Protocol

THE WHITE HOUSE

WASHINGTON

May 29,1987

MEMORANDUM FOR NANCY RISQUE AND GARY BAUER

FROM: BOB SWEET AND JAN MARES

SUBJECT: Stratospheric Ozone Protocol Negotiations

The Environmental Protection Agency, under terms of a court order resulting from a lawsuit by the Natural Resource Defense Council against the EPA Administrator, must publish in the Federal Register by December 1, 1987, a proposed decision on whether there is need for further domestic regulation, under the Clean Air Act, of chemicals which deplete the stratospheric ozone layer. These chemicals (certain chlorofluorocarbons (CFCs) and halons) are used for solvents, refigerants, foam blowing, fire extinguishing agents, sterilants, aerosal propellants, and other miscellaneous uses.

Compared to other environmental laws, the Act sets a low threshold for required action by EPA. The U.S. produces over one-third of the world's CFCs and halons. Because of the global nature of the problem of ozone depletion, unilateral U.S. regulatory action would not be as effective in protecting the ozone layer as uniform global action.

The U.S. has been participating in international negotiations since 1983 on this subject, leading to the 1985 Vienna Convention on Protection of the Ozone Layer. Negotiations on a protocol to this Convention resumed in December, 1986, and the protocol is scheduled for signing in September, 1987 in Montreal. An important U.S. objective in attaining an early and effective international agreement on ozone is to avoid disadvantages to U.S. economy resulting from unilateral U.S. action that may be required by the Clean Air Act.

The objectives for the U.S. government in the international negotiations were established in State Department Circular 175 of November 28, 1986, which was cleared on an interagency basis. These objectives include:

(a) a near-term freeze on the combined emissions of the most ozone-depleting CFC and halon substances;

(b) long-term scheduled reductions of emissions of these chemicals down to the point of eliminating emissions from all but limited uses for which no substitutes are commercially available (could be as much as 95%) subject to (c) and;

(c) periodic review of the protocol provisions based upon regular assessment of science, technology, environmental, and economic (STEE) elements, which could remove or add chemicals, or change the schedule or the emission reduction target.

The major unresolved issues concerning the international negotiations which are being discussed within the Domestic Policy Council Working Group process are:

(a) the extent of uncertainties on the science, assumptions, models estimating the effects, and costs and benefits relating to the CFC and halon emissions and their reduction; and

(b) whether the implications of the science, assumptions, and models warrant an international agreement now for a reduction in CFC's and halon emissions beyond a freeze at 1986 levels, subject to reversal if the STEE elements warranted reversal as opposed to providing a mechanism for agreeing in the future on reductions in emissions based on the STEE elements.

EPA, State, and some others appear to believe the analysis of the science, costs, and benefits justifies an international agreement that would provide for a scheduled 20% reduction in the CFC emissions and a further 30% reduction if the STEE elements warrented.

OSTP, Interior, and most others appear to believe an international agreement on a freeze of CFC and halon emissions is justified but believe any reduction steps beyond a freeze should be based on future reviews of STEE elements and subsequent agreements.

Two other major issues on which there is no apparent interagency disagreement but which have not been resolved because of their enormous implications, complexity, and difficulty are:

(a) how the trade and enforcement aspects of the protocol will be established so that the U.S. is not one of few parties complying with the protocol and doing so to its disadvantage, and

(b) how the less developed countries will be encouraged to participate in the protocol and give up the possibility of future significant use of CFCs whose replacements are currently forecast to be more expensive.

There is also no present agreement amongst the protocol countries on these two issues.

