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 2021

This report summarizes fiscal year (FY) 2021 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 details:

(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 integrate the EPSCoR states more fully 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; and
(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 uses 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 cyberinfrastructure development; (2) Co-Funding in partnership with 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's RII programs are instrumental in helping to build jurisdictional capability and capacity. RII Track-1 awards provide up to $4 million per year for up to five years. They are intended to improve the research competitiveness of jurisdictions by improving their academic research infrastructure in areas of science and engineering supported by the National Science Foundation and critical to the particular jurisdiction's science and technology initiative or plan. RII Track-2 Focused EPSCoR Collaborations awards provide up to $1 million per year for up to four years as collaborative awards between two EPSCoR jurisdictions or up to $1.5 million per year for up to four years to a consortium of three or more EPSCoR jurisdictions. These awards build interjurisdictional collaborative teams of EPSCoR investigators in scientific focus areas consistent with NSF priorities. RII Track-4: EPSCoR Research Fellows provides opportunities 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. Through these visits, the EPSCoR Research Fellows learn new techniques, benefit from access to unique equipment and facilities, and shift their research

toward transformative new directions. The experience gained through the fellowship is intended to provide a foundation for research collaborations that span the recipient's entire career. These benefits to the Fellows are also expected to in turn enhance the research capacity of their institutions and jurisdictions.

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

EPSCoR's strategies and objectives in FY 2021 remain the same as those described in the FY 2020 report. Specifically, the mission of EPSCoR is "to enhance research competitiveness of targeted jurisdictions (states, territories, commonwealths) by strengthening Science, Technology, Engineering and Math (STEM) capacity and capability." 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 STEM education, training, and professional development pathways that advance jurisdiction-identified research areas, NSF focus 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 affect sustainable engagement of project participants and partners, the jurisdiction, the national research community, and the general public through data-sharing, communication, outreach, and dissemination.
- To impact research, education, and economic development beyond the project at academic, government, and private sector levels.

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

In FY 2021, NSF EPSCoR invested a total of $200.16 million in support of its programmatic activities. Of this, $135.55 million (67.7 percent) was directed to RII, $64.02 million (32.0 percent) to co-funding, and $600,000 (0.3 percent) to outreach activities and workshops. The table below details the investments from EPSCoR resources and EPSCoR investments in co-funding actions.

FY 2021 EPSCoR Funding by Jurisdiction

(Dollars in Millions)

EPSCoR Jurisdiction	RII Program	Outreach & Workshops	EPSCoR Co-funding	EPSCoR Total
AK	$4.03	-	$0.51	$4.54
AL	3.25	-	4.72	7.97
AR	4.94	0.05	7.33	12.33
DE	3.96	-	1.18	5.14
GU	4.62	-	-	4.62
HI	2.47	0.18	1.47	4.11
IA	1.00	-	2.78	3.77
ID	5.58	-	6.80	12.38
KS	10.76	-	1.18	11.94
KY	2.60	-	3.01	5.61
LA	12.39	-	3.50	15.89
ME	8.18	-	1.26	9.44
MS	5.04	-	2.47	7.51
MT	0.60	0.01	4.18	4.79
ND	12.11	-	0.99	13.09
NE	7.67	-	1.79	9.46
NH	1.74	-	0.15	1.89
NM	0.13	0.10	3.19	3.42
NV	1.23	0.01	2.38	3.62
OK	4.84	-	2.59	7.43
PR	3.51	-	5.08	8.59
RI	5.26	-	0.89	6.15
SC	5.25	-	2.84	8.09
SD	6.45	-	0.39	6.84
VI	4.76	-	-	4.76
VT	1.79	-	0.43	2.21
WV	1.75	-	1.27	3.02
WY	4.19	-	0.87	5.06
Admin	5.46	0.25	0.79	6.49
Total	**$135.55**	**$0.60**	**$64.02**	**$200.16**

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

In FY 2021, NSF invested a total of $1,041.25 million in support of EPSCoR jurisdictions. The table below details NSF investments in EPSCoR jurisdictions including research support funding, education and human resources, and major research equipment.

FY 2021 NSF Funding Made Available to All EPSCoR Jurisdictions
(Dollars in Millions)

EPSCoR Jurisdiction	NSF Funding
AK	$56.05
AL	63.48
AR	33.84
DE	46.51
GU	5.46
HI	57.27
IA	57.91
ID	34.79
KS	40.41
KY	38.57
LA	62.14
ME	26.07
MS	31.26
MT	39.67
ND	25.07
NE	39.22
NH	33.28
NM	55.25
NV	29.94
OK	41.67
PR	18.98
RI	60.55
SC	68.96
SD	16.32
VI	8.84
VT	12.10
WV	19.92
WY	17.72
Total	**$1,041.25**

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 promote the coordination and integration of recipient jurisdictions into major NSF programmatic activities.

