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United States Government **Department of Energy**

memorandum

DATE: JUN 07 1990

REPLY TO
ATTN OF: ER-76

SUBJECT: INFORMATION: Intergovernmental Panel on Climate Change (IPCC) Working Group 1 Report

TO: The Secretary
Thru: Deputy Secretary

Background:

The IPCC was formed in October of 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP). The objectives of the IPCC were to assess the science of climate change (Working Group 1), examine the socioeconomic impacts (Working Group 2) and explore possible mitigative strategies (Working Group 3). Thirty-one countries have participated in the IPCC science assessment process. The IPCC will formally present their reports at the Second World Climate Conference in October of 1990 and then to the United Nations General Assembly in November of 1990.

Working Group 1 was chaired by the United Kingdom (U.K.); their representative is Dr. John Houghton, Head of the U.K. Meteorological Office. The U.S. representation is by the Working Group on Global Change of the Committee on Earth and Environmental Sciences (CEES). At the Working Group 1 discussions, the CEES has been represented by two of its working group members, Dan Albritton of the National Oceanic & Atmospheric Administration (NOAA), and Bob Watson of the National Aeronautics and Space Administration (NASA).

There are three IPCC Working Group 1 documents. They are a three-page Executive Summary which is a condensation of the 35-page Policymaker's Summary which, in turn, is based on the full report (approximately 200 pages). The full report includes 11 sections covering all scientific aspects of climate change from "Greenhouse Gases and Other Forcing Agencies" to "Narrowing the Uncertainties."

The IPCC Working Group 1 full report was written and reviewed by the international scientific community. Approximately 300 scientists participated in the process with over 80 scientists from the U.S. (including 30 DOE-funded scientists). The CEES and the National Academy of Sciences jointly selected the U.S. reviewers for the three documents. The review and editing of these documents has been extensive and intensive. Only the Executive Summary is final (a copy is attached) and was officially released in the U.K. on May 25, 1990. The Policymaker's Summary will be available in the next few days and the full report within the next few weeks.

Concerns:

The two summaries were initially prepared by a small group of scientists at the U.K. Meteorological Office and even with acceptance of many of the U.S. comments do not fully address U.S. concerns regarding scientific uncertainties of the full report.

Discussion:

There has been relatively little controversy regarding the full IPCC Working Group 1 report. It presents a reasonable picture of the current scientific consensus on climate change and also addresses some recommended approaches to narrowing the scientific uncertainties.

There was some controversy regarding the two draft Summaries and in particular, the Executive Summary. The issue was, and remains, whether the Summaries represent accurate condensations of the full report. The CEES deliberated to great length in developing the U.S. position on the two draft Summaries during the week of May 14, 1990. The position was presented by Dan Albritton and Bob Watson at the IPCC meeting in Windsor, U.K. during May 23-25, 1990. Many (but not all) of the U.S. suggestions were accepted.

Our principal objections to the final Executive Summary are as follows:

In the section, "WE ARE CERTAIN OF THE FOLLOWING:," second bullet, we believe that the increases in greenhouse gases "may" rather than "will" enhance the greenhouse effect.

In the section, "WE CALCULATE WITH CONFIDENCE THAT:," we believe that the third bullet discussing the need for immediate reductions does not belong in a science assessment.

In the section, "BASED ON CURRENT MODELS, WE PREDICT:," first bullet, we believe that scenario A should be called, "High-Emissions Scenario" rather than "Business-as-Usual Scenario."

It is important to recognize that the models used in this section to predict changes in temperature, precipitation and sea level rise reproduce certain, but not all, features of existing data.

In the section "OUR JUDGMENT IS THAT:," fourth bullet, we believe that there is insufficient evidence to conclude that the effect of warming on biological processes may increase atmospheric concentrations of natural greenhouse gases.

Summary and Recommendation:

The full IPCC Working Group 1 Report is a fair assessment of our current understanding of the science of climate change. The Summaries, however, make too strong a case for global warming and do not adequately represent the scientific uncertainties. Given the political realities of the European countries that dominated the drafting of the Summaries, this result is not unexpected.

We recommend that DOE promote consideration of the full IPCC Working Group 1 report in future deliberations of the climate change issue and seek to deemphasize the importance of the two Summaries.

Nelson

James F. Decker
Acting Director
Office of Energy Research

Attachment

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE WORKING GROUP 1

SCIENTIFIC ASSESSMENT OF CLIMATE CHANGE

REPORT TO IPCC, 25 MAY 1990

EXECUTIVE SUMMARY

We are certain of the following:

o there is a natural greenhouse effect which already keeps the Earth warmer than it would otherwise be.

o emissions resulting from human activities are substantially increasing the atmospheric concentrations of the greenhouse gases: carbon dioxide, methane, the chlorofluorocarbons and nitrous oxide. These increases will enhance the greenhouse effect, resulting on average in an additional warming of the Earth's surface. The greenhouse gas, water vapor, will increase in response to global warming and further enhance it.

