leaded and unleaded petrol: Unleaded petrol is now available, in particular along the main international transit routes. At present, the percentages of total sales of leaded and unleaded petrol are of the order of 55% and 45% respectively.

226. **Hungary**. Yes. Ministerial Decree 12/1998. (XI. 23.) GM enacted the phasing-out of the leaded petrol that entered into force on 1st April 1999.

227. **Ireland**. Yes. The marketing of leaded petrol was totally phased out from 1 January 2000 as required by EU Directive 98/70/EC.

228. **Italy**. Italy has not already phased out the use of leaded petrol for on-road vehicles. We will to phase out leaded petrol 1/1/2002.The market share of unleaded petrol is the following:

year	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**
%	6	8	11	26	36	41	46	51	5	62

Unleaded fuel is available along all transit routes.

229. **Latvia***. No. Up to now in force are "Regulations on Fuel Quality Standards for Environment" are approved by the Cabinet of Ministers on 07.07.1998, which include requirements of Council Directives 85/210/EEC, 87/416/EEC and 93/12/EEC. Instead of above mentioned regulations are elaborated draft "Regulations on Fuel Quality Standards" expected to be approved by the Cabinet of Ministers on 01.05.2000. These regulations include requirements of Council Directives 93/12/EEC, amendments 1999/32/EC and Directive 98/70/EC of the European Parliament. Amount of unleaded petrol 0.005 g Pb/litre will be 99.5% of total. Amount of leaded petrol 0.15 g Pb/litre for on-road vehicles will not exceed 0.5% of total from 01.05.2000. Expected date to phase out leaded petrol 0.15 g Pb/litre for 0.5% of total is not appointed

230. **Lithuania*.** Yes. From 1996, Lithuania produces only unleaded gasoline. From 1998, the use of leaded gasoline is prohibited as well as diesel fuel with sulphur content exceeding 0,05 %.

231. **Netherlands**. Yes

232. **Norway**. Yes. About 100 % of the petrol sold in Norway is unleaded. The share of unleaded petrol sold has increased notably during the past years, and in 1997 there was not sold leaded petrol at all. Hence, the use of leaded petrol is practically phased out.

233. Regulations on the availability of unleaded petrol and the content of lead in petrol are founded on the Product Control Act of 1976. From 1992 it was compulsory for all petrol stations to purchase unleaded petrol. The lead content in petrol was regulated in 1980. According to new regulations coming into force in 1985, the content of lead in unleaded petrol should be maximum 0.013 g/l, while the content in leaded petrol should not exceed 0.15 g/l. In 1986 a tax on leaded petrol was introduced. In 1997 this tax was differentiated, and the fee is now lower for petrol with a lead content of less than 0.05 g/l.

234. **Poland***. No. Lead-free fuel is available in Poland with no limitation. Lead-free petrol consumption in 1999 was at the level of 4 308 000 tonnes, which is 78% of the total petrol use in Poland. The government of Poland signed the declaration proposed by the government of Denmark to withdraw from the market the petrol containing lead by 2005.

235. **Russian Federation.**. The statistical reports of the Russian Federation's State Committee on Statistics contain no data on the consumption of leaded and unleaded petrol. Only unleaded petrol is used in the major cities and served at filling stations located along international highways. Russian Federation Government Decision No. 263 of 6 March 1996 approved a target-oriented "Fuel and energy" programme which includes a subprogramme "Reconstruction and modernization of oil-refining enterprises". The programme covers the period until 2000 and provides for an increase of up to 65% in the production of unleaded petrol.

236. A number of regional programmes have been drawn up at the level of entities of the Russian Federation to deal with issues relating to the prevention of environmental lead pollution. For example, by Decision No. 312 of 19 May 1995 the Cabinet of Ministers of the Republic of Tatarstan approved a programme to reduce emissions of pollutants into the atmosphere from motor vehicles in the Republic of Tatarstan which calls for the development of new anti-knock fuel additives instead of tetraethyl lead, and the formulation of proposals for economic incentives to convert vehicles to the use of natural gas and other alternative fuels. Moscow City Council ordinance No. 689-RM of 1 December 1993, concerning specific aspects of the marketing of motor fuel in Moscow and the imposition of fines, prohibits the retail sale of leaded petrol in Moscow.

