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SCIENCE

The history of the ozone layer

Liz Glasgow, Auckland

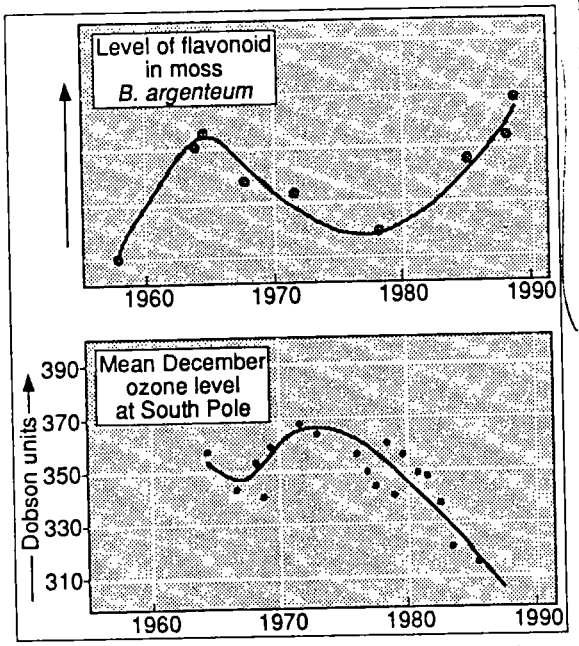
THE OZONE layer above the Antarctic was significantly depleted in the mid-1960s, according to a New Zealand scientist who has studied preserved samples of moss. He has measured the levels of "photo-protective" substances, which protect plants from harmful light, and which he says provide a novel way of reconstructing the way in which stratospheric ozone fluctuated in the past. The work may tell us whether ozone depletion is cyclical and whether chlorofluorocarbons are the only factor in creating a hole.

Kenneth Markham, a chemist at the Department of Scientific and Industrial Research (DSIR), funded by the New Zealand government, analysed samples of the moss, *Bryum argenteum*. The samples, from the Ross Sea area, were collected and preserved between 1957 and 1989. Markham looked for compounds called flavonoids, which are common plant pigments (*Bulletin de Liaison du Groupe Polyphenois*, vol 15, p 230).

Recent research has shown that flavonoids have an important photoprotective function. The compounds are synthesised in plants when they are exposed specifically to UV-B radiation, the range of wavelengths that is mostly affected by the depletion of stratospheric ozone. Flavonoids are very sensitive to small increases in UV-B radiation. Their concentration changes with the level of UV-B in a linear fashion; that is, a doubling of the UV-B intensity causes a doubling of the concentration of flavonoids, and so on.

Markham measured the flavonoid content of his moss samples. Results confirmed the well-documented ozone hole of the 1980s.

Markham then examined ground-based measurements of ozone levels made between 1964 and 1986 at the South Pole. He compared these measurements with his plot of flavonoid levels over the same period and found that they were "a near mirror image" of each other (see Figure).



Flavonoids are compounds that protect plants from harmful sunlight. Their concentration in moss is high when ozone is depleted and low when ozone recovers

According to Markham: "Even the unexpectedly high levels of UV-B irradiance in the mid-1960s, which the flavonoid data indicate, appear to be mirrored by a drop in ozone levels at this time." He says that, until now, the "intriguing mid-1960s anomaly" has received little recognition. Some recent theoretical models have predicted that the ozone layer was significantly depleted at about this time, and some early measurements support this.

Key factors in this mid-1960s depletion are believed to be tests of nuclear bombs in the atmosphere and the low flux of particles from the Sun which was associated with the mid-point of the 11-year sunspot cycle. Other factors that may be important are "the quasi-biennial oscillation"—ozone is most badly depleted in alternate years—and emissions from the volcano Agung, which erupted in the southern hemisphere in 1963.

Continuous records of ozone levels back to 1956 exist for just two sites in Antarctica: the continental Halley Bay and Argentine Island. Data are available from the South Pole from 1962 onwards and Syowa from 1966. Satellite measurements have provided more comprehensive coverage, but only since the late 1970s.

The analysis of flavonoid levels could provide data on trends in ozone levels for different regions in Antarctica and elsewhere. According to Markham: "These plants offer some prospect of confirming whether the mid-1960s ozone depletion occurred in other regions of Antarctica and of looking back beyond 1956 to see whether it happened in the past." If so, we have to re-examine our understanding of why it is occurring. Maybe the chlorofluorocarbon theory is over-simplistic. □

Why two penises are so much better than one

MALE LIZARDS and snakes have to make a choice when they mate: which penis should they use? They have two. One is connected to their right testis, and one to their left. Now two biologists from the US have found that some lizards alternate their penises as each is depleted of sperm. In this way, they maximise their chance of fertilising a female.

Richard Torkaz and Joseph Slowinski of Miami University studied the lizard *Anolis carolinensis*. They found that the penis a lizard used depended on which they used last time they mated, and how long ago they last used it (*Animal Behaviour*, vol 40, p 374).

Torkaz and Slowinski believe that such behaviour can be explained by "sperm competition". Recently, zoologists have realised that competition for a female's favour does not simply involve fights among males or displays of bright plumage; it can continue inside the female's reproductive tract as sperms compete to be first to the egg.

