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*Last Updated: 05/01/2024*

**BRIEFING ON U.S.G. POSITION**

**PREPARED FOR INTERAGENCY MEETING**

**By**

**OFFICE OF AIR AND RADIATION  
ENVIRONMENTAL PROTECTION AGENCY**

**MARCH 27, 1987**

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- I. ENVIRONMENTAL BASIS FOR U.S. POSITION
- II. CURRENT U.S. POSITION
- III. ANALYTICAL BASIS FOR POSITION

I. ENVIRONMENTAL BASIS FOR U.S. POSITION

## KEY ATMOSPHERIC ASSESSMENT

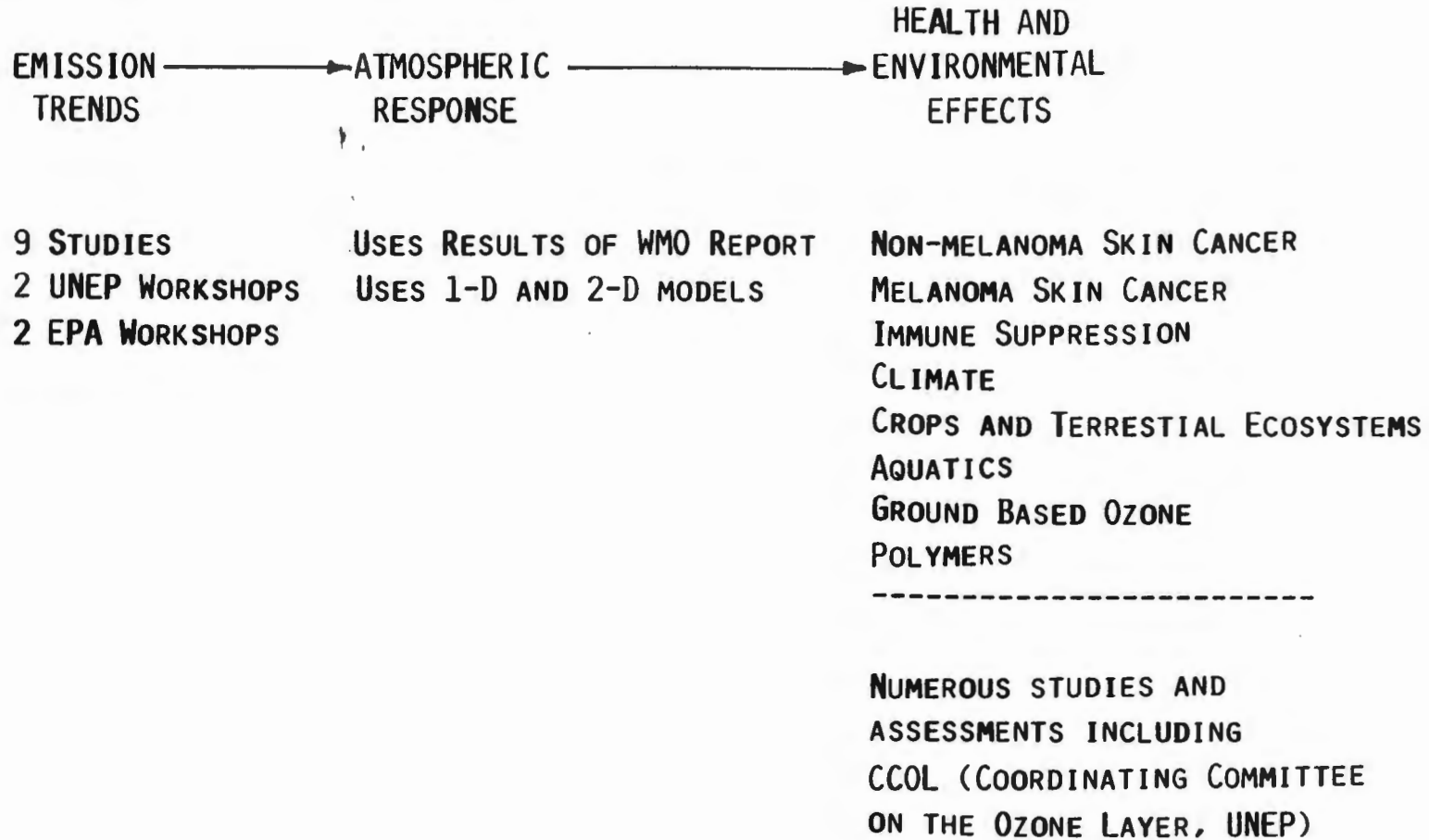
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- O WORLD METEOROLOGICAL ORGANIZATION (CO-SPONSORED BY UNEP, EEC, NASA, FRG, CMA)
  - 150 SCIENTISTS
  - COMPREHENSIVE 3 VOLUME REPORT, 15 CHAPTERS
  
- O FINDINGS
  - "COMPELLING EVIDENCE THAT THE COMPOSITION OF THE ATMOSPHERE IS CHANGING ON A GLOBAL SCALE."
  - IF CFCs INCREASE, STRATOSPHERIC OZONE WILL DEplete.
  - CRITICAL LINKAGES BETWEEN STRATOSPHERIC OZONE AND GLOBAL CLIMATE.

KEY DOMESTIC BASIS FOR DECISIONMAKING: EPA RISK ASSESSMENT

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5 VOLUME RISK ASSESSMENT



## EPA RISK ASSESSMENT -- REVIEW PROCESS

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### 0 SAB HAS PEER REVIEWED

-- 2 MAJOR MEETINGS OF ENTIRE PANEL (13 SCIENTISTS)

-- 1 WORKSHOP TO REVIEW MODELING (4 SCIENTISTS)

### 0 RECOMMENDED SAB CHANGES: FOCUS ON EXPANDING SCENARIOS AND UNCERTAINTY ANALYSES

-- SAB <sup>ci quis</sup> RECOMMENDED CHANGES ALREADY INCORPORATED IN EXECUTIVE SUMMARY

-- 5 REVISED VOLUMES: SCHEDULED PUBLICATION IS THIS SUMMER

IS SAB  
THE ICF  
GP?

SAB endorsed  
RA

★ new  
Exec Summ  
coming out  
in 3 wks.

