
Joint NGO NanoAction Group
Model U.S. Nanotechnology Legislation
June 2008

The following model legislation integrates the 21st Century Nanotechnology Research and Development Act (2003), amendments currently under consideration by Congress (the National Nanotechnology Initiative Amendments Act of 2008), and changes proposed by the Joint NGO Nanoaction group.

Deletions from the original legislation are in [brackets]; additions proposed by the Joint NGO Nanoaction Group are in *italics*; and additions passed by the House Science and Technology Committee in H.R. 5940, the National Nanotechnology Initiative Amendments Act of 2008, and supported by the Joint NGO Group, are in **bold**. In the following text, “as amended by this Act” refers to the amendments passed by the House or proposed by the Joint NGO group.

Sections 6, 7, 8 and 9 of the 2003 Act, which authorized actions and appropriations that have already been implemented, are not included in this model legislation. The integration and updating of these different sources into a single document is intended to help the reader see the model legislation as a whole.

SECTION 1. SHORT TITLE.

[The 21st Century Nanotechnology Research
and Development Act]

*The Nanotechnology Research,
Development and Assessment Act*

SECTION 2. NATIONAL NANOTECHNOLOGY PROGRAM.

(a) NATIONAL NANOTECHNOLOGY PROGRAM- The President shall implement a National Nanotechnology Program. Through appropriate agencies, councils, and the National Nanotechnology Coordination Office established in section 3, the Program shall--

(1) establish the goals, priorities, and metrics for evaluation for Federal nanotechnology research, development, and other activities;

(2) invest in Federal research and development programs in nanotechnology and related sciences to achieve those goals; and

(3) provide for interagency coordination of Federal nanotechnology research, development, and other activities undertaken pursuant to the Program.

(b) Program Activities.--The activities of the Program shall include--

(1) [developing a] *increasing the* fundamental understanding of matter [that enables control and manipulation] at the nanoscale *for the benefit of society*;

([10]2) ensuring that ethical, legal, environmental, *health, safety,* and other [appropriate] societal concerns, including *the impact of nanotechnology on poverty and income-based health disparities* and the potential use of nanotechnology in enhancing human intelligence and in developing artificial intelligence which exceeds human capacity, are considered *at an accelerated pace as a priority in the further development* [during the development] of nanotechnology by-

(A) establishing a research program to identify ethical, legal, environmental, and other [appropriate] societal concerns related to nanotechnology, *including community-based research originated by concerned citizens and completed by them independently or in collaboration with established academic, government, business, labor and/or nonprofit public interest research institutions*; and ensuring that the results of such research are widely disseminated;

Comment – We enter dangerous territory in specifying the outcome of science beyond the increased understanding of nature and society that is its basic aim. The changes proposed in (1) establish a more appropriate expectation for science, and state the rationale for supporting nanoscience.

Comment – This change repositions paragraph 10 of the 2003 Act from the bottom of the list of program activities. Placing ethical and social concerns last in the list can be construed as a statement about their priority in the program. On the other hand, paragraphs 2 - 9 all concern administration of the program, rather than its goal or significance. They are most appropriately listed after the primary orders of concern are addressed.

(B) requiring that interdisciplinary nanotechnology research centers established under paragraph ([4] 5) include activities that address societal, ethical, [and] environmental, *and health and safety concerns, including standardized procedures for protecting the health and safety of those working at or visiting those centers or residing nearby;*

(C) [insofar as possible,] integrating research *and public input* on societal, ethical, and environmental concerns with *natural science and engineering* [nanotechnology] research and development, and ensuring that [advances] *developments* in nanotechnology (1) *do no harm to Americans*, (2) bring about improvements in quality of life for all Americans, *and* (3) *support the achievement of United Nations Millenium Development Goals*; and

(D) providing, through the National Nanotechnology Coordination Office established in section 3, for *frequent* public input [and outreach] to be integrated into the Program by the convening of regular and ongoing public discussions *and deliberative public assessments*, through mechanisms such as citizens' panels, consensus conferences, *and other broadly participatory processes that provide opportunities for members of the general public to*

Comment - "Natural science and engineering" are substituted for "nanotechnology" here to include social research and public input within the scope of nanotechnological endeavors. We see nanotechnology as a system of practices that includes but is not limited to science and engineering (see proposed change in definition of nanotechnology in Section 7 of this document).

educate themselves, to take part in deliberative assessments of the impacts of nanotechnologies, and to publicize the results of those assessments [and educational events, as appropriate];

([2] 3) providing grants to individual investigators and interdisciplinary teams of investigators, *including community-based groups and other nonprofit organizations representing the public interest;*

([3] 4) establishing a network of advanced technology user facilities and centers;

([4] 5) establishing, on a merit-reviewed and competitive basis, interdisciplinary nanotechnology research centers, which shall--

(A) interact and collaborate to foster the exchange of technical information and best practices;

(B) involve academic institutions or national laboratories and other partners, which may include States [and], industry, *labor, environmental and public interest organizations;*

(C) make use of existing expertise in nanotechnology in their regions and nationally;

(D) make use of ongoing research and development at the micrometer scale to support their work in nanotechnology; and

(E) to the greatest extent possible, be established in geographically diverse locations, encourage the participation of Historically Black Colleges and Universities that are part B institutions as defined in section 322(2) of the Higher Education Act of 1965 (20 U.S.C. 1061(2)) and minority institutions (as defined in section 365(3) of that Act (20 U.S.C. 1067k(3)), and include institutions located in States participating in the Experimental Program to Stimulate Competitive Research (EPSCoR);

