

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

HEARING CHARTER

America COMPETES: Big Picture Perspectives on the Need for Innovation, Investments in R & D and a Commitment to STEM Education

Wednesday, January 20, 2010
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

1. Purpose

On Wednesday, January 20, 2010, the House Committee on Science and Technology will hold a hearing entitled “America COMPETES: Big Picture Perspectives on the Need for Innovation, Investments in R & D and a Commitment to STEM Education.” The purpose of the hearing is to examine the role that science and technology play in promoting economic security and maintaining U.S. competitiveness and to understand the perspective of the business community on the reauthorization of the *America COMPETES Act*.

Witnesses were asked to provide testimony on ways to build upon the *America COMPETES Act* to further strengthen U.S. competitiveness. Witnesses were asked specifically to discuss how the programs authorized in the *America COMPETES Act* have affected or will affect innovation and the ability to maintain a skilled workforce in the United States, and whether the priorities and focus of the *America COMPETES Act* will put the U.S. on course to maintain its ability to compete successfully in the global economy.

2. Witnesses

- **Mr. John Castellani** - President, Business Roundtable
- **Mr. Tom Donohue** - President, U.S. Chamber of Commerce
- **Governor John Engler** - President, National Association of Manufacturers
- **Ms. Deborah Wince-Smith** – President and CEO, Council on Competitiveness

3. Background

It is widely recognized that scientific advancement and technological innovation have contributed to economic growth in the United States. In fact, some economists estimate that about half of economic growth in the United States since World War II has been the result of technological innovation. At the same time, the Organisation for Economic Co-operation and Development (OECD) concluded that, since World War II, leadership in science and engineering in the United States has driven its dominant strategic position, economic advantages, and quality of life.

Although the United States continues to be a world leader in research and development, technological innovation, and science and mathematics education, there is indication that this leadership is slipping. For example, between 1990 and 2001, the United States trade surplus in high technology products turned into a trade deficit. In addition, in recent years, American students have been performing poorly on international assessments of math and science proficiency and a growing number of American companies have moved assets and jobs overseas.

On October 12, 2005, the National Academy of Sciences' Committee on Prospering in the Global Economy of the 21st Century released a report entitled *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. The report was prompted by a request to the National Academies from Chairman Bart Gordon, former Chairman Sherwood Boehlert, and Senators Lamar Alexander and Jeff Bingaman to identify the top 10 actions, in priority order, that federal policymakers could take to enhance the science and technology enterprise so that the United States can successfully compete, prosper, and be secure in the global community of the 21st century.

The *Rising Above the Gathering Storm* report offered four recommendations, with specific action items for implementation. The recommendations were:

- **Recommendation A:** Increase America's talent pool by vastly improving K-12 science and mathematics education.
- **Recommendation B:** Sustain and strengthen the nation's traditional commitment to long-term basic research that has the potential to be transformational to maintain the flow of new ideas that fuel the economy, provide security, and enhance the quality of life.
- **Recommendation C:** Make the United States the most attractive setting in which to study and perform research so that we can develop, recruit and retain the best and brightest students, scientists, and engineers from within the United States and throughout the world.
- **Recommendation D:** Ensure that the United States is the premier place in the world to innovate; invest in downstream activities such as manufacturing and marketing; and create high-paying jobs based on innovation by such actions as modernizing the patent system, realigning tax policies to encourage innovation, and ensuring affordable broadband access.

In August of 2007, the *America COMPETES Act* passed the House of Representatives by a vote of 367-57 and was signed into law by President George W. Bush. The bill, which was the culmination of a lengthy bipartisan effort by Members of the Science and Technology Committee, implemented many of the recommendations of the *Rising Above the Gathering Storm* report. Among other things, it increased funding for basic research by putting funding for the National Science Foundation, the National Institute of Standards and Technology, and the Department of Energy's Office of Science on a path to doubling and increased investment in science, technology, engineering and mathematics (STEM) education. The legislation was endorsed by a wide range of stakeholders, including the U.S. Chamber of Commerce, the National Association of Manufacturers, Business Roundtable, and the Council on Competitiveness.

Many of the provisions and programs in the *America COMPETES Act* are set to expire at the end of Fiscal Year 2010 and must be reauthorized.

4. Summary of *America COMPETES Act*

TITLE I - Office of Science and Technology Policy (OSTP) / Government Wide Science

The legislation directed the President to convene a National Science and Technology Summit to examine the health and direction of the U.S. STEM enterprise; required a National Academy of Sciences study on barriers to innovation; changed the National Technology Medal to the National Technology and Innovation Medal; established a President's Council on Innovation and Competitiveness; required prioritization of planning for major research facilities and instrumentation nationwide through the National Science and Technology Council; and expressed a sense of Congress that each federal research agency should support and promote innovation through funding for high-risk, high-reward research.

