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The National Institute of Standards and Technology: An Overview

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Summary

The National Institute of Standards and Technology (NIST), a laboratory of the Department of Commerce, has the mandate to increase the competitiveness of U.S. companies through appropriate support for industrial development of pre-competitive generic technologies and the diffusion of government-developed technological advances to users in all segments of the American economy. NIST research also provides the measurement, calibration, and quality assurance techniques that underpin U.S. commerce, technological progress, improved product reliability, manufacturing processes, and public safety. Congressional debate has focused on the merits of the external R&D programs supported by NIST and directed toward increased commercialization in the private sector, including the Advanced Technology Program (ATP) and the Manufacturing Extension Partnership (MEP). The level of funding for internal research efforts has also come under scrutiny by the Congress during the appropriations process. P.L. 108-447, the FY2005 Omnibus Appropriations Act, provides NIST with $695.3 million (after mandated rescissions), an increase of 14% over the earlier fiscal year. For FY2006, the Administration's budget request proposes funding NIST at $532 million, a 23% decrease from the current fiscal year due primarily to an absence of support for ATP and a significant cut in financing for MEP. This report will be updated as events warrant.

Mission and Background

The National Institute of Standards and Technology, formerly the National Bureau of Standards (NBS), was established by the NBS Organic Act of 1901 (P.L. 56-177). NIST is part of the Technology Administration of the Department of Commerce. Unlike most national laboratories, NIST has a mission specified by statute (15 U.S.C. 271-282a), has its own authorization and appropriation, and is headed by a Senate-confirmed presidential appointee. Prior to 1988, the mission of NBS was to develop and maintain standards and measurement support for scientific investigations, engineering,

manufacturing, commerce and educational institutions, as well as to provide technical and advisory services to other government agencies on scientific and engineering problems.

The Omnibus Trade and Competitiveness Act of 1988 (P.L. 100-418) changed the name of the National Bureau of Standards to the National Institute of Standards and Technology and explicitly charged the agency with providing technical services to facilitate the competitiveness of U.S. industry. The law directs NIST to offer appropriate support to the private sector for the development of pre-competitive generic technologies and the diffusion of government-developed technological advances to users in all segments of the American economy. Research performed in the laboratory is to generate the measurement, calibration, and quality assurance techniques that underpin U.S. commerce, technological progress, improved product reliability, manufacturing processes, and public safety.

NIST Budget

Beginning in FY1991, the NIST budget experienced marked growth as Congress funded external grant programs — the Advanced Technology Program (ATP) and the Manufacturing Extension Partnership (MEP) — authorized by P.L. 100-418. However, the 104th Congress curtailed the expansion of support for NIST and overall funding levels decreased 18% between FY1995 and FY1997. In FY1998, the NIST budget again increased as P.L. 105-119 appropriated $677.9 million (of which $5 million from the Scientific and Technical Research and Services (STRS) budget was vetoed by the President). Under P.L. 105-277, NIST received $641.1 million in funding, approximately 5% less than the previous year. For FY2000, P.L. 106-113 provided NIST with $635.8 million after the rescission mandated by law. The FY2001 appropriations legislation, P.L. 106-553, funded NIST at $598.3 million. The total included $312.6 million for the STRS account that supports intramural R&D (an 11% increase), $105.1 million for MEP, $145.7 million for ATP (a 2% increase), and $34.9 million for construction. The following fiscal year, P.L. 107-77 funded NIST at $674.5 million, an increase of 13% over FY2001. Included in this was $321.1 million for the STRS account (3% above the previous fiscal year). MEP was financed at $106.5 million and ATP received $184.5 million, a 27% increase. Construction received $62.4 million. (The FY2002 Defense Appropriations Act added $5 million into the STRS account for cybersecurity.)

The Bush Administration first proposed a significant cut in support for the Manufacturing Extension Partnership in the FY2003 budget. The proposed 89% decline in MEP funding was due to the President's recommendation that centers in operation for more than six years do so without federal financing. However, P.L. 108-7 provided NIST with $707.5 million in FY2003 funds (after the mandated 0.65% across-the-board rescission), an increase of almost 5% above the previous year. Included was $357.1 million for the STRS account (an 11% increase), $178.8 million for ATP, $105.9 million for MEP, and $65.7 million for construction.

P.L. 108-199, the FY2004 Consolidated Appropriations Act, funded NIST at $610.7 million after a 0.59% across-the-board rescission included in the Act (but not including the NIST portion of a rescission to Department of Commerce unobligated balances), almost 14% below the FY2003 appropriation. The STRS account was funded at $337.2 million (a 5.5% decrease from FY2003). Manufacturing extension was financed at $38.7

million (a 63% reduction from the previous fiscal year) and ATP received $170.5 million, 4.6% below FY2003. Construction funding totaled $64.2 million.

