COMMISSION OF THE EUROPEAN COMMUNITIES

COM(94) 177 final
Brussels, 17.05.1994

Proposal for a

COUNCIL DECISION

ON THE SIGNING BY THE EUROPEAN COMMUNITY OF THE PROTOCOL TO THE 1979 CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION, ON FURTHER REDUCTION OF SULPHUR EMISSIONS

(presented by the Commission)

[redacted]

EXPLANATORY MEMORANDUM

1. The European Community and all the Member States are parties to the Convention on long-range transboundary air pollution (Geneva, 1979), drawn up by the UN Economic Commission for Europe.

   A first SO_2 protocol was proposed for signature by the contracting parties in 1985, providing for a 30% reduction in emissions by 1993 compared with 1980 levels. The European Community was not a party to this protocol, which expired at the end of 1993.

   A second protocol on sulphur emissions has now been drawn up and will be put to the contracting parties for signature in June 1994.

2. The European Community has long recognized the need to control and reduce sulphur emissions in order to protect public health and the environment against the harmful effects of such emissions, and in particular of acidification.

   To this end, the Community adopted the following legislation designed to reduce SO_2 emissions:

   - Directive 75/716/EEC on the approximation of the laws of the Member States relating to the sulphur content of certain liquid fuels,[1] as last amended by Directive 93/12/EEC;[2]

   - Directive 80/779/EEC on air quality limit values and guide values for sulphur dioxide and suspended particulates;[3]

   - Directive 84/360/EEC on the combating of air pollution from industrial plants;[4]

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1 OJ No L 307, 27.11.1975, p. 22.

2 OJ No L 74, 27.3.1993, p. 81

3 OJ No L 229, 30.8.1980, p. 30.

4 OJ No L 188, 16.7.1984, p. 20.

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- Directive 88/609/EEC on the limitation of emissions of certain pollutants into the air from large combustion plants;[5]
- Directive 89/369/EEC on the prevention of air pollution from new municipal waste incineration plants;[6]
- Directive 89/429/EEC on the reduction of air pollution from existing municipal waste incineration plants.[7]

3. On 15 November 1993 the Commission received a mandate from the Council to participate in the activities of the working party responsible for drawing up the protocol and to negotiate on behalf of the Community, in close consultation with the Member States.

4. In view of the responsibilities which the European Community already has in this area and the need to promote action to combat air pollution in a broader international context, the Commission believes that the Union should sign the new SO_2 protocol.

Accordingly, the Commission requests the Council to approve the signing of this protocol, and to appoint a representative to sign it.

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5 OJ No L 336, 7.12.1988, p. 1.

6 OJ No L 163, 14.6.1989, p. 32.

7 OJ No L 203, 15.7.1989, p. 50.

[redacted]

Council Decision of on the signing by the European Community of the Protocol to the 1979 Convention on long-range transboundary air pollution, on further reduction of sulphur emissions

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community

Having regard to the proposal from the Commission,

Whereas one of the objectives identified by the Treaty in the sphere of environmental policy is the promotion of measures at international level to deal with regional or worldwide environmental problems; whereas the Treaty calls for active cooperation by the European Community and the Member States in international measures to protect the environment;

Whereas the European Community is a contracting party to the Convention of the United Nations Economic Commission for Europe on long-range transboundary air pollution (Geneva, 1979),(1) to one of its protocols on the financing of EMEP(2) (Cooperative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe), and, since 17 December 1993, to the Protocol on the reduction of emissions of nitrogen oxides or their transboundary fluxes (NO_X Protocol)(3)

Whereas the Commission of the European Communities participated on the Community's behalf in the negotiations conducted within a working party set up under the auspices of the United Nations Economic Commission for Europe leading to a draft second protocol to the Convention on long-range transboundary air pollution, concerning the control of sulphur emissions;

Whereas the SO_2 protocol is to be opened for signature by the contracting parties to the Convention on long-range transboundary air pollution at the special session of the executive body for the Convention to be held in Oslo on 13 and 14 June 1994,

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(1) OJ n° L 171, 27.06.1981 p. 11
(2) OJ n° L 181, 04.07.1986 p. 1
(3) OJ n° L 149, 17.05.1993 p. 14

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HAS DECIDED AS FOLLOWS:

Article 1

The European Community shall sign the Second Protocol to the 1979 Convention on long-range transboundary air pollution, concerning the control of sulphur emissions.

Article 2

The President of the Council shall appoint a representative empowered to sign the protocol on behalf of the European Community.

Done at Brussels,

For the Council
The President

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Distr.
RESTRICTED

EB.AIR/R.84
11 March 1994

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

(Special session, Oslo, 13-14 June 1994)
Item 2 of the provisional agenda

DRAFT PROTOCOL
TO THE 1979 CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION
ON FURTHER REDUCTION OF SULPHUR EMISSIONS

GE.94-

The Parties,

Determined to implement the Convention on Long-range Transboundary Air Pollution,

Concerned that emissions of sulphur and other air pollutants continue to be transported across international boundaries and, in exposed parts of Europe and North America, are causing widespread damage to natural resources of vital environmental and economic importance, such as forests, soils and waters, and to materials, including historic monuments, and, under certain circumstances, have harmful effects on human health,

Resolved to take precautionary measures to anticipate, prevent or minimize emissions of air pollutants and mitigate their adverse effects,

Convinced that where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that such precautionary measures to deal with emissions of air pollutants should be cost-effective,

Mindful that measures to control emissions of sulphur and other air pollutants would also contribute to the protection of the sensitive Arctic environment,

Considering that the predominant sources of air pollution contributing to the acidification of the environment are the combustion of fossil fuels for energy production, and the main technological processes in various industrial sectors, as well as transport, which lead to emissions of sulphur, nitrogen oxides, and other pollutants,

Conscious of the need for a cost-effective regional approach to combating air pollution that takes account of the variations in effects and abatement costs between countries,

Desiring to take further and more effective action to control and reduce sulphur emissions,

Cognizant that any sulphur control policy, however cost-effective it may be at the regional level, will result in a relatively heavy economic burden on countries with economies that are in transition to a market economy,

Bearing in mind that measures taken to reduce sulphur emissions should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international competition and trade,

Taking into consideration existing scientific and technical data on emissions, atmospheric processes and effects on the environment of sulphur oxides, as well as on abatement costs,

Aware that, in addition to emissions of sulphur, emissions of nitrogen oxides and of ammonia are also causing acidification of the environment,

Noting that under the United Nations Framework Convention on Climate

Change, adopted in New York on 9 May 1992, there is agreement to establish national policies and take corresponding measures to combat climate change, which can be expected to lead to reductions of sulphur emissions,

Affirming the need to ensure environmentally sound and sustainable development,

Recognizing the need to continue scientific and technical cooperation to elaborate further the approach based on critical loads and critical levels, including efforts to assess several air pollutants and various effects on the environment, materials and human health,

Underlining that scientific and technical knowledge is developing and that it will be necessary to take such developments into account when reviewing the adequacy of the obligations entered into under the present Protocol and deciding on further action,

Acknowledging the Protocol on the Reduction of Sulphur Emissions or Their Transboundary Fluxes by at least 30 per cent, adopted in Helsinki on 8 July 1985, and the measures already taken by many countries which have had the effect of reducing sulphur emissions,

