National Innovation Act Introduced in Senate

Senators John Ensign (R-Nev.) and Joe Lieberman (D-Conn.) introduced in December 2005 comprehensive bipartisan legislation to maintain and improve U.S. innovation in the 21st century. The National Innovation Act (S. 2109), which is based on "Innovate America," the National Innovation Initiative Report of the Council on Competitiveness, focuses on three primary areas of importance: research investment, increasing science and technology talent, and developing an innovation infrastructure.

"The number of jobs requiring technical training is growing at five times the rate of other occupations," Lieberman said. "However, the average number of students studying and entering these fields is declining, and the average age of the U.S. science and engineering workforce is rising. Our legislation will significantly increase federal support for graduate fellowship and traineeship programs in science, math, and engineering fields in order to attract more students to these fields and to create a more competitive and innovative American workforce."

To promote innovation, the bill establishes the President's Council on Innovation to develop a comprehensive agenda to promote innovation in the public and private sectors and establishes the Innovation Acceleration Grants Program, which encourages federal agencies funding research in science and technology to allocate 3% of their research and development (R&D) budgets to grants directed toward high-risk frontier research. Furthermore, the bill increases the national commitment to basic research by nearly doubling research funding for the National Science Foundation (NSF) by FY 2011 and encourages the development of regional clusters ("hot spots") of technology innovation throughout the United States.

The bill seeks to modernize science and education by expanding existing educational programs in the physical sciences and engineering by increasing funding for NSF graduate research fellowship programs as well as Department of Defense science and engineering scholarship programs; by authorizing the Department of Defense to create a competitive traineeship program for undergraduate and graduate students in defense science and engineering that focuses on multidisciplinary learning and innovation-oriented studies; and by authorizing funding for new and existing professional science master's degree programs to increase the number of qualified scientists and engineers entering the workforce.

Among incentives to encourage innovation, the legislation seeks to make permanent the research and experimentation tax credit, with modifications expanding eligibility for incentives to a greater number of firms.

Senator Dick Lugar (R-Ind.), a cosponsor of the legislation, said, "China and India alone graduate 6.4 million from college each year and over 950,000 engineers. The United States turns out 1.3 million college graduates and 70,000 engineers. We live in a global society, and by spurring research and innovation in the U.S., we are also ensuring that our companies stay competitive internationally and prosper domestically."

In approval of this legislation, Henry Kelly, president of the Federation of American Scientists, said, "America's constant advance on 'endless frontier' of scientific discovery and engineering innovation has paid enormous dividends for generations. But there is no room for complacency in a world where ideas spread around the globe at the speed of light. The National Innovation Act of 2005 ensures that America will continue to focus on the future by supporting essential investments in high risk research and education—investments that will pay dividends far into the future."

NSF Survey Shows Increase in S&E Doctorates

According to survey results, the number of PhD degrees granted in science and engineering (S&E) fields from U.S. universities has increased for the second year in a row. Despite the gains, the 26,275 PhD degrees earned in the 2004 academic year—the period the survey covers—are still shy of the 1998 peak of 27,278.

"Although there was an increase for two successive academic years, there is not yet sufficient evidence for determining if there is a new trend," said the report, which was issued in November 2005 by the National Science Foundation.

Approximately 62% of all PhD degrees earned in 2004 were in S&E fields. Biological sciences was the only S&E field to issue more doctorates than ever before. Physical sciences, psychology, and engineering in 2004 were still well below their past peaks. Doctorates in physics alone have declined nearly 20% in the past 10 years. The number of graduate students enrolling in physics, however, has been increasing since 2000, so that trend may reverse in future years.

According to the survey, more than 50% of earned doctorates in several S&E fields went to non-U.S. citizens in 2004. The fields with the highest percentage of non-U.S. recipients were—in order—engineering (64.6%), computer science and mathematics (56.1%, for each), and physics (54.7%).

The *InfoBrief* summarizing the results of the survey of earned doctorates in S&E for the academic year 2004 is available at Web site www.nsf.gov/statistics/infbrief/nsf06301/.