Additionally, EPSCoR consults and engages NSF disciplinary program officers (POs) in merit review processes 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 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 observers, 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 grantee 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 the 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. In these meetings, the EPSCoR participants are provided with information on NSF strategic priorities and funding opportunities.

In FY 2021, EPSCoR staff promoted engagement of the EPSCoR community in NSF and other national activities. Examples are:

- Communicated extensively regarding the Office of Management and Budget's (OMB) and NSF guidelines about COVID-19 flexibilities for funded awards.
- Hosted its 2021 EPSCoR Annual Principal Investigator (PI) Meeting virtually during the week of May 17-21. The EPSCoR community and NSF program officers shared effective practices in research, strategic planning, diversity, communication, evaluation, and other areas of importance to EPSCoR jurisdictions and NSF. In addition to presentations and breakout sessions, there were Track-specific symposia that showcased successful projects and offered valuable insight to potential future PIs. The agenda also included 33 open houses for PIs to meet with Program Officers from all NSF Directorates to discuss program-specific funding opportunities. Every EPSCoR jurisdiction was represented at this meeting, which had approximately 300 participants.
- Committed $13.20 million in support of three new awards led by EPSCoR institutions in the FY 2021 Mid-scale RI-1 competition. These awards went to the University of Arkansas, the University of Idaho, and the University of Kentucky.
- Provided $5.0 million to the new Center for Advanced Radio Sciences and Engineering led by the University of Puerto Rico Mayaguez, part of NSF's response to the collapse of the Arecibo Observatory.
- Contributed $831,000 to enable the award of a new NSF INCLUDES Alliance led by Auburn University focused on improving opportunities in STEM for students with disabilities.
- Provided $1.0 million to a new Sustainable Regional Systems Research Network led by the University of New Mexico, with a focus on rural-urban systems in the Intermountain West.
- Encouraged EPSCoR-supported faculty to participate in NSF committee and review panels across NSF (e.g., COVs, site visits, and merit review panels).
- Continued the RII Track-2: Focused EPSCoR Collaborations (RII Track-2 FEC) solicitation. In FY 2021,

proposals were invited on the topic of "Advancing research toward Industries of the Future to ensure economic growth for EPSCoR jurisdictions," aligned with NSF's emerging industries initiative. Ten awards were made in FY 2021, representing a total EPSCoR investment of $45.70 million over their four-year award duration.

- Committed $10.0 million in supplemental funding to 19 existing RII Track-2 awards to support individuals and institutions that are adversely affected by the COVID-19 pandemic. The supplements are specifically focused on further building EPSCoR's RII Track-2 networks by providing support to broaden the engagement of researchers from minority-serving institutions (MSIs).
- Continued the RII Track-4, EPSCoR Research Fellows solicitation and 35 awards were made, representing a total EPSCoR investment of $7.0 million over their two-year award duration.
- Debuted the Track-4 Fellows Advancing Science and Technology (FAST) funding opportunity, a collaboration with NASA-EPSCoR. Track-4 FAST allows for PIs from MSIs to further develop their individual research potential through extended collaborative visits to NASA research facilities located at NASA Centers throughout the United States. A total of two out of the 35 awards made for the FY21 RII Track-4 competition were made through the Track-4 FAST mechanism.
- Convened two meetings with the EPSCoR Interagency Coordinating Committee (EICC) to share relevant program information and identify opportunities for coordination. Representatives from the EICC also presented information on their programs at a panel session during the annual PI meeting and held breakout sessions for PIs interested in learning more about leveraging funding opportunities.

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

Demographics of all reviewers who evaluated EPSCoR proposals or the program in FY 2021 are as follows: of the 212 reviewers, 19.8 percent were underrepresented minorities, 53.8 percent were female, 9.9 percent were from EPSCoR jurisdictions.

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

All RII awards involve collaborations among scientists and engineers in EPSCoR jurisdictions. Though funding is awarded to a primary institution, there are always several subaward institutions involved in RII Track-1 and Track-2 awards. Subaward funding is not reflected in the tables provided earlier in this report but does help to enhance jurisdictional competitiveness. Data on research progress and outcomes are collected from subawards as well as the primary institution. In addition to subaward partnerships, RII awards require institutional collaborations, which are defined as collaborations among researchers at a RII awardee or sub-awardee and those at institutions not receiving any RII funds.