## MAJOR FINDINGS OF EPA RISK ASSESSMENT

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- O ATMOSPHERIC CONCENTRATIONS OF CFCs AND OTHER TRACE GASES ARE LIKELY TO INCREASE
- O STRATOSPHERIC OZONE PROJECTED TO DEplete UNDER MOST SCENARIOS
- O MOST ADVANCED 2-D MODELS PROJECT GREATER DEPLETIONS AT NORTHERN LATITUDES AND IN THE SPRING
- O SIGNIFICANT HEALTH EFFECTS FROM DEPLETION. DEPENDING ON SCENARIO, FOR PEOPLE BORN IN NEXT 88 YEARS
  - BASAL CELL AND SQUAMOUS CELL CANCER CASES INCREASE BETWEEN 6 MILLION AND 200 MILLION WITH APPROXIMATELY 1% FATALITY RATE
  - MELANOMA SKIN CANCER CASES INCREASE BETWEEN 60 THOUSAND AND 1.5 MILLION
  - MELANOMA SKIN CANCER MORTALITIES INCREASE BETWEEN 14 THOUSAND AND OVER 300 THOUSAND
  - INCREASES IN CATARACTS AND SYSTEMIC IMMUNE SUPPRESSION



MAJOR FINDINGS OF EPA RISK ASSESSMENT  
(CONTINUED)

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0 SIGNIFICANT EFFECTS ON ENVIRONMENT AND WELFARE

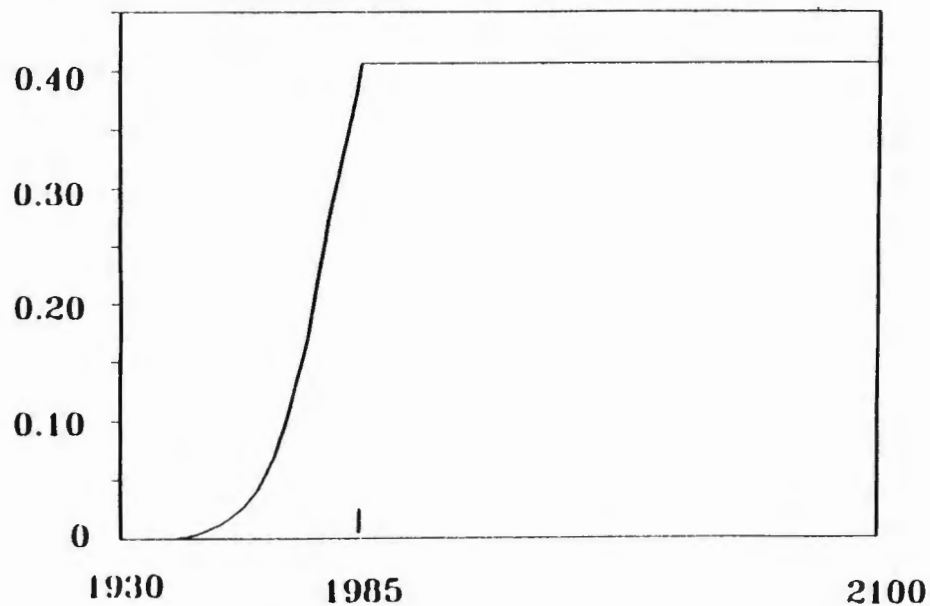
- RISK TO CROPS AND TO ECOSYSTEMS, WHILE SOMEWHAT UNCERTAIN, IS POTENTIALLY MOST SERIOUS
- AQUATIC AND TERRESTRIAL ECOSYSTEMS DISRUPTION LIKELY
- INCREASE LIKELY IN GROUND-BASED OXIDANTS
- OUTDOOR POLYMERS HARMED
- CFCs WILL EXACERBATE GLOBAL WARMING
- IF GREENHOUSE GASES ARE LIMITED (CH<sub>4</sub>, CO<sub>2</sub>, N<sub>2</sub>O) IN FUTURE, DEPLETION POTENTIAL OF CFCs WILL BE HIGHER

UNIQUE ASPECT: UNLIKE MOST ENVIRONMENTAL PROBLEMS MAJOR CUTBACKS  
WOULD BE NEEDED TO STABILIZE ANY SITUATION THAT DEVELOPS

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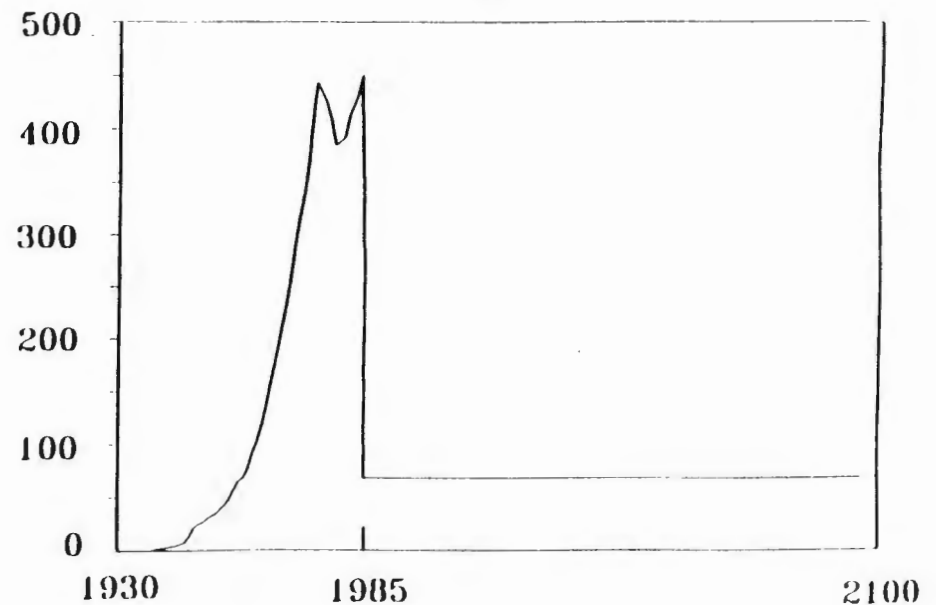
TO STABILIZE THE ATMOSPHERIC  
CONCENTRATIONS OF LONG-LIVED GASES

CFC-12 Atmospheric Concentrations  
(ppbv)



ABRUPT REDUCTIONS IN EMISSIONS  
WOULD BE NECESSARY

CFC-12: Emissions  
(mill kg)



Hoffman (1986), "Analysis of Stringency of Control Strategies  
to Achieve Alternative Ozone Depletion Limits," UNEP Workshop

Source: Hoffman (1986), "Analysis of Stringency of Control Strategies  
to Achieve Alternative Ozone Depletion Limits," UNEP Workshop

