

**NATIONAL SCIENCE FOUNDATION (NSF)
ESTABLISHED PROGRAM TO STIMULATE COMPETITIVE RESEARCH (EPSCoR)
CONGRESSIONAL REPORT
IN COMPLIANCE WITH PUBLIC LAW 114-329:
AMERICAN INNOVATION AND COMPETITIVENESS ACT, SEC. 103 (d) (1-3)
FISCAL YEAR 2016**

This report summarizes fiscal year (FY) 2016 NSF funding to institutions and entities in EPSCoR jurisdictions, as required by the American Innovation and Competitiveness Act Sec. 103 (d) (1-3). Specifically, the report itemizes:

- (1) a description of the program strategy and objectives
- (2) a description of the awards made in the previous fiscal year including:
 - (A) the total amount made available, by state, under EPSCoR
 - (B) the total amount of agency funding made available to all institutions and entities within each EPSCoR state
 - (C) the efforts and accomplishments to more fully integrate the EPSCoR states in major agency activities and initiatives
 - (D) the percentage of EPSCoR reviewers from EPSCoR states
 - (E) the number of programs or large collaborator awards involving a partnership of organizations and institutions from EPSCoR and non-EPSCoR states
- (3) an analysis of the gains in academic research quality and competitiveness, and in science and technology human resource development, achieved by the program over the last 5 years.

Introduction

EPSCoR utilizes three investment strategies in pursuit of its goal to strengthen research capacity and competitiveness in eligible jurisdictions. These investment strategies are: (1) Research Infrastructure Improvement (RII) awards that support physical, human, and cyber infrastructure development; (2) Co-Funding in partnership with National Science Foundation (NSF) directorates and offices that support individual investigators and groups within EPSCoR jurisdictions; and (3) Outreach Activities and Workshops that bring EPSCoR jurisdiction investigators together with program staff from across the Foundation to explore opportunities in emerging areas of science and engineering aligned with NSF strategic priorities and with jurisdictional science and technology goals.

EPSCoR Strategies and Objectives (Sec. 103(d)(1))

EPSCoR's strategies and objectives in FY 2016 remained the same as those described in the FY 2015 report. Specifically, the mission of EPSCoR 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." Thus, EPSCoR's goals are:

- To catalyze the development of research capabilities and the creation of new knowledge that expands jurisdictions' contributions to scientific discovery, innovation, learning, and knowledge-based prosperity.
- To establish sustainable Science, Technology, Engineering and Math (STEM) education, training, and professional development pathways that advance jurisdiction-identified research areas and workforce development.
- To broaden direct participation of diverse individuals, institutions, and organizations in the project's science and engineering research and education initiatives.
- To effect sustainable engagement of project participants and partners, the jurisdiction, the national research community, and the general public through data-sharing, communication, outreach, and dissemination.

NSF Authorizations

- To impact research, education, and economic development beyond the project at academic, government, and private sector levels.

NSF Funding Made Available, by State, under EPSCoR (Sec. 103(d)(2)(A))

In FY 2016, NSF EPSCoR invested a total of \$160.03 million in support of its programmatic activities. Of this, \$131.00 million (81.8 percent) was directed to RII, \$27.90million (17.4 percent) to co-funding, and \$1.13 million (0.7 percent) to outreach activities and workshops. The table below details the investments from EPSCoR resources, and EPSCoR investments in co-funding actions.

NSF funding made available, by State, under EPSCoR

(Dollars in Millions)

