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Testimony of Dr. Michael Oppenheimer
before the
Committee on Energy and Natural Resources
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My name is Dr. Michael Oppenheimer. I am an atmospheric physicist and senior scientist with the Environmental Defense Fund, a private, non-profit organization. I would like to thank the Committee for giving me the opportunity to testify about the recent report, DEVELOPING POLICIES FOR RESPONDING TO CLIMATIC CHANGE, (referred to hereafter as the "Bellagio Report"), published by the World Meteorological Organization and the United Nations Environment Programme. The Environmental Defense Fund, along with the Beijer Institute of the Royal Swedish Academy and the Woods Hole Research Center, was an originator of the project which produced this report. I served on the steering committee for the two international conferences which provided the basis for the report, and I also contributed to its preparation.

This project was developed in the wake of publication of the report of the 1985 UNEP/WMO/ICSU Villach meeting in which experts on climate from around the world produced a consensus that global warming due to the emissions of greenhouse gases was indeed underway. An examination of policy options was recommended. The Bellagio Report, based on deliberations by two meetings involving scientists and policy-makers (called the Villach 1987 and Bellagio workshops), finds that the time for action in response to impending warming is NOW. In particular,

the report recommends several steps to be undertaken immediately with the goal of slowing global warming. Other measures to cushion the consequences of unavoidable change, and to develop a coordinated international response, are also recommended, including consideration of an international convention or "law of the atmosphere".

In my personal opinion, greenhouse warming presents the most important global challenge of the next few decades, on a par with defense, disarmament, and economic issues. With warming apparently now measurable, we are already playing catchup ball. The Midwest drought is a warning: whether or not it is related to global changes, it provides a small taste of the dislocations society will face with increasing frequency if we fail to act. If measures are not undertaken soon to limit the warming, humans face an increasingly difficult future while natural ecosystems may have no future at all.

To illustrate the magnitude of the problem, let me briefly describe the causes of greenhouse warming. Certain gases which occur in the atmosphere in small amounts are growing rapidly in concentration due to human activities related to industry and agriculture. Primary among these is carbon dioxide, a product of coal, oil, and natural gas combustion. These "greenhouse gases" trap heat radiating from the surface of the earth which would normally escape into space, resulting in a warming of the surface. This increase in global temperature causes a concomitant rise in global sea level as ocean water expands and

land ice melts. As long as the amounts of greenhouse gases increase in the atmosphere, this process will continue unabated.

There will be no winners in this situation, only a globe full of losers. Today's beneficiaries of change will be tomorrow's victims as the changing climate rolls past them like a wave that first sweeps you up, then drops you in the trough behind it. The very concept of conservation does not exist in a world which may change so fast that ecosystems, which are slow to adjust, will wither and die.

The technical findings of the Villach-Bellagio workshops include:

. Global mean temperature will likely rise at about 0.6 degrees Fahrenheit per decade and sea level at about 2.5 inches per decade over the next century. These rates are 3 to 6 times recent historical rates. By early in the next century the world could be warmer than at any time in human experience.

Furthermore, there is no known natural limit to the warming short of catastrophic change, for as long as greenhouse gas growth continues in the atmosphere. At some point, these emissions MUST be limited.

. Because the oceans are slow to heat, there is a lag between emissions and full manifestation of corresponding warming -- a lag of perhaps 40 years. The world is now 1 degree F warmer than a century ago and may become another one or more degrees warmer EVEN IF EMISSIONS ARE ENDED TODAY. These changes

are effectively irreversible because greenhouse gases are long lived. WE CAN'T GO BACK IF WE DON'T LIKE THE NEW CLIMATE. So action to slow the warming must be taken before full consequences are manifest.

. This committed warming means some adaptation measures, such as sea defense and coastal abandonment, are inevitable. But effective adaptation will be costly and for many nations, such as Bangladesh, infeasible.

. The natural environment cannot adapt effectively to such rapid changes. The impending warming must be viewed as A DISASTER FOR NATURAL ECOSYSTEMS. The mountaintop declines of red spruce in the eastern United States, generally ascribed to air pollution or climate variability, pale in comparison to the scope of change impending if warming continues. For instance, one model predicts biomass crashes in southeast pine forests in the next century if warming continues, with declines of up to 40% occurring over decadal periods. The recent dispute over oil exploration in the Arctic National Wildlife Refuge may be beside the point if the Arctic ecosystem is driven off the north coast of Alaska by climatic change.

. If climate changes rapidly, agriculture and water resources will be stressed. Even if global food supplies are maintained, one need only look to the current Great Plains drought to see the human and economic cost associated with hot and dry weather in the grain belt, weather of the sort which we can expect with increasing frequency in the future.

. Although some change is inevitable, and in fact appears to be already underway, unacceptable warming is not inevitable if action is begun NOW. Every decade of delay in implementation of greenhouse gas abatement policies ultimately adds about a degree F of warming; and no policy can be fully implemented immediately in any event. Limitation of warming to historical rates (about 0.2 degree F/decade) for some finite time would give societies and natural ecosystems a fighting chance at adjustment. But unlimited warming at any rate is ultimately problematic.

. The foregoing picture is the good news. The bad news is that climate change may not occur smoothly; rather it could occur in jumps which would render fruitless any attempts at planned adaptation. The advent of the ozone hole should make us cautious in assuming that atmospheric change will be gradual.

. Slowing warming to an acceptable rate and ultimately stabilizing the atmosphere would require reductions in fossil fuel emissions by 60% from current levels, along with similar reductions in emissions of other greenhouse gases. Given the projected doubling in emissions over the next 40 years (see Figure 1) in "business-as-usual" scenarios, we have a daunting task ahead.

