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The Hollings Manufacturing Extension Partnership Program

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Summary

The Hollings Manufacturing Extension Partnership (MEP) program is a national network of centers established by the Omnibus Trade and Competitiveness Act (P.L. 100-418). MEP centers provide custom services to small and medium-sized manufacturers (SMMs) to improve production processes, upgrade technological capabilities, and facilitate product innovation. Operating under the auspices of the National Institute of Standards and Technology (NIST), the MEP system includes centers in all 50 states and Puerto Rico.

NIST provides funding to support MEP center operations, with matching funds provided by nonfederal sources (e.g., state governments, fees for services). Initially established with a goal of transferring technology developed in federal laboratories to SMMs, MEP shifted its focus in the early 1990s to responding to needs identified by SMMs, including off-the-shelf technologies and business advice. As MEP evolved, its focus shifted to reducing manufacturing costs through lean production, quality, and other programs targeting plant efficiencies and to increasing profitability through growth. Current MEP efforts focus on innovation and growth strategies, cybersecurity, commercialization, lean production, process improvements, workforce training, supply chain optimization, and exporting.

In 2017, NIST completed a system-wide revamp of MEP to better align center funding levels with the national distribution of manufacturing activity and to result in a single center in each state and Puerto Rico. Other objectives included aligning center activities to the NIST MEP strategic plan; aligning center activities with state and local strategies; providing opportunities for new partnering arrangements; and restructuring and reinvigorating the boards of local centers.

As originally conceived, the centers were intended to become self-supporting after six years. The original legislation provided for a 50% federal cost-share for the first three years of operation, followed by declining levels of federal support for the final three years; federal funding after a center's sixth year of operation was prohibited. In 1998, Congress eliminated the prohibition on federal funding after year six. In 2017, Congress authorized NIST to provide up to 50% of the capital and annual operating and maintenance funds required to establish and support a center. Previously, the federal cost-share was limited to 50% for a center's first three years of operation, 40% in year four, and one-third in fifth and subsequent years.

The MEP program has been, at times, included in discussions surrounding termination of federal programs that provide direct support for industry. Invoking the intent of the original legislation, President George W. Bush proposed in his FY2009 budget to eliminate federal funding for MEP and to provide for "the orderly change of MEP centers to a self-supporting basis." Nevertheless, Congress appropriated $110 million for the program. Proponents assert that SMMs play a central role in the U.S. economy and that the MEP system provides assistance not otherwise available to SMMs. Some opponents have asserted that such services are available from other sources and that MEP inappropriately shifts a portion of the costs of these services to taxpayers.

Continued federal support for MEP centers remains a point of contention. In his FY2018, FY2019, FY2020, and FY2021 budgets, President Trump sought to eliminate federal support for the MEP program. Congress appropriated $140.0 million for MEP for FY2018 and FY2019, $146.0 million for FY2020, and $150 million for FY2021.

As Congress conducts oversight, it may continue to discuss support for MEP in the context of the federal government's role in bolstering innovation and competitiveness, and in the context of the appropriate federal role in such activities.

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Overview

The Hollings Manufacturing Extension Partnership (MEP), a program of the National Institute of Standards and Technology (NIST),[1] is a national network of centers that provide custom services to small and medium-sized manufacturers (SMMs, manufacturing firms with 500 or fewer employees)[2] to improve production processes, upgrade technological capabilities, and facilitate product innovation.

The MEP mission is "to enhance the productivity and technological performance of U.S. manufacturing." The MEP program executes this mission through state and regional centers that facilitate and accelerate the transfer of manufacturing technology in partnership with industry, universities and educational institutions, state governments, and NIST and other federal research laboratories and agencies. Funding for the MEP centers is provided on a cost-shared basis between the federal government and nonfederal sources, including state and local governments, and fees charged to SMMs for center services.[3]

Though President Trump sought to eliminate funding for the MEP in each year of his presidency, Congress has continued to fund the MEP program, providing $140.0 million in both FY2018 and FY2019, $146.0 million in FY2020, and $150.0 million in FY2021.

The MEP employed approximately 55 full time equivalent federal staff at NIST in FY2020 and the centers have just over 1,400 field staff with technical and business expertise.[4] In FY2017, MEP completed a system-wide competition that awarded one center to each state and Puerto Rico; previously some states had more than one MEP center.

For FY 2020, NIST reported 27,574 interactions with 9,741 unique manufacturers.[5] In a survey performed by an independent third-party for NIST MEP covering FY2019, the companies served by MEP Centers reported $15.7 billion in new and retained sales, $1.5 billion in cost savings and investment savings, $4.5 billion in investments (including products and process, plant and equipment, information systems, workforce, and others), and creation and retention of more than 114,650 jobs (28,132 new jobs and 86,518 retained jobs).[6]

Background

In the mid-1980s, congressional debates on trade focused attention on the critical role of technological advance in the competitiveness of individual firms and long-term national economic growth and productivity. Reflecting these ideas, the Omnibus Trade and

[1] NIST is an agency of the U.S. Department of Commerce.

[2] NIST defines SMMs as manufacturers with 500 or fewer employees.

[3] NIST, *FY2020 Congressional Budget Justification,* p. NIST-80, https://www.commerce.gov/sites/default/files/2019-03/fy2020_nist_congressional_budget_justification.pdf.

[4] Email from NIST to CRS, December 18, 2020. OMB Circular A-11 (*Preparation, Submission, and Execution of the Budget*), the Office of Management and Budget defines full-time equivalent (FTE) employment as "the basic measure of the levels of employment used in the budget. It is the total number of hours worked (or to be worked) divided by the number of compensable hours applicable to each fiscal year." (Source: https://www.whitehouse.gov/wp-content/uploads/2018/06/a11.pdf.) A number of NIST employees who are not on the MEP staff provide support services for the MEP program. The work performed by MEP staff as well as by the NIST support staff are used in calculating the FTEs supported by MEP appropriations.

[5] Email from NIST to CRS, December 18, 2020.

[6] W.E. Upjohn Institute for Employment Research, *The National-Level Economic Impact of the Manufacturing Extension Partnership (MEP): Estimates for Fiscal Year 2019*, May 4, 2020, https://research.upjohn.org/cgi/viewcontent.cgi?article=1248&context=reports.

Competitiveness Act (P.L. 100-418) established a public-private program, now known as the Hollings Manufacturing Extension Partnership, to assist U.S.-based SMMs in identifying and adopting new technologies. The focus on SMMs derived from policymakers' perceptions of their contribution to job creation, innovation, and manufacturing.

Research at that time indicated that SMMs produce 2.5 times more innovations per employee than large firms.[7] Program advocates noted the efforts of other nations to provide technical and business assistance to their manufacturing communities through the establishment of manufacturing extension centers (see text box, "MEP-Like Programs of Other Countries").

In 2017, there were 244,098 SMMs in the United States. These firms accounted for 98.4% of the nation's manufacturing enterprises and employed approximately 5.0 million people in 2017, 43.0% of total U.S. manufacturing employment.[8]

The improved use of technology by SMMs is seen by policymakers and business analysts as important to the competitiveness of American manufacturing firms. How a product is designed and produced often determines costs, quality, and reliability. Lack of attention to process technologies and techniques may be the result of various factors, including company finances, insufficient information, equipment shortages, and undervaluation of the benefits of technology. A key purpose of the MEP program is to address these issues through outreach and the application of expertise, technologies, and knowledge.

MEP-Like Programs of Other Countries

Several other countries also have national networks of centers that provide technical and business support to small and medium-sized manufacturers. For example:

- Germany's Fraunhofer Institutes received approximately €802.6 million (approximately $900 million) in funding from German federal and state governments in 2019 for contract research (€2.3 billion), defense research (€145 million), and infrastructure (€306 million). Additional public funds are provided for publicly financed research projects. Fraunhofer has 74 institutes and research units and more than 28,000 staff.
- Japan's Kohsetsushi network received $2.140 billion in 2012 and has 182 centers and 6,000 technical staff.
- Canada's Industrial Research Assistance Program (IRAP) provides over $300 million (Canadian, approximately $237 million (U.S.)) to more than 3,000 technology development projects annually. IRAP has more than 130 offices and more than 250 field staff.

Like the MEP, the Fraunhofer Institutes and at least some of the Kohsetsushi centers charge clients fees for their services; IRAP does not charge clients.

Sources: U.S. Government Accountability Office, *Global Manufacturing: Foreign Government Programs Differ in Some Key Respects From Those in the United States*, GAO-13-365, July 2013; Fraunhofer, *Annual Report 2019*: *Our Future Mission: Research for Sustainable Value Creation*; National Research Council of Canada, "Industrial Research Assistance Program," accessed August 20, 2019. CRS requested more current information on the Kohsetsushi network from the Embassy of Japan, but the embassy was unable to provide comparable data.

NIST requires regular reporting by the centers, including the number and types of projects completed. According to NIST, from MEP's inception through FY2020, the program has worked with 121,084 manufacturers, leading to $134.9 billion in sales and $24.7 billion in cost savings, and has helped create and retain more than 1.3 million jobs.[9]

[7] John Bulloch, "Accommodating the Future," *Journal of Small Business and Entrepreneurship*, vol. 5, no. 2 (Fall 1987), p. 8.

[8] Latest available data. Department of Commerce, Census Bureau, 2017 SUSB Annual Data Tables by Establishment Industry, accessed December 15, 2020, https://www2.census.gov/programs-surveys/susb/tables/2017/us_6digitnaics_2017.xlsx.

[9] Email from NIST to CRS, December 18, 2020.

According to the NIST MEP Advisory Board, for every dollar of federal investment in FY2019, the MEP generated nearly $32.20 in new client investment and $33.80 in new sales growth for SMMs. The board also asserts that MEP created or retained one manufacturing job for every $1,221 in federal investment in FY2019.[10]

A 2019 study performed by the W.E. Upjohn Institute for Employment Research using a constrained model (which assumes competition or displacement between firms), estimated that the services and activities of the MEP centers have added approximately 218,000 jobs to the U.S. economy and $22.9 billion to GDP, producing a return of investment of 13.4:1, based on survey data provided by MEP clients.[11]

Evolution of the Program

The MEP program was originally established in 1988 as the "Regional Centers for the Transfer of Manufacturing Technology."[12] Over time, the program was referred to by a number of different names, including the Manufacturing Technology Centers program and the Manufacturing Extension Partnership program. The America COMPETES Reauthorization of 2010 codified the name of the program as the "Hollings Manufacturing Extension Partnership" and the centers as the "Hollings Manufacturing Extension Centers."[13]

From its inception through the mid-1990s, the MEP's principal emphasis was on

> establishing the national network—making sure there was a center within reach of all the nation's manufacturers and linking those centers to one another so they could learn from and teach each other about how best to work with manufacturers.[14]

The first three centers were established in 1989. Four more were added in 1991 and 1992. In 1994, the number of MEP centers expanded substantially when NIST took over support of extension centers originally funded by the Department of Defense's Technology Reinvestment Project. This brought the number of centers to 44. NIST awarded additional centers in 1995-1996, increasing the total to 70 centers.[15] Subsequent consolidation of centers in New York and Ohio brought the number of centers down to 60, including centers in each state and Puerto Rico.

While the focus on helping SMMs has remained constant, the methods and tools used by MEP have evolved since its creation. An intent of the legislation that created the manufacturing extension effort was to provide cutting-edge technology developed by NIST and other federal laboratories to SMMs. Royalties and licensing fees paid to the centers by the SMMs for the use of

[10] NIST, MEP Advisory Board, *2019 Annual Report,* https://www.nist.gov/mep/about-nist-mep/advisory-board/annual-advisory-board-reports.

[11] Jim Robey, Randall W. Eberts, Brian Pittelko, and Claudette Robey, *The National-Level Economic Impact of the Manufacturing Extension Partnership (MEP): Estimates for Fiscal Year 2019*, W.E. Upjohn Institute for Employment Research, Kalamazoo,, MI, May 1, 2020, https://research.upjohn.org/reports/244/. Estimation for FY2019 based on all responses using firm variables. Data based on the results of the author's use of a constrained approach that "assumes that competition among firms mitigates the overall effects of the estimated increase in sales and employment since firms that do not benefit from the services rendered by MEP may lose market share to those that do, and thus grow less quickly than they would have otherwise and perhaps even lose sales and jobs."

[12] P.L. 100-418.

[13] P.L. 111-358.