237. **Slovakia:** Yes. Since 1 January, 1998, only unleaded petrol is allowed to be produced, imported and marketed over the country. (Regulation of the Ministry of the Environment Nr. 268/1997 on fuel requirements).

238. **Spain**.Yes. According to the UE Legislation

239. **Sweden**. Lead in petrol is phased out.

240. **Switzerland**. Switzerland phased out the use of leaded petrol for on-road vehicles by 1st January 2000.

241. **Ukraine.** Yes.A programme to phase out leaded petrol is being implemented in Ukraine.Leaded petrol accounted for 5 per cent of total petrol use in 1999. Leaded petrol will be phased out completely in Ukraine by the year 2005.

242. **United Kingdom**. Unleaded fuel is widely available at refuelling stations throughout the UK. As required by EC Directive Auto-Oil II, the UK phased out leaded petrol by 1/1/2000. In doing so, the UK also complied with the deadline set in the UNECE Protocol on Heavy Metals to phase out leaded petrol for general use by on-road vehicles within 6 months after the date of its entry into force. However leaded petrol for use in light aircraft is still legal in the UK.

243. **United States**. Yes

244. **European Community**. Yes. Leaded petrol is phased out in the EU-15 with the following exceptions: Spain, Greece and Italy can continue to market leaded petrol until 31 December 2001. France may also do so in its Overseas Departments until 31 December 2004.

245. **Question 7: Provide information, as required by article 8, paragraph 1 (e), on measures taken to facilitate the exchange of technology related to the reduction and control of emissions of nitrogen oxides.**

246. **Austria**. Information about measures to promote the exchange of technology related to air pollution control and related to areas which influence the level of air pollution (energy, traffic) can be found in Q.25.

247. **Belarus**. A Franco-Belarusian company in Gomel is producing 0.2 to 7 MW_{th} boilers of the CS, CFS and CDE series for wood residues.

248. **Belgium*.** At the international level the Walloon, Flemish and Brussels regions participate:

(a) actively in the European Union IMPEL network;

(b) in the drafting of BAT reference documents (BREFs) pursuant to the European Union's IPPC directive.

In 1998 the 'Mixed Platform' was created for consultation and dissemination of information between the government (Co-ordination Committee of International Environmental Policy) and industry concerning the Belgian position on international environmental topics.

249. Walloon region: At the regional level, there is a "clean technologies" service in the Walloon environment authority and a technology observatory at the Public Service Scientific Institute (ISSeP), which are responsible for collecting and disseminating information on BATs.

250. Flemish region: Different activities have been developed during the past years to improve the exchange of technologies and information. Some examples :

(a) The Centre for Best Available Techniques, founded in 1994 and operating under VITO, collects information about available pollution prevention techniques and disseminates this information to the Flemish government and industry. The center itself also draws up BAT studies for different industrial sectors. Regulation in Flanders is based on these BAT studies. Studies relevant for NOx are the BATs for the production of chipboards and for the treatment and processing of animal manure.

(b) The Energy and Environment Information System (EMIS) collects and provides information on environmental topics to professionals, managers, civil servants and consultants. In addition to information on law, literature, statistics and BAT, there is a databank with profiles that contains information sheets on companies, consultants and administrations. Furthermore, an overview of the current support programmes (to obtain investment support or subsidies for research and development) is available.

(c) The centre of expertise Rational Use of Energy (VITO) acts as a hub for the dissemination of knowledge and the promotion of cogeneration (or Combined Heat and Power, CHP), as well as a catalyst and objective assessor for the interest groups involved.

251. Brussels capital region: Several departments at the Brussels Institute for Environmental Management have, among their tasks, the dissemination of information to enterprises in the region:

(a) The Enterprises and Environment Interface department publishes a regular information bulletin for enterprises and brochures on relevant sectoral legislation;

(b) The Enterprises' Voluntary Actions department provides information relating to eco-labelling by enterprises;

252. In addition, the ECOBRU facility in the Brussels Regional Development Agency (BRDA) issues occasional reports;The organization Technopole conducts research into marketable clean technologies and provides loans and expertise to enterprises.

