Proposal, Award, and Principal Investigator Data
For the NSF's Office of Cyberinfrastructure and Division of Advanced Cyberinfrastructure
During Fiscal Years 2011-2015

This document is a companion to National Science Foundation (NSF) Dear Colleague Letter (DCL) 16-090, *Seeking Community Input on Advanced Cyberinfrastructure*, which seeks community input about the position of NSF's Division of Advanced Cyberinfrastructure within NSF. As noted in the DCL, in FY 2013, the reporting structure for the unit within NSF responsible for coordinating research cyberinfrastructure across the Foundation was realigned from the Office of Cyberinfrastructure (OCI) to the Division of Advanced Cyberinfrastructure (ACI) within the Directorate for Computer and Information Science and Engineering (CISE). The mission of the unit was unchanged by the realignment:

> ***OCI/ACI Mission.*** *The mission of OCI and ACI has been to support and coordinate the development, acquisition, and provision of state-of-the-art cyberinfrastructure resources, tools and services essential to the advancement and transformation of science and engineering. The unit also supports forward-looking research and education to expand the future capabilities of cyberinfrastructure. By fostering a vibrant ecosystem of technologies and a skilled workforce of developers, researchers, staff and users, the unit has served a growing community of scientists and engineers, across all disciplines, whose work relies on the power of software, advanced computation, data, networking, and people.*

This document presents selected data related to OCI and ACI over the federal fiscal years (FY) 2011 through 2015. OCI data span FY 2011, FY 2012, and part of FY 2013; ACI data span part of FY 2013, FY 2014, and FY 2015. For simplicity, this document refers to the unit as "OCI/ACI" when referring to data from the entire five-year period. The document is divided into five parts:

- Section 1 presents OCI/ACI funding levels, in the context of CISE and NSF funding levels;
- Section 2 summarizes OCI/ACI proposal and award activity by thematic area;
- Section 3 documents co-funding between OCI/ACI and other NSF directorates and offices, providing a measure of the level of collaboration across unit boundaries;
- Section 4 includes demographics of the OCI/ACI principal investigator (PI) community; and
- Section 5 provides OCI/ACI staffing information, all over the five-year period.

Additional information about OCI/ACI can be found in the President's Budget Requests for the same period, available at http://www.nsf.gov/about/budget/.

1. Overall OCI/ACI Budget

Table 1 and Figure 1 show appropriated funding for NSF and its Research & Related Activities (R&RA) Account, along with funding levels for CISE and its divisions including OCI/ACI.

	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
OCI/ACI	$209.94	$211.64	$207.71	$212.29	$218.80
CCF	$175.77	$179.13	$178.09	$185.19	$191.33
CNS	$209.84	$212.50	$211.02	$220.40	$227.66
IIS	$168.74	$176.50	$176.25	$185.18	$191.65
ITR	$80.74	$85.46	$85.46	$90.95	$92.29
Total, CISE	**$845.03**	**$865.23**	**$858.53**	**$894.00**	**$921.73**
NSF, R&RA Budget	**$5,563.87**	**$5,689.00**	**$5,543.72**	**$5,808.92**	**$5,933.65**
NSF Total Budget	**$6,859.87**	**$7,033.10**	**$6,884.11**	**$7,171.92**	**$7,344.21**

Table 1: CISE divisional funding (dollars in millions), including OCI in FY 2011-FY 2013, and NSF Research and Related Activities (R&RA) appropriations, FY 2011-FY 2015.

Between FY 2011 and FY 2015, funding for NSF's R&RA Account grew from $5,563.87 million to $5,933.65 million, an overall increase of 6.6 percent.

The CISE plus OCI (FY 2011-FY 2012) and CISE including ACI (FY 2013-FY 2015) budgets grew from $845.03 million to $921.73 million, an increase of 9.1 percent.