5/26
depletion

May 26, 1987

MEMORANDUM FOR DONALD PEARLMAN
BECKY NORTON DUNLOP
MARTIN SMITH
EILEEN CLAUSSEN
DR. BEVERLY BERGER
DAVID GIBBONS
DR. STEVE DECANIO
JACK CAMPBELL

FROM: JAN W. MARES

SUBJECT: Stratospheric Ozone Depletion; Effects and Costs of Depletion

In preparation for this afternoon's meeting at 5:00 p.m. in my office of the ad hoc "cost benefit" working group of the DPC E & NR Working Group I have prepared for your review, correction and change the enclosed draft, tentative list of objectives with respect to various possible effects of stratospheric ozone depletion. The attachment also lists, in some cases, possible alternative ways to achieve the objectives as well as lists possible questions for evaluation of the cost of the specific effect at varying rates of CFCC growth. In each case that is to be considered the four CFC production cases to be evaluated should be (a) the EPA baseline case of about 2.5% annual growth of ozone depletion substances with the absence of controls; (b) a freeze by 1988-1990 at 1986 production levels of CFC's and Halons; (c) the same as (b) plus a further 20% reduction in CFC's after two to four years; and (d) the same as (c) plus a further 30% reduction in CFC's after another four to six years.

Section 157B of the Clean Air Act states in pertinent part: "The Administrator shall propose regulations for the control of any substance, practice, process, or activity (or any combination therof) which in his judgement may reasonably be anticipated to affect the stratosphere, especially ozone in the stratosphere, if such effect in the stratosphere may reasonably be anticipated to endanger public health or welfare."

I will leave it to others to determine whether this Section permits the Administrator to consider behavior changes or other protective or adaptive action by humans to respond to possible depletions of stratospheric ozone.

I am also enclosing three pertinent charts of effects from various EPA and Science Board briefings.

5/26

depletion 1

Possible Objectives and Costs of Achieving Same
Related to Depletion of Stratospheric Ozone and
Possible Alternative Ways of Achieving Such Objectives

I. Reduce skin cancer cases and deaths.

A. Cases to evaluate the cost with respect to the four CFC emission case possibilities listed in May 26, 1987 memo and on page 5 below:

(i) lives currently in being;

(ii) lives currently in being plus those born during the next 15 to 25 years; and

(iii) EPA base case of deaths through 2165.

B. Alternative reduction strategies whose cost should be "guestimated" but which may reduce the base line incidence of skin cancers:

(i) reduce exposure to UV(B) through (a) sunscreens, (b) protective clothing, or (c) behavior change like staying out of the sun or using warning device; and

(ii) develop "cheaper", more effective medical practices to remediate cases of skin cancer.

II. Reduce the potential adverse impact on the human immune system from an increase in UV(B).

A. "Guestimate", with ranges, the increase in deaths from infectious diseases that would occur under the four CFC emission cases due to the adverse effect on the human immune system. This "guestimate" should be done with respect to:

(i) lives currently in being;

(ii) lives currently in being plus those born during the next 15 to 25 years; and

(iii) lives existing in EPA's base line case through 2065.

B. Alternative strategies to reduce the adverse effect on the human immune system from an increase in UV(B) whose "costs" should be "guestimated" include:

(i) reduce exposure to UV(B) through (a) sunscreens, (b) protective clothing, or (c) behavior change;

(ii) develop cheaper, more effective medical practices to deal with those diseases which the human immune system protects against.

III. Reduce the potential adverse impact on plant life of an increase in UV(B).

A. Use a more conservative assumption than in the soybean study, namely that 1/4, not 2/3 of the cultivars, are adversely affected by UV(B) to the same extent as soybeans and that no cultivars are benefitted by increased UV(B) and "guestimate" the impact either per year or cumulatively during the next 25 years of the four CFC cases:

B. Alternative strategies to be "costed out" include:

(i) identify and further develop species of cultivars that are resistant to UV(B); and

(ii) since the incidence of UV(B) varies on the globe today, change the use of seeds for various cultivars gradually as the UV(B) intensity changes.

IV. Reduce the potential adverse effects on acquatic life.

A. based on the anchovey analysis assume that commercial and recreational fishing are adversely affected to 1/100th the similar amount as the anchovey's for similar increased UV(B) exposure and "guestimate" the impact of such fishing either per year of cumulatively during the next 25 years of the four CFC cases.