253. **Bulgaria**. The exchange of technologies related to the reduction and control of emissions of nitrogen oxides is carried out by the Bulgarian Chamber of Commerce, on company level, signed bilateral agreements for cooperation in the sphere of environment preservation with Denmark, Netherlands and Germany and the PHARE/EEC programme.

254. **Canada**. The measures taken to facilitate the exchange of technology information with respect to reducing emissions of nitrogen oxides has been focused on internet accessible information databases such as the Canadian Pollution Prevention Information Clearinghouse (CPPIC), the Business Environmental Performance Office (BEPO), and the Canadian Environmental Solutions (CES). Other information is available through Environment Canada's web site (http://www.ec.gc.ca) and its web links. Technology information exchange is also accomplished through events such as workshops, seminars, tradeshows and conferences. Information is also available in hardcopy upon request through Government publications.

255. **Czech Republic**. Privatization of cement plants was carried out through the entrance of a foreign partner (Lafarge, Dyckerhoff, Holderbank, Heidelberger Zement) which invested considerable financial means into reconstruction of production lines, to optimize firing technology and to decrease emissions of NO_x, SO_2 and particulate matter.

256. **Denmark**. Since 1991 Denmark has operated an environmental assistance programme to countries in transition, notably Poland, the Baltic countries, Russia, Ukraine, Belarus, Slovakia, the Czech Republic, Hungary, Rumania and Bulgaria. All in all more than US$ 300 mill has been spent. For year 2000 the total budget is close to US $ 100 mill. NOx reductions fall within the scope of the assistance programme. 43 projects with a total estimated emission reduction of 51.626 t NO_x have been supported. Total costs for these projects have been DKK 2.215.004.730

of which Danish assistance has been DKK 189.189.478 or approximately 9 %. However, only a few of the projects have been targeted towards NOx reductions only, whereas the majority of the projects have been general energy efficiency or fuel-substitution projects with other environmental benefits as well. E.g. a number of geothermal projects for district heating and projects concerning wind energy, straw and wood-burning replacing coal- or lignite-based heating. The largest NOx reductions stem from a few projects installing equipment enhancing burn-out of coal in power stations and installation of state of the art Low NOx burners.

257. Finland. The Ministry of the Environment has supported environmental protection in Finland´s neighbouring areas since 1991 through bilateral and multilateral cooperation projects at an approximated sum of EUR 97 million. Finland´s long-term partners in these projects have been Estonia, Latvia, Lithuania, Poland, Russia, including the City of St Petersburg, the Leningrad , Murmansk, Novgorod and Pskov areas and the Republic of Karelia. Co-operation in air pollution control has included measures in such major stationary sources as pulp and paper industry, cement industry, steel industry, power stations as well as energy efficiency and switching to renewable energy sources. Finland has given expertise to a EU twinnig project, where air pollution control legislation of Estonia is improved.

258. **Germany.** With the internet system “Cleaner Production Germany” (www cleaner-production.de) the Federal Environmental Agency provides information on projects of clean production and pollution prevention and control. With the Transform-Programme Germany provides technical assistance to the countries of Central and Eastern Europe including policy advice, training and feasibility studies. Since 1992, about 120 projects with a total volume of 27 million DM have been funded in the environmental field. Special emphasis has been given to the reduction of transboundary air pollution and the improvement of air quality in the ‘Black Triangle’ between the Czech Republic, Germany and Poland. The Twinning Programme is a support programme carried out by the European Commission to help the accession countries of central and eastern Europe bring their environmental standards into line with those of the European Union (EU). The programme’s main instrument is partnerships (twinning covenants) entered into between institutions of EU Member States and institutions in the candidate countries. Proposals for twinning projects are solicited from the Member States by the EU. The Federal Environmental Agency is carrying out a number of projects on behalf of the Federal Ministry for the Environment.

259. **Greece**. The country (competent authorities, enterprises concerned) is currently participating in the Community's work on defining the best available technology (BAT) in a number of sectors of industry, including energy production (large combustion plants) and chemicals.