Certain immediate policy responses can set us along the path toward climate stability. Measures recommended for immediate implementation include:

- . Ratification, implementation and consideration of strengthening of the Montreal Protocol on CFC emissions.

- . Development of national energy policies which encourage efficiency in generation, transmission and use.

- . Investments in research and development of non-fossil fuel alternative energy systems.

- . Encouragement of use of low-CO₂ fuels such as natural gas as a bridging measure.

- . Control of nitrous oxide, methane and tropospheric ozone emissions where technology is currently available (such as tapping solid waste landfills for methane). Funding research and development on control methods where uncertainties remain.

- . Reversal of the current deforestation trend since forests serve to store carbon which would otherwise aggravate the greenhouse problem.

- . Consideration of a global convention on greenhouse gases.

- . Planning for coastal protection and abandonment.

- . Research support for global change basic science initiatives.

- . Policy research on "how to get the job done".

The United States government should take the lead now with a series of measures in each of these areas. We still have a window of opportunity to limit these changes to acceptable

levels. The development of these policies, their implementation, and the diffusion of these solutions to the rest of the world, should largely define the framework for scientific and technological development over the next few decades. Thus the problem of global warming presents both challenges and opportunities. But the pursuit of solutions and their implementation must begin today.

FUTURE CARBON DIOXIDE EMISSIONS *

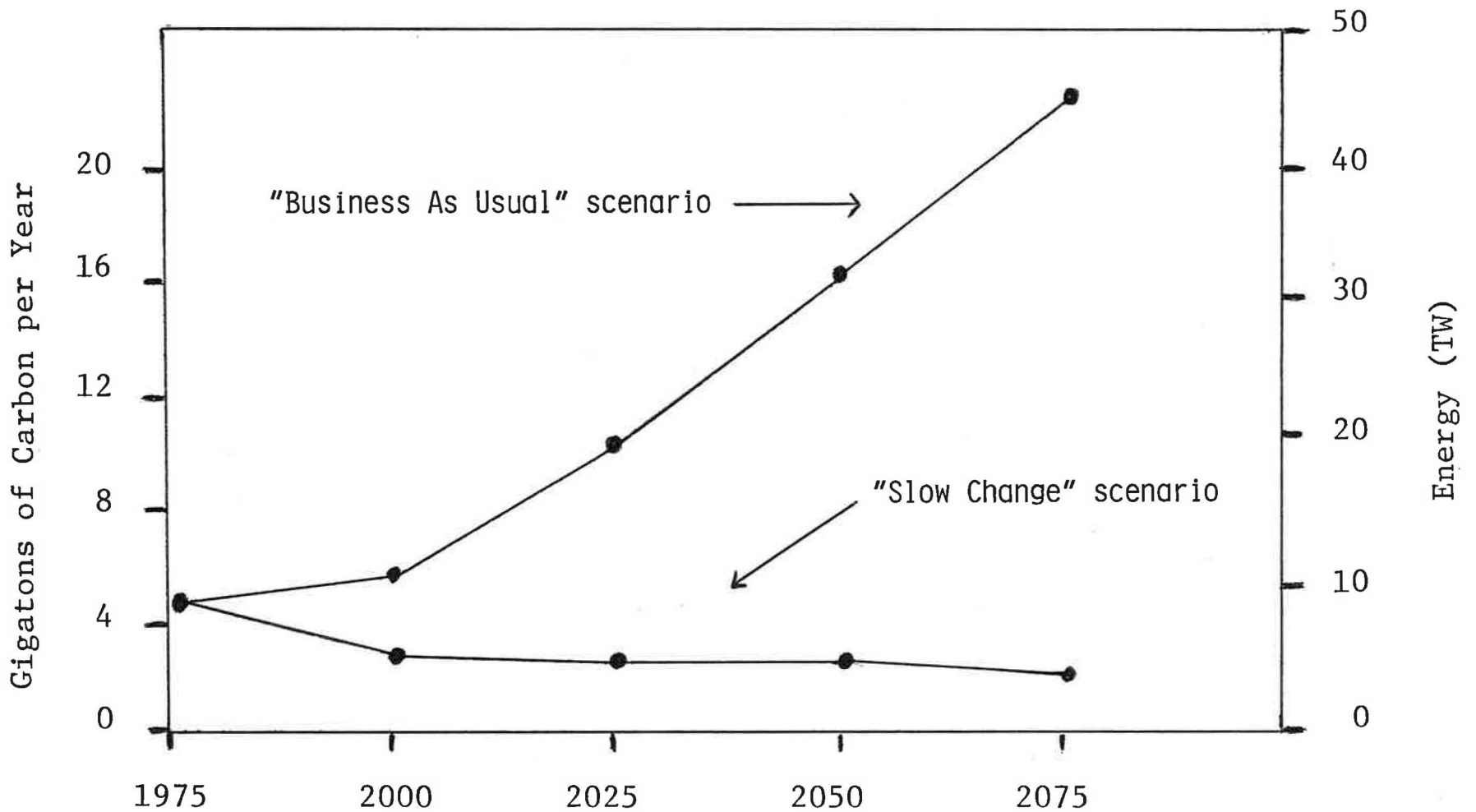


Figure 1

* Adapted from DEVELOPING POLICIES FOR RESPONDING TO CLIMATIC CHANGE, World Meteorological Organization and United Nations Environment Programme, 1988; WORLD COMMISSION ON ENVIRONMENT & DEVELOPMENT, OUR COMMON FUTURE, U.N.E.P., 1987; and I.M. Mintzer, A MATTER OF DEGREES: THE POTENTIAL FOR CONTROLLING THE GREENHOUSE EFFECT, World Resources Institute, 1987.