Have agreed as follows:

Article 1

DEFINITIONS

For the purposes of the present Protocol,

1. "Convention" means the Convention on Long-range Transboundary Air Pollution, adopted in Geneva on 13 November 1979;

2. "EMEP" means the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe;

3. "Executive Body" means the Executive Body for the Convention constituted under article 10, paragraph 1, of the Convention;

4. "Commission" means the United Nations Economic Commission for Europe;

5. "Parties" means, unless the context otherwise requires, the Parties to the present Protocol;

6. "Geographical scope of EMEP" means the area defined in article 1, paragraph 4, of the Protocol to the 1979 Convention on Long-range Transboundary Air Pollution on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP), adopted in Geneva on 28 September 1984;

7. "SOMA" means a sulphur oxides management area designated in annex III under the conditions laid down in article 2, paragraph 3;

8. "Critical load" means a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur, according to present knowledge;

9. "Critical levels" means the concentration of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur, according to present knowledge;

10. "Critical sulphur deposition" means a quantitative estimate of the exposure to oxidized sulphur compounds, taking into account the effects of base cation uptake and base cation deposition, below which significant harmful effects on specified sensitive elements of the environment do not occur, according to present knowledge;

11. "Emission" means the discharge of substances into the atmosphere;

12. "Sulphur emissions" means all emissions of sulphur compounds expressed as kilotonnes of sulphur dioxide (kt SO_2) to the atmosphere originating from anthropogenic sources excluding from ships in international traffic outside territorial waters;

13. "Fuel" means any solid, liquid or gaseous combustible material with the exception of domestic refuse and toxic or dangerous waste;

14. "Stationary combustion source" means any technical apparatus or group of technical apparatus that is co-located on a common site and is or could be discharging waste gases through a common stack, in which fuels are oxidized in order to use the heat generated;

15. "Major new stationary combustion source" means any stationary combustion source the construction or substantial modification of which is authorized after 31 December 1995 and the thermal input of which, when operating at rated capacity, is at least 50 MW_{th}. It is a matter for the competent national authorities to decide whether a modification is substantial or not, taking into account such factors as the environmental benefits of the modification;

16. "Major existing stationary combustion source" means any existing stationary combustion source the thermal input of which, when operating at rated capacity, is at least 50 MW_{th};

17. "Gas oil" means any petroleum product within HS 2710, or any petroleum product which, by reason of its distillation limits, falls within the category of middle distillates intended for use as fuel and of which at least 85% by volume, including distillation losses, distils at 350° C;

18. "Emission limit value" means the permissible concentration of sulphur compounds expressed as sulphur dioxide in the waste gases from a stationary combustion source expressed in terms of mass per volume of the waste gases expressed in mg SO_2/Nm^3, assuming an oxygen content by volume in the waste gas of 3% in the case of liquid and gaseous fuels and 6% in the case of solid fuels;

19. "Emission limitation" means the permissible total quantity of sulphur

compounds expressed as sulphur dioxide discharged from a combustion source or group of combustion sources located either on a common site or within a defined geographical area, expressed in kilotonnes per year;

20. "Desulphurization rate" means the ratio of the quantity of sulphur which is separated at the combustion source site over a given period to the quantity of sulphur contained in the fuel which is introduced into the combustion source facilities and which is used over the same period;

21. "Sulphur budget" means a matrix of calculated contributions to the deposition of oxidized sulphur compounds in receiving areas, originating from the emissions from specified areas.

Article 2

BASIC OBLIGATIONS

1. The Parties shall control and reduce their sulphur emissions in order to protect human health and the environment from adverse effects, in particular acidifying effects, and to ensure, as far as possible, without entailing excessive costs, that depositions of oxidized sulphur compounds in the long term do not exceed critical loads for sulphur given, in annex I, as critical sulphur depositions, in accordance with present scientific knowledge.

2. As a first step, the Parties shall, as a minimum, reduce and maintain their annual sulphur emissions in accordance with the timing and levels specified in annex II.

3. In addition, any Party:

(a) Whose total land area is greater than 2 million square kilometres;

(b) Which has committed itself under paragraph 2 above to a national sulphur emission ceiling no greater than the lesser of its 1990 emissions or its obligation in the 1985 Helsinki Protocol on the Reduction of Sulphur Emissions or Their Transboundary Fluxes by at least 30 per cent, as indicated in annex II;

(c) Whose annual sulphur emissions that contribute to acidification in areas under the jurisdiction of one or more other Parties originate only from within areas under its jurisdiction that are listed as SOMAs in annex III, and has presented documentation to this effect; and

(d) Which has specified upon signature of, or accession to, the present Protocol its intention to act in accordance with this paragraph,

shall, as a minimum, reduce and maintain its annual sulphur emissions in the area so listed in accordance with the timing and levels specified in annex II.

4. Furthermore, the Parties shall make use of the most effective measures for the reduction of sulphur emissions, appropriate in their particular circumstances, for new and existing sources, which include, inter alia:

- Measures to increase energy efficiency;

- Measures to increase the use of renewable energy;

- Measures to reduce the sulphur content of particular fuels and to encourage the use of fuel with a low sulphur content, including the combined use of high-sulphur with low-sulphur or sulphur-free fuel;

- Measures to apply best available control technologies not entailing excessive cost,

using the guidance in annex IV.

5. Each Party, except those Parties subject to the United States/Canada Air Quality Agreement of 1991, shall as a minimum:

(a) Apply emission limit values at least as stringent as those specified in annex V to all major new stationary combustion sources;

(b) No later than 1 July 2004 apply, as far as possible without entailing excessive costs, emission limit values at least as stringent as those specified in annex V to those major existing stationary combustion sources the thermal input of which is above 500 MW_{th} taking into account the remaining lifetime of a plant, calculated from the date of entry into force of the present Protocol, or apply equivalent emission limitations or other appropriate provisions, provided that these achieve the sulphur emission ceilings specified in annex II and, subsequently, further approach the critical loads as given in annex I; and no later than 1 July 2004 apply emission limit values or emission limitations to those major existing stationary combustion sources the thermal input of which is between 50 and 500 MW_{th} using annex V as guidance;

(c) No later than two years after the date of entry into force of the present Protocol apply national standards for the sulphur content of gas oil at least as stringent as those specified in annex V. In cases where the supply of gas oil cannot otherwise be ensured, a State may extend the time period given in this subparagraph to a period of up to ten years. In this case it shall specify, in a declaration to be deposited together with the instrument of ratification, acceptance, approval or accession, its intention to extend the time period.

6. The Parties may, in addition, apply economic instruments to encourage the adoption of cost-effective approaches to the reduction of sulphur emissions.

7. The Parties to this Protocol may, at a session of the Executive Body, in accordance with rules and conditions which the Executive Body shall elaborate and adopt, decide whether two or more Parties may jointly implement the obligations set out in annex II. These rules and conditions shall ensure the fulfilment of the obligations set out in paragraph 2 above and also promote the achievement of the environmental objectives set out in paragraph 1 above.

8. The Parties shall, subject to the outcome of the first review provided for under article 8 and no later than one year after the completion of that review, commence negotiations on further obligations to reduce emissions.

