The National Institute of Standards and Technology: An Overview

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Summary

The National Institute of Standards and Technology (NIST) of the Department of Commerce has been a major player in the Administration's strategy for civilian technology investment. However, the 104th Congress curtailed the expansion of the NIST budget; overall funding levels declined by 18% between FY1995 and FY1997. For FY1998, the Administration had proposed support for NIST at $692.5 million. The amount appropriated by P.L. 105-119 was $677.9 million. Although less than requested, the funding was 20% above FY1997. This support included $276.9 million for Scientific and Technical Research and Services ($5 million of which was vetoed by the President), $192.5 million for the Advanced Technology Program (ATP), $113.5 million for the Manufacturing Extension Partnership (MEP), and $95 million for construction. The Administration's budget request for FY1999 is $715 million, a 6% increase over the past year. The major portion of the increase reflects a 35% expansion in financing for ATP. H.R. 1274, as passed by the House on April 24, 1997, would fund NIST at $620.5 million; S. 1325, as reported to the Senate on May 22, 1998, would support the agency at $673.1 million in FY1999.

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 (the National Institutes of Health is the only other federal laboratory complex which shares these characteristics). 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 NBS to NIST, and explicitly charged the agency with providing technical services to facilitate U.S. industry's competitiveness objectives. P.L. 100-418 directs NIST also to perform functions in support of two broad goals: (1) enhancing the competitiveness of American companies by providing appropriate support for industry's development of pre-competitive generic technologies and diffusing government-developed technological advances to users in all segments of the American economy; and (2) providing the measurements, calibrations, and quality assurance techniques which underpin U.S. commerce, technological progress, improved product reliability, manufacturing processes, and public safety.

NIST Budget

Beginning in FY1991, the NIST budget began marked growth as Congress started funding external grant programs authorized by the Omnibus Trade and Competitiveness Act. However, the 104th Congress curtailed the expansion of the NIST budget, and overall funding levels decreased by 18% between FY1995 and FY1997.

The Administration's FY1998 budget request for NIST was $692.5 million, a 22.5% increase over FY1997. The Bipartisan Budget Agreement, which served as the basis of the FY1998 budget resolution (H.Con.Res. 84), listed the laboratory as one of the "protected domestic discretionary priorities." As such, the budget resolution assumed NIST funding at the Administration's proposed FY1998 level. No authorization bill was enacted for FY1998. However, 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[1]). While the figure is approximately $15 million less than the President's request, it included construction funding six times that sought by the Administration. FY1998 funding for the Advanced Technology Program is 12% less that FY1997, but support for the Manufacturing Extension Partnership is up 19% (see Table).

For FY1999, the Administration's budget proposes $715 million in financing for NIST, a 6% increase over the previous year. Of this amount, $291.6 million is for Scientific and Technical Research and Services (including $5.4 million to expand the Baldrige National Quality Program), $366.7 million is for Industrial Technology Services (ATP and MEP), and $56.7 million is for construction. The amount requested for the Advanced Technology Program ($259.9 million) is 35% above the FY1998 level; funding for the Manufacturing Extension Partnership ($106.8 million) would decline by 6%.

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[1] The Technical Research and Services budget that was to be allocated to Montana State University for research into environmentally sound technology. The President's message, dated December 1, 1997, stated that: "This program circumvents the National Institute of Standards and Technology's research selection process and meets no clear agency need."

H.R. 1274, the National Institute of Standards and Technology Authorization Act, passed by the House on April 24, 1997, would authorize funding of $620.5 million for the agency in FY1999. $286.9 million would be provided for laboratory activities and $5.3 million for the Baldrige Quality Awards Program under the STRS account. Industrial Technology Services (ITS) would receive $261.3 million including $150 million for ATP and $111.3 million for MEP. Construction would be supported at $67 million. The Senate authorization bill, S. 1325, as reported to the Senate on May 22, 1998, provides funding of $673.1 million for NIST programs in FY1999. Of this total, $282.3 million is for laboratory activities and $5.4 million for the Baldrige effort under Scientific and Technical Research and Services; $318.4 million is for ITS (of which $204 million is for ATP and $114.4 million is for MEP); and $67 million is for construction.

