

**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION**

HEARING CHARTER

***Research on Environmental and Safety Impacts of Nanotechnology: Current Status of
Planning and Implementation under the National Nanotechnology Initiative***

**Wednesday, October 31, 2007
10:00 a.m. - Noon
2318 Rayburn House Office Building**

1. Purpose

On Wednesday, October 31, 2007, the Subcommittee on Research and Science Education of the Committee on Science and Technology will hold a hearing to review the need and motivation for research on the environmental, health and safety (EHS) aspects of nanotechnology, determine the current state of planning and implementation of EHS research under the National Nanotechnology Initiative (NNI), and explore whether changes are needed to the current mechanisms for planning and implementing EHS research. This hearing is one in a series the Committee will hold to review the administration and content of the NNI as part of the process for developing legislation to reauthorize the 21st Century Nanotechnology Research and Development Act of 2003 (P.L. 108-153) during the next session of Congress.

2. Witnesses

Dr. Clayton Teague, Director of the National Nanotechnology Coordination Office (NNCO). The NNCO serves as the focal point for and provides staff support to the Nanoscale Science, Engineering, and Technology (NSET) Subcommittee of the National Science and Technology Council. The NSET Subcommittee is responsible for the planning and coordination of the interagency NNI.

Mr. Floyd Kvamme, Co-Chair of the President's Council of Advisors on Science and Technology (PCAST). PCAST was designated by the President to act as the National Nanotechnology Advisory Panel (NNAP) in accordance with the 21st Century Nanotechnology Research and Development Act of 2003 (P.L. 108-153).

Dr. Vicki L. Colvin, Executive Director
International Council on Nanotechnology and
Professor of Chemistry and Chemical Engineering
Rice University

Dr. Andrew Maynard, Chief Science Advisor

Project on Emerging Nanotechnologies
Woodrow Wilson International Center for Scholars.

Dr. Richard Denison, Senior Scientist
Environmental Defense

Mr. Paul D. Ziegler, Chairman of the Nanotechnology Panel
American Chemistry Council, and
Global Director
PPG Industries, Inc.

3. Overarching Questions

- How important for the advancement of nanotechnology is developing greater understanding of potential risks that the technology may introduce to the environment and human health? What impacts are environmental and safety concerns having on the development of nanotechnology-related products and their entry into the marketplace? What impact might these concerns have in the future?
- Are current federal research efforts adequate to address concerns about environmental and safety ramifications of nanotechnology? Is the EHS research funding properly aligned with the agencies' roles and responsibilities for environmental and safety matters; is the overall level of funding adequate; have the most important research priorities been identified; and is the funding aligned satisfactorily to address those research priorities?
- What is the status of the development of a prioritized, detailed implementation plan for EHS research under the NNI? Will the plan now under development provide specific goals and timelines for achieving those goals; will it have a description of the roles and responsibilities of the participating agencies; and will it specify funding, by agency, required to reach the goals? Are the research priorities in the interim planning document appropriate?
- How can the current planning, coordination and implementation of EHS research under NNI be improved? Are alternative mechanisms needed to ensure EHS research is carried out expeditiously and on topics that will support the research needs of the agencies charged with environmental and safety regulation?

4. Brief Overview

- Nanotechnology, the science of materials and devices of the scale of atoms and molecules, has entered the consumer marketplace. Today, there are over 300¹ products on the market claiming to contain nanomaterials (materials engineered using nanotechnology or containing nano-sized particles), generating an estimated \$32

¹ Wilson Center, Project on Emerging Nanotechnologies, "Nanotechnology: A Research Strategy for Addressing Risk" July, 2006. p. 4.

billion in revenue.² By 2014, according to Lux Research,³ a private research firm that focuses on nanotechnology, there could be \$2.6 trillion worth of products in the global marketplace which have incorporated nanotechnology.

- There is significant concern in industry that the projected economic growth of nanotechnology could be undermined by either real environmental and safety risks of nanotechnology or the public's perception that such risks exist. Recently, some reports have indicated that these concerns are causing some companies to shy away from nanotechnology-related products and downplay nanotechnology when they talk about or advertise their products⁴. There is an unusual level of agreement among researchers, and business and environmental organizations that the basic scientific information needed to assess and protect against potential risks does not yet exist.
- The President's fiscal year 2008 (FY08) budget requests \$1.4 billion for the NNI, the interagency nanotechnology research and development program. Of this amount, the budget proposes \$58.6 million (4.1 percent of the overall program) for research on EHS research. This is \$10.8 million above the FY07 funding level. Nearly 50 percent of this funding would go to NSF.
- In October 2003, the NSET organized an interagency Nanotechnology Environmental and Health Implications (NEHI) Working Group to coordinate environmental and safety research carried out under the NNI. The NEHI Working Group is charged with "facilitate[ing] the identification, prioritization, and implementation of research...required for the responsible" development and use of nanotechnology.⁵
- One of the NEHI Working Group's initial tasks was developing a prioritized plan for EHS research under the NNI. In March 2006, the Administration informed the Science Committee that this report would be completed that spring, but the document that was finally released in September 2006 was a non-prioritized list of EHS research areas. At a Science Committee hearing organized at the time of the report's release, the Chairman and Ranking Member stressed the urgency of developing the prioritized research plan.
- The latest iteration of the EHS research plan, which was released for public comment in August 2007, presents a rationale for the process of defining EHS research priorities and provides a reduced set of priorities based on the previous report. It also indicates that the "next steps" (with no indication of timing) include NEHI evaluating the NNI EHS research portfolio to carry out a gap analysis to compare current work to the priorities list and then develop "a strategy to address EHS research priorities", which is essentially what was promised in the plan expected in the spring of 2006.