Article 3

EXCHANGE OF TECHNOLOGY

1. The Parties shall, consistent with their national laws, regulations and practices, facilitate the exchange of technologies and techniques, including those that increase energy efficiency, the use of renewable energy and the processing of low-sulphur fuels, to reduce sulphur emissions, particularly through the promotion of:

(a) The commercial exchange of available technology;

(b) Direct industrial contacts and cooperation, including joint ventures;

(c) The exchange of information and experience;

(d) The provision of technical assistance.

2. In promoting the activities specified in paragraph 1 above, the Parties shall create favourable conditions by facilitating contacts and cooperation among appropriate organizations and individuals in the private and public sectors that are capable of providing technology, design and engineering services, equipment or finance.

3. The Parties shall, no later than six months after the date of entry into force of the present Protocol, commence consideration of procedures to create more favourable conditions for the exchange of technology to reduce sulphur emissions.

Article 4

NATIONAL STRATEGIES, POLICIES, PROGRAMMES, MEASURES AND INFORMATION

1. Each Party shall, in order to implement its obligations under article 2:

(a) Adopt national strategies, policies and programmes, no later than six months after the present Protocol enters into force for it; and

(b) Take and apply national measures

to control and reduce its sulphur emissions.

2. Each Party shall collect and maintain information on:

(a) Actual levels of sulphur emissions, and of ambient concentrations and depositions of oxidized sulphur and other acidifying compounds, taking into account, for those Parties within the geographical scope of EMEP, the work plan of EMEP; and

(b) The effects of depositions of oxidized sulphur and other acidifying compounds.

Article 5

REPORTING

1. Each Party shall report, through the Executive Secretary of the Commission, to the Executive Body, on a periodic basis as determined by the Executive Body, information on:

(a) The implementation of national strategies, policies, programmes and measures referred to in article 4, paragraph 1;

(b) The levels of national annual sulphur emissions, in accordance with guidelines adopted by the Executive Body, containing emission data for all relevant source categories; and

(c) The implementation of other obligations that it has entered into under the present Protocol,

in conformity with a decision regarding format and content to be adopted by the Parties at a session of the Executive Body. The terms of this decision shall be reviewed as necessary to identify any additional elements regarding the format and/or content of the information that are to be included in the reports.

2. Each Party within the geographical scope of EMEP shall report, through the Executive Secretary of the Commission, to EMEP, on a periodic basis to be determined by the Steering Body of EMEP and approved by the Parties at a session of the Executive Body, information on the levels of sulphur emissions with temporal and spatial resolution as specified by the Steering Body of EMEP.

3. In good time before each annual session of the Executive Body, EMEP shall provide information on:

(a) Ambient concentrations and deposition of oxidized sulphur compounds; and

(b) Calculations of sulphur budgets.

Parties in areas outside the geographical scope of EMEP shall make available similar information if requested to do so by the Executive Body.

4. The Executive Body shall, in accordance with article 10, paragraph 2 (b), of the Convention, arrange for the preparation of information on the effects of depositions of oxidized sulphur and other acidifying compounds.

5. The Parties shall, at sessions of the Executive Body, arrange for the preparation, at regular intervals, of revised information on calculated and internationally optimized allocations of emission reductions for the States within the geographical scope of EMEP, with integrated assessment models, with a view to reducing further, for the purposes of article 2, paragraph 1, of the present Protocol, the difference between actual depositions of oxidized sulphur compounds and critical load values.

Article 6

RESEARCH, DEVELOPMENT AND MONITORING

The Parties shall encourage research, development, monitoring and cooperation related to:

(a) The international harmonization of methods for the establishment of critical loads and critical levels and the elaboration of procedures for such harmonization;

(b) The improvement of monitoring techniques and systems and of the modelling of transport, concentrations and deposition of sulphur compounds;

(c) Strategies for the further reduction of sulphur emissions based on critical loads and critical levels as well as on technical developments, and the improvement of integrated assessment modelling to calculate internationally optimized allocations of emission reductions taking into account an equitable distribution of abatement costs;

(d) The understanding of the wider effects of sulphur emissions on human health, the environment, in particular acidification, and materials, including historic and cultural monuments, taking into account the relationship between sulphur oxides, nitrogen oxides, ammonia, volatile organic compounds and tropospheric ozone;

(e) Emission abatement technologies, and technologies and techniques to enhance energy efficiency, energy conservation and the use of renewable energy;

(f) The economic evaluation of benefits for the environment and human health resulting from the reduction of sulphur emissions.

Article 7

COMPLIANCE

1. An Implementation Committee is hereby established to review the implementation of the present Protocol and compliance by the Parties with their obligations. It shall report to the Parties at sessions of the Executive Body and may make such recommendations to them as it considers appropriate.

2. Upon consideration of a report, and any recommendations, of the Implementation Committee, the Parties, taking into account the circumstances of a matter and in accordance with Convention practice, may decide upon and call for action to bring about full compliance with the present Protocol, including measures to assist a Party's compliance with the Protocol, and to further the objectives of the Protocol.

3. The Parties shall, at the first session of the Executive Body after the entry into force of the present Protocol, adopt a decision that sets out the structure and functions of the Implementation Committee as well as procedures for its review of compliance.

4. The application of the compliance procedure shall be without prejudice to the provisions of article 9 of the present Protocol.

Article 8

REVIEWS BY THE PARTIES AT SESSIONS OF THE EXECUTIVE BODY

1. The Parties shall, at sessions of the Executive Body, pursuant to article 10, paragraph 2 (a), of the Convention, review the information supplied by the Parties and EMEP, the data on the effects of depositions of sulphur and other acidifying compounds and the reports of the Implementation Committee referred to in article 7, paragraph 1, of the present Protocol.

2. (a) The Parties shall, at sessions of the Executive Body, keep under review the obligations set out in the present Protocol, including:

(i) Their obligations in relation to their calculated and internationally optimized allocations of emission reductions referred to in article 5, paragraph 5; and

(ii) The adequacy of the obligations and the progress made towards the achievement of the objectives of the present Protocol;

(b) Reviews shall take into account the best available scientific information on acidification, including assessments of critical loads, technological developments, changing economic conditions and the fulfilment of the obligations on emission levels;

(c) In the context of such reviews, any Party whose obligations on sulphur emission ceilings under annex II hereto do not conform to the calculated and internationally optimized allocations of emission reductions for that Party, required to reduce the difference between depositions of sulphur in 1990 and critical sulphur depositions within the geographical scope of EMEP by at least 60%, shall make every effort to undertake revised obligations;

(d) The procedures, methods and timing for such reviews shall be specified by the Parties at a session of the Executive Body. The first such review shall be completed in 1997.

Article 9

SETTLEMENT OF DISPUTES

1. In the event of a dispute between any two or more Parties concerning the interpretation or application of the present Protocol, the Parties concerned shall seek a settlement of the dispute through negotiation or any other peaceful means of their own choice. The parties to the dispute shall inform the Executive Body of their dispute.