EPSCoR Jurisdiction	RII program	Outreach & workshops ¹	EPSCoR cofunding	EPSCoR Total
AK	-	-	\$0.27	\$0.27
AL	-	0.32	3.16	3.48
AR	8.00	-	0.49	8.49
DE	14.00	0.10	1.26	15.36
GU	2.09	-	-	2.09
HI	4.00	-	1.16	5.16
ID	-	0.04	1.24	1.28
KS	3.90	-	0.60	4.50
KY	3.84	0.04	1.17	5.05
LA	14.00	-	1.57	15.57
ME	3.00	-	0.94	3.94
MO	-	0.04	1.71	1.75
MS	10.00	-	1.41	11.41
MT	10.00	0.46	1.18	11.64
ND	8.00	-	0.91	8.91
NE	4.00	-	1.96	5.96
NH	6.00	-	-	6.00
NM	-	0.04	1.49	1.53
NV	4.00	0.04	0.19	4.23
OK	4.00	-	1.98	5.98
PR	5.00	-	0.51	5.51
RI	1.44	-	0.45	1.89
SC	6.00	-	1.28	7.28
SD	-	-	0.63	0.63
VI	4.00	-	-	4.00
VT	4.00	-	-	4.00
WV	4.00	-	1.76	5.76
WY	4.00	-	0.36	4.36
Admin	3.73	0.05	0.22	4.00
Total	\$131.00	\$1.13	\$27.90	\$160.03

Total NSF Funding Made Available in all EPSCoR Jurisdictions (Sec. 103 (d)(2)(B))

In FY 2016, NSF invested a total of \$711.69 million in support of EPSCoR jurisdictions. The table below details NSF investments in EPSCoR jurisdictions.

**NSF funding made available
to all EPSCoR jurisdictions**
(Dollars in Millions)

EPSCoR Jurisdiction	NSF Funding
AK	\$34.39
AL	26.40
AR	18.61
DE	44.61
GU	2.11
HI	33.66
ID	16.07
KS	30.40
KY	27.03
LA	40.90
ME	13.27
MO	58.79
MS	20.94
MT	29.02
ND	15.69
NE	25.02
NH	39.84
NM	40.33
NV	14.96
OK	25.36
PR	12.46
RI	38.41
SC	55.88
SD	6.49
VI	4.25
VT	8.61
WV	12.45
WY	15.76
Total	\$711.69

Integration of EPSCoR Jurisdictions in Major Activities and Initiatives of the Foundation (Sec. 103 (d)(2)(C))

All EPSCoR programmatic activities target integration and assimilation of EPSCoR jurisdictions into the research and education programs of the Foundation's disciplinary directorates. RII awards enhance academic research capacity and promote the coordination and integration of recipient jurisdictions into major NSF programmatic activities. Additionally, EPSCoR engages NSF disciplinary program officers (PO) in merit review and post-award evaluations, such as site visits and reverse site visits (RSVs). Site visits and RSVs are intended to provide additional project oversight by allowing jurisdictions to report on the progress of their RII Track-1 projects in relation to their stated goals and the programmatic terms and conditions. Disciplinary POs assist in the identification of reviewers, serve as site visit and RSV panelists, and provide knowledge about the ongoing activities within the directorate that could be leveraged to sustain RII efforts after the performance period of the EPSCoR award.

National, regional, and jurisdictional meetings of the EPSCoR community facilitate interactions with NSF leadership to learn about the Foundation's strategic priorities and funding opportunities. Participation by EPSCoR researchers and educators in the merit review process across all disciplinary domains of the Foundation, in Committees of Visitors (COV) activities, in external advisory (Federal Advisory Committee Act) committees, and in disciplinary workshops that shape new activities is also vital to this integration.

Outreach to EPSCoR jurisdictions by NSF staff promotes integration of the EPSCoR community into mainstream NSF programs, as does co-funding of awards with disciplinary programs of the Foundation. There is also an effort to promote in-reach, whereby EPSCoR facilitates opportunities for researchers and educators from EPSCoR jurisdictions to meet with NSF staff at the Foundation's headquarters. In these meetings, the EPSCoR participants are provided with information of NSF strategic priorities and funding opportunities, as well as meet with disciplinary POs. In FY 2016, EPSCoR staff facilitated approximately 35 in-reach meetings.

