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**Proposal for a
COUNCIL DIRECTIVE**

amending Directive 88/609/EEC on the limitation of emissions of
certain pollutants into the air from large combustion plants

(presented by the Commission)

EXPLANATORY MEMORANDUM

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EXPLANATORY MEMORANDUM

1. INTRODUCTION

On 24 November 1988, Council Directive 88/609/EEC on the limitation of emissions of certain pollutants into the air from large combustion plants (LCPs) was adopted.

This Directive - known as the LCP Directive - made a valuable contribution to the reduction of air pollution in the Community. However, in the present context, two new challenges have to be taken into account: the increasing importance of combating acidification and ground-level ozone, as part of an overall action against air pollution, and technical progress in the large combustion plant sector.

Combating acidification and ground-level ozone

In March 1997 the Commission adopted a Communication to the Council and the European Parliament for a Community strategy to combat acidification in response to a request from the Council inviting the Commission to set interim targets towards the ultimate objective of no exceedance of critical loads¹.

The Communication includes as one element in the strategy the revision of Council Directive 88/609/EEC. The reason for this is that large combustion plants - i.e. those with a thermal input of 50 MW or more - account for 63% of sulphur dioxide (SO₂) emissions and 21% of nitrogen oxides (NO_x) emissions in the EU². Furthermore, analysis has shown that reducing emissions from new large combustion plants on an EU-wide basis is a cost-effective part of the Acidification Strategy³.

Since NO_x is also a precursor for the formation of ground-level ozone - together with volatile organic compounds, VOC - the relatively large share of total NO_x emissions from LCPs indicates the importance of controlling their emissions also with regard to this problem.

Further reductions in emissions from existing large combustion plants will be covered by the Directive on National Emission Ceilings to be proposed by the Commission.

Technical progress in the large combustion plant sector

Technical progress in the LCP sector can be divided into two categories:

- advances in techniques for reducing emissions from traditional boilers;
- growth towards technical maturity of gas turbine technology.

¹ COM(97) 88 final, 12.3.1997.

² Source: CORINAIR 1990.

³ IIASA (1997) Cost-effective control of acidification and ground-level ozone. Second interim report to the European Commission, DG XI.

With regard to SO₂ reduction from traditional boilers, Flue Gas Desulphurisation (FGD) systems have improved considerably over the last decade, notably in terms of the SO₂ removal efficiency and reliability of operation at lower cost, so that they now have a minimal effect on power plant operation. The most commonly used technique is wet scrubbing, in particular lime/limestone wet scrubbing, with a share of about 90% of total FGD capacity in Germany⁴ and 75% world-wide.

With regard to NO_x reduction from traditional boilers, the construction of so-called "deNO_x" facilities has become widespread in electrical power plants firing hard coal. NO_x emissions from electric power plants in the territory of the former West Germany dropped from 750 kt in 1984 to 190 kt in 1992, the most frequently applied technique being the Selective Catalytic Reduction (SCR) process. Meanwhile, worldwide operating experience in primary measures such as low NO_x burners, which aim to reduce NO_x formation at flame level by acting on the combustion parameters, has been gained. Virtually all new combustion plants now incorporate primary measures since these combustion methods for minimising NO_x can be included at the design stage at relatively low cost. Complementary reduction can then be achieved by secondary measures such as SCR.

With regards to gas turbine, the rapid increase in their use as basic units of electricity production since the early 1990s has started to modify considerably the electricity production sector.

The following forecasts for the installation of new electricity production units containing combustion appliances⁵ serve to demonstrate this development within the EU 15:

| | Between 1996-2000 | Between 2000-2010 |
|------------------------------|----------------------|-----------------------|
| Coal, lignite or liquid fuel | 25 GW(thermal input) | 30 GW(thermal input) |
| Natural gas | 70 GW(thermal input) | 150 GW(thermal input) |

NB: the conventional thermal capacity for electricity generation was estimated at 700 GW(thermal input) in 1995.

This relatively recent growth can be seen as the result of a combination of several factors. These include:

- the development of the infrastructure for the production and distribution of natural gas;
- the advantages of using natural gas in terms of both ease of exploitation and environmental protection, the specific emission factor for CO₂ being less than half that of coal;
- the technical maturity now reached by gas turbine technology; and

⁴ In the territory of former West Germany, 1992 figures.

⁵ Deduced from Eurelectric & Unipede EURPROG report 1997, Programmes and Prospects for the European Electricity Sector.

- the wide variety of possible combinations for organising installations in such a way as to optimise the overall efficiency in fuel use, in particular by means of Combined Heat and Power generation (CHP).

It should also be kept in mind that the forthcoming liberalisation of the electricity market⁶ will create a new competitive environment which is likely to increase the significance of the above factors.

2. OBJECTIVES

The proposed amendment of Directive 88/609/EEC seeks to integrate into the original Directive the technical progress achieved in the LCP sector over the last 15 years. This will serve:

- to contribute to achieving acidification targets in accordance with the Commission Acidification Strategy of 1997 and in a cost-effective way;
- to further reduce health risks, in particular those related to small suspended particles as well as those related to the formation of tropospheric ozone for which nitrogen dioxide (NO₂) is an important precursor. The reduced emissions resulting from the proposed amendment will contribute to the achievement of air quality targets for SO₂, NO_x, particulates and ozone to be established pursuant to Council Directive 96/62/EC on ambient air quality assessment and management⁷.

3. LEGAL BASIS AND MAIN ELEMENTS OF THE PROPOSAL

Since the proposed amendment seeks to protect and improve the quality of the environment as well as to protect human health, the legal basis for the Proposal is Article 130s(1) of the Treaty.

The central elements of this revision concern

- the updating of the emission limit values applicable to combustion plants put into operation after [1/1/2000]; and
- the extension of the scope to include gas turbines.

The other new aspects of the Proposal include:

- the updating of the scope of fuels covered, notably by clarifying the relationship with the Directives dealing with waste incineration and by addressing the use of biomass as a source of energy;
- the promotion of the development of combined heat and power generation;

⁶ Council Directive 96/92/EC concerning common rules for the internal electricity market, 19 December 1996.

⁷ Commission Proposal COM(97) 500 final for a Council Directive relating to limit values for sulphur dioxide, oxides of nitrogen, particulate matter and lead in ambient air. A further Proposal concerning *inter alia* levels of tropospheric ozone is under preparation by the Commission services.

- the updating of provisions concerning abnormal operating conditions;
- the reinforcement of provisions concerning monitoring of emissions (including those from existing installations) and compliance with limit values;
- the updating of provisions concerning the annual emissions inventory for SO₂ and NO_x to include data from both new and existing installations on an individual basis and to include data concerning energy consumption in order to provide information on trends in emission factors.

It can be seen from the above that the proposed amendment constitutes an improvement and updating of the provisions of Directive 88/609/EEC, mostly relating to new installations. For this reason an in-depth analysis of alternative, market-based instruments has not been carried out at this stage. Such measures could be envisaged at a later stage, once more experience has been gained, notably in the context of the Kyoto protocol on climate change.

4. SUBSIDIARITY AND PROPORTIONALITY

The pollution caused by large combustion plants is of a transboundary nature. Acidifying pollutants and ozone precursors can be carried over distances of hundreds or thousands of kilometres before being deposited in the environment in the form of "acid rain" or leading to ground-level ozone episodes. Thus, emissions of acidifying pollutants and ozone precursors generated in one Member State can contribute to environmental degradation in other Member States. It is therefore necessary to introduce legislation setting the same minimum requirements for the whole of the Community rather than leaving it to the initiative of individual Member States.