In response to such sperm competition, males of some species have developed sperm that forms into a hard plug, blocking the way for the sperm of any other males. Males of still other species produce a lot of sperm, so that these outnumber and swamp the opposition.

However, keeping up a high level of sperm production can be a problem. If successive copulations follow on too quickly from one another, this can result in the number of sperm in the ejaculate dropping sharply. By alternating their penises, lizards of *A. carolinensis* may overcome this problem.

Torkaz and Slowinski found that males alternated the use of their right and left penises only if one copulation followed less than 24 hours after another. If the interval between copulations was longer, then they used the same penis.

The biologists carried out an experiment in which they prevented penis alternation. They did this by taping over one half of a male's cloacal vent, through which the penis protrudes when aroused. This stopped the animal from using the penis on that side.

The biologists found that males which were forced to re-use the same penis within 24 hours, transferred fewer sperm in the later copulations. However, the researchers found no such drop in the numbers of sperm when successive copulations were as long as 72 hours apart. In this situation, they say, the sperm duct has time to be restocked with sperm.

According to Torkaz and Slowinski, their research demonstrates that the lizards adjust their behaviour in response to sperm competition, using their penises alternately to ensure that maximum sperm transfer is kept up, even if the gap between copulations is short.

Georgia Mason

M E M O R A N D U M

DATE: May 18, 1989

TO: Al

FROM: Rick

SUBJECT: CFC/Ozone Hearing Tomorrow

The Subcommittee on Environmental Protection (Baucus chairs) of the Environment and Public Works Committee is holding hearings tomorrow on pending CFC legislation. Bills from you, Baucus, Chafee, and Leahy will be discussed. You will testify in the first panel, after Leahy. Baucus and Chafee are on the Committee.

The hearing will focus mainly on the Baucus and Chafee bills. They were the only original co-sponsors of each bill.

BAUCUS BILL

Assigns an ozone depletion potential to each of the substances, and sets a FEE (not "tax") on each pound of CFC or halon produced. The fee begins at 25 cents and increases annually until it reaches $2.50 per pound in 1994. Up to $100 million of the fees collected would be used to set up a trust fund to provide grants to producers and users to develop substitutes and alternatives to products now manufactured by the chemicals.

CHAFEE BILL

Phases out CFC-11, -12, -113, -114, -115, methyl chloroform, halon-1211, -1301, -2402 on the following schedule: freeze production -- on July 1, 1989 -- at 1986 levels; reduce production -- on July 1, 1992 -- to 80% of 1986 levels; reduce production -- on July 1, 1995 -- to 50% of 1986 production levels; eliminate production entirely on July 1, 1997.

Other provisions are similar to yours: exceptions for national security, use the chemicals in enclosed areas to reduce emissions, certify that other nations from which we import CFC-containing equipment have similar programs, other minor considerations (you have these provisions in S.872).

LEAHY BILL

The review of this bill in my source is poor. I'll have to pick up a copy of the bill tomorrow morning to verify its provisions. Basically, Leahy introduced Stafford's bill from last Congress -- so it should be similar to our ozone provisions in S.201 (we got most of them from Stafford's bill). I need to get a copy of Leahy's bill just to determine his exact production phaseout schedule.

Leahy may also mention his and Kerry and Gore's (we got you on as an original co-sponser) auto A/C bill that was introduced today. You should tell Leahy before the hearing that you're an original co-sponser with him, because he probably won't have gotten the word from staff. If he mentions it, then he'll have to include you. And remember, your five-year CFC-12 production phaseout essentially does the same thing. The auto A/C bill mandates that "a minimum of 25% of the motor vehicles with air conditioners sold in the U.S. in 1993 use alternative refrigerants which are far less harmful to the environment. The phaseout process continues to increase to 50% by 1994 and 100% in 1995." (I'm taking this information from a press release.)

GORE BILLS

I've forwarded the summaries of S.870, 871, and 872 for your review.

DIFFERENCES AND POSSIBLE CONFLICTS

1. Chafee and Gore phaseouts compare as follows:

	Gore	Chafee
CFC-11	w/in 5 yr	1997
CFC-12	5 yr	1997
CFC-22	10 yr	n/a
CFC-113	5 yr	1997
CFC-114	10 yr	1997
CFC-115	10 yr	1997
methyl chloroform	10 yr	1997
halon-1211	5 yr	1997
halon-1301	5 yr	1997
halon-2402	n/a	1997
carbon tetrachloride	5 yr	n/a
methylene chloride	10 yr	n/a

The most dangerous ozone depleters/greenhouse gases, as I see it, are CFC-11 and CFC-12. CFC-113 (used as a solvent), halon-1211, and halon 1301 are other important ozone depleters. We included carbon tetrachloride in our five-year phaseout after the alarms sounded by Bob Watson at your Arctic ozone hearing, and the strong impact that carbon

5/18/89 Memo

tetrachloride reductions have in lowering atmospheric chlorine loadings, according to EPA models. Carbon tetrachloride is used worldwide, in the Third World and East Bloc, in particular. It is used as a feedstock from which to manufacture CFCs, and as an industrial solvent. It is very toxic.