[14] Dave Cranmer, *Reflections—Part 2,* Manufacturing Innovation blog, http://nistmep.blogs.govdelivery.com/reflections-part-2/.

[15] Dave Cranmer, *Reflections—Part 1,* Manufacturing Innovation blog, http://nistmep.blogs.govdelivery.com/25-year-reflections/.

these technologies were expected to make the centers self-sufficient after the initial six years of operation. Advanced, federally funded technology, however, did not prove to be what most SMMs needed. Rather, their needs proved to be much more basic, including off-the-shelf technologies and business advice on topics such as management information technology, financial management systems, and business processes. A 1991 assessment of the program by the General Accounting Office (GAO, now the Government Accountability Office) concluded that

> While legislation establishing the Manufacturing Technology Centers Program emphasized the transfer of advanced technologies being developed at federal laboratories, the centers have found that their clients primarily need proven technologies. **Thus, a key mandate of this program is not realistically aligned with the basic needs of most small manufacturers** [emphasis added]... [A]ccording to officials from professional and trade associations representing small manufacturers and the results of key studies on U.S. manufacturing competitiveness, such advanced, laboratory-based technologies are not practical for most small manufacturers because these technologies generally are expensive, untested, and too complex.[16]

In recognition of this situation, the program was reoriented to offer more basic technologies that helped SMMs to improve their productivity and competitive position. By the mid-1990s, MEP was providing "a wide range of business services, including helping companies (1) solve individual manufacturing problems, (2) obtain training for their workers, (3) create marketing plans, and (4) upgrade their equipment and computers."[17] As articulated in the NIST Manufacturing Innovation blog,

> The initial services were focused on solving immediate and short-term problems—point solutions. The philosophy was an engineering one: 'You have a problem. We can fix it.'[18]

Over time, the MEP's focus moved from point solutions to more strategic, integrated services. In 2010, the "overarching strategy" for the MEP program was to reduce manufacturing costs through "lean, quality, and other programs targeting plant efficiencies" and to increase profitability "through business growth services resulting in new sales, new markets, and new products."[19]

Current MEP efforts focus on innovation strategies, commercialization, lean production, process improvements, workforce training, supply chain optimization, and exporting. One of the key areas of the MEP strategy is technology acceleration.[20] MEP defines technology acceleration as

> integrating technology into the products, processes, services and business models of manufacturers to solve manufacturing problems or pursue opportunities and facilitate competitiveness and enhance manufacturing growth. Technology acceleration spans the innovation continuum and can include aspects of technology transfer, technology transition, technology diffusion, technology deployment and manufacturing implementation.[21]

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[16] General Accounting Office, *Technology Transfer, Federal Efforts to Enhance the Competitiveness of Small Manufacturers*, GAO/RCED-92-30, November 1991, p. 3.

[17] General Accounting Office, *Manufacturing Extension Program, Manufacturers' Views About Delivery and Impact of Services*, GAO/GGD-96-75, March 1996, 2.

[18] Dave Cranmer, *Reflections—Part 2*, Manufacturing Innovation blog, http://nistmep.blogs.govdelivery.com/reflections-part-2/.

[19] Slides provided by Roger D. Kilmer, Director, Hollings Manufacturing Extension Partnership, NIST, May 19, 2010.

[20] Personal communication with MEP staff, October 8, 2015.

[21] National Institute of Standards and Technology, presentation, "Advisory Board Committee on Technology

Technology acceleration encompasses MEP efforts to assist SMMs in the improvement of existing products, the development of new products, and the development and improvement of manufacturing processes. MEP assists SMMs in this regard through a variety of approaches including technology scouting and transfer; supplier scouting; business-to-business network pilots; lean product development; technology-driven market intelligence; access to capital; cooperative research and development activities with NIST laboratories; and use of other federal programs such as the Small Business Innovation Research (SBIR) program,[22] the Advanced Manufacturing Technology (AmTech) Consortia program, and the Manufacturing USA Program (formerly the National Network for Manufacturing Innovation).[23]

While continuing to offer its services to all SMMs, MEP is emphasizing targeted outreach toward growth-oriented SMMs and small entrepreneurial startups.[24]

Statutory Mission and Activities

The statutory objective of the MEP centers is to enhance productivity and technological performance in U.S. manufacturing through the following:

- the transfer of manufacturing technology and techniques developed at NIST to centers and, through them, to manufacturing companies throughout the United States;
- the participation of individuals from industry, universities, state governments, other federal agencies, and, when appropriate, NIST in cooperative technology transfer activities;
- efforts to make new manufacturing technology and processes usable by U.S.-based small- and medium-sized companies;
- the active dissemination of scientific, engineering, technical, and management information about manufacturing to industrial firms, including small- and medium-sized manufacturing companies;
- the utilization, when appropriate, of the expertise and capability that exists in federal agencies and federally sponsored laboratories;
- the provision to community colleges and area career and technical education schools of information about the job skills needed in manufacturing companies, including small and medium-sized manufacturing businesses in the regions they serve;
- promoting and expanding certification systems offered through industry, associations, and local colleges when appropriate, including efforts such as facilitating training, supporting new or existing apprenticeships, and providing access to information and experts, to address workforce needs and skills gaps in order to assist small- and medium-sized manufacturing businesses; and

Acceleration (ABCTA) Report to the MEP Advisory Board," September 24, 2014.

[22] For more information on the SBIR program, see CRS Report R43695, *Small Business Research Programs: SBIR and STTR*, by Marcy E. Gallo

[23] For more information on the NNMI, see CRS Report R43857, *The Network for Manufacturing Innovation*, by John F. Sargent Jr.

[24] Email from NIST to CRS, December 18, 2020.

- the growth in employment and wages at United States-based small and medium-sized companies.[25]

No direct financial support is available for companies through the centers. The centers offers only technical and managerial assistance, and the cost of that is dependent on an MEP center's expenses.[26]

The statutorily authorized activities of centers include the following:

- the establishment of automated manufacturing systems and other advanced production technologies, based on NIST-supported research, for the purpose of demonstrations and technology transfer;
- the active transfer and dissemination of research findings and center expertise to a wide range of companies and enterprises, particularly small and medium-sized manufacturers; and
- the facilitation of collaborations and partnerships between small and medium-sized manufacturing companies, community colleges, and area career and technical education schools, to help those entities better understand the specific needs of manufacturers and to help manufacturers better understand the skill sets that students learn in the programs offered by such colleges and schools.[27]

MEP Organization and Structure

The MEP program includes an MEP program office located at NIST (NIST MEP), an MEP Advisory Board, and the 51 MEP centers and their Oversight Boards. In FY2020, NIST MEP had 58 employees and received appropriations to support 80 FTE.[28] The NIST FY2021 budget justification, which seeks to end federal support for MEP, requested authorization for no FTE for MEP.[29]

NIST MEP

A Director and Deputy Director lead the NIST MEP program office. The office is composed of five divisions (see **Figure 1**), some with one or more groups. Here are the some of the activities and areas of responsibility for each:

- The **Director's Office** works to provide a strong nationwide network of Manufacturing Extension Partnership centers and supports partnerships across the federal government and within industry that respond to the needs of state- and local-based extension services and supports their integration as a nationwide

[25] 15 USC 278k(c).

[26] According to NIST, the reimbursement structure for services varies among MEP centers. NIST MEP provides centers with flexibility in programmatic approaches and financial models, while requiring adherence to strict compliance with accounting systems, board governance, and reporting. NIST MEP does not provide MEP centers with guidance on charging clients. Sources: Email from NIST to CRS on November 22, 2015; email from NIST to CRS on July 25, 2018.

[27] 15 USC 278k(d).

[28] Email from NIST to CRS, December 18, 2020. See footnote 5 for the definition of an FTE.

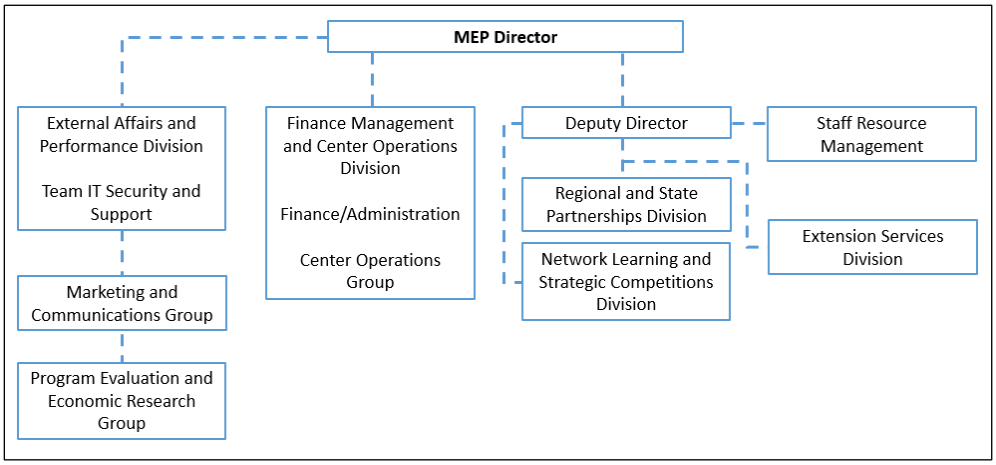
[29] National Institute of Standards and Technology, *FY2021 Congressional Budget Justification*, p. NIST-75 https://www.commerce.gov/sites/default/files/2020-02/fy2021_nist_ntis_congressional_budget_justification.pdf.

delivery system to strengthen the global competitiveness of small and medium-sized U.S. manufacturers.

- The **External Affairs Performance and Support Division** is responsible for executing the mission and vision of the organization for short-term and long-term strategic planning, communication, and program performance.
  - The **Marketing and Communications Group** is responsible for promoting awareness of the MEP National Network to small and medium-sized manufacturers as well as external and internal MEP stakeholders; is responsible for all meetings and summits; and handles communications and programmatic planning related to the MEP National Advisory Board.
  - The **Program Evaluation and Economic Research** Group carries out performance evaluations of the MEP centers and the overall network; monitors performance progress; manages center data reporting and client survey processes; and coordinates among the centers and NIST MEP on reporting, performance, and evaluation policy and issues.
- The **Finance Management and Center Operations Division** prepares annual budgets and operating outcome plans; tracks program expenditures against multiple fiscal year plans; and manages all aspects of budget and finance.
  - The **Center Operations Group** conducts oversight of all MEP cooperative agreements; executes division business plans related to cooperative agreements; coordinates efforts among MEP and grants and procurement offices; monitors centers regarding all financial and compliance aspects; and takes corrective action with respect to centers that are inefficiently or ineffectively providing services to manufacturing firms.
- The **Regional and State Partnerships Division** engages in partnership development with internal (i.e., NIST and other Department of Commerce offices and agencies) and external organizations to identify, develop, and assign resources; establishes and maintains strategic alliances with state and local government agencies and legislatures, other federal agencies, and manufacturing-related research organizations; and develops strategic alliances and partnerships with original equipment manufacturers and trade associations. The division also coaches and mentors new centers' directors.
- The **Extension Services Division** provides guidance and leadership to the MEP National Network regarding the extension services offered by MEP centers; identifies and develops new focus areas, approaches, tools, and techniques for transforming SMMs into high performing enterprises; and establishes and maintains national-level, strategic manufacturing technology alliances with NIST laboratories, other federal agencies, manufacturing research organizations, industry associations, and professional associations that support U.S. SMMs.
- The **Network Learning and Strategic Competitions Division** manages communities of practice and working groups; identifies manufacturing trends related to SME needs and barriers to adoption; is responsible for the competition processes used for MEP cooperative agreements; and conducts industry analyses and analyzes emerging markets and supply chain technologies to identify products and services to help SMMs be competitive in the global market.[30]

[30] Emails from NIST to CRS, September 4, 2019 and December 18, 2020.

Figure 1. MEP Organizational Chart



Source: CRS, based on information provided by NIST on December 18, 2020.

MEP Advisory Board

Congress established an MEP Advisory Board to provide the NIST Director with advice on MEP activities, plans, and policies; assessments of the soundness of MEP plans and strategies; and assessments of current performance against MEP program plans.[31] By statute, the MEP Advisory Board is to consist of at least 10 members broadly representative of stakeholders appointed by the NIST Director. The board is to include at least two members employed by or on an advisory board for a center, at least five members from U.S. small businesses in the manufacturing sector, and at least one member representing a community college. Federal employees may not serve as advisory board members. Members serve staggered terms of three years. A member may serve two consecutive terms. One year from the end of the second term, a member may be reappointed to the board.