([5] 6) ensuring United States global leadership in [the development and application] *research and democratic deliberations concerning the safe, effective, and responsible design and use* of nanotechnology, including through coordination and leveraging Federal investments with nanotechnology research, development, and technology transition initiatives supported by the States;”

([6] 7) advancing the United States productivity and industrial competitiveness through stable, consistent, and coordinated investments in long-term [scientific and engineering] research in nanotechnology;

([7] 8) [accelerating] *promoting* the deployment and application of nanotechnology research [and] *for sustainable* development in the private, *public and nonprofit* sectors, including startup companies;

([8] 9) encouraging interdisciplinary research, and ensuring that processes for solicitation and evaluation of proposals under the Program encourage interdisciplinary projects and collaborations;

([9] 10) providing effective education and training for researchers and professionals skilled in the interdisciplinary perspectives necessary for nanotechnology so that a true interdisciplinary research culture for [nanoscale science, engineering, and technology] *nanotechnology* can emerge.

(11) encouraging research on nanotechnology advances that utilize existing processes and technologies.

(c) PROGRAM MANAGEMENT- The National Science and Technology Council shall oversee the planning, management,

Comment - The implicit assumption in paragraph 7 is that *only* science and engineering contribute to productivity and industrial competitiveness. This assumption reduces the diversity of perspectives that can potentially be brought to bear on the design and use of nanotechnology. Researchers in any field who can make the case to peer reviewers that their project will contribute to these goals should be given the opportunity to compete for research funds and enhance society's knowledge base.

and coordination of the Program. The Council, itself or through an appropriate subgroup it designates or establishes, shall--

(1) establish goals and priorities for the Program, based on national needs for [a set of broad applications] *the responsible design and use* of nanotechnology;

(2) establish program component areas, with specific priorities and technical goals, that reflect the goals and priorities established for the Program;

(3) oversee interagency coordination of the Program, including with the activities of the Defense Nanotechnology Research and Development Program established under section 246 of the Bob Stump National Defense Authorization Act for Fiscal Year 2003 (Public Law 107-314) and the National Institutes of Health;

(4) develop, within 12 months after the date of enactment of [this Act] **the National Nanotechnology Initiative Amendments Act of 2008**, and update every 3 years thereafter, a strategic plan to guide the activities described under subsection (b) **that describes near term and long term objectives for the program, the anticipated time frame for achieving the near-term objectives, and the metrics to be used for assessing progress toward the objectives, and that describes**—[meet the goals, priorities,

and anticipated outcomes of the participating agencies, and describe--]

(A) how the Program will [move results out of the] *coordinate laboratory activities and public deliberative input described in paragraph (b)(2)(D) with the implementation of nanotechnology policies* [and into applications] for the *long term* benefit of society, *guided by the ethical, social and environmental activities required by subsection (b) (2),* [including] *implementing these objectives* through cooperation and collaborations with nanotechnology research, development and transition initiatives supported by the States”;

(B) how the Program will encourage and support interdisciplinary research and development in nanotechnology; [the Program's support for long-term funding for interdisciplinary research and development in nanotechnology;] and

(C) [the allocation of funding for interagency nanotechnology projects] **proposed research in areas of national importance in accordance with the requirements of section 5 of the National Nanotechnology Initiative Amendments Act of 2008;**

(5) propose a coordinated interagency budget for the Program to the Office of Management and Budget to ensure the maintenance of a balanced nanotechnology research portfolio and an appropriate level of research effort;

(6) exchange information with academic, industry, State and local government (including State and regional nanotechnology programs), [and other appropriate groups] *labor, environmental and public interest organization* conducting research on and using nanotechnology;

(7) develop a plan to utilize Federal programs, such as the Small Business Innovation Research Program and the Small Business Technology Transfer Research Program, in support of the activity stated in subsection (b)([7] 8);

(8) identify research areas that are not being adequately addressed by the agencies' current research programs and address such research areas;

(9) encourage progress on Program activities through the utilization of existing manufacturing facilities and industrial infrastructures such as, but not limited to, the employment of underutilized manufacturing facilities in areas of high unemployment as production engineering and research testbeds; and

(10) in carrying out its responsibilities under paragraphs (1) through (9), take into consideration the recommendations of the Advisory Panel, suggestions or recommendations developed pursuant to subsection (b)(10)(2)(D), and the views of academic, State, industry, [and other appropriate groups] *labor, environmental, and public interest organizations* conducting research on and using nanotechnology.

(d) ANNUAL REPORT- The Council shall prepare an annual report, to be submitted to the Senate Committee on Commerce, Science, and Transportation and the House of Representatives Committee on Science, and other appropriate committees, at the time of the President's budget request to Congress, that includes--

(1) the Program budget, for the previous fiscal year, for each agency that participates in the Program, including a breakout of spending for the development and acquisition of research facilities and instrumentation, for each program component area, and for all activities pursuant to subsection (b)(2)); and including a breakout of spending for Environmental, Health and Safety and Ethical, Legal and Societal Issues projects within any of the program areas. In order to be counted in these categories the central research questions and the preponderance of research activities in such

<p>Comment – More rigorous criteria for categorizing types of research are needed in order for the breakouts to be meaningful.</p>

projects must be focused on environmental, health and safety or ethical, legal and societal issues;

([1] 2) the Program budget, for the current fiscal year, for each agency that participates in the Program, including a breakout of spending for the development and acquisition of research facilities and instrumentation, for each program component area, and for all activities pursuant to subsection (b) ([10] 2); *and including a breakout of spending for Environmental, Health and Safety and Ethical, Legal and Social Issues projects within any of the program areas. In order to be counted in these categories the central research questions and the preponderance of research activities in such projects must be focused on environmental, health and safety or ethical, legal and societal issues;*

