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Established Program to Stimulate Competitive Research (EPSCoR): Background and Selected Issues

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Summary

The Established Program to Stimulate Competitive Research (EPSCoR)—originally named the *Experimental* Program to Stimulate Competitive Research (EPSCoR)—was established at the National Science Foundation (NSF) in 1978 to address congressional concerns about an "undue concentration" of federal research and development (R&D) funding in certain states. The program is designed to help institutions in eligible states build infrastructure, research capabilities, and training and human resource capacities to enable them to compete more successfully for open federal R&D funding awards. Eligibility for NSF EPSCoR funding is limited to states (including some territories and the District of Columbia) that received 0.75% or less of total NSF research and related activities (RRA) funds over the most recent three-year period. EPSCoR awards are made through merit-based proposal reviews.

EPSCoR funding and program reach have increased over the years. Congress first directed funding for the NSF EPSCoR program in FY1979 at a level of around $1 million. EPSCoR and EPSCoR-like programs are now active at five agencies and have a collective annual program budget of over $500 million. In addition to NSF, agencies with active programs include the Department of Energy (DOE), the National Aeronautics and Space Administration (NASA), the U.S. Department of Agriculture (USDA), and the National Institutes of Health (NIH, whose program is called the Institutional Development Award [IDeA] program). In FY2015, program budgets were $273 million at NIH, $166 million at NSF, $34 million at USDA, $18 million at NASA, and $10 million at DOE. While these programs vary in some operations and policies, their common focus is to help eligible states build R&D capacity and improve their ability to compete for federal R&D funding. The EPSCoR Interagency Coordinating Committee (EICC), chaired by NSF, was formed in 1992 to help integrate the activities of EPSCoR and EPSCoR-like programs across the agencies and to create a unified effort.

While EPSCoR was originally proposed as a short-term effort for certain states, it has grown in size and scope, generating debate among stakeholders about program goals and policies. As the programs have evolved, a number of assessments have been conducted to evaluate EPSCoR's challenges and success, and to inform future directions. These assessments, and research literature, have repeatedly raised some broad issues. For instance, an overarching concern is finding an appropriate balance between supporting research development equitably across states while also supporting high-quality science through the merit review process. Common topics of discussion among stakeholders include the expansion and focus of EPSCoR goals, program coordination among federal agencies, criteria for state eligibility and graduation from the program, and metrics for assessing EPSCoR's success.

Congress has a long-standing interest in the EPSCoR program. Some Members of Congress have questioned the fairness of the program, which is unique at NSF in its state-targeted approach. Additionally, some have expressed concern that the EPSCoR approach does not fit within the broader merit-based grant-making process at NSF. Others Members of Congress have supported the program, stating that it has been successful in contributing to research of national interest, helping to balance federal R&D funding among states, and providing broader research education opportunities to create a skilled workforce. In the 114th Congress, legislation and amendments were introduced both in opposition (e.g., prohibiting the use of any funding for EPSCoR programs) and in support of the program. The American Innovation and Competitiveness Act (AICA, P.L. 114-329), enacted on January 6, 2017, renamed EPSCoR as an established—rather than experimental—program, revised various program components, and included language in support of continuing EPSCoR.

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Introduction

The Established Program to Stimulate Competitive Research (EPSCoR)—originally named the *Experimental* Program to Stimulate Competitive Research (EPSCoR)[1]—is a set-aside funding program[2] that began as an effort to avoid an "undue concentration" of federal research funds by providing competitive grant opportunities to states that historically received little federal research and development (R&D) funding.[3] The National Science Foundation's (NSF's) governing board first established the program in 1978 by resolution, and EPSCoR was formally established in statute in 1988. The program was created to increase research and infrastructure capacity, thereby improving the ability of institutions in EPSCoR states to compete for non-set-aside federal R&D funding.[4] EPSCoR is distinct from other NSF programs in this geographically targeted approach.

Since the first program began at NSF, EPSCoR and EPSCoR-like programs[5] have been established at other federal agencies, with active programs at the Department of Energy (DOE), National Aeronautics and Space Administration (NASA), U.S. Department of Agriculture (USDA), and National Institutes of Health (NIH).[6] In 1992, the EPSCoR Interagency Coordinating Committee (EICC) was established through a Memorandum of Understanding to improve coordination among the programs. NSF serves as the Chair and Executive Secretary of the EICC, which was formally authorized in statute by the America COMPETES Reauthorization Act of 2010 (P.L. 111-358).

EPSCoR has long been a program of interest for Congress. Stakeholders and researchers have noted that EPSCoR—as established within NSF—was initially intended to be a limited-duration catalyst to support the development of research capacity[7] and has evolved into a long-term program that also supports education, diversity, and economic development goals. Some Members have expressed interest in supporting EPSCoR as a long-term program, while others have expressed interest in discontinuing its funding.

This report provides an overview of the active EPSCoR programs, including eligibility criteria, operations and funding information, findings and recommendations from program assessments,

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[1] The change in EPSCoR's name from "experimental" to "established" was enacted through the American Innovation and Competitiveness Act (P.L. 114-329) on January 6, 2017, and included additional provisions to revise certain program components across agencies (see the "Recent Congressional Activity" section below for more information).

[2] "Set-aside" refers to EPSCoR award funding eligibility, which is restricted to those jurisdictions that are designated as eligible based on specified criteria, as described in the "Eligibility Criteria and Operations" section. As of FY2016, the 27 NSF EPSCoR-eligible jurisdictions account for about 10% of NSF's research and related activities funding.

[3] The National Science Foundation Act of 1950, P.L. 81-507, §3(b), directs the NSF "to strengthen basic research, throughout the United States, including its Territories and possessions, and to avoid undue concentration of such research and education."

[4] Program funding eligibility may apply to the following types of U.S. jurisdictions: states, territories, and the District of Columbia. For the purposes of this report, "state" is used to refer to these eligible jurisdictions collectively. Agency-specific eligibility for FY2016 EPSCoR awards is listed in **Table 1**.

[5] "EPSCoR-like" programs include NIH's IDeA program, which functions in a similar way to NSF's EPSCoR, and USDA's EPSCoR-like program that differs in structure and operation from NSF's EPSCoR program but retains similar goals and objectives. "EPSCoR programs" is used in this report to mean both EPSCoR and EPSCoR-like programs.

[6] EPSCoR programs were previously active at the Environmental Protection Agency (established in 1991, discontinued issuing program solicitations in FY2006) and the Department of Defense (established in 1991, discontinued issuing program solicitations in FY2010). See the National Academy of Sciences (NAS) report, *The Experimental Program to Stimulate Competitive Research*, National Academies Press: Washington, DC, 2013, p. 16.

[7] Building research capacity can encompass a variety of activities, such as constructing and improving facilities (e.g., laboratories, classrooms), purchasing and upgrading equipment, hiring and training science and engineering faculty and researchers, educating students, obtaining research funding, and developing collaborative professional networks.

programmatic and policy issues, and recent congressional activity. This report focuses on the EPSCoR program at NSF, but also provides information about, and comparisons to and among, the EPSCoR programs at other federal agencies.

Eligibility Criteria and Operations

EPSCoR eligibility criteria and determinations vary by agency. EPSCoR programs at DOE and NASA follow the NSF's eligibility determinations, while USDA and NIH have established their own criteria. **Table 1** lists FY2016 eligible jurisdictions (including eligible states, territories, and the District of Columbia) for agencies with active programs. The following sections describe agency-specific operations and eligibility criteria in further detail.

Table 1. FY2016 Eligible EPSCoR Jurisdictions by Agency

Jurisdiction	NSF	DOE	NASA	USDA	NIH	Total Agencies
Alabama	X	X	X			3
Alaska	X	X	X	X	X	5
American Samoa				X		1
Arkansas	X	X	X		X	4
Connecticut				X		1
Delaware	X	X	X		X	4
District of Columbia				X		1
Guam	X	X	X	X		4
Hawaii	X	X	X		X	4
Idaho	X	X	X	X	X	5
Kansas	X	X	X		X	4
Kentucky	X	X	X		X	4
Louisiana	X	X	X	X	X	5
Maine	X	X	X	X	X	5
Micronesia				X		1
Mississippi	X	X	X	X	X	5
Montana	X	X	X	X	X	5
Nebraska	X	X	X		X	4
Nevada	X	X	X	X	X	5
New Hampshire	X	X	X	X	X	5
New Jersey				X		1
New Mexico	X	X	X	X	X	5
North Dakota	X	X	X	X	X	5
N. Mariana Islands				X		1
Oklahoma	X	X	X	X	X	5
Puerto Rico	X	X	X	X	X	5

Jurisdiction	NSF	DOE	NASA	USDA	NIH	Total Agencies
Rhode Island	X	X	X	X	X	5
South Carolina	X	X	X	X	X	5
South Dakota	X	X	X	X	X	5
Utah				X		1
Vermont	X	X	X		X	4
Virgin Islands	X	X	X	X		4
West Virginia	X	X	X	X	X	5
Wyoming	X	X	X	X	X	5
Total Jurisdictions	27	27	27	26	24	

Sources: EICC list of eligible jurisdictions by agency for FY2016 published by NSF at http://www.nsf.gov/od/oia/programs/epscor/FY16_EICC.pdf; NSF EPSCoR FY2016 eligibility table at https://www.nsf.gov/od/iia/programs/epscor/Eligibility_Tables/FY2016_Eligibility.pdf; IDeA eligibility map at https://www.nigms.nih.gov/research/crcb/IDeA/Pages/default.aspx; and FY2016 USDA EPSCoR eligibility table at https://nifa.usda.gov/resource/afri-fase-epscor-program.

Notes: Eligibility is denoted by "X." DOE and NASA follow the NSF eligibility determinations; NSF EPSCoR eligibility is specific for the Research Infrastructure Improvement (RII) grant component (for more component-specific eligibility information, see "National Science Foundation" section below).