On April 17, EPA issued an "Advance Notice of Proposed Rulemaking" (ANPRM) to the effect that it intended to add methyl chloroform and carbon tetrachloride to the list of ozone-depleting chemicals already regulated by the Montreal Protocol.

2. Gore and Baucus tax and fee compare as follows:

(a) Gore tax can be passed on to CFC consumers, raising the price of CFCs; Baucus fee is to be absorbed by the CFC manufacturers, keeping the price of CFCs stable.

Argument to support Gore approach is that higher prices use the market to decrease demand for the more dangerous chemicals; the increased price due to the tax effectively "internalizes" the environmental costs into the costs of the product (similar logic is used by those who would call for a CO2 tax). If you do not raise the price, you provide no incentive for consumers to demand the less dangerous chemicals. In addition, the higher price makes the substitutes more economically competitive with the traditionally very-low-cost CFCs. Finally, the higher price will eventually provide users with the incentive to recapture and recycle the most dangerous ozone-depleting chemicals.

(b) Baucus fee is adjustable, to capture any windfall profits that CFC producers realize as supplies drop during the phaseout; Gore tax does not provide for adjustment to capture windfall profits.

Argument to support Gore approach is that the companies will supposedly be using those profits to finance R&D into alternatives. We are, in effect, giving the companies the benefit of the doubt when they argue that we undermine their ability to produce alternatives when we simultaneously rake off their profits. We're phasing out their product already -- in our case, on the fastest timetable yet proposed. Under the Gore phaseout proposal, they will need those revenues to finance a crash R&D effort. We are not trying to disadvantage U.S. companies, we want them to find the solutions and improve our economic competitiveness in the process.

(c) Compare Gore and Baucus Trust Funds.

Basically, they are very similar in nature -- both fund R&D into alternative chemicals and technologies. Your Trust Fund gets 50% of the revenues from the excise tax (200 million in the first year, etc. -- refer to S.871 summary for revenues from excise tax) and the rest go to the Treasury. Baucus puts up to 100 million into his trust fund, the rest to Treasury. Your Trust Fund incorporates unique provisions modeled on my awareness of past goverment-industry cooperative efforts to build a new industry (such as the solar photovoltaic industry in the late 1970s) -- such as block federal purchases of new technology meeting specified performance standards. This type of approach adds to the market incentive to produce such alternative technologies.

(d) Bottom Line: You have introduced a comprehensive package in S.870, 871, and 872. The provisions of S.871 (excise tax and Trust Fund) are necessary complements to the other bills. For example, higher prices encourage recapture and recycling, and make alternatives more economically competitive.

United States Senate

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

Washington, DC

MAY 2 0 1989, 19

To: Hon. Albert Gore, Jr.

Attached is a transcript of your testimony given before the Sub/Committee on Environmental Protection on MAY 1 9 1989.

Please review and, where necessary, make **LEGIBLE** corrections directly on this transcript or on other paper attached to the appropriate transcript pages. Also, at this time, you should supply any additional information and/or exhibits requested and send to—

Paul Chimes
Committee on Environment and Public Works
Room SD-458
Dirksen Senate Office Building
Washington, DC 20510

Please be advised that any editing that is illegible, confusing, and/or exceeds editorial limits may, at the discretion of the Editorial Director, be refused or returned to sender to be redone, time permitting.

It is essential to printing schedules that the transcript be returned no later than JUN 1 3 1989. We will assume that you are satisfied with your remarks as transcribed if the transcript is not received by the due date.

Respectfully,

Paul Chimes

PAUL CHIMES
Editorial Director

GPO: 1989 96-377 (m)

Senator Gore. Thank you very much.

Senator Baucus. Excuse me. Senator Jeffords?

Senator Jeffords. I have read your bill, and I appreciate the tremendous effort that has gone into it and look forward to working with you on it. There are some strong similarities in what Senator Leahy and I introduced yesterday, and the one before, so I know, all working together, we are going to make some progress. It is a pleasure to work with you.

Senator Gore. I was pleased to be an original cosponsor with you and Senator Leahy and Senator ~~Carey~~ Kerry on that bill, which came out of the Vermont Legislature's initiative, yesterday.

Senator Jeffords. Thank you.

Thank you, Mr. Chairman.

Senator Baucus. Thank you, Senator.

Our next witness will be Dr. Robert Watson with the National Aeronautics and Space Administration. Dr. Watson has appeared before this and other committees many times, and each time this committee has learned an immense amount of new information about not only ozone but global warming, the interaction of chemicals, and the chemistry of the atmosphere as we try to make this a safer environment and a safer world.

Dr. Watson, again we are very honored to have you here and look forward to what you have to say at this hearing.

Clean Air Act, and it is a very good point; that is, the interaction of hydrocarbons and nitrogen oxides tends to be the major cause of lower atmosphere ozone, smog, somewhat caused also by the CFCs, which reduce the upper atmosphere ozone. It gets pretty complicated, but it is an additional point; it is a very valid point as we address the passage of the Clean Air Act.

