COMMISSION OF THE EUROPEAN COMMUNITIES

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COMMUNICATION FROM THE COMMISSION TO THE COUNCIL

Chlorofluorocarbons in the environment: a reexamination of control measures

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Proposal for a

COUNCIL DECISION

authorizing the Commission to participate in the negotiations for a protocol on chlorofluorocarbons to the Vienna Convention for the Protection of the Ozone Layer

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(submitted to the Council by the Commission)

COMMUNICATION FROM THE COMMISSION TO THE COUNCIL

CHLOROFLUOROCARBONS IN THE ENVIRONMENT : A REEXAMINATION OF CONTROL MEASURES

I. INTRODUCTION

By implementing the Council Decisions of 26 March 1980[1] and 15 November 1982[2] the Community has taken a number of measures to limit and reduce emissions into the atmosphere of certain chlorofluorocarbons (CFCs) which have the potential to reduce the ozone content of the stratosphere with consequent dangers for health and the environment. The principal measures which have been applied are :

- a production capacity standstill for CFCs 11 and 12 at the level existing in 1980, for which the reference figure for EEC (10) is 480 000 tonnes per year (this is to be adjusted to cover the additional capacity in EEC (12) represented by production plants in Spain, which we understand to have a total of 57 600 tonnes per year capacity);

- a reduction of at least 30 percent in the amount of CFCs 11 and 12 used for the manufacture of aerosols, relative to the amount used in 1976;

- the promotion of action to reduce CFC usage and emissions in the main non-aerosol applications : refrigeration, foam plastics and solvents.

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(1) Decision 80/372/EEC O.J. N° L 90, 03.04.80, p. 45

(2) Decision 82/795/EEC O.J. L 329, 25.11.82, p. 29

Since 1976 the Commission has monitored levels and trends in the production and sales of CFCs 11, 12, 113 and 114 in the Community by means of the annual statistics provided by the European CFC producers under the data collection system described in the Communication of 26 May 1981[3].
On 16 June 1983 the Council took note of a Communication[4] in which the Commission concluded that no change in the Community's precautionary measures policy was warranted by the available scientific and economic information, but that a re-examination of the situation could be undertaken in normal circumstances by the end of 1985.

It became necessary, however, to defer the re-examination pending the outcome of two important events arranged by UNEP in 1986. The first was a CCOL review of the ozone layer situation in the light of a comprehensive scientific assessment sponsored by NASA and other national and international bodies including the EEC. The second was a two part Workshop held in May and September 1986 to examine possible CFC control options, preparatory to the negotiations for a CFC protocol to the Vienna Convention which will resume in December 1986. Accordingly the Commission submitted a Communication[5] to Council proposing that the next re-examination should be undertaken in the second semester of 1986, and the Council took note of that Communication in December 1985.

The purpose of the present Communication is to summarise the present position, taking account of the recent CCOL review and UNEP Workshop proceedings, and to present the Commission's considered view on the course to be adopted in respect of the existing CFC control measures in the Community, and the forthcoming negotiations in UNEP.

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(3) COM (81) 261 final, 26.05.1981

(4) COM (83) 284 final, 31.05.983

(5) COM (85)644 final, 19.11.1985

II. THE SCIENTIFIC ASSESSMENT

The physical and chemical processes which control atmospheric ozone are now recognised as being far more complex than was appreciated when the theory of ozone depletion due to CFCs was first advanced in 1974. The amount of ozone in the stratosphere is the result of a balance between generation and loss processes, the former being controlled by solar radiation and largely independent of human activities. The loss processes, both natural and man made, are determined by emissions not only of CFCs but of a number of other trace gases, notably methane (CH4), nitrous oxide (N2O) and carbon dioxide (CO2), the abundance of which in the atmosphere is also observed to be rising.

The ozone depleting effect of CFCs is due to the catalytic effect of active chlorine atoms formed by decomposition of CFCs in the stratosphere by ultra-violet radiation. But active chlorine can also arise from other organic chlorine compounds such as methyl chloroform (CH_3CCl_3) which is manufactured in large tonnages. Bromine atoms also catalyse ozone decomposition, and emissions of certain bromine compounds are now rising due to their use as fire extinguishants.