([2] 3) the proposed Program budget for the next fiscal year, for each agency that participates in the Program, including a breakout of spending for the development and acquisition of research facilities and instrumentation, for each program component area, and for all activities pursuant to subsection (b) ([10] 2); *and including a breakout of spending for Environmental, Health and Safety and Ethical, Legal and Social Issues projects within any of the program areas. In order to be counted in these categories the central research*

questions and the preponderance of research activities in such projects must be focused on environmental, health and safety or ethical, legal and societal issues;

([3] 4) an analysis of the progress made toward achieving the goals and priorities established for the Program;

([4] 5) an analysis of the extent to which the Program has incorporated the recommendations of the Advisory Panel;
and

([5] 6) an assessment of how Federal agencies are implementing the plan described in subsection (c)(7), and a description of the amount of Small Business Innovative Research and Small Business Technology Transfer Research funds supporting the plan.

(e) Standards Setting- The agencies participating in the Program shall support the activities of committees involved in the development of standards for nanotechnology and may reimburse the travel costs of scientists, engineers and citizens who have contributed to the ethical, social and environmental activities required by the 21st Century Nanotechnology Research and Development Act of 2003 in (2)(b)(4), who participate in activities of such committees.

SECTION 3. PROGRAM COORDINATION

(a) *The National Nanotechnology Coordination Office shall—*

(1) provide technical and administrative support to the Council and the Advisory Panel;

(2) serve as the point of contact on Federal nanotechnology activities for government organizations, academia, industry, professional societies, State *and regional* nanotechnology programs, *labor, environmental, public interest and other* citizen groups, and others to exchange technical and programmatic information;

(3) conduct public outreach, including dissemination of findings and recommendations of the Advisory Panel, as appropriate; and

(4) promote access to and [early] *timely* application of the technologies, innovations, and expertise derived from Program activities to agency missions and systems across the Federal Government, [and] to United States industry, including startup companies, *and to the nonprofit sector.*

(b) FUNDING- [The National Nanotechnology Coordination Office shall be funded through interagency funding in accordance with section 631 of Public Law 108-7.] **The**

operation of the National Nanotechnology Coordination Office shall be supported by funds from each agency participating in the Program. The portion of such Office's total budget provided by each agency for each fiscal year shall be in the same proportion as the agency's share of the total budget for the Program for the previous fiscal year, as specified in the report required under section 2(d)(1).

(c) FUNDING GUIDELINES.—Not less than 40 percent of the aggregate amount of funds appropriated for the activities carried out under the Program during any fiscal year shall be used for the activities constituting (1) the Environmental, Health, and Safety program component area, or any successor program component area, and (2) research and public participatory deliberations on other ethical, legal and societal issues related to nanotechnology. The impact on low-income communities and on worker safety in the United States, and in other countries with nanotechnology research or production that stems from federally-funded programs, should be priority subjects for study.

[[c] d] Report.- Within 90 days after the date of enactment of this Act, the Director of the Office of Science and Technology Policy shall report to the Senate Committee on Commerce, Science, and Transportation, and the House of Representatives

Comment—Current EHS research expenditures are about 1 percent of all nanotechnology R&D (Project on Emerging Nanotechnologies at <http://www.azonano.com/news.asp?newsID=5907>). A sensible guideline for risk, social effects, and public input expenditures for a technological revolution making “most aspects of everyday life ... subject to change” (NNI, *Nanotechnology: Shaping the World Atom by Atom*, 1999) would be a dollar for every dollar spent hastening this change. Given the vast discrepancies in expenditures to date, an even higher proportion than the 40% recommended here is warranted. This conservative figure recognizes that transition to a rational balance among program areas will take time.

Committee on Science on the funding of the National Nanotechnology Coordination Office. The report shall include—

(1) the amount of funding required to adequately fund the Office;

(2) the adequacy of existing mechanisms to fund this Office; and

(3) the actions taken by the Director to ensure stable funding of this Office.

(e) PUBLIC INFORMATION.—

(1) The National Nanotechnology Coordination Office shall develop and maintain a database accessible by the public of projects funded under the Environmental, Health, and Safety, the Education and Societal Dimensions, and the Nanomanufacturing program component areas, or any successor program component areas[.]. *This database shall clearly identify any Environmental, Health and Safety and any Ethical, Legal and Societal Issues projects within all of the above categories. In order to be counted in these categories the central research questions and the preponderance of research activities in such projects must be focused on environmental, health and safety or ethical, legal and societal issues. Each entry in the database shall include [including] a description of each activity, an abstract*

describing the results (when available), its source of funding by agency, and its funding history. For the Environmental, Health, and Safety program component area, or any successor program component area, projects shall be grouped by major objective as defined by the research plan required under section 3(b) of the National Nanotechnology Initiative Amendments Act of 2008. For the Education and Societal Dimensions program component area, or any successor program component area, the projects shall be grouped in subcategories of—

- (A) education in formal settings;
- (B) education in informal settings;
- (C) public outreach; and
- (D) ethical, legal, and other societal issues.

(2) The National Nanotechnology Coordination Office shall develop, maintain, and publicize information on nanotechnology facilities supported under the Program that are accessible for use by individuals from academic institutions, from industry, from labor organizations, and from nonprofit public interest organizations. The host nanotechnology facility will provide health and safety training for users as needed.