Senator Gore. Mr. Chairman, it is hard for the scientists to quantify the extra low ozone. I wish they would call that "lozone'' instead of using the same word for both, because it does confuse people. Maybe we could call that lozone.

But, anyway, that ~~does~~ may increase ~~in~~ lower ozone concentrations, ~~maybe 5 percent or more,~~ and there are a lot of cities where that ~~will~~ may make the difference as to whether they can comply with Clean Air laws or not.

Senator Baucus. Senator Lieberman?

Senator Lieberman. I have no questions, just to thank Senator Gore for his leadership and his work. It is beyond leadership; you are really into this substantively. I also want to tell you how pleased that I was, on the first day that I became a Senator, to sign onto your bill. Thanks for coming this morning.

Senator Gore. Well, the Gore-Lieberman bill does attack this and global warming, and I appreciate your help.

Senator Baucus. Thank you, Senator.

Senator Baucus. Thank you very much, Senator, and you are also to be very commended for the work you have undertaken substantively, as well as traveling to different parts of the globe to attend conferences and to help bring the American message and also to learn the actions of other countries in order to develop a comprehensive approach, and I very much appreciate your actions.

Senator Chafee?

Senator Chafee. Two things. One, Senator Gore, I would appreciate seeing that side-by-side comparison. That would be helpful.

Two, I think the point you made is a very good one, that we are really doing a double achievement here. Well, you said five achievements that result, but I think, particularly, we want to stress not only that we are dealing with the CFCs, we are dealing with the ozone layer, but we are also dealing with the global warming, which is the other great international concern of this committee, and I think it is important to keep that before us. Twenty percent, I think, is a standard figure that you and -- I think Dr. Roland uses the same one, Dr. Watson, too. So thank you very much for bringing that to us.

Senator Gore. Thank you, Senator Chafee.

Senator Baucus. Senator Gore also made another point. That is that depletion of the stratospheric ozone also has an effect of causing more of a smog problem as we address the

My staff and I have done extensive analyses of the other bills, all of which have very welcome elements, and we have a side-by-side comparison of each provision in these bills, if it might be of any help to the committee.

~~But~~ I look forward to working with you. Like Senator Leahy, I am much comforted by the fact that this committee has such ~~a~~ strong bipartisan leadership and interest in these concerns, and I applaud you for having this hearing today.

[Material follows:]

phaseout of six specific substances that deplete the ozone layer: CFC-11 and CFC-12 -- those are the two worst; then CFC-113, halon 1211, halon 1301, and carbon tetrachloride, which was added after discussions with Robert Watson, who is going to be testifying later.

The bill then calls for a 10-year phaseout of other, somewhat less damaging chemicals. There are exceptions for medical and national security reasons, and I will be happy to elaborate for the record on that.

Now, there is a risk involved with the 5-year phaseout of the six most harmful ozone-depleting chemicals, and some will say that this timetable is too fast. I would urge this committee to consider the risk associated with not phasing them out. We are going to encounter risks whichever way we go.

I would argue very strongly that it is almost impossible to imagine a risk for the world greater than the one associated with continuing the current pattern of activity. I would much rather run the risk that one or more of these uses of these chemicals might not find a substitute in time, and might call for us to revisit the issue toward the end of the phaseout period.

Now, Mr. Chairman, I know that I have exceeded my time, and I appreciate not only your leadership but also your courtesy. I will supply additional material for the record.

Since then, I have elaborated on the provisions of S. 201 by introducing three new pieces of legislation, Mr. Chairman. The first, the Consumer Ozone Protection Act, has been referred to the Commerce Committee. I will not dwell on that here. But it would regulate, and in some cases ban, the sale of certain consumer products that contain these substances. no ¶

It would regulate the servicing of automobile air conditioners. A huge amount of the release of ozone-depleting chemicals comes from sloppy and irresponsible handling of CFCs used in automobile air conditioners, ~~ozone~~. It calls for the development of a chlorofluorocarbon and halon reclamation plan, and for the recapture and recycling of ~~the~~ ozone-depleting substances.

The second bill, the Ozone Layer Conservation Act, is going to the Finance Committee. Congressman Stark over on the House side has introduced the same measure, ~~there~~ with 59 cosponsors. I will submit for the record, Mr. Chairman, a comparison of the approach taken in that bill with the approach taken in your bill. Both of them establish a conservation trust fund. There is a little difference between a tax and a fee, and -- not here but in a more appropriate way -- I would like to argue the case for taking some of the best features of both of those bills, because I think there are strengths in both.

The third bill is the one that is coming to this Committee, ~~here~~ and that is the Upper Ozone Chemicals Act. It calls for a 5-year

~~associated with the ozone hole.~~

~~But another effect.~~ This committee has done yeoman's work on the clean air legislation, but there are cities throughout the United States ~~of America~~ that ~~cannot~~ may not meet the ozone standard partly because, as the stratospheric ozone layer thins out, more ultraviolet radiation ~~gets~~ passing through to ~~the~~ ground level, could interact with the emissions of automobiles and other production processes, possibly elevating ~~and elevates~~ the concentrations of ground-level ozone.