The MEP Advisory Board is to act solely in an advisory capacity in accordance with the Federal Advisory Committee Act.[32] The board is required to meet at least twice a year and to report annually to Congress, through the Secretary of Commerce, on the status of the MEP program and programmatic planning. Copies of the MEP Advisory Board annual reports are available online at https://www.nist.gov/mep/about-mep/advisory-board/annual-advisory-board-reports.

MEP Centers

The MEP program is administered by NIST through partnerships with 51 centers in all 50 states and Puerto Rico, including 387 service locations[33] and more than 1,400 field staff with technical

[31] 15 USC 278k(e).

[32] The Advisory Board is exempted from the provisions of Section 14 of the Federal Advisory Committee Act, which addresses questions related to termination, renewal, and continuation of advisory committees.

[33] According to NIST, "The definition of a service location is broad in that it encompasses locations for which an MEP practitioner can operate out of in order to provide support for the manufacturing community. Service locations range from one-person offices to fully staffed regional offices with all service locations intended to provide adequate coverage for manufacturers. This includes partner locations that can be used to provide services to the manufacturers across the states." Source: Email between NIST and CRS, November 22, 2015.

and business expertise.[34] MEP seeks to have a center or other service location not more than two hours away from any potential client. **Appendix A** provides a list of MEP centers.

Each center is operated by a state government, university, or other nonprofit organization. Center staff are employees of the center and its partners, not the federal government.

Center Selection

The following sections provide an overview of the criteria used by NIST MEP in awarding centers during the center recompetitions.

Criteria

MEP centers were selected in response to open and competitive solicitations issued by NIST. Federal statute requires that center selections be based on merit using, at a minimum, the following criteria:

- merits of the application, particularly those portions of the application regarding technology transfer, training and education, and adaptation of manufacturing technologies to the needs of particular industrial sectors;
- quality of service to be provided;
- geographical diversity and extent of service area; and
- percentage of funding and amount of in-kind commitment from other sources.[35]

Following the first MEP center awards in 1989, the number of centers grew to 70, including at least one center in each state and Puerto Rico. Later consolidation reduced the number to 60, and under the recompetition to 51 (one in each state and Puerto Rico).

System-Wide Center Recompetition

In 2017, NIST completed a recompetition of all its centers. At the time the recompetition began in 2014, many of the existing centers had not been competed for more than 20 years. According to NIST, the system-wide competition sought to align center funding levels with the national distribution of manufacturing activity and result in a single center in each state and Puerto Rico. Other objectives included aligning center activities to the NIST MEP strategic plan; aligning center activities with state and local strategies; providing opportunities for new partnering arrangements; and restructuring and reinvigorating local center boards.

Review Prior to Continued Center Funding

Center awards are made as cooperative agreements with an initial performance period of five years. NIST may extend an award for an additional five years following an overall assessment of the center, including "programmatic, policy, financial, administrative, and responsibility assessments."[36] According to NIST, when an application for a multiyear award is approved, funding is usually provided for only the first year of the project; for subsequent years, recipients

[34] Email from NIST to CRS, December 18, 2020.

[35] 15 U.S.C. 278k(c)(4).

[36] National Institute of Standards and Technology, "Award Competitions for Hollings Manufacturing Extension Partnership (MEP)," 79 *Federal Register* 44746-44752, August 1, 2014, https://federalregister.gov/a/2014-18264.

are required to submit detailed budgets and budget narratives prior to the award of any continued funding. The amount of funds awarded after the first year is provided on a noncompetitive basis and may be adjusted upward or downward. Center funding after the first year is contingent upon satisfactory performance, continued relevance to the mission and priorities of the program, and the availability of funds. Continuation of an award to extend the period of performance or to increase or decrease funding is at the sole discretion of NIST.[37]

Center Cost-Share and Term of Eligibility

The following sections provide current and historical information on center cost-sharing and term of eligibility for funding.

Current Status of Cost-Sharing and Term of Eligibility

Funding for the MEP centers is provided on a cost-share basis by the federal government and nonfederal sources. The federal government may provide up to 50% of the funds required to establish and support a center regardless of the year of operation of the center. A center must meet the required nonfederal cost-share to be eligible to receive federal funding.

Institutions eligible to compete for a center include nonprofit institutions, or consortia thereof; institutions of higher education; or states, United States territories, local governments, or tribal governments. There is no limit to the number of years a center may receive federal funding.

As discussed above, the recompetition sought to better align center funding levels with the number of SMMs and the cost of providing services to these firms in each center's service area. In this regard, NIST MEP set federal funding levels for each state center. These amounts are the maximum available for the federal cost-share, and a center must meet the required nonfederal cost-share to be eligible to receive full funding. (**Appendix B** provides FY2020 funding levels for centers in each state.)

Historical Background on Cost-Sharing and Term of Eligibility

Cost-Sharing

The financial support system created for MEP by Congress in the original legislation was based on matching financing between the federal government and state, local, and/or private nonprofit entities. The Senate Committee on Commerce, Science, and Transportation report to accompany the Technology Competitiveness Act of 1987 (S. 907, 100th Congress) directed that "the percentage of funding offered by particular applicants be considered in deciding which applications be selected."[38] Cost-sharing strengthens the ties between the organizations involved in the cooperative arrangement and as such, the committee stated that "special attention will be given to innovative ways in which Federal laboratories, State agencies, and business and professional groups can work together."[39] The matching provisions were seen as a means to ensure that the centers reflect the needs of the manufacturing companies in the area they serve.

The act establishing the Regional Centers for the Transfer of Manufacturing Technology (later the Manufacturing Extension Partnership program) required applicants to provide more than 50% of

[37] Email from NIST to CRS, slide presentation, October 30, 2015.

[38] S.Rept. 100-80, p. 15.

[39] Ibid., p. 17.

the capital and annual operating and maintenance costs in years three through six, but did not specify the share to be paid. Instead, the act directed the Secretary of Commerce to determine the maximum cost share and to publish it in the *Federal Register*.

Following the economic downturn of 2007-2009, there were calls for Congress to raise the federal cost-share to 50% from one-third for centers in their fourth or subsequent year of operation. At that time, some commentators argued that during the difficult economic situation, state and local financial support for the program may be curtailed. At the same time, client fees for service decreased 13.4% between FY2008 and FY2009, the first significant decline since FY1996.[40] Advocates of increasing the federal share noted that such action would permit continued outreach to small manufacturers without pricing the services out of reach for the very small manufacturers. Opponents of this approach argued that the one-third federal contribution was sufficient and that the successful operation of the program was dependent on the financial participation of state and local government as well as the companies utilizing the centers.

The America COMPETES Reauthorization Act of 2010 (P.L. 111-358) mandated that the GAO explore and report on the cost-share provisions of the MEP program. In response, GAO issued a report on April 4, 2011, that noted the following:

> We were unable to provide recommendations on how best to structure the cost-share requirement to provide for the long-term sustainability of the program because we could not identify criteria or a basis for determining the optimal cost-share structure for this program. Instead, we have identified a number of factors that could be taken into account in considering modifications to the current cost-share structure. Among other things, past GAO work has found that cost-share structures should promote equity by assigning costs to those who both use and benefit from the services. As it applies to the MEP program, manufacturers, state and local governments, and the nation may all benefit from the program to varying degrees, requiring an evaluation of the relative benefits and aligning cost-shares to reflect who receives the benefits.[41]

In this regard, GAO noted that NIST's study of the cost-share provision of the MEP program

> recommended that the cost-share requirements should be consistent with those of other economic development programs—which it noted, in Commerce, had 1:1 or lower cost-sharing—and should provide flexibility to alter the cost-share requirement in response to economic conditions.[42]

However, GAO also noted that the Congressional Budget Office (CBO) had identified the MEP program for potential elimination from discretionary spending, stating that the program's enhancement of U.S. productivity is questionable. According to CBO, the legislative agency "regularly issues a compendium of budget options to help inform federal lawmakers about the implications of possible policy choices."[43] Elimination of MEP was one more than 100 options CBO proposed in 2011 for changes to federal spending and revenues.

[40] Slides provided by Roger D. Kilmer, Director, Hollings Manufacturing Extension Partnership, NIST, May 19, 2010.

[41] Government Accountability Office, *Factors for Evaluating the Cost Share of Manufacturing Extension Partnership Program to Assist Small and Medium-Sized Manufacturers*, GAO-11-437R, April 4, 2011, p. 4, http://www.gao.gov/assets/100/97395.pdf.

[42] Ibid., p. 4.

[43] CBO, *Reducing the Deficit: Spending and Revenue Options*, March 10, 2011, https://www.cbo.gov/sites/default/files/112th-congress-2011-2012/reports/03-10-reducingthedeficit.pdf. This issue is discussed in more detail later in the report. See "Congressional Budget Office," pp. 17-18.

In 2014, two bills were introduced with provisions that would have allowed federal support for MEP centers of up to 50% of annual costs incurred, without regard to how long the cooperative agreement has been in effect.[44] The NIST Reauthorization Act of 2014 (H.R. 5035, 113th Congress) passed the House but did not advance in the Senate. The America COMPETES Reauthorization Act of 2014 (S. 2757, 113th Congress) was introduced in the Senate but did not advance out of committee.

Also in 2014, the MEP Advisory Board recommended that MEP readjust the cost-share structure in order to optimize the federal investment and provide for the long-term sustainability of the program. Specifically, the board recommended requiring to a 1:1 match (50% federal cost share) and allowing the nonfederal cost-share to include in-kind contributions of up to one-half of the center's portion of the cost-share.[45]

In 2015, the Senate Committee on Appropriations expressed concerns about the federal cost-share structure (as it existed prior to the recent system-wide competition) and directed NIST to provide a report to the committee and to the Senate Committee on Commerce, Science, and Transportation "detailing quantifiable metrics on total MEP center funding, including a breakdown of the type of contribution source across centers that have transitioned from the 50 percent Federal, 50 percent non-Federal cost-share to a lower cost-share held by the Federal Government."[46]

In 2017, Congress enacted the American Innovation and Competitiveness Act (P.L. 114-329), which, among other things, allowed the Secretary of Commerce to provide up to 50% of center costs regardless of the year of operation of a center.[47]

Term of Eligibility for Funding

The legislation that established the MEP program initially prohibited centers from receiving federal financing beyond their sixth year of operation.[48] However, federal support beyond the sixth year later became considered necessary in lieu of increasing service charges paid by SMMs. While analysts considered service charges to the SMMs to be important to the effectiveness of the MEP program,[49] some also expressed concerns that an increase in charges commensurate with making the centers self-supporting might make the services too expensive for many SMMs. This perspective was articulated in a 1998 NIST-sponsored study:

> Analysis indicates that to offset lost public revenue centers would need to take on much larger projects at much higher billing rates and focus on repeat business. As a result, many small manufacturers would not be able to afford these services. Given this conclusion, the best way to ensure high-caliber nationwide assistance to smaller manufacturers is to

[44] Both H.R. 5035 (113th Congress) and S. 2757 (113th Congress) defined "costs incurred" as costs incurred in connection with the activities undertaken to improve the competitiveness, management, productivity, and technological performance of small and medium-sized manufacturing companies.

[45] MEP Advisory Board, *2014 Annual Report*, http://www.nist.gov/mep/about/upload/Advisory-Board-Annual-Report-2014.pdf.

[46] S.Rept. 114-66.

[47] NIST, "Award Competitions for Hollings Manufacturing Extension Partnership (MEP)," 79 *Federal Register* 44746-44752, August 1, 2014, https://federalregister.gov/a/2014-18264.

[48] 15 U.S.C. 278k(c)(5), subsequently amended by P.L. 105-309.

[49] In a 1995 study, the U.S. General Accounting Office found that firms that used internal funding to implement recommendations offered by extension programs were the most likely to find an overall positive impact on their manufacturing position. Source: U.S. General Accounting Office, *Manufacturing Extension Programs, Manufactures' Views of Service*, GAO/GGD-95-216BR, August 1995.

commit to a stable amount of renewable federal funding for those centers which receive successful evaluations.[50]

The prohibition on funding after the sixth year was temporarily suspended by provisions in the FY1997 and FY1998 appropriations acts,[51] then eliminated by the Technology Administration Act of 1998 (Section 2, P.L. 105-309). Under the provisions of the act, centers were eligible to receive federal funding of up to one-third of center costs after their sixth year of operation, subject to positive, independent evaluations to be conducted at least every two years. As discussed above, in 2017, the American Innovation and Competitiveness Act (P.L. 114-329) allows the Secretary to provide up to 50% of center funding, regardless of its year of operation.

