

EXXON RESEARCH AND ENGINEERING COMPANY

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GOVERNMENT RESEARCH LABORATORIES
W. M. COOPER, JR.
Director

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Dr. Edward E. David, Jr.
General Administration
FP #101/Room G-119

Dear Ed:

A set of highly visible programs has been developed to help clarify the mechanisms associated with storage of carbon dioxide, and thus help predict the likelihood of a greenhouse effect. The programs will make use of Exxon facilities such as tankers and drilling ships to measure the rate of CO₂ uptake by the various layers of the ocean. Sophisticated techniques involving measurements of changes in isotopic ratios of carbon and the distribution of radon in the ocean will be used in conjunction with state-of-the-art techniques to measure CO₂ concentration in the atmosphere and in the oceans.

In addition to the ocean related work, a program is proposed to determine the source of the annual atmospheric CO₂ increment that has been increasing since the Industrial Revolution (1860). Researchers have attributed the CO₂ increment to varying combinations of fossil fuel burning and forest clearing. The program would measure the concentration of C-13 (stable) and C-14 (radioactive) in wines from sources that have well documented histories of temperature, weather, and location as a function of the time the wines were produced. By taking into account the relative absence of C-14 in wines, we will be able to estimate the contribution of fossil fuels (in which C-14 has decayed over the thousands of years of storage), and thus determine the relative concentration of fossil fuel derived CO₂ that was present in the atmosphere at the time the grapes were grown. Similarly, by analyzing the wine for the relative depletion of C-13 (this isotope is less reactive in photosynthesis than the predominant C-12), we will be able to estimate the contribution of forest clearing to the growth of CO₂ in the atmosphere. The wine measurement program would provide a unique and novel method to unravel the historical source of the incremental growth of CO₂ in the atmosphere.

We propose to implement our programs by May 1, 1979 in order to begin to assess the real meaning of the greenhouse effect to Exxon. We would start by equipping a tanker on the Persian Gulf to Aruba and Houston run with continuous instrumentation to measure CO₂ in the atmosphere and