II. CURRENT U.S. POSITION HAS FIVE COMPONENTS

-- CHEMICAL COVERAGE

-- STRINGENCY

-- TRADE

-- TIMING

-- SCIENCE REVIEW

CHEMICAL COVERAGE: U.S. POSITION INCLUDES LONG-LIVED, OZONE-DEPLETING CHEMICALS

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<u>CHEMICAL</u>	<u>LIFETIME (YEARS)</u>	<u>OZONE DEPLETION POTENTIAL PER KILOGRAM</u>	<u>PRIMARY USES</u>
<u>INCLUDED:</u>			
CFC-11	75	1.0	AEROSOLS, OPEN AND CLOSED CELL FOAMS, REFRIGERATION AND AIR CONDITIONING
CFC-12	111	0.86	AEROSOLS, REFRIGERATION AND AIR CONDITIONING, OPEN AND CLOSED CELL FOAMS
CFC-113	90	0.78	SOLVENT
CFC-114	-	-	SPECIALTY USES
CFC-115	-	-	SPECIALTY USES
HALON 1211	25	2.69	PORTABLE AND FIXED FIRE EXTINGUISHING
HALON 1301	110	11.43	FIXED FIRE EXTINGUISHING

CHEMICAL COVERAGE: U.S. POSITION EXCLUDES LONG-LIVED, OZONE-DEPLETING CHEMICALS

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<u>CHEMICAL</u>	<u>LIFETIME (YEARS)</u>	<u>OZONE DEPLETION POTENTIAL PER KILOGRAM</u>	<u>PRIMARY USES</u>
<u>EXCLUDED:</u> CFC-22	20	0.03	CAPTIVE CFC PRODUCTION, A/C AND REFRIGERATION
CARBON TETRACHLORIDE*	50	1.19	SOLVENT
METHYL CHLOROFORM	6.5	0.10	SOLVENT

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\* CCL4 IS LONG-LIVED, BUT RARELY EMITTED.

world pop use =  
• 2 kg/capita

LOC's

~~will~~ will be able to  
'develop up to this  
per capita use.

(discuss: U.S./capita vs - world/capita)

(annual growth rate  
of CFC's ~~2%~~  
4-5%)

### STRINGENCY AND TIMING

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- 0 NEAR TERM FREEZE
- 0 MID TERM REDUCTIONS (CURRENTLY LISTED AS 25%, 75% WITHOUT YEARS)  
PROPOSED AS 40-70% IN 6-10 YEARS)
- 0 LONG TERM PHASE DOWN (95% IN 10-14 YEARS)

"possible  
2d step"

TRADE: U.S. POSITION

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IMPOSE RESTRICTIONS

- O BULK CHEMICALS
  - IMPORTS FROM NON-SIGNATORIES
  - EXPORTS (NOT YET) BUT UNDER CONSIDERATION
- O PRODUCTS THAT CONTAIN CFCs (NOT YET IN -- PRODUCTS THAT WOULD USE CFCs, I.E., UNCHARGE CAR AIR CONDITIONERS)
- O PRODUCTS THAT WERE MANUFACTURED WITH CFCs (STUDY FEASIBILITY, ADD AS NEEDED)

SCIENCE REVIEW: U.S. POSITION

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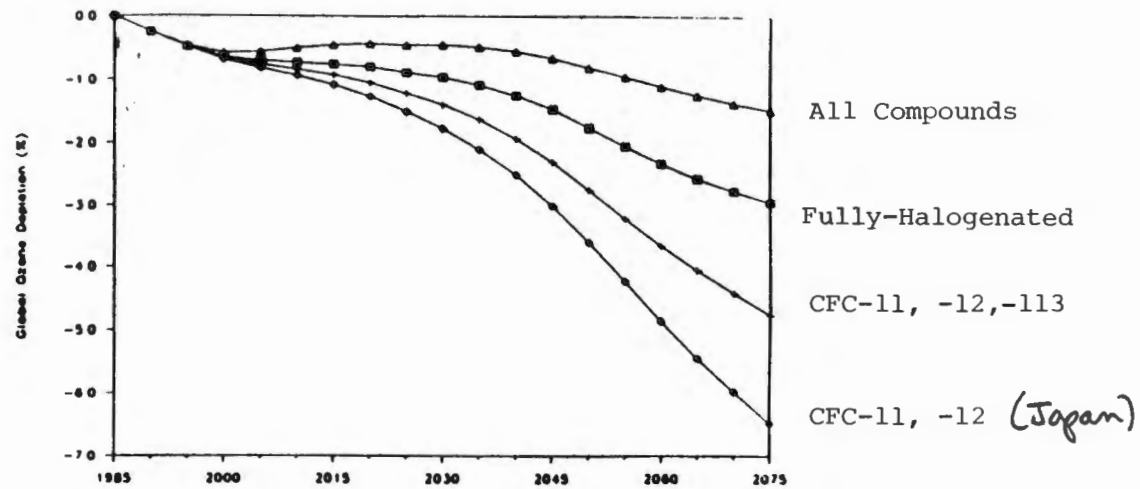
- 0 PERIODICALLY OR BY SPECIAL EMERGENCY
- 0 REVIEW SCIENCE AND ECONOMICS
- 0 USED AS BASIS FOR AMENDING PROTOCOL AS NECESSARY



### III. ANALYTICAL BASIS U.S. POSITION

COVERAGE

Global Action  
(80% Compliance)



- o Developed world (80%) compliance:
  - 1990: freeze at 1986 levels
  - 1996: 50% reduction from 1986 levels
  - 2005: 95% reduction from 1986 levels
- o Developing world (80% compliance):
  - use allowed to grow to current global average use per capita (.2 kg)
- o Baseline use: 2.5% annual growth from 1985 to 2050; constant thereafter
- o Other trace gases:
  - CO2 = NAS 50th percentile (Doubled by 2060)
  - N2O = 0.2%/yr
  - CH4 = 0.017 ppm/yr

JUSTIFICATION U.S. POSITION ON COVERAGE:

THE CONSEQUENCES OF UNDER-PREDICTING DEPLETION FOR DIFFERENT CHEMICALS

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O LONG-LIVED GASES

- RECOVERY TAKES DECADES TO CENTURIES ONCE EMISSIONS ARE ELIMINATED
- STABILIZING THE ATMOSPHERE (PREVENTING FURTHER DEPLETION) REQUIRES REDUCTIONS IN EMISSION OF UP TO 85% WORLDWIDE

O SHORT-LIVED GASES

- RECOVERY IS RELATIVELY QUICK
- STABILIZATION POSSIBLE WITH SMALLER CUTS

JUSTIFICATION OF U.S. POSITION ON COVERAGE:

HALONS IN DEFENSE

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- O PREPONDERANCE OF HALON EMISSIONS IN TRAINING, INSTALLATION, ACCIDENTS
- O INDUSTRY BELIEVES EMISSIONS CAN BE RADICALLY REDUCED
- O MILITARY HAS BEEN CONTACTED AND IS COOPERATING
- O IN LONG-TERM, CHEMICAL ALTERNATIVES MAY BE POSSIBLE

