

ENGINEERING RESEARCH CENTERS 2019 END-OF-YEAR SLIDES



i. 19 ERCs Referenced in Slides 1–5

ERC for Integrated Access Networks at the University of Arizona (CIAN) (Class: 2008; AY: 2008 – 2019; RY: 2008 – 2019)*

Future Renewable Electric Energy and Management Systems Center at North Carolina State University (FREEDM) (Class: 2008; AY: 2008 – 2019; RY: 2008 – 2019)*

NSF Nanosystems Engineering Research Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST) (Class: 2012; AY: 2012 – 2019; RY: 2012 – 2019)*

Nanosystems Engineering Research Center for Nanotechnology Enabled Water Treatment Systems at Rice University (NEWT) (Class: 2015; AY: 2015 – 2019; RY: 2015 – 2019)*

Engineering Research Center for Bio-mediated and Bioinspired Geotechnics at Arizona State University (CBBG) (Class: 2015; AY: 2015 – 2019; RY: 2015 – 2019)*

ERC for Precise Advanced Technologies and Health Systems for Underserved Populations at Texas A&M University (PATHS-UP) (Class: 2017; AY: 2017 – 2019; RY: 2017 – 2019)*

ERC for Directed Multiscale Assembly of Cellular Metamaterials with Nanoscale Precision at Boston University (CELL-MET) (Class: 2017; AY: 2017 – 2019; RY: 2017 – 2019)*

ERC for Power Optimization for ElectroThermal Systems at University of Illinois (POETS) (Class: 2015; AY: 2015 – 2019; RY: 2015 – 2019)*

ERC for Innovative and Strategic Transformation of Alkane Resources at Purdue University (CISTAR) (Class: 2017; AY: 2017 – 2019; RY: 2017 – 2019)*

ERC for Quantum Energy and Sustainable Solar Technologies at Arizona State University (QESST) (Class: 2011; AY: 2011 – 2019; RY: 2011 – 2019)*

ERC for Cell Manufacturing Technologies at Georgia Institute of Technology (CMaT) (Class: 2017; AY: 2017 – 2019; RY: 2017 – 2019)*

ERC for Re-inventing the Nation's Urban Water Infrastructure at Stanford University (ReNUWIt) (Class: 2011; AY: 2011 – 2019; RY: 2011 – 2019)*

Center for Biorenewable Chemicals at Iowa State University (IOWA) (Class: 2008; AY: 2008 – 2019; RY: 2008 – 2019)*

Nanosystems Engineering Research Center for Translational Applications of Nanoscale Multiferroic Systems at University of California Los Angeles (TANMS) (Class: 2012; AY: 2012 – 2019; RY: 2012 – 2019)*

ERC for Lighting Enabled Systems & Applications at Rensselaer Polytechnic Institute (LESA) (Class: 2008; AY: 2008 – 2019; RY: 2008 – 2019)*

ERC for Ultra-wide-area Resilient Electric Energy Transmission Networks at University of Tennessee (CURENT) (Class: 2011; AY: 2011 – 2019; RY: 2011 – 2019)*

NSF Nanosystems Engineering Research Center for Nanomanufacturing Systems for Mobile Computing and Mobile Energy Technologies at University of Texas (NASCENT) (Class: 2012; AY: 2012 – 2019; RY: 2012 – 2019)*

Center for Neurotechnology at University of Washington (CNT) (Class: 2011; AY: 2011 – 2019; RY: 2011 – 2019)*

ERC for Revolutionizing Metallic Biomaterials at North Carolina A&T State University (NCAT) (Class: 2008; AY: 2008 – 2019; RY: 2008 – 2019)*

**AY and RY denotes the Award Year and Reporting Year Range*

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- ii. “Annualized ERCs” on slides 1–5 include the 19 ERCs from the previous slide and the following additional 5 ERCs

Quality of Life Technology Engineering Research Center at Carnegie Mellon University (CMU) (Class: 2006; AY: 2006 – 2015; RY: 2006 – 2014)*

Engineering Research for Structured Organic Particulate Systems at Rutgers University (C-SOPS) (Class: 2006; AY: 2006 – 2016; RY: 2006 – 2015)*

Engineering Research Center for Compact and Efficient Fluid Power at the University of Minnesota – Twin Cities (Class: 2006; AY: 2006 – 2016; RY: 2006 – 2017)*

Synthetic Biology ERC at the University of California, Berkeley (SynBERC) (Class: 2006; AY: 2006 – 2016; RY: 2006 – 2015)*

ERC on Mid-Infrared Technologies for Health and the Environment at Princeton University (MIRTHE) (Class: 2006; AY: 2006 – 2016; RY: 2006 – 2016)*

**AY and RY denotes the Award Year and Reporting Year Range*

1 | ERC Products of Innovation, FY 1985–2019*

	FY 2019 (19 ERCs)		FY 2014–2018 Annualized		FY 1985–2019 (65 ERCs)
<i>Intellectual Property Transaction</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
Inventions Disclosed	62	3	91	5	2,507
Patent Applications Filed (Provisional and Full)	73	4	105	6	2,173
Patents Awarded	10	1	33	2	861
Licenses Issued	5	< 1	12	1	1,368
<i>Economic Development</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
Spinoff Companies	5	< 1	10	1	228
Spinoff Employees	51	3	74	4	1,465

* Does not include centers from the Earthquake Technology Sector

2 | ERC Influence on Curriculum, FY 1985–2019*

	FY 2019 (19 ERCs)		FY 2014–2018 Annualized		FY 1985–2019 (65 ERCs)
<i>Degrees</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
New Full-Degree Programs Based on ERC Research	1	< 1	2	< 1	55
New Degree Minors Based on ERC Research	1	< 1	0	< 1	32
New Certificate Programs Based on ERC Research	0	< 1	3	< 1	41
<i>Courses</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
New Courses Based on ERC Research	23	1	33	2	1,053
Ongoing Courses With ERC Content	223	12	312	17	3,237
Course Modules Based on ERC Research	22	1	37	2	702
<i>Textbooks</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
New Textbooks Based on ERC Research	3	< 1	5	< 1	182
New Textbook Chapters Based on ERC Research	4	< 1	10	1	104