2. When ratifying, accepting, approving or acceding to the present Protocol, or at any time thereafter, a Party which is not a regional economic integration organization may declare in a written instrument submitted to the Depositary that, in respect of any dispute concerning the interpretation or application of

the Protocol, it recognizes one or both of the following means of dispute settlement as compulsory ipso facto and without agreement, in relation to any Party accepting the same obligation:

(a) Submission of the dispute to the International Court of Justice;

(b) Arbitration in accordance with procedures to be adopted by the Parties at a session of the Executive Body as soon as practicable, in an annex on arbitration.

A Party which is a regional economic integration organization may make a declaration with like effect in relation to arbitration in accordance with the procedures referred to in subparagraph (b) above.

3. A declaration made under paragraph 2 above shall remain in force until it expires in accordance with its terms or until three months after written notice of its revocation has been deposited with the Depositary.

4. A new declaration, a notice of revocation or the expiry of a declaration shall not in any way affect proceedings pending before the International Court of Justice or the arbitral tribunal, unless the parties to the dispute agree otherwise.

5. Except in a case where the parties to a dispute have accepted the same means of dispute settlement under paragraph 2, if after twelve months following notification by one Party to another that a dispute exists between them, the Parties concerned have not been able to settle their dispute through the means mentioned in paragraph 1 above, the dispute shall be submitted, at the request of any of the parties to the dispute, to conciliation.

6. For the purpose of paragraph 5, a conciliation commission shall be created. The commission shall be composed of an equal number of members appointed by each party concerned or, where parties in conciliation share the same interest, by the group sharing that interest, and a chairman chosen jointly by the members so appointed. The commission shall render a recommendatory award, which the parties shall consider in good faith.

Article 10

ANNEXES

The annexes to the present Protocol shall form an integral part of the Protocol. Annexes I and IV are recommendatory in character.

Article 11

AMENDMENTS AND ADJUSTMENTS

1. Any Party may propose amendments to the present Protocol. Any Party to the Convention may propose an adjustment to annex II to the present Protocol to add to it its name, together with emission levels, sulphur emission ceilings and percentage emission reductions.

2. Such proposed amendments and adjustments shall be submitted in writing to the Executive Secretary of the Commission, who shall communicate them to all Parties. The Parties shall discuss the proposed amendments and adjustments at the next session of the Executive Body, provided that those proposals have been circulated by the Executive Secretary to the Parties at least ninety days in advance.

3. Amendments to the present Protocol and to its annexes II, III and V shall be adopted by consensus of the Parties present at a session of the Executive Body, and shall enter into force for the Parties which have accepted them on the ninetieth day after the date on which two thirds of the Parties have deposited with the Depositary their instruments of acceptance thereof. Amendments shall enter into force for any other Party on the ninetieth day after the date on which that Party has deposited its instrument of acceptance thereof.

4. Amendments to the annexes to the present Protocol, other than to the annexes referred to in paragraph 3 above, shall be adopted by consensus of the Parties present at a session of the Executive Body. On the expiry of ninety days from the date of its communication by the Executive Secretary of the Commission, an amendment to any such annex shall become effective for those Parties which have not submitted to the Depositary a notification in accordance with the provisions of paragraph 5 below, provided that at least sixteen Parties have not submitted such a notification.

5. Any Party that is unable to approve an amendment to an annex, other than to an annex referred to in paragraph 3 above, shall so notify the Depositary in writing within ninety days from the date of the communication of its adoption. The Depositary shall without delay notify all Parties of any such notification received. A Party may at any time substitute an acceptance for its previous notification and, upon deposit of an instrument of acceptance with the Depositary, the amendment to such an annex shall become effective for that Party.

6. Adjustments to annex II shall be adopted by consensus of the Parties present at a session of the Executive Body and shall become effective for all Parties to the present Protocol on the ninetieth day following the date on which the Executive Secretary of the Commission notifies those Parties in writing of the adoption of the adjustment.

Article 12

SIGNATURE

1. The present Protocol shall be open for signature at Oslo from 13 June 1994 until 14 June 1994 inclusive, then at United Nations Headquarters in New York until 12 December 1994 by States members of the Commission as well as States having consultative status with the Commission, pursuant to paragraph 8 of Economic and Social Council resolution 36 (IV) of 28 March 1947, and by regional economic integration organizations, constituted by sovereign States members of the Commission, which have competence in respect of the negotiation, conclusion and application of international agreements in matters covered by the Protocol, provided that the States and organizations concerned are Parties

to the Convention and are listed in annex II.

2. In matters within their competence, such regional economic integration organizations shall, on their own behalf, exercise the rights and fulfil the responsibilities which the present Protocol attributes to their member States. In such cases, the member States of these organizations shall not be entitled to exercise such rights individually.

Article 13

RATIFICATION, ACCEPTANCE, APPROVAL AND ACCESSION

1. The present Protocol shall be subject to ratification, acceptance or approval by Signatories.

2. The present Protocol shall be open for accession as from 12 December 1994 by the States and organizations that meet the requirements of article 12, paragraph 1.

Article 14

DEPOSITARY

The instruments of ratification, acceptance, approval or accession shall be deposited with the Secretary-General of the United Nations, who will perform the functions of Depositary.

Article 15

ENTRY INTO FORCE

1. The present Protocol shall enter into force on the ninetieth day following the date on which the sixteenth instrument of ratification, acceptance, approval or accession has been deposited with the Depositary.

2. For each State and organization referred to in article 12, paragraph 1, which ratifies, accepts or approves the present Protocol or accedes thereto after the deposit of the sixteenth instrument of ratification, acceptance, approval or accession, the Protocol shall enter into force on the ninetieth day following the date of deposit by such Party of its instrument of ratification, acceptance, approval or accession.

Article 16

WITHDRAWAL

At any time after five years from the date on which the present Protocol has come into force with respect to a Party, that Party may withdraw from it by giving written notification to the Depositary. Any such withdrawal shall take effect on the ninetieth day following the date of its receipt by the Depositary, or on such later date as may be specified in the notification of the withdrawal.

