The Technology Innovation Program

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Summary

The Technology Innovation Program (TIP) at the National Institute of Standards and Technology (NIST) was established in 2007 to replace the Advanced Technology Program (ATP). This effort is designed "to support, promote, and accelerate innovation in the United States through high-risk, high-reward research in areas of critical national need," according to the authorizing legislation. Grants are provided to small and medium-sized firms for individual projects or joint ventures with other research organizations.

While similar to the Advanced Technology Program in the promotion of R&D that is expected to be of broad-based economic benefit to the nation, TIP appears to have been structured to avoid what was seen as government funding of large firms that did not necessarily need federal support for research. The committee report to accompany H.R. 1868, part of which was incorporated into the final legislation, stated that TIP replaces ATP in consideration of a changing global innovation environment focusing on small and medium-sized companies. The design of the program also "acknowledges the important role universities play in the innovation cycle by allowing universities to fully participate in the program."

The elimination of ATP and the creation of TIP have renewed the debate over the role of the federal government in promoting commercial technology development. In arguing for less direct federal involvement, advocates believe that the market is superior to government in deciding technologies worthy of investment. Mechanisms that enhance the market's opportunities and abilities to make such choices are preferred. It is suggested that agency discretion in selecting one technology over another can lead to political intrusion and industry dependency. On the other hand, supporters of direct methods argue that it is important to focus on those technologies that have the greatest promise as determined by industry and supported by matching funds from the private sector. They assert that the government can serve as a catalyst for cooperation. As the 111th Congress continues to make budget decisions, the discussion may serve to redefine thinking about governmental efforts in facilitating technological advancement in the private sector.

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Introduction

The Technology Innovation Program (TIP) at the National Institute of Standards and Technology (NIST) was created to "to support, promote, and accelerate innovation in the United States through high-risk, high-reward research in areas of critical national need," according to the authorizing legislation. The intent of the program is to provide grants to small and medium-sized firms for individual projects or joint ventures with other research organizations to undertake work that

> (A) has the potential for yielding transformational results with far-ranging or wide-ranging implications;
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> (B) addresses critical national needs within the National Institute of Standards and Technology's areas of technical competence; and
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> (C) is too novel or spans too diverse a range of disciplines to fare well in the traditional peer-review process.[1]

NIST published the final rule prescribing the policies and procedures for the TIP activity on June 25, 2008 (15 C.F.R. Part 296). Small or medium-sized for-profit firms are eligible for individual project awards of up to $3 million over three years. Collaborative research ventures including small or medium-sized companies, national laboratories, universities, or other non-profit research institutions may be funded for a total of up to $9 million over five years. A competitive, merit-based process is to be used to make grants of up to 50% of total project costs. In January 2009, nine awards were announced for "new research projects to develop advanced sensing technologies that would enable timely and detailed monitoring and inspection of the structural health of bridges, roadways and water systems that comprise a significant component of the nation's public infrastructure." According to TIP, $42.5 million in federal money was expected to be matched by $45.7 in private sector support. Twenty more awards were announced in December 2009 totaling almost $71.0 million in NIST financing with approximately $145.7 million in funding from other sources.

The Technology Innovation Program was authorized by the America COMPETES Act (P.L. 110-69). The FY2008 Consolidated Appropriations Act, P.L. 110-161, provided the initiative $65.2 million (with an additional $5 million in unobligated balances from the FY2007 ATP appropriation). This was 17.6% less than FY2007 funding for the Advanced Technology Program which TIP replaced. According to NIST, the major portion of FY2008 support was to be used to meet previous ATP funding commitments. The President's FY2009 budget request did not contain any financial support for TIP. During the 110th Congress, the FY2009 appropriations bill reported from the House Committee on Appropriations provided $65.2 million for the program; the bill reported from the Senate Committee on Appropriations included $65 million for TIP.