* Does not include centers from the Earthquake Technology Sector

3 | ERC Information Dissemination, FY 1985–2019*

	FY 2019 (19 ERCs)		FY 2014–2018 Annualized		FY 1985–2019 (65 ERCs)
<i>Peer-Reviewed Publications (Total)</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
Journals**	705	37	988	54	24,017
Conference Proceedings**	406	21	571	32	18,119
Trade Journals	7	< 1	17	1	640
Coauthored With ERC Students	452	24	641	35	12,582
<i>Education and Outreach</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
Education and Colloquia	855	45	955	53	16,968
Workshops, Short Courses, and Webinars	366	19	373	21	5,550

* Does not include centers from the Earthquake Technology Sector

** Includes publications that result from center support, associated projects, and sponsored projects

	FY 2019 (19 ERCs)		FY 2014–2018 Annualized		FY 2007–2019 (39 ERCs)
	Total	Per Center	Total	Per Center	Total
<i>New and Ongoing Courses, Workshops, Short Courses, Webinars, and Textbooks Based on ERC Research</i>					
With Engineered-System Focus	265	14	403	22	3,748
With Multidisciplinary Content	176	9	335	18	3,245
Offered at Undergraduate Level	160	8	239	13	2,243
Offered at Graduate Level	180	9	319	17	3,038
Used at More Than One ERC Institution	72	4	102	6	850
Team Taught by Faculty in More Than One Department	88	5	75	4	836

* Does not include centers from the Earthquake Technology Sector

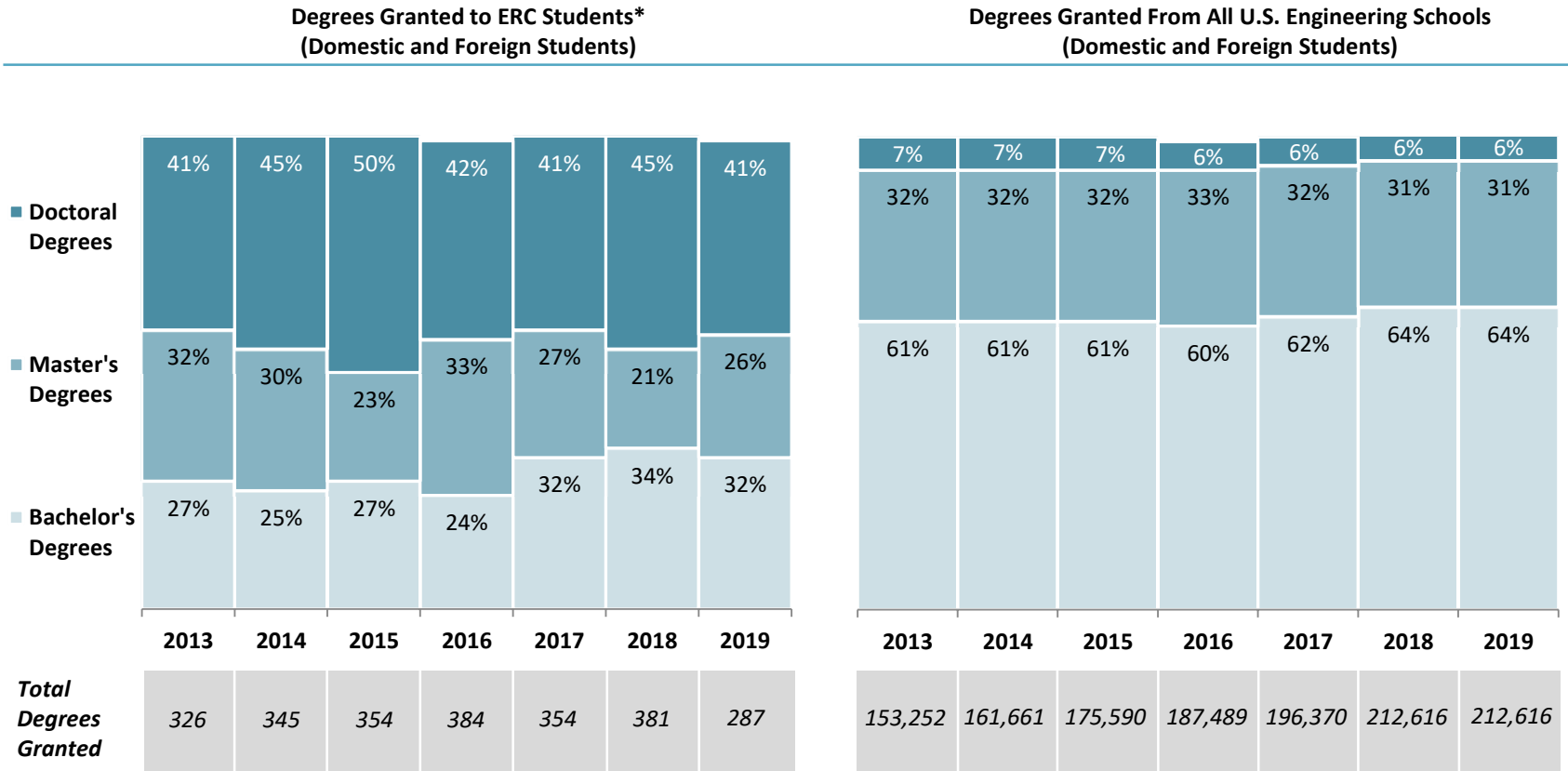
** Data collection of curricular impacts started in 2007.

5 | ERC Student Degrees, FY 1985–2019*

	FY 2019 (19 ERCs)		FY 2014–2018 Annualized		FY 1985–2019 (65 ERCs)
<i>Degree Type</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
Bachelor's	93	5	104	6	4,507
Master's	76	4	98	5	4,314
Doctoral	118	6	162	9	5,080
<i>Total</i>	<i>287</i>	<i>15</i>	<i>364</i>	<i>20</i>	<i>13,901</i>