National Science Foundation

NSF's EPSCoR program was established in 1978 by a resolution of the National Science Board (NSB).[8] Congress directed initial appropriations for the program in FY1979.[9] NSF's EPSCoR was formally established in statute in 1988 to assist states that "historically have received relatively little Federal [R&D] funding" and have "demonstrated a commitment to develop their research bases and improve science and engineering research and education."[10] The America COMPETES Reauthorization Act of 2010 directed NSF to continue the program "with the objective of helping eligible States to develop the research infrastructure that will make them more competitive for Foundation and other Federal research funding."[11] According to NSF, the overall program mission is

> to advance excellence in science and engineering research and education in order to achieve sustainable increases in research, education, and training capacity and competitiveness that will enable EPSCoR jurisdictions to have increased engagement in areas supported by the NSF.[12]

NSF states that EPSCoR's goals are

> to provide strategic programs and opportunities for EPSCoR participants that stimulate sustainable improvements in their R&D capacity and competitiveness; [and] to advance

[8] The National Science Board (NSB) is a 25-member board that jointly governs the NSF with the Director (who is an ex officio NSB member). The board has two main roles: establishing agency policies and serving as an independent body of advisors to Congress and the President. See NSF's "About the NSB," https://www.nsf.gov/nsb/about/index.jsp.

[9] H.Rept. 95-1255, accompanying H.R. 12936, Department of Urban Development-Independent Agencies Appropriation Act, 1979 (P.L. 95-392).

[10] Per the National Science Foundation Authorization Act of 1988 (P.L. 100-570, §113; 42 U.S.C. 1862g).

[11] P.L. 111-358, §517(b); 42 U.S.C. 1862p-9.

[12] National Science Foundation's EPSCoR overview website at http://www.nsf.gov/od/oia/programs/epscor/index.jsp.

> science and engineering capabilities in EPSCoR jurisdictions for discovery, innovation and overall knowledge-based prosperity.[13]

EPSCoR program objectives further include broadening participation of diverse groups in EPSCoR projects and establishing science, technology, engineering, and math (STEM) education, training, and professional development opportunities that advance research and workforce development needs identified by each jurisdiction.[14]

NSF's EPSCoR program is broadly set up as federal-jurisdiction partnerships. To participate in the EPSCoR program, an eligible jurisdiction is required to form its own EPSCoR steering committee[15] and to develop a science and technology (S&T) plan specific to the jurisdiction's needs and goals. Each steering committee is expected to undertake "a recent comprehensive analysis of the strengths, barriers, and opportunities for further development of its institutions in support of overall objectives in research, education, and innovation."[16] Through these activities, steering committees work closely with partners in academia, government, and the private sector to build statewide networks.

The funding awards structure for the NSF EPSCoR program has changed over time. In 1980, NSF awarded the first EPSCoR planning grants to seven states to support establishment of state steering committees, identify barriers to research competitiveness, and suggest possible remedies.[17] Building from that work, five states subsequently developed successful research grant proposals and received five years of initial funding, primarily to support individual investigators. In the 1990s, award levels increased, and the grant focus changed to support for research clusters and statewide proposals for infrastructure development.[18] In the 2000s, NSF's EPSCoR program was moved to the Office of Integrative Activities (OIA) and developed to include the three current investment components: Research Infrastructure Improvement (RII) awards, co-funding, and outreach/workshops.

Research Infrastructure Improvement. In FY2016, the RII component included three tracks:

- RII Track-1 awards provide up to $20 million total over a five-year period to support physical, human, and cyberinfrastructure improvements critical to a jurisdiction's science and technology (S&T) plan (e.g., acquisition of research equipment, establishment of university-private sector partnerships).[19]
- RII Track-2 (Focused EPSCoR Collaborations [FEC]) awards provide up to $1.5 million per year for up to four years to support the establishment of

[13] Ibid.

[14] EPSCoR Informational Brochure, NSF 14-61. NSF reports that EPSCoR jurisdictions represent 23% of the U.S. population and 27% of research institutions, including 50% of historically black colleges and universities, 29% of Hispanic-serving institutions, and 68% of tribal colleges and universities (based on 2010 census data).

[15] State EPSCoR "steering committees" are also sometimes referred to as "governing committees."

[16] National Science Foundation, Program Solicitation, *EPSCoR Research Infrastructure Improvement Program Track-1: (RII Track-1), NSF 16-557,* April 1, 2016, available at http://www.nsf.gov/pubs/2016/nsf16557/nsf16557.htm.

[17] Jerome D. Odom, *EPSCoR 2020: Expanding State Participation in Research in the 21st Century—A New Vision for The Experimental Program to Stimulate Competitive Research (EPSCoR)*, August 2006, p. 4; the report can be found at https://www.nsf.gov/od/oia/programs/epscor/docs/EPSCoR_2020_Workshop_Report.pdf.

[18] Ibid. For additional background information on the EPSCoR program's origin and development, see W. Henry Lambright, "Building State Science: The EPSCoR Experience," in *Strategies for Competitiveness in Academic Research*, ed. J.S. Hangar and C. McEnaney (Washington, DC: American Association for the Advancement of Science, 2000), pp. 37-76.

[19] See NSF's RII Track-1 program solicitation (NSF 16-557) at http://www.nsf.gov/pubs/2016/nsf16557/nsf16557.htm.

interjurisdictional teams of investigators from at least two RII-eligible jurisdictions working collaboratively on NSF priority research topics. FY2016 awards supported EPSCoR proposals on two topics: (1) Understanding the Brain, and (2) Sustainable, Food, Energy, and Water Systems.[20]

- RII Track-3 (Building Diverse Communities) awards provide up to $750,000 per award for an award period of up to five years, with projects serving as a "testbed" for building approaches to broaden participation of underrepresented groups in STEM. Track-3 proposals were first called for in FY2013 as a pilot program.[21] Initial funding supported five proposals including projects to develop and implement chemistry coursework in tribal colleges and test cyber-learning methods for STEM education in rural middle schools.[22]

For FY2017, NSF announced an RII Track-4 (EPSCoR Research Fellows) component. These awards provide up to $300,000 over a two-year period for non-tenured investigators to "further develop their individual research potential through extended collaborative visits to the nation's premier private, governmental, or academic research centers."[23] According to the program solicitation, through activities such as accessing unique equipment and developing research collaborations, fellows are expected to improve their individual research competitiveness, and, in turn, to enhance the research capacity of their institutions and jurisdictions.

Specific criteria and proposal requirements vary by track. For example, for RII Track-1 awards, cost-sharing is required and an eligible jurisdiction may only submit one proposal. For RII Track-2 and -3 awards, no cost-sharing requirement is listed in the program solicitation and limits on proposal submissions are less restrictive. EPSCoR proposal evaluations follow the merit-based, peer-review process used for the vast majority of NSF's competitive awards.[24]

A jurisdiction becomes eligible to participate in the EPSCoR program "if their most recent 3-year funding level of NSF research support is equal to or less than 0.75% of the total NSF Research and Related Activities (RRA) budget."[25] This criterion is commonly used when referring to a jurisdiction as EPSCoR-eligible. **Figure 1** shows EPSCoR-eligible jurisdictions for FY2016, as well as year of entry into the program. **Table A-1** shows NSF RRA funding received by each jurisdiction for FY2013-FY2015, the three-year total by jurisdiction, and the percentage each three-year total accounts for of NSF's total RRA funding for that period.

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[20] FY2016 RII Track-2 awards are described in the NSF press release, "NSF announces $55 million toward national research priorities," August 22, 2016, at https://www.nsf.gov/news/news_images.jsp?cntn_id=189466&org=NSF. For FY2017, NSF invited RII Track-2 proposals on one topic: Genomes to Phenomes; see NSF's program solicitation (17-503) at https://www.nsf.gov/pubs/2017/nsf17503/nsf17503.htm.

[21] A new program solicitation is pending results from the pilot. The FY2013 RII Track-3 solicitation (NSF 13-533) can be found at http://www.nsf.gov/pubs/2013/nsf13553/nsf13553.htm. The program solicitation further describes "testbed" activity as projects that "lead to promising strategies, models, and or technologies for broadening participation" with a "long-term intent... to demonstrate novel and effective strategic approaches for inclusiveness in S&E [science and engineering] that can be adapted and replicated nationally."

[22] For information on NSF's RII Track-3 pilot awards, see "NSF Grants Broaden Participation in Science and Engineering Across the Nation," September 17, 2013, at https://www.nsf.gov/news/news_summ.jsp?cntn_id=129037.

[23] NSF, Program Solicitation, EPSCoR Research Infrastructure Improvement Track 4: EPSCoR Research Fellows (RII Track-4), NSF 17-509, available at https://www.nsf.gov/pubs/2017/nsf17509/nsf17509.htm.

[24] For more information on NSF and its grant-making process, see CRS Report R43585, *The National Science Foundation: Background and Selected Policy Issues*, by Heather B. Gonzalez.

[25] NSF RII Eligibility Table for FY2016, https://www.nsf.gov/od/oia/programs/epscor/Eligibility_Tables/FY2016_Eligibility.pdf.