In FY 2021, RII Track-1 participants developed 333 institutional collaborations within EPSCoR jurisdictions; 284 institutional collaborations between EPSCoR jurisdictions and non-EPSCoR jurisdictions; and 118 collaborations between institutions in EPSCoR jurisdictions and in foreign countries. These collaborative efforts highlight the vast network of institutional involvement among EPSCoR jurisdictions and their partners in RII Track-1 projects.

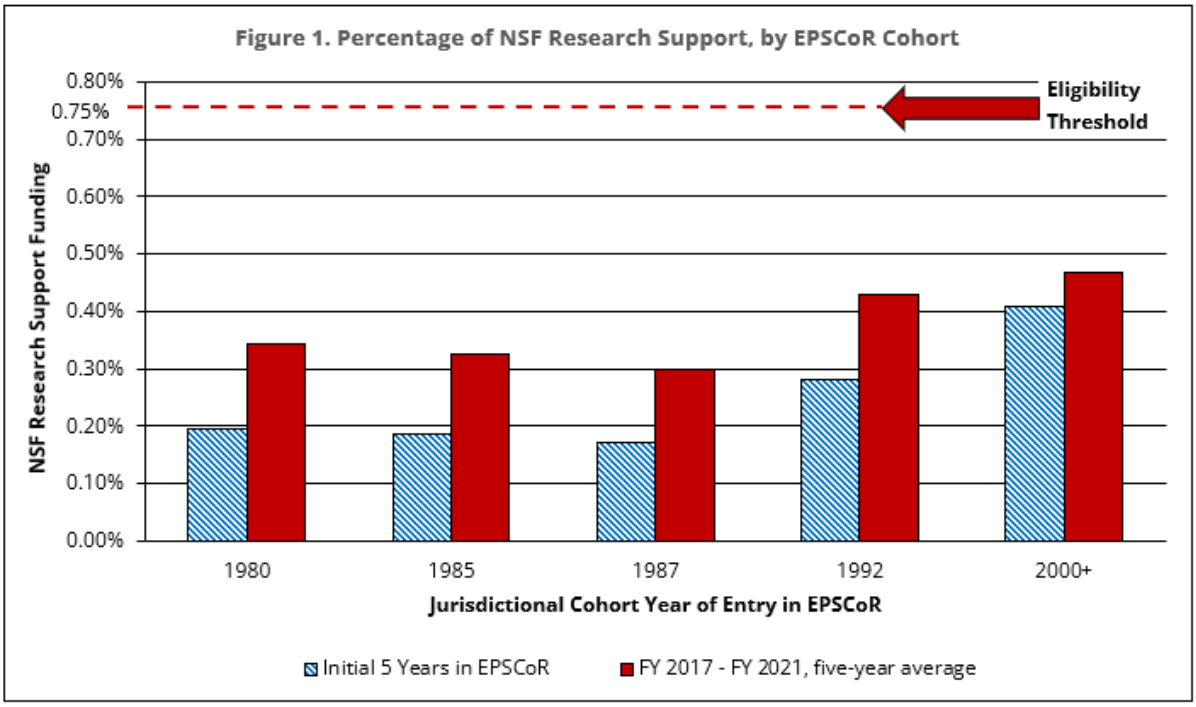
Among the 219 awards co-funded by EPSCoR in FY 2021, 173 involved collaborative research between multiple institutions. Of those 173 collaborative awards, 98 (57 percent) were collaborations between

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 budget over the most recent five-year period, excluding NSF funding to other federal agencies and EPSCoR RII and workshop/conference funding. Jurisdictions above 0.75 percent but less than 0.80 percent are allowed to remain EPSCoR-eligible for up to five years. 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.

Figure 1 (below) shows the average annual amount of NSF research funds given to each 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 and are still EPSCoR-eligible for RII competitions: Alaska, Delaware, Guam, Hawaii, Iowa, New Hampshire, New Mexico, Rhode Island, and the U.S. Virgin Islands. Former EPSCoR jurisdictions Missouri, Tennessee, and Utah are excluded because they were not EPSCoR-eligible in FY 2021.



Each cohort shows an increase in competitiveness over the periods of participation. For example, the

1980 cohort shows a 76 percent increase in NSF research funding over the past 41 years of EPSCoR activity. The 1985 cohort (Alabama, Kentucky, Nevada, North Dakota, Oklahoma, Puerto Rico, Vermont, and Wyoming) demonstrates a 74 percent increase during its 36 years of participation in EPSCoR. The 1987 cohort (Idaho, Louisiana, Mississippi, and South Dakota) shows a 73 percent increase over the past 34 years, whereas the 1992 cohort (Kansas and Nebraska) has a 54 percent increase in competitiveness over its 29 years of EPSCoR involvement. Currently eligible 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 15 percent increase in research funding.

