EXXON RESEARCH AND ENGINEERING COMPANY
P.O. BOX 8. LINDEN. N. J. 07036

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

December 7, 1978

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 CO_2 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 CO_2 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 CO_2 increment that has been increasing since the Industrial Revolution (1860). Researchers have attributed the CO_2 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 CO_2 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 CO_2 in the atmosphere. The wine measurement program would provide a unique and novel method to unravel the historical source of the incremental growth of CO_2 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 CO_2 in the atmosphere and

in the ocean. A number of batch ocean samples will be taken and stored for measurement of C-14. This measurement will be used to estimate the penetration of CO_2 into the ocean. The equipment will be manned by two ER&E technicians. We expect to conduct measurements for at least a year, and this will involve 5 round trips. Preliminary discussions with Esso International tanker personnel on the feasibility of using Exxon tankers have been favorable.

The drilling ship program which is designed to measure the mass transfer coefficient for CO_2 between the atmosphere and the ocean as a function of weather conditions would probably be started in Exxon drilling operations off the coast of Australia. The program would involve a month or two of Rn-222 on-board measurement using conventional equipment for α-counting. The program would get underway towards the end of the Summer of 1979. The wine measurement program would procure some 100 bottles of wine that have well documented histories, probably from a single chateau in France. These wines would be analyzed for C-13 using the highly sophisticated facilities at EPRCo., and for C-14 using the unique equipment at the University of Miami (School of Marine and Atmospheric Science). The program would start in May 1979.

We expect to conduct these programs in two phases over the period 1979-1984 (inclusive). Phase I would start May 1, 1979 and be conducted entirely with Exxon funding over the first year. Phase II would start as soon as Government (DOE) funding can be obtained. We visualize the drilling ship operations and the wine measurements programs to be entirely funded by Exxon and the tanker measurements program funded by the DOE. Our screening-type estimates in 1979 $ indicate the Phase I programs will cost 0.5 M$ and the total programs (Phase I and Phase II) 8 M$. Personnel costs account for over 70% of the cost, so methods of automating the tanker sampling program will be sought during Phase I.

In view of the highly complex nature of the programs, and the need to integrate the Exxon results into the global weather modeling programs, we intend to work closely with a university and the Government. We are currently considering a cooperative program with Columbia University's Lamont-Doherty Geological Observatory because two of the oustanding oceanographers and experts on the CO_2 problem, W. S. Broecker and T. Takahashi are associated with that institution.

The rationale for Exxon's involvement and commitment of funds and personnel is based on our need to assess the possible impact of the greenhouse effect on Exxon business. Exxon must develop a credible scientific team that can critically evaluate the information generated on the subject and be able to carry bad news, if any, to the corporation. This team must be recognized for its excellence in the scientific community, the government, and internally by Exxon management. We see no better method to acquire the necessary reputation than by attacking one of the major uncertainties in the global CO_2 balance, i.e., flux to the oceans and providing the necessary data. In addition, the international significance of the proposed programs will enhance the Exxon image in the public domain and provide great public relations value. As a consequence of the above, these programs are prime candidates for early implementation under the National Impact Program charter.

We have attached to this letter two appendices which assess the state-of-the-art on the greenhouse effect and provide details of the proposed programs. We are looking to you and the management council for guidance.

Very truly yours,

Henry Shaw

HS/jep

Attachments

cc: J. F. Black
W. M. Cooper, Jr.
R. T. Craig
F. J. Feely
W. Glass
E. J. Gornowski, Jr.
P. J. Lucchesi
R. E. Lyon, Jr.
J. K. Patterson
B. T. Richards, Jr.
L. E. Swabb, Jr.
R. L. Weeks
H. N. Weinberg
N. R. Werthamer

0757-L-RWC

EXXON RESEARCH AND ENGINEERING COMPANY

CORPORATE RESEARCH
SCIENCE LABORATORIES

P. O. Box 45, Linden, N. J. 07036

DUANE G. LEVINE, Director

ROGER W.COHEN, Director
Theoretical and Mathematical Sciences Laboratory

September 2, 1982

H. N. WEINBERG
SEP 2 1982

Mr. A. M. Natkin
Office of Science and Technology
Exxon Corporation
1251 Avenue of the Americas
New York, New York 10020

Dear Al:

I would like to summarize the findings of our research in climate modeling and place our results in the context of the existing body of knowledge of the CO_2 greenhouse effect.