Any changes in the emission rates of these trace gases may affect ozone levels, and to predict what may happen in the years ahead it is necessary to use computerised mathematical models which represent all the complex interactive processes involved. The model predictions, however, are dependent on the assumptions that have to be made on future emissions of the various trace gases, some of which are partly of natural origin. Methane is particularly important because it acts as a "sink" for active chlorine. The extent to which CFCs may cause ozone depletion is therefore related to the rate of methane emission.

To calculate future ozone changes it is thus always necessary to construct a total trace gas emission scenario in which CFCs are only one set of components.

In the 1986 CCOL review, three different CFC emission growth rate were considered : zero (i.e. continuing emissions at 1980 levels); 1.5 % per year compounded and 3 % per year compounded. These three scenarios

were examined in conjunction with currently observed trends in other trace gases, and at zero CFC emission growth the model predicted no total ozone change, mainly because the depleting effect of CFCs would be offset by methane. For CFC emission increases of less than 1.5 % per year the total ozone column change was found to be less than 3 % over the next 70 years but with a sustained CFC growth rate of 3 % per year the predicted ozone depletion after 70 years is 10 % and rapidly increasing.

These predictions relate to the total ozone column and in fact are combinations of quite large percentage decreases in the upper stratosphere and large increases at lower altitudes, the former geing mainly due to CFCs and the latter mainly to methane - hence the critical influence of methane in the equation.

The total column ozone changes are derived from one-dimensional models relating only to altitude, but two-dimensional models take latitude and season into account and these predict that ozone depletion will be greater at high latitudes than at the equator. In other words, a degree of total ozone depletion which might be regarded as presenting a relatively small risk could imply depletion at high latitudes which would be viewed with alarm by the populations concerned.

It should be noted that existing models do not account for the recently reported large decreases in the ozone column over Antarctica during spring. This is to be the subject of a special investigation and, while the outcome could affect regulatory policy, it appears premature to take the phenomenon into account in the initial formulation of a CFC protocol.

To summarise the current scientific situation, although there are uncertainties it is believed that if sufficient chlorine enters the upper atmosphere from whatever source or activity, ozone depletion will depend on the combined effects of a number of trace gases, and two-dimensional models predict that depletion will vary with season and latitude, being greater at high latitudes and in Spring.

Observations by ground-based instruments have not disclosed a significant trend in total ozone over the past 15 years.

To validate and refine model prediction capability it is necessary to obtain more data on trace gase concentrations in the atmosphere, and much is expected from a program of satellite observations.

Although this brief review has concentrated on ozone depletion, it should be remembered that many of the trace gases concerned - including CFCs and also ozone itself - are also "greenhouse" gases which may cause global warming and consequent climatic and other effects. Changes in the vertical distribution of atmospheric ozone expected due to the effects of CFCs are also predicted to be significantly important for the climate change issue.

It is clear, therefore, that any system of CFC control must have enough in-built flexibility to respond to rapidly advancing knowledge of atmospheric processes, and that measures may also have to be developed for emissions of other substances.

III. ECONOMIC TRENDS

It is now possible to review production and use data for CFCs 11, 12, 113 and 114 in the EEC over a ten year period, 1976 to 1985, and the statistics are summarised in the tables and graphs in Annex I.

For CFCs 11 and 12 the main features are as follows :

- from 1976 to 1982, there was an overall downward trend in production - which effectively represents total sales - and this was mainly due to decreasing sales for aerosols. The trend in the past three years has been upwards because the reduction in sales for aerosols has been halted, while sales for non-aerosol uses, mainly foam plastics, and for exports, have continued to rise;

- the production of 336.3 kilotonnes in 1985 represents 70 % of nominal total capacity for the EEC (10) of 480 kt per year. Portugal has no CFC production, and production figures for Spain will not be available until the 1986 figures are issued in the first half of 1987;

- usage for aerosols of 117.6 kt in 1985 is 33.5 % below the 1976 reference level. Despite small increases since 1982 this is still well below the ceiling of 123.8 kt represented by the maximum of 70 % of the 1976 total set by the Council Decision of 26 March 1980;

- refrigeration and miscellaneous uses have registered significant rises in percentage terms but represent relatively minor proportions of EEC sales : 10.6 % and 5.3 % respectively in 1985.

Turning to the picture for CFCs 113 and 114, it will be noted that the total production of these two compounds has increased from 23.5 kt in 1976 to 64.3 kt in 1985, representing a compound annual growth rate over the 9 years of 11.8 %. Most of this growth is in the use of CFC 113 for solvent cleaning applications and is mainly associated with the development of the electronics industry.