B. No apparent alternative protection strategies.

V. Reduce the potential adverse effects of increased cataracts in humans.

A. Estimate the added number and/or cost of correction of cataracts to be expected in each of the four CFC cases for the following groups of people:

(i) lives currently in being;

(ii) lives in being plus those born during the next 15 to 25 years; and

(iii) lives existing in EPA's base line case through 2065.

B. Alternative strategies whose costs should be "guestimated" include:

(i) provide sunglasses to everyone;

(ii) provide other protective measures measures, like a hat and urging people to stay out of the sun; and

(iii) develop "cheaper" medically corrective procedures.

VI. Reduce potential adverse effects on polymers.

A. "Guestimate" cost of polymer deterioration either of PVC alone or also of some realistic multiple of PVC on a per year or cumulative basis during the next 15 to 25 years and during the next approximately 50 years for each of the four CFC cases.

B. Alternative strategies whose cost should be "guestimated" include:

(i) develop and use more effective UV(B) resistant polymers;

(ii) develop and use more effective UV(B) resistant additives to polymers to prevent degredation; and

(iii) use alternative materials than PVC which are more resistant to UV(B).

VII. Reduce potential for increased ground level ozone concentrations.

A. "Guestimate" the average increase in ozone concentration that may occur during the next 10 to 25 years from the four CFC cases; "guestimate" the average cost to reduce other ozone precursors by an amount equivalent to the subject increase in ozone during the same time period and for the same cases.

B. Alternative strategies. None apparent

VIII. Reduce potential for increased global temperature due to stratospheric ozone depletion.

A. For each of the four CFC cases "guestimate" the potential change in global temperature at approximately 25 year intervals for the next century.

B. Alternative strategies. None apparent.

IN EACH ESTIMATE OR "GUESTIMATE" IN THE ABOVE EIGHT EVALUATIONS SOME RANGE OF UNCERTAINTY SHOULD BE INDICATED AS WELL AS, IF FEASIBLE, THE RANGE OF NATURAL VARIATION IN THE SUBJECT QUANTITY.

The "four CFC emission cases" are:

(a) the Epa baseline case of about 2.5% annual growth of ozone depletion substances with the absence of controls;

(b) a freeze by 1988-1990 at 1986 production levels of CFC's and Halons;

(c) the same as (b) plus a further 20% reduction in CFC's after two to four years; and

(d) the same as (c) plus a further 30% reduction in CFC's after another four to six years.

The exact assumptions regarding compliance with the "freeze" and "reduction" in the U.S., and the developing countries needs to be explicitely stated by EPA.

SAB-EC-87-025

REVIEW OF EPA'S

AN ASSESSMENT OF THE RISKS OF STRATOSPHERIC MODIFICATION

BY THE

STRATOSPHERIC OZONE SUBCOMMITTEE

SCIENCE ADVISORY BOARD

U. S. ENVIRONMENTAL PROTECTION AGENCY

March, 1987

Effect	State of Knowledge	Potential Global Impact
Skin Cancer	Moderate to high	Moderate
Immune System	Low	High
Cataracts	Moderate	Low
Plant Life	Low	High
Aquatic Life	Low	High
Climate Impacts*	Moderate	Moderate
Tropospheric O_3 and H_2O_2	Moderate	Low
Polymers	Moderate	Low

* Contribution of O_3 to climate changes, including sea level rise

A principal use of this table could be as a guide to research planning, especially in conducting research for effects where current knowledge is low and potential global impacts are high. Such a table is, however, an imperfect guide for allocating research dollars, and is subject to change as new information becomes available.

The Subcommittee does not know, based on current knowledge, whether effects with a potential global impact designated as "high" with a state of knowledge designated as low will occur but, if such effects are experienced, they could be significant.

e) The Executive Summary should devote less emphasis to climate change and its effects, such as sea level rise. It should focus, instead, on the contribution of changes in ozone concentration to climate modification, rather than reviewing all the radiatively-active gases that affect climate. We recognize that the ozone depletion and global warming (greenhouse) issues are linked; nonetheless, the emphasis in this document should be placed on stratospheric, rather than tropospheric processes.