Apart from Directive 88/609/EEC, several Community legislative measures relating wholly or partially to acidifying pollutants and ozone precursors are already in place. These include Council Directives 70/220/EEC and 88/77/EEC relating to the control of emissions from vehicles, Directive 94/63/EC on VOC recovery from petrol storage and distribution, Directive 84/360/EEC on the combating of air pollution from industrial plants, Directive 93/12/EEC relating to the sulphur content of certain liquid fuels, Directive 96/61/EC on integrated pollution prevention and control (IPPC), and Directive 96/62/EC on ambient air quality assessment and management. By improving the provisions relating to large combustion plants the proposed amendment will contribute to the completion of the legislative framework concerning acidifying pollution and ozone precursors. It will be complemented by the proposal for a Directive on national emission ceilings due to be put forward by the Commission by the end of 1998 or early 1999.

Action at Community level is further embedded in a framework of broader international activities, notably within the 1979 UN-ECE Convention on Long-Range Transboundary Air Pollution (CLRTAP).

In accordance with the principle of subsidiarity the proposed amendment leaves Member States the possibility:

- to introduce stricter standards than those set out in the measure;
- to allow industry to opt for the best available techniques in the context of local conditions.

It is, however, essential that the measures adopted are sufficiently strict to ensure adequate protection of the environment and that they are the same throughout the Community. The measures contained in the proposed amendment are complementary to the "Best Available Techniques" approach established by the IPPC Directive 96/61/EC and are based on a careful consideration of the costs as well as the benefits of the action.

It is important to note in this respect that:

- since the revised emission limit values will apply only to new installations the cost burden of the proposed measures will be modest;
- as well as helping to reduce acidification and ground-level ozone the proposed measures will contribute to the achievement of air quality targets. They will also lead to reductions in eutrophication and corrosion of buildings and monuments, to which long-range transport of NO_x and SO₂ contributes.

5. CONSISTENCY WITH OTHER COMMUNITY POLICIES

5.1. Integrated Pollution Prevention and Control

The prevention and control of pollution from large industrial sources is governed by Council Directive 96/61/EC on Integrated Pollution Prevention and Control (IPPC). The IPPC Directive contains provisions for the permitting of industrial installations based on an integrated assessment of their environmental performance. Combustion installations with a rated thermal input exceeding 50 MW are included within the scope of the Directive.

In addition to the permitting requirements, the IPPC Directive requires emission limit values to be set at Community level in cases where the need for such action has been identified⁸. In the absence of such Community emission limit values, relevant emission limit values contained in existing Community legislation are to be applied as minimum emission limit values for IPPC installations. These Community emission limits provide a safeguard against over-flexible interpretation of the IPPC Directive.

In view of the urgency of updating the emission limit values for new installations in Directive 88/609/EEC/EEC, and the legal requirement contained in the Directive to do so, revised values have been based on currently available techniques considered best for the minimisation of atmospheric emissions of SO₂, NO_x and dust. Full consistency between the IPPC approach and the current proposed amendment of Directive 88/609/EEC has been achieved by taking care that the revised emission limit values do not hinder the overall environmental performance of the installations.

⁸ Council Directive 96/61/EC, Article 18(1).

5.2. Waste management

At present there are three measures dealing with the incineration of waste: Directives 89/369/EEC and 89/429/EEC for municipal waste (corresponding to new or existing installations respectively) and 94/67/EC for hazardous waste.

Directive 94/67/EC also deals with cases where an installation not primarily intended for the incineration of hazardous waste is supplied with hazardous waste (co-incineration). This includes any large combustion installation using such waste as substitute fuel.

The current Directive 88/609/EEC excludes from the definition of fuels domestic refuse and toxic and hazardous waste. In order to avoid any overlap with the existing legislation on waste this exclusion now refers directly to Council Directives 89/369/EEC, 89/429/EEC and 94/67/EC.

5.3. Energy efficiency and renewable energy

The European Union has a general policy of promoting energy efficiency in the context of commitments resulting from the Kyoto Protocol on the reduction of greenhouse gas emissions.

Several measures in line with this policy are in progress at Community level. Among them, is a strategy⁹ recently published by the Commission for the promotion of combined heat and power (CHP), also known as co-generation, which can convert up to 85-90% of the energy content of the fuel, instead of a mere 35-50% in conventional installations. Such increased fuel efficiency will contribute to a reduction in CO₂ emissions as well as energy resource savings.

The Commission Communication draws attention to the various barriers to the development of CHP. The proposed amendment will contribute to the dismantling of some of these barriers by requiring that this option is explored whenever a new installation is designed. This is consistent with the objectives and requirements of Directive 85/337/EEC as amended by Directive 97/11/EC on the assessment of the effects of certain public and private projects on the environment, and in particular with the requirement to include in the information to be provided by the developer to the competent authority the main alternatives studied by the developer and an indication of the main reasons of the proposed choice.

Recovery of energy from biomass represents as well one other means of implementing sustainability, since it has the double benefit of exploiting an important renewable energy resource and contributing to a reduction in CO₂ exceedance.

In the new Member States - Austria, Finland and Sweden - this renewable source currently accounts for 12%, 23% and 18% respectively of primary energy supply.

⁹ COM(97) 514 final "A Community strategy to promote CHP and to dismantle barriers to its development".

According to the Commission White Paper "Energy for the future, renewable sources of energy"¹⁰ the overall volume of the solid vegetable biomass market is estimated at 57 Million tonnes oil equivalent (Mtoe) in 2010, the projected feedstocks mainly being energy crops and woody residues. 32 Mtoe could go to power generation in co-firing plants in combination with coal and in combined heat and power installations.

For this reason, it has been decided to consider biomass explicitly as a fuel in order to provide fair requirements for this type of fuel.

6. POSITION OF STAKEHOLDERS

Extensive consultation has taken place with the principal stakeholders concerned by the proposed amendment, namely the Member States, industry and business organisations and environmental Non Governmental Organisations (NGOs)¹¹.

Industrial interests were represented by:

- UNICE;
- EURELECTRIC for the electricity supply industry;
- COGEN Europe for the promotion of cogeneration;
- EUROPIA for the petroleum industry;
- CECISO for the solid fuel industry;
- MARCOGAZ for the natural gas industry;
- European gas turbine manufacturers and associations (EGT, Rolls Royce, VDMA, EUMIGT).

These consultations revealed a general support for the Proposal and focused primarily on the emission limit values for new installations and on definitions.

On the emission limit values, the stakeholders were divided as to the stringency. Special emphasis was put on the need for a fair burden sharing between installations using different types of fuel.

On the definitions, discussions mainly concerned the issue of waste and biomass. A majority of the stakeholders, in particular the Nordic countries, supported by EEB, were in favour of excluding waste while including biomass in the definition of fuels in order to promote the use of renewable energy sources.

¹⁰ White Paper for a Community Strategy and Action Plan COM(97) 599 final (26/11/97) - Annex II.1.

¹¹ Represented by European Environmental Bureau (EEB).

7. ECONOMIC ASSESSMENT

The expected costs and benefits of the proposed amendment have been calculated over the period 2000-2010. It should be emphasised that a large majority of the costs of the proposed amendment form part of those of the Acidification Strategy adopted by the Commission in 1997, and therefore do not represent additional costs.

Figures presented below correspond to a benefit to cost ratio greater than seven for boilers and greater than 26 for gas turbines. Since a large majority of the quantified benefits relate to mortality, these ratios are approximately proportional to the Value of Statistical Life used in the benefits calculation¹². By contrast they are largely insensitive to the discount rate used to calculate Net Present Values (NPV).

It should be noted that both the costs and the benefits indicated below are generally overestimated to the extent that some Member States already have national provisions stricter than those of Directive 88/609/EEC, however this does not significantly affect the benefit to cost ratio.