260. **Ireland**. The Electricity Supply Board (ESB) participates in the international technical bodies (Eurelectric, VGB) seeking, inter alia, to improve knowledge of emission abatement techniques, increased use of renewable fuels etc. In addition, the ESB has participated in two EU funded Thermie projects exploring NOx reduction techniques. The first of these entitled “Longannet Gas Reburn Demonstration Project” was undertaken by Scottish Power at the Longanett Power Station and demonstrated the application of gas over coal reburn technology. The final technical report was submitted in December 1998. The second project entitled “Vado Ligure Coal Reburn Demonstration Project” is being undertaken at a 330 MW coal fired power

plant at Vado Ligure in Italy. The coal on coal reburn equipment has been installed and demonstration tests are ongoing. The project is scheduled for completion this year.

261. **Italy**. Italy supports a number of activities to facilitate access to technologies through bilateral and multilateral co-operation; a lot of such activities are related to energy sector (efficiency, saving, renewable energy). Through many trust funds and international financing organisations such as World Bank, European Bank for Reconstruction and Development, etc, Italy co-finances, among others, projects related clean technologies and energy saving. With the law 212/92 Italy instituted a fund for bilateral assistance to Eastern Europe Countries and in the projects related to technical and professional formation and technical assistance some environmental components are funded. Italy contributes to the PHARE and TACIS Programmes that provide assistance to Central and Eastern Europe in the energy sector contributing to reduce nitrogen oxides emissions. A number of specialised Italian Research Institutions provide direct assistance, mostly through capacity building initiatives such as scholarship programmes in Italian laboratories, specialised training and workshops, with particular regard to energy saving technologies.

262. **Latvia***. The Division of Laboatory of the Environmental Data Centre of Latvia provides the quality of emission control data according to the requirements of international standards for emission measurements of major stationary sources of pollution: ISO 10396: 1993 Stationary source emissions B Sampling for the automated determination of gas concentrations; LVS ISO 9096:1992 Stationary source emissions B Determination of concentration and mass flow rate of articulate material in gas-carrying ducts B Manual gravimetric method. ISO 11564:1998 Stationary source emissions B Determination of the mass concentration of nitrogen oxides B Naphthylethylenediamine photometric method.

263. **Netherlands.** The Dutch Ministry Housing, Spatial Planning and the Environment has given the consultant agency, Infomil, the assignment to provide information, especially to companies, about permitting and ALARA/Best Available Techniques (BAT) to reduce emissions of NOx, SOx, VOC, HM, POP's etc.

264. For the IPPC (Intergovernmental Panel on Climate Change) the Netherlands made integrated documents on BAT for iron and steel, cement, paper and pulp, aluminium and zink, glass, chloralkaline, nitric acid, oil refineries, phosphoric acid and air abatement in general.

265. **Norway**. The Norwegian Ministry of Environment and the Norwegian Pollution Control Authority have supported Cleaner Production (CP) Programs in Poland, Slovakia, the Czech Republic, Lithuania and the north-western parts of Russian Federation. The main goals of the CP-Programme are to reduce pollution discharges and to achieve an optimal exploitation of natural resources and raw materials. By transfer of know-how of the CP-concept from Norwegian engineers, Norway aims at increased productivity and reduced pollution in Central and Eastern Europe. By educating advisors from Central and East-European countries (CEE), national pollution prevention programs are being established in these countries.

266. In the field of transboundary air pollution, Norway has given high priority to bilateral and multilateral environmental co-operation with countries in CEE. Agreements have so far been established with Poland, Slovakia, the Czech Republic, Hungary, Russian Federation and

Lithuania. In addition, Norway is financing projects in the Baltic States.

267. Concerning Norway's commitments under the United Nations Framework Convention on Climate Change (UNFCCC), several projects have been initiated under the pilot phase for Joint implementation (AIJ). Priority has been given to projects related to fuel switch, energy efficiency, and renewable energy. In particular, Norway has signed an agreement with Slovakia on a fuel-switching project. At present an agreement with Romania is being developed regarding a district heating energy conservation project with emphasis on efficiency. Besides the reduction of emissions of CO_2, implementation of these projects will result in reduced emissions of SO_2, NO_X, CO and particles. Specific plans also exist for several other projects, while some are under evaluation.

