U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

HEARING CHARTER

Climate Change: Examining the Processes Used to Create Science and Policy

Thursday, March 31, 2011
10:00 a.m. to 12:00 p.m.
2318 Rayburn House Office Building

PURPOSE

On Thursday, March 31, 2011 at 10:00 a.m. the House Committee on Science, Space, and Technology will hold a hearing to examine processes used to generate key climate change science and information used to inform policy development and decision-making.

WITNESSES

- **Dr. J. Scott Armstrong,** Professor of Marketing, the Wharton School, University of Pennsylvania.
- **Dr. Richard Muller,** Professor of Physics, University of California, Berkeley and Faculty Senior Scientist, Lawrence Berkeley Laboratory
- **Dr. John Christy,** Director, Earth System Science Center, University of Alabama in Huntsville
- **Mr. Peter Glaser,** Partner, Troutman Sanders, LLP
- **Dr. Kerry Emanuel,** Professor of Atmospheric Science, Massachusetts Institute of Technology
- **Dr. W. David Montgomery,** Economist

BACKGROUND

In the last two years, the U.S. climate change policy debate has increasingly focused on development of a comprehensive response to the potential impacts of climate change. As with any government policy based on science, this evolution has been based on the information provided to policy makers by scientists.

However, questions have been raised regarding the integrity of the processes employed by those scientists in generating the information for use in public policy. Such process questions have triggered concerns about the robustness of the information being used to support policy shifts, reducing public confidence in certain policy solutions. According to Presidential Science

Advisor John Holdren, "Successful application of science in public policy depends on the integrity of the scientific process both to ensure the validity of the information itself and to engender public trust in Government."[1] Likewise, government rulemaking is subject to a process to provide regularity and predictability to agency decision making. Several laws, such as the Administrative Procedure Act, are applicable with both formal and informal rulemaking.[2]

The potentially monumental impact of climate change policy on the U.S. economy and nearly all aspects of daily life demand that not only are such policies grounded in science, but that the science itself is generated through processes and procedures that are universally accepted. This hearing will provide an overview of some of the process questions within climate change science and policy that have been raised in recent years.

Scientific Process, Integrity, and Debate

Since the dawn of science, man has tried to describe and measure the natural world. Through an iterative process of data collection, formulation of hypotheses, and testing and refining these hypotheses, a knowledge base of information is built that yield theories and allow for predictive models to be built that describe them. Experiments are conducted to test these hypotheses, theories and models. As new observations are incorporated throughout the process, the theories must be able to assimilate these new data or change to accommodate new facts. Confidence in a theory grows only if it is able to survive a rigorous testing process, it is supported by multiple and independent lines of evidence, and competing explanations can be ruled out. The American Physical Society statement on ethics and values states that:

"The success and credibility of science are anchored in the willingness of scientists to:

1. Expose their ideas and results to independent testing and replication by others. This requires the open exchange of data, procedures and materials.
2. Abandon or modify previously accepted conclusions when confronted with more complete or reliable experimental or observational evidence.

Adherence to these principles provides a mechanism for self-correction that is the foundation of the credibility of science.[3]

The creation of government regulations is dictated by several statutes, including the law that provides agencies the authority regulate some chemical or action as well as the Administrative Procedure Act (APA). While the APA provides guidelines as to what steps should be taken by agencies when promulgating rules, the statutes that give specific authority may also require additional measures to ensure a fair and impartial process. Furthermore, agencies have the discretion to allow for greater public participation, longer public comment periods, or even a greater burden of proof depending on the level of impact a given rule is projected to have.

Whether it is scientific method or regulatory procedure, process is defined as a systematic series of actions that are broadly known and well understood. Given the potential widespread impacts on the U.S. economy, climate change policy has received a level of scrutiny and analysis that rival some of the most important debates the U.S. has engaged in. As such, it is vital that the

[1] Holdren, John P., Memo for the Heads of Executive Departments and Agencies, Washington, DC. 17 Dec. 2010.
[2] Congressional Research Service. *The Federal Rulemaking Process: An Overview*. RL32240. February 22, 2011.
[3] http://www.aps.org/policy/statements/99_6.cfm

processes upon which climate change science and policy are based be widely accepted, understood, and adhered to.

In November of 2009, thousands of emails were leaked from the University of East Anglia's Climate Research Unit (CRU). These emails—many of which involved world-leading scientists in positions of influence with respect to key scientific assessments relied upon by policymakers—revealed significant communications suggesting a lack of adherence to basic principles of scientific conduct, openness, and information sharing. The controversy regarding the leaked emails—dubbed "ClimateGate" in the media—called into question the processes used in the Intergovernmental Panel on Climate Change (IPCC) as well as the processes used to create models and data that support claims that anthropogenic emissions of greenhouse gases have caused changes in the Earth's climate that is beyond natural variability. The significance of and concern regarding the emails has been heightened by the fact that CRU is one of the primary institutions that provide data and information to the IPCC, raising questions regarding the integrity of the models, data and processes, and ultimately the key scientific conclusions upon which climate policies are based.