7.1. Estimation of costs

The expected costs have been calculated by estimating both the projected capacity of installations to be commissioned during this period and the extra costs per unit of capacity as a result of the proposed amendment.

Projections of the capacity of boilers to be commissioned between 2000 and 2010 are from Eurelectric¹³ and gas turbines from a European manufacturer¹⁴. These suggest 30 GW(thermal input) of new boiler capacity for the electricity generation industry with nearly none in other industrial sectors and a 150 GW(thermal input) increase in gas turbine capacity. The gas turbine capacity can be divided roughly by attributing one third to electricity generation and two thirds to other industrial sectors. This is consistent with current Commission energy projections and other EC policy on the promotion of combined heat and power.

With regard to the extra costs per unit, data have been drawn from preparatory work¹⁵ and supplemented by further data from gas turbine manufacturers. The calculation has been based on a comparison between the emission limit values (ELVs) contained in the current Directive 88/609/EEC and ELVs in this Proposal.

¹² A figure of ECU 3 million has been used here - see footnote 23.

¹³ Eurelectric & Unipede EURPROG report 1997, Programmes and Prospects for the European Electricity Sector.

¹⁴ European Gas Turbines.

¹⁵ ERM (1996) Revision of the EC Emission Limit Values for New Large Combustion Installations >50 MW(thermal)) - known as "ERM LCP BAT study".

The total extra cost of the measures to reduce SO₂, NO_x and total suspended particulates (TSP) from boilers is estimated to be ECU 800 million¹⁶ for the period 2000-2010. The total cost of measures to reduce NO_x from gas turbines is estimated at ECU 1 200 million for the same ten-year period.

7.2. Quantification of benefits

Using the same basis of calculation as for costs, the proposed amendment is expected to lead to the following emission reductions over the period 2000-2010:

- 1 000 kT of SO₂ from boilers;
- 4 000 kT of NO_x, of which 500 kT from boilers and 3 500 kT from gas turbines;
- 100 kT of TSP.

The expected benefits associated with these reductions relate to the harmful impact on the environment and on human health caused by the release of these pollutants from large combustion plants.

There are several adverse effects on human health resulting from SO₂, NO_x and TSP pollution. The main impact is on the respiratory function, which is affected by all the pollutants. In addition, SO₂ is directly toxic, NO_x increases reactivity with other allergens, while exposure to TSP has been shown to increase mortality and morbidity, even at low levels¹⁷.

Crops are also degraded by the presence of excess SO₂ and NO_x, although in small amounts both are beneficial to plant development. However, at higher concentrations plant function can be impaired and notable damage sustained, resulting in reductions in crop yield and ecosystem amenity.

Building materials are damaged by SO₂ and NO_x and discoloured by TSP. Both SO₂ and NO_x hasten weathering because of their acidity, while TSP "soils" buildings, necessitating cleaning in many cases.

Monetary valuation of these impacts has been carried out in the context of the ExternE¹⁸ projects, taking into account only the damage to human health, materials and crops. Damage to other kinds of receptors such as forests, fisheries and natural ecosystems have been excluded since the estimation of damage to these is subject to an unacceptable level of uncertainty.

¹⁶ This represents a present value, which is the sum of the discounted capital and operating costs of measures to reduce emissions. Discounting is a procedure to create a value to make costs occurring over time comparable. A discount rate of 8% has been selected, all costs are given in 1995 prices.

¹⁷ The mechanism by which particulate matter affects health is not presently known. The most recent research suggests that it is the smaller particles (such as those from primary combustion sources and secondary particulate matters) which are most strongly linked to health effects.

¹⁸ ExternE project (Accounting framework of external costs of fuel cycles) JOULE programme EC DG XII.

Approximately 99% of the quantified benefits¹⁹ arising from the proposed amendment are related to human health effects²⁰ - of which the largest part is mortality - with the remainder representing reductions in damage to crops and building materials. The table below presents the breakdown of the quantified benefits by category for boilers and gas turbines, estimated for the ten-year period.

Breakdown of the quantified benefits from reducing emissions from boilers and gas turbines over the period 2000-2010

| Benefit Category | Boilers (ECU million) | Gas Turbines (ECU million) |
|---------------------------------|--------------------------|-------------------------------|
| Crops | -1 | |
| Materials | 40 | 150 |
| Acute Morbidity | 270 | 1 400 |
| Chronic Morbidity | 15 | 70 |
| Acute Mortality | 1 300 | 6 500 |
| Chronic Mortality ²¹ | 4 700 | 24 000 |
| Total | 6 324 | 32 120 |

^a The benefits from boilers are aggregated for each benefit category for SO₂, NO_x and TSP.

^b The benefits from gas turbines are related only to NO_x reductions.

^c A negative sign represents a damage rather than a benefit as presented elsewhere in this table.

The net benefit^{22,23} from the reductions in emissions is estimated at ECU 6 000 million for boilers and ECU 32 000 million for gas turbines. It should be noted that it is not necessary to include the least certain elements of the benefit evaluation – in particular those related to mortality – in order to justify the costs of the proposed amendment for the same ten-year period (ECU 800 million for boilers and ECU 1 200 million for gas turbines).

Benefits also accrue to countries that have no costs of abatement, as there are reductions in transboundary pollution with a resulting downward impact on local concentrations which are detrimental to health, crops and materials. In addition, the monetary benefits for non-EU countries are not included in these estimates. In the case of Member States in the border regions failure to

¹⁹ The term "quantifiable benefit" is used to mean a benefit to which a monetary value can be attached.

²⁰ ERM (1997) Revision of the Council Directive 88/609/EEC of 24 November 1988 on the Limitation of Certain Pollutants into the Air from Large Combustion Plant: Cost Benefit Analysis of this Revision.

²¹ Chronic mortality refers to the increased risk of death associated with an exposure to a particular environmental stress over a long period; long term exposure to coal dust results in some instances in respiratory diseases later in life.

²² These values are calculated as a Net Present Value (NPV) over ten years, which is deemed to be the lifetime of the proposed amendment although benefits will continue to accrue.

²³ ECU 3 million (1995 prices) has been used to represent the value of a statistical life for both acute and chronic effects on human health.

include these benefits will result in an underestimation of the total benefit from emission reductions from the power plants in that Member State.

7.3. Cost effectiveness analysis

As part of the preparatory work undertaken for the proposed amendment, an assessment of Best Available Techniques (BAT) has been completed²⁴. This assessment, based on a definition for BAT consistent with IPPC, includes a cost effectiveness analysis calculated in terms of cost per tonne of pollutant, in the context of progressing from unabated operation to compliance with emission levels consistent with BAT.

The values given below are calculated in the context of progressing from compliance with the existing ELVs to compliance with the ELVs contained in the proposed amendment.

For SO₂, the estimated values lie within the range ECU 400-800 per tonne removed for the larger plants. For smaller plants they may be in the range ECU 1 000-2 000 per tonne where abatement equipment is used, although the alternative of using low sulphur coal is likely to cost less than ECU 1 000 per tonne not emitted.

For TSP, the figure is of the order of ECU 1 000 per tonne removed, although it may vary from zero to 2 000 depending on each specific case.

For NO_x, costs are estimated at less than ECU 500 per tonne not emitted where the proposed ELVs can be achieved using primary measures, as will be the case for most installations. Where primary measures need to be complemented by flue gas denitrification, costs may be as high as ECU 1 500-2 000 per tonne removed.

Since gas turbines are not yet regulated at Community level, costs are estimated on the basis of a complete abatement by means of combustion measures in order to comply with the proposed ELVs. They are estimated to be between ECU 200 and 400 per tonne of NO_x not emitted, depending on the size of the turbine.