There are, in other words, ~~at least five~~ many important reasons to ~~ban~~ phase out CFCs and the other chemicals that ~~are like CFCs.~~ deplete the stratospheric ozone layer.

As some have noted, the Montreal Protocol is a great step forward. But, as this committee has led the Congress in understanding, we would have to reduce the production of CFCs by almost 90 percent just to maintain the current level of damage to the ozone layer, and the Montreal Protocol ~~does~~ at best ~~35 percent~~ will lead to a 35 percent reduction and will not even do that if the loopholes are not closed.

Let me go quickly to the legislation. I mentioned S. 201, and I want to acknowledge my debt to Senator Stafford as well. I was an original cosponsor of his legislation last year, and I know that members of this committee staff who were deeply involved in drafting that bill are also at work in this Congress, and I am grateful to them as well.

volumes. ~~CO 2~~ Carbon dioxide is probably 40 to 50 percent of the cause of the greenhouse effect, and yet CFCs are 20 percent. Why? Because each CFC molecule has as much as 10,000 to 20,000 times ~~as much~~ the strength ~~effect~~ of a carbon dioxide molecule in producing the greenhouse effect.

~~Well, simultaneously, they~~ At the same time, CFCs are responsible for virtually all of the depletion of the stratospheric ozone layer. And so as the world looks at the global ~~climate of~~ environmental problems that we face, and looks at the prospects for solving these problems, ~~you~~ we naturally must look first at the worst culprits ~~first~~ and ~~the things~~ which seem ~~easiest to do~~ most controllable. call for reducing those pollutants

Controlling CFCs is not going to be easy, but it is easier than virtually anything else that we are going to have to do. So we cannot fool around with it. We have ~~got~~ to ~~really~~ be firm and bold and strong and move on this question.

~~They cause several problems, also.~~ I have already mentioned the role of CFCs in the greenhouse effect ~~I mentioned.~~ But what comes from the depletion of the stratospheric ozone layer? The best known effect is millions of additional cases of skin cancer, millions of additional and cases of cataracts.

But, as Senator Lieberman pointed out, an even more important problem is that ~~it affects by depressing~~ stratospheric ozone depletion will lead to depression of the immune system of virtually all the living organisms. ~~That can be~~ Other particularly dangerous impacts will be felt at the bottom of the food chain, where the smaller plankton species can be greatly affected by increases in ultraviolet radiation ~~of the kind that is~~

#09STATEMENT OF HON. ALBERT GORE, JR., A UNITED STATES SENATOR FROM THE STATE OF TENNESSEE

Senator Gore. Thank you very much, Mr. Chairman.

Thank you for your outstanding leadership on this and so many other environmental questions. And to the ranking Republican member of this subcommittee, Senator Chafee, thank you for your kind words, and I appreciate the opportunity I have had to work closely with you and have admired your leadership on these issues as well.

To Senator Lieberman, I am honored that the Gore-Lieberman bill, S. 201, was introduced on the very first day of this Congress and encompasses the first effort in this Congress to deal with the problem of CFCs. I remember when Senator Lieberman -- then Candidate Lieberman -- was arguing about the need to protect the environment.

And to Senator Jeffords, thank you for your leadership. We served together in the House on these questions.

Mr. Chairman, one of the reasons CFCs have been singled out for particular attention is, of course, that they are greenhouse gases as well as ozone-depleting substances. ~~and~~ Indeed, many people are very surprised to learn that as much as 20 percent of the greenhouse effect is caused by these very same substances.

It is hard to imagine ~~that~~ how a substance like this could ~~would~~ be comparable ~~even as much as it is~~ to ~~CO2~~ carbon dioxide, which occurs so in much larger in its greenhouse-effect contribution

PM-GE-Freon,0521<
GE Agrees to Freon Program<
Eds: also on general news wires.<
By LARRY MARGASAK=
Associated Press Writer=

8/3/89

WASHINGTON (AP) Lynda Draper was watching a General Electric repairman fix her refrigerator when she noticed him releasing ozone-depleting freon into her kitchen.

Suspicious of the procedure, the Ellicott City, Md., woman complained earlier this year to GE, a company she knew well. Her grandfather, father and husband had worked there.

She didn't receive what she considered a satisfactory response.

Thus began a chain of events that led Sen. Albert Gore, D-Tenn., to announce a landmark arrangement Wednesday in which one of the best-known corporations in America agreed to keep up to 300,000 pounds of ozone-depleting freon from the marketplace.

''Hi, I'm the person that exposed GE emitting CFCs in my kitchen, across the country and probably the world,'' Ms. Draper said, introducing herself at a news conference called by Gore, who negotiated the agreement.

CFC is the abbreviation for chlorofluorocarbons.

S RETURN TO CONTINUE OR ENTER A REQUEST.

The company agreed, according to Gore and GE spokesman Jim Allen, to offset whatever amount of freon is released as part of a program to replace faulty refrigerator compressors.

Ms. Draper said she was ''totally outraged'' at the freon release, and contacted the U.S. Public Interest Research Group. The environmental lobbying and research organization contacted Gore, who has introduced legislation to ban CFCs.