Article 17

AUTHENTIC TEXTS

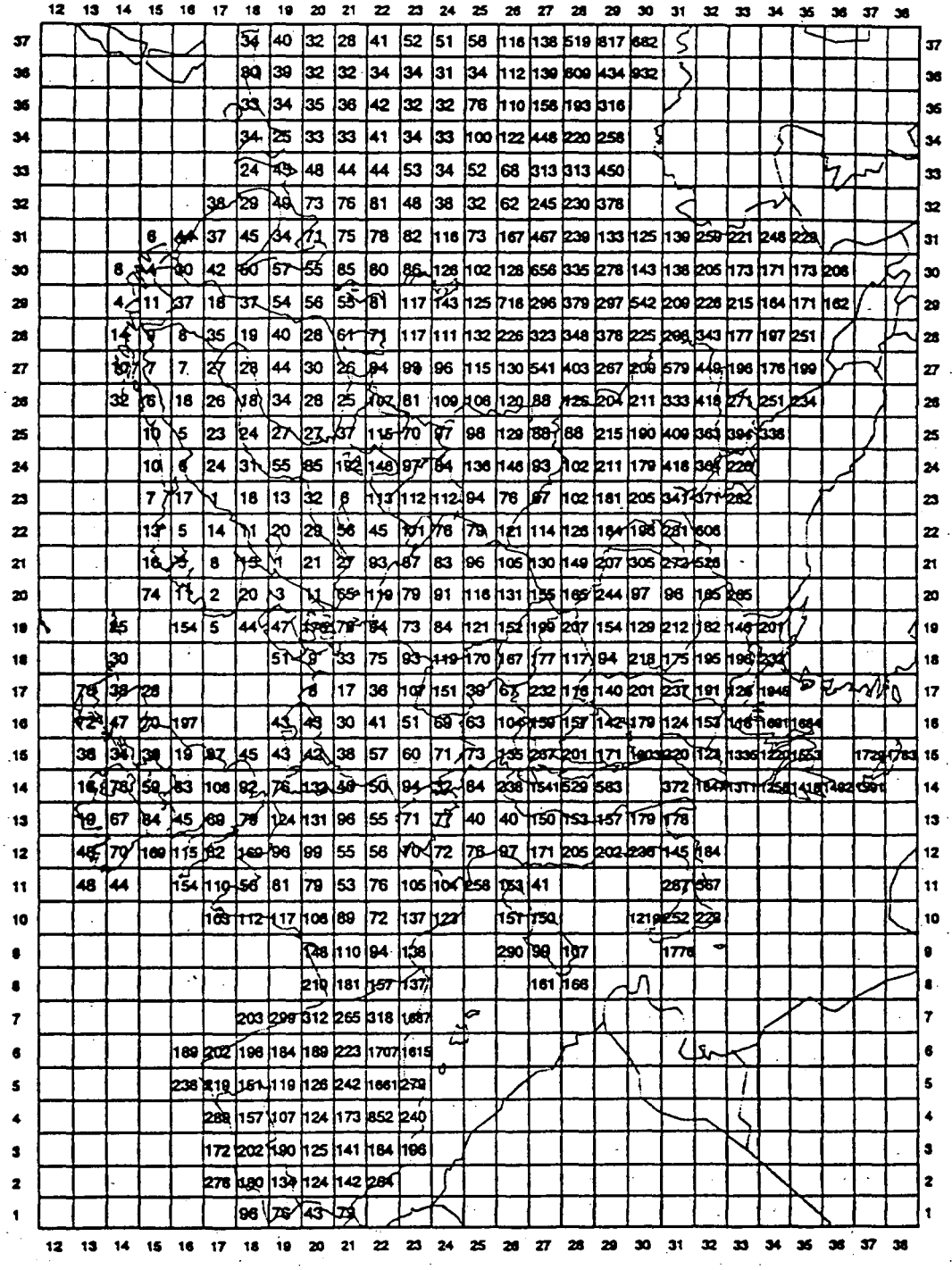
The original of the present Protocol, of which the English, French and Russian texts are equally authentic, shall be deposited with the Secretary-General of the United Nations.

IN WITNESS WHEREOF the undersigned, being duly authorized thereto, have signed the present Protocol.

DONE at Oslo, this thirteenth day of June one thousand nine hundred and ninety-four.

Annex I

CRITICAL SULPHUR DEPOSITION
(5-percentile in centigrams of sulphur per square metre per year)



Annex II

SULPHUR EMISSION CEILINGS AND PERCENTAGE EMISSION REDUCTIONS

The sulphur emission ceilings listed in the table below give the obligations referred to in paragraphs 2 and 3 of article 2 of the present Protocol. The 1980 and 1990 emission levels and the percentage emission reductions listed are given for information purposes only.

	Emission levels kt SO_2 per year		Sulphur emission ceilings[a] kt SO_2 per year			Percentage emission reductions (base year 1980[b])		
	1980	1990	2000	2005	2010	2000	2005	2010
Austria	397	90	78			80		
Belarus	740		456	400	370	38	46	50
Belgium	828	443	248	232	215	70	72	74
Bulgaria	2050	2020	1374	1230	1127	33	40	45
Canada - national	4614	3700	3200			30		
- SOMA	3245		1750			46		
Croatia	150	160	133	125	117	11	17	22
Czech Republic	2257	1876	1128	902	632	50	60	72
Denmark	451	180	90			80		
Finland	584	260	116			80		
France	3348	1202	868	770	737	74	77	78
Germany	7494	5803	1300	990		83	87	
Greece	400	510	595	580	570	0	3	4
Hungary	1632	1010	898	816	653	45	50	60
Ireland	222	168	155			30		
Italy	3800		1330	1042		65	73	
Liechtenstein	0.4	0.1	0.1			75		
Luxembourg	24		10			58		
Netherlands	466	207	106			77		
Norway	142	54	34			76		
Poland	4100	3210	2583	2173	1397	37	47	66
Portugal	266	284	304	294		0	3	
Russian Federation[c]	7161	4460	4440	4297	4297	38	40	40
Slovakia	843	539	337	295	240	60	65	72
Slovenia	235	195	130	94	71	45	60	70
Spain	3319	2316	2143			35		
Sweden	507	130	100			80		
Switzerland	126	62	60			52		
Ukraine	3850		2310	2118	1696	40	45	56
United Kingdom	4898	3780	2449	1470	980	50	70	80
European Community	25513		9598			62		

Notes

a/ If, in a given year before 2005, a Party finds that, due to a particularly cold winter, a particularly dry summer and an unforeseen short-term loss of capacity in the power supply system, domestically or in a neighbouring country, it cannot comply with its obligations under this annex, it may fulfil those obligations by averaging its national annual sulphur

emissions for the year in question, the year preceding that year and the year following it, provided that the emission level in any single year is not more than 20% above the sulphur emission ceiling.

The reason for exceedance in any given year and the method by which the three-year average figure will be achieved, shall be reported to the Implementation Committee.

b/ For Greece and Portugal percentage emission reductions given are based on the sulphur emission ceilings indicated for the year 2000.

c/ European part within the EMEP area.

Annex III

DESIGNATION OF SULPHUR OXIDES MANAGEMENT AREAS (SOMAs)

The following SOMA is listed for the purposes of the present Protocol:

South-east Canada SOMA

This is an area of 1 million km^2 which includes all the territory of the provinces of Prince Edward Island, Nova Scotia and New Brunswick, all the territory of the province of Quebec south of a straight line between Havre-St.Pierre on the north coast of the Gulf of Saint Lawrence and the point where the Quebec-Ontario boundary intersects the James Bay coastline, and all the territory of the province of Ontario south of a straight line between the point where the Ontario-Quebec boundary intersects the James Bay coastline and Nipigon River near the north shore of Lake Superior.

Annex IV

CONTROL TECHNOLOGIES FOR SULPHUR EMISSIONS FROM STATIONARY SOURCES

I. INTRODUCTION

1. The aim of this annex is to provide guidance for identifying sulphur control options and technologies for giving effect to the obligations of the present Protocol.

2. The annex is based on information on general options for the reduction of sulphur emissions and in particular on emission control technology performance and costs contained in official documentation of the Executive Body and its subsidiary bodies.

3. Unless otherwise indicated, the reduction measures listed are considered, on the basis of operational experience of several years in most cases, to be the most well-established and economically feasible best available technologies. However, the continuously expanding experience of low-emission measures and technologies at new plants as well as of the retrofitting of existing plants will necessitate regular review of this annex.