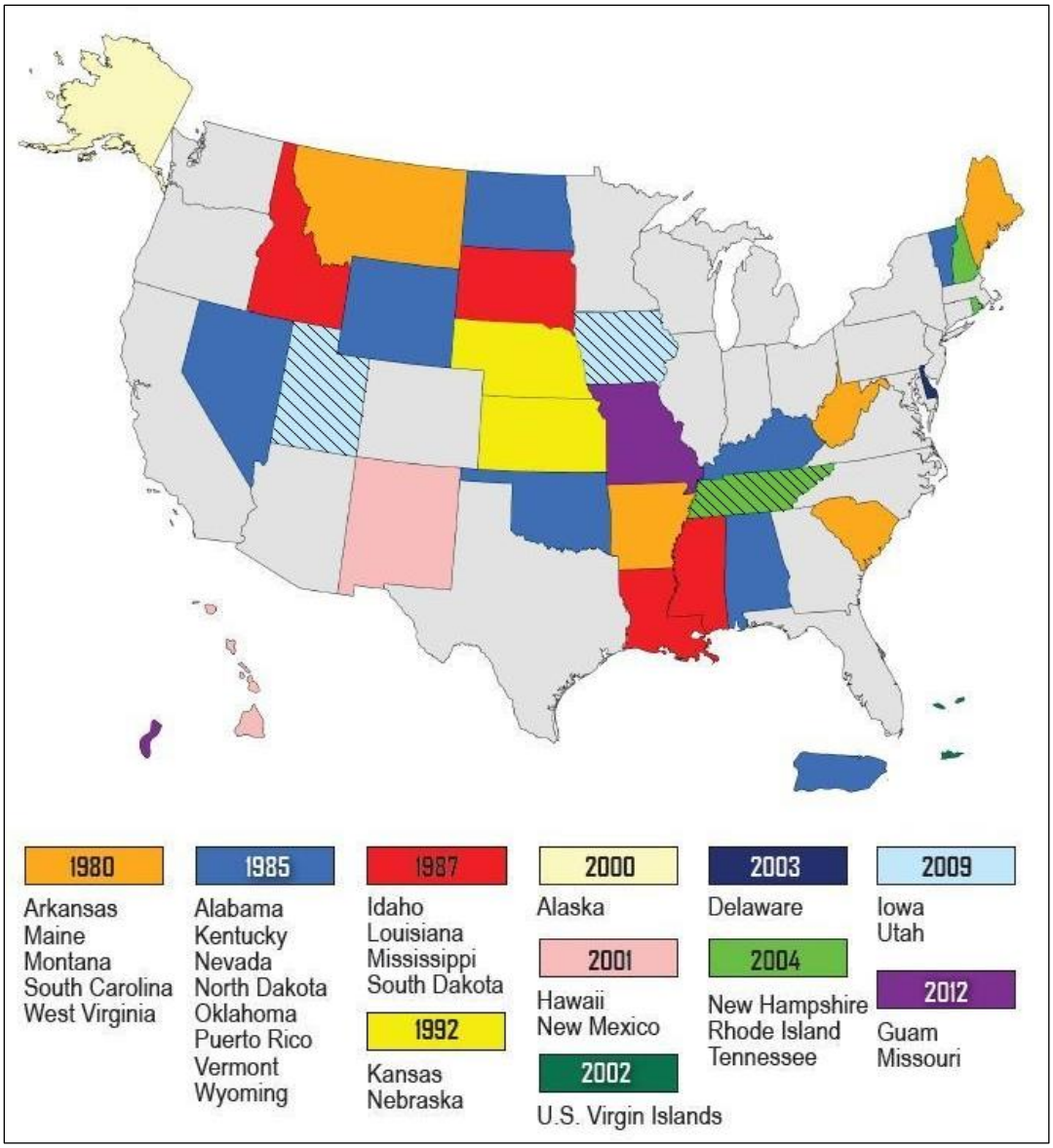
Co-funding. The co-funding component is not a grant program, but rather an internal, joint funding mechanism, in which project funding is provided by both EPSCoR and another NSF directorate or office. Co-funding awards provide combined support for proposals submitted to NSF's non-EPSCoR awards competitions by investigators in EPSCoR jurisdictions. Proposals deemed meritorious and recommended for funding—but not able to be funded otherwise due to budget limitations—may be evaluated for EPSCoR co-funding consideration.[26] States that have lost eligibility for the RII component remain eligible for three years for the co-funding component.

Outreach/Workshops. The outreach/workshop component provides funding for workshops, conferences, and other community-based activities designed to explore new scientific areas, share best practices, and build capacity. Program administrators expect workshops to be multijurisdictional and of interest to the broad EPSCoR community. This funding component also supports travel costs associated with connecting NSF staff across directorates and offices with research and education communities in EPSCoR jurisdictions.[27] States that have lost eligibility for the RII component remain eligible for three years for the outreach/workshop component.

[26] Additional co-funding details at https://www.nsf.gov/od/oia/programs/epscor/EPSCoR_Co-funding_Mechanism.pdf.

[27] More information can be found in NSF's Workshop Opportunities (EPS-WO) program solicitation (NSF 12-588) at http://www.nsf.gov/pubs/2012/nsf12588/nsf12588.htm.

Figure 1. NSF EPSCoR Eligible Jurisdictions for FY2016, and Year of Entry into the Program



Source: NSF FY2016 EPSCoR Jurisdiction Map, published at https://www.nsf.gov/od/oia/programs/epscor/images/FY16_EPSCoR_Map.png.

Notes: Jurisdictions are color-coded based on year of entry into the program; North and South Dakota were eligible in 1980 but were not successful in competing for funding until 1985 and 1987, respectively. Eligibility refers to any component; states that have lost eligibility for the RII component remain eligible for three years for the co-funding and outreach/workshop components. For example, Missouri is no longer eligible for the RII component, having lost eligibility as of April 2015, but is shown as EPSCoR-eligible here because it remains eligible for co-funding and outreach/workshop support. Iowa, Tennessee, and Utah are no longer EPSCoR-eligible for any EPSCoR component and are therefore marked with striations. Grey color indicates never eligible.

Department of Energy

The Energy Policy Act of 1992 directed DOE to operate an EPSCoR program and established objectives for the program.[28] Located within its Office of Science (OS), DOE's EPSCoR is a merit-based program that works to support basic and applied energy-related research and development across many interdisciplinary program areas. Program priorities include increasing the number of professionals in energy-related fields and building relationships between professionals in EPSCoR jurisdictions and scientists from DOE facilities.[29]

The DOE EPSCoR program follows NSF's EPSCoR eligibility determinations; states that are eligible for the NSF EPSCoR RII component are eligible for DOE's program. In other words, eligibility for the DOE EPSCoR is based on recent funding received by each state from NSF, rather than from DOE.

The program offers three types of funding opportunities: EPSCoR Implementation Grants, EPSCoR-State/National Laboratory Partnership Grants, and DOE OS Early Career Awards. DOE award components are similar in structure and function to those at NSF, with some differences. For example, DOE Implementation Grants—which support research infrastructure improvement similar to NSF RII awards—do not require matching funds, nor is there a limit on the number of active grants per jurisdiction.[30]

National Aeronautics and Space Administration

In 1992, the Experimental Program to Stimulate Competitive Research on Space and Aeronautics Act established the NASA EPSCoR program, directing NASA to conduct a merit-based grant competition among states eligible for NSF's EPSCoR program.[31] The program goals focus on enabling jurisdictions to develop long-term, self-sustaining, nationally competitive aerospace and related research capabilities to, in turn, contribute to local economic viability and the expansion of the nation's aerospace R&D base.[32]

NASA's EPSCoR program includes three award components, each based on a performance period of up to three years: EPSCoR Research Infrastructure Development (RID) awards of up to $125,000 per year to help jurisdictions build relationships with NASA researchers; EPSCoR Research awards of up to $750,000 for topic-specific projects on high-priority NASA research and technology development needs; and EPSCoR International Space Station (ISS) Flight Opportunity awards of up to $100,000.[33]

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[28] P.L. 102-486, Title XXII, §2203(b)(3); 42 U.S.C. 13503(b)(3). Similar to the NSF EPSCoR program, DOE's EPSCoR program is directed to assist "those States that historically have received relatively little Federal [R&D] funding; and have demonstrated a commitment to develop their research bases and improve science and engineering research and education programs at their universities and colleges."

[29] See DOE's EPSCoR program website at http://science.energy.gov/bes/epscor/about/.

[30] Additional DOE EPSCoR funding details are available at http://science.energy.gov/bes/epscor/how-to-apply/. "Cost sharing," also known as "matching," is the portion of costs not borne by the sponsor, which could include grantee or third-party contributions.

[31] This was enacted as Title III of the NASA Authorization Act, FY1993 (P.L. 102-588, §§301-305); 51 U.S.C. 40903.

[32] See NASA's EPSCoR program website at http://www.nasa.gov/offices/education/programs/national/epscor/home/index.html. Recent programs and projects are summarized by jurisdiction in the NASA EPSCoR Stimuli 2014-15 report, available at http://www.nasa.gov/sites/default/files/atoms/files/epscor-stimuli.pdf.

[33] Award requirements are listed in funding opportunity announcements, searchable in the NSPIRES database at https://nspires.nasaprs.com/external/index.do. Recent announcement numbers include NNH15ZHA001C (RID

U.S. Department of Agriculture

At USDA, the National Institute of Food and Agriculture's (NIFA's) Agriculture and Food Research Initiative (AFRI) operates the Food and Agricultural Science Enhancement (FASE) grants program. Broadly, FASE grants are designed to help institutions develop competitive projects and attract new scientists and educators to work in national high-priority research areas. The FASE program includes three types of grants: New Investigator Grants, Pre- and Post-doctoral Fellowships, and Strengthening Grants. The Strengthening Grants component includes USDA's EPSCoR-like program funding.[34]

Strengthening Grants are awarded with the goal of enhancing institutional capacity, leading to future funding within the supported project area, and strengthening the competitiveness of research, education, and/or extension activities. This subset of the FASE grants can be awarded to

> (1) small and mid-sized or minority-serving degree-granting institutions that previously had limited institutional success for receiving Federal funds, or (2) State Agricultural Experiment Stations or degree-granting institutions eligible for USDA Experimental Program to Stimulate Competitive Research (EPSCoR) funding.[35]

While Strengthening Grants comprise 11.25% of AFRI FASE funding overall, there is no specific set-aside amount for grants to EPSCoR-eligible states.[36] Furthermore, all AFRI grant applicants are first considered together regardless of EPSCoR status; those applicants that do not receive funding due to budget constraints but were ranked highly and identified as EPSCoR-eligible may then be considered for a Strengthening Grant award. Awards are provided directly to individual investigators. Eligibility for Strengthening Grants is determined by NIFA each year and includes states that have a "funding level no higher than the 38th percentile of all states based on a three-year rolling average of AFRI funding levels, excluding FASE Strengthening Grant funds granted to EPSCoR states and small, mid-sized, and minority-serving degree-granting institutions."[37]

National Institutes of Health

The NIH Institutional Development Award (IDeA) program is also an EPSCoR-like program. IDeA is administered by the National Institute of General Medical Sciences (NIGMS). The National Institutes of Health Revitalization Act of 1993 directed NIH to establish a program to provide research institute funding in states with historically low success rates.[38] The program has two main components: Centers of Biomedical Research Excellence (COBRE) and IDeA Networks of Biomedical Research Excellence (INBRE).[39]

Awards); NNH16ZHA001C (Research Awards); and NNH14ZHA002C (ISS Flight Opportunity Awards).