Gore agreed to negotiate with the company.

The freon releases began in January, when GE began repairing the compressors in large-size refrigerators sold in 1987 and 1988. The work should be completed by year's end.

Gore estimated the 5 ounces of the gas released from each service call could total 300,000 pounds by the time the program ends.

The arrangement, Gore said, was ''breaking new ground,'' because it would mean ''real reductions in the volume of CFCs now being released into our air.''

Allen, a spokesman for GE's appliance division in Louisville, Ky., said he expected the offset would take place next year.

GE, Allen said, hadn't decided exactly how to offset the releases, but that the company has pledged to ''take off the marketplace the amount we use in the (replacement) program.''

SS RETURN TO CONTINUE OR ENTER A REQUEST.

While ozone is the chief ingredient of smog when close to the ground, it protects against ultraviolet radiation at higher levels. If a hole in the ozone layer develops and increased radiation comes through, it could cause more skin cancer, cataracts, depressed human immune systems and reduced crop yields, according to scientists and the Environmental Protection Agency.

CFCs also have been implicated in global warming, in which the earth's heat is trapped, causing temperature increases, droughts, heat waves and a rise in sea levels.

Gore and William Walsh, of the U.S. Public Interest Research Group, contended GE could have done more by using special equipment to recapture the freon during repairs instead of releasing it into the atmosphere.

Allen said portable machines that could immediately recapture the freon are not widely available and are unable to recycle the gas during the repair process.

8/2/89
8/2/89

WASHINGTON (AP)- General Electric Co. has agreed to hold back up to 300,000 pounds of ozone-depleting freon to offset the release of the gas from a refrigerator repair program, it was announced Wednesday.

Sen. Albert Gore, D-Tenn., who negotiated with GE officials, said the arrangement was ''breaking new ground,'' because it would mean ''real reductions in the volume of CFC's (chlorofluorocarbons) now being released into our air.''

Jim Allen, a spokesman for GE's appliance division in Louisville, Ky., said he expected the offset would take place next year after completion of the program to replace compressors in nearly a million large-size refrigerators sold in 1987-88.

GE is replacing the compressors, which drive the coolant system, in customers' homes. But during that process, about five ounces of freon are released. The freon joins other CFC's in floating towards the stratosphere, where the chemicals can destroy the paper-thin ozone layer.

While ozone is the chief ingredient of smog when close to the ground, it protects against ultraviolet radiation at higher levels. If a hole in the ozone layer develops and increased radiation comes through, it could cause more cases of skin cancer and eye cataracts, depressed human immune systems and reduced crop yields,

S RETURN TO CONTINUE OR ENTER A REQUEST.

according to scientists and the Environmental Protection Agency.

CFC's also have been implicated in global warming, in which the earth's heat is trapped, causing temperature increases, droughts, heat waves and a rise in sea levels.

Gore has introduced legislation to reduce and eventually ban ozone-depleting chemicals, which already are headed for a 50 percent worldwide reduction by the end of the century under an international agreement.

Allen, the GE spokesman, said the company hasn't decided exactly how to offset the releases caused by repairs, but added that the firm has pledged to ''take off the marketplace the amount we use in the (replacement) program.''

He said the company initiated the replacement program voluntarily in January after testing showed that certain compressors would not last the required 10 years.

Gore and an official of an environmental research group told a news conference that GE could have done more by using special equipment to recapture the freon during repairs instead of releasing it into the atmosphere.

''We are deeply disappointed by the company's refusal to stop routine releases of CFC's,'' William Walsh, of the U.S. Public Interest Group, said in a letter to GE. Walsh also was involved in

S RETURN TO CONTINUE OR ENTER A REQUEST.

the negotiations.

Allen said portable machines that could recapture the freon on the spot are not widely available and are unable to recycle the gas during the repair process.

The negotiations with GE began after Lynda Draper of Ellicott City, Md., complained when the freon was released in her kitchen.

''I was totally outraged,'' she said. Draper said she contacted the public interest group after calls to GE brought no satisfactory response. The public interest organization then contacted Gore.

Refrigerator Repairs Release CFCs

Groups Urge Regulation of 'Intentional' Ozone Destruction

By Kara Swisher
Washington Post Staff Writer

While conducting a nationwide repair program of more than 1 million refrigerators, the General Electric Co. has been intentionally releasing chlorofluorocarbons (CFCs) into the environment—five ounces per unit. Repairing one million refrigerators would put more than 300,000 pounds of CFCs into the atmosphere, where it is known to destroy the Earth's protective ozone layer.

Dozens of pieces of legislation to ban such "preventable releases" of CFCs are pending in both houses of Congress and in state legislatures and city councils. But for the time being, the practice of releasing small amounts of CFCs by refrigerator and air conditioning repairmen is commonplace and legal. While equipment is available to reclaim and recycle the chemical, it is not widely used.

The $450 million G.E. program came to light and to the attention of Sen. Albert Gore Jr. (D-Tenn.), an environmental advocate, through the efforts of an Ellicott City housewife who was outraged when a G.E. repairman asked her to open her kitchen windows when he came to repair a faulty rotary compressor in her 1987 G.E. refrigerator.