In 1985 EEC (10) production of CFCs 113 and 114 equated to 16 % of the total production of the four CFCs : 11, 12, 113 and 114.
The level of imports into the EEC of CFCs 11, 12, 113 and 114 is thought to remain negligible.

Figure 1 and Table 3 in Annex 1 show how EEC production and use of CFCs 11 and 12 relate to be the global totals for the companies which report under the data collection scheme administered by the US Chemical Manufacturers Association. In 1985 EEC production represented 48 % of the CMA total, and production outside the EEC has also been rising since 1982.

There is a contrast in the pattern of CFC 11 and 12 usage within and outside the EEC. In 1985 over 51 % of sales in the EEC were for aerosols compared with 22 % outside, whereas sales for refrigeration

accounted for only 11 % compared with 40 % outside the Community. The percentages for foams and other uses were very similar, at about 33 % and 6 % respectively within and outside the EEC.

IV. THE TECHNICAL SITUATION

The technical possibilities for reducing perhalogenated CFC usage in the main application sectors was one of the topics examined in the UNEP Workshop.

In the aerosol field, European and Japanese experience is that CFCs cannot be fully replaced in some major personal product sectors without serious loss of quality although partial replacement with CFC/hydrocarbon blends is possible and already widely employed. In the USA conflicting views were expressed on this issue. Extensive studies in the Netherlands have indicated that dimethylether in aerosols presents no danger for health and the environment and this propellant may increase the scope for CFC substitution.

No substitutes are yet available for CFC blowing agents for rigid (closed cell) foams for insulation purposes. For flexible foams methylene chloride is used instead of CFCs by some manufacturers, especially in the US, but most European producers would reject this move on health as well as technical grounds. Successful trials for an activated carbon filter unit for recovering CFC 11 in flexible polyurethane slabstock manufacture are reported from Denmark, but further technical evaluation is required and there are doubts about the economics.

Prospects for CFC 12 replacement in refrigeration and air conditioning appear limited but some replacement with non-perhalogenated CFCs is possible and there is scope for reducing losses by improved leak detection practice and equipment design, and by reclamation.

There are alternative cleaning solvents for CFC 113, but for some applications it is still considered technically irreplaceable.

In an extensive search by a major CFC producer for alternatives to the principal fully halogenated commercial CFCs it was concluded that no fully satisfactory fluorocarbon alternatives would become available in the foreseeable future.

V. FUTURE CFC CONTROL OPTIONS

The 1986 UNEP Workshop on the Control of Chlorofluorocarbons examined a range of control options against a set of criteria, including effects on emissions and consequent atmospheric modification, cost effectiveness, equity and ease of implementation and monitoring.

It was not the function of the Workshop to reach a concensus but the weight of opinion clearly supported the Community policy of a production capacity limit as being the only realistic long term global control measure. As the limit is approached, the market price mechanism would operate to channel consumption into the uses of CFCs perceived as being the most socially valuable, and stimulate research for substitutes and alternative technology in all application fields. Arbitrary restrictions on specific uses result in emission reduction in the short term but fail to encourage searches for alternatives in the others, and recent history has demonstrated how non-aerosol uses are offsetting the reductions due to aerosol restrictions.

The level at which a production limit should be set is debatable, however, and some experts at the UNEP Workshop believed that there is a case for immediate action to reduce production below present levels.

The question also arises as to how secure an equitable distribution of the facility to produce and use CFCs. Two contructive suggestions in particular were put forward at the UNEP Workshop in Washington by Canadian and Japanese experts. The Canadian paper suggested that a global emission limit should be set and that individual countries should be given quota shares of that emission limit based on population and national income. The proposal aroused considerable interest at the Workshop and clearly merits detailed examination. There do appear however to be some difficulties which have to be overcome before any such scheme can be implemented. First, it would be necessary to agree

on a global emission limit, ideally based on a scientific assessment of a safe level of emissions, but perhaps based on historical levels of production or in some other pragmatic way. In addition, in order to avoid unnecessary disruption of current production and trade, there would need to be detailed monitoring of exports and imports, not only of CFCs but of all products containing CFCs or whose manufacture has involved the use of CFCs.

The Japanese proposal advocated a provisional regulatory measure to "cap" CFC 11 and 12 production capacity at existing levels, in line with current EEC control measures. This would be followed by the establishment within, say, five years, of a national quota system for production and consumption. This approach provides for early action to secure an emission limit, while recognising that time will be needed to develop an acceptable method of meeting individual national requirements.