7.4. Impact of the Proposal on Business as a whole

The proposed amendment only affects new plants to be commissioned after 2000. Of the above estimated ECU 2 billion cost of the modification over the period 2001-2010, approximately ECU 1.2 billion will be borne by the electricity supply industry and ECU 0.8 billion by other industrial sectors.

For the other industrial sectors there are a few key energy-intensive industries that are likely to bear a large part of the cost. These include petro-chemical industry, ferrous and non-ferrous metal production and processing, pulp and paper as well as some agricultural product processing. In many cases it is likely that the extra costs will be offset by the benefits provided by the

²⁴ ERM LCP BAT study - see footnote 15.

development of CHP techniques. It is therefore highly likely that no cost will be passed on to the consumers of the products.

For the electricity supply industry the proposed amendment may affect the costs of electricity generation. However, since most new plants will be gas turbines, it is unlikely that the costs of generation from new plants will increase by more than a few percent on average. Assuming that extra costs are passed on fully and equally to all final consumers the average price increase will be very low (less than 0.5%). In practice the price increase will depend on elements such as demand elasticities, market liberalization and the actual cost structures and supply curves.

7.5. Impact of the Proposal on SMEs

The number of SMEs in the energy-intensive industrial sectors and the electricity supply industry - such as independent power producers - is likely to be small. The proposed amendment is therefore expected to have only a minor impact on SMEs throughout the Community.

It is difficult to determine the precise nature of indirect impacts on SMEs as consumers. It is possible that SMEs will see some increase in production costs, but they are likely to be very modest.

Employment may also be affected by the revised Directive, although the extent is likely to be very limited and neutral since reductions in employment caused by increased costs are likely to be offset by the extra employment generated by the manufacture, installation and operation of abatement equipment²⁵.

8. CONCLUSIONS

The proposed amendment constitutes an important element both in the implementation of the Community strategy to combat acidification and in the context of actions to reduce the concentrations of ground-level ozone in the Community.

The proposed new emission limit values, made possible by technical developments in the large combustion plant sector, are particularly timely in view of the current growth of gas turbine technology, and will provide a benchmark for future permitting of existing LCPs. The Acidification Strategy provides that these measures will be supplemented in the future by the setting of national emission ceilings for SO₂, NO_x, NH₃ and VOCs.

The main elements of the proposed amendment include:

- revised emission limit values which take account of the technical progress achieved over the last 15 years;

²⁵ This point is demonstrated by Klaassen in "Macroeconomic impacts of an EEC policy to control air pollution" August 1992.

- a widening of the scope of Directive 88/609/EEC in order to include gas turbines in view of the important role this technology will play in the future;
- the promotion of combined heat and power generation in order to bring the existing Directive 88/609/EEC into line with recent developments in Community policy on sustainable development;
- the improvement of existing monitoring provisions, in line with current progress in this field and the need for a better insight into current emissions from industrial plants.

The economic evaluation shows that the extra costs induced by these modifications are unlikely to have a significant impact on business, while the benefits both in terms of resource management and emission of pollutants are likely to outweigh the costs. In the vast majority of cases the cost of these measures will remain less than ECU 1 000 per tonne of pollutant removed.

9. CONTENTS OF THE PROPOSAL

Article 1, point (1)(a) widens the scope of the definition to cover the case where the reduction of sulphur content in the waste gases can be achieved by means other than abatement in a process especially designed for this purpose. Thus, the reduction of SO₂ emissions can be achieved by installing a boiler using the fluidised bed combustion technique which, although not specifically designed for this purpose, nevertheless increases the desulphurisation efficiency from sorbent.

Article 1, point (1)(b) updates the fuel exclusion and provides a clear borderline with the waste incineration Directives.

Article 1, point (1)(c) includes (i) and (ii) gas turbines within the scope of the LCP Directive.

All gas turbines used on offshore oil exploration platforms are excluded from the scope in view of the very special conditions under which such equipment is operated. In particular, the fuel gas used is subject to large variations in its composition and consequently in calorific value, which makes abatement techniques used in land-based gas turbines unsuitable. In addition, the operation of gas turbines under these conditions requires simple systems without the need for specialist personnel. Furthermore, since the currently-installed off-shore power in EU represents 1.5% of installed power generation capacity in EU, and since the major growth in the use of off-shore platforms has already occurred, emissions from this source are not likely to increase further.

Article 1, point (1)(d) introduces definitions of gas turbine and biomass. The purpose of the definition of biomass is to allow specific ELVs appropriate for this type of fuel.

Article 1, points (2) and (3) respectively delete the provisions of Articles 3(4) and 4(2) in Directive 88/609/EEC which are no longer relevant.

Article 1, point (4) excludes new plants subject to the updated ELVs from the derogation for new plants operating less than 2 200 hours a year, since it is no longer considered to be justified for such plants.

Article 1, point (5) deletes Article 7 in Directive 88/609/EEC since it is no longer considered relevant. It is replaced by a new provision which seeks to promote the combined generation of heat and power from the same installation, as this is a technique which clearly outperforms production from separate installations in terms of energy conversion efficiency.

Article 1, point (6)(a) seeks to improve the current provisions of Article 8(1) of Directive 88/609/EEC concerning procedures relating to malfunction or breakdown of the abatement equipment.

Since it is no longer considered realistic for the competent authority to decide in real time on the action to be taken, the new provision requires the competent authority to define the principles governing such action at the time the permit is issued in function of each individual installation. The competent authority should, however, always be informed, at least a posteriori, of any event of this type.

In addition, the maximum time allowed for the operator to repair the installation before completely stopping production is fixed at 24 hours. An annual 120-hour limit defines the framework within which the competent authority can grant an exemption in the event of an incident occurring during periods when it would be particularly undesirable to stop production.

Article 1, point (6)(b) deletes the current provision of Article 8(2) concerning the event of a serious shortage of low-sulphur fuel. Since the Commission has never received any information on such a case, this provision is deemed no longer relevant.

Article 1, point (6)(c) seeks to improve the current wording "short period" in Article 8(3), because it is too vague. The limit of ten days during any one year is considered appropriate to deal with technical incidents (occurring on pipelines, for example) as well as with cases of interruption of supplies envisaged in commercial gas sale clauses.

Article 1, point (6)(d) is related to the deletion of Article 8(2).

Article 1, point (7) updates the provisions for refineries.

The value of 400 mg/Nm^3 , proposed as a mean value for the new combustion plants for which a licence is granted after the mentioned date within a refinery, corresponds to the value that would normally apply to new installations in which there is a blend of gaseous and liquid fuels. This value leaves sufficient flexibility for the operator to pursue a wide variety of options.

Article 1, point (8) deletes the current paragraphs 2 and 3 of Article 13 in conjunction with the new provisions of Annex IX.A which now provides the general updating related to emission monitoring techniques.

Article 1, point (9) introduces a new paragraph 4 in Article 15 concerning compliance with the new emission limit values given in Annexes III to VII. It specifies that they must be respected with regard to their daily mean value. Hourly averages may exceed the limit values, but must always be less than twice the limit value.

These provisions are simple and avoid long delays in obtaining or calculating the results. They are considered preferable to the current concepts based on the compliance with a monthly mean value and the examination of all 48 hourly mean values over a calendar year. Although stricter, the proposed modifications are nevertheless coherent with the values fixed in Annexes III to VII in terms of their industrial feasibility.

Article 1, point (10) deletes the provision concerning the regular comparisons of the programmes set out in 1990 for the progressive reduction of emissions from existing plants. This provision is considered no longer relevant.

The Annex, points (1) to (6) introduces new ELVs.