² Lux Research, "Taking Action on Nanotech Environmental, Health, and Safety Risks," Advisory, May 2006 (NTS-R-06-003) (hereafter cited as "Taking Action").

³ Lux Research, "Sizing Nanotechnology's Value Chain," October 2004.

⁴ Matthew Nordan testimony, Science Committee hearing, September 21, 2006, Serial No. 109-63.

⁵ Terms of Reference, Nanotechnology Environmental and Health Implications Working Group Nanoscale Science, Engineering, and Technology Subcommittee Committee on Technology; March, 2005.

5. Previous Hearings

The Committee held a hearing on this topic, *Environmental and Safety Impacts of Nanotechnology: What Research is Needed?* [Serial No. 109-34], on November 17, 2005. At that hearing, witnesses from the federal government, industry, and environmental organizations agreed that relatively little is understood about the environmental and safety implications of nanotechnology. The non-governmental witnesses emphasized that, for the emerging field of nanotechnology to reach its full economic potential, the federal government must significantly increase funding for research in this area. The hearing also raised questions about the effectiveness of the coordination and prioritization of EHS research being carried out under the NNI, as well as whether the key agencies having responsibilities for regulating exposure of people and the environment to nanomaterials were fully engaged in setting the priorities and funding appropriate activities.

A second, related hearing was held by the Committee on September 21, 2006, *Research on Environmental and Safety Impacts of Nanotechnology: What Are the Federal Agencies Doing?* [Serial No. 109-63]. The witnesses were from the agencies sponsoring EHS research and participants in the NEHI Working Group, along with representatives from an industry association and an NGO. The hearing was intended to review the NEHI EHS research plan that the Committee had expected to receive earlier that year (see following section). The agency witnesses were unable to explain why the prioritized research plan had not been completed. The non-government witnesses reiterated the urgency of developing and implementing such a plan without further delay and indicated that there were deficiencies in the scale and content of the current EHS research portfolio. The hearing also raised, but did not resolve, the issue of whether the current process for planning and carrying out EHS research under NNI is viable.

6. National Nanotechnology Initiative

Fiscal Year 2008 Budget

The National Nanotechnology Initiative (NNI) is a multi-agency research and development (R&D) program authorized by the 21st Century Nanotechnology Research and Development Act (P.L. 108-153). Currently, 13 federal agencies participate in the coordination, planning, and implementation of the research and development activities carried out under the NNI. The primary goals of the NNI are to foster the development of nanotechnology and coordinate federal R&D activities. The total NNI funding for FY 2007 is \$1.35 billion and the FY 2008 request is \$1.44 billion. More information on agency roles and activities under the NNI is available at <http://www.nano.gov/>.

The following table provides the FY 2008 funding proposal for each participating agency and the amount the agency has identified as supporting EHS activities:

(\$ in millions)

Agency	Total Spending on Nanotechnology R&D (FY08 Proposed)	Environment Health, and Safety Implications R&D (FY08 Proposed)	Percent of Total Environment, Health and Safety Implications R&D
NSF	389.9	28.8	49.1%
DOD	374.7	1.0	1.7%
DOE	331.5	3.0	5.1%
DHHS (NIH)	202.9	5.7	9.7%
DOC (NIST)	96.6	5.8	9.9%
NASA	24.0	0.0	0.0%
EPA	10.2	9.6	16.4%
USDA (CSREES)	3.0	0.1	0.2%
DHHS (NIOSH)	4.6	4.6	7.8%
USDA (FS)	4.6	0.0	0.0%
DHS	1.0	0.0	0.0%
DOJ	0.9	0.0	0.0%
DOT (FHWA)	0.9	0.0	0.0%
TOTAL	1,444.8	58.6	100.0%

Acronyms

CSREES = Cooperative State, Research, and Education Extension Service (within USDA)