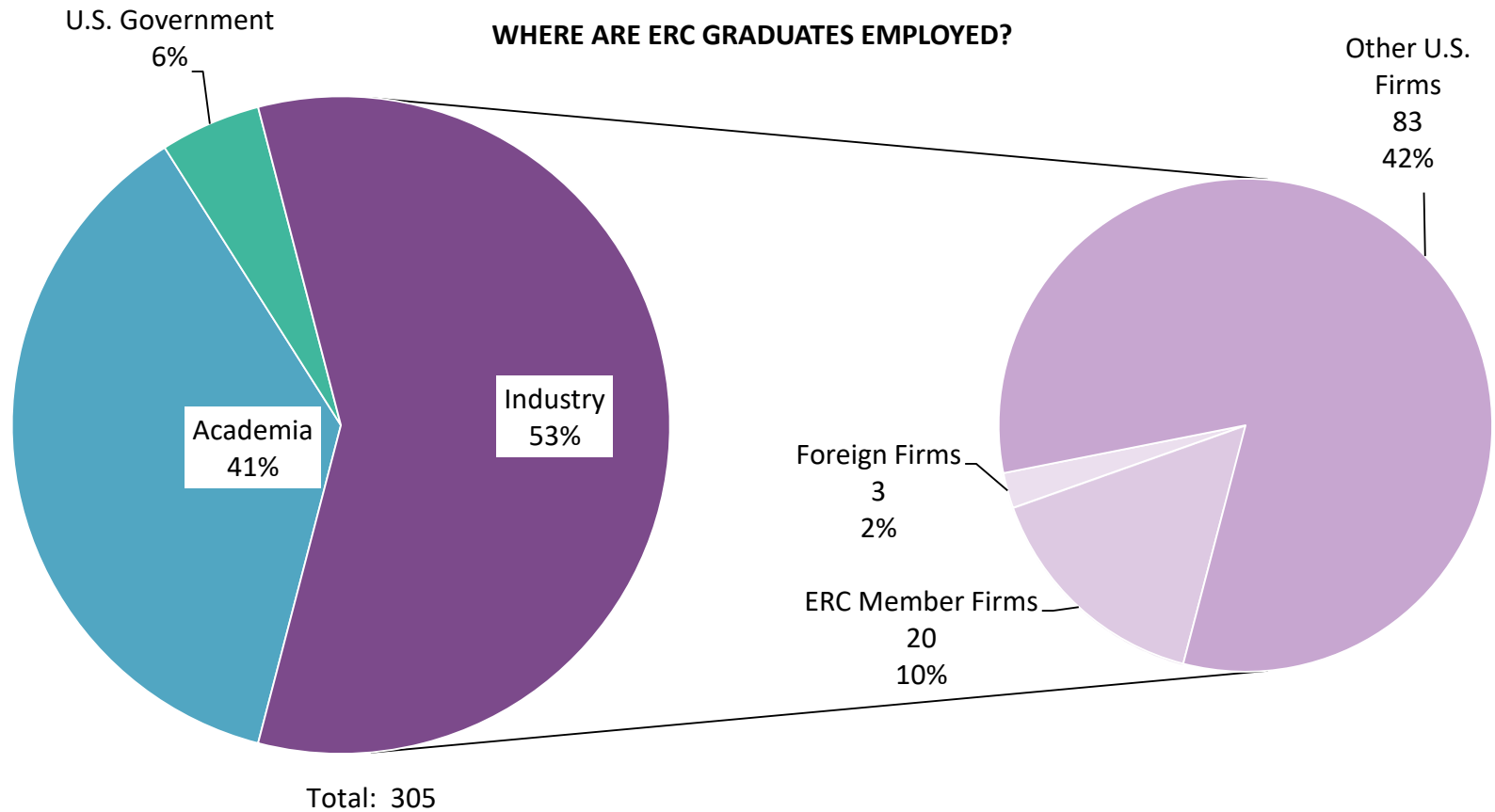
* Does not include centers from the Earthquake Technology Sector

Degrees Granted to ERC Students vs. All U.S. Engineering Graduates, FY 2013–2019



* Does not include centers from the Earthquake Technology Sector

Data Source: American Society for Engineering Education (ASEE) (<http://edms.asee.org>)



ERC Research and Education Personnel, by Underrepresented Group and Citizenship Status, FY 2019

Personnel Category	Total	Total U.S. Citizens and Permanent Residents	Women*		Underrepresented Racial Minorities*		Hispanic*		Foreign	
			Number	%	Number	%	Number	%	Number	%
Faculty										
Total	571	464	127	27%	26	6%	49	11%	59	10%
Graduate Students										
Postdocs	167	57	26	46%	2	4%	4	7%	95	57%
Graduate Students	1,105	520	195	38%	41	8%	67	13%	473	43%
Doctoral	906	417	156	37%	31	7%	43	10%	419	46%
Master's	200	104	39	38%	10	10%	24	23%	54	27%
Total**	1,270	576	220	38%	43	7%	71	12%	567	45%
Undergraduate Students										
ERC Undergraduate Students (Research Assistants, Non-REU Students)	765	522	258	49%	68	13%	135	26%	41	5%
NSF REU Site Award Students	101	101	55	54%	20	20%	30	30%	0	0%
ERC's Own REU Students	130	117	59	50%	35	30%	46	39%	0	0%
Total**	947	694	350	50%	111	16%	186	27%	41	4%
Community College										
Participants in RET Program	3	3	2	67%	0	0%	1	33%	0	0%
K-12 Teachers										
K-12 RET	150	131	75	57%	27	21%	16	12%	0	0%
K-12 Non-RET	56	53	30	57%	13	25%	9	17%	0	0%
Total	206	184	105	57%	40	22%	25	14%	0	0%
Young Scholars										
Total	186	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grand Total***	3,216	1,954	831	43%	227	12%	339	17%	667	22%