VI. CONCLUSIONS AND RECOMMENDATIONS

1. Having examined all aspects of the current situation, and after considering the views put forward at the recent UNEP Workshop, the Commission concluded that the present Community measures for controlling the use and in particular the production of CFCs represent an intrinsically sound framework policy, but recognises that modification in detail may be required in the context of a global regulatory system, and in the light of advancing scientific and technical knowledge. For example this may involve setting a limit on production, which could be below current capacity. At the same time the Commission will continue to examine how the Community might participate in a global programme for monitoring levels in the concentrations of trace gases in the atmosphere which may affect ozone.

2. Pending the outcome of the forthcoming negotiations for a CFC protocol, the Commission considers that the status quo in respect of the existing Council Decisions on CFCs in the environment should be maintained.

3. Accordingly, the Commission invites the Council to take note of this Communication and to authorise the Commission to participate in negotiations for a CFC protocol to the Vienna Convention in accordance with the attached draft Negotiating Mandate.

ANNEX 1

CFC PRODUCTION AND USE STATISTICS

Contents:

Data sources:

EEC : Independent accountants acting for European Fluorocarbon Technical Committee (EFCTC) of Council of European Chemical Manufacturers Federations (CEFIC).

USA : US International Trade Commission (ITC)

CMA Reporting Company totals : Independent accountants acting for US Chemical Manufacturers Association (CMA). (The EEC producers report under the CMA and EFCTC annual data collection systems).

Note: EEC data for years 1976 - 1980 is for EEC-9; data for years 1981 - 1985 is for EEC-10 and includes Greece but excludes Spain and Portugal. After 1977, EEC data for CFC 113 & 114 has been issued only when the annual production exceeds 45,000 tonnes. The CMA data reporting scheme does not cover CFC 113 & 114.

TABLE 1. CFC 11 and 12 PRODUCTION AND SALES BY EEC PRODUCERS : 1976 - 1985

Unit : thousand tonnes CFC 11 and 12

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Change: 1976 to 1985 '000 tonnes	%
PRODUCTION (including imports from outside EEC)	326.4	319.1	307.0	304.2	295.7	300.1	289.0	310.2	322.2	336.3	+ 9.8	+3.0
SALES IN EEC												
Aerosols	176.9	162.6	150.4	136.5	126.4	116.1	111.7	113.9	114.7	117.6	-59.3	- 33.5
Non-aerosol uses:												
Refrigeration	20.8	20.3	20.4	20.3	21.2	21.5	21.2	21.6	23.1	24.3	+ 3.5	+ 17.0
Foam Plastics	42.2	45.3	54.5	55.8	61.9	64.1	65.6	70.1	69.4	74.4	+32.2	+ 76.5
Solvents/Other Uses	4.2	4.9	6.1	6.9	7.4	8.1	8.2	10.9	10.6	12.1	+ 7.9	+190.0
Total: non-aerosol uses	67.1	70.4	81.0	83.0	90.0	93.6	95.1	102.5	103.1	110.8	+43.7	+ 65.1
TOTAL SALES IN EEC	244.0	233.0	231.4	219.6	216.8	209.8	206.8	216.4	217.7	228.5	-15.6	- 6.4
TOTAL EXPORTS OUTSIDE EEC	83.6	81.2	82.2	81.6	79.4	88.2	82.0	91.2	103.4	107.4	+23.9	+ 28.6
TOTAL EEC AND EXPORT SALES	327.6	314.2	313.7	301.2	296.2	298.0	288.8	307.6	321.1	335.9	+ 8.3	+ 2.5
Production less sales	- 1.2	+4.9	- 6.6	+ 3.0	- 0.5	+ 2.1	+ 0.2	+ 2.5	+ 1.1	+ 0.4		