In setting the proposed ELVs, a number of considerations have been taken into account. These include:

The state of the art

Two separate reports have been produced examining the state of the art and the implications of a BAT approach to establishing Emission Limit Values: one for boilers²⁶ and another for gas turbines²⁷.

ELVs as minimum requirements

Care has been taken to ensure that ELVs are consistent with their function of minimum requirement at Community level, leaving room for competent authorities to apply more stringent ELVs if necessary in accordance with the provisions of the IPPC Directive 96/61/EC. As an example, NO_x ELVs for gas turbines are based on the current state of the primary reduction technique known as "Dry Low Emission", taking into account the difference between a benchmark-test performance and industrial performances over the operating life of the installation. A further level of reduction is possible with end-of-pipe treatment (SCR), although as a general rule it does not appear to be cost effective.

A range of techniques

The proposed ELVs make it possible, for each plant size, to choose a solution between a range of different available techniques not entailing excessive cost.

In general, there is a wider range of techniques for NO_x reduction than for SO₂ reduction, due to the number of package site-specific techniques using various primary measures complemented by end-of-pipe abatement where needed.

²⁶ ERM LCP BAT study - see footnote 15.

²⁷ Byrne O'Cleirigh (1997) Limiting the Emissions of Pollutants into the Air from Gas Turbines.

For SO₂, the use of low sulphur fuel provides an alternative method of complying with emission limit values for new plants, especially for those with a thermal input not exceeding 300 MW.

A fair balance between fuels

In order to avoid an excessive impact on the market share between competing fuels, care has been taken to balance the reduction burden-sharing between different types of fuels, in particular between solid fuels and liquid fuels for SO₂, and between the three main categories with regard to NO_x reduction.

Particular care has been taken to ensure that the emission limit values for biomass are set at a level which allows this type of fuel to be used without significant extra cost. In this way, the amended Directive will enhance the competitive position of biomass compared with traditional fuels. For NO_x, the emission limit values set out in the proposed amendment can easily be achieved through the use of currently used emission reduction techniques such as "circulating fluidised bed". For SO₂ the emission limit values have been set at a level which does not require the use of any abatement techniques, given the low sulphur content of biomass. In fact, the new emission limit values proposed for SO₂ have the effect of promoting the co-firing of biomass with other solid fuels such as coal, lignite or peat, since the low sulphur content of the biomass will help in complying with the emission limit values those fuels have to reach.

Specific considerations for Gas Turbines

A number of specific considerations concerning gas turbines have been taken into account.

The proposed ELVs are applicable only to the fuels most commonly used in gas turbines, namely natural gases and light and medium distillates. These represent more than 95% fuels used in gas turbines. For the remaining fuels the setting of ELVs is left to the national competent authority.

As economics dictate that the majority of gas turbines operate to maximum power and efficiency and given that NO_x emissions are increased when operating at part load, the proposed ELVs will apply only when the installation is operating at more than 70% of its full capacity.

An "efficiency factor" has been introduced in order to avoid a technically unjustified and unfair treatment of highly developed gas turbines: gas turbines with higher efficiency produce slightly higher NO_x emissions due to the increased temperatures. This provision encourages the development of more efficient gas turbines without harming the environment, since NO_x emissions per energy output remain equal.

Combined heat and power plants often use the possibility to increase power output and flexibility by water or steam injection, which contributes to the economic viability of the installation. Since water or steam injection does not achieve the same reduction of NO_x emissions as the "Dry Low Emission" technique and since the overall benefit of CHP to the environment is well established - due to the better use of energy input - a less stringent ELV has been set for these installations.

Gas turbines driving compressors are used in natural gas supply systems. In contrast to other gas turbine installations, such a stand-alone apparatus operates most of the time on part-load and has a lot of starts and stops. It also requires a very high reliability and availability. For these reasons currently-applied NO_x reduction techniques cannot be used as successfully. Since the number of such cases is small, a less stringent ELV is also proposed for this specific case.

To avoid misunderstanding, a definition of natural gas is suggested, as well as the ISO conditions when referring to the operating performances of gas turbines.

Point (7)(a) of the Annex introduces modifications in Annex IX.A which seek to:

- extend the requirements relating to continuous monitoring of pollutants: by lowering from 300 MW(thermal) to 100 MW (thermal input) the relevant capacity threshold concerning new plants and by extending the obligation to existing plants with a capacity of more than 300 MW (thermal input), except in the case of a plant near the end of its life (less than 10 000 hours of further operation);
- update the provisions concerning the methodology and the quality of measurements in line with work carried out by the CEN (European Committee for Standardization) on this issue.

Point (7)(b) of the Annex introduces modifications in Annex IX.B which seek to improve knowledge of the total emissions from large combustion plants, since this will provide the necessary basis for future decisions on how to deal effectively with the problem of acidification.

The relevant current provisions of Directive 88/609/EEC are a step in the right direction but have certain limitations. The experience gained and the means available today make it possible to improve significantly the quality of the inventories without implying an increased workload for the national administrations, as long as sufficient care is taken to ensure coherence with data acquisitions already carried out under CORINAIR.

The new provisions of Annex IX.B thus constitute a valuable improvement, especially because they associate estimates of the energy consumed by the installation concerned with the annual SO₂ and NO_x emission figures. This makes it possible to characterise each installation in terms of its emissions per unit of energy consumption (expressed in g/GJ). This is a particularly significant parameter for determining the environmental performance of a combustion plant.

Point (7)(c) of the Annex introduces the year 2003 as the last year for which the determination of the total annual emissions of existing plants alone is requested - in order to check compliance against the figures laid down in Annex I, column 3, of the Directive 88/609/EEC - having in mind that this year is also proposed in the modified Annex IX.B to be the starting year for a comprehensive inventory of all large combustion plants.

10. THE CURRENT SITUATION IN THE EU

10.1. Legislation in the Member States

Boilers

Currently all Member States have regulations controlling emissions of SO₂, NO_x and TSP from large combustion plants. Most of these regulations have been enacted to implement the Directive 88/609/EEC. Member State regulations define emission limit values which vary according to the type of fuel - solid, liquid or gaseous - and plant capacity (thermal input).

In some Member States (Belgium, Germany, Denmark, Italy, Austria, Finland, Sweden and the Netherlands) the emission limit values are generally more stringent than those contained in the LCP Directive. In the remaining Member States (Spain, France, UK, Ireland, Luxembourg, Greece and Portugal) the emission limit values are the same as those contained in the LCP Directive.

In most cases emission limit values expressed in mg/Nm³ are more stringent for gaseous fuels than liquid fuel which in turn are more stringent than solid fuels. A similar relationship can be observed for plant sizes, with larger plants being more tightly controlled than smaller plants²⁸.

Gas Turbines

Most Member States (excluding Ireland, Greece and Luxembourg) regulate NO_x emissions from gas turbines. Some Member States have specific regulations for gas turbines, while others use emission limit values applicable to large combustion plants. However, currently there are no common approaches to environmental standards for gas turbines in the Community.

Some Member States base, or plan to, emission limit values on the German TA Luft standards, which are set at 150 mg/Nm³, regardless the type of fuel. However, there are considerable variations from this standard in the Member States, especially in the case of combined heat and power. This means there is no uniform regulation of NO_x emissions from gas turbines as compared to boilers.

10.2. Inventory of Emissions

Directive 88/609/EEC requires Member States to provide the Commission with summary reports which detail emissions of SO₂ and NO_x (see Articles 3(3) and 16(1)). All Member States have submitted emission data from existing plants - plants put into operation before 1 July 1987 - for the years 1990-1993, and some have been received for the years 1994-1996.

²⁸ A more complete breakdown of emission limit values are presented in "ERM LCP BAT study".