4. Although the annex lists a number of measures and technologies spanning a wide range of costs and efficiencies, it cannot be considered as an exhaustive statement of control options. Moreover, the choice of control measures and technologies for any particular case will depend on a number of factors, including current legislation and regulatory provisions and, in particular, control technology requirements, primary energy patterns, industrial infrastructure, economic circumstances and specific in-plant conditions.

5. The annex mainly addresses the control of oxidized sulphur emissions considered as the sum of sulphur dioxide (SO_2) and sulphur trioxide (SO_3), expressed as SO_2. The share of sulphur emitted as either sulphur oxides or other sulphur compounds from non-combustion processes and other sources is small compared to sulphur emissions from combustion.

6. When measures or technologies are planned for sulphur sources emitting other components, in particular nitrogen oxides (NO_x), particulates, heavy metals and volatile organic compounds (VOCs), it is worthwhile to consider them in conjunction with pollutant-specific control options in order to maximize the overall abatement effect and minimize the impact on the environment and, especially, to avoid the transfer of air pollution problems to other media (such as waste water and solid waste).

II. MAJOR STATIONARY SOURCES FOR SULPHUR EMISSIONS

7. Fossil fuel combustion processes are the main source of anthropogenic sulphur emissions from stationary sources. In addition, some non-combustion processes may contribute considerably to the emissions. The major stationary source categories, based on EMEP/CORINAIR'90, include:

(i) Public power, cogeneration and district heating plants:

(a) Boilers;

(b) Stationary combustion turbines and internal combustion engines;

(ii) Commercial, institutional and residential combustion plants:

(a) Commercial boilers;

(b) Domestic heaters;

(iii) Industrial combustion plants and processes with combustion:

(a) Boilers and process heaters;

(b) Processes, e.g. metallurgical operations such as roasting and sintering, coke oven plants, processing of titanium dioxide (TiO_2), etc.;

(c) Pulp production;

(iv) Non-combustion processes, e.g. sulphuric acid production, specific organic synthesis processes, treatment of metallic surfaces;

(v) Extraction, processing and distribution of fossil fuels;

(vi) Waste treatment and disposal, e.g. thermal treatment of municipal and industrial waste.

8. Overall data (1990) for the ECE region indicate that about 88% of total sulphur emissions originate from all combustion processes (20% from industrial combustion), 5% from production processes and 7% from oil refineries. The power plant sector in many countries is the major single contributor to sulphur emissions. In some countries, the industrial sector (including refineries) is also an important SO_2 emitter. Although emissions from refineries in the ECE region are relatively small, their impact on sulphur emissions from other sources is large due to the sulphur in the oil products. Typically 60% of the sulphur intake present in the crudes remains in the products, 30% is recovered as elemental sulphur and 10% is emitted from refinery stacks.

III. GENERAL OPTIONS FOR REDUCTION OF SULPHUR EMISSIONS FROM COMBUSTION

9. General options for reduction of sulphur emissions are:

(i) Energy management measures: */

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*/ Options (i) (a) and (b) are integrated in the energy structure and policy of a Party. Implementation status, efficiency and costs per sector are not considered here.

(a) Energy saving

The rational use of energy (improved energy efficiency/process operation, cogeneration and/or demand-side management) usually results in a reduction in sulphur emissions.

(b) Energy mix

In general, sulphur emissions can be reduced by increasing the proportion of non-combustion energy sources (i.e. hydro, nuclear, wind, etc.) to the energy mix. However, further environmental impacts have to be considered.

(ii) Technological options:

(a) Fuel switching

The SO_2 emissions during combustion are directly related to the sulphur content of the fuel used.

Fuel switching (e.g. from high- to low-sulphur coals and/or liquid fuels, or from coal to gas) leads to lower sulphur emissions, but there may be certain restrictions, such as the availability of low-sulphur fuels and the adaptability of existing combustion systems to different fuels. In many ECE countries, some coal or oil combustion plants are being replaced by gas-fired combustion plants. Dual-fuel plants may facilitate fuel switching.

(b) Fuel cleaning

Cleaning of natural gas is state-of-the-art technology and widely applied for operational reasons.

Cleaning of process gas (acid refinery gas, coke oven gas, biogas, etc.) is also state-of-the-art technology.

Desulphurization of liquid fuels (light and middle fractions) is state-of-the-art technology.

Desulphurization of heavy fractions is technically feasible; nevertheless, the crude properties should be kept in mind. Desulphurization of atmospheric residue (bottom products from atmospheric crude distillation units) for the production of low-sulphur fuel oil is not, however, commonly practised; processing low-sulphur crude is usually preferable. Hydro-cracking and full conversion technology have matured and combine high sulphur retention with improved yield of light products. The number of full conversion refineries is as yet limited. Such refineries typically recover 80 to 90% of the sulphur intake and convert all residues into light products or other marketable products. For this type of refinery, energy consumption and investment costs are increased. Typical sulphur content for refinery products is given in table 1 below.

Table 1

Sulphur content from refinery products
(S content (%))

	Typical present values	Anticipated future values
Gasoline	0.1	0.05
Jet kerosene	0.1	0.01
Diesel	0.05 - 0.3	< 0.05
Heating oil	0.1 - 0.2	< 0.1
Fuel oil	0.2 - 3.5	< 1
Marine diesel	0.5 - 1.0	< 0.5
Bunker oil	3.0 - 5.0	< 1 (coastal areas) < 2 (high seas)

Current technologies to clean hard coal can remove approximately 50% of the inorganic sulphur (depending on coal properties) but none of the organic sulphur. More effective technologies are being developed which, however, involve higher specific investment and costs. Thus the efficiency of sulphur removal by coal cleaning is limited compared to flue gas desulphurization. There may be a country-specific optimization potential for the best combination of fuel cleaning and flue gas cleaning.

(c) Advanced combustion technologies

These combustion technologies with improved thermal efficiency and reduced sulphur emissions include: fluidized-bed combustion (FBC): bubbling (BFBC), circulating (CFBC) and pressurized (PFBC); integrated gasification combined-cycle (IGCC); and combined-cycle gas turbines (CCGT).

Stationary combustion turbines can be integrated into combustion systems in existing conventional power plants which can increase overall efficiency by 5 to 7%, leading, for example, to a significant reduction in SO_2 emissions. However, major alterations to the existing furnace system become necessary.

Fluidized-bed combustion is a combustion technology for burning hard coal and brown coal, but it can also burn other solid fuels such as petroleum coke and low-grade fuels such as waste, peat and wood. Emissions can additionally be reduced by integrated combustion control in the system due to the addition of lime/limestone to the bed material. The total installed capacity of FBC has reached approximately 30,000 MW_{th} (250 to 350 plants), including 8,000 MW_{th} in the capacity range of greater than 50 MW_{th}. By-products from this process may cause problems with respect to use and/or disposal, and further development is required.

The IGCC process includes coal gasification and combined-cycle power generation in a gas and steam turbine. The gasified coal is burnt in the

combustion chamber of the gas turbine. Sulphur emission control is achieved by the use of state-of-the-art technology for raw gas cleaning facilities upstream of the gas turbine. The technology also exists for heavy oil residues and bitumen emulsions. The installed capacity is presently about 1,000 MW_{el} (5 plants).