The FY2005 Omnibus Appropriations Act (P.L. 108-447) provides NIST with $695.3 million (after a mandated 0.8% across-the-board rescission and a 0.54% rescission from Commerce, Justice, State discretionary accounts). This amount is 14% above FY2004 funding. The STRS account is to receive $378.8 million, 12% over the previous fiscal year. The Manufacturing Extension Partnership is funded at $107.5 million, an increase of 178% that will bring support for the program up to pre-FY2004 levels. ATP is financed at $136.5 million (20% below FY2004), and the construction budget totals $72.5 million. The legislation also rescinds $3.9 million in unobligated balances from prior year funds in the ATP account.

The President's FY2006 budget requests $532 million in funding for NIST, a 23% decrease from FY2005 due primarily to an absence of support for the Advanced Technology Program (ATP) and a significant cut in financing for the Manufacturing Extension Partnership (MEP). Included in the total figure is $426.3 million for the Scientific and Technology Research and Services (STRS) account which covers primarily the internal R&D activities of the laboratory. This amount is 12.5% above the current fiscal year (and includes $5.7 million for the Baldrige National Quality Program). MEP would be funded at $46.8 million, 56% below FY2005 support. The construction budget would be $58.9 million.

Table 1. NIST Appropriations, FY2001-FY2004 Request
(millions of dollars)

NIST Appropriation		FY2003 P.L.108-7*	FY2004 P.L. 108-199**	FY2005 P.L. 108-447†	FY2006 Request
STRS		357.1	337.2	378.8	426.3
Industrial Technology Services	ATP	178.8	170.5	136.5	0
	MEP	105.9	38.7	107.5	46.8
	Subtotal	284.7	209.2	244	46.8
Construction		65.7	64.2	72.5	58.9
Total		707.5	610.7	695.3	532

Figures may not add up because of rounding.
*Figures include the 0.65% across-the-board rescission mandated in the legislation.
** Figures reflect a mandated 0.59% across-the-board rescission (but not a rescission to unobligated balances)
† Figures include the 0.83% across-the-board rescission and 0.54% rescission from the Commerce, Justice, State discretionary accounts mandated in the legislation

Scientific and Technical Research and Services (STRS). The NIST in-house R&D effort, involving approximately 3,300 scientists, engineers, technicians, and support personnel (plus some 1,200 visiting scientists per year from industry, academia, and other government agencies), is conducted at laboratories in Maryland and Colorado. A major emphasis is cooperative research with industry to overcome technical barriers to commercialization of emerging technologies. NIST participates with U.S. companies in

collaborative R&D programs in 130 research areas.[1] Since 1988, NIST has participated in over 960 formal Cooperative Research and Development Agreements with industry.

NIST is composed of seven internal research laboratories.[2] Much of the research is focused on measurements, evaluated data, standards, and test methods. NIST sees these activities as supporting basic "infrastructural technologies" which enable the development of advanced technologies, and which industry can use to characterize new materials, monitor production processes, and ensure the quality of new product lines. Under the President's FY2003 budget request, funding for this in-house research and development would increase 23% over the previous year (including the $5 million added for cybersecurity activities by the FY2002 Defense Appropriations Act). The new budget also included an additional $5 million to expand homeland security.

Industrial Technology Services (ITS). In response to what was perceived as the necessity of maintaining a strong manufacturing base, Title V of the Omnibus Trade and Competitiveness Act (P.L. 100-418) "... significantly expands the role of NIST as the Government's lead laboratory in support of U.S. industrial quality and competitiveness." To this end, NIST was given specific technology transfer functions, and several programs were created including the Advanced Technology Program, Regional Centers for the Transfer of Manufacturing Technology, and State Technology Extension. These efforts were designed to facilitate industrial activities to utilize advanced process technology; to promote cooperative ventures among industry, universities, and government laboratories; and to encourage shared risks, accelerated development, and increased skills.

The Advanced Technology Program provides seed funding, matched by private sector investment (generally of at least 50% of costs), to companies or consortia of universities, businesses, and government laboratories for development of generic technologies that have broad application across industries.[3] Awards, based on technical and business merit, are made for high-risk work past the basic research stage but not yet ready for commercialization. The first awards were made in 1991; to date, 736 projects have been funded. NIST restructured part of ATP to manage groups of projects in "well-defined" programmatic areas designed for long-range support which were selected in conjunction with industry. A general competition also continued. In FY1999, the focused programs were dropped in favor of one competition for all technologies.

Initial funding for the Advanced Technology Program was $36 million in FY1991. Appropriations increased to $48 million in FY1992, $67.9 million in FY1993, and $199.5 million in FY1994. In FY1995 funding expanded significantly to $431 million; however, P.L. 104-6 rescinded $90 million from this total. Support declined to $221 million in FY1996 and P.L. 105-18 rescinded $7 million of unobligated balances from the FY1997 ATP account of $225 million. Funding for FY1998 again declined to $192.5 million, but increased 3% to $197.5 million for FY1999. This figure reflected a $6 million rescission

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[1] Available at the National Institute of Standards and Technology website: [http://www.nist.gov/].

[2] These are: Electronics and Electrical Engineering, Manufacturing Engineering, Physics, Chemical Science and Technology, Materials Science and Engineering, Building and Fire Research, and Information Technology.