Other MEP-Related Activities

The MEP program has provided additional funding opportunities for a number of activities that support the program's overarching mission. The Competitive Awards Program (CAP), Manufacturing Disaster Assessment Program (MDAP), Advanced Manufacturing Technology Services (AMTS), and Measurement Science and Engineering (MSE) awards are examples of such activities. A number of other efforts have been completed. These activities, current and completed, are discussed below.

Current MEP-Related Activities

Competitive Awards Program

In 2017, Congress established the CAP program for "the development of projects to solve new or emerging manufacturing problems."[52] Awards are to be made on a peer-reviewed and competitive basis[53] and may span a period of up to three years.[54] No matching funds are required under CAP.[55]

NIST has used a rolling Notice of Funding Opportunity (NOFO) to solicit funding applications for cooperative awards of $50,000 to $1.0 million each.[56] Only NIST-funded MEP centers with specified performance ratings are eligible to apply. Centers can apply individually or in partnership with other centers and collaborating entities such as local economic development organizations, universities, community colleges, and other organizations.[57]

Proposals are evaluated on their likelihood of achieving one or more of the following objectives:

- improving the competitiveness of industries in the region in which the center or centers are located;

[50] E.S. Oldsman, G.M. Ugiansky, and R. Jamin, *Review of Mission and Operations of Regional Centers*, National Institute of Standards and Technology, February 1, 1998, available at http://www.nist.gov/cgi-bin/view_pub.cgi?pub_id=200288&divison=260.

[51] P.L. 104-208 and P.L. 105-277, respectively.

[52] 15 U.S.C. 278k-1(c)(1).

[53] 15 U.S.C. 278k-1(e)(1).

[54] 15 U.S.C. 278k-1(h).

[55] 15 U.S.C. 278k-1(f).

[56] See for example, "Notice of Funding Opportunity (NOFO), NIST MEP Competitive Awards Program," 2017-NIST-MEP-CAP-01, April 17, 2017, https://www.nist.gov/document/20170417cap01meprollingcompetitiveawardsprogramnofofinalpdf.

[57] Ibid., p.3.

- creating jobs or train newly hired employees;
- promoting the transfer and commercialization of research and technology from institutions of higher education, national laboratories or other federally funded research programs, and nonprofit research institutes;
- recruiting a diverse manufacturing workforce, including through outreach to underrepresented populations;
- producing other results the NIST director determines will advance the CAP objective.[58]

The statute also encourages the NIST director to seek "broad geographic diversity among selected proposals"[59] and to consider "significant potential for enhancing the competitiveness of small and medium-sized United States manufacturers in the global marketplace."[60]

Further, the statute provides for the NIST director to "identify [one] or more themes for a competition carried out under this section, which may vary from year to year, as the Director considers appropriate after assessing the needs of manufacturers and the success of previous competitions." Themes identified by the NIST director—developed in consultation with the MEP Advisory Board and other federal agencies, and specified in the NOFO—are new manufacturing technologies of relevance to small and mid-size manufacturers, particularly those related to Industry/Manufacturing 4.0;[61] supply chain management technologies and practices; and workforce intermediary and business services.[62] Service area thrusts for CAP awards under these themes include Food Industry Services/Food Manufacturing, Toyota Kata, and Cybersecurity for Manufacturing.

In FY2020, NIST MEP made 12 awards under the CAP program.

- **California Manufacturing Technology Consulting (CMTC).** NIST made a one-year, $925,000 award to the California MEP center to foster a regional approach to establishing MEP Centers of Excellence (COEs) focused on cybersecurity competency and expertise. The network is to focus on meeting evolving Department of Defense (DOD) cybersecurity requirements, particularly preparation for Cybersecurity Maturity Model Certification (CMMC). Regional partners include the Washington and Colorado MEP centers. The COEs will provide services to the Northwest, Southwest, and Mountain State MEP centers, as well as Hawaii and Alaska.
- **GENEDGE.** NIST made a one-year, $1.0 million award to the Virginia MEP center a to foster a regional approach to establishing MEP COEs focused on cybersecurity competency and expertise. The network is to focus on meet evolving DOD cybersecurity requirements, particularly preparation for CMMC. Regional partners include the Maryland and Connecticut MEP centers. The COEs will provide services to New England, as well as the Middle Atlantic and Southeast regions.

[58] 15 U.S.C. 278k-1(e)(3).

[59] 15 U.S.C. 278k-1(e)(2).

[60] 15 U.S.C. 278k-1(g).

[61] NIST, "Notice of Funding Opportunity (NOFO), NIST MEP Competitive Awards Program," 2017-NIST-MEP-CAP-01, April 17, 2017, https://www.nist.gov/document/20170417cap01meprollingcompetitiveawardsprogramnofofinalpdf.

[62] Ibid., pp. 4-5.

- **Michigan Manufacturing Technology Center (MMTC).** NIST made a one-year, $1.0 million award to the Michigan MEP center to foster a regional approach to establishing MEP COEs that create cybersecurity competency and expertise. The network is to focus on meet evolving DOD cybersecurity requirements, particularly preparation for CMMC. Regional partners include the Texas and Missouri MEP centers. The COEs will provide services to the Midwest MEP Centers.
- **Georgia MEP (GaMEP).** NIST made a one-year, $457,663 award to the Georgia MEP center to develop and deliver a training program for SMMs for the CMMC standard published in January 2020, with a focus on DOD suppliers. The training will be piloted with GaMEP clients and MEP Centers in Iowa, Missouri, and North Carolina.
- **CONNSTEP.** NIST made a one-year, $1.0 million award to the Connecticut MEP center which is to lead Manufacturing Skills for Connecticut, a project to produce an accessible database that describes, maps, and analyzes the design, impact, and efficacy of manufacturing-related programs across school districts. The project seeks to expand the availability and quality of K-12 programs aimed at preparing students for manufacturing careers at all skill levels; to increase and diversify the highly qualified manufacturing labor pool; and to accelerate the growth of the manufacturing sectors New England, and eventually nationwide.
- **FloridaMakes.** NIST made an 18-month, $1.0 million award to the Florida MEP center to develop and implement a new, manufacturing-specific, Baldrige Performance Excellence Program-derived assessment tool incorporating Industry 4.0 principles.[63] Partners include the NIST Baldrige Performance Excellence Program, the Illinois MEP center, Johnson & Johnson Vision, Florida Sterling Council, and Florida's Regional Manufacturers Associations.
- **GENEDGE.** NIST made a one-year, $600,000 award to the Virginia MEP center to expand the Medical Manufacturers MedAccred® Accreditation Pathway (MedMMAP) to aid U.S. medical device manufacturing facilities to efficiently and effectively prepare for accreditation. MedAccred is an industry-managed critical process accreditation program that aims to improve quality, lower costs, and improve patient safety. The project will train and certify subject matter experts in nine MEP centers, build relationships with MedAccred companies, and expand marketing to promote the MedMMAP program to the MEP National Network. Partners include the California, Georgia, Illinois, Massachusetts, Michigan, New Jersey, North Carolina, Texas, and Puerto Rico MEP centers.
- **Missouri Enterprise.** NIST made a three-year, $1.0 million award to the Missouri MEP center to develop America Works, a database of MEP National Network workforce efforts. America Works will offer a shared, centralized space for MEP center staff to congregate, discuss, innovate and create new solutions. Missouri Enterprise will partner with MAGNET, part of the Ohio MEP center; the Iowa, Indiana, and New Jersey MEP centers; and the Foundation for Manufacturing Excellence (FORME).

[63] According to NIST, "Industry 4.0 'refers to the fourth industrial revolution, which connects machines, people, and physical assets into an integrated digital ecosystem that seamlessly generates, analyzes and communicates data, and sometimes takes action based on that data without the need for human intervention.'" (NIST, "Why You Know More About Industry 4.0 Than You Think," December 2, 2019, https://www.nist.gov/blogs/manufacturing-innovation-blog/why-you-know-more-about-industry-40-you-think).

- **New York MEP.** NIST made a three-year, $999,000 award to the New York MEP center to coordinate the Manufacturing Readiness Program (MRP). The funded partners are NextCorps, Inc. (part of the NY MEP), which serves the Finger Lakes regions, and Catalyst Connection (part of Pennsylvania MEP), which serves Southwestern Pennsylvania. The project will provide training, education, and operational and programming support to decrease the time it takes to move from prototype to commercial product.
- **Ohio MEP.** NIST made a three-year, $1.0 million award to the Ohio MEP to develop and deploy a strategically focused approach to implementing advanced technology services for SMMs. The program will focus on engaging and supporting SMMs in underserved communities in Ohio. Project partners include the Ohio State University's Ohio Manufacturing Institute and the MPI Group, and will engage the Ohio MEP's regional affiliate service organizations for statewide assistance.
- **Oregon MEP (OMEP).** NIST made a three-year, $1.0 million award to the Oregon MEP center to develop a regional strategy in five western states focused on the development and delivery of Industry 4.0-related projects.[64] The project is focused on the Internet of Things (IoT), cloud computing, and related technologies; automation, augmented reality/virtual reality (AR/VR), and robotics; and cybersecurity. Regional partners include the Montana, Idaho, Hawaii, and Nevada MEP centers.
- **University of Tennessee Center for Industrial Services (UT CIS).** NIST made a two-year, $1.0 million award to the Tennessee MEP center to establish an MEP National Advanced Tech Team. The project is focused on developing capabilities for the transfer of technology based on the needs of SMMs and the available technologies of higher education, laboratories, and other technology-producing entities. The Tech Team experts will be responsible for understanding readiness and applicability of technologies and finding similar technological expertise at local universities, national laboratories, and Manufacturing USA institutes. The Tennessee MEP will partner with the New York MEP and coordinate with the Washington MEP center.[65]

Other FY2020 Competitive Awards

In addition to the CAP awards, in FY2020 NIST MEP issued a Manufacturing Disaster Assessment Program (MDAP) award of $1.0 million, five Advanced Manufacturing Technology Services (AMTS) awards totaling $5.0 million, and a Measurement Science and Engineering (MSE) award of approximately $0.5 million.

Manufacturing Disaster Assessment Program

NIST made an 18-month, $1.0 million award to PRIMEX, the Puerto Rico MEP center, to assist manufacturers in preparing for and recovering from major business interruptions and operation challenges due to disasters. Project activities include assessments; workshops and events;

[64] See footnote 63 for information on Industry 4.0.

[65] NIST, "NIST Awards $11 Million to MEP Centers in 10 States," September 21, 2020, https://www.nist.gov/news-events/news/2020/09/nist-awards-11-million-mep-centers-10-states.

technical assistance, such as risks mitigation, crisis management plans, and disaster recovery; infrastructure assessments; and referral assistance.[66]

Advanced Manufacturing Technology Services (AMTS)

Michigan Manufacturing Technology Center. NIST made a one-year, $1.0 million award to the Michigan MEP center to conduct a project, D3+ Bringing Digital Technologies to Three Essential Manufacturing Functions. The project is focused on automation and robotics, Big Data, and the Internet of Things. The Michigan MEP center will collaborate with MEP centers in Illinois and Ohio.

Purdue University, Indiana MEP. NIST made a one-year, $1.0 million award to the Indiana MEP center to conduct a project, Implementing Small Manufacturer Assistance with Robotic Technologies (I-SMART), to provide technical assistance services to small U.S. manufacturers via project-level engagements to increase the adoption of robotics, flexible automation, and related Industry 4.0 technologies to help address the skilled manufacturing needs.[67] The Indiana MEP center will collaborate with MEP centers in Iowa, Ohio, Illinois, and Pennsylvania.

University of Texas in Arlington (TMAC). NIST made a two-year, $1.0 million award to TMAC, the Texas MEP center, to conduct a project, Applied Advanced Manufacturing Technologies, a collaborative effort to advance the awareness, deployment, and sustenance of Industry 4.0 technologies.[68] Areas of focus include industrial automation, robotics and sensorization, data analytics and business intelligence, additive manufacturing, cyber security, and industrial 3D simulation AR/VR applications. The Texas MEP center will collaborate with MEP centers in New Mexico and Oklahoma.

