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Ozone Hearing Questions for Witnesses April 16, 1991

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Questions for Industry:

Mr. Fay, I do want to say that I believe industry is devoting considerable time and resources in an attempt to identify substitutes for ozone - depleting chemicals. Indeed, almost every week my staff and I read news accounts or receive reports of new, ozone-safe chemicals and manufacturing processes being made by manufacturers such as DuPont and being used by Ford, GM, and others.

You note in your testimony that regulatory certainty and accelerated approval of substitutes by EPA are essential to your ability to develop environmentally sound substitutes for ozone depleting substances.

What exactly has your experience with EPA in this regard been?

What changes would you recommend?

In 1989, DuPont testified before this subcommittee on its efforts to develop substitute chemicals. Some of those chemicals have zero ozone depleting potential. DuPont noted, however that toxicology testing was incomplete for many of these compounds.

Has this situation changed? Have any of these important substitutes come on line. If not, why not? (Is this purely an EPA staffing problem, or have the companies themselves not been putting enough effort into it?)

Mr. Fay, you indicate that the decision of the European Community to phaseout CFC's in 1997, and the decision of Germany to phaseout those substances by 1995 and HCFC-22 by 2000 is less onerous for them, in part, because they do not have the refrigeration needs that we have. Could you please explain that statement?

Mr. Fay, Dr. Rowland has pointed to a disturbing trend. Why is it that, while you industries recognize the need to phaseout ozone destroying chemicals, production of CFC 113 actually seems to be rising. I find this particularly disturbing in light of the progress many electronics manufacturers have made in using non-cfc substances to clean equipment (especially aqueous and terpene-based cleaning systems).

Dr. Watson, at a Science Subcommittee hearing two years ago, you, Dr. Albritton, and Dr. Susan Solomon testified on new data on Arctic ozone depletion. At that hearing, Dr. Solomon mentioned that researchers were starting to see evidence that aerosols (like sulfuric acid droplets) and dust in the stratosphere may be catalyzing ozone depletion at mid-latitudes much as the ice crystals in polar stratospheric clouds are catalyzing ozone depletion at the poles.

- Do we have any better data on this now?
- What kind of additional research is needed in this area?
- One of the main sources of stratospheric aerosols is volcanic activity. It has been more than ten years since there has been a major volcanic eruption capable of lofting large quantities of aerosols into the stratosphere. And the last REALLY large eruption was almost 30 years ago. How do aerosol concentrations in the stratosphere today compare to the historical average? Do we know what would happen to ozone levels if there was a large volcanic eruption today?

In the last several months, several companies have announced new substitute for CFCs. How practical are these substitutes? Can the substitute be just "dropped in" or will they require extensive retrofitting of existing equipment? And how expensive are the new substitutes?

Mr. Fay, how long does it typically take to complete testing on a new substitute? Can the process be accelerated?

What percent of ozone depleting CFCs is used for air conditioning and refrigeration?

What effect will the phaseout in CFC production mandated by the Montreal Protocol have on the air conditioning and refrigeration industry?

What efforts is the industry making to improve CFC conservation, reclamation and responsible field practices to reduce ozone depleting emissions?

Do you know if students at air conditioning and refrigeration trade schools are made aware of the environmental problems of CFCs and taught how to handle these compounds conservatively? What could we do to improve these efforts?

What can we do to better reclaim CFCs contained in cars, air conditioning units and refrigerators which are scrapped?

Is there any indication that foreign companies are making any headway in the development of substitutes?

Do you believe that in light of the environmental and commercial importance of this issue, the federal government can and should increase its efforts in assisting the private sector to develop safe substitutes? What kind of efforts would be most effective?

Are CFC substitutes safe? Some substitutes are only 5% as destructive as the current chemicals. Is 5% too high? Can you do better, and, if so, at what cost?

How much of an investment must the CFC industry make in substitutes? Might developing countries enter the market for the old CFCs if we abandon them unilaterally?

What incentives could the federal government provide to make CFC substitutes affordable and useful?

CFC replacements and ozone depletion

Do we understand enough about the proposed CFC replacements to know whether and how much they might harm the ozone layer?

CFC replacements as greenhouse gases

Many of the proposed replacements for CFCs contain hydrofluorocarbons (HFCs), which don't deplete the ozone layer at all, or HCFCs (hydrochlorofluorocarbons), which do cause ozone depletion but much less than CFCs.