TITLE II - National Aeronautics and Space Administration

The legislation established the National Aeronautics and Space Administration (NASA) as a full participant in all interagency activities to promote competitiveness and innovation and to enhance science, technology, engineering and mathematics education. The legislation affirmed the importance of NASA's aeronautics program to innovation and to the competitiveness of the United States. It urged NASA to implement a program to address aging workforce issues at NASA and to utilize NASA's existing Undergraduate Student Research program to support basic research by undergraduates on subjects of relevance to NASA. The legislation also expressed the sense of Congress that the International Space Station (ISS) National Laboratory offers unique opportunities for educational activities and provides a unique resource for research and development in science, technology, and engineering which can enhance the global competitiveness of the U.S.

TITLE III - National Institute of Standards and Technology

The legislation authorized a total of \$2.652 billion over fiscal years 2008 – 2010 for NIST.

The legislation established a Manufacturing Extension Partnership (MEP) Advisory Board and required the Board to provide advice on MEP programs, plans, and policies; assessments of the soundness of the MEP plans and strategies; and assessments of current performance against MEP program plans. It also established a program to award competitive grants among MEP Centers, or a consortium of Centers, for the development of projects to solve new or emerging manufacturing problems.

The legislation authorized a manufacturing research pilot grants program to make awards to partnerships that foster cost-shared collaborations among firms, educational and research institutions, state agencies, and nonprofit organizations in the development of innovative, multidisciplinary manufacturing technologies. It required such partnerships to include at least one manufacturing industry partner and one non-industry partner, and to conduct applied research to develop new manufacturing processes, techniques, or materials that would contribute to improved performance, productivity, and competitiveness of US manufacturing.

The legislation established a program to award postdoctoral research fellowships at NIST for research activities related to manufacturing sciences and senior research fellowships to establish researchers in industry or at institutions of higher education who wish to pursue studies related to the manufacturing sciences at NIST.

The legislation created a new initiative called the Technology Innovation Program (TIP), which is based on the proven success of the Advanced Technology Program (ATP), but is focused on high-risk, high-reward, pre-competitive technology development through small- and medium-sized companies. TIP allowed for greater industry input in the operation of the program and allows university participation for the first time.

TITLE IV – National Oceanic and Atmospheric Administration

The legislation established a coordinated ocean, Great Lakes, coastal and atmospheric research and development program at the National Oceanic and Atmospheric Administration (NOAA) in consultation with the National Science Foundation (NSF) and NASA. The bill required NOAA to build upon existing educational programs and activities to enhance public awareness and understanding of the ocean, Great Lakes, and atmospheric science, and to develop a science education plan. It required NOAA to be a full participant in any interagency effort to promote innovation and economic competitiveness through basic scientific research and development and the promotion of science, technology, engineering, and mathematics education.

TITLE V – Department of Energy

The legislation provided nearly \$17 billion to Department of Energy (DOE) programs over fiscal years 2008 – 2010. It specifically authorized \$5.8 billion for the DOE Office of Science for Fiscal Year 2010.

The legislation also established an Advanced Research Projects Agency for Energy, or ARPA-E. ARPA-E will address long-term and high-risk technological barriers in energy through collaborative research and development that private industry or the DOE are not likely to

undertake alone. ARPA-E is specifically structured to respond very quickly to energy research challenges, as well as terminate or restructure programs just as quickly. A fund is established in the U.S. Treasury, separate and distinct from DOE appropriations, for ARPA-E. The legislation authorized \$300 million in FY 2008, and such sums as are necessary thereafter for fiscal years 2009 and 2010.

The legislation provided \$150 million for K-12 STEM education programs that capitalize on the unique scientific and engineering resources of the national laboratories. These programs include a pilot program of grants to states to help establish or expand statewide specialty high schools in STEM education; a program to provide internship opportunities for middle and high-school students at the national labs, with priority given to students from high-needs schools; a program at each national lab to help establish a Center of Excellence in STEM education in at least one high-need public secondary school in each lab region in order to develop and disseminate best practices in STEM education; and a program to establish or expand summer institutes at the national labs and partner universities in order to improve the STEM content knowledge of K-12 teachers throughout the country. All of these programs are coordinated by a newly appointed Director for STEM Education at the Department, who also serves as an interagency liaison for K-12 STEM education.

