

Office of Science and Technology Policy and the National Economic Council

Grand Challenges of the 21st Century; Request for Information

ACTION: Notice

SUMMARY: On September 21, 2009, President Barack Obama released his “Strategy for American Innovation.” The strategy outlines the Administration’s plans to foster innovation for sustainable growth and the creation of high-quality jobs.

One of the goals of the President’s strategy is to harness science and technology to address the “grand challenges” of the 21st century. This RFI is designed to collect input from the public regarding (1) the grand challenges that were identified in the strategy document; (2) other grand challenges that the Administration should consider, such as those identified by the National Academy of Engineering; (3) partners (e.g. companies, investors, foundations, social enterprises, non-profit organizations, philanthropists, research universities, consortia, etc.) that are interested in collaborating with each other and the Administration to achieve one or more of these goals, and (4) models for creating an “architecture of participation” that allows many individuals and organizations to contribute to these grand challenges.

RFI GUIDELINES: Responses to this RFI should be submitted by 11:59 p.m. Eastern Time on April 15, 2010. Responses to this RFI must be delivered electronically as an attachment to an e-mail sent to challenge@ostp.gov

Responses to this notice are not offers and cannot be accepted by the Government to form a binding contract or issue a grant. Information obtained as a result of this RFI

may be used by the government for program planning on a non-attribution basis. Do not include any information that might be considered proprietary or confidential.

FOR FURTHER INFORMATION CONTACT: Any questions about the content of this RFI should be sent to challenge@ostp.gov

Additional information regarding this RFI is at <http://www.ostp.gov/grandchallenges/>

SUPPLEMENTARY INFORMATION:

The Obama Administration believes that grand challenges should be an important organizing principle for America's science, technology and innovation policy. Grand challenges can address key national priorities, catalyze innovations that catalyze economic growth and quality jobs, spur the formation of multidisciplinary teams of researcher and multi-sector collaborators, bring new expertise to bear on important problems, strengthen the "social contract" between science and society, and inspire students to pursue careers in science, technology, engineering, and mathematics.

There are multiple types of grand challenges. Some define important problems in a particular field of science and engineering. For example, in 1900, the German mathematics professor David Hilbert posed 23 "mathematical puzzles" which helped keep his contemporary and future colleagues busy for a century. Others pursue an advance in technological capability, such as the development of an exaflop

supercomputer capable of one million trillion calculations per second. The focus of this RFI is on hard, unsolved scientific or engineering challenges that will have significant economic or societal impact and address an important national priority.

The classic grand challenge is the “moon shot.” As President Kennedy said in his speech before a 1961 joint session of Congress, “I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the Earth.” More recently, in the late 1980s, the United States launched an effort to sequence an entire human genome, which has transformed biomedical research and promises to improve healthcare.

The Gates Foundation identified 14 grand challenges in global health in areas such as developing new or improved vaccines, controlling insect vectors, and creating low-cost diagnostics for global health conditions. Their goal is to radically improve in the developing world by “engaging creative minds across scientific disciplines, including those who have not traditionally taken part in health research.” See <http://www.grandchallenges.org> for additional information.

The National Academy of Engineering identified 14 engineering grand challenges associated with sustainability, health, security, and human empowerment, such as providing access to clean water, engineering better medicines, securing cyberspace, and restoring and improving urban infrastructure. These grand challenges are already beginning to have an impact on undergraduate education. 25 universities have decided to

participate in the Grand Challenge Scholars Program. Undergraduate students at these campuses will be able to tackle these problems by integrating research, an interdisciplinary curriculum, entrepreneurship, international activities, and service learning. Some universities are also organizing campus-wide research initiatives around grand challenges. See <http://www.engineeringchallenges.org> for additional information.

In his “Strategy for America Innovation,” President Obama identified the following grand challenges:

- Complete DNA sequencing of every case of cancer; smart anti-cancer therapeutics that kill cancer cells and leave their normal neighbors untouched; early detection of dozens of diseases from a saliva sample; nanotechnology that delivers drugs precisely to the desired tissue; personalized medicine that enables the prescription of the right dose of the right drug for the right person; a universal vaccine for influenza that will protect against all future strains; and regenerative medicine that can end the agonizing wait for an organ transplant.
- Solar cells as cheap as paint, and green buildings that produce all of the energy they consume.
- A light-weight vest for soldiers and police officers that can stop an armor-piercing bullet.
- Educational software that is as compelling as the best video game and as effective as a personal tutor; online courses that improve the more students use

them; and a rich, interactive digital library at the fingertips of every child.

- Intelligent prosthetics that will allow a veteran who has lost both of his arms to play the piano again.
- Biological systems that can turn sunlight into carbon-neutral fuel, reduce the costs of producing anti-malarial drugs by a factor of 10, and quickly and inexpensively dispose of radioactive wastes and toxic chemicals.
- An “exascale” supercomputer capable of a million trillion calculations per second – dramatically increasing our ability to understand the world around us through simulation and slashing the time needed to design complex products such as therapeutics, advanced materials, and highly-efficient autos and aircraft.
- Automatic, highly accurate and real-time translation between the major languages of the world – greatly lowering the barriers to international commerce and collaboration.

Clearly, support for addressing such specific challenges should be only one element of the federal government’s overall R&D portfolio. The government also plays a critical role in supporting investigator-initiated research and research that is motivated solely by an interest in expanding the frontiers of human knowledge.

RFI RESPONSE INSTRUCTIONS: The White House Office of Science and Technology Policy and the National Economic Council are interested in responses that address one or more of the following topics:

Input Regarding any of the Grand Challenges Identified by President Obama's Strategy for American Innovation.

- Should the United States make it a priority to achieve this grand challenge? Why or why not?
- What existing activities in the public and private sector could the United States build on to achieve this challenge?
- What specific metrics or goals should the United States use to evaluate its progress towards this grand challenge? What roadmap would help inform decision-makers in the public and private sectors?
- What are the most important scientific and technical challenges that would need to be addressed to realize this challenge?
- What are the most important gaps in the nation's R&D portfolio that should be addressed? What kinds of R&D investments (e.g. supports for individual

investigators, small teams, centers, research infrastructure, etc.) should the United States Government emphasize?

- What are the appropriate roles of the government, industry, academia and other stakeholders in achieving this challenge, and what new forms of collaboration should be explored? What are the appropriate roles for pre-competitive collaboration and market-based competition?
- What are the economic, ethical, legal, and societal issues raised by pursuit of this challenge? What roles are there for researchers and scholars in the humanities and the social and behavioral sciences?
- In addition to investment in R&D – what are other policies should the United States Government be considering to achieve this challenge and to realize the broader economic and societal benefits associated with related scientific and technological advances (e.g. procurement, incentive prizes, development or adoption of technical standards, international collaboration, targeted investment in education and workforce development, sponsorship of pilots or test beds, changes in legal, regulatory or other public policies)?

Identification of Additional Grand Challenges.

- What are other grand challenges should the United States be considering, such as those identified by the National Academy of Engineering? Please provide input to one or more of the questions identified above.

Identification of Partners.

The Administration is interested in stimulating multi-sector collaborations to achieve these grand challenges that might involve companies, research universities, foundations, social enterprises, non-profits, and other stakeholders.

- What partners or types of partners would need to collaborate to accomplish this goal?
- What specifically would your organization be willing to do to achieve this grand challenge?
- What models, institutions, technologies, and networks would enable broad participation by individuals and organizations in achieving these grand challenges?

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