268. **Poland***. The Technical and Technological Agency, founded in 1996, is to became a specialised unit in aiding in the implementation of new techniques and technologies in Poland, and the transfer of Polish achievements to other countries. Development and support for the transfer of environmentally sound technologies is served by the following financial mechanisms:

(a) tax concessions on investments (including licences, patents and know-how);

(b) concessions on dividends;

(c) State Treasury guaranties. Investments in new environment friendly technologies are also favoured by the policy for the redistribution of the target funds of the National Fund for Environmental Protection and Water Management, as well as by preferential loans from the Bank for Environmental Protection.

269. Poland participates in the EURECA program in which the research units participate in many projects aimed at the development of new technologies for the air protection and new environmentally oriented industrial technologies. Of particular significance are the SPRINT and BRITE programmes supporting the transfer and absorption of innovations and technologies for small and medium-sized enterprises. The transfer of technologies for the emission reduction are supported by projects of the found EKOFUNDUSZ, generated and maintained by government of Poland, as a form of an appropriation to Poland's debts to USA, France, Italy and Switzerland.

270. **Russian Federation**. The Government of the Russian Federation and the Government of the Kingdom of Sweden have signed an agreement on cooperation in the field of energy efficiency and renewable sources of energy. International treaty of 26 April 1999.

271. **Slovakia**. No special measures are introduced for that purpose.

272. **Spain**. See answer to question 2. According to the European Union legislation and strategies.

273. **Sweden**. Q.7, Q.16, Q.25,Q26 and Q 64:Exchange of technology, SO_x, NO_x och VOC. Sweden are active in assisting in the S:t Petersburg area of Russia, in the Baltic countries and Polen. Important areas have been energy saving, district heating, boiler technology and conversion from fossil to biomass fuels. In the joint projects both technology improvements and training programmes are included. Sweden amongst other countries is helping to maintain and improve EMEP-stations and city air monitoring equipment in Russia and the Baltic countries.

274. **Switzerland**. No special activity at the governmental level. Rather on a commercial and consultants basis.

275. **United Kingdom**. The UK participates in the UNECE Working Group on Technology which helps to ensure information exchange on abatement measures and technologies for NOx, amongst other pollutants. The UK also provides bilateral technical assistance for environmental projects to countries in transition through the Environmental Know How Fund, set up by the UK Department for International Development (DFID).

276. **United States**. Efforts to facilitate the exchange of information regarding technologies used to control nitrogen oxides are typically distributed via professional associations, meetings/conferences and journals e.g., Society of Automotive Engineers, Edison Electric Institute, websites and listservs.

277. **Question 8: Provide information, as required by article 8, paragraph 1 (f), on progress made in establishing critical loads. Have you provided critical loads data to the UN/ECE Working Group on Effects as part of its Mapping Programme?**

278. **Austria**. Critical Loads for acidification and for eutrophication have been established in Austria at a spatial resolution of 2,75 km x 2,75 km. A first map was produced in the early nineties, and the calculations and the data base used as input were continuously improved since then. The methodology currently used is mainly based on the recommendations in the UN/ECE Mapping Manual. Critical Loads for acidification were calculated for forest soils, while Critical Loads for eutrophication were established for forest soils, oligotrophic bogs and Alpine heathlands, covering almost 70 % of the federal territory of Austria. The data were transmitted to the Coordination Center for Effects and incorporated into the European Critical Loads maps.

279. **Belarus**. Critical loads for the EMEP 50 x 50 km grid were defined in the Republic of Belarus in 1998.

280. **Belgium***. Walloon region: Yes, data on critical loads have been sent to ECE as from 1998 for the years 1996 and 1997. The Walloon region has logged data for forests, surface water and construction material for acidifying pollutants and ozone (vegetation).

281. Flemish region**:** In 1996 a study was completed in which critical loads were determined for 652 points in forests in Flanders. This study was conducted according to the methods prescribed by the Coordination Center of Effects (RIVM) in their 'CCE-status report 1993'. This information was handed to the WG on Effects. Recently, a study has been started with the aim to construct sensitivity maps for acidification and eutrophication in Flanders. For this purpose, critical loads will be determined for forest, heath and meadow. The information on critical loads as well as information on deposition of acidifying pollutants will be linked to areas so that can be calculated which percentage of the area, and to what extent, has to cope with an exceedance of the critical loads. The end of this study is foreseen for August 2001.