<p>Comment – The host nanotechnology facilities should be available to a full range of appropriate guest users, and responsibility for validating their purposes and the health and safety preparedness of these users should rest solely with the host facility. Health and safety training should be provided by the facility when needed and feasible, in order to assure equal access.</p>

SECTION 4. SOCIETAL DIMENSIONS

(a) **Coordinator for Societal Dimensions of Nanotechnology-** The Director of the Office of Science and Technology Policy shall designate an associate director of the Office of Science and Technology Policy as the Coordinator for Societal Dimensions of Nanotechnology. The Coordinator shall be responsible for oversight of the coordination, planning, and budget prioritization of activities required by section 2(b)([10] 2) of the 21st Century Nanotechnology Research and Development Act (15 U.S.C. 7501(b)(10)). The Coordinator shall, with the assistance of appropriate senior officials of the agencies funding activities within the Environmental, Health, and Safety and the Education and Societal Dimensions program component areas of the Program, or any successor program component areas, ensure that the requirements of such section 2(b)([10]2) are satisfied. The responsibilities of the Coordinator shall include—

(1) **ensuring that a research plan for the Environmental, Health, and Safety research activities and the Education and Societal Dimensions research activities required under subsection (b) is developed, updated, and implemented and that the plan is responsive to the recommendations of the [subpanel] subpanels of the**

Rather than making EHS a *research* activity and Education and Societal Dimensions an *outreach and citizen participation* activity, the latter should encompass both public participation *and* research, including participatory research. To do otherwise would either imply that new knowledge on ethical, legal and societal issues is not an important element in the responsible design and use of nanotechnology, or that responsible design and use is not an important goal.

Advisory Panel established under section 4(a) of the 21st Century Nanotechnology Research and Development Act (15 U.S.C. 7503 (a)), as amended by this Act;

(2) encouraging and monitoring the efforts of the agencies participating in the Program to allocate the level of resources and management attention necessary to ensure that frequent public input and the ethical, legal, environmental, health, safety, and other [appropriate] societal concerns related to nanotechnology [including human health concerns] are prioritized [addressed] under the Program, including the implementation of the research plan described in subsection (b); and

(3) encouraging the agencies required to develop the research plan under subsection (b) to identify, assess, and implement suitable mechanisms for the establishment of public-private-nonprofit partnerships for support of environmental, health and safety research that includes labor, environmental, and community-based groups.”

(b) Research Plan-

(1) IN GENERAL- The Coordinator for Societal Dimensions of Nanotechnology shall convene and chair a panel comprised of representatives from the agencies funding research activities under the Environmental,

The “third sector” of knowledge production that is represented by phenomena ranging from Wikipedia to seed savers to community-based research should be acknowledged and welcomed into research partnerships (see European Commission, *Questions of Science*, 2005, p. 22, at http://ec.europa.eu/research/conferences/2005/forum2005/docs/questions_sciences_en.pdf). This sector is already researching nanotechnology issues, and official exclusion of it will cause polarization between “insiders” and “outsiders” in policy development.

Health, and Safety program component area of the Program, or any successor program component area, and from the Education and Societal Dimensions program component area, or any successor program component area, and from such other agencies as the Coordinator considers necessary to develop, periodically update, and coordinate the implementation of a research plan for [this] these program component areas. In developing and updating the plan, the panel convened by the Coordinator shall solicit and be responsive to recommendations and advice from--

(A) the [subpanel] subpanels of the Advisory Panel established under section 4(a) of the 21st Century Nanotechnology Research and Development Act (15 U.S.C. 7503(a)), as amended by this Act; and

(B) the agencies responsible for environmental, health, and safety regulations associated with the production, use, and disposal of nanoscale materials and products.

(2) DEVELOPMENT OF STANDARDS- The plan required under paragraph (1) shall include a description of how the Program will help to ensure the development of--

(A) standards related to nomenclature associated with engineered nanoscale materials;

(B) engineered nanoscale standard reference materials for environmental, health, and safety testing; and

(C) standards related to methods and procedures for detecting, measuring, monitoring, sampling, and testing engineered nanoscale materials for environmental, health, and safety impacts.

(3) COMPONENTS OF PLAN- The plan required under paragraph (1) shall, with respect to activities described in paragraphs (1) and (2)--

(A) specify near-term research objectives and long-term research objectives;

(B) specify milestones associated with each near-term objective and the estimated time and resources required to reach each milestone;

(C) with respect to subparagraphs (A) and (B), describe the role of each agency carrying out or sponsoring research in order to meet the objectives specified under subparagraph (A) and to achieve the milestones specified under subparagraph (B);

(D) specify the funding allocated to each major objective of the plan and the source of funding by agency for the current fiscal year; and

(E) estimate the funding required for each major objective of the plan and the source of funding by agency for the following 3 fiscal years.

(F) specify the near-term and far-term goals that should be achieved before further commercialization, so that long term benefits to society can be provided in a safe, responsible, and democratically-directed manner.

(4) TRANSMITTAL TO CONGRESS- The plan required under paragraph (1) shall be submitted not later than 60 days after the date of enactment of this Act to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives.

(5) UPDATING AND APPENDING TO REPORT- The plan required under paragraph (1) shall be updated annually and appended to the report required under section 2(d) of the 21st Century Nanotechnology Research and Development Act (15 U.S.C. 7501(d)).

(c) NANOTECHNOLOGY PARTNERSHIPS.—

(1) ESTABLISHMENT.—As part of the program authorized by section 9 of the National Science Foundation Authorization Act of 2002, the Director of the National Science Foundation shall provide 1 or more grants to

establish partnerships as defined by subsection (a) (2) of that section, except that each such partnership shall include one or more businesses engaged in the production of nanoscale materials, products, or devices, and one or more worker representatives in such businesses, and one or more community-based groups in areas where those business production facilities are located, and one or more nonprofit public interest groups engaged in research or public education on nanotechnology. Partnerships established in accordance with this subsection shall be designated as “Nanotechnology Education Partnerships.”