In FY 2016, EPSCoR staff sought to promote engagement of the EPSCoR community in NSF and other national activities. Examples are:

- In FY 2016, EPSCoR continued its efforts to better communicate the "EPSCoR success story" by continuing its communication workshop, "Becoming an EPSCoR Champion," which targets RII Track-1 researchers to specifically emphasize successful outcomes of EPSCoR research. This workshop series helps researchers cultivate communication skills through disciplined, systematic messaging to convey an influential, economically-framed message that effectively signals the value of EPSCoR's activities. It seeks to enhance abilities to deliver the jurisdiction's scientific messages effectively, charismatically, and successfully.
- NSF EPSCoR has continued to encourage the involvement of EPSCoR-supported faculty in NSF committee and review panels across NSF (e.g., COVs, site visits, and merit review panels).
- EPSCoR continued its RII Track-2: Focused EPSCoR Collaborations (RII Track-2 FEC) solicitation. RII Track-2 FEC builds interjurisdictional collaborative teams of EPSCoR investigators in scientific focus areas consistent with NSF priorities, including cognitive science and neuroscience, clean energy, and food security. In addition, these awards have a particular focus on the development of early career/junior faculty. Eleven awards were made in FY 2016.

EPSCoR Reviewers (Sec. 103(d)(2)(D))

Demographics of all reviewers who evaluated EPSCoR proposals or the program in FY 2016 are as follows: of the 149 reviewers, 24 percent were underrepresented minorities, 47 percent were female, 19 percent were from EPSCoR jurisdictions, 83 percent were new reviewers for the EPSCoR program (most had prior NSF review experience), and 9 percent were new reviewers from EPSCoR jurisdictions.

EPSCoR Collaborations and Partnerships (Sec. 103(d)(2)(E))

All RII awards involve collaborations among scientists and engineers in EPSCoR jurisdictions. Additionally, RII awards require institutional collaborations, which are defined as collaborations between researchers at a RII awardee or sub-awardee and those at institutions not receiving any RII funds.

In FY 2016, there were 909 institutional collaborations within EPSCoR jurisdictions; 774 institutional collaborations between EPSCoR jurisdictions and other EPSCoR and non-EPSCoR jurisdictions; and 255 international institutional collaborations with EPSCoR jurisdictions. These efforts highlight the vast network of institutional involvement among EPSCoR jurisdictions and their partners in RII projects.

Among the 160 awards co-funded by EPSCoR in FY 2016, 82 involved collaborative research between multiple institutions. Of those 82 collaborative awards, 34 were collaborations between investigators from institutions in EPSCoR and non-EPSCoR jurisdictions.

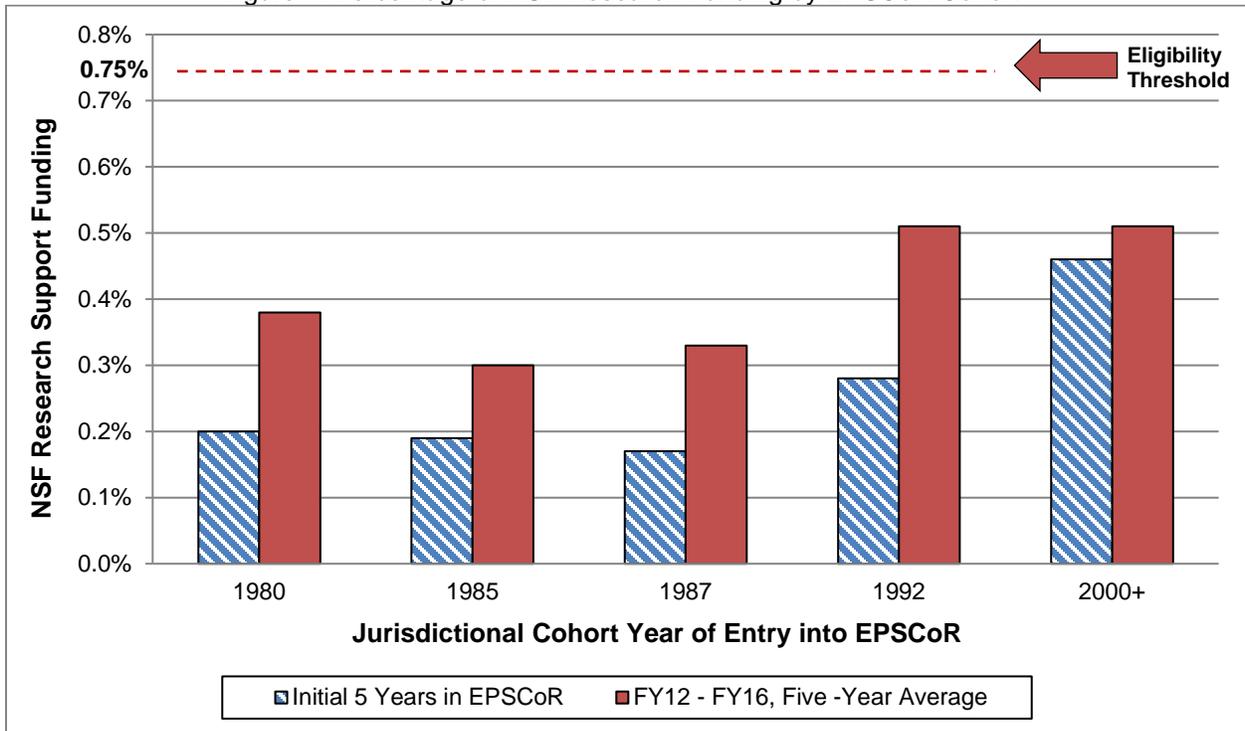
An analysis of the gains in academic research quality and competitiveness, and in science and technology human resource development, achieved by the program over the last 5 fiscal years (Sec. 103(d)(3))