282. **Bulgaria**. Effects as part of its Mapping Programme? Bulgaria has been providing information and critical loads data to the UN/ECE Working Group on Effects since 1997.

283. **Canada**. Canada is not part of the EMEP geographical domain and thus we have not provided critical loads data to the Mapping Programme. However, we published a critical loads map in The 1990 Canadian Long-Range Transport of Air Pollutants and Acid Deposition Assessment Report (RMCC,1990). The map shows critical sulphate load values for deposition to aquatic ecosystems - designed to maintain at least 95 percent of the lakes in a region at a pH of 6.0 or higher. In the 1997 Canadian Acid Rain Assessment, we published a map of critical (sulphur + nitrogen) load for forest soils, as well as their exceedance. We are also in the process of revising this map, using a larger dataset. We hope to complete the work within the next 3 years.

284. **Croatia***. Yes. In 1998, the calculation and mapping of critical load in Croatia was performed for the area of Gorski Kotar and the mapping of a part of the north-western Croatia will soon be completed.. The below table shows critical loads for the area of Gorski Kotar in which 24 recipients (pedological and vegetational types) with different critical load values were identified.

Table: critical load (deposition) in the area of Gorski Kotar, $eqha^{-1}year^{-1}$

Sulphur		**Nutrient nitrogen**	
Range of values for 24 recipients Clmax(S)	**5-percentile value Clmax(S)**	**Range of values for 24 recipients Clnut(N)**	**5-percentile Clnut(N)**
1761-4694	**1761**	**531-1794**	**693**

For other areas of Croatia critical loads still have to be detrmined. It is particularly important to carry out the mapping of the western part of Craotia, because calculations show that, besides realisation of the planned emission abatement in the framework of the Protocol to the LRTAP Convention, the figgest exceedings of the critical values in Europe are to be expected in this area.

285. **Czech Republic**. The data on critical loads for sulphur and nitrogen in the territory of the Czech Republic have been provided to the UN/ECE Working Group on Effects as part of its activities in the framework of the Mapping Programme. The following critical loads have been calculated: critical loads of sulphur maximum $CL_{max}(S)$, critical loads of nitrogen minimum $CL_{min}(N)$, critical loads of nitrogen maximum $CL_{max}(N)$ and critical loads of nutrient nitrogen $CL_{nut}(N)$. The data on critical loads for the Czech Republic have been incorporated into European critical loads and exceedance maps or stock-at-risk maps. The data have been used for integrated assessment modelling and emission reduction scenarios for Europe have been developed. The new Protocol to the CLRTAP, the so-called multi-pollutant, multi-effect protocol, adopted in 1999, is based on the critical load data.

286. At present time critical loads of heavy metals such as Pb, Cd and Cu are being developed with use of a semi-dynamic approach. Adsorption and complexation processes are involved in the model used in the assessment of critical loads.

287. **Denmark**. Yes, Denmark has provided data on critical loads to the UNECE Working Group on Effects. The last official updating was in 1997.

288. **Finland**. The National Focal Centre for mapping critical loads, located at the Finnish Environment Institute, has provided data to the UN/ECE Coordination Centre for Effects (CCE). The last update, according to the request from the CCE, was in 1999 (see CCE Status Report 1999 for details). The Finnish critical loads data has also been used for the work of the Finnish Acidification Committee, which was appointed to prepare a programme to reduce emissions that cause acidification. Furthermore, the data has been used in the EU/LIFE-project 'Coupling of CORINAIR data to cost-effective emission reduction strategies (LIFE97/ENV/FIN/336).

289. **Germany**. Germany is Lead Country of the Task Force on Mapping Critical Levels and Loads. As such the National Focal Center (the Federal Environmental Agency) promoted the further development of methods and data bases needed for defining and mapping critical loads and levels. The German data have regularly been updated according to scientific knowledge and availability of input data. Germany submitted data on critical loads for acidification and eutrophication as a basis for the multi-pollutant protocol negotiations in 1998.