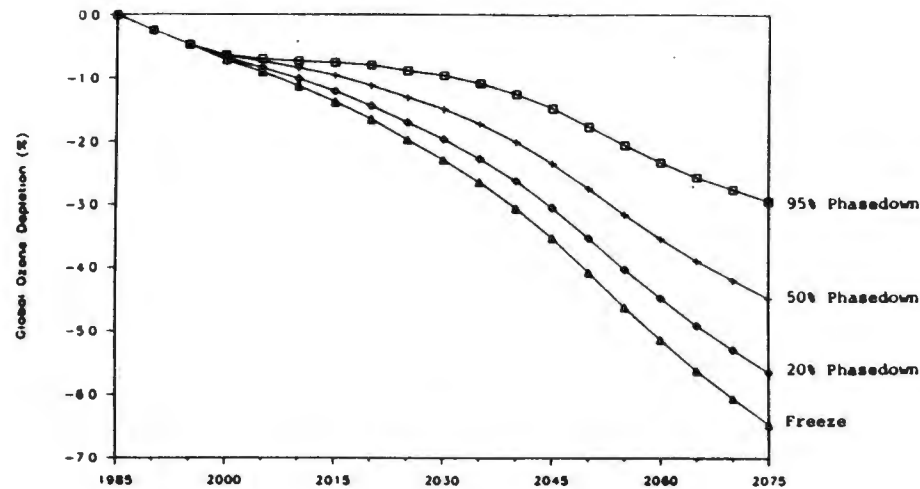
*} Indus is coop'g  
& may ↓ 40%  
by itself this yr.*

JUSTIFICATION OF U.S. POSITION ON STRINGENCY:

GLOBAL OZONE DEPLETION ESTIMATES FOR ALTERNATIVE COVERAGE OF  
FULLY-HALOGENATED COMPOUNDS:

GLOBAL ACTION  
(80% COMPLIANCE)

*all 5 chemicals  
U.S. is proposing*



- o 80% COMPLIANCE IN DEVELOPING NATIONS. DEVELOPING NATIONS ALLOWED TO GROW TO CURRENT GLOBAL AVERAGE USE PER CAPITA LEVELS (80% COMPLIANCE).

(ADDITIONAL NOTES ON NEXT PAGE)

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BASELINE USE: 2.5% ANNUAL GROWTH FROM 1985 TO 2050; CONSTANT THEREAFTER

CONTROLS:

- O 95% PHASEDOWN AS FOLLOWS:
  - 1990: FREEZE AT 1986 LEVELS
  - 1996: 50% REDUCTION FROM 1986 LEVELS
  - 2005: 95% REDUCTION FROM 1986 LEVELS
  
- O 50% PHASEDOWN AS FOLLOWS:
  - 1990: FREEZE AT 1986 LEVELS
  - 1996: 50% REDUCTION FROM 1986 LEVELS
  
- O 20% PHASEDOWN AS FOLLOWS:
  - 1990: FREEZE AT 1986 LEVELS
  - 1996: 20% REDUCTION FROM 1986 LEVELS
  
- O FREEZE AT 1986 LEVELS STARTING IN 1990

COVERAGE: FULLY-HALOGENATED COMPOUNDS: CFCs-11, -12, -113 AND HALON 1211 AND 1301

OTHER TRACE GASES:

- O CO2 = NAS 50TH PERCENTILE (DOUBLED BY 2060)
- O N2O = 0.2%/YR
- O CH4 = 0.017 PPM/YR

JUSTIFICATION OF U.S. POSITION ON STRINGENCY

PARTIAL LIST OF REDUCED DAMAGES

Baseline Growth	Reduced Skin Cancer Cases (Millions) <u>b/</u>	Reduced Skin Cancer Deaths (Thousands) <u>c/</u>	Reduced Polymer Damage <u>d/</u> (Millions \$)	Reduction Projected Global Warming <u>h/</u> (°C)	Reduction in Projected Sea Level (cm)	CASE STUDY RESULTS		
						Reduced Potential Food Loss <u>e/</u> (Soybean Example)	Reduced Potential Ozone (Smog) Increase <u>f/</u>	Reduced Potential Aquatics' Damage Anchovy <u>g/</u> Example
	60	1200	N/A	5.7	98	219	22%	
<b>U.S. POSITION: 95% Phase Down <u>i/</u></b>								
2.5% through 2050	55	1,100	N/A	1.1	9	15%	20%	25%
<b>E.C. POSITION: 20% Phasedown <u>k/</u></b>								
2.5% through 2050	50	975	N/A	0.9	7	10%	15-20%	25%
<b>FREEZE: <u>l/</u></b>								
2.5% through 2050	45	900	N/A	0.8	6	10%	15%	20%

(Notes on Following Page)

20-30% used in dev'g nations relative to dev'd world.

→ freeze wld accomp. 3/4 of cancer saving bene's

JUSTIFICATION OF U.S. POSITION ON STRINGENCY

(NOTES)

- 
- a) Baseline annual growth 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; 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 warning.
- i) Based on 3°C climate sensitivity and diffusivity of  $1.7 \text{ cm}^2/\text{sec}$ . 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).



## JUSTIFICATION FOR U.S. POSITION ON TRADE

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- O U.S. TRADE IN CFC-RELATED PRODUCTS IS PRIMARILY IMPORTS
- O PRICE CONSEQUENCES ON CONSUMERS WILL BE RELATIVELY LOW
- O NEWLY INDUSTRIALIZING NATIONS LIKELY TO JOIN RATHER THAN FACE RESTRICTIONS

U.S. IMPORTS/EXPORTS OF CFC-RELATED PRODUCTS FROM/TO SELECTED COUNTRIES, 1986

AUTOMOBILES<sup>1/</sup>

(ALL VALUES IN THOUSAND U.S. DOLLARS)

<u>COUNTRY</u>	<u>U.S. IMPORTS</u>	<u>U.S. EXPORTS</u>
EEC	9,968,841	7,690
BELGIUM-LUXEMBOURG	125,043	981
FRANCE	271,750	297
GERMANY	8,635,475	3,233
GREECE	191	25
ITALY	185,511	1,061
NETHERLANDS	1,943	966
PORTUGAL	27	38
SPAIN	230	58
TURKEY	0	0
UNITED KINGDOM	748,671	1,031
JAPAN	23,318,107	3,006
KOREA	798,685	400
MALAYSIA	768	0
SINGAPORE	0	0
TAIWAN	0	305

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<sup>1/</sup> SOURCE: "TARIFF SCHEDULE OF THE UNITED STATES, ANNOTATED" (TUSA),  
DEPARTMENT OF COMMERCE, 1986.