We calculate with confidence that:

o some gases are potentially more effective than others at changing climate, and their relative effectiveness can be estimated. Carbon dioxide has been responsible for over half the enhanced greenhouse effect in the past and is likely to remain so in the future.

o atmospheric concentrations of the long-lived gases (carbon dioxide, nitrous oxide and the CFCs) adjust only slowly to changes in emissions. Continued emissions of these gases at present rates would commit us to increased concentrations for decades to centuries. The longer emissions continue to increase at present day rates, the greater reductions would have to be for concentrations to stabilize at a given level.

o the long-lived gases would require immediate reductions in emissions from human activities of over 60% to stabilize their concentrations at today's levels; methane would require a 15 - 20% reduction.

Based on current models, we predict:

o under the IPCC Business-as-Usual (scenario A) emissions of greenhouse gases, a rate of increase of global mean temperature during the next century of about 0.3 degrees C per decade (with an uncertainty range of 0.2 to 0.5 degrees C per decade); this is greater than that seen over the past 10,000 years. This will result in a likely increase in global mean temperatures of about 1 degree C above the present value by 2025 and 3 degrees C before the end of the next century. The rise will not be steady because of the influence of other factors.

o under the other IPCC emission scenarios which assume progressively increasing levels of controls, rates of increase in global mean temperature of about 0.2 degrees C per decade (scenario B), just above 0.1 degree C per decade (scenario C) and about 0.1 degree per decade (scenario D).

o that land surfaces warm more rapidly than the ocean, and high northern latitudes warm more than the global mean in winter.

o regional climate changes different from the global mean, although our confidence in the prediction of the detail of regional changes is low. For example, temperature increases in Southern Europe and central North America are predicted to be higher than the global mean, accompanied on average by reduced summer precipitation and soil moisture. There are less consistent predictions for the tropics and southern hemisphere.

o under the IPCC Business-as-Usual emissions scenario, an average rate of global mean sea level rise of about 6 cm per decade over the next century (with an uncertainty range of 3 - 10 cm per decade), mainly due to thermal expansion of the oceans and the melting of some land ice. This amounts to a rise of about 20 cm in global mean sea level by 2030 and 65 cm by the end of the next century. There will be significant regional variations.

There are many uncertainties in our predictions, particularly with regard to the timing, magnitude, and regional patterns of climate change:

- o sources and sinks of greenhouse gases, which affect predictions of future concentrations.
- o clouds, which strongly influence the magnitude of climatic change,
- o oceans, which influence the timing and patterns of climate change, and
- o polar ice sheets, which affect predictions of sea level rise.

These processes are already partially understood, and we are confident that the uncertainties can be reduced by further research. However, the complexity of the system means that we cannot rule out surprises.

Our judgment is that:

o global-mean surface air temperature has increased by 0.3 to 0.6 degrees C over the last 100 years, with five global-average warmest years being in the 1980s. Over the same period, global sea level has increased by 10 - 20 cm. These increases have not been smooth with time, nor uniform over the globe.

o the size of this warming is broadly consistent with predictions of climate models, but it is also of the same magnitude as natural climate variability. Thus, the observed increase could be largely due to this natural variability; alternately, this variability and other human factors could have offset a still larger human-induced greenhouse warming. The unequivocal detection of the enhanced greenhouse effect from observations is not likely for a decade or more.

o there is no firm evidence that climate has become more variable over the last few decades. However, with an increase in the mean temperature, episodes of high temperatures will most likely become more frequent in the future and cold episodes less frequent.

o ecosystems effect climate and will be affected by a changing climate and by increasing carbon dioxide concentrations. Rapid changes in climate will change the composition of ecosystems; some systems will benefit, while others will be unable to migrate or adapt fast enough and may become extinct. Enhanced levels of carbon dioxide may increase productivity and efficiency of water use of vegetation. The effect of warming on biological processes, although poorly understood, may increase the atmospheric concentrations of natural greenhouse gases.

To improve our predictive capability, we need:

- to understand better the various climate-related processes, particularly those associated with clouds, oceans and the carbon cycle.
- to improve the systematic observations of climate-related variables on a global basis, and further investigate changes which took place in the past.
- to develop improved models of the Earth's climate system.
- to increase support for national and international research activities, especially in developing countries.
- to facilitate international exchange of climate data.