290. **Greece**. We have provided data on annual emissions from all anthropogenic sources for the period 1985-1998.

291. **Hungary.** Yes, the Hungarian NFC provides critical loads data of Nitrogen and Sulphur (50X50 km5 grid) to the Working Group on Effects as part of its Mapping Programme. The NFC plans to produce critical loads maps of finer resolution.

292. **Ireland**. Ireland has established a database on critical loads for acidity, sulphur and nitrogen and their exceedances. This is maintained by the Environmental Protection Agency. Ireland provides data to the UNECE Working Group on Effects as part of its estimation and mapping programme of critical loads for acidity, sulphur and nitrogen for various terrestrial receptors in Ireland according to international guidelines and methodologies. The Agency will continue to act as the National Focal Centre for mapping critical loads in Ireland and deal with any queries which arise from submissions already made to the Co-ordination Centre for Effects.

293. **Italy**. The National Focal Centre for mapping of critical loads and levels was constituted in 1995. It develops Italian maps of total acidity, maximum critical loads for sulphur, minimum critical loads for nitrogen, maximum critical loads for acidifying nitrogen, critical loads for nutrient nitrogen. All the data were submitted to the Co-ordination Centre for Effects and the contribution of Italy to mapping programme was reported into 1997 and 1999 status report of Co-ordination Centre for Effects.

294. **Latvia***. 1 LVS ISO 7934:1989

295. **Lithuania*.** Critical loads of nitrogen and sulphur compaunds have been mapped for Lithuanian ecosystems, using recently available calculation methods. The results of calculation showed that critical loads of nitrogen compounds lay in the range from 0,7 to 3,0 g/m^2 yr with the lowest values in western and south eastern parts of Lithuania. The range of critical loads of sulphur compaunds was found to be from 0.2 to 1.8 g/m^2 yr with the lowest values in southern and north eastern parts of Lithuania.

296. The mapping of critical loads and exceedances for nitrogen and sulphur have been conducted with the aim of defining the most sensitive terrestrial ecosystems and providing the decision making organizations with a quantitative information as the basis for assessing the strategies of emission reduction for nitrogen and sulphur oxides in Lithuania. The results of the assessment are presented in the report ″Assessment of influence of acid precipitation on national ecosystem (plants, soil and waters)″. It has been demonstrated that forest ecosystems are the most sensitive, while surface waters can tolerate comparatively high loads of acidifying compaunds. Therefore as a second step, the maps of critical loads of S and N for terrestrial ecosystems are developed. These maps have been compared with the monotoring data on annual deposition of S and N in Lithuania, and maps of the exceedances of critical loads have been generated.

297. **Netherlands**. The Netherlands sponsers the Coordination Center for Effects (CCE), which is the scientific center under the ICP on Mapping and Modelling. The CCE coordinates the mapping and development of methodologies for critical loads for whole Europe. The Netherlands has provided the CCE with national critical load data for acid deposition and nitrogen deposition whenever there has been official calls for data. Further, the Netherlands is presently working on updated national critical loads in relation to the evaluation of the emission targets and environmental quality objectives. Also the Netherlands is working on producing critical loads based on dynamic modelling and biodiversity.

298. **Norway**. Work on the establishment of national critical loads started in 1988 at the Norwegian Institute for Water Research (NIVA), established as a National Focal Centre in 1989. The first critical loads were estimated in 1991, and concerned surface waters only. Critical loads for soil were reported for the first time in 1993-94 and critical loads for vegetation in 1996. Through research projects financed by the Nordic Council of Ministers (NMR), NIVA has contributed substantially to the development of methods for the calculation of critical loads for sulphur and nitrogen internationally over the years. Norway has reported regularly critical loads to the Mapping Programme of the UN/ECE Working Group on Effects. The last submission took place in January 1999.

299. **Poland*.** Since 1990 Poland contributes to the Mapping Programme regularly submitting to the UN/ECE Working Group on Effects databases and maps of critical loads of acidity and since 1995 also critical loads of eutrophication. These maps were published in the consecutive status reports of the UN/ECE Co-ordination Centre for Effects. The last update of the Polish critical load maps was carried out in spring 2000.