The California Manufacturing Technology Center (CMTC). NIST made a two-year, $1.0 million award to the California MEP center to conduct a project, MEP Network Deployment of Industry 4.0 Technology Assistance Services, for small manufacturers to support the adoption of additive, robotics, and smart manufacturing.[69] The California MEP center will collaborate with MEP centers in Ohio and Pennsylvania.

New Jersey MEP. NIST made a one-year, $994,929 award to the New Jersey MEP to conduct a project with two Manufacturing USA institutes—the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL) and BioFabUSA—focused on technology assistance in six areas: process automation; smart manufacturing, including artificial intelligence, sensors, and data analytics; additive manufacturing; robotics; digital manufacturing; and cyber security. The New Jersey MEP center will collaborate with MEP centers in Massachusetts and Puerto Rico.[70]

Measurement Science and Engineering (MSE) Award

Association of Public and Land-grant Universities (APLU). NIST made a one-year, $498,421 award to the Association of Public and Land-grant Universities to identify and promulgate

[66] NIST, "Federal Funding Opportunity Awards," https://www.nist.gov/mep/about-nist-mep/notice-funding-opportunities/federal-funding-opportunity-awards.

[67] See footnote 63 for information on Industry 4.0.

[68] Ibid.

[69] Ibid.

[70] NIST, "Federal Funding Opportunity Awards," https://www.nist.gov/mep/about-nist-mep/notice-funding-opportunities/federal-funding-opportunity-awards.

innovative strategies to advance technology through partnerships between SMMs and MEP centers; determine and share factors that lead to successful partnerships; and apply the results of that research to build tools and resources helping scale university-SMM-MEP effective practices.[71]

MEP-Assisted Technology and Technical Resource (MATTR) Program

The NIST MATTR program provides MEP SMM clients access to the laboratory's core scientific and engineering capabilities, in advanced manufacturing technology, collaborative robotics, additive manufacturing, materials design and characterization, nanotechnology, information and communications technology, quantum information, biosciences, industrial standards, cybersecurity, and other fields.

> The MATTR program provides a mechanism for manufacturers with specific needs or questions concerning products or processes to be connected through the MEP centers to the technical expertise, laboratory facilities, and other resources of the NIST laboratories. It also allows NIST lab staff to inquire of the MEP National Network if there are needs in the manufacturing arena that NIST should address.[72]

NIST offers many kinds of technical assistance through the MATTR program at no cost. However, NIST may charge fees for certain services such as instrument calibrations and special measurements. NIST has rendered technical assistance to SMMs under MATTR on a number of issues, including nanotechnology and thin film measurement technology. NIST is also using MATTR to increase awareness among SMMs of the NIST library of patents and products available for licensing.[73]

According to NIST, in FY2020:

- 6 NIST laboratories and offices responded to 70 MATTR requests submitted by 22 MEP centers;
- 5 NIST laboratories made 23 offers of assistance to the MEP National Network;
- NIST laboratory staff provided webcasts to the MEP National Network addressing various technical topics; and
- NIST MEP facilitated CRADAs between MEP center clients and NIST labs.[74]

Value and Utility of Skill Credentials to Manufacturers and Workers

The manufacturing workforce is a significant concern for SMMs, including the number of workers available with the knowledge and skills required for unfilled jobs. Some assert a mismatch between open positions in manufacturing firms and the skills of potential employees. One mechanism for addressing this mismatch is the use of skills credentials. In coordination with the NIST Standards Coordination Office (SCO), MEP awarded a competitive contract to Workcred, an affiliate of the American National Standards Institute, to examine the quality,

[71] Email from NIST to CRS, December 18, 2020; and APLU, APLU Receives NIST Grant to Advance Innovation in Manufacturing, November 2, 2020, https://www.aplu.org/news-and-media/News/aplu-receives-nist-grant-to-advance-innovation-in-manufacturing.

[72] NIST, "Connecting Manufacturers to NIST Laboratories," website, article written by FuzeHub, November 30, 2017, https://www.nist.gov/blogs/manufacturing-innovation-blog/connecting-manufacturers-nist-laboratories.

[73] Ibid.

[74] Email from NIST to CRS, December 18, 2020.

market value, and effectiveness of manufacturing credentials, and the need for new or improved manufacturing credentials.[75]

In April 2018, Workcred published the results of its study in the report, *Examining the Quality, Market Value, and Effectiveness of Manufacturing Credentials in the United States*.[76] According to NIST, 945 manufacturers participated in the study's surveys and in-depth focus groups. The report cites the following key findings:

- credentials have uneven use in the manufacturing industry and are not routinely required or used as a major factor in hiring or promotion decisions;
- many manufacturers do not know what credentials are available or how they are relevant to their workplace;
- facility size appears to influence credential use, with large manufacturing facilities more likely to prefer credentials than smaller facilities;
- many manufacturers do not view credentials as the most relevant tools to identify new skilled personnel or as incentives to improve the quality of their existing workforce;
- manufacturers often feel they need to train new employees regardless of whether or not they held a credential, and could not quantify whether credentials added value in terms of reduced cost or reduced training time; and
- manufacturers believe that credentials could serve as a critical resource if they were better understood and made more in line with skills needed in their facilities.[77]

In addition, the report recommended

- improving understanding about the content, use, and value of credentials;
- expanding the use of quality standards for credentials;
- strengthening relationships between employers, education and training providers, and credentialing organizations;
- adding an employability skills component to existing and new credentials;
- creating credentials that focus on performance and address new roles; and
- increasing the number of apprentices and expanding apprenticeships to more occupations.[78]

As a result of the initial findings, NIST MEP and Workcred hosted a discussion roundtable with certification and credential organizations. Roundtable participants identified a need to gather more quantified information on the return on investment for companies and individuals that obtain manufacturing related credentials. In FY2020, NIST MEP funded a new Workcred project, Research Examining the Return on Investment (ROI) of Manufacturing Credentials. The project

[75] NIST financial assistance award 70NANB16H239, made under an Announcement of Federal Funding Opportunity (FFO, 2016-NIST-MSE-01) by the NIST Material Measurement Laboratory (MML) Grant Program. The NIST FFO can be accessed at https://www.nist.gov/sites/default/files/documents/2017/06/20/fy16-mse-ffo_1.pdf.

[76] Workcred, *Examining the Quality, Market Value, and Effectiveness of Manufacturing Credentials in the United States,* April 2018, https://workcred.org/Documents/NIST-MEP-Report.pdf.

[77] Ibid.

[78] Ibid.

is underway, with data collection at 10 manufacturing organization across the country, identified by the MEP Centers. NIST expects a final report in Fall 2021.[79]

Completed MEP-Related Activities

Embedding of MEP Staff in Manufacturing USA Institutes

In 2016 and 2017, NIST made 14 awards of approximately $1.2 million each in three rounds of competitions to establish partnerships between MEP and the 14 operating Manufacturing USA institutes (also known as the National Network for Manufacturing Innovation or NNMI).[80] The awards required no cost-share and had a two-year period of performance; most projects were granted no-cost extensions by NIST to continue working up to an additional year. This effort is sometimes referred to as the Embedding Project. Some projects have ended; others will operate into 2020.[81]

The purpose of these awards, according to NIST, was to further transition of technologies developed at the NNMI institutes to small and medium-size manufacturers.[82] Specifically, embedded staff were to

> develop innovate approaches for transferring technology from the Manufacturing USA institutes to small U.S. manufacturers; create approaches for engaging small manufacturers in the work of the institutes through hands-on assistance and services; develop and test business models by which MEP centers and institutes may effectively serve the needs of small U.S. manufacturers in the technology areas of the institutes, and facilitate knowledge and best practice sharing; and cultivate an enhanced nationwide network of partnerships among the institutes and MEP centers.[83]

The awards were made to the following centers:

- California MEP center, to partner with the Clean Energy Smart Manufacturing Innovation Institute.
- California MEP center, to partner with NextFlex, the Flexible Hybrid Electronics Manufacturing Innovation Institute.
- Delaware MEP center, to partner with the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL).
- Illinois MEP center, to partner with the Digital Manufacturing and Design Innovation Institute (DMDII).
- Massachusetts MEP center, to partner with the Advanced Functional Fabrics of America (AFFOA) Institute.
- Massachusetts MEP center, to partner with the Advanced Regenerative Manufacturing Institute (ARMI).

[79] Email from NIST to CRS, December 18, 2020.

[80] For more information on the Manufacturing USA/NNMI institutes, see CRS Report R44371, *The National Network for Manufacturing Innovation*, by John F. Sargent Jr.

[81] Email from NIST to CRS, August 21, 2019.

[82] Email from NIST to CRS, September 13, 2017.

[83] NIST, "NIST Awards $12 Million to MEP Centers in 11 States," press release, January 13, 2017, https://www.nist.gov/news-events/news/2017/01/nist-awards-12-million-mep-centers-11-states.

- Michigan MEP center, to partner with Lightweight Innovations for Tomorrow (LIFT).
- New York MEP center, to partner with the Reducing Embodied-energy and Decreasing Emissions (REMADE) Institute.
- New York MEP center, to partner with the American Institute for Manufacturing Integrated Photonics (AIM Photonics).
- North Carolina MEP center, to partner with Power America.
- Oregon MEP center, to partner with the Rapid Advancement in Process Intensification Deployment (RAPID) Institute.
- Pennsylvania MEP center, to partner with America Makes, the National Additive Manufacturing Innovation Institute.
- Pennsylvania MEP center, to partner with the Advanced Robotics Manufacturing (ARM) Institute.
- Tennessee MEP center, to partner with the Institute for Advanced Composites Manufacturing Innovation (IACMI).[84]

According to NIST, initial survey responses from MEP centers indicated "significant new and retained revenue, operational cost savings, and new client investments."[85] NIST states that this activity has concluded.

Business-to-Business Networks

In December 2014, NIST MEP awarded $2.5 million to 10 MEP centers for the establishment of pilot projects to develop, deploy, and maintain business-to-business (B2B) networks.[86] These networks were intended to help match buyers and sellers of technologies or products and services in support of SMMs. The two-year projects were designed to be scalable and interoperable to help determine whether they could be expanded into a national network or a series of regional ones.[87] The B2B Network projects have been completed.

Make it in America Challenge

In December 2013, NIST MEP awarded grants to 10 winners in nine states as part of the multiagency Make it in America (MiiA) Challenge, an Obama Administration initiative to accelerate job creation and encourage business investment in the United States. Nine awards were

[84] NIST, "Pilot Projects Will Bring MEP Small-Business Expertise to Manufacturing USA Institutes," September 13, 2016; NIST, "NIST Awards $12 Million to MEP Centers in 11 States," January 13, 2017; and NIST, "Twelve Awards Made for Notices of Funding Opportunities," September 1, 2017.

[85] Email from NIST to CRS, August 21, 2019.

[86] Funding for the B2B awards was provided via reprogramming of $2.5 million in FY2014 appropriations from the NIST Technology Innovation Program. Source: Letter from Ellen Herbst, Chief Financial Officer and Assistant Secretary for Administration, Department of Commerce, to Senator Barbara Mikulski, Chairwoman, Senate Committee on Appropriations, March 7, 2014.

[87] National Institute of Standards and Technology, *FY2016 Congressional Budget Justification*, pp. NIST-229-NIST-230, http://www.osec.doc.gov/bmi/budget/FY16CJ/NIST-NTIS_FY_2016_CJ_Final_508_Compliant.pdf; NIST, press release, "NIST Awards $2.5 Million in Grants to MEP Centers for Pilot Business-to-Business Networks," December 2, 2014, http://www.nist.gov/mep/mep-120214.cfm.

to MEP centers. Two were to affiliates of the Ohio MEP center. Each received $125,000 per year for three years.[88] All MiiA projects have been completed.

According to NIST, MiiA was intended to support the efforts of U.S. companies to keep, expand, or reshore manufacturing operations and jobs in the United States, and to encourage foreign companies to build facilities in the United States and make products domestically. The MEP's MiiA Challenge grants were intended to support greater connectivity in regional supply chains and to assist SMMs.

Advanced Manufacturing Jobs and Innovation Accelerator Challenge

NIST MEP centers participated in the Advanced Manufacturing Jobs and Innovation Accelerator Challenge (AMJIAC), a multiagency effort seeking to strengthen U.S. manufacturing.[89] A 2012 solicitation led to 10 three-year awards totaling $20 million. All AMJIAC projects have been completed.