Although the increase of atmospheric CO_2 is well documented, it has not yet resulted in a measurable change in the earth's climate. The concerns surrounding the possible effects of increased CO_2 have been based on the predictions of models which simulate the earth's climate. These models vary widely in the level of detail in which climate processes are treated and in the approximations used to describe the complexities of these processes. Consequently the quantitative predictions derived from the various models show considerable variation. However, over the past several years a clear scientific consensus has emerged regarding the expected climatic effects of increased atmospheric CO_2. The consensus[+] is that a doubling of atmospheric CO_2 from its pre-industrial revolution value would result in an average global temperature rise of $(3.0 \pm 1.5)^{\circ}C$. The uncertainty in this figure is a result of the inability of even the most elaborate models to simulate climate in a totally realistic manner. The temperature rise is predicted to be distributed nonuniformly over the earth, with above-average temperature elevations in the polar regions and relatively small increases near the equator. There is unanimous agreement in the scientific community that a temperature increase of this magnitude would bring about significant changes in the earth's climate, including rainfall distribution and alterations in the biosphere. The time

[+]National Research Council Panel Report, Carbon Dioxide and Climate: A Second Assessment, National Academy Press, Washington, D.C., 1982.

required for doubling of atmospheric CO_2 depends on future world consumption of fossil fuels. Current projections indicate that doubling will occur sometime in the latter half of the 21st century. The models predict that CO_2-induced climate changes should be observable well before doubling. It is generally believed that the first unambiguous CO_2-induced temperature increase will not be observable until around the year 2000.

It should be emphasized that the consensus prediction of global warming is not unanimous. Several scientists have taken positions that openly question the validity of the predictions of the models, and a few have proposed mechanisms which could mitigate a CO_2 warming. One of the most serious of these proposals has been made by Professor Reginald Newell of MIT. Newell noted that geological evidence points to a relative constancy of the temperature of the equatorial waters over hundreds of millions of years. This constancy is remarkable in view of major climatic changes in other regions of the earth during this period. Newell ascribed this anchoring of the temperature of the equatorial waters to an evaporative buffering mechanism. In this mechanism, when heating increases at the equator, most of the extra energy induces greater rates of evaporation rather than raising temperatures. Newell proposed that this effect might greatly reduce the global warming effect of increased atmospheric CO_2.

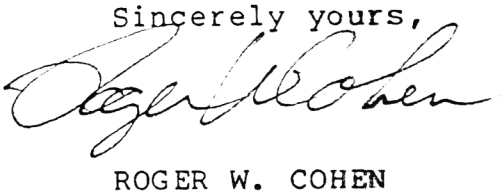
In our climate research we have explored the global effects of Newell's evaporative buffering mechanism using a simple mathematical climate model. Our findings indicate that Newell's effect is indeed an important factor in the earth's climate system. As Newell predicted, evaporative buffering does limit CO_2-induced temperature changes in the equatorial regions. However, we find a compensatingly larger temperature increase in the polar regions, giving a global averaged temperature increase that falls well within the range of the scientific consensus. Our results are consistent with the published predictions of more complex climate models. They are also in agreement with estimates of the global temperature distribution during a certain prehistoric period when the earth was much warmer than today.

In summary, the results of our research are in accord with the scientific consensus on the effect of increased atmospheric CO_2 on climate. Our research appears to reconcile Newell's observations and proposed mechanism with the consensus opinion.

We are now ready to present our research to the scientific community through the usual mechanisms of conference presentations and publications in appropriate journals. I have enclosed a detailed plan for presenting our results.

As we discussed in the August 24 meeting, there is the potential for our research to attract the attention of the popular news media because of the connection between Exxon's major business and the role of fossil fuel combustion in contributing to the increase of atmospheric CO_2. Despite the fact that our results are in accord with those of most researchers in the field and are subject to the same uncertainties, it was recognized that it is possible for these results to be distorted or blown out of proportion. Nevertheless the consensus position was that Exxon should continue to conduct scientific research in this area because of its potential importance in affecting future energy scenarios and to provide Exxon with the credentials required to speak with authority in this area. Furthermore our ethical responsibility is to permit the publication of our research in the scientific literature; indeed to do otherwise would be a breach of Exxon's public position and ethical credo on honesty and integrity.