U.S. IMPORTS/EXPORTS OF CFC-RELATED PRODUCTS FROM/TO SELECTED COUNTRIES, 1986

ELECTRONIC PRODUCTS<sup>1/</sup>

(ALL VALUES IN THOUSAND U.S. DOLLARS)

<u>COUNTRY</u>	<u>U.S. IMPORTS</u>	<u>U.S. EXPORTS</u>
EEC	N/A	N/A
BELGIUM-LUXEMBOURG	N/A	N/A
FRANCE	N/A	N/A
GERMANY	1,636,535	2,447,116
GREECE	N/A	N/A
ITALY	N/A	N/A
NETHERLANDS	N/A	N/A
PORTUGAL	N/A	N/A
SPAIN	N/A	N/A
TURKEY	N/A	N/A
UNITED KINGDOM	1,103,477	2,987,044
JAPAN	22,197,172	2,592,865
KOREA	2,700,948	618,665
MALAYSIA	310,227	109,190
SINGAPORE	2,335,381	739,382
TAIWAN	3,648,645	653,534

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<sup>1/</sup> PRODUCT COVERAGE INCLUDES COMMUNICATIONS PRODUCTS, CONSUMER ELECTRONICS, ELECTRONIC PARTS, AND INDUSTRIAL ELECTRONICS. SOURCE: "ELECTRONICS FOREIGN TRADE", ELECTRONICS INDUSTRY ASSOCIATION (EIA) MARKETING SERVICES DEPARTMENT, P. 20.

EXHIBIT ES-1

ESTIMATES OF GLOBAL OZONE DEPLETION IN 2075  
FOR SIX CASES OF CFC USE

- ① CFC use ↓'s 80% by 2010
- ② CFC use constant (no growth in use)
- ③ CFC use grows 1.2% 1985-2050, no growth 2050-2100 (1.7% avg)
- ④ CFC use grows 2.5% 1985-2050, no growth 2050-2100 (1.4% avg)
- ⑤ CFC use grows 3.8% 1985-2050, no growth 2050-2100 (2.1% avg)
- ⑥ CFC use grows 5% 1985-2050, no growth 2050-2100 (2.8% avg)  
(Cut and Tape)

Using a parameterized representation of a one-dimensional model, the potential change in ozone was evaluated for six cases: // Case 1: global CFC use declines to 20 percent of current levels by 2010, and remains constant thereafter; Case 2: no growth in CFC use from current levels; Case 3: 0.7 percent annual average growth in CFC use from 1985 to 2100 (1.2 percent growth from 1985 to 2050, followed by no growth through 2100); Case 4: 1.4 percent annual average growth in CFC use from 1985 to 2100 (2.5 percent growth from 1985 to 2050, followed by no growth through 2100); Case 5: 2.1 percent annual average growth in CFC use from 1985 to 2100 (3.8 percent growth from 1985 to 2050, followed by no growth through 2100); Case 6: 2.8 percent annual average growth in CFC use from 1985 to 2100 (5.0 percent growth from 1985 to 2050, followed by no growth through 2100). // The trace gas concentration assumptions used in these six cases are: CO<sub>2</sub>: NAS 50th percentile; CH<sub>4</sub>: 0.017 ppm per year (approximately 1 percent of current CH<sub>4</sub> concentration); and N<sub>2</sub>O: 0.20 percent per year.

U.S. IMPORTS/EXPORTS OF CFC-RELATED PRODUCTS FROM/TO SELECTED COUNTRIES, 1986

FOAM PRODUCTS<sup>1/</sup>

(ALL VALUES IN THOUSAND U.S. DOLLARS)

<u>COUNTRY</u>	<u>U.S. IMPORTS</u>	<u>U.S. EXPORTS</u>
EEC	19,340	786
BELGIUM-LUXEMBOURG	278	5
FRANCE	3,077	79
GERMANY	12,546	217
GREECE	8	0
ITALY	1,548	18
NETHERLANDS	391	20
PORTUGAL	0	0
SPAIN	93	0
TURKEY	40	0
UNITED KINGDOM	1,359	447
JAPAN	68,700	168
KOREA	588	0
MALAYSIA	0	0
SINGAPORE	0	5
TAIWAN	15,325	6

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<sup>1/</sup> PRODUCT COVERAGE INCLUDES AUTOMOBILE FURNITURE, PILLOWS, AND CUSHIONS. SOME OF THESE PRODUCTS MAY BE MADE WITH MATERIALS OTHER THAN FOAM. SOURCE: "TARIFF SCHEDULE OF THE UNITED STATES, ANNOTATED" (TUSA), DEPARTMENT OF COMMERCE, 1986.

U.S. IMPORTS/EXPORTS OF CFC-RELATED PRODUCTS FROM/TO SELECTED COUNTRIES, 1986

AIR CONDITIONERS<sup>1/</sup>

(ALL VALUES IN THOUSAND U.S. DOLLARS)

<u>COUNTRY</u>	<u>U.S. IMPORTS</u>	<u>U.S. EXPORTS</u>
EEC	4,967	N/A
BELGIUM-LUXEMBOURG	8	N/A
FRANCE	365	N/A
GERMANY	2,999	N/A
GREECE	0	N/A
ITALY	732	N/A
NETHERLANDS	22	N/A
PORTUGAL	0	N/A
SPAIN	36	N/A
TURKEY	0	N/A
UNITED KINGDOM	805	N/A
JAPAN	213,637	N/A
KOREA	3,931	N/A
MALAYSIA	1,932	N/A
SINGAPORE	6,662	N/A
TAIWAN	704	N/A

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<sup>1/</sup> SOURCE: "TARIFF SCHEDULE OF THE UNITED STATES, ANNOTATED" (TUSA),  
DEPARTMENT OF COMMERCE, 1986.

U.S. IMPORTS/EXPORTS OF CFC-RELATED PRODUCTS FROM/TO SELECTED COUNTRIES, 1986

REFRIGERATION EQUIPMENT<sup>1/</sup>  
(ALL VALUES IN THOUSAND U.S. DOLLARS)

<u>COUNTRY</u>	<u>U.S. IMPORTS</u>	<u>U.S. EXPORTS</u>
EEC	49,857	N/A
BELGIUM-LUXEMBOURG	696	N/A
FRANCE	803	N/A
GERMANY	7,590	N/A
GREECE	1	N/A
ITALY	31,428	N/A
NETHERLANDS	850	N/A
PORTUGAL	1,898	N/A
SPAIN	1,543	N/A
TURKEY	543	N/A
UNITED KINGDOM	5,201	N/A
JAPAN	40,375	N/A
KOREA	45,926	N/A
MALAYSIA	0	N/A
SINGAPORE	37	N/A
TAIWAN	1,620	N/A

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<sup>1/</sup> SOURCE: "TARIFF SCHEDULE OF THE UNITED STATES, ANNOTATED" (TUSA),  
DEPARTMENT OF COMMERCE, 1986.