[34] 7 U.S.C. 450i(b) authorizes the FASE program, within which Part (6) allows AFRI to provide grants to states "in which institutions have been less successful in receiving funding under this subsection, based on a 3-year rolling average of funding level."

[35] USDA, "AFRI FASE & EPSCoR Program," at https://nifa.usda.gov/resource/afri-fase-epscor-program.

[36] See USDA NIFA, "Diagram of AFRI FASE and EPSCoR Funding," April 2015, https://nifa.usda.gov/sites/default/files/resource/FASE%20grants%20diagram%202015.pdf.

[37] From https://nifa.usda.gov/resource/afri-fase-epscor-program; also see Title 7, Part 3430, §§302-304, of the Code of Federal Regulations.

[38] P.L. 103-43, §202; 42 U.S.C. 285k.

[39] Additional IDeA program information at https://www.nigms.nih.gov/research/crcb/IDeA/Pages/default.aspx; for COBRE information and current funding opportunity announcements (FOAs), see https://www.nigms.nih.gov/Research/CRCB/IDeA/pages/COBRE.aspx; for INBRE information and current FOAs, see https://www.nigms.nih.gov/

The COBRE program supports thematic, multidisciplinary centers with related projects run by junior faculty and overseen by senior mentors. COBRE focuses on developing both infrastructure and scientific investigator capacity by providing up to 15 years of funding in three five-year phases. Centers must apply for each five-year phase, with funding in the second and third phases contingent upon previous success. An additional COBRE activity is the IDeA Program Infrastructure for Clinical and Translational Research (IDeA-CTR) initiative. IDEA-CTR funding supports the development of regional infrastructure and capacity to address the "tremendous challenges and opportunities [that] remain for pursuing activities aligned with NIH's growing interest and focus on clinical and translational research."[40]

The INBRE program supports the establishment of statewide systems of biomedical institutions and efforts to improve student access to biomedical training and resources. Similar to NSF's EPSCoR program, the IDeA program also has a co-funding component for meritorious awards from other NIH institutes and centers in IDeA-eligible states.

In NSF EPSCoR states, IDeA program staff work informally with the EPSCoR committees and have made efforts to ensure that the committees include members with knowledge of biomedical research and medicine.[41] An eligible jurisdiction may only have one active INBRE grant at a time[42]—similar to the NSF RII restriction—but may have up to three active COBRE grants per institution.[43] Cost-sharing is not required, though applicants are encouraged to provide matching funds. Strong support from the institution and a commitment to building and sustaining the research program are important considerations in the proposal review process.

By statute, IDeA eligibility is to be based on historic proposal success rates of institutions in each state.[44] The most recent NIH eligibility requirement was set at a proposal success rate of less than 20% or a three-year average of total NIH awards of under $120 million per year.[45] In 2008, a reassessment of these criteria and a nationwide decline in NIH proposal success rates led NIH to freeze program eligibility; the list of eligible states has not changed since that time. If eligibility had not been frozen, 47 states and territories would currently be IDeA-eligible.[46] In a report to the Senate and House Appropriations committees, IDeA administrators have proposed a revision in the program's statutory language that would change the basis for eligibility to "aggregate NIH funding received by entities in the state at or below the median of all states."[47]

Research/CRCB/IDeA/pages/INBRE.aspx.

[40] IDeA-CTR FOA, PAR-14-303, at http://grants.nih.gov/grants/guide/pa-files/PAR-14-303.html.

[41] Telephone conversation between CRS and NIH IDeA program staff, August 5, 2016.

[42] Ibid. Applicants of the INBRE program are supposed to establish a statewide network before applying, and therefore, by design, only one application is submitted per eligible state. Program staff report that each eligible state currently has an INBRE program (as of August 5, 2016).

[43] For COBRE Phase I and Phase II grants; Phase III grants do not contribute to the limit of three awards per institution.

[44] 42 U.S.C. 285k(b)(1)(B) specifies eligibility for "entities that conduct biomedical and behavioral research and are located in a State in which the aggregate success rate for applications to the national research institutes for assistance for such research by the entities in the State has historically constituted a low success rate of obtaining such funds, relative to such aggregate rate for such entities in other States."

[45] Email communication between CRS and IDeA program administrators, July 26, 2016.

[46] Ibid.

[47] Ibid. For more information on NIH success rates, among other related topics, see CRS Report R41705, *The National Institutes of Health (NIH): Background and Congressional Issues*, by Judith A. Johnson.

Funding

Total EPSCoR funding across agencies began to grow significantly starting around FY1999, largely due to increased funding for EPSCoR programs at NIH and NSF. In FY2015, total EPSCoR program funding across agencies was $500.8 million, with NIH and NSF programs together accounting for close to 88% of the funding: nearly 55% at NIH ($273.3 million) and 33% at NSF ($165.5 million). **Table 2** shows the funding amounts for prior and current EPSCoR programs across agencies from FY1997 through the FY2017 budget requests. **Figure 2** illustrates funding trends for EPSCoR programs by agency from FY1997 through the FY2017 budget requests.

In FY2015, NSF EPSCoR funding comprised about 2.3% of the agency's $7.3 billion overall budget. NSF's EPSCoR program is currently administered by the Research and Related Activities (RRA) account. The RII component has historically accounted for the largest proportion of the program funding. In FY2016, estimated funding for the RII component is $128 million, which is 80% of the total NSF EPSCoR funding; the co-funding component accounts for 19% ($30 million), and the outreach/workshop component accounts for about 1% ($2 million).[48]

Table 2. EPSCoR Program Budgets by Agency, FY1997-FY2017 Request

in millions of current dollars

FY	NIH	NSF	USDA	NASA	DOE	DOD	EPA	All Agencies
1997	1.9	38.4	11.0	4.6	6.3	16.2	2.5	80.9
1998	5.0	36.8	n/a	5.0	6.8	18.0	2.5	74.1
1999	10.0	48.4	n/a	10.0	6.8	19.0	2.5	96.7
2000	40.0	51.3	5.2	10.0	6.8	24.0	2.5	139.8
2001	100.0	74.8	11.6	10.0	7.7	18.7	2.5	225.3
2002	160.0	79.3	13.7	10.0	7.7	15.7	2.5	288.9
2003	210.0	88.8	19.3	10.0	11.7	15.7	2.5	358.0
2004	214.0	93.7	17.0	10.0	7.7	8.4	2.5	353.3
2005	222.0	93.4	18.6	12.0	7.6	11.4	2.4	367.4
2006	220.0	97.8	18.0	12.5	7.3	11.5	–[a]	367.1
2007	218.0	101.5	14.0	12.8	7.3	9.5	–	363.1
2008	223.6	120.0	28.1	15.5	14.7	17.0	–	418.9
2009	224.3	133.0	29.0	20.0	16.8	14.1	–	437.2
2010	228.8	147.1	37.6	25.0	21.6	–[b]	–	460.1
2011	226.5	146.8	29.2	25.0	8.5	–	–	436.0
2012	276.5	150.9	29.5	18.0	8.5	–	–	483.4
2013	261.6	147.6	25.4	18.0	8.4	–	–	461.0
2014	273.3	158.2	29.1	18.0	10.0	–	–	488.6
2015	273.3	165.5	34.0	18.0	10.0	–	–	500.8

[48] National Science Foundation, *FY2017 Budget Request to Congress*, February 9, 2016, p. IA-6, available at http://www.nsf.gov/about/budget/fy2017/pdf/fy2017budget.pdf.

FY	NIH	NSF	USDA	NASA	DOE	DOD	EPA	All Agencies
2016 (Est.)	320.8	160.0	n/a[c]	18.0	14.8	–	–	513.6
2017 (Req.)	320.8	170.7	n/a[c]	9.0	8.5	–	–	509.0

Sources: CRS, based on data from *Science and Engineering Indicators*, 2008, 2016, National Science Foundation; agency budget documents for FY2017; USDA email correspondence with CRS, July 19, 2016.

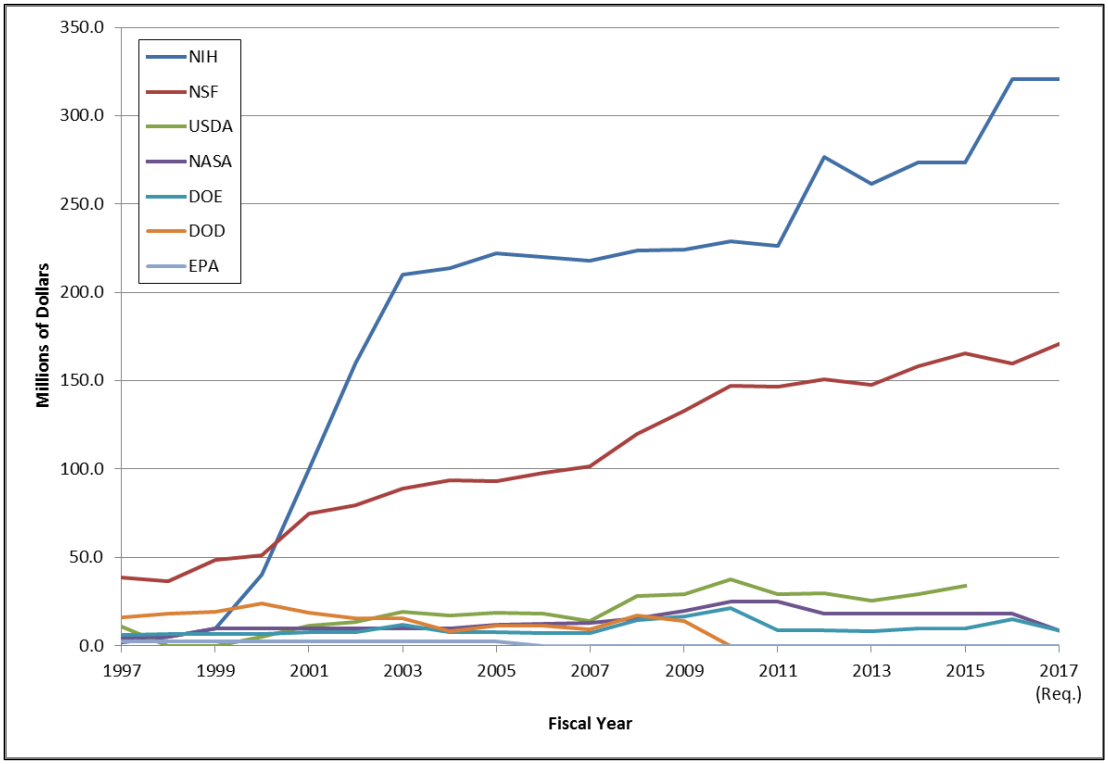
Notes: NIH = National Institutes of Health; NSF = National Science Foundation; USDA = U.S. Department of Agriculture; NASA = National Aeronautics and Space Administration; DOE = Department of Energy; DOD = Department of Defense; EPA = Environmental Protection Agency. The term "n/a" means not available. FY2007-FY2015 data are actual. USDA's reported budget in FY2012 includes $6.8 million in unobligated funds. NASA made minor revisions to prior-year data in 2014. FY2016 data are estimated. FY2017 data are based on agency budget requests. The dash represents no data due to a discontinuation of the program at the agency.