Sincerely yours,



ROGER W. COHEN

RWC:tmc

Enclosure

cc: A. J. Callegari
E. E. David, Jr.
B. P. Flannery
M. B. Glaser
D. G. Levine
P. J. Lucchesi
H. N. Weinberg

0763-L-RWC

CO_2 Climate Modeling Research: Timetable for Presentations and Publications

I. Presentations

(1) DOE Sponsored CO_2-CLimate Meeting
September 19-23, 1982 (West Virginia)

(a) Results pertaining to general aspects of the model to be presented in an informal session by our collaborator Professor M. I. Hoffert of NYU. The CO_2 calculations will not be included.

(b) Preprints of the paper [#(1) below] to be distributed at this meeting to general peer comments and discussion.*

(2) Ewing Symposium (Lamont-Doherty/Exxon Foundation Supported)
October 25-27, 1982

(a) Results concerning general aspects of the model and the CO_2 calculations to be presented by B. P. Flannery (CR).

II. Publications

(1) Manuscript developing general aspects of the model to be submitted for publication to the Journal of Geophysical Research, September, 1982.*

(2) Manuscript on CO_2 related model predictions to be submitted in late 1982.

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* Provided formal publication clearance has been granted by this time.

Mobil

Status Report Environmental & Toxicology Issues

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MOBIL OIL CORPORATION
ENVIRONMENTAL AFFAIRS AND TOXICOLOGY DEPARTMENT

ATMOSPHERIC GREENHOUSE EFFECT: IS BURNING OF FOSSIL FUELS AFFECTING WORLD CLIMATE?

INTRODUCTION

In theory, increasing levels of carbon dioxide produced by burning fossil fuels could alter the world's climate by raising the earth's temperature. This warming might occur because carbon dioxide in the air acts like glass in a greenhouse--trapping the sun's heat at the earth's surface--heat that would normally escape back into space.

The "greenhouse" effect is an emerging environmental issue characterized by considerable scientific uncertainty. But, some scientists argue that plans to cope with the greenhouse effect need to be made soon, because of the extremely long lead time for any conceivable corrective actions. Such plans could affect the energy industry by dictating what fuels could be marketed.

This report summarizes the background and status of the greenhouse effect, indicating possible impacts on Mobil operations.

DISCUSSION

Plants consume carbon dioxide during growth, and release it back to the atmosphere when they decay. There is a relationship between carbon dioxide in the air and carbonate salts in the oceans. Before 1850, man had little influence on the carbon dioxide cycle. There appears to have been a balance between carbon dioxide in the air and carbon compounds in the land and seas.

However, since the industrial revolution human activities, such as fossil fuel combustion and forest clearing, may have altered the carbon cycle. The net effect of these activities could add carbon dioxide to the atmosphere more rapidly than it can be removed by oceans and plants. Since 1850, carbon dioxide in the air has increased about 18 percent--reaching a level today of 335 parts-per-million. The most reliable atmospheric carbon dioxide monitoring programs-- established in 1957--show an 8 percent increase in just

the past 25 years. Based on future world energy demand, many scientists believe that carbon dioxide levels could double within the next century.

The effects of such an increase are controversial. For example, using global climate theories, some scientists predict that a two-fold increase in atmospheric carbon dioxide could warm the earth's surface from 3° to 6°F. Temperature increases of 12°-18°F are predicted at the poles. If these estimates are correct, melting of the arctic ice packs could occur, and sea levels could rise 15 to 20 feet, inundating many of the world's coastal cities.

This large temperature change could bring on drought which might drop crop yield in the major grain growing areas of the northern hemisphere. On the other hand, the change in climate in equatorial and northern countries, where growing conditions are presently poor, could improve agricultural productivity. If these projections are accurate, Third World countries would have little incentive to control carbon dioxide emissions by restraints on fossil fuel consumption.

The scenario described offers one view of potential long-range climate impacts of increased carbon dioxide levels. But the climate response predicted by theory cannot yet be detected. Moreover, there are other plausible forecasts that suggest a completely different effect.

For example, some scientists say that more carbon dioxide will stimulate plant growth--partly offsetting projected warming trends. Still other scientists claim that more carbon dioxide will increase humidity and cloudiness, block incoming sun rays, and moderate the trend toward higher temperatures.