No final FY2009 appropriations legislation was enacted for the program by the close of the 110th Congress; the Consolidated Security, Disaster Assistance, and Continuing Appropriations Act, 2009, P.L. 110-329, funded TIP at FY2008 levels through March 6, 2009. P.L. 111-8, the FY2009 Omnibus Appropriations Act, provided $65.0 million for the program.

[1] P.L. 110-69

P.L. 111-117, the Consolidated Appropriations Act, 2010, as well as the President's budget request and H.R. 2847, as originally passed by both the House and the Senate, included $69.9 million for TIP, an increase of 7.5% over FY2009.

The $79.9 million for the Technology Innovation Program in the Administration's FY2011 budget reflects a 14.3% increase in support over the current fiscal year.

Background

The Advanced Technology Program,[2] which was replaced by the Technology Innovation Program, was established by Title V of the Omnibus Trade and Competitiveness Act (P.L. 100-418). ATP was intended "to serve as a focal point for cooperation between the public and private sectors in the development of industrial technology" and to help solve "problems of concern to large segments of an industry," as noted in the conference report to accompany the bill. Placed within the National Institute of Standards and Technology (NIST), in recognition of the laboratory's ongoing relationship with industry, ATP provided seed funding to single companies or to industry-led consortia of universities, businesses, and/or government laboratories for development of generic (broad-based), pre-competitive technologies that had applications across industries. Awards, based on technical and business merit, were for high-risk work past the basic research stage but not yet ready for commercialization. Market potential was an important consideration in project selection.

Awards were for either product or process technology development. Individual firms were restricted to funding of $2 million over three years. Money was to be used only for direct R&D costs. Large firms provided at least 60% of total (direct and indirect) projects costs; small and medium-sized companies were not required to cost-share direct costs. Joint ventures could receive up to five years of financing for any amount, limited only by availability. In such cases, the private sector provided more than 50% of funding. While universities and federal laboratories could participate in collaborative work, the ATP grant was made solely to companies.

According to NIST, through the end of 2007 when ATP was terminated, 824 projects had been funded, of which about 28% were joint ventures. Approximately $1.6 billion in federal funds have been matched by $1.5 billion from the private sector. Small businesses or cooperative efforts led by such firms made up almost 68% of the awardees. (The legislation creating TIP required that the Director of NIST "continue to provide support originally awarded under the Advanced Technology Program, in accordance with the terms of the original award and consistent with the goals of the Technology Innovation Program.")

A major congressional funding issue was the continued support for the Advanced Technology Program. Opponents of the program cited it as a prime example of "corporate welfare," whereby the federal government invests in applied research activities that, they emphasize, should be conducted by the private sector. Others defended ATP, arguing that it assisted businesses (and small manufacturers) in developing technologies that, while crucial to industrial competitiveness, would not or could not be developed by the private sector alone.

[2] For additional information on ATP see CRS Report 95-36, *The Advanced Technology Program*, by Wendy H. Schacht.

The National Institute of Standards and Technology undertook numerous analyses of ATP; the General Accounting Office (GAO, now the Government Accountability Office) also studied the program. In its first evaluation (1994), NIST concluded the program had stimulated research that would not have been done without the federal support; that R&D cycles within companies have been abbreviated; and that "valuable business alliances" had been created.[3] However, in a May 1995 report, GAO argued that these conclusions can not be adequately substantiated by the information provided in the NIST study on which they were based.[4] Acknowledging that it was too early to determine the long-term impact of ATP, the GAO report stated that some of the indicators NIST utilized "may create false expectations of the program's economic success." NIST vigorously defended its methodology.