These data are presented in figures 1 and 2. These figures show that:

- most countries have emitted less than the allowed ceilings, and in some cases considerably less, both for NO_x and SO₂;
- two exceptions are SO₂ emissions in Greece which are higher than the 1993 ceiling, and NO_x emissions in Portugal which are slightly higher than the 1993 ceiling²⁹.

If as forecast this progress is to continue it will be possible to achieve the 1998 limits.

Despite the provisions of Annex IX.C2 of Directive 88/609/EEC, some Member States have failed to provide data concerning emissions from "new" combustion plants - plants put into operation after 1 July 1987). However, from data provided by Germany, United Kingdom, France and Netherlands, it appears that emissions from "new" plants represent less than 2% of total emissions from large combustion plants for the year 1993.

²⁹ The Member States concerned explained these exceedances in terms of exceptional atmospheric conditions which required a greater output from thermal power stations than had been envisaged.

Figure 1
Emissions of SO₂ from existing LCPs for 1980, 1990 and 1993,
Compared to the 1993 emission ceiling, by Member State

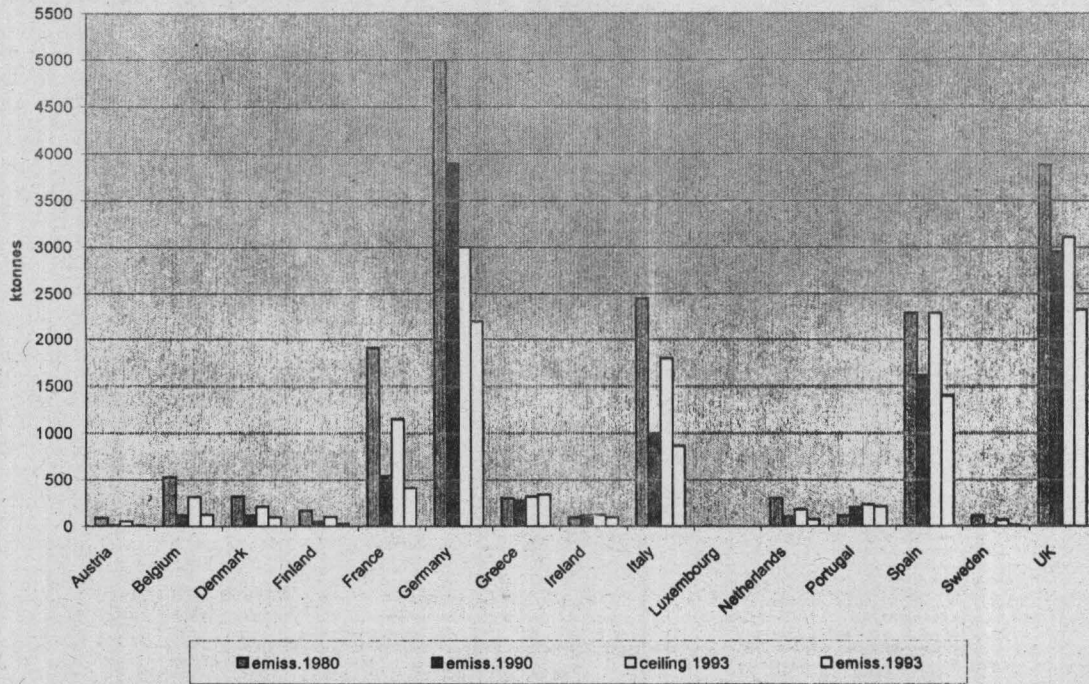
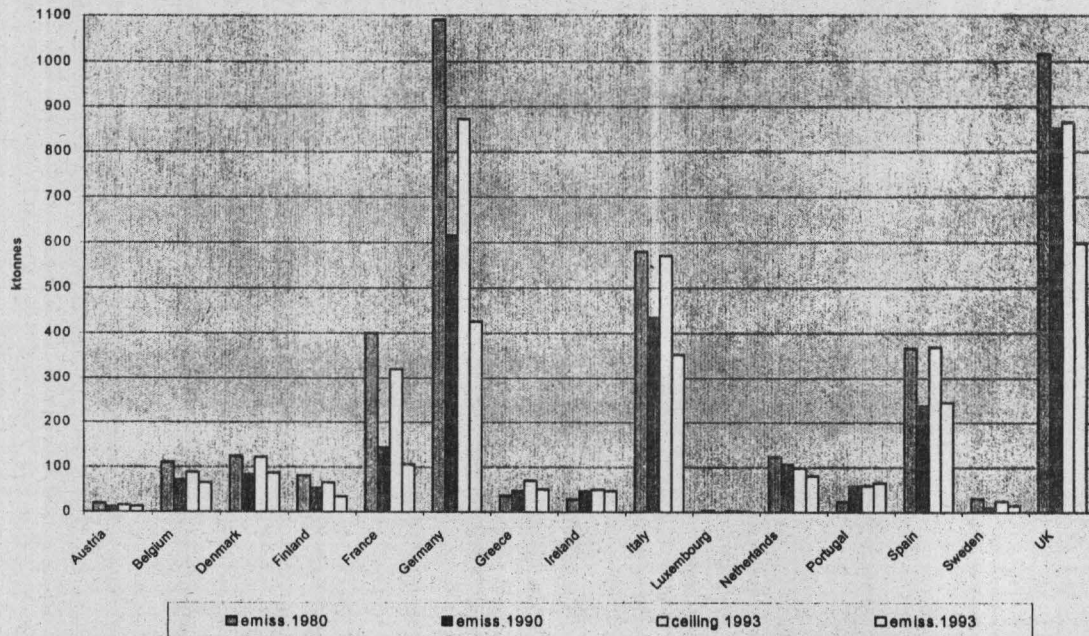


Figure 2
Emissions of NO_x from existing LCPs for 1980, 1990 and 1993,
compared to the 1993 emission ceiling, by Member State



**Proposal for a
COUNCIL DIRECTIVE**

amending Directive 88/609/EEC on the limitation of emissions of
certain pollutants into the air from large combustion plants

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130s(1) thereof,

Having regard to the proposal from the Commission³⁰,

Having regard to the Opinion of the Economic and Social Committee³¹,

Acting in accordance with the procedure laid down in Article 189c of the Treaty, in cooperation with the European Parliament³²,

- (1) Whereas the fifth Environmental Action Programme³³ sets as an objective "no exceedance ever of critical loads and levels" of certain acidifying pollutants such as sulphur dioxide (SO₂) and nitrogen oxides (NO_x), and in terms of air quality the objective is that "all people should be effectively protected against recognised health risks from Air Pollution";
- (2) Whereas Council Directive 88/609/EEC³⁴, as amended by Directive 94/66/EC³⁵ and last amended by the Act of Accession of Austria, Finland and Sweden, contributed to the reduction and control of atmospheric emissions from large combustion plants;
- (3) Whereas the Commission has recently published a Communication on a Community strategy to combat acidification³⁶; whereas the revision of Directive 88/609/EEC was identified as being an integral component of that strategy;
- (4) Whereas, in accordance with the principles of subsidiarity and proportionality as set out in Article 3b of the Treaty, the objective of reducing acidifying emissions from large combustion plants cannot be sufficiently achieved by the Member States acting individually and uncoordinated action offers no guarantee of achieving the desired objective; whereas, in view of the need to reduce acidifying emissions across the Community, it is more effective to take action at the level of the

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33 OJ C 138, 17.5.1993, p. 1.