IMPACT ON INDUSTRY AND MOBIL OPERATIONS

The magnitude and timing of carbon dioxide-greenhouse effects could be closely tied to future energy consumption, with particular focus on coal and synfuels.

On an end-use energy equivalent basis, the production and combustion of coal and synfuels releases more carbon dioxide into the atmosphere than does production and combustion of natural gas or oil. Compared to oil, coal contributes about 25% more carbon dioxide, shale syncrude contributes about 25% more, and direct coal synfuel liquids contribute about 70% more. On the other hand, production and combustion of natural gas contributes about 25% less carbon dioxide than oil.

The greenhouse effect will continue to receive attention by government agencies charged with balancing energy and environmental policies. If the greenhouse effect should become an urgent national concern, restrictions on fossil fuel and land use might be established. Such restrictions could require changes in supply and distribution of oil, coal, and gas. Increased forest preservation could also be required.

Some people, perhaps realistically, believe society cannot react in time to prevent major climate changes. However, they suggest that society will adapt to the changes that will occur over a 100 year period.

MOBIL ACTIVITIES

Given the current lack of knowledge, additional research is needed and government programs to study this issue should be supported. Mobil's response should be to follow these research developments. Mobil participates in API sponsored research projects to improve climate models. Corporate Environmental Affairs and Mobil Research and Development Corporation monitor research activities in this area, and Mobil participation in Conservation of Clean Air and Water-Europe keeps us informed of European thinking and approaches to this problem.

Dr. Fite

Date 8/3/85

To: Dr. L

From: **Joseph M. Carlson**

Attached is a draft on the Greenhouse effect. As you can see, most of it is taken from the Hyde Park material. I haven't attempted to research any of the facts, given Brian's absence. The first two items on the last page are intended to address the question "what do you think is the direct impact on Exxon's business. I haven't checked them with Corporate Planning as yet.

Joe

The Greenhouse Effect

Issue

The Greenhouse effect refers to atmospheric gases which retain reflected solar radiation, which is essential to the support of life on Earth. Current concern is associated with the "enhanced" Greenhouse effect, or the possible increase in global surface temperatures due to an increased rate of build-up of Greenhouse gases.

Background

- The Greenhouse effect may be one of the most significant environmental issues for the 1990s.

- Gases that favor absorption of infrared (IR) radiation: carbon dioxide, water vapor, methane, nitrous oxide, chloro-fluorocarbons, and halogens.

- THE PRINCIPAL GREENHOUSE GASES ARE BY-PRODUCTS OF FOSSIL FUEL COMBUSTION.

"ENHANCED" GREENHOUSE EFFECT

- MOLECULES OF CO_2 WHICH ARE EFFICIENT ABSORBERS OF REFLECTED SOLAR IR CAN CAUSE DISPROPORTIONATE WARMING OF THE ATMOSPHERE.

- THIS WARMING INCREASES THE EARTH'S SURFACE TEMPERATURE, IN TURN INCREASING WATER VAPORIZATION.

- WATER VAPOR MOLECULES ARE ALSO EFFICIENT IR ABSORBERS AND GREATLY MAGNIFY THE ORIGINAL CO_2 EFFECT. OTHER ATMOSPHERIC GASES LIKE TRACE QUANTITIES OF CHLORO-FLUOROCARBONS CAN TRIGGER THE WATER VAPOR WARMING CYCLE.

- THERE IS NO CONSENSUS ON THE NET EFFECT OF THESE PROCESSES.

- THERE IS SCIENTIFIC AGREEMENT ON TWO POINTS:
  - ATMOSPHERIC CO_2 IS INCREASING AND COULD DOUBLE IN 100 YEARS.

- FOSSIL FUELS CONTRIBUTE ABOUT FIVE BILLION TONS/YEAR OF CO_2. DEFORESTATION ADDS TWO-FIVE BILLION TONS PER YEAR.

CLIMATE MODELS

o MOST DEBATE CENTERS ON PROJECTING FUTURE IMPACT USING CLIMATE MODELS.

o THESE MODELS ARE EXTREMELY COMPLEX AND REQUIRE TRACKING CO_2 INTERACTIONS IN THE ATMOSPHERE AND BIOSPHERE AND MUST ADDRESS THE ROLE OF TRACE GASES, OCEANS, CLOUDS, BIOMASS AND LARGE ICE FORMATIONS AT THE POLES. THESE INTERACTIONS ARE NOT WELL UNDERSTOOD.