SIGNIFICANCE OF CFCs IN SELECTED U.S. IMPORTS<sup>1/</sup>

<u>PRODUCT</u>	<u>IMPORTS (\$ THOUSANDS)</u>	<u>CFC CONTENT (LBS./UNIT)</u>	<u>TOTAL CFC IN PRODUCT IMPORTED (MILLION LBS.)</u>	<u>PERCENT CFC COST-SHARE OF PRODUCT</u>
AUTOMOBILES	34,835,072	N/A	N/A	VERY MINIMAL
-- MOBILE AIR CONDITIONERS	N/A	2.50	3.78	MINIMAL
REFRIGERATION AND AIR CONDITIONING EQUIPMENT	231,833	N/A	N/A	MINIMAL
-- 17,000 BTU's	N/A	N/A	N/A	MINIMAL
-- 17,000 BTU's (LOADED IN COUNTRY OF ORIGIN)	N/A	2.50	0.32	MINIMAL
REFRIGERATORS AND FREEZERS	137,815	0.70 (REFRIGERANT)	1.00	MINIMAL
		1.50 (INSULATION)		MINIMAL
ELECTRONICS	33,932,385	NONE	0.00	N/A

<sup>1/</sup> SOURCE: U.S. DEPARTMENT OF COMMERCE.



POSSIBLE RESPONSES TO PROTOCOL TRADE PROVISION

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EEC

COSPONSOR

JAPAN

LIKELY TO JOIN; MAJOR EXPORT MARKETS ARE  
U.S. AND EC; COSTS OF NOT JOINING  
ENORMOUS

NEWLY INDUSTRIALIZING NATIONS

LIKELY TO JOIN; U.S. AND EC ARE MAJOR  
MARKETS THESE NATIONS CANNOT AFFORD TO  
LOSE

*India } probs b/c  
-PRC } ~lyg expt's*

## MAJOR TRADE ISSUES

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- O DETECTION IN PRODUCTS MADE WITH BUT NOT CONTAINING CFCs
  - DETECTION APPEARS PROBABLE IF RESTRICTED TO OCCASIONAL SAMPLING
  - CERTIFICATION PROGRAM POSSIBLE
  
- O IMPORTS OF ESSENTIAL ELECTRONICS
  - DEFENSE DEPARTMENT WANTS DOMESTIC PRODUCTION
  - WAIVERS POSSIBLE FOR INDUSTRIES NEEDING OTHERWISE UNAVAILABLE PRODUCTS

*proposing as*

## JUSTIFICATION OF U.S. POSITION ON COMBINED TIMING, STRINGENCY AND COVERAGE

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### 0 FREEZE

- PREVENTS UNACCEPTABLE ENVIRONMENTAL DAMAGE
- COSTS ARE LOW
- PROVIDES SIGNAL TO INDUSTRY TO STOP INVESTING, START LOOKING FOR OPTIONS

### 0 PROPOSED 2ND STAGE (40-70% IN 6 TO 10 YEARS)

- PROVIDES INCENTIVES NEEDED TO STIMULATE CHEMICAL SUBSTITUTES AND OTHER TECHNOLOGICAL DEVELOPMENTS
- WILL PREVENT LARGE ECONOMIC DISRUPTION IF CURRENT MODELS UNDERPREDICT DEPLETION
- DOES NOT PREMATURELY RETIRE CAPITAL

### 0 3RD STAGE (95% PHASEOUT IN 10-14 YEARS)

- CAN BE DONE COST-EFFECTIVELY
- PRODUCES ADDITIONAL ENVIRONMENTAL BENEFITS

CURRENT USES AND TIMING OF EMISSIONS

<u>APPLICATION (CHEMICALS)</u>	<u>(METRIC TONS)</u>		<u>TIMING OF EMISSIONS</u>
	<u>USE</u>	<u>WEIGHTED USE</u>	
AEROSOLS (CFC 11,12)	8,000	7,328	PROMPT
MOBILE AIR-CONDITIONING (CFC-12)	56,500	48,590	PROMPT
REFRIGRATION (CFC-11,12)	22,351	19,992	PROMPT
FLEXIBLE FOAM (CFC-11)	14,800	14,800	PROMPT
RIGID FOAM (CFC-113)	55,530	53,685	DELAYED
SOLVENTS (CFC-113)	41,369	33,095	PROMPT
STERILIZATION (CFC-12)	12,061	10,372	PROMPT
FOOD FREEZING (CFC-12)	3,000	2,580	PROMPT
FIRE EXTINGUISHER HAND-HELD (HALON 1211)	3,529	9,493	DELAYED
FIRE EXTINGUISHER FLOOD SYSTEM (HALON 1301)	3,463	39,478	UNCERTAIN
MISCELLANEOUS APPLICATIONS	<u>4,056</u>	<u>3,598</u>	PROMPT
TOTAL	224,659	243,011	



Freeze  
Stats

②

How does this unit relate to actual production costs?

SHORT-TERM EMISSIONS REDUCTIONS\*

Application	Current Weighted Emission (MT)	Emission Control	Weighted Emission Reduced (MT)	Control Cost* (\$/kg)
o Aerosols	7,328	-- Ban non-essential and loophole uses	1,832	< \$1
o Mobile Air Conditioning	41,710	-- Use alternative leak test gas (Helium)	42	< \$1
o Refrigeration	17,345	-- Centrifugal/Riciprocal chillers recovery at service	1,331	< \$1
		-- Alternate leak test gas for chillers, transport, etc.	350	< \$1
		-- Recovery at disposal for cold storage, retail food, chillers	878	< \$1
o Flexible Foam	14,800	-- Use vertical chamber	46	< \$1
		-- Use minimim foam density standard with methylene chloride	6,440	< \$2
o Rigid Foam	12,758	-- Use EPS or fiberglass in various insulation applications	2,550	< \$1
		-- Replace foam products with paper or plastic products in food and packaging industries	3,030	< \$1
o Solvents	33,095	-- Use refrigerated chillers and covers on degreasers	2,985	< \$1
		-- Switch to chlorinated solvents	6,830	< \$1
		-- Use carbon adsorption in dry cleaning process	330	< \$1
o Sterilization	9,985	-- Switch to Ethylene Oxide (EO)/CO2 mixture	7,488	< \$1
		-- Switch to nitrogen purge, EO system	5,990	< \$1
o Food Freezing	2,580	-- Use air blast technology for freezing flood	2,064	< \$1
o Halon-1211 Portable Fire Extinguishers	972	-- Alternative training procedure	67	< \$1
o Halon-1301 Flood System Fire Extinguishers	11,120	-- Segment the system	931	

