Statement of

The Honorable John Marburger, III

Director of the Office of Science and Technology Policy

before the Committee on Science
United States House of Representatives

July 10, 2002

Good afternoon, Mr. Chairman and Members of the Committee. I am grateful for this opportunity to testify before you on the important subject of global climate change.

The President takes the issue of global climate change very seriously, and so do I. In a series of clear and public statements, the President has described climate change as a complex, long-term challenge that requires an effective and science-based response. The President has acknowledged the responsibility of the United States to lead in dealing with this challenge.

On June 11 of last year, President Bush said that "the issue of climate change respects no border. Its effects cannot be reined in by an army or advanced by any ideology. Climate change, with its potential to impact every corner of the world, is an issue that must be addressed by the world."

In a subsequent speech on February 14 the President reaffirmed America's commitment to the United Nations Framework Convention and its central goal, to stabilize atmospheric greenhouse gas concentrations at a level that will prevent dangerous human interference with the climate. At the same time, the President noted that given current scientific uncertainties, no one knows what that level is. This clear statement challenges the scientific community to improve our understanding of this and other important uncertainties that remain, including the effect of natural variations in climate on warming, the actual degree and rate of warming, and how some of our actions could impact it.

To accelerate our understanding of climate change, the President has taken steps to engage the best science and technology on these issues, stating, "The policy challenge is to act in a serious and sensible way, given the limits of our knowledge. While scientific uncertainties remain, we can begin now to address the factors that contribute to climate change."

The climate change at issue is a global phenomenon, and dealing with it requires actions that will affect the economies of nations. The "serious and sensible" approach advocated by the President responds to the breadth of this challenge, and also to the quality of judgment needed to address it. To begin the process within his administration, the President last year requested the National Academy of Sciences to produce a report on the state of climate change science. The 2001 National Academy Report on climate change that subsequently appeared contains a sentence that is often half-quoted, and I would like to read it here in its entirety: "The changes observed over the last several decades are likely mostly due to human activities, but we cannot rule out that some significant part of these changes is also a reflection of natural variability." This is the third sentence in the summary at the very beginning of the report. The entire report, available on the National Academies website, provides valuable insights into the state of climate science, including areas of fundamental uncertainty that require additional investigation. Even a cursory reading of the report indicates that the uncertainties are real and they are significant. Mr. Chairman, I ask that this important report from our National Academies be included in as part of the record of this hearing.

I would like to address some concerns that have arisen since the Climate Action Report was released several weeks ago. Some press accounts have said that this report acknowledged a dire, near term threat to the environment from climate change. This is not true. Since much of the discussion of climate change and its impacts centers on the use of computer models that attempt to look into the future, it may be useful to reflect for a moment on these models and how they are employed.

"Climate" is a general term for physical properties of the atmosphere, especially air temperature and pressure, wind, water vapor, and particle content. Air is a substance that obeys laws of motion that can be solved for small volumes using a computer. The same equations are used to estimate, or "forecast," future weather, based on current conditions. With the most powerful computers, we can forecast the weather reliably only a few days ahead, as you know. How then can we hope to predict climatic conditions far into the future? Science has developed approaches to long-term climate modeling that do not attempt to give the fine detail we expect in a weather report.

Long-term climate models are sets of computer programs that attempt to simulate all the processes of nature that affect the atmosphere. The best current models average these properties over an area roughly the size of the State of Connecticut. It is not enough to model just the atmosphere, because climate is affected by the cloud cover, by vast ocean currents, by the polar ice sheets, by the presence of atmospheric chemicals and light absorbing or reflecting particles, and by the interaction of all these with life processes -- trees, crops, ocean organisms, and human beings. All these processes need to be understood *quantitatively* before they can be modeled. This is the ongoing challenge of climate change research.

Once the models are constructed -- a task that is by no means complete today -- they have to be loaded with current conditions before they can be used for prediction. That means the state of the entire earth must be determined at a given instant of time by measurements on land, sea, and air. Satellite imagery is important but not sufficient for this task. Since the output of the models depends on the input, incomplete knowledge of the state of the earth translates to uncertainty in the predictions. And the output is notoriously sensitive to the input. This is why the Intergovernmental Panel on Climate Change concluded in its Third Assessment Report that "Science cannot predict the climate and its impacts in Milwaukee, Mumbai, or Moscow half a century ahead very accurately, and it may never be able to do so."

Today's climate models cannot be used for definite predictions of regional or local conditions. They are typically run many times, for a range of input assumptions, and the results are assessed with statistical methods. Given our present state of knowledge, it is not surprising that the results vary widely, leading to apparently contradictory results.

That is why reports such as the 2002 U.S. Climate Action Report do not claim to make predictions about future impacts. That report employs "scenarios" that are invented to capture the range of results of multiple runs of different climate models with different ad hoc input assumptions. The scenarios are then used to make "projections," a word that is carefully defined in an important footnote on page 84 of the report: "… *prediction* is meant to indicate forecasting of an outcome that will occur as a result of the prevailing situation and recent trends (e.g. tomorrow's weather or next winter's El Niño event), whereas *projection* is used to refer to potential outcomes that would be expected *if* some scenario of future conditions were to come about …." Notice that such projections can give no information about when, or even if, the assumed scenarios occur. I fear that many readers of the Climate Action Report have mistaken its "projections" for forecasts.

The President believes, and I strongly concur, that responsible implementation of public policy on a scale commensurate with global climate change requires the best possible understanding of the phenomena we wish to influence. The uncertainties have to be reduced. That is why the President

established a new management structure to advance and coordinate climate change science and technology research. Under this structure, we are accelerating work in areas needed to create better tools to provide science-based policy guidance, and developing a technology base that matches the climate change challenge. To these ends, the President established a Cabinet-level Committee on Climate Change Science and Technology Integration to oversee the entire effort. The Secretary of Commerce and Secretary of Energy are leading the effort, in close coordination with my office, the Office of Science and Technology Policy (OSTP), and this effort incorporates work conducted under the Global Change Research Act of 1990. OSTP will continue to perform important coordinating functions within this new framework. I want to emphasize that the point of the new organization is to take advantage of the global change research that is under way, and focus it on the current urgent need to improve climate change analysis tools.

The President's FY '03 budget proposal dedicates $1.7 billion for fundamental scientific research on climate change and $1.2 billion to fund research on advanced technologies including energy production and carbon sequestration technologies relevant to the climate issues. These figures include $80 million in funding dedicated to implementation of the Climate Change Research Initiative (CCRI) and the National Climate Change Technology Initiative (NCCTI) announced last year. My colleagues on this panel will be providing you with more details about these two initiatives.

President Bush is addressing the serious issue of climate change through a focused and vigorously managed program. He is engaging science to increase our understanding, and technology to devise ways of meeting our responsibility to future generations while preserving our quality of life and maintaining the competitiveness of our economy.

Thank you again for the opportunity to speak with you today. I will be glad to respond to specific questions on these important issues.