TABLE 2. CFC 113 AND 114 PRODUCTION AND SALES BY EEC PRODUCERS : 1976 - 1985

Unit : thousand tonnes CFC 113 and 114

	1976	1977		1984	1985	Change: 1976 to 1985 '000 tonnes	%
PRODUCTION (including imports from outside EEC)	23.5	23.9		53.6	64.3	+40.8	+173.5
SALES IN EEC							
Aerosols	5.2	5.3		5.3	5.4	+ 0.2	+ 4.0
Non-aerosol uses:							
Refrigeration	0.1	0.2	Data	0.3	0.3	+ 0.2	+127.4
Foam Plastics	0.4	1.0	for	1.7	2.6	+ 2.2	+596.0
Solvents/Other Uses	11.9	12.8	1978-83 not issued	31.3	35.4	+23.5	+198.1
Total: non-aerosol uses	12.4	14.0		33.3	38.3	+25.9	+209.3
TOTAL SALES IN EEC	17.6	19.3		38.6	43.7	+26.1	+148.6
TOTAL EXPORTS OUTSIDE EEC	5.2	5.7		12.9	20.0	+14.8	+286.5
TOTAL EEC AND EXPORT SALES	22.8	25.0		51.5	63.7	+40.9	+180.0
Production less sales	+0.7	-1.1		+2.1	+0.6		

TABLE 3. CFC 11 AND 12 SALES BY APPLICATION WITHIN AND OUTSIDE THE EEC BY CMA REPORTING COMPANIES IN 1985

Unit: thousand tonnes (kt) CFC 11 and 12

Application	Sales in EEC		Sales outside EEC		World Sales by CMA reporting companies	
	kt	%	kt	%	kt	%
Aerosols	117.6	51.5	102.5	21.6	220.1	31.3
Refrigeration	24.3	10.6	187.6	39.5	211.9	30.1
Foam Plastics	74.4	32.6	157.1	33.1	231.4	32.9
Other non-aerosol uses	12.1	5.3	27.5	5.8	39.6	5.6
Total: Non-aerosol uses	110.8	48.5	372.2	78.4	483.0	68.7
TOTAL : ALL APPLICATIONS	**228.5**	**100.0**	**474.7**	**100.0**	**703.2**	**100.0**

Note: Sales outside EEC derived by difference between reported figures for total sales by CMA reporting companies and sales within EEC reported by EFCTC

FIG. 1

ANNUAL EEC, USA AND WORLD PRODUCTION OF CFC 11 AND 12 BY CMA REPORTING COMPANIES : 1970 - 1985

Sources : EFCTC, ITC, CMA

(EEC production excludes Spain but includes Greece after 1980)