* U.S. citizens and permanent residents only

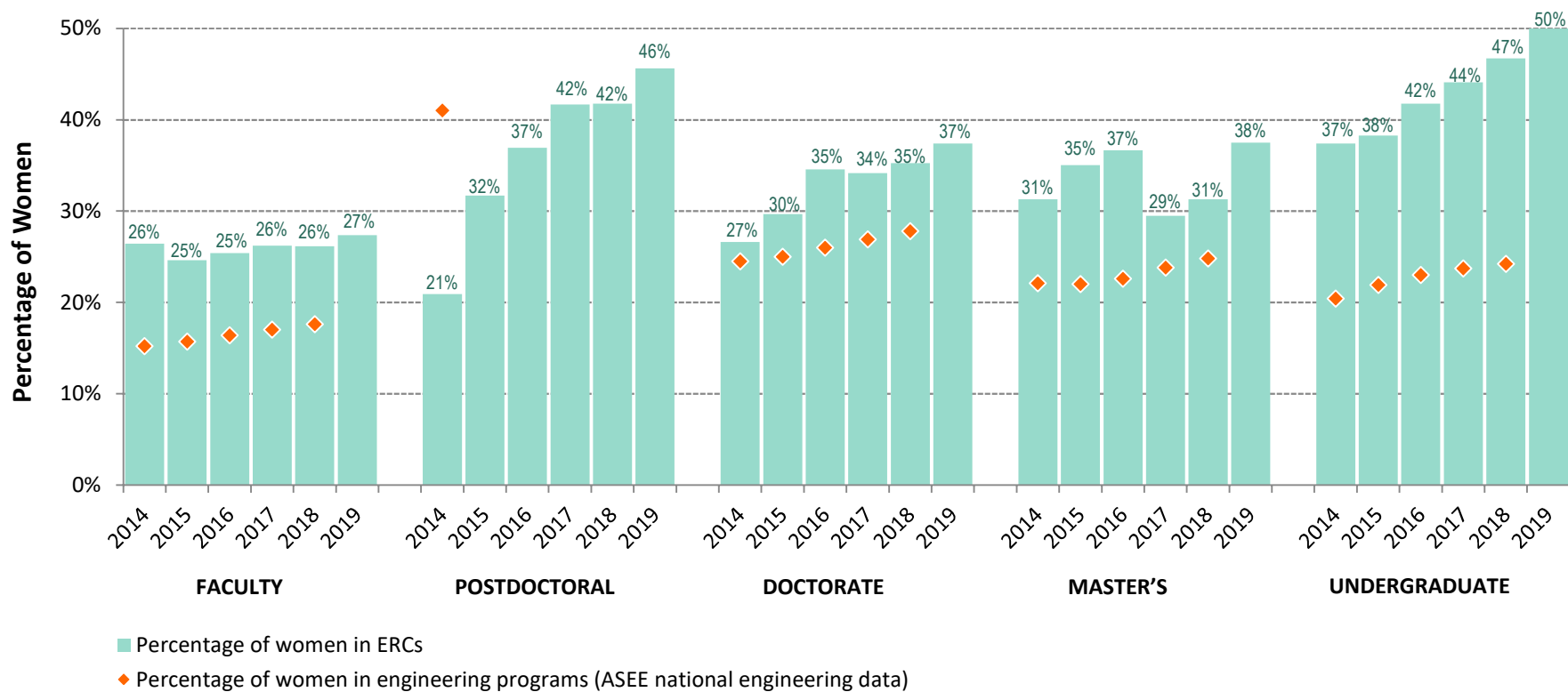
** The sum of the number of personnel for each row may exceed the total because personnel may belong to multiple categories.

*** Leadership/Administration Directors, Thrust Leaders, and Education Program Leaders are included in the Grand Total. For the Grand Total row, all columns exclude Young Scholars, except the Total column.

NOTE: For years in which the center entered demographic data by institution rather than per person, data are not included.

Outreach Participants	Total
<i>Community College Events</i>	
Faculty Who Attended ERC-Sponsored Educational Outreach Events	30
Students Who Attended ERC-Sponsored Educational Outreach Events	357
Total	387
<i>K–12 Events</i>	
Pre-college K–12 Teachers	6,838
K–12 Students	81,847
Total	88,685
<i>Grand Total</i>	
<i>89,072</i>	

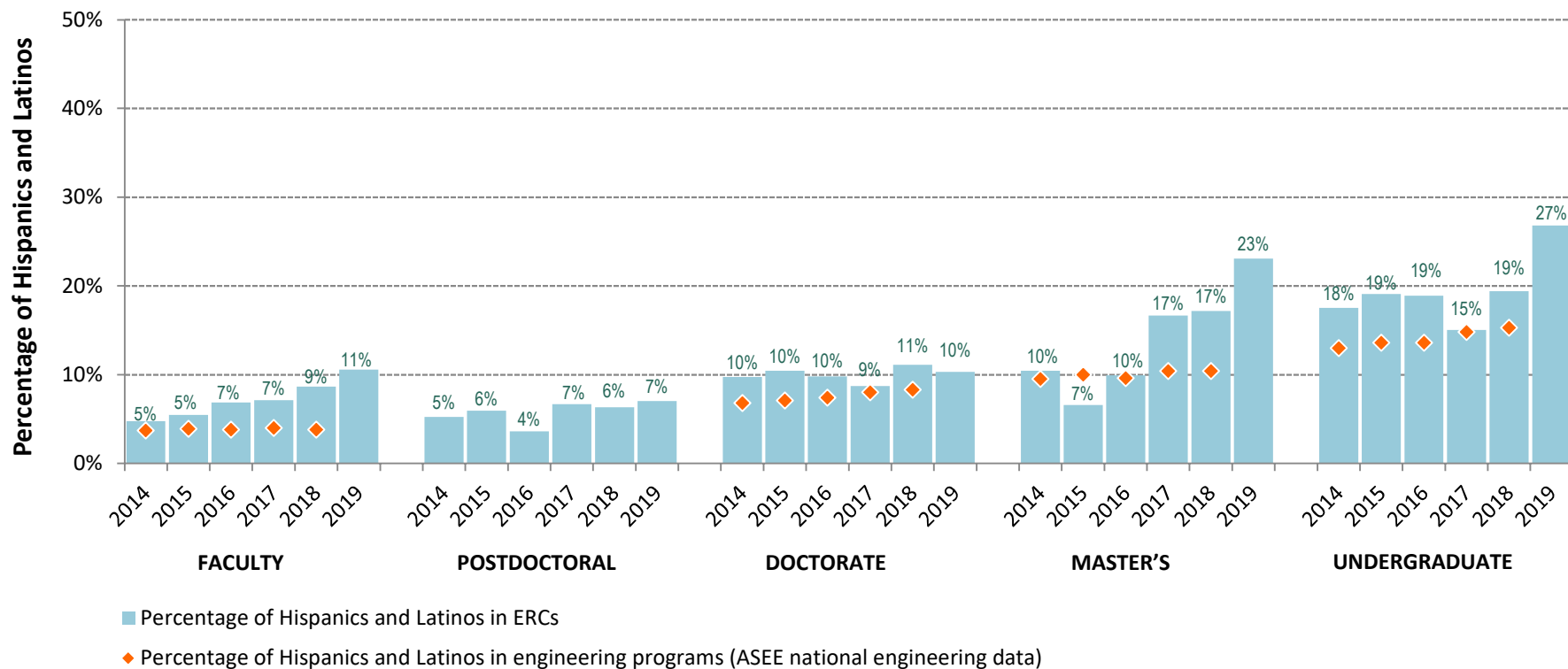
Percentage of Women Personnel in ERCs vs. Percentage of Women in Engineering Programs Generally