a. EPA discontinued issuing EPSCoR program solicitations in FY2006.

b. DOD discontinued issuing EPSCoR program solicitations in FY2010.

c. For USDA, FY2016 and FY2017 numbers are not yet available, per email communications with program staff November 2, 2016.

Figure 2. Funding for EPSCoR Programs by Agency, FY1997-FY2017 Request



Sources: Table 2.

Notes: NIH = National Institutes of Health; NSF = National Science Foundation; USDA = U.S. Department of Agriculture; NASA = National Aeronautics and Space Administration; DOE = Department of Energy; DOD = Department of Defense; EPA = Environmental Protection Agency. See **Table 2** for additional notes.

Interagency Coordination

In 1992, with direction from the Senate Committee on Appropriations, federal agencies with EPSCoR or EPSCoR-like programs formed the EPSCoR Interagency Coordinating Committee (EICC) "to integrate all EPSCoR programs into a single unified effort to maximize taxpayer investment."[49] Member agencies initially worked together under the guidance of a Memorandum of Understanding (MOU). Statutory authority was subsequently provided to the EICC by the America COMPETES Reauthorization Act of 2010, which directed NSF to continue to carry out its EPSCoR program, to coordinate federal EPSCoR and EPSCoR-like programs through the EICC, and to report to Congress annually on activities, among other provisions.[50] Current EICC membership includes NSF—serving as Chair and Executive Secretary—DOE, NASA, USDA, and NIH.

The EICC meets regularly to improve federal agency coordination and implementation of active EPSCoR and EPSCoR-like programs. The committee's goals include the following:

- To coordinate federal EPSCoR and EPSCoR-like programs to maximize the impact of federal support while eliminating duplication in states receiving EPSCoR support from more than one agency;
- To coordinate agency objectives with state and institutional goals, to obtain continued nonfederal support of science and technology (S&T) research and training;
- To coordinate the development of metrics to assess gains in academic research quality and competitiveness and in S&T human resource development; and
- To exchange information on pending legislation, as appropriate, agency policies, and relevant programs related to S&T research and training, and to provide responses on issues of common concern.[51]

As an example of its work, the EICC's FY2015 report to Congress highlighted discussions from its two meetings. Topics included EICC and NSF responses to the National Academy of Sciences EPSCoR assessment report (discussed in the "Program Assessments" section); NSF eligibility criteria and the "graduation"[52] of Iowa, Tennessee, and Utah from the NSF, NASA, and DOE EPSCoR programs; and the role of, and need for, jurisdictional EPSCoR steering committees.

Program Assessments

As the EPSCoR program has grown and developed, Congress and others have expressed interest in determining how successfully it has achieved its mission of helping states with less developed R&D capacity to improve their ability to compete for federal R&D funding. To this end, a number of institutions have conducted assessments of EPSCOR. Many assessments have focused

[49] S.Rept. 102-356, p. 167 (accompanying H.R. 5679, Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1993).

[50] P.L. 111-358, §517(d); 42 U.S.C. 1862p-9.

[51] NSF, "EPSCoR EICC," at https://www.nsf.gov/od/oia/programs/epscor/nsf_oiia_epscor_epscor_eicc.jsp.

[52] NSF defines "graduation" as "when a previously eligible EPSCoR jurisdiction exceeds the eligibility threshold of 0.75% of NSF research funds"; email communication between CRS and NSF, July 26, 2016.

largely or solely on the NSF and NIH programs, while some recent assessments have examined the programs across agencies.

In 1999, NSF released the results of an external evaluation of the EPSCoR program's initial years, from 1980 to 1994. The evaluation was intended to assess the program's influence on the geographical concentration of federal R&D funds and to identify successful strategies.[53] According to the report, the EPSCoR states' share of federal R&D increased modestly from 0.25% to 0.4% ($10.1 million to $50.5 million) per state on average during that period, though the EPSCoR program's impact on this change was not able to be quantified.[54] Evaluators stated that a "plausible argument" could be made that EPSCoR contributed to increased R&D competitiveness—citing program features that reportedly helped build research infrastructure, investigator capabilities, and intra- and inter-university collaborations—though the program's impacts on university-wide actions and policies were limited.[55] The report recommended periodic reassessments of eligibility criteria and continued support of research clusters to promote long-term, sustainable research efforts.

In 2008, NIH sponsored an external process evaluation of its COBRE program, which was initiated in FY2000.[56] The study included 19 centers and 107 junior investigators. While there was considerable variation in baseline characteristics and program activity emphasis among centers, the report concluded that the program was effective in strengthening institutional research infrastructure and training investigators. The report further stated that, as a group, the centers were successful in achieving program goals. Recommendations from evaluators included conducting rigorous assessments of research progress, placing a strong emphasis on mentorship of junior investigators, and increasing involvement from external assessment committees.

Through the America COMPETES Reauthorization Act of 2010, Congress directed the NSF to contract with the National Academies of Sciences (NAS) to conduct a study of "all Federal agencies that administer an [EPSCoR program] or a program similar to [EPSCOR]."[57] The resulting study was released in 2013.[58] Therein, the NAS committee reported that it could not adequately assess EPSCoR effectiveness as charged, citing program goals that have broadened over time and vary by agency, and a "scarcity of rigorous data and scholarly assessment literature."[59] Focusing rather on understanding overall program structure and policies and evaluating core concerns, the committee findings and recommendations included the following:

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[53] COSMOS Corporation, *A Report on the Evaluation of the National Science Foundation Experimental Program to Stimulate Competitive Research*, NSF 99-115, submitted to the National Science Foundation, May 1999.

[54] According to the report, "The 'per state' assessment is given because the program continually added newly eligible states during this period of time; overall, the EPSCoR states' share of federal R&D funding represented 7.65 percent or $960 million by 1994." Further, the report's hypothesized EPSCoR model includes the following assumptions: EPSCoR funds should lead to improvements in infrastructure and state capabilities, which should lead to more scientifically competitive research, which should lead to an increased share of R&D funding for the state (pp. 6-7).

[55] Ibid., p. v.

[56] Carlyn Consulting, *Process Evaluation of the Centers of Biomedical Research Excellence (COBRE) Program*, submitted to the National Center for Research Resources, NIH, September 2008.

[57] P.L. 111-358, §517(f); statutory direction includes evaluating the effectiveness of each program and making recommendations for improvement.

[58] National Academy of Sciences (NAS), National Academy of Engineering, and Institute of Medicine, Policy, and Global Affairs, Committee on Science, Engineering, and Public Policy, Committee to Evaluate the Experimental Program to Stimulate Competitive Research (EPSCoR) and Similar Federal Agency Programs, *The Experimental Program to Stimulate Competitive Research*, (Washington, DC: The National Academies Press, 2013).

[59] Ibid., p. 12.

- *Challenges*. Per the report, EPSCoR programs across agencies have competing objectives and policy directives, as well as inconsistent and incomplete evaluation metrics, making assessment difficult. Participating states reportedly have uneven commitments to improving research capacity, and the aggregate share of federal R&D funding to eligible states has not changed significantly over the course of the EPSCoR program.
- *Successes*. Evaluators found that EPSCoR programs have enhanced infrastructure, training, and human capital in participating states. The study notes that nearly all states reported positive changes in cultural attitudes, programs, and policies regarding science, engineering, and research.
- *Recommendations*. Broadly, the committee recommended that the federal government continue promoting the development of research capacity in all states, asserting that "students in all parts of the country must have the chance to participate in high-quality research, and it is in the national interest that federal funding be provided to universities in every state to ensure that these research opportunities are available."[60] To improve the focus and impact of the EPSCoR program, recommendations included an enhancement of research and STEM training capacity; more rigorous proposal and project evaluation processes, including effective third-party evaluation; a matching funds requirement for all research awards; and, working through the EICC, development of a new framework for eligibility and graduation.[61]

In 2014, the Institute for Defense Analyses (IDA) Science and Technology Policy Institute (STPI) released a report commissioned by NSF in 2011 to conduct a life-of-program assessment of NSF-specific EPSCoR activities, outputs, and outcomes.[62] The analyses focused on program goals and funding levels, competitiveness for research funding, S&T research base enhancements, eligibility indicators, and the concentration of NSF research funding.

The IDA/STPI report found that NSF's EPSCoR program has meaningfully contributed to increased competitiveness for NSF funding overall; however, competitiveness increased for state cohorts entering the program prior to 2000, but not for those entering after. Furthermore, evaluators stated that the geographic concentration of NSF R&D funding was shown to have decreased slightly since 1980, though the decrease could not be attributed to EPSCoR. Evaluators also noted that jurisdictions have developed their research bases, improved university policies promoting research, and sustained their EPSCoR activities over the long term. While the EPSCoR statute states that the purpose of the program is to assist states that "historically have received relatively little Federal research and development funding," it does not define "relatively little" with respect to determining program eligibility nor does it define the units to be considered (e.g., dollars, share of total federal research funding). The report notes that the choice of such criteria can have important implications for determining eligibility.[63]

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[60] Ibid., p. 1.