34 OJ L 336, 7.12.1988, p. 1.

35 OJ L 337, 24.12.1994, p. 83.

36 COM(97) 88 final.

Community; whereas this Directive confines itself to minimum requirements for new combustion plants;

- (5) Whereas Council Directive 96/61/EC³⁷ sets out an integrated approach to pollution prevention and control in which all the aspects of an installation's environmental performance are considered in an integrated manner; whereas combustion installations with a rated thermal input exceeding 50 MW are included within the scope of that Directive;
- (6) Whereas compliance with the emission limit values laid down by Directive 88/609/EEC, as amended by this Directive, should be regarded as a necessary but not sufficient condition for compliance with the requirements of Directive 96/61/EC regarding the use of best available techniques; whereas such compliance may involve more stringent emissions limit values, emission limit values for other substances and other media, and other appropriate conditions;
- (7) Whereas industrial experience in the implementation of techniques for the reduction of polluting emissions from large combustion plants has been acquired over a period of 15 years;
- (8) Whereas installations for the production of electricity represent an important part of the large combustion plant sector;
- (9) Whereas Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity³⁸ must be transposed by 19 February 1999; whereas this is likely to have the effect of distributing new production capacity among new arrivals in the sector;
- (10) Whereas the Community is committed to a reduction of carbon dioxide emissions; whereas the combined production of heat and electricity represents a valuable opportunity for significantly improving overall efficiency in fuel use;
- (11) Whereas a significant increase in the use of natural gas for producing electricity is already underway and is likely to continue, in particular through the use of gas turbines;
- (12) Whereas Council Resolution of 24 February 1997 on a Community strategy for waste management³⁹ emphasises on the need for promoting waste recovery and states that appropriate emission standards should apply to the operation of facilities in which waste is incinerated in order to ensure a high level of protection for the environment;
- (13) Whereas industrial experience has been gained concerning techniques and equipments for the measurement of the principal pollutants emitted by large combustion plants; whereas the European Committee for Standardization (CEN) has undertaken work with the aim of providing a framework securing comparable

³⁷ OJ L 257, 10.10.1996, p. 26.

³⁸ OJ L 27, 30.1.1997, p. 20.

³⁹ OJ C 76, 11.3.1997, p. 1.

measurement results within the Community and guaranteeing a high level of quality of such measurements;

- (14) Whereas there is a need to improve knowledge concerning the emission of the principal pollutants from large combustion plants; whereas, in order to be genuinely representative of the level of pollution of an installation, such information should also be associated with knowledge concerning its energy consumption;
- (15) Whereas Directive 88/609/EEC should therefore be amended accordingly,

HAS ADOPTED THIS DIRECTIVE

Article 1

Directive 88/609/EEC is hereby amended as follows:

1. Article 2 is amended as follows:

- (a) In point 4, the words "*by processes especially designed for this purpose*" are deleted
- (b) In point 6, the words "*with the exception of domestic refuse and toxic or dangerous waste*" are replaced by the words "*with the exception of waste covered by Council Directives 89/369/EEC^{*}, 89/429/EEC^{**} and 94/67/EC^{***}*".

^{*} OJ L 163, 14.6.1989, p. 32.

^{**} OJ L 203, 15.7.1989, p. 50.

^{***} OJ L 365, 31.12.1994, p. 34."

(c) Point 7 is amended as follows:

(i) The following indents are added to the third paragraph:

- "- any technical apparatus used in the propulsion of a vehicle, ship or aircraft,
- gas turbines used on offshore platform."

(ii) In the fourth paragraph, the words "*or by gas turbines, irrespective of the fuel used*" are deleted.

(d) The following points are added:

- "11. "biomass" means: any whole or part of a vegetable matter which can be used for the purpose of recovering its energy content. Wood wastes and vegetable matter wastes are also considered as biomass provided that they do not fall into the scope of Council Directives 89/369/EEC, 89/429/EEC and 94/67/EC;

12. "gas turbine" means: any rotating machine which converts thermal energy into mechanical work, consisting mainly of a compressor, a thermal device in which fuel is oxidised in order to heat the working fluid, and a turbine."
2. In Article 3, paragraph 4 is deleted.
3. In Article 4, paragraph 2 is deleted.
4. In Article 5, the following sentence is added to point 1:

"This provision does not apply to new plants for which the licence is granted on or after 1 January 2000."

5. Article 7 is replaced by the following:

"Article 7

In new plants for which the licence is granted on or after 1 January 2000 the competent authorities shall ensure that there is provision for the combined generation of heat and electricity where this is technically and economically feasible. To this end, the Member States shall ensure that operators examine the possibilities of locating the installations on sites with a heat requirement."

6. Article 8 is amended as follows:

- (a) Paragraph 1 is replaced by the following:

"1. Member States shall ensure that provision is made in the licences referred to in Article 4(1) for procedures relating to malfunction or breakdown of the abatement equipment. In case of a breakdown the competent authority shall in particular require the operator to reduce or close down operations if a return to normal operation is not achieved within 24 hours, or to operate the plant using low polluting fuels. In any case the competent authority shall be notified within 48 hours. In no circumstances shall the cumulative duration of unabated operation in any one year period exceed 120 hours except in cases where, in the judgement of the competent authority, there is an overriding need to maintain energy supplies."

- (b) Paragraph 2 is deleted.

- (c) In paragraph 3, the words "*a short period*" are replaced by the words "*a period not exceeding ten days*".

- (d) In paragraph 4, the words "*this Article*" are replaced by the words "*paragraph 3*".

7. In Article 9(3), the first subparagraph is replaced by the following:

"As an alternative to paragraph 2, the following emission limit values for sulphur dioxide averaged over all new plants within the refinery and irrespective of the fuel combination used by be applied:

- (a) for plants for which a licence is granted before 1 January 2000:
1 000 mg/Nm³,
- (b) for plants for which a licence is granted on or after 1 January 2000:
450 mg/Nm³.
8. In Article 13, paragraphs 2 and 3 are deleted.
9. In Article 15, the following paragraph 4 shall be added:
- "4. For new plants for which the licence is granted on or after 1 January 2000, the emission limit values shall be regarded as complied with if:
- no validated daily average value exceeds the relevant figures set out in Annexes III to VII;
 - no validated hourly average value exceeds 200% of the relevant figures set out in Annexes III to VII.
- The "validated average values" are determined as set out in Annex IX, Part A, paragraph 6."
10. In Article 16, paragraph 3 is deleted.
11. Annexes III to IX are amended as set out in the Annex to this Directive.

Article 2

Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 31 December 2000 at the latest. They shall forthwith inform the Commission thereof.

When Member States adopt those provisions, they shall contain a reference to this Directive or be accompanied by such a reference on the occasion of their official publication. Member States shall determine how such reference is to be made.

Article 3

This Directive shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Communities*.

Article 4

This Directive is addressed to the Member States.

Done at Brussels,

For the Council

The President

- (1) The following Annex shall be added to Annex III:

"SO₂ emission limit values expressed in mg/Nm³ (O₂ content 6%) to be applied by new plants for which the licence is granted on or after 1 January 2000

| Type of fuel | 50 to 100 MWth | 100 to 300 MWth | > 300 MWth |
|--------------|----------------|---------------------------------|------------|
| Biomass | 200 | 200 | 200 |
| General case | 850 | 850 to 200 (linear decrease) | 200 |

- (2) The following shall be added to Annex IV:

"SO₂ emission limit values expressed in mg/Nm³ (O₂ content 3%) to be applied by new plants for which the licence is granted on or after 1 January 2000

| 50 to 100 MWth | 100 to 300 MWth | > 300 MWth |
|----------------|---------------------------------|------------|
| 850 | 850 to 200 (linear decrease) | 200 |

- (3) The following shall be added to Annex V:

"SO₂ emission limit values expressed in mg/Nm³ (O₂ content 3%) to be applied by new plants for which the licence is granted on or after 1 January 2000

| | |
|--|-----|
| Gaseous fuels in general | 35 |
| Liquefied gas | 5 |
| Low calorific gases from coke oven | 400 |
| Low calorific gases from blast furnace | 200 |