OCI funding decreased by 1.06 percent between FY 2011 and FY 2013. Funding for NSF's R&RA Account decreased by 0.03 percent over this time period. ACI funding increased by 5.3 percent between FY 2013 and FY 2015. During the same time, NSF's overall R&RA funding increased by 7.03 percent.
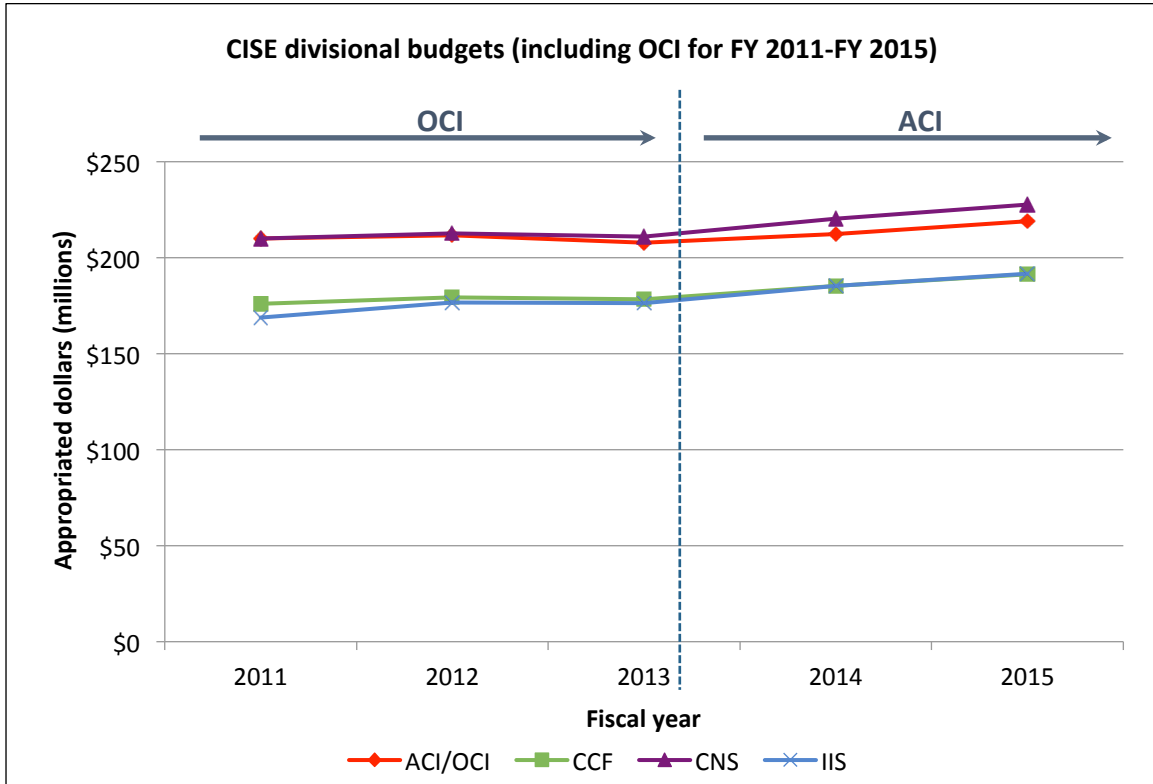

Figure 1: FY 2011-FY 2015 CISE divisional funding (dollars in millions), including OCI in FY 2011-FY 2013. CISE divisions: ACI (FY 2013-FY 2015); Computing & Communication Foundations (CCF);

Computer & Network Systems (CNS); and Information & Intelligent Systems (IIS).

2. Proposal and Award Activity: Overall and by Thematic Area

2.1 Number of proposals received

Figure 2 shows the number of proposals submitted to OCI/ACI by fiscal year between FY 2011 and FY 2015.
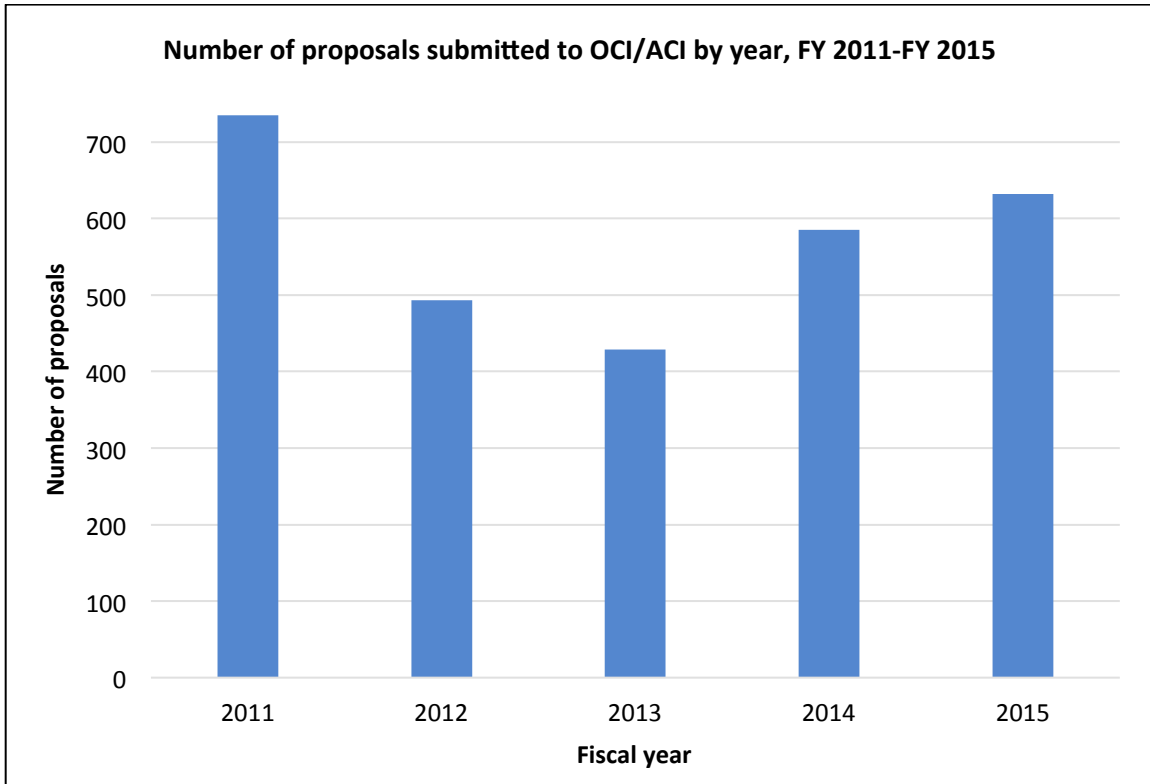
Number of proposals submitted to OCI/ACI by year, FY 2011-FY 2015

Figure 2: Number of proposals received by OCI/ACI in a given year, FY 2011-FY 2015.