**NOTES:**

- Data from centers are not included for years in which the center entered demographic data by institution rather than per person
- Both ERC data and National statistics are for U.S. citizens and permanent residents only
- Undergraduates include REU students
- The percentages of women are calculated out of the total number of U.S. citizens and permanent residents, including personnel who did not report gender
- ASEE data were not collected for 2019 and for postdoctoral for 2015–2019
- The percentages of personnel who did not report gender are as follows: 2014: 7.34%, 2015: 8.12%, 2016: 9.77%, 2017: 12.06%, 2018: 10.67%, 2019: 10.95%

11 Hispanics and Latinos in ERCs, FY 2014–2019

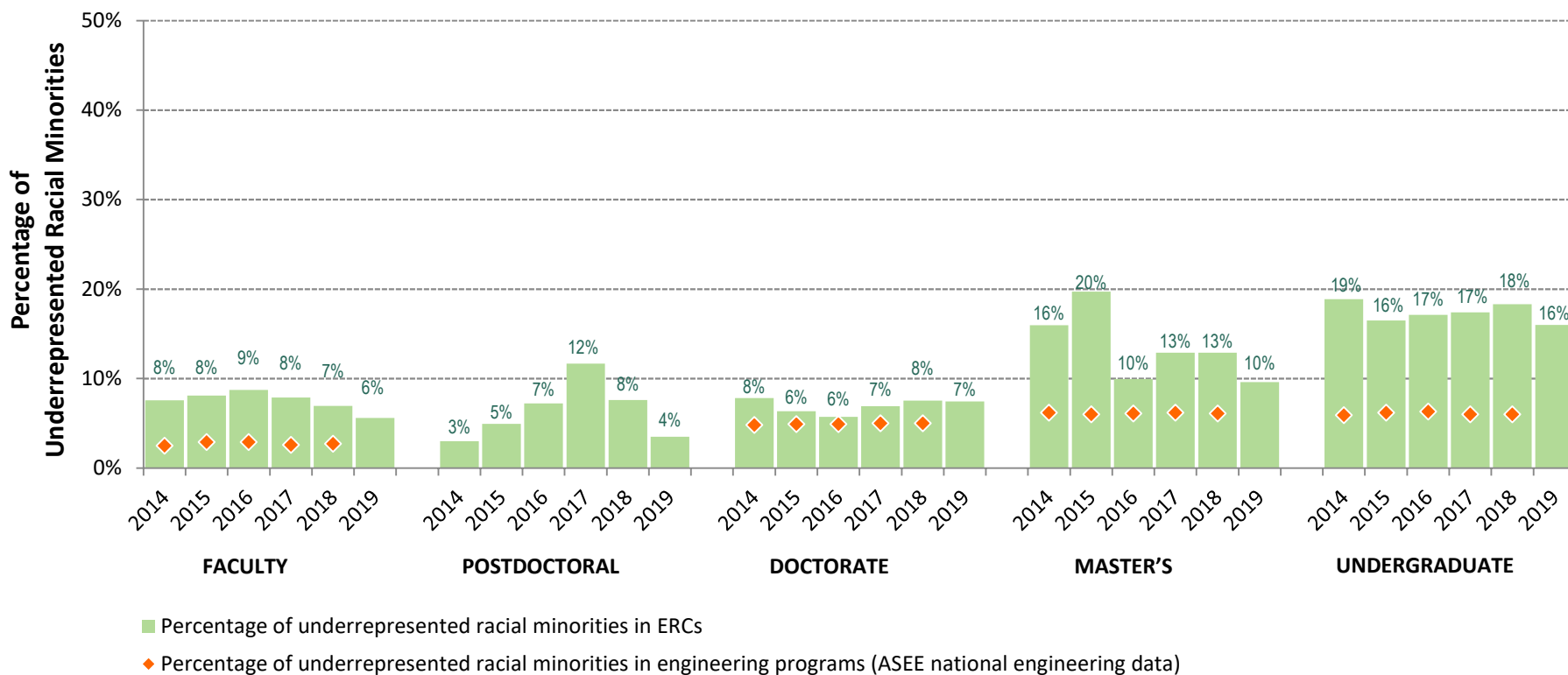
Percentage of Hispanic and Latino Personnel in ERCs vs. Percentage of Hispanics and Latinos in Engineering Programs Generally



NOTES:

- Data from centers are not included for years in which the center entered demographic data by institution rather than per person
- Both ERC data and National statistics are for U.S. citizens and permanent residents only
- Undergraduates include REU students
- The percentages of Hispanics and Latinos are calculated out of the total number of U.S. citizens and permanent residents, including personnel who did not report ethnicity
- ASEE data were not collected for 2019 and for postdoctoral for 2014–2019
- The percentages of personnel who did not report ethnicity are as follows: 2014: 18.61%, 2015: 17.59%, 2016: 20.85%, 2017: 17.43%, 2018: 15.81%, 2019: 15.57%