- Unfortunately, both HFCs and HCFCs are greenhouse gases. How much would HFCs and HCFCs contribute to greenhouse warming? How do they compare to CFCs?

Arctic ozone depletion

Dr. Watson, your measurements of the Arctic stratosphere found an abundance of the active form of chlorine responsible for the Antarctic ozone hole. Yet you've indicated that there has not been the kind of dramatic ozone depletion seen in Antarctica. That's due in part to the leaky nature of the Arctic vortex.

- My questions is, where does all that chlorine leak to? Does it remain a threat to stratospheric ozone?
- Will we ever see an ozone hole in the Arctic that's as deep as the one in the Antarctic?

Future surprises

I'd like you to do a little crystal ball grazing if you could. In the years ahead, are atmospheric scientists going to be finding new unpleasant surprises like the Antarctic ozone hole? Or have researchers uncovered most of the surprises by now?

Latest news on the Antarctic ozone hole

I understand that last year's Antarctic ozone hole was even larger and persisted longer than in previous years.

- Just how severe was the 1990 ozone hole?
- Do we understand the cause of these year-to-year variations?

Need for TOMS

2. The Total Ozone Monitoring System satellite provided us with the first complete picture of the Antarctic ozone hole.

- How important is TOMS to ozone monitoring efforts?
- Which other NASA satellites provide useful data on ozone depletion?
- Which future satellite missions will contribute directly to improving our understanding of ozone depletion? How will UARS (Upper Atmosphere Research Satellite) help? What about EOS? What will these satellites be able to do that present systems cannot?

The essential facts of ozone depletion

I'd like to begin by establishing a few basic scientific facts for the Subcommittee's hearing record:

- Is there now a consensus that CFCs are the largest source of ozone depletion? What is the relative contribution of CFCs to ozone depletion?
- Halons, the bromine-containing compounds found in fire extinguishers, also destroy ozone. How does their impact compare with that of CFCs? What other chemicals (if any) should we be worried about?
- What is the relationship between ozone depletion and CFC concentration? Does doubling the amount of CFCs double the amount of ozone depletion?

Polar Ozone depletion

Based on the results of the polar research expeditions,

- how much faster does ozone depletion occur in the polar regions than at lower latitudes?
- What part of the global reduction in stratospheric ozone can be accounted for by polar ozone depletion?

Future plans

This new data is very troubling, particularly because it tells us how much we do not understand about ozone depletion. It is clear that there is more work to be done.

- In your mind what are the critical questions that remain to be answered? What is the best way to answer them? And how long will it take?

Impacts of ozone depletion

EPA has estimated that ozone depletion will lead to increased UV radiation and millions of additional cases of skin cancer.

- Please outline the other expected impacts of ozone depletion.
- Which of the reported impacts worry you the most?

In 1988, I was able to visit Antarctica. Among other things, I was briefed on research being done there on the effects of enhanced UV on Antarctic phytoplankton and krill. (Unfortunately, that research was interrupted when an Argentine oil tanker ran aground near the research station, spilling thousands of barrels of oil into the water and upsetting the entire ecosystem.) The plankton are at the bottom of the Antarctic food chain. If they are adversely impacted by increased UV radiation, the whole marine ecosystem in the Antarctic could be threatened.

- I know that you're not marine biologists, but I would like to know if that we now know enough to say whether the plankton are vulnerable to the effects of ozone depletion. Do we have any good data on the impact of enhanced UV on plankton?
- In general, it seems that we know a lot more about the mechanisms of ozone depletion than we know about the impacts of ozone depletion. Why is that? Do we need more funding for research on impacts? Where should we focus our efforts?

The old models underestimate how serious ozone depletion is

Over the years, dozens of plots have been made of how ozone depletion will increase in the future under different scenarios. According to a 1987 EPA "Assessment of the Risks of Stratospheric Modification", if we rolled back worldwide CFC emissions to 1980 levels (that's about 10% less than today), there would be about a 3% depletion of the ozone layer at higher latitudes.

The EPA models don't take into account the accelerated ozone depletion that has been documented in the polar regions, and it does not take into account your new data. It is clear that these models are overly optimistic because they grossly underestimate the problem.

- Just how much worse is the problem?

Growing chlorine concentrations

An EPA report on "Future Concentrations of Stratospheric Chlorine and Bromine" showed how chlorine concentrations will rise in the future according to different scenarios. The report doesn't predict ozone depletion, just the concentration of the chlorine that causes it.