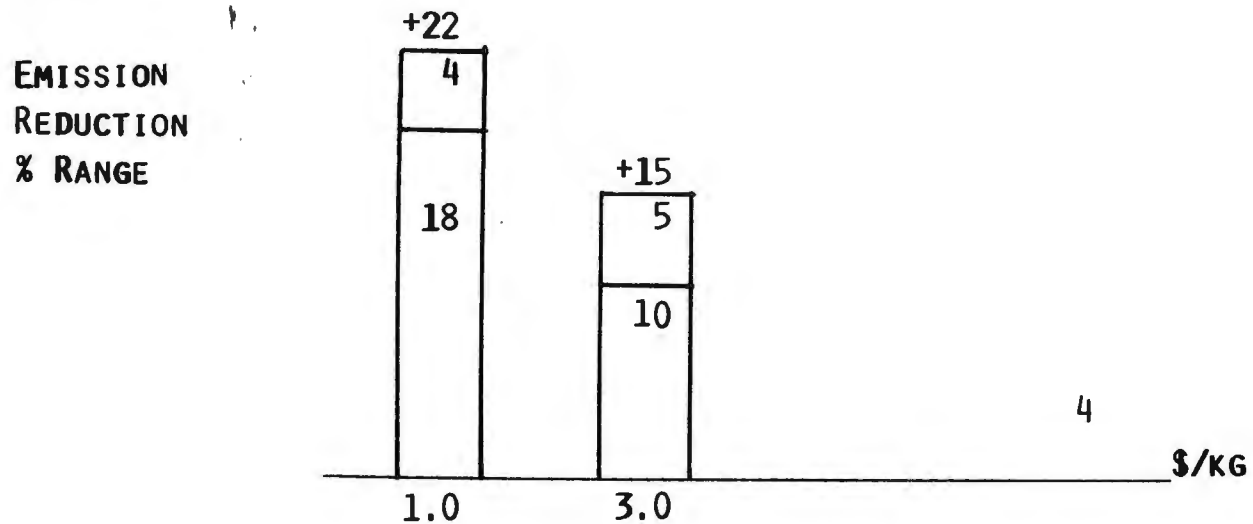
- opp cost of produce incl'd?  
- what type of assump's made wrt fit mkt reqs + pot'l growth needs.

28,866-34,209  
(18-22% of total weighted emissions)

\* Preliminary estimates, some of the above options are mutually exclusive.

## MEETING A NEAR TERM FREEZE\*

- 0 LOW-MODERATE COST CONTROLS (WITH EXISTING TECHNOLOGIES) COULD REDUCE EMISSIONS BY



- 0 IF DEMAND GROWS AT 2.5% PER YEAR ALL REDUCTIONS SHOULD BE \$1.00

\* PRELIMINARY ESTIMATES.

## SECOND PHASE: MID-TERM REDUCTIONS

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### PROPOSED POSITION:

- O MID-TERM REDUCTIONS OF 40-70% OVER 6-10 YEARS

### GOALS:

- O TO STIMULATE THE DEVELOPMENT OF CHEMICAL SUBSTITUTES AND OTHER TECHNOLOGICAL INNOVATIONS
- O TO PREVENT LARGE FUTURE ECONOMIC DISLOCATIONS IF CURRENT MODELS UNDER-PREDICT DEPLETION

*lots questions  
↑  
re cost  
calc's.*

POSSIBLE MID-TERM EMISSIONS REDUCTIONS\*

Application	Current Weighted Emission (MT)	Emission Control	Total Weighted Emission Reduced (MT)	Control Cost* (\$/kg)
o Aerosols	7,328	Use Chemical Substitutes	1,832	<\$2
o Mobile Air Conditioning	41,710	-- Tighten the System	1,820	<\$1
		-- Switch to CFC-22	14,534	<\$10
		-- Switch to CFC-134a	8,342	<\$8
o Refrigeration	17,345	-- Increase recovery at service and disposal and use of alternate test gas	3,470	<\$1
		-- Switch to CFC-22	870	<\$10
		-- Switch to CFC-134a	3,580	<\$8
o Flexible Foam	14,800	-- Switch to methylene chloride	5,750	<\$3
		-- Switch to water blown foam	4,200	<\$4
		-- Switch to formic acid for molded foam	1,200	<\$2
o Rigid Foam	12,758	-- Increase use of EPS and other insulating material	5,000	<\$2
		-- Switch to 141b blowing agent	2,550	<\$3
o Solvents	33,095	-- Increase vapor recovery	4,970	<\$1
		-- Increase use of chlorinated solvents	13,300	<\$1
		-- Switch to CFC-123, -132b	6,620	<\$1
o Sterilization	9,985	-- Complete switching to other systems EO/CO2 or N2 purge	9,985	<\$1
o Food Freezing	2,580	-- Complete switching to air blast technology	2,580	<\$1
o Fire Extinguishing Portable	972	-- Increase training and use alternative agent and non-destructive test	195	<\$1
o Fire Extinguishing	11,120	-- Use alternative test procedure, alternative test agent	5,000	<\$1

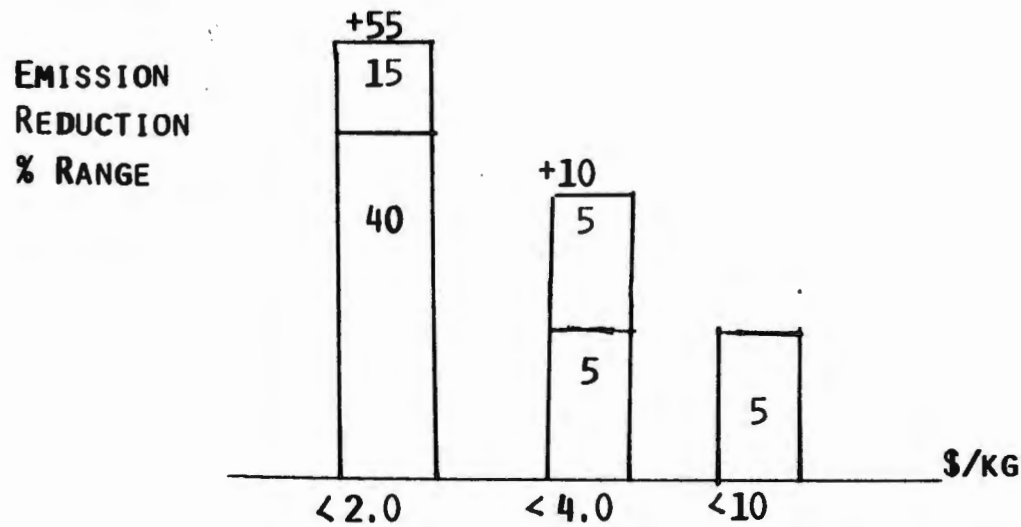
\* Preliminary estimates, options are sometimes mutually exclusive.