Additional studies funded by NIST found that ATP shortened R&D cycles by half and accelerated technological progress within the firm; stimulated productive collaborative activities among companies and between firms and universities; facilitated commercialization; and increased private sector investment in high-risk technology development.[5] An April 2000 progress report reinforced these earlier findings.[6] This study indicated that "participants in 261 projects have identified more than 1,200 different applications (or uses) of the technologies under development," and that the majority of these are new solutions to market needs or improvements in existing products or processes. Product cycles were being reduced, and while 24% of respondents said that they would not have undertaken the project without ATP funding, most others noted that the R&D would have been significantly slower without such support. NIST found that "organizations are pursuing different R&D than they would have undertaken without ATP funding," and that this work is more technically advanced and risky. The ATP financing also stimulated additional private sector money in these technical areas than otherwise would be the case. Over half of the companies were able to make a new or improved product. In March 2000 testimony, Raymond Kammer, then director of NIST, stated that approximately 120 new technologies have been commercialized. According to NIST, more than 60% of ATP projects resulted in commercial products and processes available in the marketplace.[7]

The concern over whether ATP supported projects that could reasonably attract private sector investment had been an issue throughout the life of the program. In a report examining award winners and "near winners" during the first four years of ATP, GAO found the program funded both projects that would not have progressed without this federal support and those that would have been financed by the private sector.[8] Half of the awardees stated that they would have

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[3] National Institute of Standards and Technology, *Setting Priorities and Measuring Results at the National Institute of Standards and Technology*, January 31, 1994.

[4] General Accounting Office, *Performance Measurement, Efforts to Evaluate the Advanced Technology Program*, GAO/RCED-95-68, May 1995.

[5] Silber and Associates, *Company Opinion about the ATP and Its Early Effects*, January 30, 1995; *Acceleration of Technology Development by the Advanced Technology Program: The Experience of 28 Projects Funded in 1991*, by Frances Jean Laidlaw, for the National Institute of Standards and Technology, Economic Assessment Office, October 23, 1997; National Institute of Standards and Technology, *Advanced Technology Program: Development, Commercialization, and Diffusion of Enabling Technologies*, by Jeanne W. Powell, December 1997; National Institute of Standards and Technology, *Advanced Technology Program Performance of Completed Projects, Status Report Number 1*, by William F. Long, March 1999.

[6] National Institute of Standards and Technology, *Development, Commercialization, and Diffusion of Enabling Technologies: Progress Report*, by Jeanne W. Powell and Karen L. Lellock, April 2000.

[7] National Institute of Standards and Technology, *ATP is Meeting Its Mission: Evidence From ATP Evaluation Studies*, available at http://www.atp.nist.gov/factsheets/1-a-1.htm.

[8] General Accounting Office, *Measuring Performance: The Advanced Technology Program and Private-Sector*
(continued...)

continued without ATP financing. Of the "near winners," 50% pursued their efforts in the absence of federal money but took longer to achieve their goals. According to GAO, while 63% of the applicants did not look elsewhere for funds, about half of the applicants who did "were told by prospective funders that their projects were either too risky or 'precompetitive'—characteristics that fulfill the aims of ATP funding." Respondents also noted that the program facilitated development of joint ventures to pursue ATP activities.

A study undertaken by the American Enterprise Institute concluded that ATP "has had only limited success" in choosing projects that could not raise private sector funds. According to the authors, this occurred because companies are not interested in pursuing R&D that fails to complement work performed for profit. In addition, the ATP selection criteria focused on commercial sales and job creation, not on projects for which there are "broad social benefits" and insufficient private investment. An April 2000 report by GAO, reinforced by May 26, 2005, testimony, noted that "two inherent factors in ATP's current award selection process—the need to guard against conflicts of interest and the need to protect proprietary information—make it unlikely that ATP can avoid funding research already being pursued by the private sector in the same time period."[9]

A Different Approach

The Technology Innovation Program appears to have been designed to avoid what was seen as government funding of large firms that did not necessarily need federal support for R&D activities. The committee report to accompany H.R. 1868, part of which was incorporated into the final legislation, stated that TIP replaces ATP in consideration of a changing global innovation environment focusing on small and medium-sized companies. The structure of TIP also "acknowledges the important role universities play in the innovation cycle by allowing universities to fully participate in the program."[10]