(2) PURPOSE- Nanotechnology Education Partnerships shall be designed to recruit and help prepare secondary school students to pursue postsecondary level courses of instruction in nanotechnology. At a minimum, grants shall be used to support--

(A) professional development activities to enable secondary school teachers to use curricular materials incorporating nanotechnology and to inform teachers about career possibilities and civic responsibilities for students in nanotechnology;

[(B) enrichment programs for students, including access to nanotechnology facilities and

Comment – The safety record at all these facilities should be well established for a minimum of three years, and validated by an independent author, before putting children in a potentially dangerous environment that has been designed for adult users.

equipment at partner institutions, to increase their understanding of nanoscale science and technology and to inform them about career possibilities in nanotechnology as scientists, engineers, and technicians; and]

([C] B) identification of appropriate nanotechnology educational materials and incorporation of nanotechnology into the curriculum for secondary school students at one or more organizations participating in a Partnership.

(3) SELECTION- Grants under this subsection shall be awarded in accordance with subsection (b) of such section 9, except that paragraph (3)(B) of that subsection shall not apply.

(d) Undergraduate Education Programs-

(1) ACTIVITIES SUPPORTED- As part of the activities included under the Education and Societal Dimensions program component area, or any successor program component area, the Program shall support efforts to introduce nanoscale science, engineering, and technology -- including their environmental, safety, ethical, and societal dimensions -- into undergraduate science and engineering education through a variety of

interdisciplinary approaches. Activities supported may include--

(A) development of courses of instruction or modules to existing courses;

(B) faculty professional development; and

(C) acquisition of equipment and instrumentation suitable for undergraduate education and research in nanotechnology.

(2) COURSE, CURRICULUM, AND LABORATORY IMPROVEMENT AUTHORIZATION-

There are authorized to be appropriated to the Director of the National Science Foundation to carry out activities described in paragraph (1) through the Course, Curriculum, and Laboratory Improvement program--

(A) from amounts authorized under section 7002(b)(2)(B) of the America COMPETES Act, \$5,000,000 for fiscal year 2009; and

(B) from amounts authorized under section 7002(c)(2)(B) of the America COMPETES Act, \$5,000,000 for fiscal year 2010.

(3) ADVANCED TECHNOLOGY EDUCATION AUTHORIZATION- There are authorized to be appropriated to the Director of the

National Science Foundation to carry out activities described in paragraph (1) through the Advanced Technology Education program—

(A) from amounts authorized under section 7002(b)(2)(B) of the America COMPETES Act, \$5,000,000 for fiscal year 2009; and

(B) from amounts authorized under section 7002(c)(2)(B) of the America COMPETES Act, \$5,000,000 for fiscal year 2010.

(e) Interagency Working Group-

The National Science and Technology Council shall establish under the Nanoscale Science, Engineering, and Technology Subcommittee an Education Working Group to coordinate, prioritize, and plan the educational activities supported under the Program. *This Working Group shall incorporate members from the full range of categories of groups listed in Section 4 for the Advisory Panel and subpanels.*

(f) Societal Dimensions in Nanotechnology Education Activities-

Activities supported under the Education and Societal Dimensions program component area, or any successor program component area, that involve informal, precollege, or undergraduate nanotechnology education shall include

education regarding the environmental, health and safety, and other societal aspects of nanotechnology.

(g) Remote Access to Nanotechnology Facilities- (1) Agencies supporting nanotechnology research facilities as part of the Program shall require the entities that operate such facilities to allow access via the Internet, and support the costs associated with the provision of such access, by secondary school students and teachers, to instruments and equipment within such facilities for educational purposes.

SEC. 4. ADVISORY PANEL.

(a) IN GENERAL- The President shall establish or designate a National Nanotechnology Advisory Panel **as a distinct entity**. *The Advisory panel shall form two subpanels on Environment, Health and Safety, and on Education and Societal Dimensions, respectively, with membership having specific qualifications tailored to enable [it] each subpanel to carry out the requirements of subsection (c) (7).*

(b) Qualifications.--The Advisory Panel established [or designated] by the President under subsection (a) shall consist primarily of members from academic institutions, [and] *from industry, from organizations representing labor, and from*

environmental and other nonprofit organizations with research, education, and/or public information programs concerned with nanotechnology. Members of the Advisory Panel shall be qualified to provide advice and information on nanotechnology research, development, demonstrations, education, technology transfer, commercial application, or societal and ethical concerns. In selecting an Advisory Panel, the President may also seek and give consideration to recommendations from the Congress, industry, the scientific community (including the National Academy of Sciences, scientific professional societies, and academia), [the defense community,] State and local governments, regional nanotechnology programs, *labor, environmental and public interest organizations*, and other [appropriate organizations] *citizen groups*. **At least one member of the Advisory Panel shall be an individual employed by and representing a minority-serving institution.**

(c) Duties.--The Advisory Panel shall advise the President and the Council on matters relating to the Program, including assessing--

- (1) trends and developments in nanotechnology [science and engineering] *research*;
- (2) progress made in implementing the Program;
- (3) the need to revise the Program;

(4) the balance among the components of the Program, including funding levels for the program component areas;

(5) whether the program component areas, priorities, and technical goals developed by the Council are helping to maintain United States leadership in *the responsible design and use of nanotechnology*;

(6) the management, coordination, implementation, and activities of the Program; and

(7) whether societal, ethical, legal, environmental, and workforce concerns [are adequately addressed by] *guide the goals and practices of the Program*.

