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NOAA [National Oceanic and Atmospheric Administration] - Rural Ozone and the Clean Air Act Amendments March 8, 1993

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Environmental Research Laboratories
325 Broadway
Boulder, Colorado 80303-3328

8 March 1993 R/E/AL

MEMORANDUM FOR: Katie McGinty
Director, White House Office of Environmental Policy

FROM: Dan Albritton Dan
Director, NOAA Aeronomy Laboratory

SUBJECT: Rural ozone and the Clean Air Act Amendments

I appreciate your interest in more details of the emerging environmental issue of elevated ozone levels in rural areas. This memo summarizes that problem, gives the relation to the Clean Air Act Amendments, and notes NOAA's research plans for helping clarify this and related issues.

I. Rural Ozone: Tomorrow's Problem?

Urban smog and the Clean Air Act. Pollutant ozone is made photochemically from the combination of nitrogen oxides (NO_x) and volatile organic compounds (VOCs), in the presence of sunlight and elevated temperatures and humidity. In most urban areas, automobiles are the major source of NO_x and VOCs, hence smog. High urban ozone episodes are very common in most major cities and are a threat to human health. For that reason, the original Clean Air Act required that automobiles have catalytic convertors that could remove the VOCs from their exhaust. (Removal of either VOCs or NO_x would reduce ozone, but NO_x removal was deemed too expensive relative to VOC removal.)

Rural ozone: A new issue. High ozone episodes are now occurring more frequently in rural areas, where crop and forest damage are the growing environmental issue. Originally, these high rural ozone episodes were deemed to be simply residues of urban smog that had been transported to the countryside. Hence, it was believed that the same control strategy, i.e., the removal of VOCs, should ameliorate both urban and rural ozone. NOAA research has shown that this belief is unlikely to be true.

Rural ozone: The new picture of its origin. NOAA field measurements and diagnostic modeling have shown that, in rural areas in Pennsylvania and Alabama, ozone is formed largely by man-made NO_x and natural VOCs from local vegetation. Indeed, in the Pennsylvania study, diagnostic modeling indicated that if all of the man-made VOCs were to be removed, then the high ozone episodes that were observed there would only have been reduced by 10%, since there were large amounts of natural VOCs to combine with the man-made NO_x.

Implications to current policies. If these NOAA results are indeed representative of the rural Eastern United States:

- o Current regulations likely will not help reduce rural episodes.
- o Possible strategies for reducing nitrogen oxides deserve revisiting.
- o Wooded Southern cities may never be able to be in compliance under current approaches.

Both costs and benefits are large. On the one hand, the Environmental Protection Agency has estimated that the early phases of the Clean Air Act Amendments of 1990 will require $ 4 - 8 B per year to meet urban health standards. On the other hand, the Office of Technology Assessment has estimated that if ozone could be lowered by 25%, U. S. crop yield would increase by $ 0.5 - 1 B per year, particularly for protein-export grains as such as soybeans. Thus, both the potential costs and the possible benefits associated with reducing ozone levels are large. The Clean Air Act Amendments are the flagship of our domestic environmental legislation. Are they flawed relative to emerging science? Can a better scientific understanding reduce their costliness, but not their environmental benefits?

Information is the key. The Clean Air Act Amendments must be implemented state by state. The role of natural VOCs will be markedly different in various regions, thereby affording the opportunity, for example, to tailor the regulations efficiently by region, yielding less ozone formation for minimum cost of controls. Drawing upon NOAA's discoveries and other recent research results, the National Academy of Sciences, in their report, *Rethinking the Ozone Problem in Urban and Regional Air Pollution* (1992), has called for a much more fundamental research approach to understanding the basics of the air-quality problem, since previous ad-hoc techniques have failed. NOAA, in conjunction with others, has developed the approaches for doing so. NOAA's Rural Ozone $3.9M component of its FY 1994 "Health of the Atmosphere" Initiative will identify which regions of the U.S. are dominated by natural VOC emissions, characterize the chemistry whereby these and NO_x emissions form ozone, and provide model simulations that will define the most effective emission control for reducing high rural ozone episodes.

II. Related Clean Air Act Amendments Research Needs

Early Detection of Cleaner Air. NOAA has designed a monitoring network that can provide the early observation of the response of air quality to the Phase 1 emission reductions required by the Clean Air Act Amendments. This $4.7M component of NOAA's FY 1994 "Health of the Atmosphere" initiative will help specify how the subsequent Phase 2 emission reductions can be made most effectively. This will be particularly important in the implementation of the Clean Air Act Amendments since the Phase 2 reductions will be quite costly. Furthermore, being able to show the public and industry how the Phase 1 reductions have indeed improved U. S. air quality will increase the support for the more-expensive Phase 2 reductions.

Rehabilitation of the Ozone Layer. The nation is committed to eliminating the ozone-depleting chlorofluorocarbons (CFCs) and halons. But what to use in their place? And what are the risks introduced by other ozone-depleting substances, such as methyl bromide, which is widely used as a fumigant. The maximum stratospheric ozone depletions will occur over the next 10 - 15 years. Appropriate use of the CFC and halon substitutes and other ozone-depleting substances can minimize those peak ozone losses. NOAA has designed a $1.9M field, laboratory, and modeling research component in its FY 1994 "Health of the Atmosphere" initiative to characterize the ozone-depleting potentials of the CFC and halon substitutes and the atmospheric processes of methyl bromide. This information will provide guidance to U. S. industry as to which substitutes are the most appropriate for investment. Clarifying the ozone-depleting role of methyl bromide will provide an improved scientific basis for the international regulations of this substance under the U. N. Montreal Protocol.

Please do contact me again if I can provide other information regarding the science and NOAA's research plans for addressing the above three issues involving effective implementation of the U. S. Clean Air Act Amendments.