300. **Russian Federation**. The Russian Federation has introduced no changes regarding the establishment of critical loads.

301. **Slovakia**. Critical loads for NO_x are not established yet in the Slovak Republic, and so far, there is not any programme for doing so.

302. **Spain**. See answer to question 2. According to the European Union legislation and strategies.

303. **Sweden**. Yes.

304. **Switzerland.** Information on critical loads determination in Switzerland are available from the CCE status reports and from special publications of the Swiss Agency for the Environment, Forests and Landscape (SAEFL).

305. **Ukraine**. Ukraine has not provided critical load data to the UN/ECE Working Group on Effects as part of its Mapping Programme.

306. **United Kingdom**. Progress made in establishing critical loads in the UK:

(a) Acidity critical loads (ie critical loads that take account of the acidifying effects of both sulphur and nitrogen) have been calculated for 6 ecosystems in the UK:Acid grassland,Calcareous grassland,Heathland,Coniferous woodland, Deciduous woodland, Freshwaters;

(b) Acidity critical loads data exist for the above terrestrial ecosystems for each 1km square of the UK where the ecosystem type occupies at least 5% of the square (as defined from the ITE Land Cover map and associated databases). For freshwaters, critical loads have been calculated for only 1475 sites throughout Great Britain (ie they are not available for all waters in the UK). The sites selected are mainly upland lakes or first-order streams with small catchment areas;

(c) In addition, critical loads for nutrient nitrogen have been calculated for all ecosystems except freshwaters. The freshwater sites selected for the calculation of acidity critical loads are not expected to be at risk from eutrophication, due to their upland nature (it tends to be phosphorous that is limiting in these systems, so nitrogen is unlikely to lead to eutrophication);

(d) National critical loads data were last submitted to the Coordination Centre on Effects (CCE) in the Netherlands in January 1998 for use by the Mapping Programme under the UNECE Working Group on Effects. The data submitted at this time have been used in the development of the Gothenburg Protocol adopted in December 1999;

(e) Nationally work is continuing to examine and evaluate the models used for the calculation of critical loads and the data inputs required. This may enable revised critical loads to be calculated in the future, should they be required for the further development of emission abatement strategies;

307. Further information on the derivation of critical loads for the UK, as used by the Mapping Programme, can be found in:Hall, J., Bull, K., Bradley, I., Curtis, C., Freer-Smith, P., Hornung, M., Howard, D., Langan, S., Loveland, P., Reynolds, B., Ullyett, J. & Warr, T. 1998. Status of UK Critical Loads and Exceedances, January 1998. Part 1 – Critical Loads and Critical Load Maps. Report prepared DETR/NERC Contract EPG1/3/116. Published October 1998. Also on the internet at: http://www.nmw.ac.uk/ite/monk/critical_loads/nclmp.html

Hall, J. 1999. UK National Focal Centre Report. In: Calculation and mapping of critical thresholds in Europe. Status Report 1999, Coordination Centre for Effects (Eds, M.Posch, P.A.M. de Smet, J.-P. Hettelingh & R.J.Downing) RIVM, Netherlands. pp 150-154.

308. **United States**. The United States is outside the geographic region of the Mapping Programme, and therefore, has not provided critical loads information to the Working Group on Effects. However, the United States has established critical levels for ozone, as well as nitrogen dioxide and particulate matter, in the form of National Ambient Air Quality Standards (NAAQS). Emission control programmes for nitrogen oxides are designed to achieve these critical levels, along with other environmental quality objectives.The NAAQS are developed to protect both

human health and environmental quality. Under the Clean Air Act, the NAAQS are required to be reviewed every 5 years and updated based on the latest scientific information. During this review process, the U.S. develops a comprehensive review of the latest information available concerning the ambient measurement, atmospheric chemistry and physics, exposure, human health effects, and environmental and material damage related to the pollutant under review. This comprehensive review, known as a Criteria Document, undergoes extensive scientific and public review and is available to the Working Group on Effects. The most recent Criteria Documents for ozone and particulate matter NAAQS were completed in 1996. The most recent Criteria Document for nitrogen dioxide NAAQS was completed in 1995. A new Criteria Document for particulate matter is expected to be completed by the end of 2000.