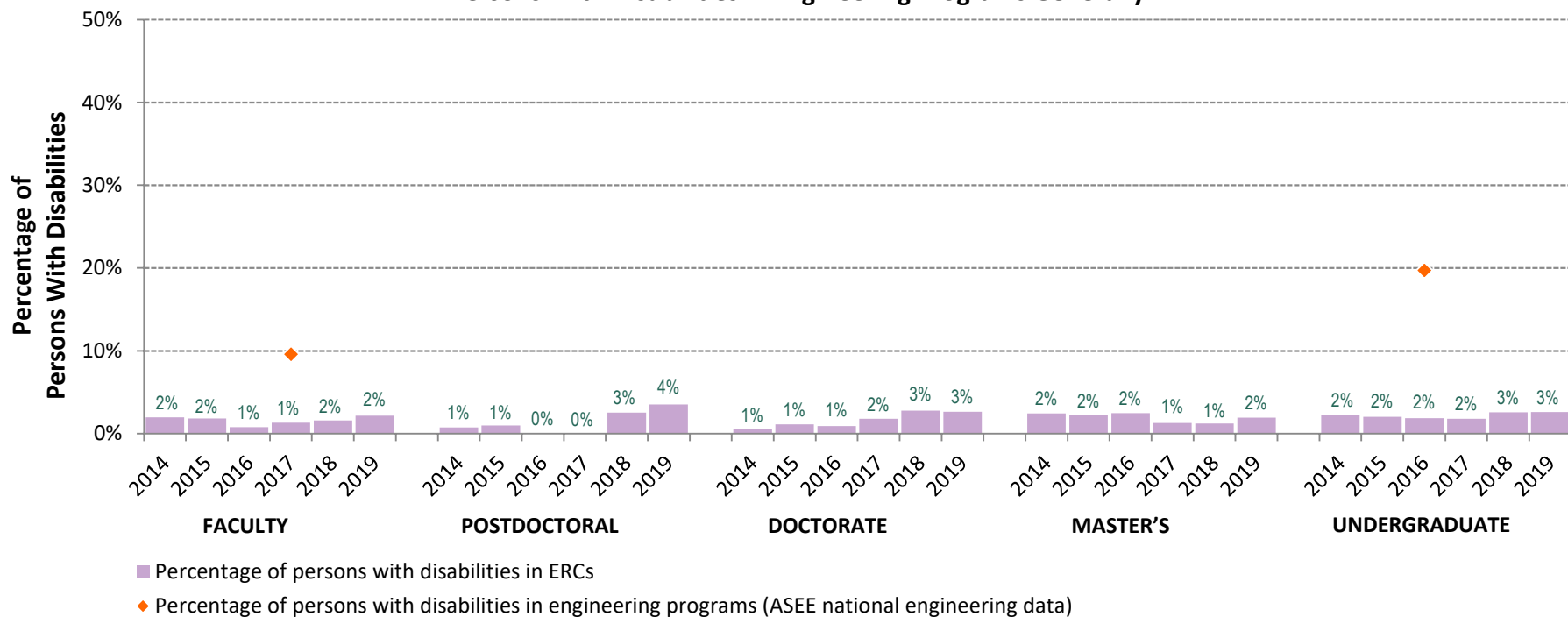
Percentage of Underrepresented Racial Minority Personnel in ERCs vs. Percentage of Underrepresented Racial Minorities in Engineering Programs Generally



NOTES:

- Data from centers are not included for years in which the center entered demographic data by institution rather than per person
- Both ERC data and National statistics are for U.S. citizens and permanent residents only
- Undergraduates include REU students
- The percentages of underrepresented racial minorities are calculated out of the total number of U.S. citizens and permanent residents, including personnel who did not report race
- ASEE data were not collected for postdoctoral for 2014–2019
- The percentages of personnel who did not report race are as follows: 2014: 19.07%, 2015: 19.24%, 2016: 22.06%, 2017: 17.88%, 2018: 16.91%, 2019: 17.68%

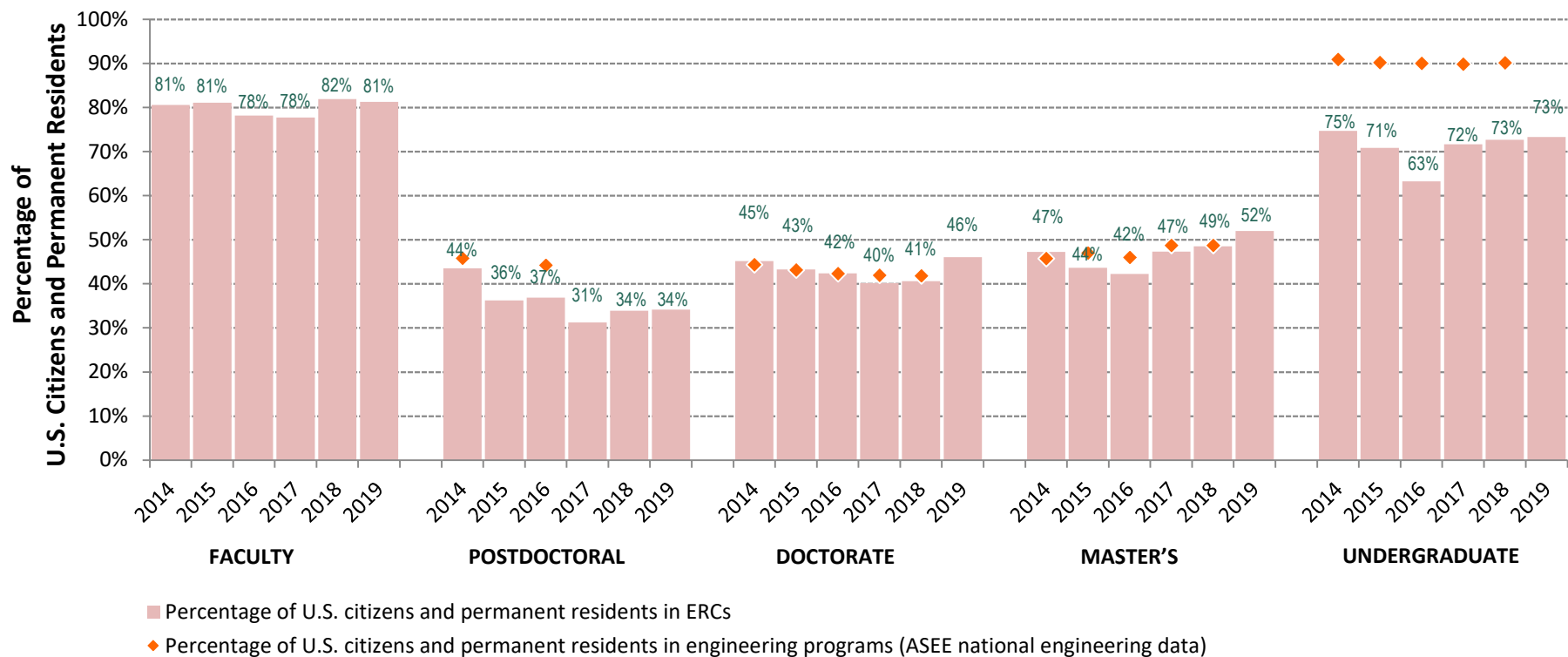
Percentage of Persons With Disabilities Personnel in ERCs vs. Percentage of Persons With Disabilities in Engineering Programs Generally



NOTES:

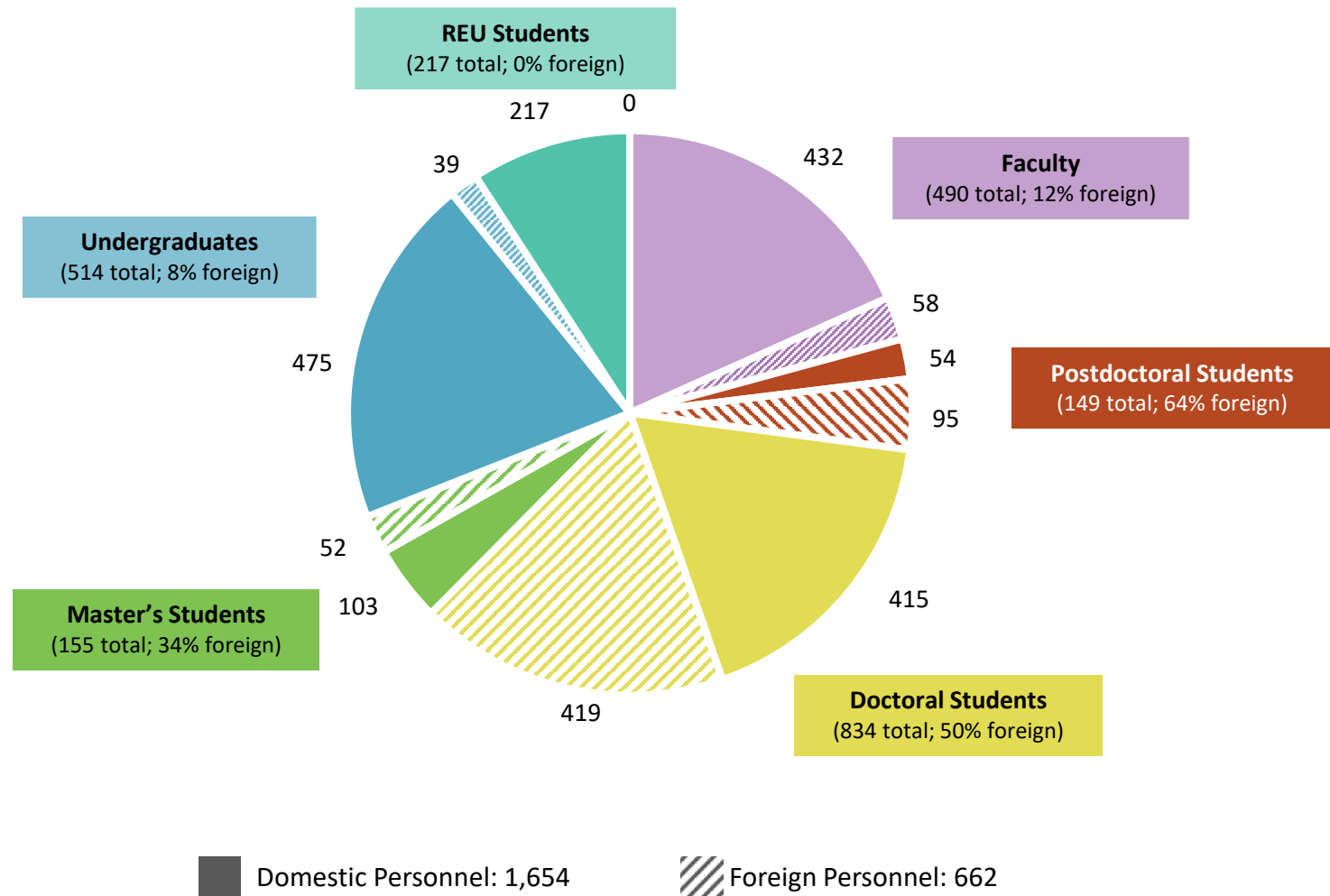
- Data from centers are not included for years in which the center entered demographic data by institution rather than per person
- Undergraduates include REU students
- The percentages of persons with disabilities are calculated out of the total number of U.S. citizens and permanent residents, including personnel who did not report disability status
- The national percentages for persons with disabilities are for all persons, regardless of citizenship. The national percentages for doctoral students with disabilities and master's students with disabilities are from the national percentages for graduate students (master's and doctoral students combined)
- ASEE data are only available for faculty for 2017 and for undergraduate for 2016
- The percentages of personnel who did not report disability status are as follows: 2014: 20.67%, 2015: 21.86%, 2016: 23.79%, 2017: 27.63%, 2018: 20.44%, 2019: 21.66%

Percentage of U.S. Citizen and Permanent Resident Personnel in ERCs vs. Percentage of U.S. Citizens and Permanent Residents in Engineering Programs Generally

**NOTES:**

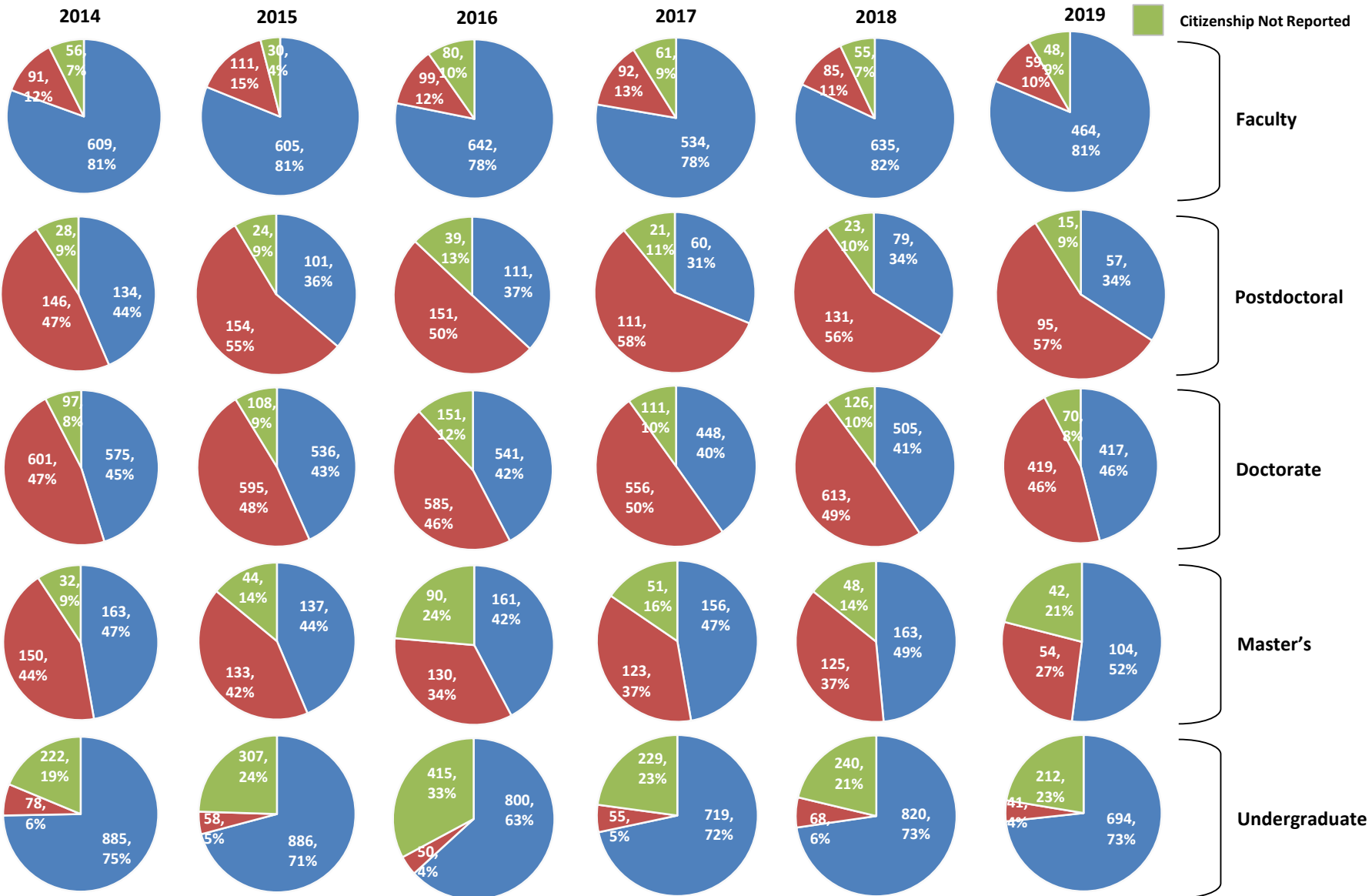
- Data from centers are not included for years in which the center entered demographic data by institution rather than per person
- Undergraduates include REU students
- The percentages of U.S. citizens and permanent residents are calculated out of the total number of personnel, including personnel who did not report citizenship
- ASEE data are not yet available for 2019 and were not collected for faculty for 2014–2019 or for postdoctoral for 2015, and 2017–2019
- The percentages of personnel who did not report citizenship are as follows: 2014: 11%, 2015: 13.49%, 2016: 18.42%, 2017: 14.07%, 2018: 13.09%, 2019: 12.73%