- THE CLIMATE MODELS ARE NOT VERY RELIABLE BECAUSE APPROXIMATIONS ARE USED TO REPRESENT POORLY UNDERSTOOD INTERACTIONS.

o CLIMATE MODELS PREDICT A 1.5^{o} C TO 4.5^{o} C GLOBAL TEMPERATURE INCREASE IN 100 YEARS - DEPENDING ON THE PROJECTED GROWTH IN FOSSIL FUEL USE.

- Such warming could result in partial polar ice cap melting with associated sea level rise and since CO_2 and H_2O vapor aid plant growth, there could be an acceleration or alteration in vegetation growth patterns favoring selected species.

- It is too early to specify the severity of the potential impacts of the enhanced Greenhouse effect.

- Actual measurements of northern hemisphere average temperatures show no clear pattern over a 20-year period from 1960 to 1980. When projected at a rate corresponding to about 2^{o} C increase over 100 years, the trend does not escape from the uncertainty band for another 10 years.

Current Mitigation Efforts

- Reduction in chloro-fluorocarbon emissions to protect ozone in the upper atmosphere.

- Protection of major global forest resources.

- Continuing the emphasis on efficiency in energy generation and use.

Worldwide Research

- National and international research programs are being established to monitor and evaluate the Greenhouse phenomenon.

- In the U.S., about $25 million per year is budgeted for direct CO_2 Greenhouse research.

Exxon Research

- In the last five years Exxon has supported both in-house and theoretical studies and outside research programs at key institutions.
  - Lamont Doherty Geological Observatory

- Columbia University Climate Center (total funds for both about $.6 million)

o Exxon scientists are interacting with key government agencies including the United Nations' Environmental Program, IPECA, OECD, DOE, and U.S. EPA.

o Exxon is providing leadership through API in developing the petroleum industry position.

Exxon Position

o Emphasize the uncertainty in scientific conclusions regarding the potential enhanced Greenhouse effect.

o Urge a balanced scientific approach.

- DUE TO CURRENT SCIENTIFIC UNCERTAINTY, EXXON IS NOT CONDUCTING SPECIFIC IMPACT STUDIES WITH RESPECT TO PARTICULAR COMPANY OPERATIONS OR GEOGRAPHIC REGIONS.

- EXXON HAS NOT MODIFIED ITS ENERGY OUTLOOK OR FORECASTS TO ACCOUNT FOR POSSIBLE CHANGES IN FOSSIL FUEL DEMAND OR UTILIZATION DUE TO THE GREENHOUSE EFFECT.

- RESIST THE OVERSTATEMENT AND SENSATIONALIZATION OF POTENTIAL GREENHOUSE EFFECT WHICH COULD LEAD TO NONECONOMIC DEVELOPMENT OF NONFOSSIL FUEL RESOURCES.

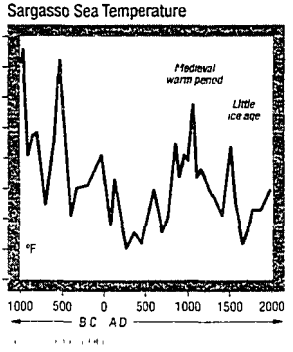
Unsettled Science

Knowing that weather forecasts are reliable for a few days at best, we should recognize the enormous challenge facing scientists seeking to predict climate change and its impact over the next century In spite of everyone's desire for clear answers it is not surprising that fundamental gaps in knowledge leave scientists unable to make reliable predictions about future changes

A recent report from the National Research Council (NRC) raises important issues, including these still-unanswered questions (1) Has human activity already begun to change temperature and the climate, and (2) How significant will future change be?