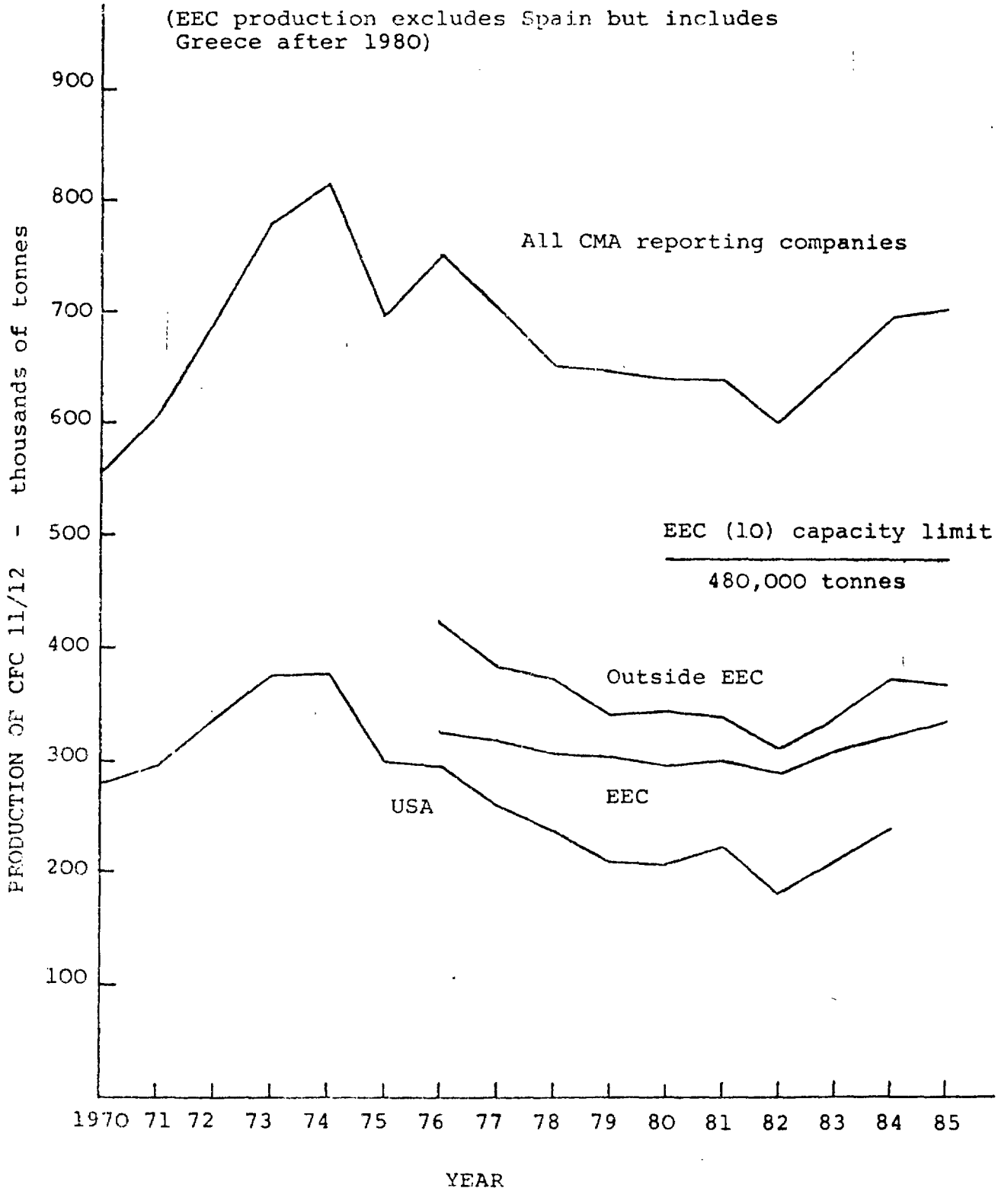
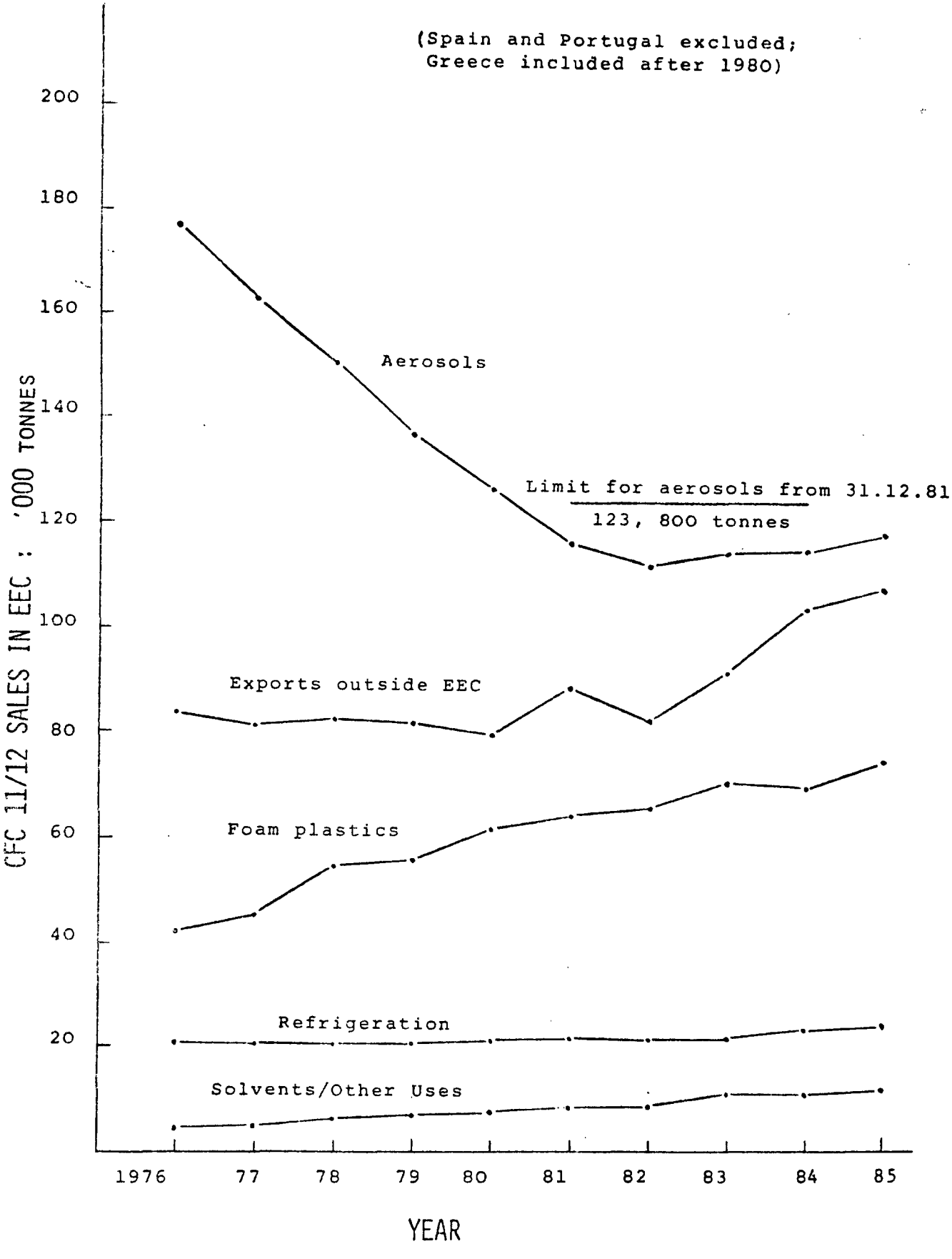