- (4) The following is added to Annex VI:

"Solid fuels

NO_x emission limit values expressed in mg/Nm³ (O₂ content 6%) to be applied by new plants for which the licence is granted on or after 1 January 2000

| Type of fuel | 50 to 100 MWth | 100 to 300 MWth | > 300 MWth |
|--------------|----------------|-----------------|------------|
| Biomass | 350 | 300 | 300 |
| General case | 400 | 300 | 200 |

Liquid fuels

NO_x emission limit values expressed in mg/Nm³ (O₂ content 3%) to be applied by new plants (with the exception of gas turbines) for which the licence is granted on or after 1 January 2000

| 50 to 100 MWth | 100 to 300 MWth | > 300 MWth |
|----------------|-----------------|------------|
| 400 | 300 | 200 |

Gaseous fuels

NO_x emission limit values expressed in mg/Nm³ (O₂ content 3%) to be applied by new plants (with the exception of gas turbines) for which the licence is granted on or after 1 January 2000

| | 50 to 300 MWth | > 300 MWth |
|----------------------|----------------|------------|
| Natural gas (note 1) | 150 | 100 |
| Other gases | 200 | 200 |

Gas Turbines

NO_x emission limit values expressed in mg/Nm³ (O₂ content 15%) to be applied by a single gas turbine unit for which the licence is granted on or after 1 January 2000

following limit values apply only above 70% load

| | > 50 MWth (thermal input at ISO conditions) |
|-----------------------|--|
| Natural gas (Note 1) | 50 (Note 2) |
| Liquid fuels (Note 3) | 120 |

Note 1: Natural gas is naturally occurring methane with not more than 20% (by volume) of inerts and other constituents.

Note 2: 75 mg/Nm³ in following cases:

- gas turbine used in a combined heat and power system;
- gas turbine driving compressor for public gas grid supply.

For gas turbines not falling into either of the above categories, but having an efficiency greater than 35% – determined at ISO base load conditions – the ELV shall be $50 \cdot \eta / 35$ where η is the gas turbine efficiency expressed as a percentage (and determined at ISO base load conditions).

Note 3: This emission limit value only applies to gas turbine firing light and middle distillates."

(5). The following is added to Annex VII:

"Solid fuels

Dust emission limit values expressed in mg/Nm^3 (O_2 content 6%) to be applied by new plants for which the licence is granted on or after 1 January 2000

| 50 to 100 MWth | > 100 MWth |
|----------------|------------|
| 50 | 30 |

Liquid fuels

Dust emission limit values expressed in mg/Nm^3 (O_2 content 3%) to be applied by new plants for which the licence is granted on or after 1 January 2000

| 50 to 100 MWth | > 100 MWth |
|----------------|------------|
| 50 | 30 |

Gaseous fuels

Dust emission limit values expressed in mg/Nm^3 (O_2 content 3%) to be applied by new plants for which the licence is granted on or after 1 January 2000

| | |
|--|----|
| As a rule | 5 |
| For blast furnace gas | 10 |
| For gases produced by the steel industry which can be used elsewhere | 30 |

6. The following is added to Annex VIII:

"For new plants for which the licence is granted on or after 1 January 2000

| 50 to 100 MWth | 100 to 300 MWth | > 300 MWth |
|--|-----------------|------------|
| 90% | 92% | 95% |
| NB: Installations which achieve $300 \text{ mg}/\text{Nm}^3$ SO_2 are exempt from application of the relevant rate of desulphurisation. | | |

7. Annex IX is amended as follows:

(a) Part A is amended as follows:

(i) In the title, the words *'from new plants'* are replaced by the words *'from combustion plants'*

(ii) Paragraph 1 is replaced by the following:

"1. Until 1 January 2000 concentrations of SO₂, dust, NO_x shall be measured continuously in the case of new plants with a rated thermal input of more than 300 MW. However, monitoring of SO₂ and dust may be confined to discontinuous measurements or other appropriate determination procedures in cases where such measurements or procedures, which must be verified and approved by the competent authorities, may be used to obtain concentration.

In the case of plants not covered by the first subparagraph, the competent authorities may require continuous measurements of those three pollutants to be carried out where considered necessary. Where continuous measurements are not required, discontinuous measurements or appropriate determination procedures as approved by the competent authorities shall be used regularly to evaluate the quantity of the above-mentioned substances present in the emissions.

From 1 January 2000 competent authorities shall require continuous measurements of concentrations of SO₂, NO_x, and dust from each combustion plant which falls into one of the following categories:

- new combustion plant with a rated thermal input of 100 MW or more.
- other combustion plant with a rated thermal input of 300 MW or more.

By way of derogation from the third subparagraph, continuous measurements shall not be required in the following cases:

- for combustion plants with a life span less than 10 000 operational hours;
- for SO₂ and dust from gas turbines firing natural gas or light and middle distillates.

Where continuous measurements are not required, discontinuous measurements shall be required at least each six months. As an alternative, appropriate determination procedures, which must be verified and approved by the competent authorities, may be used to evaluate the quantity of the above-mentioned pollutants present in the emissions. Such procedures shall use relevant CEN standards as soon as they are available."

(iii) Paragraph 4 is replaced by the following:

"4. The continuous measurements carried out in compliance with paragraph 1 shall include the relevant process operation parameters such as oxygen content, temperature, pressure. The continuous measurement of the water vapour content of the exhaust gases shall not be necessary, provided that the sampled exhaust gas is dried before the emissions are analysed.

Representative measurements, i.e. sampling and analysis, of relevant pollutants and process parameters as well as reference measurement methods to calibrate automated measurement systems shall be carried out in accordance with CEN standards. Until the CEN standards are drawn up, national standards shall apply.

Continuous measuring systems shall be subject to control by means of parallel measurements with the reference methods at least every one year."

(iv) The following paragraphs 5 and 6 are added:

"5. The value of the 95% confidence intervals determined at the emission limit values shall not exceed the following percentages of the emission limit value:

| | |
|-----------------|-----|
| Sulphur dioxide | 20% |
| Nitrogen oxides | 20% |
| Dust | 30% |

6. The validated hourly and daily average values shall be determined within the effective operating time (excluding start-up and shut-off periods), from the measured valid hourly average values after having subtracted the value of the confidence interval specified above.

Any day in which more than three-hourly average values are invalid due to malfunction or maintenance of the continuous measurement system shall be invalidated. If more than ten days over a year are invalidated for such situations the competent authority shall require the operator to take adequate measures to improve the reliability of the continuous monitoring system."

(b) Part B is amended as follows:

(i) In the title, the words "*new plants*" are replaced by the words "*combustion plants*".

(ii) The words "*Until 2003*" are added at the beginning of the first paragraph.

(iii) The following paragraphs are added:

"Member States shall establish, starting in 2003 and for each subsequent year, an inventory of SO₂ and NO_x emissions from all combustion plants with a rated thermal input of 50 MW or more. The competent authority shall obtain for each plant operated under the control of one operator at a given location the following data:

- the total annual emissions of SO₂, NO_x and dust (as total suspended particles),
- the total annual amount of energy input, related to the net calorific value, broken down in terms of the five categories of fuel: biomass, other solid fuels, liquid fuels, natural gas, other gases.

A summary of the results of this inventory shall be communicated to the Commission every three years within twelve months from the end of the three-year period considered. The yearly plant-by-plant data shall be made available to the Commission upon request."

(c) Part C is amended as follows:

- (i) In paragraph 1, the words "*until and including 2003*" are inserted after "*and for each subsequent year*".
- (ii) In paragraph 2, the second subparagraph is deleted.

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