Combined-cycle gas-turbine power stations using natural gas as fuel with an energy efficiency of approximately 48 to 52% are currently being planned.

(d) Process and combustion modifications

Combustion modifications comparable to the measures used for NO_x emission control do not exist, as during combustion the organically and/or inorganically bound sulphur is almost completely oxidized (a certain percentage depending on the fuel properties and combustion technology is retained in the ash).

In this annex dry additive processes for conventional boilers are considered as process modifications due to the injection of an agent into the combustion unit. However, experience has shown that, when applying these processes, thermal capacity is lowered, the Ca/S ratio is high and sulphur removal low. Problems with the further utilization of the by-product have to be considered, so that this solution should usually be applied as an intermediate measure and for smaller units (table 2).

Table 2

Emissions of sulphur oxides obtained from the application of technological options to fossil-fuelled boilers

	Uncontrolled emissions		Additive injection		Wet scrubbing a/		Spray dry absorption b/	
Reduction efficiency (%)			up to 60		95		up to 90	
Energy efficiency ($kW_{el}/10^3$ m^3/h)			0.1 - 1		6 - 10		3 - 6	
Total installed capacity (ECE Eur) (MW_{th})					194,000		16,000	
Type of by-product			Mix of Ca salts and fly ashes		Gypsum (sludge/ waste water)		Mix of $CaSo_3 * 1/2 H_2O$ and fly ashes	
Specific investment (cost ECU(1990)/kW_{el})			20 - 50		60 - 250		50 - 220	
	mg/m^3 c/	g/kWh_{el}	mg/m^3 c/	g/kWh_{el}	mg/m^3 c/	g/kWh_{el}	mg/m^3 c/	g/kWh_{el}
Hard coal d/	1,000-10,000	3.5-35	400-4,000	1.4-14	<400 (<200, 1% S)	<1.4 <0.7	<400 (<200, 1% S)	<1.4 <0.7
Brown coal d/	1,000-20,000	4.2-84	400-8,000	1.7-33.6	<400 (<200, 1% S)	<1.7 <0.8	<400 (<200, 1% S)	<1.7 <0.8
Heavy oil d/	1,000-10,000	2.8-28	400-4,000	1.1-11	<400 (<200, 1% S)	<1.1 <0.6	<400 (<200, 1% S)	<1.1 <0.6
	Ammonia scrubbing b/		Wellman Lord a/		Activated carbon a/		Combined catalytic a/	
Reduction efficiency (%)	up to 90		95		95		95	
Energy efficiency ($kW_{el}/10^3$ m^3/h)	3-10		10-15		4-8		2	
Total installed capacity (ECE Eur) (MW_{th})	200		2,000		700		1,300	
Type of by-product	Ammonia fertilizer		Elemental S Sulphuric acid (99 vol.%)		Elemental S Sulphuric acid (99 vol.%)		Sulphuric acid (70 wt.%)	
Specific investment (cost ECU(1990)/kW_{el})	230-270 e/		200-300 e/		280-320 e/ f/		320-350 e/ f/	
	mg/m^3 c/	g/kWh_{el}	mg/m^3 c/	g/kWh_{el}	mg/m^3 c/	g/kWh_{el}	mg/m^3 c/	g/kWh_{el}
Hard coal d/	<400 (<200, 1% S)	<1.4 <0.7	<400 (<200, 1% S)	<1.4 <0.7	<400 (<200, 1% S)	<1.4 <0.7	<400 (<200, 1% S)	<1.4 <0.7
Brown coal d/	<400 (<200, 1% S)	<1.7 <0.8	<400 (<200, 1% S)	<1.7 <0.8	<400 (<200, 1% S)	<1.7 <0.8	<400 (<200, 1% S)	<1.7 <0.8
Heavy oil d/	<400 (<200, 1% S)	<1.1 <0.6	<400 (<200, 1% S)	<1.1 <0.6	<400 (<200, 1% S)	<1.1 <0.6	<400 (<200, 1% S)	<1.1 <0.6

a/ For high sulphur content in the fuel the removal efficiency has to be adapted. However, the scope for doing so may be process-specific. Availability of these processes is usually 95%.

b/ Liquid applicability for high-sulphur fuels.

c/ Emission in mg/m^3 (STP), dry, 6% oxygen for solid fuels, 3% oxygen for liquid fuels.

d/ Conversion factor depends on fuel properties, specific fuel gas volume and thermal efficiency of boiler (conversion factors (m^3/kWh_{el}, thermal efficiency: 36%) used: hard coal: 3.50; brown coal: 4.20; heavy oil: 2.80).

e/ Specific investment cost relates to a small sample of installations.

f/ Specific investment cost includes denitrification process.

The table was established mainly for large combustion installations in the public sector. However, the control options are also valid for other sectors with similar exhaust gases.

(e) Flue gas desulphurization (FGD) processes

These processes aim at removing already formed sulphur oxides, and are also referred to as secondary measures. The state-of-the-art technologies for flue gas treatment processes are all based on the removal of sulphur by wet, dry or semi-dry and catalytic chemical processes.

To achieve the most efficient programme for sulphur emission reductions beyond the energy management measures listed in (i) above a combination of technological options identified in (ii) above should be considered.

In some cases options for reducing sulphur emissions may also result in the reduction of emissions of CO_2, NO_x and other pollutants.

In public power, cogeneration and district heating plants, flue gas treatment processes used include: lime/limestone wet scrubbing (LWS); spray dry absorption (SDA); Wellman Lord process (WL); ammonia scrubbing (AS); and combined NO_x/SO_x removal processes (activated carbon process (AC) and combined catalytic NO_x/SO_x removal).

In the power generation sector, LWS and SDA cover 85% and 10%, respectively, of the installed FGD capacity.

Several new flue gas desulphurization processes, such as electron beam dry scrubbing (EBDS) and Mark 13A, have not yet passed the pilot stage.

Table 2 above shows the efficiency of the above-mentioned secondary measures based on the practical experience gathered from a large number of implemented plants. The implemented capacity as well as the capacity range are also mentioned. Despite comparable characteristics for several sulphur abatement technologies, local or plant-specific influences may lead to the exclusion of a given technology.

Table 2 also includes the usual investment cost ranges for the sulphur abatement technologies listed in sections (ii) (c), (d) and (e). However, when applying these technologies to individual cases it should be noted that investment costs of emission reduction measures will depend amongst other things on the particular technologies used, the required control systems, the plant size, the extent of the required reduction and the time-scale of planned maintenance cycles. The table thus gives only a broad range of investment costs. Investment costs for retrofit generally exceed those for new plants.

IV. CONTROL TECHNIQUES FOR OTHER SECTORS

10. The control techniques listed in section 9 (ii) (a) to (e) are valid not only in the power plant sector but also in various other sectors of industry. Several years of operational experience have been acquired, in most cases in the power plant sector.

11. The application of sulphur abatement technologies in the industrial sector merely depends on the process's specific limitations in the relevant sectors. Important contributors to sulphur emissions and corresponding

reduction measures are presented in table 3 below.