[61] Ibid., pp. 7-8.

[62] Brian L. Zuckerman, Rachel A. Parker, and Thomas W. Jones, et al., *Evaluation of the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR): Final Report*, IDA Science and Technology Policy Institute, IDA Paper P-5221, Washington, DC, December 2014, available at https://www.ida.org/idamedia/Corporate/Files/Publications/STPIPubs/2015/P-5221.ashx.

[63] Ibid., pp. iv-vii, 25-27.

To help ensure that EPSCoR funding has the greatest impact, the IDA/STPI report concluded that NSF should define "undue concentration";[64] encourage jurisdictions to use experimental strategies to enhance their research capacity; and improve eligibility calculations, program-level evaluations, and research competitiveness data analysis.

In 2015, NSF provided an official response to the NAS and STPI reports.[65] In the two-page response, the agency proposed strengthening program-level evaluations; encouraging jurisdictions to experiment with flexible and competitive mechanisms to support research, faculty, and STEM education; and working with other agencies in the EICC to explore the use of specific indicators of "undue concentration" and to reexamine eligibility criteria.

In addition to the assessments, NSF has previously held two workshops with a variety of stakeholders from state and federal government, business, and EPSCoR administrators and faculty to recommend long-term program goals and strategies—the EPSCoR 2020 workshop in 2006 and the EPSCoR 2030 workshop in 2012.[66] Broadly, the EPSCoR 2030 workshop recommended effectively coordinating across federal agencies, maintaining a focus on increasing research capacity, using EPSCoR institutions as test beds for new agency initiatives, and developing robust cyberinfrastructure at institutions to help them stay competitive.

Further, as part of NSF's ongoing internal review processes, the NSF Committee of Visitors (COV) completed a detailed EPSCoR program review in FY2015. The review included program processes and a sample of 74 proposals spanning the three EPSCoR award components. Reviewers provided recommendations for improving proposal review and post-award data collection, expanding certain award components, and establishing a standing advisory committee for the program.[67] NSF's response document included plans to convene an advisory panel in FY2017, building on the EPSCoR 2020 and EPSCoR 2030 workshops.[68]

In summary, assessment activities over the years have included repeated recommendations in certain areas: reevaluating eligibility and graduation criteria, improving data collection and program evaluation processes, and focusing on flexible and sustainable program strategies.

Selected Issues

An overarching challenge for the EPSCoR program since its inception has been crafting a balance between supporting sustainable research capacity development equitably across states while also

[64] "Undue concentration" is used, but not defined, in the National Science Foundation Act of 1950, P.L. 81-507, §3(b), which directs the NSF "to strengthen basic research, throughout the United States, including its Territories and possessions, and to avoid undue concentration of such research and education."

[65] NSF, *NSF Comments on Two Reports Concerning the Experimental Program to Stimulate Competitive Research (EPSCoR): the National Academy of Sciences (NAS) and the Science and Technology Policy Institute (STPI)*, August 2015, available at https://nsf.gov/od/oia/programs/epscor/NSF_EPSCoR_Report_Response.pdf.

[66] Corresponding reports for the two workshops include Jerome D. Odom, *EPSCoR 2020: Expanding State Participation in Research in the 21st Century—A New Vision for The Experimental Program to Stimulate Competitive Research (EPSCoR), A Report to the National Science Foundation*, August 2006; and Paul Hill, *EPSCoR 2030: A Report to the National Science Foundation*, April 2012.

[67] The NSF Committee of Visitors, a panel of outside experts, conducts periodic (usually every three years) reviews of NSF programs (see https://www.nsf.gov/od/oia/activities/cov/); the COV FY2015 EPSCoR program review report is available at https://www.nsf.gov/od/oia/activities/cov/oia/2015/2015%20EPSCoR_COV-Report.pdf.

[68] NSF, *EPSCoR Responses to Findings and Recommendations of the 2015 Committee of Visitors Report*, September 2015, https://nsf.gov/od/oia/activities/cov/oia/2015/Response-to-2015-COV-Recommendations.pdf.

supporting high-quality science through the merit review process. As EPSCoR has grown among agencies, with variations in policy and program structures, a number of issues have emerged.

Expanding Duration and Focus

EPSCoR's lengthening duration and evolving program focus have been considered by program supporters and critics, and addressed in program reviews and academic analyses. As the program's time frame has continued beyond the initial limit of five years, the goals and objectives have both evolved and expanded.

In planning the creation of EPSCoR, then-Director of NSF Richard Atkinson stated that:

> It would be clearly understood from the beginning that no support would be provided beyond five years through [EPSCoR], as scientists in the funded states should then be able to compete more successfully for support from NSF and other agencies.[69]

Some critics contend that the existence of an experimental program 30 years after its establishment demonstrates that the program is ineffective and instead is a "redistribution of wealth."[70] One academic analyst who conducts research on federal decisionmaking regarding integration of science with policy and technology transfer asserted that EPSCoR "was not intended as an entitlement, but rather as a catalyst."[71]

On the other hand, EPSCoR supporters have argued for the necessity of the program's long tenure. One NSF staff member during EPSCoR's initial years has asserted that he and others realized that it was not feasible to achieve the program's objectives in such a short time.[72] A recent study asserted that building research capacity and competitiveness through investments in physical infrastructure and human capital "is not an easily achievable target because capacity building generally takes a long time."[73] Just how long remains uncertain for EPSCoR programs and states and is a topic of debate among stakeholders.

As EPSCoR's duration has increased, program focus has evolved and expanded. Initially, EPSCoR was termed "experimental" in its approach to building research capacity in certain states. More recently, the program has been referred to as "established," with "experimental" referring to support for innovative methods to achieve program goals.[74] In 2009, Arden Bement, then Director of NSF, called it a "program of experimentation"[75] as opposed to an experimental

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[69] Memorandum to Members of the Science Board, Subject: Program Plan for Experimental Program to Stimulate Competitive Research, January 4, 1978, as cited on p. 9 of the NAS report *The Experimental Program to Stimulate Competitive Research*, Washington, DC, 2013.

[70] Remarks by Rep. Bill Foster and Rep. Scott Garrett during House debate, *Congressional Record*, daily edition, vol. 161, no. 87 (June 2, 2015), p. H3732.

[71] W. Henry Lambright, "Building State Science: The EPSCoR Experience," in *Strategies for Competitiveness in Academic Research*, ed. J.S. Hangar and C. McEnaney (Washington, DC: American Association for the Advancement of Science, 2000), pp. 37-76. This report was produced from work by AAAS's Research Competitiveness Program (RCP), which "undertook science policy research to develop a better understanding of competitiveness in academic research and to develop strategies for enhancing research competitiveness."

[72] J. Scott Hauger, "From Best Science Toward Economic Development: The Evolution of NSF's Experimental Program to Stimulate Competitive Research (EPSCoR)," *Economic Development Quarterly*, vol. 18, no. 2 (May 2004), p. 102.

[73] Yonghong Wu, "Tackling Undue Concentration of Federal Research Funding: An Empirical Assessment on NSF's Experimental Program to Stimulate Competitive Research (EPSCoR)," *Research Policy*, vol. 39 (2010), p. 837.

[74] As in S. 3084, the American Innovation and Competitiveness Act, Section 103, as enacted on January 6, 2017 (P.L. 114-329).

[75] Arden L. Bement, Jr., "From the Top," Luncheon remarks, NSF EPSCoR 21st Annual Conference, Arlington, VA,

program. Some have compared EPSCoR state projects to the work of small businesses—in regards to purportedly being more nimble than large entities—and have asserted that EPSCoR states are able to develop "unique S&T related abilities and expertise to contribute to the national agenda."[76]

Furthermore, some researchers have noted that EPSCoR has become an important component in developing states' economies.[77] One analyst contends that EPSCoR somewhat inadvertently "evolved into a program that fosters science-based economic development, an extension of the best science paradigm on which NSF and EPSCoR were founded," during which time there was also "a general national trend toward partnering academic research with economic development."[78] A former state EPSCoR administrator asserted that EPSCoR has "put [S&T] on the forefront in discussions of the role and importance of universities in states. Not only from the perspective of education and research, but particularly from the perspective of technology transfer and economic development."[79]

In its RII Track-1 program solicitation, NSF has emphasized the importance of linking an EPSCoR jurisdiction's S&T plan with its economic development plan:

> [A jurisdiction's] S&T plan should be informed by the jurisdiction's Economic Development Plan (if applicable) and should describe innovation pathways for bringing outputs and outcomes of the proposed RII Track-1 research to the marketplace.[80]

In addition, the 2015-2016 NSF EPSCoR Workshop Series on Innovation, Entrepreneurship, and Translational Research led to a guide to help EPSCoR jurisdictions build such connections.[81]

NIH's program has a focus on innovation and economic development, as well. In its FY2017 budget request, NIH stated its intention to initiate small business and technology transfer activities in IDeA states.[82] NIH also expressed its intention to use funds from the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs to set up biotechnology incubators in each of the four IDeA regions.[83] The Senate Committee on Appropriations has expressed support for such plans: "The Committee supports the initiative to

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October 21, 2009.

[76] Jerome D. Odom, *EPSCoR 2020: Expanding State Participation in Research in the 21st Century—A New Vision for The Experimental Program to Stimulate Competitive Research (EPSCoR)*, EPSCoR 2020 Workshop Report, August 2006, p. iii.

[77] Yonghong Wu, "Tackling Undue Concentration of Federal Research Funding: An Empirical Assessment on NSF's Experimental Program to Stimulate Competitive Research (EPSCoR)," *Research Policy*, vol. 39 (2010), p. 837.

[78] J. Scott Hauger, "From Best Science Toward Economic Development: The Evolution of NSF's Experimental Program to Stimulate Competitive Research (EPSCoR)," *Economic Development Quarterly*, vol. 18, no. 2 (May 2004), pp. 97-112.