DHS = Department of Homeland Security

DOC = Department of Commerce

DOD = Department of Defense

DOJ = Department of Justice

DOT = Department of Transportation

FHWA = Federal Highway and Works Administration (within DOT)

FS = Forest Service (within USDA)

NASA = National Aeronautics and Space Administration

USDA = U.S. Department of Agriculture

Research Plan for Environmental and Safety Implications of Nanotechnology

At the Science Committee’s November 17, 2005 hearing on EHS research related to nanotechnology, Dr. Clayton Teague, Director of the National Nanotechnology Coordination Office, testified that the NEHI Working Group was “preparing a document that identifies and prioritizes information and research needs in this area. The document will serve as a guide to the NNI agencies as they develop budgets and programs and will inform individual investigators as they consider their research directions.”⁶ In his responses to questions for the record, Dr. Teague said the report was expected to be completed by “Spring 2006” and “is intended to be sufficiently detailed to guide investigators and managers in making project-level decisions, yet broad enough to provide a framework for the next five to ten years.” The report was finally released at the time of the September 21, 2006 Committee hearing, but it was merely a listing of

⁶ Clayton Teague testimony, Science Committee hearing, November 17, 2005, Serial No. 109-34.

research topics, not a prioritized research plan with agency roles and funding levels delineated.

In August 2007, a new report was released, “Prioritization of Environmental, Health, and Safety Research Needs for Engineered Nanoscale Materials: An Interim Document for Public Comment”⁷. This report, once again, is not the prioritized research plan originally anticipated for release in the Spring of 2006. It is a refined list of research priorities along with a description of a process for updating the priorities list. The document includes a “next steps” section that indicates NEHI will evaluate the NNI EHS research portfolio to carry out a gap analysis to compare current work to the priorities list and then develop “a strategy to address EHS research priorities”. No estimate is given for a date for completion of this EHS research program assessment and strategy document.

7. Witness Questions

Dr. Teague was asked to provide an overview of the current scope of EHS research being conducted under the NNI, including how it relates to international and private sector EHS research efforts, and to provide an update on the development of a detailed implementation plan for EHS research. He was asked to include in his testimony:

- a description of the process that is underway to develop the EHS research plan;
- a description of the tenor of the responses received during the period the NEHI Working Group report referenced above was open for public comment; and
- recommendations for ways to improve the planning, prioritization, and implementation of EHS research under the NNI.

Mr. Kvamme was asked to provide the views of the NNAP on the effectiveness, scope, and content of the current EHS research efforts under the NNI and any recommendations the NNAP may have on ways to improve the process for planning, prioritization, and implementation of EHS research under NNI. He was asked to answer the following questions:

- Has the NNAP reviewed the recent report of the Nanotechnology Environmental and Health Implications Working Group, “Prioritization of Environmental, Health, and Safety Research Needs for Engineered Nanoscale Materials”? If so, are the priorities listed in the report the right ones, and will carrying out the “next steps” described in the report result in a satisfactory detailed implementation plan for EHS research?
- Has the NNI assigned a sufficiently high priority to EHS research and are there gaps in the portfolio of NNI research now underway? What level of funding over what time period is needed to make acceptable progress in understanding the potential environmental and health risks associated with the development of nanotechnology?

⁷http://www.nano.gov/Prioritization_EHS_Research_Needs_Engineered_Nanoscale_Materials.pdf.

- What are the optimum roles for the agencies in sponsoring or conducting EHS research? Are responsibilities and available resources currently in balance?
- Does the NNAP believe the current process is working for developing an EHS research plan under the NNI, and if not, what changes are needed?

The other witnesses were asked to provide their views on the effectiveness, scope, and content of the current EHS research efforts under the NNI and recommendations on ways to improve the process for planning, prioritization, and implementation of EHS research under NNI. They were asked to answer the following questions:

- What is your reaction to the recent report of the Nanotechnology Environmental and Health Implications Working Group, “Prioritization of Environmental, Health, and Safety Research Needs for Engineered Nanoscale Materials”? Do outside groups have a way to influence this planning process? Are the priorities listed in the report the right ones, and do you believe that carrying out the “next steps” described in the report will achieve the detailed implementation plan for EHS research that is needed?
- Has the NNI assigned a sufficiently high priority to EHS research and are there gaps in the portfolio of NNI research now underway? What level of funding over what time period is needed to make acceptable progress in understanding the potential environmental and health risks associated with the development of nanotechnology?
- What are the optimum roles for the agencies in sponsoring or conducting EHS research? Are responsibilities and available resources currently in balance?
- Can the current process for developing the EHS research plan under the NNI be made to work, and if so, what changes are needed? If not, do you have recommendations for a different approach for developing and implementing a prioritized, appropriately funded EHS research plan with well defined goals, agency roles, and milestones?