Europe's Green Energy Sector Examines Its Research Agenda

Using the earth's natural heat, the power of waves, the rays of the sun, or the earth's green resources to produce energy and fuel are all at the center of the European Commission's efforts to promote research in renewable energy. The European Union plans to invest €440 million in research money toward advancing these technologies between 2002 and 2006. The objective is that by 2010, at least 12% of the EU's overall energy consumption should come from renewable sources, for both environmental and supply security reasons. Research is fundamental to achieving this goal, showing the close link between energy, research, and environmental policies. A major conference on renewable energies, held in Brussels in November 2005, brought together a wide range of organizations involved in renewable energy research, to discuss how better to work together to develop this important sector. The conference was accompanied by an exhibition showcasing some of the successful projects that have been funded at the European level.

European Commissioner for Science and Research Janez Potočnik said, "Today's research policy provides the knowledge for tomorrow's energy policy. Our long-term goal is a transformation of the current fossil-fuel–based energy system into a more secure, energy-efficient, and sustainable one. Enhancing our knowledge of renewable energy sources through research is an important step to achieving this goal as part of a sustainable energy mix."

The Commission's approach has been to promote cross-industry and cross-sector collaboration in the short, medium, and long term. It has supported the creation of a Technology Platform for the photovoltaics sector. This approach has been successful in bringing together interested parties, from industry to research institutions to consumer groups and NGOs. The creation of Technology Platforms in other sectors, such as biofuels for transport, wind power, and solar thermal energy, are now in the pipeline. By bringing these sectors together in this way, the EU ensures

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the most efficient use of funds and attracts more private investment, working with a research agenda that is agreed in common, according to the European Commission.

Renewable energy research currently represents about 50% of the energy research program. The European Commission is proposing to maintain this level of investment in the future research program for 2007 to 2013. If research funds increase, as requested by the Commission, this will mean considerable new investment in this type of research.

Renewable energy sources include:

- wind—harnessing the naturally occurring energy of the wind to generate electricity, both onshore and offshore;
- photovoltaics—using semiconductor materials to capture the energy in sunlight and convert it directly into electricity;
- biomass—converting organic matter such as wood, plants, and agricultural waste to provide heat, produce fuel, and generate electricity;
- concentrated solar power—concentrating the energy of the sun to generate electricity or provide heat;
- ocean energy systems—exploiting energy from the ocean such as tidal current and waves to generate electricity; and
- geothermal—using steam and hot water generated by heat from the earth's crust to produce electricity and provide heating.

Any future large-scale development of these technologies will depend on improvement in their costs and other factors when compared with conventional energy sources, according to the European Commission.

Committee Releases Report on Nanoscience in Finland

The Committee on the Development of Nanoscience, in a report announced in December 2005, proposes that the Ministry of Education in Finland initiate a program for developing nanosciences and nanotechnology in universities from 2007 to 2009 and reserve a total of €24 million for the purpose. The development program must promote the prerequisites of nanoresearch and ensure that the education supply corresponds to labor market needs.

On April 27, 2005, the Ministry of Education appointed a committee, chaired by Markku Mattila, to look into university research and education in the nanosciences and to give its recommendations for a development program. The committee studied the development of nanosciences in major industrialized countries and the social impact of nanosciences. Furthermore, it reviewed nanosciences research in universities and polytechnic institutions and identified focus areas. It also looked into nanotechnology business and technology transfer in Finland.

The committee considers it important that education relating to nanosciences be developed in a coordinated manner to preclude overlapping and with due consideration of existing education. Universities must agree on cooperation and a division of labor and identify their own strong areas. Cooperation between universities and research institutes needs to be stepped up, according to the committee.

The committee said that the development program should especially strengthen research prerequisites in the spearhead domains in Finland, which are nanomaterials, nanoelectronics and nanophotonics, and nanobiotechnology. Similarly, the existing strong research and knowledge clusters must be strengthened, said the committee. In the committee's opinion, the benefits to be gained from pooling resources in the acquisition, maintenance, and technical support of the expensive nanoscience infrastructure should be used to the full extent. High-quality education and research in nanosciences entail close national and international cooperation, which is of special benefit in the focus areas. Alongside research, the development program should enhance knowledge transfer, cooperation with business, and the commercialization of research findings.

The input must promote the goals of the FinNano technology program of Tekes (the National Technology Agency of Finland) and the FinNano science program of the Academy of Finland.

The committee proposes that the Ministry of Education set up a national nanoscience cooperation forum to develop the division of work between the parties involved, to monitor the implementation and plan the evaluation of the program, and to develop the indicators needed in the monitoring.

A copy of the committee's report (in Finnish) can be accessed at Web site www.minedu.fi/julkaisut/koulutus/2005/tr39/tr39.pdf. □

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