[79] Ibid., p. 106.

[80] NSF EPSCoR Research Infrastructure Improvement Program Track-1 Program Solicitation (NSF 16-557), April 1, 2016, p. 4.

[81] The guide and workshop information, funded through NSF award number 1521666, can be found at http://sdepscor.org/resources/nsf-innovation-workshop/. The workshops were designed to "help accelerate the translation of innovation-based research into products and services that benefit society."

[82] NIH, National Institute of General Medical Sciences (NIGMS), *FY2017 Congressional Budget Justification*, p. 17, at https://publications.nigms.nih.gov/cjs/2017/cj2017.pdf.

[83] NIH, *Congressional Justification: FY2017 Budget Request, Significant Items*, p. 109, at https://officeofbudget.od.nih.gov/pdfs/FY17/30-SIs%20(002).pdf. For more information on SBIR/STTR programs, see CRS Report R43695, *Small Business Innovation Research and Small Business Technology Transfer Programs*, by John F. Sargent Jr.

direct small business research funding to IDeA States to foster the development of products to advance public health."[84]

This focus on innovation is part of a growth of the EPSCoR objectives, which include supporting research projects, developing statewide and regional networks, building infrastructure and human capacity, broadening diversity in STEM, and connecting research to technology transfer, state economic development, and national priorities.

Reevaluating Eligibility Criteria

The threshold for NSF EPSCoR eligibility has changed multiple times over the program's duration.[85] Recently, the 2014 IDA/STPI assessment of NSF's EPSCoR program noted—based on a literature review—that "a range of indicators ... could be used to identify jurisdictions with 'relatively little' Federal funding," but found "no consensus that one or more of those indicators is the preferred way to select EPSCoR-eligible jurisdictions."[86] In addition to the IDA/STPI report, the 2013 NAS assessment also suggested a number of EPSCoR eligibility factors for consideration, including per capita federal research funding; state commitment; proposal success rates of research university faculty; total research funding; progress to date; future opportunities for progress; and financial need.[87]

Responding to the reports, NSF noted that it would "consider models for eligibility and graduation,[88] including the option of using median funding level" and "explore the use of specific indicators of 'undue concentration' in collaboration with other federal agencies ... and ensure that EPSCoR's program design, funding levels, and eligibility criteria reflect the indicators."[89] The NSF's FY2017 budget request stated that this issue was being explored by the EICC: "In FY2016, the [EICC] was tasked with examining the eligibility criteria across the five agencies with active programs ... and determining if there should be a common federal EPSCoR eligibility criterion."[90] The EICC subsequently provided recommendations to NSF's Office of Integrative Activities (OIA); as of October 2016, the recommendations remained under review by NSF leadership.[91] Developing a common federal eligibility criterion (or criteria) might help address concerns voiced by some Members of Congress that eligibility for EPSCoR funding at DOE is based on NSF research award expenditures rather than on DOE Office of Science award expenditures (as discussed in the "Recent Congressional Activity" section).

NIH also reports that, since freezing eligibility in 2008, the agency has developed a new proposed criterion under which eligible states would include those for which the aggregate NIH funding received by entities in the state is at or below the median of all states.[92] Such a criterion raises the

[84] S.Rept. 114-274.

[85] For more information on how NSF EPSCoR eligibility threshold criteria have evolved, see Zuckerman et al., pp. 1-5.

[86] Ibid., pp. 25-27.

[87] National Academy of Sciences (NAS), *The Experimental Program to Stimulate Competitive Research*, (Washington, DC: The National Academies Press, 2013), p. 8.

[88] As noted in the "Interagency Coordination" section of this report, three states—Iowa, Tennessee, and Utah—have "effectively graduated" from NSF's EPSCoR this year and are no longer eligible for any funding category.

[89] NSF, NSF Comments on Two Reports Concerning the Experimental Program to Stimulate Competitive Research (EPSCoR): the National Academy of Sciences (NAS) and the Science and Technology Policy Institute (STPI), August 2015, available at https://nsf.gov/od/oia/programs/epscor/NSF_EPSCoR_Report_Response.pdf.

[90] National Science Foundation, *FY2017 Budget Request to Congress*, February 9, 2016, p. IA-6.

[91] Email communication between CRS and NSF, October 17, 2016. The EPSCoR program is located within the OIA.

[92] Telephone conversation between CRS and NIH IDeA program staff, August 5, 2016.

question of whether or not state "graduation" from EPSCoR remains a goal. It is uncertain yet if EPSCoR agencies will develop common eligibility and graduation criteria.

Determining Success

Program assessments, peer-reviewed literature, and Members of Congress have all raised broad questions about how to determine EPSCoR's success. Among the types of questions raised: What metrics should be used to determine success (e.g., increases in agency-specific R&D funding, all federal R&D funding, grant proposal success rates, research collaborations)? At which level should these metrics be evaluated—institution, state, region? How can federal agencies with active EPSCoR programs best coordinate data collection and evaluation of comprehensive program success in light of the differences in agency-specific missions?

Several academic studies have been conducted to assess EPSCoR's impact on university research, competitiveness in R&D awards funding, and economic development.[93] A primary measure of program effectiveness has been increased shares of federal funding in EPSCoR states. Some research has shown that states become more competitive for federal science and engineering (S&E) funding the longer they stay in the EPSCoR program. This finding was based on faster growth of federal S&E obligations in EPSCoR states compared to non-EPSCoR states; however, the effect was small, suggesting a long and slow process of addressing changes in concentrations of research funding.[94] A 2009 study concluded that, for some states, greater success in securing federal R&D funding may have led to reduced state contributions to academic institutions.[95] Another evaluation found that the percentage of university-performed R&D funded by industry—used in the study as a rough indicator of the intensity of university-industry research partnerships—was comparable in EPSCoR and non-EPSCoR states between 1985 and 2000.[96]

In addition to funding, researchers have suggested that including a more nuanced evaluation of capacity building—looking at both the "hard infrastructure and the human-based infrastructure and resources"—is needed to fully understand capacity and competitiveness improvements in EPSCoR states.[97] For example, one study showed that EPSCoR had a significant positive impact on publication quality at universities in participating states.[98] A 2009 study noted that "a social capital approach to the assessment of EPSCoR would address capacity building at the micro level, and be targeted to state characteristics"; the study found that—within EPSCoR states—scientists who participated in program projects performed better in capacity-related characteristics

[93] See a brief review of literature on EPSCoR in Yonghong Wu, "Tackling Undue Concentration of Federal Research Funding: An Empirical Assessment on NSF's Experimental Program to Stimulate Competitive Research (EPSCoR)," *Research Policy*, vol. 39 (2010), pp. 837-838. CRS conducted a search for recent peer-reviewed journal articles focused on EPSCoR programs but was unable to find any such academic literature published after 2012.

[94] Ibid., pp. 839-840.

[95] Yonghong Wu, "NSF's Experimental Program to Stimulate Competitive Research (EPSCoR): Subsidizing Academic Research or State Budgets?," *Journal of Policy Analysis and Management*, vol. 28, no. 3 (2009), pp. 479-495.

[96] J. Scott Hauger, "From Best Science Toward Economic Development: The Evolution of NSF's Experimental Program to Stimulate Competitive Research (EPSCoR)," *Economic Development Quarterly*, vol. 18, no. 2 (May 2004), p. 110.

[97] Julia Melkers and Yonghong Wu, "Evaluating the Improved Research Capacity of EPSCoR States: R&D Funding and Collaborative Networks in the NSF EPSCoR Program," *Review of Policy Research*, vol. 26, no. 6 (2009), pp. 761-782. "Human-based infrastructure and resources" or "social capital" might include more graduate students, postdoctoral researchers, grant support offices and personnel to assist S&E faculty in awards management, etc.

[98] Abigail A. Payne, "The Role of Politically Motivated Subsidies on University Research Activities," *Educational Policy*, vol. 17, no. 1 (2003), pp. 12-37.

(e.g., larger collaborative networks) than their colleagues who did not.[99] Notably, this and other studies highlight a common challenge—demonstrating that EPSCoR is not only associated with measures of success, but directly contributes to them. Nevertheless, some may caution against focusing too heavily on directly quantifiable outcomes, which might not adequately assess impacts from EPSCoR support. For example, research investments, particularly investments in basic research, may have impacts on future competitiveness that are difficult to measure or anticipate, such as advancing fundamental knowledge and spurring new and innovative research directions.

Broadly, researchers and program assessors have recommended more thorough data collection procedures with standardization across programs to allow for improved comparisons in future EPSCoR evaluations. NSF EPSCoR has stated that it "strongly agrees that detailed data, captured in a uniform fashion over time, is essential to assessing the outputs and outcomes of EPSCoR investments, and effective program management overall," highlighting recent efforts to standardize data reporting for RII awards.[100]

Recent Congressional Activity

On several occasions, the 114th Congress addressed aspects of the EPSCoR program.

The American Innovation and Competitiveness Act (AICA, P.L. 114-329), enacted on January 6, 2017, revises program requirements and renames EPSCoR as the *Established* Program to Stimulate Competitive Research, among other provisions.[101] The act directs agencies with EPSCoR programs to consider modifications to award structures and evaluations, including an emphasis on harmonization of EPSCoR metrics across agencies, long-term investments, and support for innovative and experimental research and funding models.[102] Further, the AICA requires the EICC to brief the appropriate committees of Congress on any such modifications one year after enactment.

In 2015, H.Amdt. 317 would have amended H.R. 2578, the Commerce, Justice, Science, and Related Agencies Appropriations Act, 2016, to prohibit the use of funds for any EPSCoR program funded by the bill; this would have included EPSCoR programs at NSF and NASA. The amendment failed on a floor vote of 195-232. During floor debate, some Members expressed concerns with the program, asserting that many EPSCoR states have small populations and receive more in federal spending than they pay in taxes; program monies are determined on a per state basis, rather than a per capita basis; and what was originally intended as temporary

[99] Melkers and Wu, pp. 779-780; see also James Dietz, "Building a Social Capital Model of Research Development: The Case of the Experimental Program to Stimulate Competitive Research," *Science and Public Policy*, vol. 27 (2000), 137-145; for an examination of "scientific and technical human capital" at EPSCoR research centers, see Juan Rogers, "Research Centers as Agents of Change in the Contemporary Academic Landscape: Their Role and Impact in HBCU, EPSCoR, and Majority Universities," *Research Evaluation*, vol. 21 (2012), pp. 15-32.