According to NIST:

> These grants support the creation and strengthening of regional partnerships capable of accelerating innovation and growing a region's capacity for advanced manufacturing. This funding has been used for activities such as worker training programs or connecting manufacturers to resources like national labs or universities. Ultimately, these grants present regions with an opportunity not only to expand their current activities, but also to fundamentally transform the way that the region supports its manufacturers.[90]

The role of the MEP center participation varied in the awards. In some cases, an MEP center had the primary management role. In other cases, an MEP center was engaged in a partnership with another organization to lead different project elements. In still other cases, an MEP center was part of a broad-based partnership with different organizations leading one or two project elements.

Manufacturing Technology Acceleration Centers

In July 2013, NIST announced a pilot program under MEP, the Manufacturing Technology Acceleration Centers (M-TACs). M-TACs were designed

> to explore different approaches to providing manufacturers with the technology transition and commercialization assistance they need to compete successfully and grow their market share within manufacturing supply chains.[91]

All M-TAC projects have been completed.

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[88] The award recipients were: Maine MEP; Michigan Manufacturing Technology Center; InnovateMEP Mississippi; Missouri Enterprise; Ohio MEP (State of Ohio, Ohio Development Services Agency: two awards, including the Appalachian Partnership for Economic Growth and the Manufacturing Advocacy and Growth Network); Oregon MEP; Northeastern Pennsylvania Industrial Resource Center; South Carolina MEP; and Impact Washington. Source: Email from NIST to CRS, November 5, 2015.

[89] Participating agencies include the NIST, the Department of Commerce's Economic Development Administration, the Department of Energy, the Department of Labor's Employment and Training Administration, the Small Business Administration, and the National Science Foundation.

[90] NIST, The Advanced Manufacturing Jobs and Innovation Accelerator Challenge (AMJIAC): Mid-Project Review, May 2014, http://www.nist.gov/mep/upload/AMJIAC-Report-final0520.pdf.

[91] NIST, *Manufacturing Technology Acceleration Center (M-TAC) Pilot Project): Report on Initial Progress and Learning*, February 2015, p. 5, http://www.nist.gov/mep/services/supplychain/upload/MTAC_Report-print.pdf.

Other Grants

In October 2010, NIST announced $9.1 million in cooperative agreements for 22 projects "designed to enhance the productivity, technological performance and global competitiveness of U.S. manufacturers."[92] The funding was provided by MEP on a competitive basis to nonprofit organizations to work with the MEP centers and address one or more of these areas identified by NIST as critical to U.S. manufacturing:

- responding to evolving supply chains;
- accelerating the adoption of new technology to build business growth;
- implementing environmentally sustainable processes;
- establishing and enabling strong workforces for the future; and
- encouraging cultures of continuous improvement.[93]

According to NIST, "The funding will help encourage the creation and adoption of improved technologies and provide resources to develop new products that respond to changing market needs."[94] In this regard, the awards differed from other MEP center activities which do not support research activities.

MEP Strategic Plan

In 2017, NIST MEP released its *MEP National Network Strategic Plan, 2017-2022*. Among other things, the plan identified MEP strategic goals and objectives. The four goals of the plan are to

- **empower U.S. manufacturers**, by assisting them in adopting productivity-enhancing manufacturing technologies, navigating advanced technology solutions, and recruiting and retaining a skilled and diverse workforce;
- **champion manufacturing**, by promoting the importance of a strong manufacturing base to the U.S. economy and protection of national security interests, creating awareness of innovations in manufacturing, creating enabling workforce development partnerships to build a stronger and diverse pipeline, and maximizing awareness of the MEP national network;
- **leverage partnerships,** by leveraging national, regional, state, and local partnerships to increase market penetration, identifying mission-complementary advocates to help expand the brand recognition of the MEP national network, and building an expanded service delivery model to support manufacturing technology advances; and
- **transform the network,** by maximizing the MEP's knowledge and experience to operate as an integrated national network, increasing efficiency and effectiveness by employing a learning organization platform, and by creating a resilient and

[92] NIST, "NIST Manufacturing Extension Partnership Awards $9.1 Million for 22 Projects to Enhance U.S. Manufacturers' Global Competitiveness," press release, October 5, 2010, http://www.nist.gov/mep/mep_100510.cfm.

[93] Ibid.

[94] NIST, "NIST Manufacturing Extension Partnership Awards $9.1 Million for 22 Projects to Enhance U.S. Manufacturers' Global Competitiveness," press release, October 5, 2010, https://www.nist.gov/news-events/news/2010/10/nist-manufacturing-extension-partnership-awards-91-million-22-projects.

> adaptive MEP national network to support a resilient and adaptive U.S. manufacturing base.[95]

The *MEP National Network Strategic Plan, 2017-2022*—with information on objectives, measures of success, and priorities—is available at https://www.nist.gov/document/mepnationalnetworkplan2017to2022finalpdf.

Annual Report to Congress

NIST is required to annually produce and submit to Congress a three-year programmatic planning document, concurrent with the President's annual budget request. This report is to include an assessment of the NIST Director's governance of the MEP program.

The latest version of the plan, *NIST Three-Year Programmatic Plan: 2017-2019,* includes the following information about the MEP program:

> NIST's MEP provides technical and business assistance to smaller manufacturers through partnerships between Federal and state governments and non-profit organizations in all 50 states and Puerto Rico. Field agents and programs help manufacturers understand, adopt, and apply new technologies and business practices, increasing productivity, performance, cost savings, reducing waste and creating and retaining manufacturing jobs. MEP also is a strategic advisor to promote business growth and innovation and to connect manufacturers to public and private resources essential for expanding into new markets, developing efficient processes, and training an advanced workforce.[96]

The *NIST Three-Year Programmatic Plan: 2017-2019* report is available at https://www.nist.gov/sites/default/files/documents/director/planning/3_year_plan_2017-19_web_ready2.pdf.

External Reviews and Recommendations

A number of organizations have reviewed and commented on the program's management and effectiveness, and some have offered recommendations for improving the program. The following sections discuss some of the findings and recommendations of these organizations.[97]

MEP Advisory Board

The FY2019 MEP Advisory Board annual report recommended the following 18-month MEP program goals:

- reaching consensus across the MEP network on the definition of project and client interaction to ensure accurate and consistent measurement;
- improving operations through on-time and accurate reporting;
- increasing projects by 10% reported new clients by 5%; and
- increasing MEP National Network brand awareness by at least 10%.[98]

[95] NIST, *MEP National Network Strategic Plan, 2017-2022*, https://www.nist.gov/document/mepnationalnetworkplan2017to2022finalpdf.

[96] Ibid., p. 8.

[97] Other comments and recommendations by these organizations are included elsewhere in this report.

[98] NIST, MEP Advisory Board, *MEP Advisory Board 2019 Annual Report*, 2020, https://www.nist.gov/document/mep-advisory-board-report-2019pdf.

Government Accountability Office

The Government Accountability Office has reviewed aspects of the MEP program on several occasions since the early 1990s. This section provides highlights of those reviews in reverse chronological order.

In March 2019, GAO issued a congressionally mandated report on the implementation of the American Innovation and Competitiveness Act provision that allowed the federal government to provide up to 50% of center funding regardless of the center's year of operation; previously, centers in their fourth year could receive no more than 40%, and those in their fifth and later years could receive no more than one-third. The GAO report stated that MEP centers reported that the change improved their financial stability and helped them to better serve SMMs, especially very small and rural manufacturers. The report noted that the change in cost-sharing occurred concurrently with other factors (notably the recompetition of the centers), making it hard to determine the exact impact of the cost-share change.[99]

In an April 2017 report on advanced manufacturing, GAO recommended that the Department of Commerce strengthen its collaboration with the other agencies participating in Manufacturing USA.[100] The Revitalize American Manufacturing and Innovation Act of 2014 (RAMI Act), which established a statutory basis for a Network of Manufacturing Innovation (now branded as "Manufacturing USA"), directed the Secretary of Commerce to ensure that MEP is incorporated in the Manufacturing USA institutes to ensure the research results reach SMMs. NIST sought to accomplish this by placing MEP staff in the institutes through competitive grants to MEP centers; however, that program has concluded. (See "Embedding of MEP Staff in Manufacturing USA Institutes.")

In a March 2014 report, GAO reported on its investigation into the extent to which the MEP program achieves administrative efficiencies. GAO found that 81.4% of MEP funding supported center awards with the balance devoted to contracts, staff, agency-wide overhead charges, and other items, some of which NIST considered direct support and some of which NIST considered administrative spending. In total, NIST estimated that more than 88.5% of federal MEP program spending in FY2013 was for direct support, and the remainder supported MEP administration.[101]

In 2010 Congress directed the GAO to report on the cost-share structure of the MEP program and provide recommendations for how best to structure the cost-share requirement to provide for the long-term sustainability of the program.[102] GAO concluded that it was unable to provide such recommendations, as it could not identify criteria or a basis for determining the optimal cost-share structure for this program.[103] However, GAO cited a number of factors that could be taken into account in modifying the existing cost-share structure including promoting equity by

[99] GAO, U.S. Government Accountability Office, *Manufacturing Extension Partnership: Centers Cite Benefits from Funding Change, but Impacts Hard to Distinguish from Other Factors*, GAO-19-219, March 7, 2019, https://www.gao.gov/assets/700/697319.pdf.

[100] GAO, U.S. Government Accountability Office, *Advanced Manufacturing: Commerce Could Strengthen Collaboration with Other Agencies on Innovation Institutes*, GAO-17-320, April 6, 2017, http://www.gao.gov/assets/690/684343.pdf.

[101] Government Accountability Office, *Most Federal Spending Directly Supports Work with Manufacturers, but Distribution Could Be Improved*, GAO-14-317, March 2014.

[102] America COMPETES Reauthorization Act (P.L. 111-358).

[103] Government Accountability Office, *Factors for Evaluating the Cost Share of Manufacturing Extension Partnership Program to Assist Small and Medium-Sized Manufacturers*, GAO-11-437R, April 4, 2011, p. 4, http://www.gao.gov/assets/100/97395.pdf.

assigning costs to those who both use and benefit from the services. In this regard, GAO identified potential beneficiaries as manufacturers, state and local governments, and the nation and recommended an evaluation of the relative benefits and aligning cost-shares to reflect who receives the benefits.[104] (See "Cost-Sharing" for a further discussion of GAO's findings.)

In an August 1995 briefing paper, the GAO explored how small and medium-sized firms were served by various manufacturing extension efforts, including the MEP program.[105] GAO received 551 responses to 766 questionnaires distributed. Approximately 73% of responding firms stated that their relationships with an extension activity had a positive effect on the company's business performance. Fifteen percent indicated that there was no effect at all. Among the impacts identified were improved use of technology (63%), better product quality (61%), and expanded productivity (56%). According to GAO, this suggested that manufacturing extension activities "had some success in achieving their primary goal of helping manufacturers improve their operations through the use of appropriate technologies and through increases in product quality and worker productivity." The study also found that companies which used internal funding to implement recommendations offered by extension programs were the most likely to find an overall positive impact. "Significantly, approximately 97 percent of [these respondents] ... said that they believed that this investment had been worthwhile." Those who utilized these organizations noted that practical experience in the field contributed to the success of staff activities, as did the affordability of the assistance. Companies that did not utilize the resources provided by the MEP tended to be those that were unaware of the program and the opportunities associated with it.

Further refining this information in a March 1996 report, GAO also noted that company size and age were significant factors in business perceptions of the extension program. Smaller (under $1 million gross sales) and newer (established after 1985) firms "were most likely to report that their overall business performance was boosted by MEP assistance."[106] While there were no real differences in perception between extension services offered by NIST and those funded by other institutions, there was a difference in assessments of effectiveness based on whether or not payment was required. According to GAO, those firms that paid fees "were half as likely as those that paid no fees to credit the assistance for having an extremely positive impact, as opposed to a generally positive impact, on their business performance."

Congressional Budget Office

As discussed earlier, the CBO regularly issues a compendium of budget options to help inform federal lawmakers about the implications of possible policy choices. In 2009 and 2011, one of the options CBO proposed was elimination of the MEP program; more recent editions of CBO's *Options for Reducing the Deficit* have not included the MEP program among its options.