We note a substantive decrease in the number of proposals received between FY 2011 and 2012. This decrease tracked a drop in the number of proposals submitted to the Software Infrastructure for Sustained Innovation (SI^2) program: that program ran only one of the three program components, Scientific Software Innovation Institutes (S^2I^2), in FY 2012, resulting in 74 proposals submitted, whereas other classes of awards (namely Scientific Software Elements, SSE, and Scientific Software Integration, SSI) were offered in FY 2011, with more than 300 proposals submitted. This prompted fewer proposal submissions in FY 2012 as compared to FY 2011.

2.2 Distribution of OCI/ACI funding by thematic areas

OCI/ACI investments span seven thematic areas: Data; High-Performance Computing (HPC); Networking and Security; Software; Virtual Organizations (VO); Workforce Development; and Crosscutting. Each of these thematic areas may comprise one or more programs. For example, VO reflects OCI/ACI funding of the Virtual Organizations as Sociotechnical Systems (VOSS)

program, which ended in FY 2013. Similarly, the Workforce Development thematic area includes CAREER proposals. The Crosscutting thematic area includes OCI/ACI's participation in cross-directorate and NSF-wide activities, such as Science, Engineering, and Education for Sustainability (SEES) and Exploiting Parallelism and Scalability (XPS). Figure 3 illustrates the distribution of OCI/ACI funds by primary thematic area.
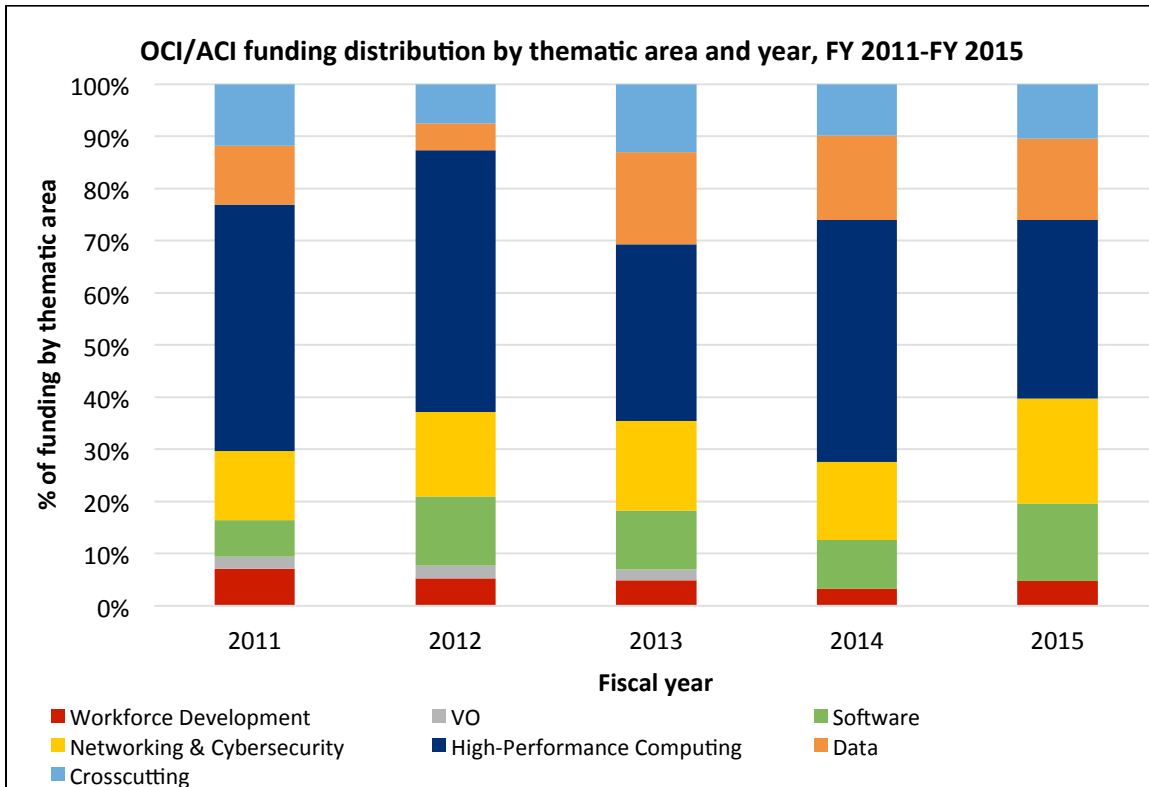

Figure 3: Allocation of OCI/ACI funding by primary thematic area (Data, High-Performance Computing, Networking and Cybersecurity, Software, Virtual Organizations (VO), Workforce Development, and Crosscutting) and year, FY 2011-FY 2015[1].

