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Second Major U.S. Climate Change Science Program Report Issued

Report Evaluates the Emissions, Energy, and Economic Implications of Stabilizing Greenhouse Gas Concentrations

http://www.climatescience.gov/Library/sap/sap2-1/finalreport/default.htm

WASHINGTON, DC – The U.S. Climate Change Science Program (CCSP) today announced the release of the second in a series of 21 Synthesis and Assessment (S&A) reports. Coordinated by the U.S. Department of Energy (DOE), this S&A 2.1 report is titled "Scenarios of Greenhouse Gas Emissions and Atmospheric Concentrations, and Review of Integrated Scenario Development and Application," and provides a new long-term, global reference for greenhouse gas stabilization scenarios and an evaluation of the process by which scenarios are developed and used. CCSP was established by President Bush in 2002 to integrate Federal research on global environmental change at 13 federal agencies, and to provide the nation with science-based knowledge to manage the risks and opportunities of change in the climate and related environmental systems.

This report is presented in two parts. Part A, "Scenarios of Greenhouse Gas Emissions and Atmospheric Concentrations," uses computer-based scenarios to evaluate four alternative stabilization levels of greenhouse gases in the atmosphere and the implications to energy and the economy for achieving each level. Although these scenarios should not be considered definitive predictions of future events, they provide valuable insights for decision-makers. Part B, "Global-Change Scenarios: Their Development and Use," examines how scenarios have been developed and used in global climate change applications, evaluates the effectiveness of current scenarios, and recommends ways to make future scenarios more useful.

The three integrated assessment models that were used in Part A included: the **Massachusetts Institute of Technology's Integrated Global Systems Model**; Electric Power Research Institute's Model for Evaluating the Regional and Global Effects of Greenhouse Gases; and the DOE's Pacific Northwest National Laboratory's integrated assessment model, MiniCAM.

"All three models agree that widespread deployment of new energy technologies will be essential to reduce global carbon dioxide emissions on an appreciable scale," John Houghton, DOE's Office of Science Program Manager and Lead Coordinator for CCSP 2.1 Report said. "Achieving the transformational breakthroughs needed to develop these new energy technologies and make them economically viable is a major objective of DOE-sponsored science and technology programs."

This report uses a reference case and four scenarios that evaluate the implications of stabilizing greenhouse gases. The reference case assumes that no new measures are instituted to limit emissions. In the four stabilization scenarios, global greenhouse gas concentrations are limited in the atmosphere to 450 parts per million (ppm), 550 ppm, 650ppm and 750ppm. The report shows that stabilizing the concentration of carbon dioxide (CO2), the most important greenhouse gas released by human activities, requires global emissions to peak in the 21st century and then decline indefinitely thereafter for all four stabilization levels. Non-CO2 greenhouse gas emissions, such as methane and nitrous oxide, played an important role in each level.

Under all the stabilization scenarios, the technology and economic development paths for the U.S. and global energy systems were dramatically different from the reference case. The scenarios assume widespread

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development and deployment of alternatives to fossil fuels over the next century, including nuclear energy, biomass, and advanced carbon sequestration technology for coal use. The report also shows a range of economic effects for a given stabilization level due to variations in key assumptions, such as the availability of energy technologies and the magnitude of the emissions cuts needed, particularly in the post-2050 years.

Part A goes beyond previous scenario development by the Intergovernmental Panel on Climate Change and others, which modeled stabilization for carbon dioxide. Part A includes stabilization scenarios for the six primary anthropogenic greenhouse gases - CO2, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride – and it used updated economic and technological data and new tools for scenario development. However, the report highlights that the outcomes, estimated over a 100-year period, reflect simplified assumptions about economic, societal, and political behavior, including a presumption of perfect economic efficiency and policy agreement among nations. "It is important," write the authors, "to view these results as scenarios under specified conditions, not as predictions or best-judgment forecasts of the most likely outcome within the national and international political system."

Part B of the report concludes that scenarios can support decision-making by providing insights regarding key uncertainties, including future emissions and climate as well as other environmental and economic conditions. The report argues that useful scenarios require a blend of scientific knowledge with judgment and speculation, and that improving scenario practice does not require avoiding speculation, but making it more disciplined and transparent. The report recognizes that different types of decisions–e.g., those related to climate impacts and adaptation, emissions mitigation policy, or private-sector energy resource and technology development—are informed by scenarios in different ways. To support diverse climate-related decisions, the authors advocate greater transparency about the assumptions and reasoning underlying scenarios, including more explicit statements of developers' probability judgments, and they recommend an expanded capacity to commission, disseminate, document, and evaluate scenarios and related decision-support tools.

"I applaud the efforts of DOE and the authors of this excellent assessment," said Acting Director of the CCSP Dr. William J. Brennan. "With the development of each S&A report, CCSP's focused efforts are making true breakthroughs in answering and addressing how our planet's climate is changing. The authors of 2.1 have incorporated advances made in economics and natural sciences to update emission scenarios – the first time since IPCC's Third Assessment five years ago. This alone is a huge benefit to the scientific community, and the results deserve close analysis by policy makers."

The authors of CCSP Synthesis and Assessment Product 2.1, Part A, "Scenarios of Greenhouse Gas Emissions and Atmospheric Concentrations," include Leon E. Clarke, DOE's Pacific Northwest National Laboratory; James A. Edmonds, DOE's Pacific Northwest National Laboratory; **Henry D. Jacoby**, Massachusetts Institute of Technology; Hugh M. Pitcher, DOE's Pacific Northwest National Laboratory; **John M. Reilly,** Massachusetts Institute of Technology; and Richard G. Richels, Electric Power Research Institute.

The authors of CCSP Synthesis and Assessment Product 2.1, Part B, "Global Change Scenarios: Their Development and Use," include Edward A. Parson, University of Michigan; Virginia R. Burkett, U.S. Geological Survey; Karen Fisher-Vanden, Dartmouth College; David W. Keith, University of Calgary; Linda O. Mearns, National Center for Atmospheric Research; Hugh M. Pitcher, DOE's Pacific Northwest National Laboratory; Cynthia E. Rosenzweig, NASA Goddard Institute for Space Studies; and **Mort D. Webster,** Massachusetts Institute of Technology.

Publication of today's report follows the first CCSP S&A report announced last May by the National Oceanic and Atmospheric Administration. Federal agencies plan to deliver the remaining 19 products over the course of the next year to increase scientific understanding related to climate change. DOE will coordinate two of the remaining 19 CCSP reports.

To read this report and find more information on the CCSP, access www.climatescience.gov.