NIST APPROPRIATION (millions of dollars)		FY1997	FY1998 (req)	FY1998	FY1999 (req)
Scientific and Technical Research and Services		268.0	276.8	276.9*	291.6
Industrial Technology Services	Advanced Technology Program	218.0	275.6	192.5	259.9
	Manufacturing Extension Partnership	95.0	123.4	113.5	106.8
	Subtotal	313.0	399.0	306.0	366.7
Construction of Research Facilities		(16.0)[2]	16.7	95.0	56.7
Total		565.0	692.5	677.9*	715

* President Clinton vetoed $5 million of this amount on December 1, 1997.

Scientific and Technical Research and Services. The NIST in-house R&D effort, conducted by 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 cooperative research and development programs in nearly 230 research areas.[3] Since 1988, NIST has signed over 650 formal Cooperative Research and Development Agreements (CRADAs) with industry.

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[2] P.L. 104-208 provides no funding for construction, while rescinding $16 million of unobligated balances from the same account.

[3] U.S. Department of Commerce. Technology Administration. National Institute of Standards and Technology. Guide to NIST. NIST Special Publication 858. September 1996. p. 40.

NIST is composed of seven internal research laboratories.[4] Much of the research work 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. For example, NIST's super-accurate atomic clock is used to calibrate time and frequency signals critical in electric power grids, communications networks, banking systems, and satellite navigation systems.

In FY1996, management of the Malcolm Baldrige National Quality Award, which promotes quality concepts in the private sector, was shifted into the STRS account. Funding for the NIST Quality Program was $3.4 million in FY1995; $2.9 million in FY1996; and $2.9 million in FY1997. The President requested $5.3 million for FY1998 to allow for expansion into the health care and education arenas. However, P.L. 105-119 provided appropriations of $2.98 million and instructed the agency not to augment the program at this time. For FY1999, the Administration has proposed funding at $5.4 million. As noted above, both the House and Senate authorization bills include financing to permit the use of new award categories for health care and education.

Industrial Technology Services. 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 achieve this mission, NIST is 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 between industry, universities, and government laboratories; and to promote shared risks, accelerated development, and increased skills.

The Advanced Technology Program provides seed funding, matched by private-sector investment (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. Awards, based on technical and business merit, are made for work which is high-risk and past the basic research stage but not yet ready for commercialization. The first ATP awards were made in 1991; to date, 352 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: information infrastructure for healthcare; tools for DNA diagnostics; component-based software; computer integrated manufacturing for electronics; manufacturing composite structures; motor vehicle manufacturing technology; catalysis and biocatalysis technologies; materials processing for heavy manufacturing; digital data storage; digital video in information networks; advanced vapor compression refrigeration systems; advanced manufacturing control systems; and

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

tissue engineering. A general competition also exists. Initial funding for ATP in FY1991 was $36 million. Further 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 the FY1997 emergency supplemental appropriations and rescission bill (P.L. 105-18) rescinded $7 million of unobligated balances from the FY1997 ATP account of $225 million. Funding for FY1998 is $192.5 million.

H.R. 1274, which authorizes FY1999 ATP funding, requires that award recipients provide 60% of project costs, limits federal financing to 5 years, and mandates grantees demonstrate that the project could not be undertaken without federal assistance. The Senate authorization bill, S. 1325, requires that large companies partner with other firms (including small businesses) to receive program awards and makes all competitions general in nature. Despite continued funding, congressional efforts to reduce the deficit, combined with Republican opposition to direct support for private sector technology development, have focused debate on whether to eliminate the ATP.[5]

Regional Centers for the Transfer of Manufacturing Technology were established 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 are made for up to 6 years (now extended as discussed above). Non-federal sources are required to provide 50% or more of each Center's capital and costs. The Centers offer expertise, needs evaluation, application demonstrations for new production technologies, training, and information dissemination. The original emphasis on the transfer of leading edge manufacturing technologies has given way to actual experience, which shows that for the majority of companies using the Centers, the appropriate production processes were those that have been proven, not necessarily those that are the most advanced.