Eligibility to participate in NSF EPSCoR programmatic activities is based upon the jurisdictions' demonstrated ability to obtain NSF research funds. Currently, a jurisdiction is eligible to participate in EPSCoR programs if its level of NSF research support is equal to or less than 0.75 percent of the total NSF research and related activities budget averaged over the most recent three year period.

Given EPSCoR's aim to stimulate research that is fully competitive in NSF's disciplinary and multidisciplinary research programs, increases in the ability to capture NSF research funds serve as a proxy for gains in research competitiveness. In FY 2016, the 3-year rolling average of NSF research funds for Iowa, Missouri, Tennessee, and Utah was over the 0.75 percent threshold and these jurisdictions were no longer eligible to compete in new RII competitions. Additionally, Iowa, Tennessee, and Utah exceeded the threshold for three consecutive years and were no longer EPSCoR-eligible for co-funding or outreach in FY 2016.

Figure 1 (below) shows the average amount of NSF research funds by cohort for the initial five years (hatched bars) and the most recent five years (solid bars) of their participation in the NSF EPSCoR Program. A cohort is defined as the group of states or jurisdictions that entered the EPSCoR program within a given fiscal year. For example, the 1980 cohort consists of the initial five states that qualified for EPSCoR: Arkansas, Maine, Montana, South Carolina, and West Virginia. For this summary, the 2000+ cohort consists of jurisdictions that entered EPSCoR in FY 2000 or later: Alaska, Delaware, Guam, Hawaii, Missouri, New Hampshire, New Mexico, Rhode Island, and the U.S. Virgin Islands. Former EPSCoR jurisdictions Iowa, Tennessee, and Utah are excluded because they were no longer EPSCoR-eligible in FY 2016.

Figure 1. Percentage of NSF Research Funding by EPSCoR Cohort



Each cohort shows an increase in competitiveness over the periods of participation. For example, the 1980 cohort shows a 90 percent increase in NSF research funding over the past 36 years of EPSCoR activity. The 1985 cohort (Alabama, Kentucky, Nevada, North Dakota, Oklahoma, Puerto Rico, Vermont, and Wyoming) demonstrates a 58 percent increase during its 31 years of participation in EPSCoR. The 1987 cohort (Idaho, Louisiana, Mississippi, and South Dakota) shows a 94 percent increase over the past 29 years, while the 1992 cohort (Kansas and Nebraska) has an 82 percent increase in competitiveness over its 24 years of EPSCoR involvement. Jurisdictions participating in EPSCoR since FY 2000 entered into the program at a higher level of NSF research funding than the previous cohorts. For the 2000+ cohort, there has been a small, yet demonstrable 11 percent increase in research funding. The data for each jurisdiction is provided in the table immediately after the figure.