[100] NSF, "EPSCoR Responses to Findings and Recommendations of the 2015 Committee of Visitors Report," September 2015, at https://nsf.gov/od/oia/activities/cov/oia/2015/Response-to-2015-COV-Recommendations.pdf.

[101] Section 103 EPSCoR Reaffirmation and Update of the AICA amended section 502 of the America COMPETES Reauthorization Act of 2010 (P.L. 111-358; 42 U.S.C. 1862p-9), as well as section 113 of the National Science Foundation Authorization Act of 1988 (P.L. 100-570; 42 U.S.C. 1862g).

[102] The AICA was informed by the Innovation and Competitiveness Working Group and policy recommendations from the NAS and others. See U.S. Congress, Senate Committee on Commerce, Science, and Transportation, *Leveraging the U.S. Science and Technology Enterprise*, 114th Cong., May 11, 2016; webcast of the hearing available at http://www.commerce.senate.gov/public/index.cfm/2016/5/leveraging-the-u-s-science-and-technology-enterprise.

assistance funding to develop research infrastructure has grown into a permanent program.[103] Opposition to the amendment asserted that EPSCoR has supported areas of strategic importance and helped to stabilize an imbalance in funding—cited as 28 EPSCoR jurisdictions accounting for about 10% of NSF funding but 20% of the U.S. population—and should continue to do so.[104]

In 2016, H.Amdt. 1122, a similarly focused amendment to H.Amdt. 317, would have amended H.R. 5055, the Energy and Water Development and Related Agencies Appropriations Act, 2017, to prohibit the use of funds for DOE's EPSCoR program. The amendment failed on a floor vote of 206-213. During House floor debate, many of the same objections to the program were raised as for H.Amdt. 317 with additional concerns that the program at DOE is based on NSF's EPSCoR program eligibility and research grant expenditures, rather than DOE research expenditures. Supporters of the amendment asserted that "a rational program would ... collect all research funding in all areas and base the set-asides on that [and] would do it on a per capita basis."[105] Opponents of the amendment stated a willingness to debate program details—such as potential modifications to program formulas—and emphasized that eliminating the program would be a mistake.[106]

The introduced version of the 2015 Senate Labor, Health and Human Services, and Education, and Related Agencies Appropriations bill (S. 1695) would have revised eligibility criteria for the IDeA program, including allowing NSF EPSCoR-eligible entities to apply for inclusion in NIH INBRE awards. That program revision was not included in the FY2016 omnibus,[107] but the accompanying explanatory statement included recognition of the IDeA program's success and requests to update and incorporate EPSCoR eligible states into IDeA program eligibility criteria.[108]

Concluding Observations

The EPSCoR program funding and objectives have expanded and evolved since its establishment more than three decades ago. Assessments and workshops involving a wide range of stakeholders have helped to inform these changes, as has some academic research. As the program has grown, some stakeholders have also raised program-specific concerns due to EPSCoR's geographically targeted structure and variations among agency approaches. Further, some of the questions raised about the program are similar to questions raised about the broader role of the NSF,[109] such as: What is the federal government's role in scientific research? How do Congress and agencies balance supporting innovative, independent scientific research while remaining accountable for the use of public funds?

Going forward, Congress may consider whether or not to provide additional direction and oversight regarding EPSCoR's longevity and focus, and the development of new eligibility and graduation criteria. Should graduation remain a desired goal for EPSCoR programs, Congress

[103] House debate, *Congressional Record*, daily edition, vol. 161, no. 87 (June 2, 2015) pp. H3732-H3733; remarks by Rep. William Foster and Rep. Scott Garrett.

[104] Ibid., remarks by Rep. John Culberson and Rep. David Cicilline.

[105] House debate, *Congressional Record*, daily edition, vol. 162, no. 83 (May 25, 2016) pp. H3229-H3230; remarks by Rep. William Foster.

[106] Ibid., remarks by Rep. Michael Simpson.

[107] H.R. 2029, Consolidated Appropriations Act, 2016; P.L. 114-113.

[108] See *Congressional Record*, daily edition, vol. 161, no. 184, Book III (December 17, 2015), p. H102825.

[109] For more information on NSF and ongoing considerations for the agency, see CRS Report R43585, *The National Science Foundation: Background and Selected Policy Issues*, by Heather B. Gonzalez.

may further explore how new eligibility criteria—such as setting eligibility at a median funding level—would affect the potential for jurisdictions to "graduate" from a program. Congress may also consider whether or not to require additional data collection and comparative program evaluations across agencies to inform future program direction and congressional action.

Appendix. NSF EPSCoR Eligibility Table

Table A-1. FY2016 NSF EPSCoR RII Eligibility: RRA Funding Basis by Jurisdiction

current dollars, in thousands

State	FY2013	FY2014	FY2015	Total	% Total
Total	**$5,434,325**	**$5,633, 873**	**$5,526,504**	**$16,594,702**	**100%**
Guam	$205	$129	$2,055	$2,389	0.01%
Virgin Islands	$951	$4,093	$4,376	$9,420	0.06%
Puerto Rico	$2,465	$9,289	$5,724	$17,478	0.11%
North Dakota	$8,818	$10,740	$9,969	$29,527	0.18%
Vermont	$11,410	$10,919	$9,664	$31,993	0.19%
South Dakota	$8,998	$13,538	$15,303	$37,839	0.23%
West Virginia	$11,828	$14,207	$12,889	$38,924	0.23%
Mississippi	$12,259	$13,416	$15,204	$40,879	0.25%
Wyoming	$14,893	$12,813	$13,578	$41,284	0.25%
Arkansas	$14,831	$16,808	$12,626	$44,265	0.27%
Nevada	$15,258	$20,873	$16,259	$52,390	0.32%
Idaho	$23,881	$11,477	$20,283	$55,641	0.34%
Montana	$21,946	$16,819	$17,853	$56,618	0.34%
Maine	$25,387	$17,969	$19,055	$62,411	0.38%
Kentucky	$15,703	$19,869	$27,872	$63,444	0.38%
Alabama	$26,700	$24,834	$23,486	$75,020	0.45%
Nebraska	$22,578	$26,474	$30,106	$79,158	0.48%
Kansas	$25,982	$26,332	$33,731	$86,045	0.52%
Alaska*	$27,313	$27,574	$31,255	$86,142	0.52%
Delaware*	$34,139	$33,755	$19,983	$87,877	0.53%
Louisiana*	$30,501	$33,491	$25,020	$89,012	0.54%
Oklahoma	$24,376	$26,212	$38,406	$88,994	0.54%
Hawaii*	$29,903	$31,236	$30,256	$91,395	0.55%
New Hampshire*	$34,039	$33,565	$30,714	$98,318	0.59%
South Carolina*	$28,753	$35,142	$34,984	$98,879	0.60%
New Mexico	$36,351	$30,721	$42,575	$109,647	0.66%
Rhode Island*	$39,420	$41,131	$43,883	$124,434	0.75%
Missouri	$44,328	$44,357	$53,759	$142,444	0.86%
Iowa	$47,584	$45,987	$51,577	$145,148	0.87%
Tennessee	$43,831	$51,476	$52,853	$148,160	0.89%
Connecticut	$50,253	$60,250	$58,174	$168,677	1.02%
Utah	$61,452	$53,189	$61,450	$176,091	1.06%

State	FY2013	FY2014	FY2015	Total	% Total
Oregon*	$47,909	$74,529	$66,383	$188,821	1.14%
Minnesota*	$79,601	$80,954	$91,376	$251,931	1.52%
Wisconsin	$107,210	$84,116	$99,869	$291,195	1.75%
Ohio	$98,908	$89,951	$115,206	$304,065	1.83%
Georgia*	$112,232	$97,282	$120,581	$330,095	1.99%
Washington*	$115,009	$106,099	$115,503	$336,611	2.03%
New Jersey	$114,195	$124,234	$130,773	$369,202	2.22%
Maryland*	$122,770	$135,306	$123,848	$381,924	2.30%
Indiana	$128,730	$131,205	$124,974	$384,909	2.32%
Arizona	$140,019	$137,402	$135,841	$413,235	2.49%
Florida*	$125,662	$134,310	$159,960	$419,932	2.53%
North Carolina*	$140,520	$147,641	$153,086	$441,247	2.66%
Michigan	$166,047	$176,890	$175,811	$518,748	3.13%
Virginia	$165,970	$177,451	$192,100	$535,521	3.23%
Texas	$193,738	$194,337	$276,664	$664,739	4.01%
District of Columbia	$233,900	$260,434	$213,258	$707,592	4.26%
Pennsylvania	$229,020	$230,769	$251,954	$711,743	4.29%
Colorado	$250,866	$266,148	$266,569	$783,583	4.72%
Illinois	$286,899	$304,253	$286,436	$877,588	5.29%
Massachusetts*	$364,866	$364,007	$370,675	$1,099,548	6.63%
New York*	$375,921	$395,210	$424,051	$1,195,182	7.20%
California*	$722,356	$757,759	$731,879	$2,211,994	13.33%

Source: CRS, based on data from the "EPSCoR RII Eligibility Table FY 2016" published by NSF at https://www.nsf.gov/od/oia/programs/epscor/Eligibility_Tables/FY2016_Eligibility.pdf; data from NSF's Budget Internet Information System (available at http://dellweb.bfa.nsf.gov/).

Notes: The line between Rhode Island and Missouri marks the cutoff for FY2016 RII award eligibility; states that received 0.75% or less of total RRA funding are RII-eligible in FY2016. The asterisks indicate states for which NSF adjusted research support funding totals for large-scale logistical operations, as detailed in the NSF source table at the link above. Jurisdiction funding does not sum to totals at top of column.

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