2.3 Funding rates by thematic areas

Table 2 shows the five-year funding rates by thematic area, calculated as the percentage of

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[1] Data includes programs such as Data Infrastructure Building Blocks (DIBBs) and DataNet, along with the Data component of the Campus Cyberinfrastructure – Data, Networking, and Innovation (CC-DNI) program; High-Performance Computing includes investments in shared research infrastructure (e.g., Blue Waters, Comet), access to those resources (e.g., XSEDE), and contributions to other shared resources (e.g., Open Science Grid); Networking and Cybersecurity includes programs such as Campus Cyberinfrastructure (CC*; exclusive of the Data components of CC-DNI) and International Research Network Connections (IRNC); Software includes programs such as Software Infrastructure for Sustained Innovation (SI^2); VO includes Virtual Organization for Sociotechnical Systems (VOSS), which ended in FY 2013; Workforce Development includes focused programs on learning and workforce such as IGERT-CIF21, the Data-Enabled Science and Engineering (DESE) priority area within the NSF Research Traineeships (NRT) program, and OCI/ACI's CAREER awards; and Crosscutting includes investments in cross-directorate and NSF-wide activities in which OCI/ACI participates, such as Science, Engineering, and Education for Sustainability (SEES) and Exploiting Parallelism and Scalability (XPS).

OCI/ACI proposals in each thematic area that result in awards. A small number of proposals that did not fit into one of the primary thematic areas have been omitted from this analysis. Because of the diversity of programs involved, and their differing and often overlapping timelines, it is difficult to break out thematic funding rate statistics between the OCI and ACI periods. The overall funding rate for proposals processed in FY 2011-FY 2013 was 28 percent, while the overall funding rate for proposals processed in FY 2013-FY 2015 was 37 percent; note that these statistics do not take into account differences in numbers of proposals processed from one year to the next (see, e.g., Figure 2, which shows differences in numbers of proposals submitted by fiscal year) or differences in sizes and scopes of awards issued.

Thematic Area	Mean funding rate, FY 2011-FY 2015
Crosscutting	34%
Data	24%
High-Performance Computing[2]	22%
Networking and Cybersecurity	51%
Software	24%
Virtual Organizations[3]	38%
Workforce Development	35%
Total Mean Funding Rate, FY 2011-FY 2015	33%

Table 2: Mean funding rates across the seven OCI/ACI thematic areas over the five-year period FY 2011-FY 2015. (A small number of proposals that did not fit into any of these thematic areas are excluded.)

3. Joint Funding between OCI/ACI and Other Parts of NSF

As noted earlier, the mission of OCI/ACI is to support and coordinate state-of-the-art research cyberinfrastructure essential to the advancement and transformation of all science and engineering disciplines. Consequently, an important role of OCI/ACI is to collaborate with all NSF directorates and offices to develop models, prototypes, and common approaches to sustainable cyberinfrastructure that open new frontiers for discovery, furthering the mission of NSF as well as national science and engineering priorities. This approach often includes joint funding mechanisms such as:

- Co-funding of proposals submitted to OCI/ACI programs, such as SI[2] or Data Infrastructure Building Blocks (DIBBs);
- Co-funding of proposals submitted to programs that are led by one or more other directorates/offices and that have cyberinfrastructure components of broad research applicability, such as Computational and Data-Enabled Science and Engineering (CDS&E);
- Co-funding of proposals submitted to programs that span one or more other directorates/offices focused on critical research cyberinfrastructure needs for specific

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[2] High-Performance Computing funding rate includes proposals processed from acquisitions solicitations, renewals, and workshops.
[3] Mean for Virtual Organizations is for three fiscal years, FY 2011-FY 2013, as the Virtual Organization for Sociotechnical Systems (VOSS) program ended in FY 2013.

communities, such as EarthCube or the Cyberinfrastructure Framework for 21st-Century Science and Engineering (CIF21) track of the Integrative Graduate Education and Research Traineeship (IGERT) program; and

- Co-funding of proposals submitted to NSF-wide programs and that contain novel or innovative cyberinfrastructure components, such as cyberinfrastructure-related proposals submitted to SEES, Risk and Resilience/Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP), or Understanding the Brain (UtB).