MEETING A MID-TERM FREEZE\*

*ICF's Models are base*

0 COSTS FOR 40-65% REDUCTIONS LESS THAN \$2-4/KG.



*\$/KG  
- what components of cost?  
- where come from?  
\*predicated on cost of solvents?  
but bind eng'g*

0 AS AVAILABLE, FC-134A COULD REDUCE EMISSIONS BY AN ADDITIONAL 10% AT ESTIMATED COST OF \$4-8/KG

\* PRELIMINARY ESTIMATES.

## CHEMICAL SUBSTITUTES

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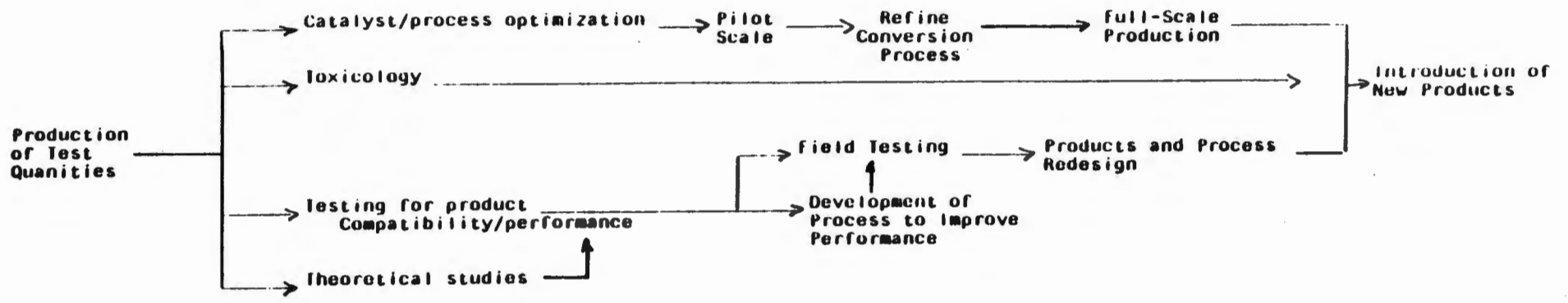
- O DUPONT CLAIMS SUBSTITUTES (123 AND 134A CAN REACH MARKET IN 5 YEARS)\*  
AT 2 TO 6 TIMES CURRENT PRICE IF FINANCIAL INCENTIVES EXIST
  
- O CONTRACTOR STUDY FINDINGS
  - CFC-123 APPEARS GOOD SUBSTITUTE FOR CFC-11 (BUT MUCH LOWER OZONE DEPLETING POTENTIAL)
  - CFC-134A APPEARS EXCELLENT SUBSTITUTE FOR CFC-12 (BUT NO OZONE DEPLETING POTENTIAL)
  - MANY COUNTRIES AND COMPANIES HAVE 134A AND 123 PATENTS
  - PRELIMINARY TOXICOLOGY TESTING ENCOURAGING
  - COSTS LIKELY TO BE HIGHER THAN CFC-11 AND -12 EVEN IN LONG TERM
  
- O INTERNATIONAL SUBSTITUTES PANEL
  - INCLUDES INDUSTRIAL AND ACADEMIC CHEMISTS FROM MANY COUNTRIES
  - DISCUSSION HAS IDENTIFIED ADDITIONAL SUBSTITUTES
  - DISCUSSION INDICATES KEYS TO SUBSTITUTE AVAILABILITY ARE:
    - TOXICOLOGY TESTING
    - USE TESTING
    - ADEQUATE INCENTIVES FOR FIRMS TO MAKE R&D INVESTMENTS

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\* DUPONT SPOKESMAN ROME, 1986 UNEP MEETING.

# CRITICAL PATH STEPS IN DEVELOPING SUBSTITUTES

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This path can occur in 5-7 years,  
but is difficult to compress

### 3: LONGER-TERM REDUCTIONS

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PHASE 3 POSTION: UPTO 95% -- REDUCTION IN 10-20 YEARS

GOAL: COMPLETE TRANSITION AWAY FROM SUSPECT CHEMICALS WITH  
EXEMPTIONS FOR CRITICAL USES.

POSSIBLE LONGER-TERM EMISSIONS REDUCTIONS\*

<u>Application</u>	<u>Current Weighted Emission (MT)</u>	<u>Emission Control</u>	<u>Total Weighted Emission Reduced (MT)</u>	<u>Control Cost* (\$/kg)</u>
o Aerosol	8,000	Switch to chemical substitutes except for some critical uses	7,600	< \$4
o Mobile Air Conditioning	48,500	Switch to chemical substitutes, CFC-134, or alternative technology using hydrocarbons as refrigerants	48,500	< \$10
o Refrigeration	19,273	Switch to chemical substitutes CFC-22, 134a	19,273	< \$8
o Flexible Foam	14,800	o Switch to alternative blowing agents, CFC-123, or methylene chloride o Use minimum density foam standard	14,800	< \$6
o Rigid Foam	12,758	o Switch to chemical substitutes, CFC-123, -124, and other insulating material	12,758	< \$10

\* Preliminary estimates.

PHASE OUT TIMING INFLUENCES COSTS\*

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<u>OPTION</u>	<u>PHASE OUT</u>	<u>AVERAGE COST PER KILOGRAM REDUCED (1985 \$)</u>
95% PHASE OUT: 1990-2005	15	5.00 TO 15.00
95% PHASE OUT: 1990-1996	6	15.00 TO 50.00
95% PHASE OUT: 1990-1993	3	70.00 TO 200.00

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\* PRELIMINARY ESTIMATES. COST ESTIMATES ARE BASED ON INCOMPLETE DATA THAT ARE CURRENTLY BEING REVIEWED AND REVISED. SINCE OPTIONS FOR CONDUCTING A 95% PHASE OUT IN 3 YEARS HAVE NOT BEEN IDENTIFIED, THE UPPER LIMIT IS A JUDGMENT.

## EFFECTS OF U.S. POSITION ON INDIVIDUAL U.S. INDUSTRIES

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- O INTERNATIONAL PROTOCOL CAN BE IMPLEMENTED
  - FEES
  - PERMITS
- O EPA IS STRONGLY MOTIVATED TO USE ECONOMIC INCENTIVES
- O COSTS WILL INEVITABLY BE LOWER THAN STUDIES INDICATE IF MARKET IS GIVEN FREE REIGN
- O INCENTIVES SYSTEM ALLOWS MARKET RATHER THAN GOVERNMENT TO DECIDE HIGH VALUE USES
- O INCENTIVES WILL DRIVE INNOVATION