**Percentage of NSF Research Support Funding,
by Jurisdiction and EPSCoR Cohort**

	Initial 5 Years in EPSCoR	Most Recent 5 Year Period (FY 2012-2016)
1980 Cohort	0.20%	0.38%
Arkansas	0.10%	0.32%
Maine	0.27%	0.34%
Montana	0.13%	0.37%
South Carolina	0.41%	0.63%
West Virginia	0.07%	0.24%
1985 Cohort	0.19%	0.30%
Alabama	0.33%	0.47%
Kentucky	0.22%	0.39%
Nevada	0.14%	0.29%
North Dakota	0.06%	0.18%
Oklahoma	0.30%	0.51%
Puerto Rico	0.15%	0.12%
Vermont	0.10%	0.17%
Wyoming	0.20%	0.25%
1987 Cohort	0.17%	0.33%
Idaho	0.08%	0.25%
Louisiana	0.36%	0.58%
Mississippi	0.16%	0.27%
South Dakota	0.09%	0.21%
1992 Cohort	0.28%	0.51%
Kansas	0.34%	0.58%
Nebraska	0.22%	0.44%
2000+ Cohort	0.46%	0.51%
Alaska	0.55%	0.51%
Delaware	0.41%	0.57%
Guam	0.02%	0.02%
Hawaii	0.56%	0.56%
Missouri	0.88%	0.87%
New Hampshire	0.44%	0.60%
New Mexico	0.58%	0.66%
Rhode Island	0.70%	0.70%
Virgin Islands	0.00%	0.06%

The table below demonstrates the quantifiable outputs of NSF EPSCoR’s RII Track-1 program over the last 5 fiscal years. This information elucidates the gains in academic research quality over time, as defined by publications, leveraged grants, and patents. For publications, primary support is defined as research that is directly funded by EPSCoR and partial support is defined as use of equipment or facilities funded by EPSCoR. The number and valuation of grants awarded encompasses all federal, private industry, and private foundation awards across the U.S. in a given fiscal year for all EPSCoR jurisdictions.

Aggregate of EPSCoR Outputs (n=31*)

	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Total
Primary Support Publications	543	679	591	581	409	2,803
Partial Support Publications	1,237	1,254	1,001	1,026	927	5,445
Grants Awarded	640	654	601	563	675	3,133
Value of Grants Awarded (\$M)	\$264.3	\$259.5	\$278.8	\$181.8	\$379.1	\$1,363.5
Patents Awarded	22	12	15	13	14	76
Patents pending	49	55	38	44	34	220

*The maximum number of jurisdictions with active RII Track-1 awards in any given fiscal year. Outputs are not comparable from year-to-year due to the influx of new and expiring awards over the time period.

The table below indicates EPSCoR’s ongoing support of human resource development over the last 5 fiscal years in the RII Track-1 program. The number of faculty and students involved in RII Track-1 projects have remained fairly constant over time, signifying a strong commitment by NSF and the jurisdictions in strengthening jurisdictional human capital in science and engineering research and education.

EPSCoR Human Resource Development

	FY12	FY13	FY14	FY15	FY16	Total
Faculty Supported	1,461	1,535	1,581	1,602	1,552	N/A*
Post-Docs Supported	211	211	215	231	200	N/A*
Graduate Students Supported	1,443	1,383	1,346	1,361	1,332	N/A*
Undergraduates Supported	1,769	1,955	1,867	1,965	1,861	N/A*
New Faculty Hired	79	60	73	89	84	385
Graduate Degrees Conferred	233	305	326	245	258	1,367
Undergraduate Degrees Conferred	425	376	380	408	404	1,993

* The number of faculty and students supported are not summed because many of them remain tied to their respective projects for the duration of the award and would, therefore, be double-counted over time.

Additionally, NSF EPSCoR is working with NSF’s Evaluation and Assessment Capability Section to develop a cohesive evaluation framework for the program. This evaluation will address the legislative objective of increasing the research competitiveness of jurisdictions receiving EPSCoR funding. The evaluation is informed by the findings and recommendations from the EPSCoR retrospective evaluation completed by the Science and Technology Policy Institute (STPI) in 2012. Part of this effort involves developing an evaluation contract that will (1) develop a flexible framework to explore, define, and measure research competitiveness in relation to the unique jurisdictional contexts and (2) use evidence of jurisdictional progress toward research competitiveness over time for strategic program improvement.