Figure 4 shows the total amount of co-funding of OCI/ACI proposals by other NSF directorates/offices ("Co-Funding $ In") by fiscal year in FY 2011-FY 2015, as well as the total amount of co-funding from OCI/ACI of proposals received by other NSF directorates/offices ("Co-Funding $ Out") during the same period. Additionally, least-squares (linear) regression lines are plotted for both forms of co-funding, depicting overall trends across the five-year period.
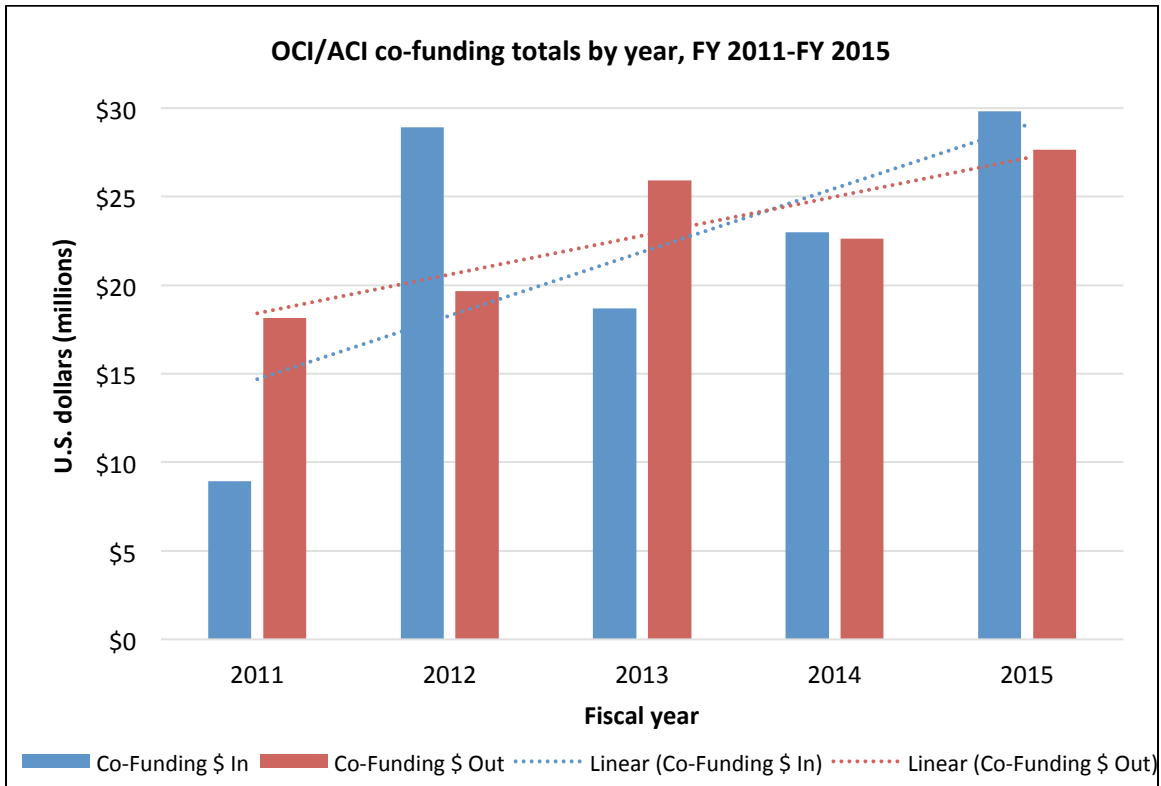

Figure 4: Co-funding with OCI/ACI by year, FY 2011-FY 2015. "Co-Funding $ In" represents co-funding of OCI/ACI proposals by other NSF directorates/offices; "Co-Funding $ Out" represents OCI/ACI co-funding of proposals processed by other NSF directorates/offices by OCI/ACI. Least-squares (linear) regression lines are also plotted.