Percentage of NSF Funding, by Jurisdiction and EPSCoR Cohort

	Initial 5 Years in EPSCoR*	Most Recent 5 Year Period (FY 2017-2021)**
1980 Cohort	0.19%	0.34%
Arkansas	0.10%	0.28%
Maine	0.27%	0.27%
Montana	0.13%	0.41%
South Carolina	0.41%	0.58%
West Virginia	0.07%	0.17%
1985 Cohort	0.19%	0.33%
Alabama	0.33%	0.74%
Kentucky	0.22%	0.40%
Nevada	0.14%	0.32%
North Dakota	0.06%	0.16%
Oklahoma	0.30%	0.42%
Puerto Rico	0.15%	0.21%
Vermont	0.10%	0.13%
Wyoming	0.20%	0.22%
1987 Cohort	0.17%	0.30%
Idaho	0.08%	0.28%
Louisiana	0.36%	0.52%
Mississippi	0.16%	0.26%
South Dakota	0.09%	0.13%
1992 Cohort	0.28%	0.43%
Kansas	0.34%	0.46%
Nebraska	0.22%	0.40%
2000+ Cohort	0.41%	0.47%
Alaska	0.55%	0.67%
Delaware	0.41%	0.46%
Guam	0.02%	0.01%
Hawaii	0.56%	0.63%
Iowa***	N/A	0.69%
New Hampshire	0.44%	0.44%
New Mexico	0.58%	0.63%
Rhode Island	0.70%	0.63%
Virgin Islands	-	0.04%

*Percentages based on eligibility guidelines at the time of entry into the EPSCoR

**Percentages based on current eligibility guidelines.

***Iowa reentered EPSCoR eligibility in FY 2019; data for the initial five years not

The following table demonstrates the quantifiable outputs of NSF EPSCoR's RII Track-1 program over the last five fiscal years. This information elucidates the gains in academic research quality over time, as defined by publications, leveraged grants, and patents. The number and valuation of grants awarded encompass all federal, private industry, and private foundation awards across the U.S. in a given fiscal year for all active projects.

RII Track-1 Aggregate of EPSCoR Outputs

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	Total
Number of Active Awards*	27	28	27	26	26	
Publications	985	1,044	732	638	720	**4,119**
Grants Awarded	455	505	451	326	334	**2,071**
Value of Grants Awarded (Dollars in Millions)	$492.10	$269.13	$314.40	$146.87	$182.66	**$1,405.16**
Patents Awarded	17	8	17	10	12	**64**
Patents pending	29	15	44	38	20	**146**

*The outputs for the active RII Track-1 awards are not comparable from year-to-year due to the influx of new and expiring awards over the time period. Data is self-reported by each project through annual reports and aggregated for the program, by year.

The table below indicates EPSCoR's ongoing support of human resource development over the last five fiscal years in the RII Track-1 program. The number of faculty and students involved in these projects signifies strong commitment by NSF and the jurisdictions in strengthening jurisdictional human capital in science and engineering research and education.

RII Track-1 Human Resource Development

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	Total
Faculty Supported	1,183	1,126	1,062	891	975	**N/A***
Post-Docs Supported	156	179	165	170	196	**N/A***
Graduate Students Supported	1,056	1,128	992	834	916	**N/A***
Undergraduates Supported	1,220	1,187	1,168	870	972	**N/A***
New Faculty Hired	54	27	40	35	45	**201**
Graduate Degrees Conferred	254	262	202	166	162	**1,046**
Undergraduate Degrees Conferred	634	357	297	183	242	**1,713**

*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.
Data is self-reported by each project through annual reports and aggregated for the program, by year.

NSF EPSCoR is continuing to refine and implement a cohesive research competitiveness evaluation framework for the program. The framework draws upon recommendations from a study completed in FY 2020 that helped to develop a flexible framework to explore, define, and measure research competitiveness. The evaluation framework will also be informed by the Future of NSF EPSCoR Committee, a subcommittee of the Committee on Equal Opportunities in Science and Engineering (CEOSE) at NSF. The subcommittee's charge is to address the questions:

a. What does the available evidence tell us about the effectiveness of NSF EPSCoR's current investment strategies, both individually and collectively, in advancing scalable, jurisdiction-wide solutions and best practices to achieve the program's goals?

b. Based on the answers to the question above, are there novel strategies or changes to the current strategies that would enable NSF EPSCoR and its jurisdictional partners to more effectively achieve its mission?

The committee's report is expected to be completed in May 2022. The report and evaluation framework will: (1) help identify potential impactful programmatic changes with respect to achieving the overall mission and increasing academic research competitiveness, and (2) produce a revised set of strategic priorities and an implementation plan that will leverage the current staffing capacity.