Table 3

Source	Reduction measures
Roasting of non-ferrous sulphides	Wet sulphuric acid catalytic process (WSA)
Viscose production	Double-contact process
Sulphuric acid production	Double-contact process, improved yield
Kraft pulp production	Variety of process integrated measures

12. In the sectors listed in table 3, process-integrated measures, including raw material changes (if necessary combined with sector-specific flue gas treatment), can be used to achieve the most effective reduction of sulphur emissions.

13. Reported examples are the following:

(a) In new kraft pulp mills, sulphur emission of less than 1 kg of sulphur per tonne of pulp AD (air dried) can be achieved; **/

(b) In sulphite pulp mills, 1 to 1.5 kg of sulphur per tonne of pulp AD can be achieved;

(c) In the case of roasting of sulphides, removal efficiencies of 80 to 99% for 10,000 to 200,000 m^3/h units have been reported (depending on the process);

(d) For one iron ore sintering plant, an FGD unit of 320,000 m^3/h capacity achieves a clean gas value below 100 mg SO_x/Nm^3 at 6% O_2;

(e) Coke ovens are achieving less than 400 mg SO_x/Nm^3 at 6% O_2;

(f) Sulphuric acid plants achieve a conversion rate larger than 99%;

(g) Advanced Claus plant achieves sulphur recovery of more than 99%.

V. BY-PRODUCTS AND SIDE-EFFECTS

14. As efforts to reduce sulphur emissions from stationary sources are increased in the countries of the ECE region, the quantities of by-products will also increase.

15. Options which would lead to usable by-products should be selected. Furthermore, options that lead to increased thermal efficiency and minimize the waste disposal issue whenever possible should be selected. Although most

**/ Control of sulphur-to-sodium ratio is required, i.e. removal of sulphur in the form of neutral salts and use of sulphur-free sodium make-up.

by-products are usable or recyclable products such as gypsum, ammonia salts, sulphuric acid or sulphur, factors such as market conditions and quality standards need to be taken into account. Further utilization of FBC and SDA by-products have to be improved and investigated, as disposal sites and disposal criteria limit disposal in several countries.

16. The following side-effects will not prevent the implementation of any technology or method but should be considered when several sulphur abatement options are possible:

(a) Energy requirements of the gas treatment processes;

(b) Corrosion attack due to the formation of sulphuric acid by the reaction of sulphur oxides with water vapour;

(c) Increased use of water and waste water treatment;

(d) Reagent requirements;

(e) Solid waste disposal.

VI. MONITORING AND REPORTING

17. The measures taken to carry out national strategies and policies for the abatement of air pollution include: legislation and regulatory provisions, economic incentives and disincentives; as well as technological requirements (best available technology).

18. In general, standards are set, per emission source, according to plant size, operating mode, combustion technology, fuel type and whether it is a new or existing plant. An alternative approach also used is to set a target for the reduction of total sulphur emissions from a group of sources and to allow a choice of where to take action to reach this target (the bubble concept).

19. Efforts to limit the sulphur emissions to the levels set out in the national framework legislation have to be controlled by a permanent monitoring and reporting system and reported to the supervising authorities.

20. Several monitoring systems, using both continuous and discontinuous measurement methods, are available. However, quality requirements vary. Measurements are to be carried out by qualified institutes using measuring and monitoring systems. To this end, a certification system can provide the best assurance.

21. In the framework of modern automated monitoring systems and process control equipment, reporting does not create a problem. The collection of data for further use is a state-of-the-art technique; however, data to be reported to competent authorities differ from case to case. To obtain better comparability, data sets and prescribing regulations should be harmonized. Harmonization is also desirable for quality assurance of measuring and monitoring systems. This should be taken into account when comparing data.

22. To avoid discrepancies and inconsistencies, key issues and parameters, including the following, must be well defined:

(a) Definition of standards expressed as ppmv, mg/Nm^3, g/GJ, kg/h or kg/tonne of product. Most of these units need to be calculated and need specification in terms of gas temperature, humidity, pressure, oxygen content or heat input value;

(b) Definition of the period over which standards are to be averaged, expressed as hours, months or a year;

(c) Definition of failure times and corresponding emergency regulations regarding bypass of monitoring systems or shut-down of the installation;

(d) Definition of methods for back-filling of data missed or lost as a result of equipment failure;

(e) Definition of the parameter set to be measured. Depending on the type of industrial process, the necessary information may differ. This also involves the location of the measurement point within the system.

23. Quality control of measurements has to be ensured.

Annex V

EMISSION AND SULPHUR CONTENT LIMIT VALUES

A. EMISSION LIMIT VALUES FOR MAJOR STATIONARY COMBUSTION SOURCES a/			
	(i) (MW_{th})	(ii) Emission limit value (mg SO_2/Nm^3 b/)	(iii) Desulphurization rate (%)
1. SOLID FUELS (based on 6% oxygen in flue gas)	50-100	2000	
	100-500	2000-400 (linear decrease)	40 (for 100-167 MW_{th}) 40-90 (linear increase for 167-500 MW_{th})
	>500	400	90
2. LIQUID FUELS (based on 3% oxygen in flue gas)	50-300	1 700	
	300-500	1 700-400 (linear decrease)	90
	>500	400	90
3. GASEOUS FUELS (based on 3% oxygen in flue gas)			
Gaseous fuels in general		35	
Liquefied gas		5	
Low calorific gases from gasification of refinery residues, coke oven gas, blast-furnace gas		800	

B. GAS OIL	Sulphur content (%)
Diesel for on-road vehicles	0.05
Other types	0.2

Notes

a/ As guidance, for a plant with a multi-fuel firing unit involving the simultaneous use of two or more types of fuels, the competent authorities shall set emission limit values taking into account the emission limit values from column (ii) relevant for each individual fuel, the rate of thermal input delivered by each fuel and, for refineries, the relevant specific characteristics of the plant. For refineries, such a combined limit value shall under no circumstances exceed 1700 mg SO_2/Nm^3.

In particular, the limit values shall not apply to the following plants:

- Plants in which the products of combustion are used for direct heating, drying, or any other treatment of objects or materials, e.g. reheating furnaces, furnaces for heat treatment;

- Post-combustion plants, i.e. any technical apparatus designed to purify the waste gases by combustion which is not operated as an

independent combustion plant;

- Facilities for the regeneration of catalytic cracking catalysts;

- Facilities for the conversion of hydrogen sulphide into sulphur;

- Reactors used in the chemical industry;

- Coke battery furnaces;

- Cowpers;

- Waste incinerators;

- Plants powered by diesel, petrol and gas engines or by gas turbines, irrespective of the fuel used.

In a case where a Party, due to the high sulphur content of indigenous solid or liquid fuels, cannot meet the emission limit values set forth in column (ii), it may apply the desulphurization rates set forth in column (iii) or a maximum limit value of 800 mg SO_2/Nm^3 (although preferably not more than 650 mg SO_2/Nm^3). The Party shall report any such application to the Implementation Committee in the calendar year in which it is made.

Where two or more separate new plants are installed in such a way that, taking technical and economic factors into account, their waste gases could, in the judgement of the competent authorities, be discharged through a common stack, the combination formed by such plants is to be regarded as a single unit.

b/ mg SO_2/Nm^3 is defined at a temperature of 273° K and a pressure of 101.3 kPa, after correction for the water vapour content.

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