4. Demographics of the OCI/ACI-Supported Community

When submitting proposals to NSF, PIs have the option of self-reporting a number of key demographics. Figures 5-7 show proposals received by OCI/ACI in a given fiscal year by self-reported (including un-reported) gender, minority status, and disability status.
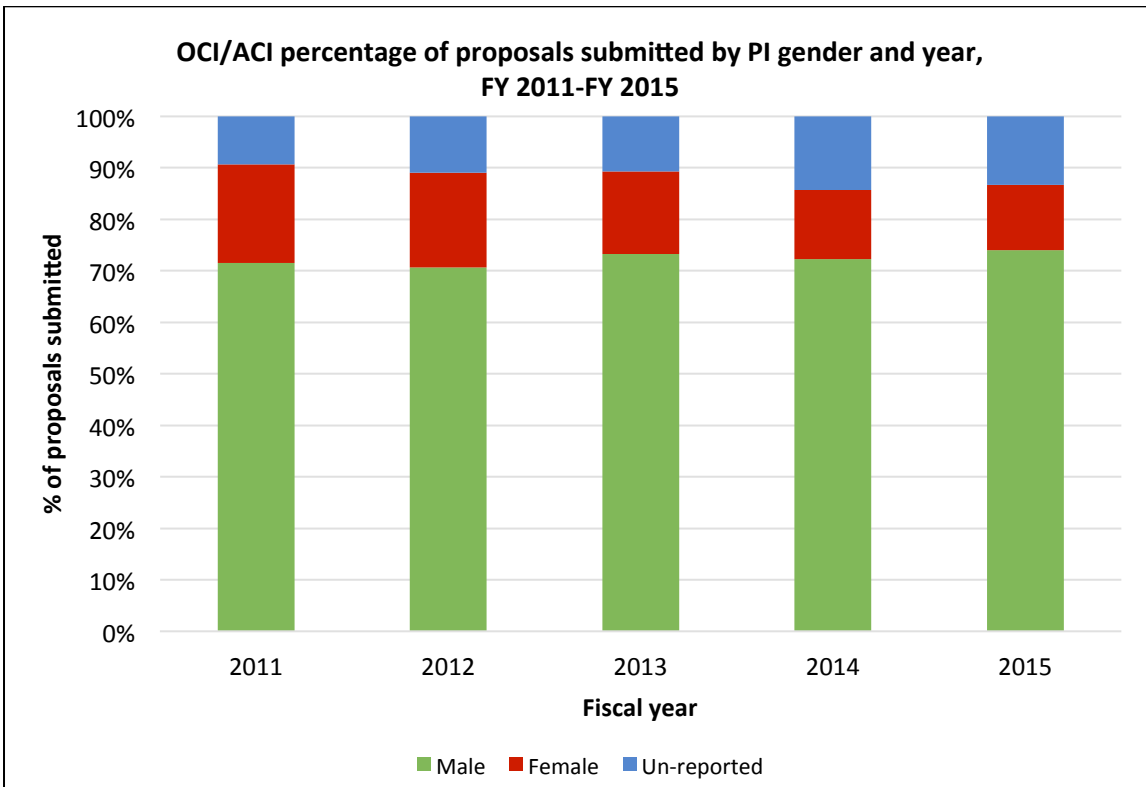
Figure 5: Distribution of proposals received by OCI/ACI in a given year by self-reported PI gender, FY 2011-FY 2015.
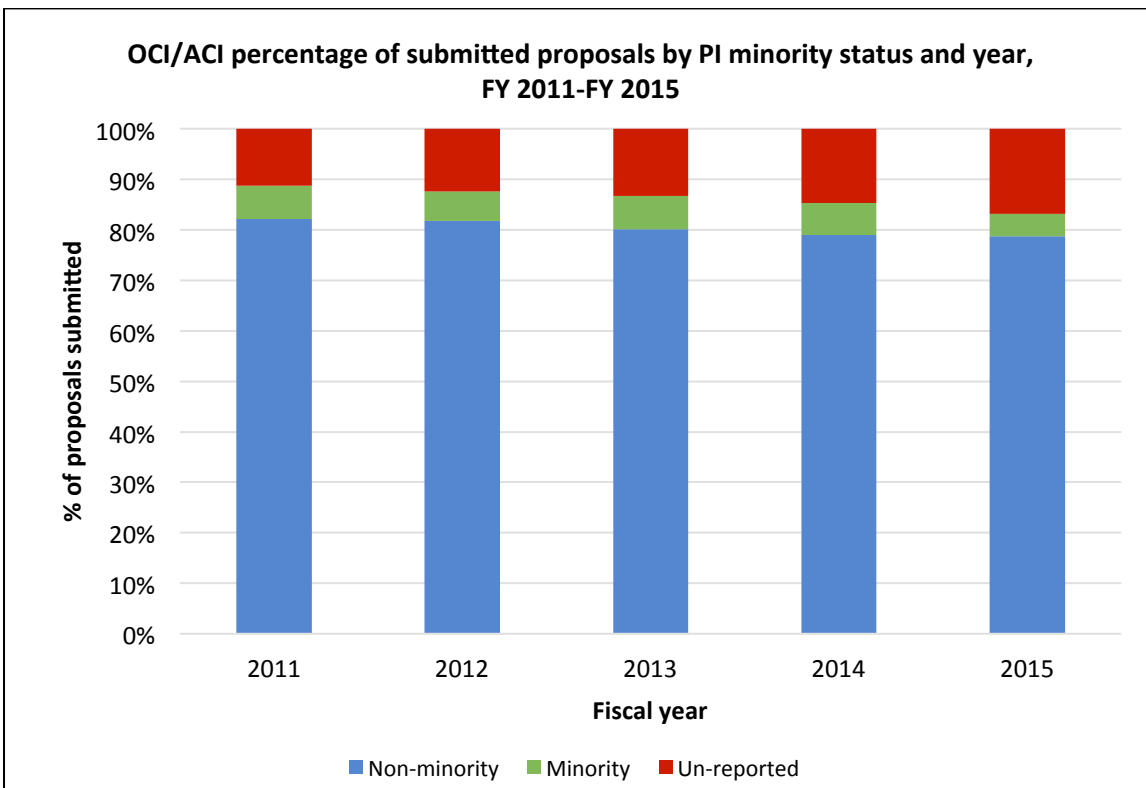

Figure 6: Distribution of proposals received by OCI/ACI in a given year by self-reported PI minority status, FY 2011-FY 2015. Minority status includes American Indian or Alaska Native; Black or African American; Hispanic or Latino; and Native Hawaiian or Other Pacific Islander.
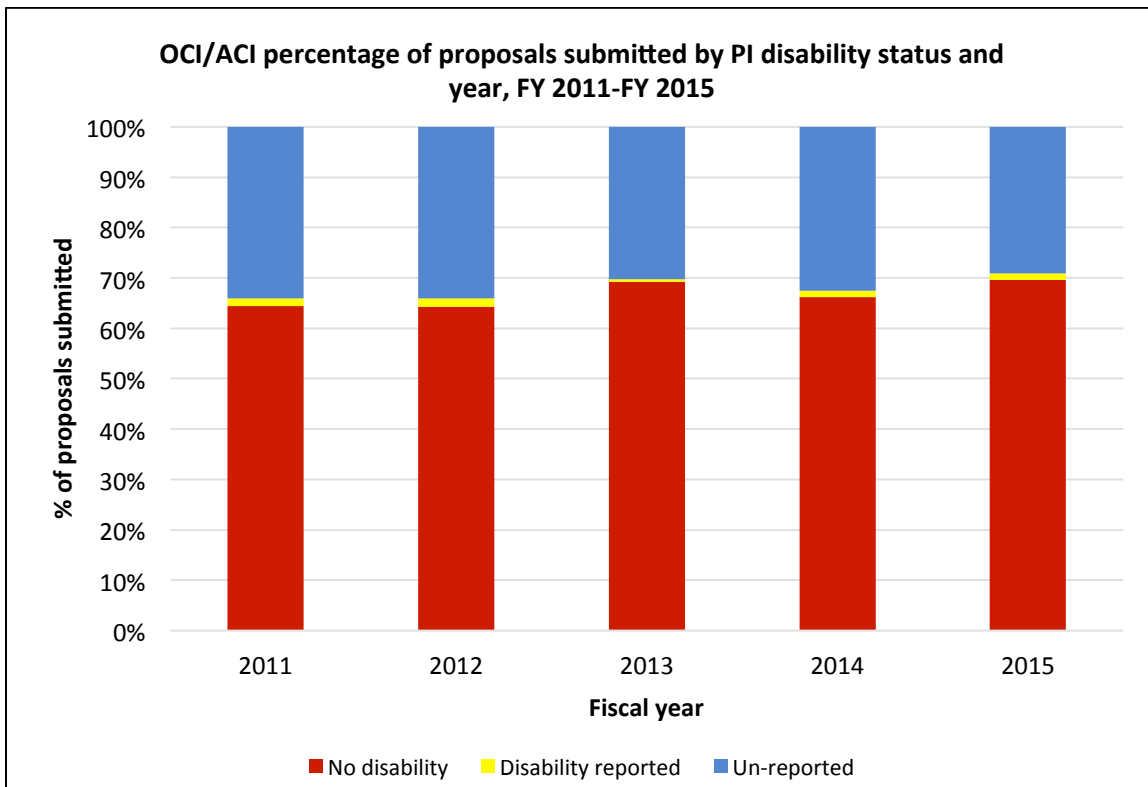
OCI/ACI percentage of proposals submitted by PI disability status and year, FY 2011-FY 2015