While similar to ATP in the promotion of high-risk R&D that would be of broad-based economic benefit to the Nation, there are several differences in the expected operation of the new Technology Innovation Program primarily associated with the size of eligible companies. Financial support under TIP is limited to small and medium-sized businesses whereas grants under ATP were available to companies regardless of size. In addition, the Advanced Technology Program required that joint ventures include two separately owned for-profit firms and could include universities, government laboratories, and other research establishments as participants in the project but not as recipients of the grant. In the TIP initiative, a joint venture may involve two separately owned for-profit companies but may also be comprised of one small or medium-sized firm and a university (or other non-profit research institution). A single company could receive up to $2 million for up to three years under ATP; under TIP, the participating company (which must be a small or medium-sized business) may receive up to $3 million over three years. In ATP, small and medium-sized companies were not required to cost share (large firms provided 60% of

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Funding, GAO/RCED-96-47, January 1996.

[9] General Accounting Office, *Advanced Technology Program: Inherent Factors in Selection Process Could Limit Identification of Similar Research*, GAO/RCED-00-114, April 2000, 5.

[10] U.S. Congress, House Committee on Science and Technology, *Technology Innovation and Manufacturing Stimulation Act of 2007*, Report to accompany H.R. 1868, H.Rept. 110-115, April 30, 2007, 21.

the total cost of the project) while in TIP there is a 50% cost sharing requirement which, again, only applies to the small and medium-sized businesses that are eligible. There were no funding limits for the five-year funding available for joint ventures under ATP; the TIP limits joint venture funding to $9 million for up to five years. The Advisory Board that was created to assist in the Advanced Technology Program included industry representatives as well as federal government personnel and representatives from other research organizations. The Advisory Board for the Technology Innovation Program would be comprised of only private sector members.

Issues and Observations

The effort to terminate the Advanced Technology Program, along with additional attempts to withdraw government support for certain other technology development efforts, appeared to reflect a philosophy that eschewed direct federal financing of private sector R&D efforts aimed at the commercialization of new technologies and production processes. Such activities are seen by opponents as "industrial policy," the means by which government rather than the marketplace "picks winners and losers." Instead, measures that would occasion a better investment environment for industry to expand their innovation-related efforts would, proponents argue, be preferable to government funding.

The current approach, including the new Technology Innovation Program, involves varied mechanisms to facilitate technological advancement. Legislation has created a body of laws, programs, and policies that involve both indirect and direct measures to stimulate technology advancement in the private sector. Indirect incentives include a research and experimentation tax credit; changes to the antitrust laws to encourage collaborative R&D and cooperative manufacturing ventures; alterations of patent ownership policies to facilitate government-industry-university interaction; and practices to promote technology transfer. Direct measures involve, among other things, federal funding for TIP and the Small Business Innovation Research Program. These cost-shared programs have been supported, in part, because of what proponents argue is their potential contribution to the country's national or economic security.

The elimination of ATP and the creation of TIP have renewed the debate over the role of the federal government in promoting commercial technology development. In arguing for less direct federal involvement, advocates believe that the market is superior to government in deciding technologies worthy of investment. Mechanisms that enhance the market's opportunities and abilities to make such choices are preferred. It is suggested that agency discretion in selecting one technology over another can lead to political intrusion and industry dependency. On the other hand, supporters of direct methods argue that it is important to focus on those technologies that have the greatest promise as determined by industry and supported by matching funds from the private sector. They assert that the government can serve as a catalyst for cooperation.

Technological progress is important to the nation because of its contribution to economic growth and a high standard of living. How best to achieve this continues to be debated. Critics viewed ATP as a means for a federal agency to select commercial firms and/or technologies for support. They maintained that the absence of market-generated decisions will result in technologies that can not be utilized productively by participating companies. Such a program, they argue, encourages selection of well-written proposals rather than assistance for truly important technologies. However, proponents stressed that ATP was market driven and that the technical areas for investment had been developed in conjunction with industry. In addition, companies were required to put up significant amounts of funding and survive a rigorous business review;

procedures that made the ATP different from other federal efforts. Replacing ATP with the Technology Innovation Program may be one response to criticisms that large firms should not be recipients of this form of federal research funding, support that should be reserved for small and medium-sized companies which do not have the financial resources available to major corporations.

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