In its 2009 narrative, CBO asserted that proponents of elimination question the appropriateness and necessity of the type of technical assistance offered by MEP, stating that "many university professors of business, science, and engineering consult with private industry, and other ties

[104] Government Accountability Office, *Factors for Evaluating the Cost Share of Manufacturing Extension Partnership Program to Assist Small and Medium-Sized Manufacturers*, GAO-11-437R, April 4, 2011, p. 4, http://www.gao.gov/assets/100/97395.pdf.

[105] U.S. Government Accountability Office, *Manufacturing Extension Programs, Manufacturers' Views of Services*, GGD-95-216BR, August 7, 1995, http://gao.gov/products/GGD-95-216BR.

[106] Government Accountability Office, *Manufacturing Extension Programs, Manufacturers' Views about Delivery and Impact of Services*, GGD-96-75, March 14, 1996, p. 3, http://gao.gov/products/GGD-96-75.

between universities and business promote knowledge transfer," that many centers in the MEP system existed before the establishment of the MEP program, and that surveys indicated that about half of MEP's clients reported that the same services were available to them through other channels but at a higher price. Supporters of the MEP program, according to CBO, point to the importance of SMMs to the economy in terms of output and employment, and in providing supplies and intermediate goods for large companies. Proponents also argue that many SMMs "face barriers that can prevent them from obtaining the sort of information" that MEP provides.[107]

CBO also asserted that

> The program's enhancement of U.S. productivity also is questionable. It can be argued that federal spending for [MEP] allows some inefficient companies to remain in business, tying up capital, labor, and other resources that could be used more productively elsewhere.[108]

National Academy of Public Administration

The National Academy of Public Administration also studied the MEP program and in a 2004 report stated that while "on balance ... the MEP Program performs capably and effectively and that the core premise ... remains viable as it is fulfilling its mission by leveraging both public and private resources to assist the nation's small manufacturers," there should be consideration of a "fundamental change in the mix of the types of services it provides as well as the structures for delivering them."[109] As such, a Next Generation Strategic Plan was developed by the MEP in 2006 to concentrate on not just the shop floor but on "the entire enterprise and its position in the marketplace." In addition to individual manufacturing firms, NIST concluded that MEP "must focus on industry/supply chain requirements as well as overall economic development trends."[110] Current MEP efforts include a focus on helping companies to participate in supply chains (e.g., by helping them become compliant with quality standards) and on supply chain optimization.

Appropriations and Related Issues

This section provides information on FY2020 appropriations for MEP, the status of FY2021 appropriations, and a longer-term perspective on MEP budget requests and appropriations from FY2003 to FY2021.

FY2020 and FY2021 Appropriations

As in his FY2018, FY2019, and FY2020 budgets, President Trump proposed to eliminate federal support for MEP in his FY2021 budget request. In FY2018 and FY2019, Congress provided $140.0 million for MEP, $146.0 million for FY2020, and $150.0 million for FY2021.

[107] Congressional Budget Office, *Budget Options: Volume 2*, 370-372, p. 88, August 2009, https://www.cbo.gov/sites/default/files/111th-congress-2009-2010/reports/08-06-budgetoptions.pdf.

[108] Ibid.

[109] National Academy of Public Administration, The Manufacturing Extension Partnership Program, Report 2, Alternative Business Models, May 2004, available at http://www.napawash.org/Pubs/NIST6-2-04.pdf.

[110] Manufacturing Extension Partnership, *Next Generation Strategic Plan*, 2006, http://www.mep.nist.gov/documents/pdf/about-mep/Next_Gen_MEP_Strategy.pdf.

Table 1. Manufacturing Extension Partnership Program Appropriations, FY2020-FY2021

(budget authority, in millions of dollars)

	FY2020 Enacted	FY2021 Request	FY2021 House	FY2021 Senate	FY2021 Enacted
Manufacturing Extension Partnership program	$146.0	$0.0	$153.0	$149.5	**$150.0**

Source: U.S. Department of Commerce, National Institute of Standards and Technology, National Institute of Standards and Technology/National Technical Information Service, Fiscal Year 2021 Budget Submission to Congress, February 2020, https://www.commerce.gov/sites/default/files/2020-02/fy2021_nist_ntis_congressional_budget_justification.pdf; H.R. 7617; H.Rept. 116-455; Senate Departments of Commerce and Justice, Science, and Related Agencies appropriation bill, as posted on Senate Appropriations Committee website on November 11, 2020, https://www.appropriations.senate.gov/news/committee-releases-fy21-bills-in-effort-to-advance-process-produce-bipartisan-results; and H.R. 133.

a. This bill was not passed by the Senate, but was presented by the Senate Majority Leader as a basis for discussions and negotiation with the House.

Appropriations and Requests FY2003-FY2021

The MEP program has, at times, enjoyed presidential and congressional support; at other times, it has been targeted for reductions or elimination. These changes are visible in the history of presidential budget requests and congressional actions on MEP appropriations. **Figure 2** illustrates requested and enacted funding levels for the NIST MEP program for FY2003-FY2021; **Table 2** provides the requested and enacted appropriations amounts for these years.

While President George W. Bush's annual budget requests generally called for substantial reductions in support for MEP, Congress appropriated generally steady funding except for FY2004 and FY2008. In FY2004, MEP funding was cut to $38.6 million, down 62.6% from its FY2003 level of $105.9 million. However, Congress restored MEP funding in FY2005, appropriating somewhat more than it had in FY2003.

In FY2008, MEP funding was cut to $89.6 million, down 14.4% from its FY2007 level of $104.7 million. For FY2009, President Bush's final budget proposed to end federal funding for MEP, requesting $4 million to allow for "the orderly change of MEP centers to a self-supporting basis."[111] Congress opted instead to provide $110.0 million for MEP, an increase of 22.8% above the FY2008 enacted level.

Under President Obama, MEP budget requests equaled or exceeded actual appropriations. In FY2010, President Obama requested and received $124.7 million for MEP. For the rest of the Obama Administration, MEP budget requests proposed higher funding for MEP than was enacted.

President Trump proposed the elimination of federal support for the MEP centers in FY2018, requesting $6.0 million "for the orderly wind down" of the program. In his FY2019, FY2020, and FY2021 budgets, President Trump proposed the elimination of federal support for the MEP centers, requesting no funding for the program. In each of those years, however, Congress provided funding at or above the previous year's enacted funding level, appropriating $140.0 million for FY2018 and FY2019, $146 million in FY2020, and $150 million in FY2021. Between

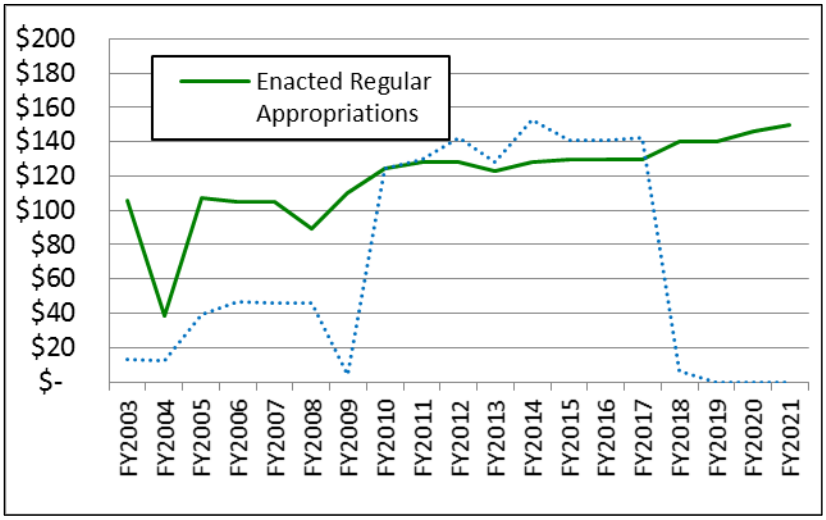
[111] NIST, *Fiscal Year 2009 Budget Submission to Congress*, http://www.osec.doc.gov/bmi/budget/09CBJ/NISTand%20NTIS%20FY2009%20Congressional%20Justification.pdf.

FY2003 and FY2021, enacted appropriations for MEP grew at a compound annual growth rate (CAGR) of 1.95% per year, approximately the same as inflation.[112]

Figure 2. Manufacturing Extension Partnership Program Funding

Requested and Enacted Appropriations, FY2003-2021

(in millions of current dollars)



Source: Department of Commerce and NIST budget documents, FY2003-FY2021; P.L. 115-141; and H.R. 133.

Table 2. Requested and Enacted Appropriations for the MEP Program

(FY2003-FY2021, in millions of current dollars)

Fiscal Year	Request	Enacted
2003[a]	$ 12.9	$ 105.9
2004[b]	12.6	38.6
2005[c]	39.2	107.5
2006[d]	46.8	104.6
2007	46.3	104.7
2008	46.3	89.6
2009	4.0	110.0
2010	124.7	124.7
2011[e]	129.7	128.4
2012	142.6	128.4
2013[f]	128.0	123.0
2014	153.1	128.0
2015	141.0	130.0
2016	141.0	130.0

[112] The GDP (Chained) Price Index, a measure used by the Office of Management and Budget to adjust for inflation in research and development, grew at 1.95% CAGR during this period; the Consumer Price Index for the period grew at 2.1% CAGR.

2017	142.0	130.0
2018	6.0	140.0
2019	0.0	140.0
2020	0.0	146.0
2021	0.0	150.0

Source: Department of Commerce and NIST budget documents, FY2003-FY2021; H.R. 133 (116th Congress).

Notes:

a. Enacted levels reflect an across-the-board rescission enacted in P.L. 108-7.

b. Enacted levels reflect across-the-board rescissions enacted in the FY2004 Consolidated Appropriations Act, P.L. 108-199, and NIST's share of the Department of Commerce's unobligated balances rescission.

c. Enacted levels reflect across-the-board rescissions enacted in P.L. 108-447, FY2005 Consolidated Appropriations Act ($9.5 million). Does not reflect unobligated balances rescission of $3.9 million.

d. Enacted levels reflect across-the-board rescissions enacted in P.L. 109-108, FY2006 Science, State, Justice, and Commerce Appropriations Act and in P.L. 109-148, FY2006 Defense Appropriations Act.

e. Enacted levels include 0.2% across-the-board rescission.

f. Enacted levels reflect the 1.877% rescission, 0.2% rescission, and the 5% sequester applied to 2013 annualized CR level.

Use of MEP Appropriations for Center Awards

In response to direction from Congress,[113] GAO investigated the extent to which the MEP program achieves administrative efficiencies. In its March 2014 report, GAO found that of the $608 million spent on the MEP program from FY2009 to FY2013, about $495 million (81.4%) went to center awards. The balance was spent on contracts, staff, agency-wide overhead charges, and other items, some of which NIST considered direct support and some of which NIST considered administrative spending. According to GAO, NIST estimated that more than 88.5% of federal MEP program spending in FY2013 was for direct support, and the remainder (11.5%) was for administration.[114]

For FY2020, NIST MEP administrative spending (MEP labor and program overheard) accounted for about 11.9% of total MEP spending; 88.1% of MEP funding was provided for direct support of the centers. The NIST FY2020 spending plan anticipated the following allocation of MEP FY2020 appropriations ($146.0 million), carry over funding from FY2019 ($4.7 million), and funding from other agencies ($0.3 million):

- $111.7 million (74.0% of total FY2020 MEP spending) for center support,
- $17.5 million (11.6%) for strategic competitions and partnership activities,
- $3.8 million (2.5%) for contracts (e.g., marketing, communications, center transformation),
- $9.8 million (6.5%) for NIST MEP labor, and
- $8.2 million (5.4%) for NIST and program overhead.[115]

[113] Explanatory Statement, Consolidated and Further Continuing Appropriations Act, 2013, *Congressional Record*, March 11, 2013, p. 1301.

[114] Government Accountability Office, *Most Federal Spending Directly Supports Work with Manufacturers, but Distribution Could Be Improved*, GAO-14-317, March 2014.