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

included in the FY1999 appropriations to account for funds originally obligated for projects that were terminated early and thus available for use in other ATP competitions. For FY2000, ATP received $142.6 million. In FY2001, ATP funding was $145.7 million and in FY2002 the program was financed at $184.5 million.

As required by law, NIST created Regional Centers for the Transfer of Manufacturing Technology.[4] Expanded in 1994 to include the State Technology Extension Program, and known as the Manufacturing Extension Partnership (MEP), this activity is designed to transfer expertise and technologies developed under NIST programs to small and mid-sized U.S.-based manufacturing firms. Funded through cooperative agreements with non-profit or state and local organizations, competitive awards were originally made for up to six years (now extended as discussed below). Non-federal sources are required to provide 50% or more of each Center's capital and costs during this time period. P.L. 105-309 permits the federal government to support centers after the six years if a positive, independent evaluation is made every two years. Federal funding is limited to one-third of the capital and annual operating and maintenance costs of the center. Centers offer expertise, needs evaluation, application demonstrations for new production technologies, training, and information dissemination.

Centers are located in all 50 states and Puerto Rico with approximately 400 regional offices. NIST also assumed support of the 36 centers originally funded by the Department of Defense through its Technology Reinvestment Project when funding for this program was terminated in FY1994. Appropriations for FY1988 and FY1989 totaled $12.5 million. Further funding included $11.9 million in FY1991; $15.1 million in FY1992; and $16.9 million in FY1993. In FY1994, when the original program was expanded, appropriations for MEP increased to $30.3 million. The $90.6 million funding for FY1995 included support for a new program, LINKS, to tie together federal, state, and local agencies, the private sector, and the manufacturing outreach institutions through communications and data systems. P.L. 104-19 rescinded $16.3 million from the FY1995 appropriation for the MEP. Funding for FY1996 was $80 million and $95 million in FY1997. FY1998 support was $113.5 million. P.L. 105-277 appropriated $106.8 million for FY1999, a decrease that reflected statutory requirements reducing the federal financial commitment as centers reach six years of operation. FY2000 funding totaled $104.2 million. In FY2001, MEP received $105.1 million and in FY2002 the program was financed at $106.5 million.

Construction of Research Facilities. Concerns have been raised whether NIST laboratories are technologically obsolete, preventing state-of-the-art research. In 1993, a $540 million, 10-year plan to upgrade the lab was endorsed and by FY1995 approximately $220 million had been appropriated for construction. Recommending a reassessment of NIST's plans, the 104th Congress rescinded $61 million of unobligated building funds. In FY1998, $95 million was provided for construction. Part of the $56.7 million made available in FY1999 and the $106.9 million in FY2000 was used to build the Advanced Measurement Laboratory. Support for construction totaled $34.9 million in FY2001 and $62.4 million in FY2002.

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[4] For more information on the MEP, see CRS Report 97-104, *Manufacturing Extension Partnership Program: An Overview*, by Wendy H. Schacht.

Issues for Congress

Beginning with the 104th Congress, many Members expressed skepticism over a "technology policy" based on providing federal funds to industry for development of pre-competitive generic technologies. This philosophical shift from previous Congresses, coupled with pressures to balance the federal budget, led to significant reductions in funding for NIST. The Advanced Technology Program and the Manufacturing Extension Partnership, which were key players in the former Clinton Administration's civilian technology development strategy, and which accounted for over 50% of the FY1995 NIST budget, were proposed for elimination. However, strong support by the former Administration and the Senate led to their continued financing. Yet funding for ATP remains controversial. Since FY2000, the original appropriations bills as passed by the House did not contain any financial support for ATP, although the final legislation funded the program. Many of the budget requests submitted by President Bush also proposed abolishing ATP. In the FY2003 budget, the Administration also recommended suspension of federal support for those manufacturing extension centers in operation for more than six years. The following year, P.L. 108-199, the FY2004 Consolidated Appropriation Act, significantly cut funding for manufacturing extension. However, the FY2005 Omnibus Appropriations Act brought support for MEP back up to the level necessary to fully fund the existing centers. The legislation also financed the Advanced Technology Program, although this financing is below that of previous fiscal years.

While much of the legislative debate has focused on the Advanced Technology Program and the Manufacturing Extension Partnership, increases in spending for the NIST laboratories that perform the research essential to the mission responsibilities of the agency have tended to remain small: a 3.7% increase between FY1995 and FY1996, a 3.5% increase in FY1997, no increase for FY1998, and 3.1% for FY1999. During FY2000, there was less than a 1% increase in support. However, FY2001 appropriations were 11% above the previous year while the figure for FY2002 included a 2.7% increase in funding. In FY2003, support for in-house R&D was 12% more than the previous fiscal year; although the FY2004 figure decreased by 5.5%, funding for FY2005 included a 12% increase. It remains to be seen how support for this effort will evolve and how this might affect financing of extramural efforts such as ATP and MEP. As the new Congress debates the budget beyond the current fiscal year, the resulting dispensation of funding for NIST programs may affect the ways by which the federal government supports technology development for commercial application.[5]

[5] See CRS Report 95-50, *The Federal Role in Technology Development,* by Wendy H. Schacht.