There are now centers in all 50 states and Puerto Rico. Since the program was created in 1989, 78 awards have been made by NIST for extension activities resulting in the creation of approximately 300 regional offices. It should be noted that the Department of Defense also funded 36 centers through its Technology Reinvestment Project (TRP) in FY1994 and FY1995. When the TRP was terminated, NIST took over support for 20 of these programs in FY1996 and is expected to fund the remaining efforts during FY1997. 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, the State Technology Extension Program was combined with this activity to establish the Manufacturing Extension Partnership (MEP) as part of a planned network, including Manufacturing Outreach Centers, to provide additional assistance to small and medium sized firms. The FY1994 appropriation for MEP was $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

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[5] For more information on the ATP, see: U.S. Library of Congress. Congressional Research Service. The Advanced Technology Program. CRS Report 95-36 SPR, by Wendy Schacht. Washington, December 2, 1997.

$16.3 million from the FY1995 appropriation for the MEP.[6] Funding for FY1996 was $80 million and $95 million in FY1997. FY1998 support is $113.5 million. The current NIST appropriations legislation, P.L. 105-119, temporarily lifts the 6-year cap on federal funding for MEP centers, but requires, for continued funding, a positive evaluation through independent review every year after the sixth year of operation.

Construction of Research Facilities. NIST has expressed concern that its facilities have become technologically obsolete, making it difficult, if not impossible, to conduct the state-of-the-art research needed for advanced technologies. The Gaithersburg, Maryland site is over 30 years old, and the Boulder, Colorado site over 40. In 1993, the Clinton Administration and the 103rd Congress endorsed a $540 million, 10 year plan to upgrade NIST facilities, and Congress appropriated approximately $220 million for construction between FY1993 and FY1995. However, the 104th Congress rescinded $61 million of unobligated funds from the construction account, and recommended a reassessment of NIST's long-term facilities needs in light of reduced program and staffing levels and overall fiscal constraints. While the Administration's FY1998 budget request for $16.7 million was intended for critical maintenance and fire and safety upgrades of NIST facilities, the Congress appropriated $95 million in FY1998 for construction, renovation, and maintenance.

Issues for the 105th Congress

The 104th Congress expressed skepticism that government should pursue a "technology policy" by 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 have been key players in the Administration's civilian technology development strategy (and which accounted for over 50% of the FY1995 NIST budget), were proposed for elimination. While the final FY1996 and FY1997 appropriations bills ultimately continued funding for the ATP and MEP (at the insistence of the Administration), future funding for these programs (especially the ATP) remains controversial. Meanwhile, funding increases for the NIST labs (not including the Quality Program) remain small: a 3.7% increase between FY1995 and FY1996, a 3.5% increase in FY1997, and no increase for FY1998. During the second session of the 105th Congress, debates between Congress and the Administration over downsizing the NIST budget and redefining the NIST mission will likely be part of a continuing discussion over what role, if any, the federal government should play in supporting technology development for commercial application.[7]

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[6] For more information on the MEP, see: U.S. Library of Congress. Congressional Research Service. Manufacturing Extension Partnership Program: An Overview. CRS Report 97-104 SPR, by Wendy Schacht. Washington, Dec. 9, 1997.

[7] See: U.S. Library of Congress. Congressional Research Service. The Federal Role in Technology Development. CRS Report 95-50 SPR, by Wendy Schacht. Washington, Jan. 12, 1998. 6 p.