IV. Specific Comments on Individual Chapters

Chapter 1: Goals and Approach

This short introductory chapter was not formally reviewed. The

TUES 5 PM
NRDC ETC.

Some utility systems require 113/2

where is next Colcatini scenario

PRELIMINARY ANALYSIS OF COSTS AND BENEFITS OF
STRATOSPHERIC OZONE PROTECTION

MAY 6 global warming

U.S. EPA
OFFICE OF AIR AND RADIATION

APRIL 10, 1987

DO NOT QUOTE, CITE, OR REPRODUCE
PRELIMINARY COST ESTIMATES SUBJECT TO REVIEW AND REVISION

BENEFITS -- THE NUMBERS BELOW THE DOUBLE LINE ARE REDUCTIONS FROM NO CONTROL CASE

	Skin Cancer Cases (millions)[a/,b/]	Skin Cancer Deaths (thousands)[a/,c/]	Polymer Damage (millions)[a/,d/]	Equilibrium Global Warming (assumes 3°C for 2 x CO2)[a/,h/]	Sea Level Rise Due to Thermal Expansion (cm)[a/,i/]	Soybeans (Essex) (example)[a/,e/]	Ozone (ground-based ceramic)[a/,f/]	Anchovy Damage (example)[a/,j/]
No Controls[b/]	(>105)	(>2000)	(>2000)	(5.7 C)	(98)	(>19)	(22%)	(25)
Freeze[b/]	>92	>1,792	>1,090	0.9	6.4	>15	17%	24
50% Phasedown[a/]	>97	>1,875	>1,282	1.1	8.0	>16	19%	

a/ A recent science panel convened by UNEP intercompared 1-D models and found the 1-D parameterization used in this analysis has the lowest depletion estimates, perhaps 3% less than other models. (Personal communication: Dr. Robert Watson.) Readjustment of estimates upwards will be necessary. In addition, 2-D models tend to show greater depletion north of 40 N.

b/ Baseline annual growth (2.5%) in the use of ozone-depleting substances in the absence of controls. No growth assumed after 2050. The freeze is analyzed assuming a freeze at 1986 levels, starting in 1990, 2nd stage starts by 1996; 100% compliance in the U.S.; 80% compliance among other developed nations; developing nations allowed to grow to the current global use per capita; 80% compliance assumed among developing nations; compounds covered include: CFC-11, -12, -113, Halon 1211, 1301. Assumption of baseline growth in non-complying countries and developing world undergoing revision so that growth rate depends on protocol stringency.

c/ Cancer estimates are to 2165 in the U.S. Total includes basal cell, squamous cell, and melanoma skin cancers. Based on DNA- damage action spectrum. Values are underestimated because increasing baseline rate and population aging are not considered.

d/ For PVC in the U.S. only. Damage to other polyers may be expected.

e/ Estimate based on extrapolation of Essex, a sensitive cultivar. Actual damage expected to be lower since only 2/3 of the cultivars are sensitive.

f/ Based on a single case study and chamber study. Results in process of verification. Number shown is average for three case study cities.

g/ Based on a single study. Assumes 10 meter mixed layer. If larger or smaller, results could be large.

h/ Based on 3°C climate sensitivity. Equilibrium warming.

i/ Based on 3°C climate sensitivity and diffusivity of 1.7 cm^2/sec. Contributions from Antarctic discharge are not modeled as temperature sensitive.

j/ Based on 10 meter mixing layer, see Risk Assessment draft.