[115] Email from NIST to CRS, December 18, 2020. According to NIST, "The amount needed to fully fund renewals for all 51 MEP centers in FY 2020 was $125.5 million. The amount of $111.7 million projects funds obligated from MEP's

Appropriate Role of the Federal Government

Continuing financial support for the MEP program is part of a larger ongoing debate among federal policymakers about the appropriate role of the federal government in providing assistance to U.S. industry. The MEP program has, at times as it is now, been included in discussions surrounding termination of federal programs that provide direct support for industry. Proponents assert that SMMs play a central role in the U.S. economy and that the MEP system provides information and assistance not otherwise available to SMMs. Some opponents have asserted that such services are available from other sources and that MEP inappropriately shifts a portion of the costs of these services to taxpayers. NIST MEP notes that an independent survey of MEP clients provides evidence that MEP activities bring positive returns to the U.S. Treasury.

Proponents of the program stress that no direct funding is available to companies. Some opponents assert that activities such as those performed by the MEP centers are a state responsibility and that the federal role should have ended as the original legislation envisioned.

In addition, some have questioned whether federal support for the MEP centers should continue to be provided indefinitely.[116] As originally expressed in statute, MEP centers were to receive no federal funding after their fifth year of operation, instead deriving necessary revenues from state and local governments as well as from the companies utilizing the centers' services. In 1998, Congress lifted the prohibition on funding after the fifth year and allowed NIST MEP to provide up to one-third of center costs after their sixth year of operation indefinitely. More recently, Congress has enacted legislation that allows for federal MEP funding to support up to 50% of a center's costs indefinitely. The debate over whether the federal government should continue to provide financial support to the centers indefinitely and, if so, at what level, may be revisited by Congress, especially in light of the Trump Administration's proposals to eliminate the program.

These and other issues may be debated as Congress continues to make appropriation decisions relating to manufacturing extension as it pertains to the role of the federal government in facilitating research and technological advancement.

FY20 appropriation. The difference represents early funding provided to several centers using FY2019 funds in part to mitigate the risk of a funding lapse due to a possible government shutdown."

[116] Note: In this usage, "indefinitely" refers to the MEP centers in general, not to a specific center. Under ACIA, each MEP center must be competed after 10 years of continuous funding.

Appendix A. Hollings Manufacturing Extension Partnership Centers

Table A-1. Hollings Manufacturing Extension Partnership Centers

State	Center Name, Address, and Website
Alabama	Alabama Technology Network 135 South Union Street, Suite 441, Montgomery, AL 36104 http://www.atn.org/
Alaska	Alaska Manufacturing Extension Partnership Center 1901 Bragaw Street, Suite 199, Anchorage, AK 99508 https://alaska-mep.com/
Arizona	Arizona Manufacturing Extension Partnership 100 N. 7th Avenue, Suite 400, Phoenix, AZ 85007 http://www.azmep.com
Arkansas	Arkansas Manufacturing Solutions 900 West Capitol Avenue, Suite 400, Little Rock, AR 72201 http://www.mfgsolutions.org
California	California Manufacturing Technology Consulting 690 Knox Street, Suite 200, Torrance, CA 90502 http://www.cmtc.com/
Colorado	Manufacturer's Edge Manufacturer's Edge c/o Geotech, 2650 E. 40th Avenue, Denver, CO 80205 http://www.manufacturersedge.com
Connecticut	CONNSTEP 350 Church Street, 3rd Floor, Hartford, CT 06103-1126 http://www.connstep.org/
Delaware	Delaware Manufacturing Extension Partnership 400 Stanton-Christiana Road, Suite A-158, Newark, DE 19713 http://www.demep.org/
Florida	FloridaMakes 800 N. Magnolia Avenue, Suite 1850, Orlando, 32803 http://www.floridamakes.com
Georgia	Georgia Manufacturing Extension Partnership (GaMEP) Georgia Tech, 75 Fifth Street, NW Suite 3010, Atlanta, GA 30308 http://www.gamep.org/
Hawaii	INNOVATE Hawaii 521 Ala Moana Blvd., Suite 255, Honolulu, HI 96813 http://www.htdc.org
Idaho	TechHelp Boise State University, 1910 University Drive, Boise, ID 83725-1656 http://www.techhelp.org
Illinois	Illinois Manufacturing Excellence Center 1501 W. Bradley Avenue, Bradley University, Peoria, IL 61625 http://www.imec.org
Indiana	Purdue Manufacturing Extension Partnership 8628 E. 116th Street, Suite 200, Fishers, IN 46038 http://www.mep.purdue.edu

State	Center Name, Address, and Website
Iowa	Center for Industrial Research and Service (CIRAS) Iowa State University, 1805 Collaboration Place, Suite 2300, Ames, IA 50010 http://www.ciras.iastate.edu
Kansas	Kansas Manufacturing Solutions 10550 Barkley Street, Suite 116, Overland Park, KS 66212 https://www.wearekms.com/
Kentucky	Advantage Kentucky Alliance (AKA) 2413 Nashville Road, B8, Suite 310, WKU Center for Research and Development, Bowling Green, KY 42101 http://www.advantageky.org
Louisiana	Manufacturing Extension Partnership of Louisiana (MEPOL) 265 South Foster Drive, Baton Rouge, LA 70806 http://www.mepol.org
Maine	Maine Manufacturing Extension Partnership 87 Winthrop Street, Augusta, ME 04330-5554 http://www.mainemep.org/
Maryland	Maryland MEP 8894 Stanford Boulevard, Suite 304, Columbia, MD 21045 http://www.mdmep.org
Massachusetts	Massachusetts Manufacturing Extension Partnership (MassMEP) 100 Grove Street, Suite 108, Worcester, MA 01605 http://www.massmep.org/
Michigan	Michigan Manufacturing Technology Center (MMTC) 45501 Helm Street, Plymouth, MI 48170 http://www.the-center.org
Minnesota	Enterprise Minnesota 2100 Summer Street, Suite 150, Minneapolis, MN 55413 http://www.enterpriseminnesota.org
Mississippi	Mississippi Manufacturers Association Manufacturing Extension Partnership (MMA-MEP) 720 North President Street, Jackson, MS 39202 http://www.mma-web.org/mep
Missouri	Missouri Enterprise 900 Innovation Drive, Suite 300, Rolla, MO 65401 http://www.missourienterprise.org
Montana	Montana Manufacturing Extension Center (MMEC) PO Box 174255, Montana State University, 2310 University Way Building 2, Suite 1, Bozeman, MT 59717-4255 http://www.montana.edu/mmec
Nebraska	Nebraska Manufacturing Extension Partnership (Nebraska MEP) University of Nebraska-Lincoln, 3 Agricultural Communications Building 3625 East Campus Loop South, Lincoln, NE 68583-0939 http://nemep.unl.edu
Nevada	Nevada Industry Excellence (NVIE) UNR Mail Stop 406, Reno, NV 89557-0406 http://www.nevadaie.com
New Hampshire	New Hampshire Manufacturing Extension Partnership (NHMEP) 172 Pembroke Road, Concord, NH 03301 http://www.nhmep.org/

State	Center Name, Address, and Website
New Jersey	New Jersey Manufacturing Extension Program (NJMEP) 2 Ridgedale Avenue, Suite 305, Cedar Knolls, NJ 07927 http://www.njmep.org
New Mexico	New Mexico Manufacturing Extension Partnership (New Mexico MEP) 8600 San Mateo Blvd., NE, Suite 200, Albuquerque, NM 87113 http://www.newmexicomep.org
New York	New York Manufacturing Extension Partnership (NY MEP) 625 Broadway, ESD, Division of Science, Technology and Innovation (NYSTAR), Albany, NY 12245 http://www.esd.ny.gov/nystar/nymep.asp
North Carolina	North Carolina Manufacturing Extension Partnership (NCMEP) 1005 Capability Drive, Research III Building, Suite 200, Raleigh, NC 27606 http://www.ncmep.org
North Dakota	Impact Dakota 1929 North Washington Street, Suite M, Bismarck, ND 58501 http://www.impactdakota.com
Ohio	Ohio Manufacturing Extension Partnership (Ohio MEP) 77 South High Street, 28th Floor, Columbus, OH 43215 http://www.development.ohio.gov/bs/bs_mep.htm
Oklahoma	Oklahoma Manufacturing Alliance 525 South Main Street, Suite 210, Tulsa, OK 74103 http://www.okalliance.com/
Oregon	Oregon Manufacturing Extension Partnership 7650 SW Beveland Street, Suite 170, Portland, OR 97223 http://www.omep.org
Pennsylvania	Pennsylvania Manufacturing Extension Partnership One College Avenue, DIF 32, Williamsport, PA 17701 http://www.pamep.orghttp://www.pamade.org/network
Puerto Rico	Puerto Rico Manufacturing Extension Inc. (PRiMEX) #268 Muñoz Rivera Avenue, World Plaza Building, Suite 1002, Hato Rey, PR 00918 http://www.primexpr.org
Rhode Island	Polaris MEP 75 Lower College Road, Carlotti Administration Building, Kingston, RI 02881 http://www.polarismep.org
South Carolina	South Carolina Manufacturing Extension Partnership (SCMEP) 250 Executive Center Drive, Suite 200, Greenville, SC 29615 http://www.scmep.org
South Dakota	South Dakota Manufacturing and Technology Solutions 2329 N. Career Avenue, Suite 106, Sioux Falls, SD 57107 http://www.sdmanufacturing.com
Tennessee	University of Tennessee Center for Industrial Services (UT CIS) 193 Polk Avenue, Suite C, University of Tennessee Center for Industrial Services, Nashville, TN 37210 http://www.cis.tennessee.edu/
Texas	TMAC 202 E. Border Street Suite #323 Arlington, TX 76010 http://www.tmac.org/

State	Center Name, Address, and Website
Utah	University of Utah Manufacturing Extension Partnership (UUMEP) Center 100 South 1495 East MEK 1121, Salt Lake City, UT 84112 http://www.mep.utah.edu
Vermont	Vermont Manufacturing Extension Center (VMEC) 1540 VT Rt. 66, Suite 103, VT Tech Enterprise Center, Randolph, VT 05060 http://www.vmec.org/
Virginia	GENEDGE 32 Bridge Street, Suite 200, Martinsville, VA 24112-6216 http://www.genedge.org
Washington	Impact Washington 3303 Monte Villa Parkway, Suite 340, Bothell, WA 98021 http://www.impactwashington.org
West Virginia	West Virginia Manufacturing Extension Partnership (WVMEP) West Virginia University Industrial Extension, 317 Mineral Resources Building, PO Box 6070, Morgantown, WV 26506 http://www.wvmep.com
Wisconsin	Wisconsin Center for Manufacturing and Productivity (WCMP) 2601 Crossroads Drive, Suite 145, Madison, WI 53718 http://www.wicmp.org
Wyoming	Manufacturing-Works Department 3362, 1000 East University Avenue, Laramie, WY 82071-2000 http://www.manufacturing-works.com/

Source: NIST, MEP Center Quick List, https://www.nist.gov/mep/centers/quick-list, provided by NIST to CRS by email, December 18, 2020.

Appendix B. NIST FY2020 Center Funding

Table B-1. NIST FY2020 Center Funding

(in current dollars)

State	NIST FY2020 Funding
Alabama	2,042,802
Alaska[a]	600,000
Arizona	1,190,000
Arkansas	1,161,218
California	15,100,000
Colorado	1,919,292
Connecticut	1,708,752
Delaware	700,000
Florida	4,210,215
Georgia	3,037,601
Hawaii	700,000
Idaho	815,236
Illinois	5,557,299
Indiana	3,108,481
Iowa	2,120,743
Kansas	2,130,987
Kentucky	1,200,000
Louisiana	1,400,519
Maine	1,041,522
Maryland	1,190,786
Massachusetts	2,784,770
Michigan	4,693,900
Minnesota	2,994,302
Mississippi	1,193,782
Missouri	2,489,601
Montana	724,000
Nebraska	775,000
Nevada	923,893
New Hampshire	803,176
New Jersey	3,169,074
New Mexico	1,578,978
New York	6,599,660
North Carolina	3,410,118

State	NIST FY2020 Funding
North Dakota	700,000
Ohio	5,813,083
Oklahoma	1,529,756
Oregon	2,052,008
Pennsylvania	5,851,784
Puerto Rico	818,133
Rhode Island	1,189,000
South Carolina	2,571,105
South Dakota	700,000
Tennessee	2,252,219
Texas	7,393,645
Utah	1,352,198
Vermont	700,000
Virginia	1,981,221
Washington	2,865,192
West Virginia[a]	600,000
Wisconsin	3,633,398
Wyoming[a]	600,000

Source: Email from NIST to CRS, December 18, 2020.

a. Did not accept $100,000 adjustment to base for FY2020.

Author Information

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