Figure 7: Distribution of proposals received by OCI/ACI in a given year by self-reported PI disability status, FY 2011-FY 2015. Disability status includes hearing impairment, visual impairment, mobility/orthopedic impairment, or other (as reported by the PI).

Figure 8 shows the percentage of OCI/ACI proposals (awards and declines) from institutions in U.S. states and territories designated as members of the Experimental Program to Stimulate Competitive Research (EPSCoR) compared to the percentage of proposals from non-EPSCoR states and territories[4]. For Figures 8 and 9, EPSCoR designation is based on the original time of proposal submission.

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[4] See http://www.nsf.gov/od/oia/programs/epscor/statewebsites.jsp for a list of current EPSCoR states.

OCI/ACI percentage of awards and declines by EPSCoR state status, award/decline status, and fiscal year processed, FY 2011-2015
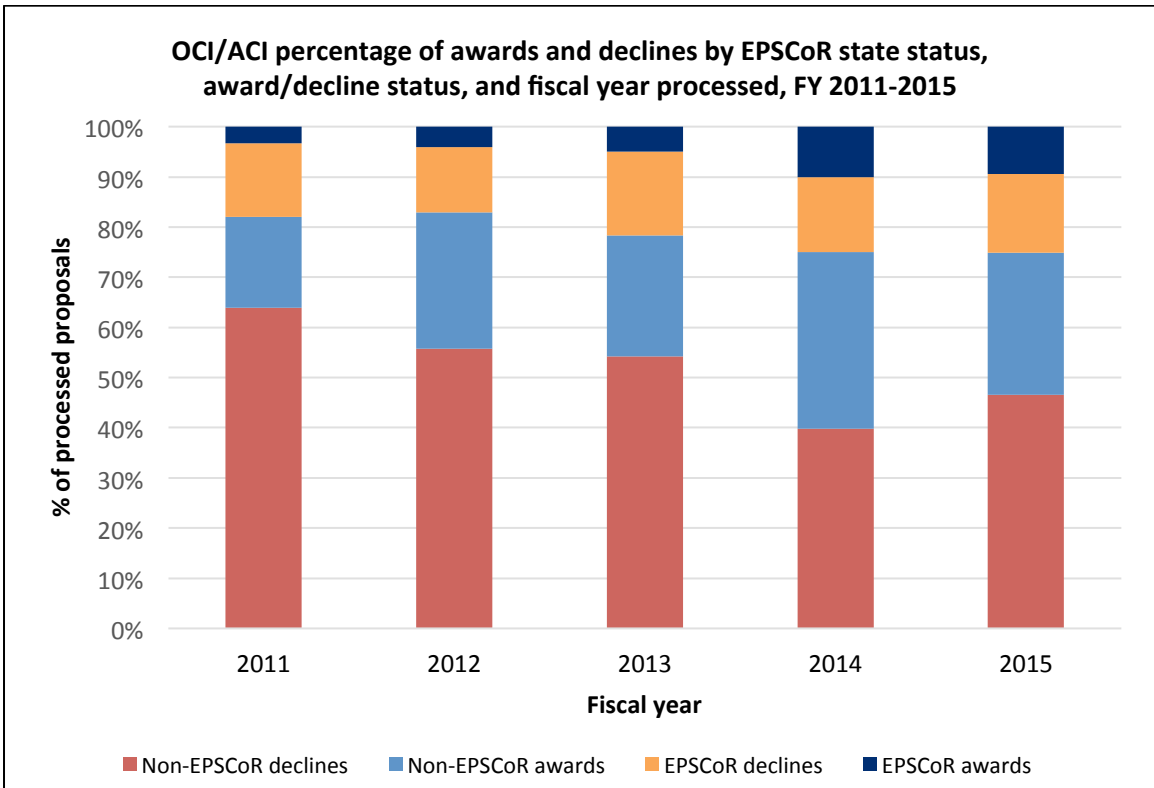
Figure 8: OCI/ACI proposals and awards processed in a given year, as distinguished by EPSCoR status, FY 2011-FY 2015.