Lynda Draper complied with his request, but as she listened to the noise, which she described as like "air seeping out of a tire," she realized it was the substance considered by scientists to be the main culprit responsible for decreased ozone levels.

"He must have thought I was crazy because I kept shouting, 'What are you doing?' and 'Stop that immediately' when I realized what was going on," she recounted. "And he said it was only a little, so I shouldn't worry."

After complaining to G.E. officials, Draper called the Environmental Protection Agency, state agencies in Maryland, reclamation and recycling companies and environmental groups. Those groups arranged for her to meet with Gore.

"It's important to say first that we are not in violation of anything," said G.E. spokesman Jim Allen. "And our process works on the one fact that we stand behind our product with the consumer, and we felt these refrigerators needed to be fixed immediately."

Environmental groups do not agree. "It is inexcusable from an environmental point of view, considering the evolution in technology in this area and the well-documented dangers of CFCs," said Cynthia Pollock Shea, a senior researcher for the Worldwatch Institute who specializes in ozone issues. "They know the thinking on this issue. The solution to the problem

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BY JUSTINE FRAZIER FOR THE WASHINGTON POST

realized a refrigerator repairman was releasing CFCs pen the windows. She called the EPA to complain.

Refrigerator Repairs Cause Ozone Layer Breakdow

REFRIGERATORS, From A5

is strongly dependent on how quickly we stop emissions now. I'd come down on them pretty hard for even incremental emissions that they could have stopped. They should have delayed the recall until they had recycling units in the field."

If all the 1986 and 1987 G.E. refrigerators—sold under the names G.E. and Hotpoint—were repaired, approximately 150 to 300 tons of CFCs will be vented, a tiny amount when compared to the total estimated emissions of this type. In the United States, the EPA, which tracks production but not emissions, estimates that 383,537 tons of the CFCs used in air conditioning, refrigeration and foams will be made this year. Refrigeration makes up 9 percent of that. Yearly, worldwide production of the three major types of CFCs was more than one million tons. It is generally assumed that all CFCs produced will eventually find their way into the atmosphere as refrigerating equipment is junked.

"The problem with this thing is that it is entirely preventable and thoroughly premediatated," said Bill Walsh of the U.S. Public Interest Group, who arranged for a May meeting at Gore's Washington office between G.E. executives, enviromental groups, Draper and the senator. "It's not the biggest, but everyone says this about what they are doing. They say, 'Not us first.' But it's a crisis situation and every little scrap helps or hurts. Everybody has got to be counted."

No definitive agreement has yet resulted from the meeting in which Gore asked the company to quickly find alternatives to the practice. "We are working with G.E. to reduce emissions, and they are working hard to find a way to ease the emissions of CFCs overall," said Marla Romash, press secretary for Gore. "They have said they would reduce significantly, and we have a good faith in their willingness to reduce."

G.E. was cryptic about how this would be achieved. "We're going to have an offset for the amount of CFCs we emitted, but I can't tell you how. A mix of reclamation, recycling, conservation, other things," Allen said. "If reclamation equipment existed in a way we feel we could use them, we would."

Time they may not have. There are a record number of bills in the legislative process that address this issue and others, including fees on CFC production, product labeling, safe alternatives policy and, most sweepingly, a total phase-out of CFCs by the turn of the century. More than a dozen states are getting into the act—Vermont has passed a a law prohibiting the preventable ozone release as of 1990. And the 1987 Montreal Protocol, an international agreement to reduce CFC production by 50 percent by 1998, is also set to be updated next April.

The question of reclamation is controversial. G.E. maintains there is no workable equipment a But at least one company, th moflo Co. of Springfield, says it has machines ready "We have a special portable 90 pounds mounted on a cart. It's 18 inches wide, 30 high, 30 inches wide, so it c any door," said regional m Roger Dumais. The unit $3,000. A similar unit—c "vampire"—does the same th auto air conditioners—con by researchers to cause the emissions of CFCs. "Hearin things about holes in the said, "why should we dump we can use it?"

But dumping is exactly w curs. "Due to the high cost equipment and the relative cost of Freon [one brand n CFC], companies have not b ing it [capturing Freon]," said Matthews, a technician with Myers Service Co. in Falls Va. "Ninety-nine percent of th it's vented into the atmosphe

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S. 870
Consumer Ozone Protection Act of 1989

SUMMARY: The Bill would label, regulate, and -- in some cases -- eliminate the sale of certain consumer products that contain manmade substances that have been shown to deplete the stratospheric ozone layer. In addition, it promotes the development of a Chlorofluorocarbon and Halon Reclamation Plan for the purpose of encouraging recapture and recycling of ozone-depleting substances.

SPECIFIC PROVISIONS INCLUDE:

o Mobile Air Conditioners.

- Regulates auto air conditioner servicing, to ensure that chlorofluorocarbons (CFCs) are recaptured and recycled, and not unnecessarily vented to the atmosphere. (About 30% of U.S. emissions of CFC-12 originate from auto air conditioners, and three-quarters of those emissions occur during maintenance and recharging.)