(d) Reports.--The Advisory Panel shall report, not less frequently than once every 2 fiscal years, to the President on its assessments under subsection (c) and its recommendations for ways to improve the Program. The first report under this subsection shall be submitted within 1 year after the date of enactment of this Act. The Director of the Office of Science and Technology Policy shall transmit a copy of each report under this subsection to the Senate Committee on Commerce, Science, and Technology, the House of Representatives Committee on Science, and other appropriate committees of the Congress.

(e) Travel Expenses of Non-Federal Members.--Non-Federal members of the Advisory Panel, while attending meetings of the

Advisory Panel or while otherwise serving at the request of the head of the Advisory Panel away from their homes or regular places of business, may be allowed travel expenses, including per diem in lieu of subsistence, as authorized by section 5703 of title 5, United States Code, for individuals in the government serving without pay. Nothing in this subsection shall be construed to prohibit members of the Advisory Panel who are officers or employees of the United States from being allowed travel expenses, including per diem in lieu of subsistence, in accordance with existing law.

(f) Exemption from Sunset.--Section 14 of the Federal Advisory Committee Act shall not apply to the Advisory Panel.

SECTION 5. TRIENNIAL REVIEW OF THE NATIONAL NANOTECHNOLOGY PROGRAM

(a) IN GENERAL.—The Director of the National Nanotechnology Coordination Office shall enter into arrangements with the National Research Council of the National Academy of Sciences to conduct a triennial review of the program. The Director shall ensure that the arrangement with the National Research Council is concluded in order to allow sufficient time for the reporting requirements of

subsection (b) to be satisfied. Each triennial review shall include an evaluation of the—

(1) research priorities and technical content of the Program, including whether the allocation of funding among program component areas, as designated according to section 2 (c) (2), is appropriate;

(2) effectiveness of the Program's management and coordination across agencies and disciplines, including an assessment of the effectiveness of the National Nanotechnology Coordination Office;

(3) the Program's scientific and technological accomplishments and its success in transferring technology to the private, *public and nonprofit* [sector] *sectors* ;

(4) *public input activities, as described in section 2 (b)(2)(D) above, and their success in communicating the results of environmental, health, safety, ethical, legal and societal research and development, and the results of public deliberations, to the private sector, to industry workers, and to the general public;*

([4] 5) [adequacy] *the effectiveness of the Program's activities addressing ethical, legal, environmental, health, and other [appropriate] societal concerns*

Comment – Technology transfer to public and nonprofit organizations should not be ignored, even if it is likely to be small in comparison to the private sector.

[including human health concerns], *including issues of poverty and health disparities, in guiding the Program's goals and activities.*

(b) EVALUATION TO BE TRANSMITTED TO CONGRESS.—The National Research Council shall document the results of each triennial review carried out in accordance with subsection (a) in a report that includes any recommendations for ways to improve the Program's management and coordination processes and for changes to the Program's goals, funding priorities, and technical content, incorporating to the extent possible participatory evaluation methods. Each report shall be submitted to the Director of the National Nanotechnology Coordination Office, who shall transmit it to the Advisory Panel, the Committee on Commerce, Science, and Transportation of the Senate, and the Committee on Science and Technology of the House of Representatives not later than September 30 of every third year, with the first report due September 30, 2009.

(c) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated to the Office of Science and Technology Policy to carry out this section—

(1) [\$500,000] \$600,000 for the fiscal year 2009

(2) [\$500,000] \$600,000 for the fiscal year 2010

Comment – The interactions of technological change and income/social disparities are receiving increased attention and should be tracked for effective policy development and management. See, e.g., James K. Galbraith, *Created Unequal: The Crisis in American Pay*, 1998, and the ten country project on inequality and technology at <http://www.resist-research.net/home.aspx>

Comment – The increased authorization is required to fund participatory evaluation.

(3) [~~\$500,000~~] \$600,000 for the fiscal year 2011.

SECTION [5] 6. RESEARCH IN AREAS OF NATIONAL IMPORTANCE

(a) **IN GENERAL.**—The program shall include support for [nanotechnology] research and development activities directed toward application areas that have the potential [for significant contributions to national economic competitiveness and for other significant societal benefits.] *to address significant social and environmental problems. Studies assessing the potential for these research and development activities, and any applications associated with them that generate new social and environmental problems, whether intended or unintended, shall be a priority for funding under this program. The activities supported shall be designed to advance the development of research discoveries by demonstrating technical solutions to important problems in such areas as nano-electronics, energy efficiency, health care, and water remediation and purification, and to thoroughly assess, including through frequent public deliberative input, the environmental, health, safety, ethical, and other social impacts of such applications before commercialization occurs. The Advisory Panel shall make recommendations to the Program for*

candidate research and development areas for support under this section.

(b) Characteristics-

(1) IN GENERAL- Research and development activities under this section shall--

(A) include projects selected on the basis of applications for support through a competitive, merit-based process;

(B) involve collaborations among researchers [in] from two or more of the following sectors: academic institutions, [and] industry, [and may involve] nonprofit research institutions, [and] Federal laboratories, [as appropriate;] labor organizations, other nonprofit public-interest groups, and community-based organizations with concerns that can be addressed by the researchers.; and

(C) when possible, leverage Federal investments through collaboration with related State initiatives; and

(D) include a plan for [fostering the transfer of research discoveries and the results of technology demonstration activities to industry for commercial development] thoroughly evaluating potential applications of this research, including through frequent public deliberative input, in terms of the environmental, health,

safety, ethical, and other social impacts, before commercial development.”