BRIEFING FOR OMB ON

U.S. INTERNATIONAL AND DOMESTIC STRATOSPHERIC PROTECTION PROGRAM

PREPARED BY

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF AIR AND RADIATION

MARCH 24, 1987

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JUSTIFICATION OF U.S. POSITION ON STRINGENCY

PARTIAL LIST OF REDUCED DAMAGES

Baseline Growth	Reduced Skin Cancer Cases (Millions) b/	Reduced Skin Cancer Deaths (Thousands) c/	Reduced Polymer Damage d (Millions $)	Reduction Projected Global Warning h/ (°C)	Reduction in Projected Sea Level (cm)	CASE STUDY RESULTS: Reduced Potential Food Loss g/ (Soybean Example)	CASE STUDY RESULTS: Reduced Potential Ozone (Smog) Increase f/	CASE STUDY RESULTS: Reduced Potenti Aquatic Damage Anchov Examp
U.S. POSITION: 95% Phase Down j/								
2.5% through 2050	55	1,100	N/A	1.1	9	>15%	>20%	>25
3.8% through 2050	120	2,500	N/A	2.6	20	>15%	>20%	>25
1.2% through 2050	8	140	N/A	0.5	4	5%	5%	
E.C. POSITION: 20% Phasedown k/								
2.5% through 2050	50	975	N/A	0.9	7	10%	15-20%	>25
FREEZE: l/								
2.5% through 2050	45	900	N/A	0.8	6	10%	15%	20

(Notes on following Page)

JUSTIFICATION OF U.S. POSITION ON STRINGENCY

(NOTES)

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a) Baseline annual growth in the use of ozone-deleting substances in the absence of controls. No growth assumed after 2050. The freeze is analyzed assuming a freeze at 1986 levels, starting in 1990; 80% compliance among developed nations; developing nations allowed to grow to the current global use per capita; 80% compliance assumed among developing nations; compounds covered include: CfC-11, -12, -113, Halon 1211, 1301.

b) For people alive today and born by 2075 in the U.S. Total includes basal cell, squamous cell, and melanoma skin cancers. Based on DNA-damage actions spectrum. Values are underestimated because increasing baseline rate and population aging are not considered.

c) For people alive today and born by 2075 in the U.S. Total includes basal cell, squamous cell, and melanoma skin cancers. Based on DNA-damage actions spectrum. Values are underestimated because increasing baseline rate and population aging are not considered.

d) For PVC in the U.S. only. Damage to other polymers may be expected.

e) Estimate based on extrapolation of Essex, a sensitive cultivar. Actual damage expected to be lower since only 2/3 of the cultivars are sensitive.

f) Based on a single case study and chamber study. Results in process of verification. Number shown is average for three case study cities.

g) Based on a single study. Assumes 10 meter mixed layer. If larger or smaller, results could be large.

h) Based on 3°C climate sensitivity. Equilibrium warming.

i) Based on 3°C climate sensitivity and diffusivity of 1.7 cm^2/sec. .Contributions from Antarctic discharge are not modeled as temperature sensitive.

j) Coverage of all fully-halogenated compounds. Developed nations: 1990 = freeze at 1986 levels; 1996 = 50% reduction; 2005 = 95% reduction; 80% compliance. Developing nations allowed to grow to current global average use per capita (80% compliance).

k) Coverage of CFC-11, -12, and -113. Developed nations: 1990 = freeze at 1986 levels; 1996 = 20% reduction; 80% compliance. Developing nations allowed to grow to current global average use per capita (80% compliance).

l) Coverage of CFC-11 and -12. Developed nations: 1990 = freeze at 1986 levels; 80% compliance. Developing nations allowed to grow to current global average use per capita (80% compliance).

5/26
depletion 2

Possible Objectives and Costs of Achieving Same Related to Depletion of Stratospheric Ozone and Possible Alternative Ways of Achieving Such Objectives

I. Reduce skin cancer cases and deaths.

II. Reduce the potential adverse impact on the human immune system from an increase in UV(B).

III. Reduce the potential adverse impact on plant life of an increase in UV(B).

IV. Reduce the potential adverse effects on acquatic life.

V. Reduce the potential adverse effects of increased cataracts in humans.

VI. Reduce potential adverse effects on polymers.

VII. Reduce potential for increased ground level ozone concentrations.

VIII. Reduce potential for increased global temperature due to stratospheric ozone depletion.

5/26

depletion 3

The "four CFC emission cases" are:

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(c) the same as (b) plus a further 20% reduction in CFC's after two to four years; and

(d) the same as (c) plus a further 30% reduction in CFC's after another four to six years.