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BACKGROUND FACT SHEET ON CARBON DIOXIDE BUILD-UP IN THE ATMOSPHERE

PURPOSE OF HEARING

The purpose of this hearing is to provide the committee with information concerning the build up of carbon dioxide (CO_2) in the atmosphere and to achieve a better understanding of the implications that such a build up holds for our national energy policy.

An ad hoc study group of the National Academy of Sciences, convened at the request of the Director of the Office of Science Technology Policy to make an impartial examination of the validity of CO_2 forecasts, has confirmed concerns expressed by the scientific community that the continued burning of fossil fuels, particularly coal, could raise the temperature of the earth's atmosphere and lead to serious global climatic changes.

These findings are especially disturbing in light of the emergence of energy initiatives designed to increase our reliance on coal, the country's most abundant fuel source. Legislation to encourage the development of synthetic fuels from coal, for example, is pending in House-Senate conference committee, and the Energy Committee will soon be called upon to consider legislation designed to encourage utilities to convert their oil and gas fired power plants to coal.

The Committee seeks to ascertain:

- the nature and sources of the CO_2 build up;
- the risks posed by the CO_2 build up on climate, the ecosystem and society;
- the prospects for increased knowledge about the CO_2 problem through current research efforts;
- the extent to which current research findings are being integrated into agency policy decisions; and
- the extent to which information on the CO_2 build up is being shared among agencies and with other countries.

BACKGROUND ON THE CO_2 PROBLEM

Carbon dioxide is released into the atmosphere during the burning of fossil fuels, such as coal, oil and gas. Despite the fact that CO_2 comprises a relatively small part of the earth's atmosphere, it exerts a significant impact on the thermal structure of the atmosphere because CO_2 molecules absorb some of the infrared radiation (heat) that is emitted from the earth's surface that would otherwise escape into space. Because glass in a greenhouse also serves to trap the sun's heat, this phenomenon has popularly come to be known as the "greenhouse effect."

Over the last thirty years, fuel-generated CO_2 emissions have been increasing at an almost constant rate of 4.3 percent per year. If this current emission rate of CO_2 continues, scientists estimate that the amount of CO_2 in the atmosphere may increase by 50 percent in about the next thirty-five years and double in about fifty years. The data show that the rate of CO_2 increase is accelerating as the world use of fossil fuels increases.

In addition to the burning of fossil fuels, current land clearing and deforestation practices have contributed to the CO_2 build up through the subsequent oxidation of plant material and the removal of plants that use CO_2 during photosynthesis. Human activity thus appears to have increased CO_2 levels at a greater rate than can be naturally absorbed by any biospheric or ocean sink.

EFFECTS OF THE CO_2 BUILD UP

While there is little dispute that increasing amounts of CO_2 are being retained in the atmosphere, the precise impacts of such an increase are much more difficult to predict and to evaluate. At a minimum, most scientists agree that a doubling of CO_2 content in the atmosphere will cause a critical rise in global temperatures and that such a warming will be conspicuous by the beginning of the next century. They estimate that average temperatures could increase about $3^{o}C$ (about $5.5^{o}F$), with substantially higher increases of from 8^{o} to $20^{o}C$ at the poles.

This global warming could bring about a number of serious climatic and geographic changes with attendant environmental and societal consequences. Some glaciologists forsee a rapid melting of the West Antarctic ice sheet that could raise sea levels as much as 20 feet in a matter of decades, causing major disruptions of the world's coastal regions. Under a catastrophic scenario, heavily populated low-lying areas of Florida, Louisiana, Texas, Georgia, South Carolina, Delaware, New Jersey, New York, Massachusetts and California could be submerged.

A warming climate could also cause significant shifts of the agriculturally productive regions of the world. While a warmer climate could lengthen the growing season in higher latitudes, it could also produce prolonged drought in grain belts such as the midwestern United States. Water availability could be threatened through altering precipitation patterns and enhancing evaporation through soils and plants. Groundwater reserves would be reduced by decreases in soil moisture. Commercially important fish populations could be displaced northward by a warming of the surface-water layers of the ocean.

PROSPECTS FOR THE FUTURE

Many uncertainties remain as to the nature of the carbon cycle, future fossil fuel use, the magnitude and character of anticipated climate changes, the contribution of CO_2 from the biosphere and the interaction between the ocean and the atmosphere. New and ongoing research over the next five to ten years will be seeking more definitive answers.

In 1978, Congress passed legislation establishing a National Climate Program Advisory Committee and an office within the National Oceanic and Atmospheric Administration to coordinate research efforts, including the role of CO_2 on climate change. A five-year national climate plan was recently unveiled on March 24. In addition, the Department of Energy is coordinating an interagency CO_2 Effects Research and Assessment Program to aid future energy policy decision-making. Comprehensive reports are to be issued in 1983 and 1988. Conferences at the international level are also beginning to address the problem on a world-wide basis.

These latest research efforts are clearly worthwhile, but results may not be available before this country embarks on a massive long-term commitment to fossil fuels. In making energy policy decisions, we are handicapped by the absence of sufficient information as to what the full ramifications will be. While this situation is not an uncommon one for today's policy-maker, the CO_2 problem poses a unique challenge. Scientists fear that, in another twenty years, the CO_2 accumulation in the atmosphere may well be on its way to producing effects that are irreversible. The critical question confronting this committee is how uncertainty and preliminary results can best be incorporated into our energy policy decisions so as to minimize potential adverse consequences to the greatest extent possible.