(2) PROCEDURES- Determination of the requirements for applications under this subsection, review and selection of applications for support, and subsequent funding of projects shall be carried out by a collaboration of no fewer than 2 agencies participating in the Program. In selecting applications for support, the agencies shall give special consideration to projects that include cost sharing from non-Federal sources, *or that involve collaborations with non-profit organizations that are analyzing the public interest aspects of nanotechnology applications.*

(3) INTERDISCIPLINARY RESEARCH CENTERS- Research and development activities under this section may be supported through interdisciplinary nanotechnology research centers, as authorized by section 2 (b) 5 of the 21st Century Nanotechnology Research and Development Act, as amended by this Act.

SECTION [4] 7. TECHNOLOGY TRANSFER

(a) PROTOTYPING

(1) ACCESS TO FACILITIES.—In accordance with section 2 (b) (7) of the 21st Century Nanotechnology

Research and Development Act (15 U.S.C. 7501 (b) (7), the agencies supporting nanotechnology research facilities as part of the Program shall provide access to such facilities, and to federally supported researchers at those facilities, to companies, labor organizations, and nonprofit organizations. Such access shall be for the purpose of assisting [companies] these for-profit and nonprofit organizations in the development of prototypes that include evaluation of the full life-cycle implications [involving] of nanoscale products, devices, or processes (or products, devices or processes enabled by nanotechnology) [for determining proof of concept], including the evaluation of Environmental, Health, and Safety and the Societal Dimensions issues related to nanotechnology. The agencies shall publicize the availability of these facilities and the research personnel conducting federally funded studies, and encourage consultations with them by companies, labor organizations, and nonprofit public interest organizations as well as other researchers investigating the environmental, health, safety, ethical, and social dimensions of nanotechnologies.”

Comment – Technology transfer and commercialization processes that exclude consideration of life-cycle costs and benefits encourage quick private gains that may overlook future social and environmental costs. The harm, conflict and litigation resulting from this approach have proven to be a detriment to both business and society. Potential public concerns should be an integral component of publicly-funded research and development in order to effectively incorporate these concerns into product design at the outset.

(2) PROCEDURES- The agencies identified in paragraph (1)--

(A) shall establish and publish procedures, guidelines, and conditions for the submission and approval of applications for use of nanotechnology facilities;

(B) shall publish descriptions of the capabilities of facilities available for use under this subsection, including the availability of technical support; and

(C) may require full or partial recovery of the costs associated with use of the facilities for projects under this subsection, *if prorated for nonprofit public interest users in accordance to their ability to pay.*

(3) SELECTION AND CRITERIA.— In cases when less than full cost recovery is required pursuant to paragraph (2)(C), projects provided access to nanotechnology facilities in accordance with this subsection shall be selected through a competitive, merit-based process, and the criteria for the selection of such projects shall include at a minimum—

(A) the readiness of the project for technology demonstration *or for assessment or demonstration of environmental, health, safety, ethical, or social concerns;*

<p>Comment – The changes proposed here aim to incorporate EHS, societal dimensions, and public input within the purview of technology transfer.</p>
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(B) evidence of a commitment by [the] any applicant for further development of the project to full commercialization if the proof of concept is established by the prototype;

(C) a plan detailing how further development of the project, including decisions about full commercialization, will not cause irrevocable environmental, health, safety or social harm, and how the results of frequent public deliberative inputs will be taken into account in such decisions, [and] if there is

([C] D) evidence of the potential for further funding from private sector sources following the successful demonstration of proof of concept[.], or

(E) evidence that the project will assess the potential for nanotechnology-related products or processes that have already been commercialized to do environmental, safety, health, or social harm, including through the provision for public deliberative input into the project.

(b) Use of existing technology transfer programs --

(1) PARTICIPATING AGENCIES.—Each agency participating in the Program shall—

(A) encourage the submission of applications for support of nanotechnology related projects to the Small Business Innovation Research Program and the Small Business Technology Transfer Program administered by such agencies, *including projects to enable identifying, measuring, and developing product labels on exposure to nanomaterials, or projects assessing the environmental, health, and safety impacts of nanotechnology,* ; and

Comment – Small businesses should be encouraged to contribute to public purposes such as product labeling and environmental, health and safety developments particular to their industry segment.

(B) through the National Nanotechnology Coordination Office and within 6 months after the date of enactment of this Act, submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives--

(i) the plan described in section 2(c)(7) of the 21st Century Nanotechnology Research and Development Act (15 U.S.C. 7501(c)(7)); and

(ii) a report specifying, if the agency administers a Small Business Innovation Research Program and a Small Business Technology Transfer Program--

(I) the number of proposals received for nanotechnology related projects during the current fiscal year and the previous 2 fiscal years;

(II) the number of such proposals funded in each year;

(III) the total number of nanotechnology related projects funded and the amount of funding provided for fiscal year 2003 through fiscal year 2007; and

(IV) a description of the projects identified in accordance with subclause (III) which received private sector funding beyond the period of phase II support.

(2) NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY- The Director of the National Institute of Standards and Technology in carrying out the requirements of section 28 of the National Institute of Standards and Technology Act (15 U.S.C. 278n) shall--

(A) in regard to subsection (d) of that section, encourage the submission of proposals for support of nanotechnology related projects; and

(B) in regard to subsection (g) of that section, include a description of how the requirement of subparagraph (A) of this paragraph is being met, the number of proposals for nanotechnology related projects received, the number of such proposals funded, the total number of such projects funded since the beginning of the Technology Innovation Program, and the outcomes of such funded projects in terms of the metrics developed in accordance with such subsection (g).