FIG 2. CFC 11/12 SALES BY EEC PRODUCERS: 1976-1985



Proposal for a

COUNCIL DECISION

AUTHORISING THE COMMISSION TO PARTICIPATE IN THE NEGOTIATIONS FOR A PROTOCOL ON CHLOROFLUOROCARBONS TO THE VIENNA CONVENTION FOR THE PROTECTION OF THE OZONE LAYER

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community,

Having regard to the proposal from the Commission,

Whereas the aim of the Community environment policy as stated in the Declaration of the Council of the European Communities and of the representatives of the Governments of the Member States meeting in the Council of 22 November 1973 on the programme of action of the European Communities on the environment [1], supplemented by the Resolution of the Council of the European Communities and of the representatives of the Governments of the Member States meeting within the Council of 17 May 1977 on the continuation and implementation of a European Community policy and action programme on the environment [2], namely the improvement of the quality and setting of life, of the surroundings and living conditions of the people of the Community, implies, in particular, preventing, reducing and as far as possible, eliminating pollution and nuisances as well as seeking common solutions particularly within international organizations to environmental problems with States outside the Community;

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[1] O.J. n. C 112, 20/12/1973, page 1

[2] O.J. n. C 139, 13/6/1977, page 1

Whereas in accordance with this policy the Council has already adopted measures concerning chlorofluorocarbons in the environment, and action on an international level, particularly in the framework of the United Nations Environment Programme, has been promoted by the Community;

Whereas the Governing Council of the United Nations Environment Programme, at its ninth session, decided to initiate work aimed at the elaboration of a global framework Convention for the protection of the ozone layer;

Whereas the Vienna Convention for the Protection of the Ozone layer was opened for signature on 22 March 1985 and has been signed by the European Community and the Member States;

Whereas the Report of the Eighth Session of the Coordinating Committee on the Ozone layer, and the proceedings of the two-part Workshop on chlorofluorocarbons, held in the context of the United Nations Environment Programme, have provided valuable insight as to the current state of scientific knowledge and the possibilities for control of chlorofluorocarbons on a global scale;

Whereas in view of the abovementioned considerations and because of the competences of the Community in this area, it is necessary for the Community to participate in the negotiations for a protocol on chlorofluorocarbons to the Vienna Convention for the Protection of the Ozone layer, which will commence in Geneva in December 1986;

HAS DECIDED AS FOLLOWS:

Sole Article

The Commission is hereby authorized to participate in the negotiations for a protocol on chlorofluorocarbons to the Vienna Convention for the Protection of the Ozone Layer.

The Commission will conduct these negotiations in consultation with Representatives of the Member States and in conformity with the annexed directives.

ANNEX

Directives for the negotiations

The negotiations should aim towards the elaboration of a protocol concerning chlorofluorocarbons. This would provide for appropriate global strategies and policies for the control of emissions of chlorofluorocarbons, which should be consistent with the broad framework of existing policies developed in the Community, but should recognise that the changing state of scientific knowledge, and the positions of other parties to the negotiations, may require some changes to the details of those policies.

The negotiations should also aim at ensuring that appropriate provisions enabling the Community to become a Contracting Party are contained in the protocol.