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INDEPENDENT REVIEW FINDS FEDERAL NANOTECHNOLOGY INITIATIVE HIGHLY EFFECTIVE; RECOMMENDS CHANGES TO ASSURE ONGOING U.S. DOMINANCE

*Report Calls for Greater Emphasis on Commercialization,
Strategic Coordination of Health and Safety Research*

The Federal government's ten-year-old program for nurturing and coordinating the young science of nanotechnology—the engineering of materials at vanishingly small scales—has been highly successful and has helped to make the United States the world's leader in this increasingly valuable manufacturing sector, concludes an independent report prepared for the President and Congress. But that leadership position is threatened by several aggressively investing competitors such as China, South Korea, and the European Union, according to the report, which recommends a number of changes in the Federal oversight program in order to assure U.S. dominance in the decade ahead.

The report—released by the President's Council of Advisors on Science and Technology, a group of 21 experts from across the country—is the third in a decade-long series of assessments of the National Nanotechnology Initiative (NNI), which coordinates Federal research and development activities involving the manipulation of matter at scales smaller than 100 billionths of meter. At such small scales, ordinary materials exhibit extraordinary properties that can be invaluable in a range of applications including electronics, computing, energy and fuels, medicine, and national defense. The report concludes that the NNI— which provided \$12 billion in investments by 25 Federal agencies over the past decade—has had a “catalytic and substantial impact” on the growth of U.S. nanotechnology innovation and should be continued.

However, the report warns, the United States stands to surrender its global lead in nanotechnology if it does not address some pressing needs. Key among those is a need to increase investments in product commercialization and technology transfer to help ensure that new nanotech methods and products make it to the marketplace, and the need to strengthen NNI commitments to explore in a more orderly fashion environmental, health, and safety issues.

“It is important not only to continue increasing the Federal investment in environmental, health, and safety research but to do so in a coordinated way so the most important questions are answered first,” said Ed Penhoet, co-chair of PCAST's National Nanotechnology Initiative Working Group. That approach will ensure safety, bolster public confidence, and provide a clear path to market for new companies and their products.”

The report calls for a strengthening of the National Nanotechnology Coordinating Office—which oversees the strategic implementation of the NNI—to achieve these two objectives and to make other improvements in the initiative’s effectiveness. It also recommends increased Federal support for “signature initiatives” that harness nanotechnology to address specific grand challenges, such as the need to develop novel materials that can capture solar energy more efficiently. And it calls upon the Federal government to address the steady loss of U.S.-trained foreign national scientists and engineers to their home countries.

Importantly, the report also finds that the metrics commonly used to estimate the economic benefits of nanotechnology, including product value, jobs created, and other parameters, are far less well validated than is often acknowledged. It calls for a major effort by the NNI to develop reliable economic metrics, to better assess the net benefits of the national investment in this field and to pinpoint specific areas worthy of targeted support.

“Our early investments in nanotechnology have brought us to the point where the science is being translated into important new products in health, electronics, energy, defense and other fields,” said Working Group co-chair Maxine Savitz. “Going forward we need to place even more emphasis on the commercialization of the technology—through, for example, strategic funding of nanomanufacturing—supported by improved measures of the true value-added that nano products can bring to our economy.”

PCAST members presented a penultimate draft of the report to President Obama in an hour-long meeting at the White House on March 12 after a public meeting in which the Council approved the report pending final revisions.

Among the report’s primary findings:

- The United States invests more money in nanotechnology R&D than any other country—a total of \$5.7 billion in 2008—but other nations are closing the gap.
- Corporate R&D and venture capital investments exceed those of the Federal government, but the development path is challenging and more government support is needed to help bring nascent advances to fruition in the marketplace.
- U.S. government investments in nanotechnology R&D were overtaken by the European Union in 2005 and by Asia in 2008 (Primarily Japan, China and South Korea).
- From 2003 to 2008, U.S. public and private investments in nanotechnology grew at 18 percent annually, as compared to 27 percent annually in the world overall.
- U.S. leadership in nanotechnology is at risk as assessed, for example, by the number of scientific publications per year, which has declined slightly while the number from the European Union and particularly China has climbed—although U.S. research is still more likely to appear in high-quality publications, as assessed by citation indices.
- The United States is the world leader by a large margin in the absolute number of nanotechnology patents issued, but in recent years China has surpassed the U.S. in the number of patents applied for, suggesting U.S. patent dominance may be at risk.
- The United States produced a reported \$11 billion worth of nanotech components for use in commercial products out of a reported worldwide total of \$29 billion in sales. But such estimates have significant margins of error and there is a great need for better metrics of nanotechnology’s economic value and commercial potential.

Among the report’s primary recommendations:

- Increase the focus of NNI programs on commercialization of products and increase NNI's investment in nanomanufacturing by 100 percent over the next five years.
- Better coordinate and rationalize the Nation's approach to identifying any environmental and health risks that may plausibly be associated with nanotechnology and develop a coordinated strategic research plan to fill knowledge gaps and decision-making needs of government and industry.
- Strengthen the National Nanotechnology Coordinating Office—which is central to the NNI's interagency planning, budgeting, and educational outreach activities and which serves as liaison to academia, industry, and professional societies—in part by increasing its agency-contributed budget to about \$5 million from the current \$3 million.
- Congress and the Administration need to take steps to retain scientific and engineering talent trained in the United States by developing a program to provide Permanent Resident Cards for foreign individuals who receive an advanced degree in science or engineering at a U.S. accredited institution and for whom proof of permanent employment in that scientific or engineering discipline exists.

To read the full report, please go to: www.whitehouse.gov/ostp/pcast

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