According to the report, even if we got 92% worldwide compliance with a total CFC ban, we'd still get twice the current levels of chlorine by the year 2000 and 4 times current levels by 2050.

Even with a total CFC phaseout, chlorine concentrations will go up 50% by the year 2000 and they'll stay high for decades.

- I understand that there is pretty good agreement on these figures. Is that true?
- These projections indicate that we need a comprehensive, international ban on CFC production. If just one major or medium-sized country chose not to comply with the ban, it could single-handedly double the amount of damage done to the ozone layer. Are you optimistic that we might be able to get the kind of compliance required to completely stop CFC production worldwide? This would require the kind of worldwide cooperation seen in the embargo against Iraq and for decades, not just months.
- Which countries are most reluctant to cut CFC production and use?
- What kinds of incentives might help convince them to stop their CFC emissions?
- **Mr. Fay**, are your member companies doing anything to help developing countries find alternatives to CFCs, halons, and other ozone-depleting chemicals?

Effect on the Man in the Street

How much ozone depletion would have to occur before the man in the street would start seeing the effects in his everyday life. You've documented a five percent thinning over the United States during the spring.

- How much worse would it have to get before people would start noticing that they get sunburned more quickly than they used to? Or that their garden yields noticeably less produce?

Missing carbon tetrachloride

Dr. Watson, when you testified before the Subcommittee two years ago, you mentioned that we really did not know where all the emission of ozone-depleting chemicals were coming from. You specifically mentioned carbon tetrachloride.

- Do we have any better data now? Can we account for all the sources of CFCs, halons, and other chemicals?

NASP, HSCT, and Ozone Depletion

Mr. Doniger, in your testimony you stated that NASA's proposed High-Speed Civil Transport and the National Aerospace Plane would both pose a serious threat to the ozone layer, and for that reason you strongly oppose both projects.

- Would the other members of the panel agree that these programs should be terminated?

One wish (science)

It is clear that there are many unresolved scientific questions regarding ozone depletion, many of which have a direct bearing on policy. Suppose each of were given the chance to get the answer to a single scientific question. What would it be?

One wish (policy)

It is also clear that there are many different steps that might be taken, both nationally and internationally, to slow ozone depletion.

- If you were made "ozone czar" and given sole responsibility for U.S. policy, what is the first action you would take? What is the most cost-effective step that could be taken to protect the ozone layer?

- What would you do in the international arena?

CFCs and the Clean Air Act

Last year, Congress amended the Clean Air Act to give the Administrator of EPA the authority to speed up the phase-out of ozone-depleting chemicals if "based on an assessment of credible current scientific information . . . regarding harmful effects on the stratospheric ozone associated with a class I or class II substance, the Administrator determines that such more stringent schedule may be necessary to protect human health and the environment against such effects . . ."

- Mr. Doniger, in your testimony you stated that you felt this new data should trigger new regulations under the Clean Air Act Amendments. Where do the rest of you stand on this question?

Action on CFCs and Action of Global Warming

In the mid-1970s, the Commerce Committee was instrumental in passing a ban on the use of CFCs in aerosol spray cans. That ban was instituted solely on the basis of Dr. Rowland's laboratory research and theoretical calculations. At the time, we had no observational evidence that indicated that ozone depletion had actually begun. Still, legislation was passed and CFC production in the U.S. dropped almost 50 percent.

- Where would we be today if we had not acted? How much worse would the situation be? (concerning both ozone depletion and global warming)
- What if the rest of the world had gone along with the aerosol ban? How much better off would we be?
- Today we face a similar situation with global warming. We know greenhouse gases are building up in the atmosphere. There is a scientific consensus that those gases will inevitably lead to warming. Do we know as much about global warming now as we did about ozone depletion in the mid-1970s? Do you think we can justify unilateral restrictions on greenhouse gases, especially when you consider the consequences of doing nothing?

Involvement of foreign scientists

Whether other countries decide to restrict their emissions of CFCs will depend a great deal on the advice those countries' leaders get from their scientific advisors. It is wishful thinking to think that developing countries will act solely on the basis of what scientists from the developed world are saying.

- Are there scientists in the developing world who understand the threat posed by ozone depletion and who are pushing their governments to act?
- Have scientists from the developed world done enough to reach out to scientists elsewhere?