The NRC report confirms that Earth's surface temperature has risen by about 1 degree Fahrenheit over the past 150 years Some use this result to claim that humans are causing global warming, and they point to storms or floods to say that dangerous impacts are already under way Yet scientists remain unable to confirm either contention

Geological evidence indicates that climate and greenhouse gas levels experience significant natural variability for reasons having nothing to do with human activity Historical records and current scientific evidence show that Europe and North America experienced a *medieval warm period* one thousand years ago, followed centuries later by a *little ice age* The geological record shows even larger changes throughout Earth's history Against this backdrop of large poorly understood natural variability, it is impossible for scientists to attribute the recent small surface temperature increase to human causes



Moreover, computer models relied upon by climate scientists predict that lower atmospheric temperatures will rise as fast as or faster than temperatures at the surface However, only within the last 20 years have reliable global measurements of temperatures in the lower atmosphere been available through the use of satellite technology These measurements show little if any warming

Even less is known about the potential positive or negative impacts of climate change In fact, many academic studies and field experiments have demonstrated that increased levels of carbon dioxide can promote crop and forest growth

So, while some argue that the science debate is settled and governments should focus only on near-term policies—that is empty rhetoric Inevitably, future scientific research will help us understand how human actions and natural climate change may affect the world and will help determine what actions may be desirable to address the long-term

Science has given us enough information to know that climate changes may pose long-term risks Natural variability and human activity may lead to climate change that could be significant and perhaps both positive and negative Consequently, people, companies and governments should take responsible actions now to address the issue

One essential step is to encourage development of lower-emission technologies to meet our future needs for energy We'll next look at the promise of technology and what is being done today

ExxonMobil

Display Ad 25 -- No Title
New York Times (1923-Current file); Oct 30, 1997;
ProQuest Historical Newspapers: The New York Times (1851-2007) with Index (1851-1993)
pg. A31

Reset the alarm

The alarm is about to go off as the Kyoto deadline approaches. Government negotiators meet in a month to decide on a mandatory plan for industrialized nations to cut their emissions of carbon dioxide and other heat-trapping gases. But imposing a solution before the problem has been defined could prove a rude awakening for the developed and developing countries.

Basically, three proposals are under consideration. The European Union plan wants industrialized nations to cut greenhouse gas emissions 15 percent below 1990 levels by 2010. Japan's plan calls for reducing emissions five percent below 1990 levels between 2008 and 2012. The U.S. plan targets a return to 1990 emissions levels over the 2008–2012 period, with additional cuts coming later.

The U.S. plan also encourages joint implementation projects—where one country invests in an emission-reduction project in another country and earns credit for the reductions at home—and emissions trading. More importantly, the U.S. plan recognizes that developing countries, which will become tomorrow's largest carbon emitters, must participate in the solution. The president said the U.S. will not "assume binding obligations unless key developing nations meaningfully participate in this effort." The problem is that if they aren't signatories and participants to a treaty that binds them to action, then there's no global solution.

Energy conservation and development of energy-efficient technologies in the U.S. via tax cuts and other incentives are also under consideration.

At first reading, the U.S. proposal seems moderate. We're encouraged by the call for voluntary, market-based steps. But we're wary of incentives, which are usually subsidies in disguise.

What is not moderate is the call to lower emissions to 1990 levels. A cutback of that size would inflict considerable economic pain.

The Energy Information Agency projects that energy demand in industrialized nations over the 1990–2010 period will grow about 30 percent. Committing to binding targets and timetables now will alter today's lifestyles and tomorrow's living standards. Flexibility will be constrained. Carpooling in; sport utility vehicles out. High fuel and electric bills. Factory closures. Job displacement. And could businesses and consumers cut their energy consumption by 30 percent without some form of tax or carbon rationing? Probably not.

Let's face it: The science of climate change is too uncertain to mandate a plan of action that could plunge economies into turmoil. Yet, that's what nations seem prepared to do.

Scientists cannot predict with certainty if temperatures will increase, by how much and where changes will occur. We still don't know what role man-made greenhouse gases might play in warming the planet.

We're not impugning the existing science or suggesting that "our science is better than your science." Current science isn't bad; it just doesn't go far enough. Better science is emerging on what factors affect global warming. No need to wait 20 or 50 years; big breakthroughs that will dramatically inform our decision-making are expected in the next five to 10 years. Scientists are getting more precise in calculating temperature variations; they're probing the role of clouds and oceans on climate. Such information can take much of the guesswork out of what and where actions will be needed.

In the meantime, businesses, individuals and governments can take precautionary, voluntary steps to reduce their emissions. And we can begin to work more closely with developing nations to help them grow their economies in energy efficient ways.

Let's not rush to a decision at Kyoto. Climate change is complex; the science is not conclusive; the economics could be devastating. And the world's not ready for it. Reset the alarm and take the time to get it right.

Mobil The energy to make a difference.

http://www.mobil.com/climatechange