The legislation highlighted the critical role of young investigators working in areas relevant to the mission of DOE by establishing an early career grant program for scientists at both universities and the national labs, and a graduate research fellowship program for outstanding graduate students in these fields. The legislation also brought attention to research and education needs in the nuclear sciences and hydrocarbon systems sciences by establishing grant programs to universities to establish or expand degree programs in these areas.

Finally, the legislation helped DOE recruit distinguished scientists to the national labs and foster collaboration between universities and the labs by providing competitive grants to support joint appointments between the two.

TITLE VI – Department of Education

To enhance teacher education in the STEM fields and critical foreign languages, the legislation authorized two new competitive grant programs. One program specifically enabled partnerships to implement courses of study in STEM fields and critical foreign language that lead to a baccalaureate degree with concurrent teacher certification. Another program implemented 2- or 3-year part-time master's degree programs in these areas for current teachers to improve their content knowledge and pedagogical skills. The legislation authorized \$151,200,000 for the baccalaureate degree program and \$125,000,000 for the master's degree program for fiscal year 2008 and the two succeeding fiscal years.

The legislation authorized competitive grants to increase the number of highly qualified teachers serving high-need schools and to expand access to AP and IB classes. It also authorized the Secretary of Education to contract with the National Academy of Sciences to convene a national panel within a year after the enactment of this Act to identify promising practices in the teaching of science, technology, engineering and mathematics in elementary and secondary schools.

The legislation authorized grants to states to implement mathematics programs or initiatives that are research-based, provide professional development and instructional leadership activities for teachers and administrators on the implementation of mathematics initiatives, and conduct student mathematics progress monitoring and identify areas in which students need help in learning mathematics. It also established a demonstration program which awards grants to states for the provision of summer learning grants to disadvantaged students. It also authorized grants to states to establish new service and activities to improve the overall mathematics performance of secondary school students.

The legislation also authorized a competitive grant program to increase the number of students studying critical foreign languages, starting in elementary school and continuing through postsecondary education programs.

The legislation also authorized competitive grants to states to promote better alignment of elementary and secondary education with the knowledge and skills needed to succeed in academic credit-bearing coursework in institutions of higher education, in the 21st century workforce and in the Armed Forces. It also authorized the Secretary of Education to award grants of \$50,000 to three elementary and three secondary schools, with a high concentration of low-income students in each state, whose students demonstrate the largest improvement in mathematics and science.

TITLE VII – National Science Foundation

The legislation provided \$22 billion to NSF over fiscal years 2008 - 2010. Particularly large increases were provided for K-12 STEM education programs. These programs, including the Noyce Teacher Scholarship program and the Math and Science Partnerships program, are geared to preparing thousands of new STEM teachers and provide current teachers with content and pedagogical expertise in their area of teaching.

The legislation increased support for the STEM talent expansion program (STEP) and the Advanced Technological Education (ATE) program in an effort to help create thousands of new STEM college graduates, including 2-year college graduates.

The legislation provided support for young, innovative researchers by expanding the graduate research fellowships (GRF) and integrative graduate education and research traineeship (IGERT) programs, strengthening the early career grants (CAREER) program, and creating a new pilot program of seed grants for outstanding new investigators.

Finally, the legislation included provisions to help broaden participation in STEM fields at all levels. These include several programs of outreach and mentoring for women and minorities, a request for a National Academy of Sciences report to identify barriers to and opportunities for increasing the number of underrepresented minorities in STEM fields, and an emphasis on inclusion of students and teachers from high-needs schools.

TITLE VIII – General Provisions

The legislation required the Secretary of Commerce to report to Congress on the feasibility, cost and potential benefits of establishing a program to collect and study data on export and import of services; expressed a sense of the Senate that the Securities and Exchange Commission and the Public Company Accounting Oversight Board should promulgate final regulations implementing the section of the Sarbanes-Oxley Act that are designed to reduce burdens on small businesses; directs the Government Accountability Office, after three years, to assess a representative sample of programs under this Act and make recommendations to ensure their effectiveness; expressed a sense of the Senate that federal funds should not be provided to any organization or entity that advocates against a U.S. tax policy that is internationally competitive; directed a National Academy of Sciences study on the mechanisms and supports needed for an institution of higher education or non-profit organization to develop and maintain a program to provide free access to on-line educational content as part of a degree program, especially in science, technology, engineering, mathematics and foreign languages, without using federal funds; expressed a sense of the Senate that deemed exports should safeguard U.S. national security and basic research and that the President and the Congress should consider the recommendations of the Deemed Exports Advisory Committee; and lastly, expressed a sense of the Senate that U.S. decision-makers should take the necessary steps for the U.S. to reclaim the preeminent position in the global financial services marketplace.