- Eliminates the sale of CFC-containing air conditioner recharge cannisters smaller than 30 pounds. (This provision is intended to limit the sale of CFC-containing air conditioner fluid to bulk purchasers -- servicers -- only.)

- Requires that any servicer who recharges an auto air conditioner with CFC-containing fluids, first test the system for leaks and repair those leaks.

o Fire Extinguishers for Consumer Applications.

- Eliminates the sale of fire extinguishers that contain ozone-depleting substances for consumer applications, except for those applications required by Federal law.

o Nonessential Consumer Products Containing Chlorofluorocarbons.

- Eliminates the sale of certain nonessential CFC-containing consumer products (e.g., party streamers, noise horns, certain cleaning fluids.)

o Labeling.

- Labels consumer products that contain ozone-depleting chemicals, or use such chemicals in their manufacture or operation. The label would warn that the product's contents or manufacturing process pose a danger to

the stratospheric ozone layer, and that depletion of the ozone layer could lead to increased risk of skin cancer and damage to natural systems, including food production.

o Chlorofluorocarbon and Halon Reclamation Plan.

- Calls for a Chlorofluorocarbon and Halon Reclamation Plan, for the purpose of determining the most effective way to ensure widespread reclamation, recycling, or regulated disposal of the ozone-depleting chemicals covered by the Act,

-Referred to Commerce Committee.

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S. 871
Ozone Layer Conservation Act of 1989

SUMMARY: The Bill calls for a manufacturers' excise tax on certain chemicals that deplete the stratospheric ozone layer; establishes an Ozone Layer Conservation Trust Fund in the Treasury Department; and directs half of the revenues from the excise tax into the Trust Fund for the purpose of promoting research, development, and market incentives for technological alternatives to ozone-depleting chemicals.

SPECIFIC PROVISIONS INCLUDE:

o Manufacturers' Excise Tax on Chemicals that Deplete the Stratospheric Ozone Layer.

- Amends the Internal Revenue Code of 1986 to impose a manufacturers' excise tax on certain chemicals that deplete the stratospheric ozone layer. The amount of the tax is adjusted for each chemical, depending upon the chemical's potential for depleting stratospheric ozone.

- A similar bill has been introduced in the House of Representatives by Rep. Stark, with 59 co-sponsers; according to a Joint Committee on Taxation study, this measure would raise 0.4 billion in the first year, 0.8 billion in the second year, 1.1 billion in the third year, 1.3 billion in the fourth year, and 1.5 billion in the fifth year.

o Ozone Layer Conservation Trust Fund.

- Would receive one-half of the revenues from the manufacturers' excise tax.

- Expenditures from the Trust Fund would provide for government-industry cooperation in research, development, and market incentives for non-ozone-depleting chemical and technological alternatives (such as new refrigerator and air conditioner designs) to ozone-depleting substances.

- In addition, the federal government would investigate the means by which it might assist United States manufacturers of such alternative technologies, in exporting the equipment for applications in developing and developed countries.

-Referred to Finance Committee.

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S. 872
Upper-Ozone Chemicals Act of 1989

SUMMARY: The Bill provides for a five-year phaseout of six substances that deplete the stratospheric ozone layer (CFC-11, CFC-12, CFC-113, halon-1211, halon-1301, carbon tetrachloride), and a ten-year phaseout of other ozone-depleting substances (CFC-22, CFC-114, CFC-115, methyl chloroform, methylene chloride), with exceptions for medical and national security reasons. There are provisions for certifying that nations from which we import products that contain ozone-depleting chemicals have a similar phaseout program in place, and a requirement for safe disposal of ozone-depleting substances. Finally, the bill calls for developing a safe alternatives policy, for replacing the substances to be phased out with chemicals, product substitutes, or alternative manufacturing processes that reduce overall risk to public health and the environment.

SPECIFIC PROVISIONS INCLUDE:

o A Production Phaseout.

- Five-year phaseout for CFC-11, CFC-12, CFC-113, halon-1211, halon-1301, carbon tetrachloride.

- Ten-year phaseout for CFC-22, CFC-114, CFC-115, methyl chloroform, and methylene chloride.

- There is an exception to the production phaseout for medical and national security reasons.

o Certification of Equivalent Foreign Phaseout Programs.

- Requires certification by the Secretary of State that foreign countries have equivalent phaseout programs in place before allowing their products that contain or are manufactured with ozone-depleting substances, to be exported to the United States.

o Disposal of Ozone-Depleting Substances, and of Products That Contain Ozone-Depleting Substances.

- Requires ozone-depleting substances to be disposed of in a way that ensures that the substances will not be released to the environment.

- Requires that ozone-depleting substances be removed from appliances, machines, or other goods before those goods are disposed of, and that the substances be disposed of as indicated above.

o Safe Alternatives Policy.

- Establishes the policy that the substances to be phased out will be replaced, to the maximum extent possible, by chemicals, product substitutes, or alternative manufacturing processes that reduce overall risks to public health and the environment.

- Calls on EPA to review and report on the alternatives being considered, and assess their risks to public health and the environment.

-Referred to Environment and Public Works Committee.

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