Figure 9 shows the percentage of awards in a given fiscal year, as distinguished by EPSCoR status.
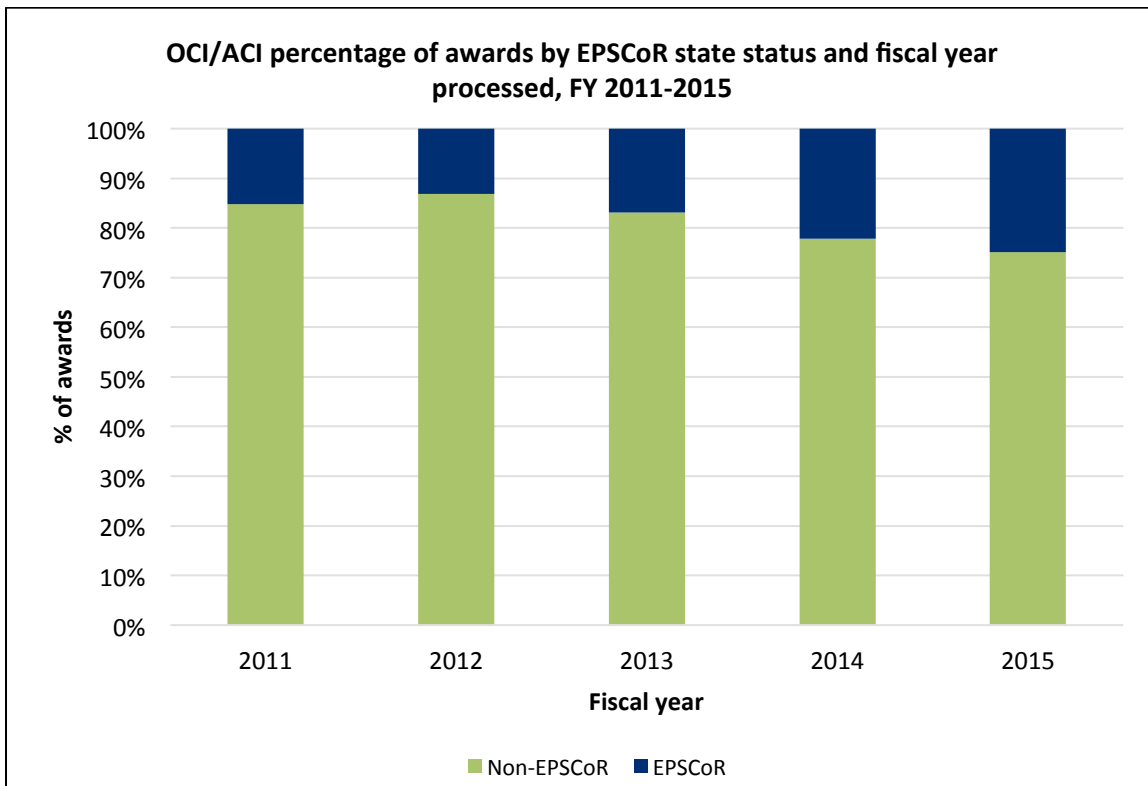
Figure 9: OCI/ACI awards processed in a given year, as distinguished by EPSCoR status, FY 2011-FY 2015.

5. Staffing for OCI/ACI

Table 3 shows the number of OCI/ACI staff in a given category – program staff, administrative support staff, management, and intermittent experts (consultants) in each year for the period FY 2011-15. The data correspond to a snapshot on April 1 of each year.

OCI/ACI staffing[5]	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Program staff	9	9	7	8	9
Administrative support staff	7	7	8	6	6
Management	2	2	2	2	2
Intermittent experts (consultants)	0	0	0	1	1

Table 3: Staffing levels for OCI/ACI by category and year, FY 2011-FY 2015.

6. Summary

The proposal, award, and budget data presented in this document aim to inform comments responsive to the DCL.

As noted in the DCL, NSF is particularly interested in community input on the following questions:

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[5] AAAS Science & Technology Policy Fellows, Albert Einstein Distinguished Educator Fellows, and contractors are not shown.

(1) Given the data and trends available above, direct interactions with ACI, and in the context of NSF's budgets, indicate the extent to which ACI's current role within NSF supports and anticipates the cyberinfrastructure needed by science and engineering research communities.

(2) Given the data and trends available above, direct interactions with ACI, and in the context of NSF's budgets, what additional improvements can you suggest to further ACI's role and contribution to research cyberinfrastructure in support of NSF's mission?

(3) Are there particular positive or negative trends that, in your opinion, arise directly from the realignment of OCI within CISE as ACI?

Comments from the interested community should be submitted by 6/30/2016. These comments will be used internally within NSF. Succinct responses are most useful to the review group, but there are no formal restrictions on the form or length of comments. Please send comments to:

NSF Advanced Cyberinfrastructure Review Input
aci-review@nsf.gov