(3) TIP ADVISORY BOARD- The TIP Advisory Board established under section 28(k) of the National Institute of Standards and Technology Act (15 U.S.C. 278n(k)), in carrying out its responsibilities under subsection (k)(3), shall provide the Director of the National Institute of Standards and Technology with--

(A) advice on how to accomplish the requirement of paragraph (2)(A) of this subsection; and

(B) an assessment of the adequacy of the allocation of resources for nanotechnology related projects supported under the Technology Innovation Program.

(c) INDUSTRY LIAISON GROUPS An objective of the Program shall be to establish industry liaison groups for all industry sectors that would be impacted by applications of nanotechnology. The Nanomanufacturing, Industry Liaison, and Innovation Working Group of the National Science and Technology Council shall actively pursue establishing such **liaison groups**, *including one focused on industries producing and employing composite materials. These liaison groups shall include representatives of labor, environmental and other nonprofit public interest groups, including community-based groups.*

SEC. 6. NANOMANUFACTURING RESEARCH.

(a) Research Areas- The Nanomanufacturing program component area, or any successor program component area, shall include research on--

(1) development of instrumentation and tools required for the rapid characterization of nanoscale materials and for monitoring of nanoscale manufacturing processes; and

(2) approaches and techniques for scaling the synthesis of new nanoscale materials to achieve industrial-level production rates.

(3) the full range of environmental, health, safety, ethical, and other social impacts of nanomanufacturing, before commercial development proceeds.

(b) Green Nanotechnology- Interdisciplinary research centers supported under the Program in accordance with section 2(b)(4) of the 21st Century Nanotechnology Research and Development Act (15 U.S.C. 7501(b)(4)) that are focused on nanomanufacturing research and centers established under the authority of section 5(b)(3) of this Act shall include as part of the activities of such centers--

(1) research on methods and approaches to develop environmentally benign nanoscale products and nanoscale manufacturing processes, taking into consideration relevant findings and results of research supported under the Environmental, Health, and Safety program component area, or any successor program component area;

(2) fostering the transfer of the results of such research to industry; and

(3) providing for the education of scientists and engineers through interdisciplinary studies in the *ethics, societal dimensions, principles and techniques for efforts to design and develop environmentally benign nanoscale products and processes.*

(c) REVIEW OF NANOMANUFACTURING RESEARCH —

(1) PUBLIC MEETING.—Not later than 6 months after the date of enactment of this Act, the National Nanotechnology Coordination Office shall sponsor a public meeting with representation from a wide range of industries engaged in *evaluating whether to pursue nanoscale manufacturing, labor organizations representing workers in those industries, researchers, nonprofit public interest groups, and citizens representing the general public to --*

(A) obtain the views of participants at the meeting on--

(i) the relevance and value of the research being carried out under the Nanomanufacturing program component area of the Program, or any successor program component area; and

(ii) whether the capabilities of nanotechnology research facilities supported under the Program are adequate--

(I) to meet current and near-term requirements for the fabrication and characterization of nanoscale devices and systems; and

(II) to provide access to and use of instrumentation and equipment at the facilities, by means of networking technology, to individuals who are at locations remote from the facilities; and

(B) receive any recommendations on ways to strengthen the research portfolio supported under the Nanomanufacturing program component area, or any successor program component area, and on improving the capabilities of nanotechnology research facilities supported under the Program.

Companies participating in industry liaison groups shall be invited to participate in the meeting, *in addition to participants from the groups listed in (c) (1)*. The Coordination Office shall prepare a report documenting the findings and recommendations resulting from the meeting.

(2) ADVISORY PANEL REVIEW- The Advisory Panel shall review the Nanomanufacturing program component area of the Program, or any successor program component area, and the capabilities of nanotechnology research facilities supported under the Program to assess--

(A) whether the funding for the Nanomanufacturing program component area, or any

successor program component area, is adequate and receiving appropriate priority within the overall resources available for the Program;

(B) the relevance of the research being supported to the identified needs and requirements of industry;

(C) whether the capabilities of nanotechnology research facilities supported under the Program are adequate--

(i) to meet current and near-term requirements for the fabrication and characterization of nanoscale devices and systems; and

(ii) to provide access to and use of instrumentation and equipment at the facilities, by means of networking technology, to individuals who are at locations remote from the facilities; and

(D) the level of funding that would be needed to support--

(i) the acquisition of instrumentation, equipment, and networking technology sufficient to provide the capabilities at nanotechnology research facilities described in subparagraph (C); and

(ii) the operation and maintenance of such facilities. In carrying out its assessment, the Advisory Panel shall take into consideration the findings and recommendations from the report required under paragraph (1).

(3) REPORT- Not later than 18 months after the date of enactment of this Act, the Advisory Panel shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives a report on its assessment required under paragraph (2), along with any recommendations and a copy of the report prepared in accordance with paragraph (1).

SECTION 7. DEFINITIONS

NANOTECHNOLOGY.—The term ‘nanotechnology’ means the [science and technology] *full array of scientific and technological practices and activities that enable a society* [one] to (1) understand, measure, manipulate, and manufacture at the nanoscale materials, devices, and systems with fundamentally new properties or functions[,]; (2) evaluate the

Comment – In a public policy context, nanotechnology should be understood as the full range of ideas, artifacts, uses, and consequences connected with the purposive manipulation of matter at the nanoscale. A definition that excludes purposes, uses and consequences marginalizes these concerns and relegates them to a structurally inferior status. This status is unambiguously demonstrated by current administrative structures and funding priorities in the National Nanotechnology Initiative.

social and environmental consequences of using these materials, devices and systems before any such consequence became irrevocable; (3) use these materials, devices and systems; and (4) contain, destroy, retire, isolate or otherwise safely manage such materials, devices and systems when they no longer serve a useful purpose.