Examples of Process Issues

- Climate Models - General circulation models (GCMs) are mathematical models of the general circulation of a planetary atmosphere or ocean. GCMs that model the climate as a whole are actually an amalgamation of several different models, including atmospheric models, ocean circulation models, land surface models, and sea ice models[4]. Each one of these models is built with mathematical equations that describe the physical world as it is understood. However, not all the observable physical processes are able to be described or explained by an equation. For example, clouds are not well modeled in the GCM, creating a very large question of uncertainty regarding climate sensitivities,[5] i.e. could higher temperatures result in more clouds that then reflect more incoming radiation or do the clouds act as an additional warming layer preventing radiation from escaping the Earth's atmosphere.

  While it has been well known for years that climate change modeling is difficult, imprecise and yielding results that are subject to interpretation, there has been increasing evidence that these models have not been developed and used according to accepted modeling and forecasting principles. As mentioned above, the scientific method requires that models be subjected to rigorous testing and experimentation in order to validate their results. Such testing and validation is necessary to generate confidence in the models as useful projective tools.

- Data Quality - In any scientific pursuit, data is the key ingredient that informs scientists as to whether or not the hypothesis being tested is supported or wrong. Bad quality data

[4] U.S. Climate Change Science Program, Synthesis and Assessment Product 3.1. *Climate Models: An Assessment of Strengths and Limitations.* July 2008.

[5] Zhang, Y., Klein, S.A., Boyle, J. and Mace, G.G. 2010. Evaluation of tropical cloud and precipitation statistics of Community Atmosphere Model version 3 using CloudSat and CALIPSO data. Journal of Geophysical Research 115: doi:10.1029/2009JD012006

may demonstrate a hypothesis is supported, when in fact, the data may obscure the fact that the hypothesis is incorrect. High quality data, however, generates confidence that the results of an experiment represent the truth of the scientific inquiry. Therefore, the quality of data is paramount to production of good science.

In recent years, there have been questions regarding not only the quality of the data collected but also the processes used for normalization (in order to compare "apples to apples"). The quality of data collected from instruments that have not been maintained or whose placement violates government positioning procedures has not been established. Furthermore, the process used for quality assurance has come under question as well, prompting several data quality projects across the country to test the quality of the data used in climate change science.

- IPCC Process - The issuance of the third (2001) and fourth (2007) assessment reports have been accompanied by increasing questions regarding the process used by the IPCC. Specifically, transparency, conflicts of interest, political interference, the characterization of uncertainty, and the use of non-peer reviewed data and information are all areas of the IPCC process that have caused concern among scientists, academics and policy makers.[6] Although there have been many recommendations as to how to reform the process in order to restore confidence in the assessment results, and the IPCC has stated it would adopt many of these reforms, there has been no evidence as of yet whether or not these reforms will sufficiently address the shortcomings in the process.

  If the IPCC assessments are to be used in the U.S. as a resource for the U.S. Climate Change Science Program and as a justification for changing U.S. government policies, the processes and procedures employed by the IPCC must meet the rigorous standards for integrity, objectivity and quality control that is imposed on other scientific information (i.e., requirements under the Data Quality Act). The aforementioned process issues mentioned and the questions raised about them demonstrate a need to determine whether or not the IPCC standards meet the necessary threshold to qualify as a resource for the U.S. government. Questions remain as to whether or not the reforms adopted by the IPCC will actually meet those standards.

- EPA Endangerment Process - In December 2009, the Environmental Protection Agency (EPA) finalized its endangerment finding, officially declaring the emission of greenhouse gases by mankind to be a danger to public health and welfare. Upon making this determination, the EPA became obligated under the Clean Air Act to regulate greenhouse gases, particularly carbon dioxide, under other parts of the bill, namely, the Prevention of Significant Deterioration (PSD) and Title V permitting of stationary sources[7].

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[6] InterAcademy Council, Committee to Review the Intergovernmental Panel on Climate Change . *Climate Change Assessments: Review of the processes and procedures of the IPCC.* October, 2010. http://reviewipcc.interacademycouncil.net/report/Climate%20Change%20Assessments,%20Review%20of%20the%20Processes%20&%20Procedures%20of%20the%20IPCC.pdf

[7] Congressional Research Service. *Legal Consequences of EPA's Endangerment Finding for New Motor Vehicle Greenhouse Gas Emissions*. R40984. December 15, 2009.

The process used to make the endangerment finding under section 202(a) of the Clean Air Act allows for significant agency discretion. The scientific basis the Agency used for its determination is detailed in the Technical Support Document (TSD). More than half of the references in the TSD are from the IPCC or from government reports that relied heavily on the IPCC as a resource. The concerns mentioned above regarding the integrity of the modeling results, the quality of the data used, and the IPCC process itself, raise questions about the robustness of the information used to make the endangerment determination, thus calling the finding into question.