Personnel Conducting ERC Research, FY 2019

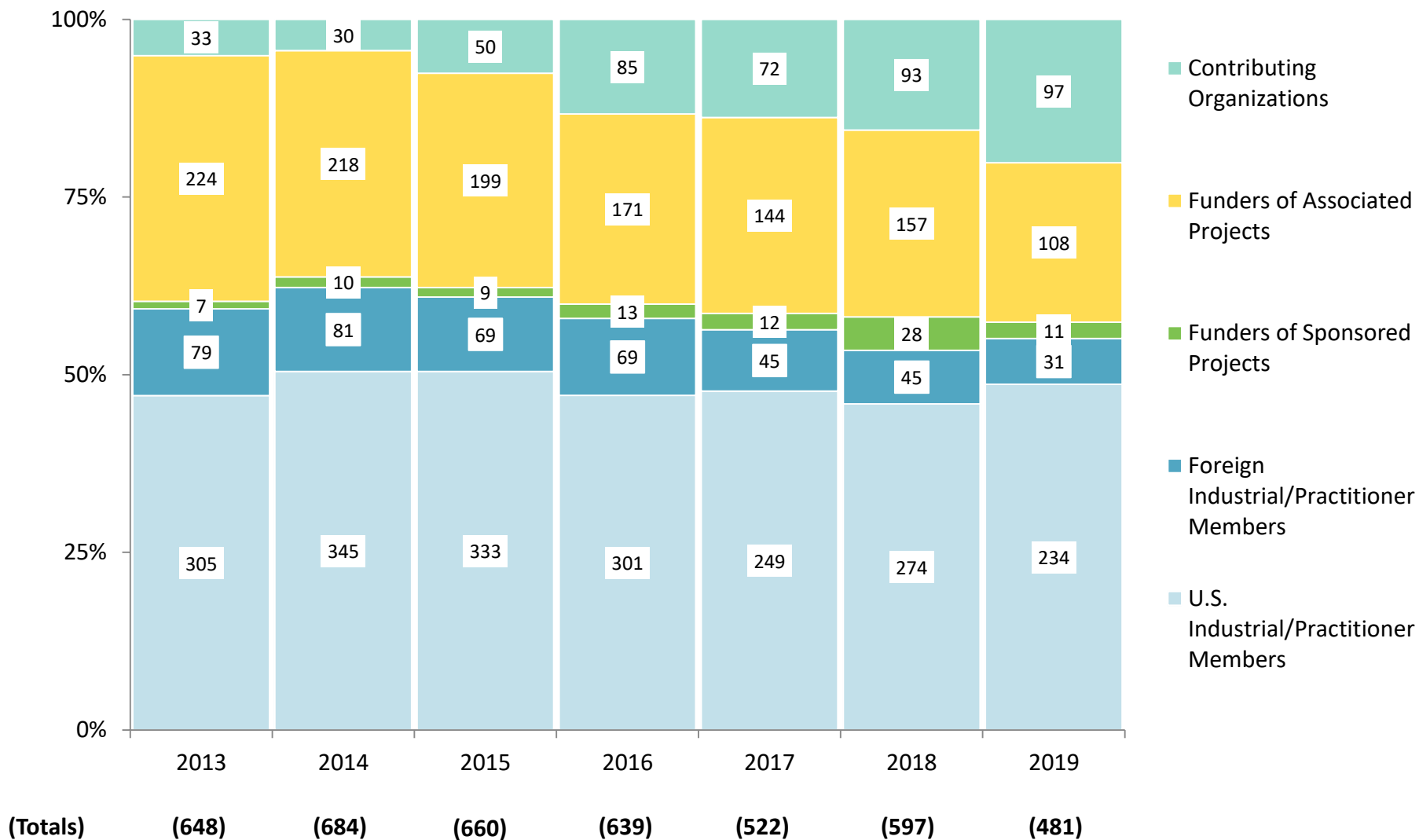
**NOTES:**

- The sum of the number of personnel for each category may exceed the total number of personnel because personnel may belong to multiple categories
- Percentage of foreign personnel is calculated out of domestic and foreign personnel, excluding personnel who did not report citizenship

Citizenship in ERCs, FY 2014–2019



ERC Industrial/Practitioner Members and Supporting Organizations, FY 2013–2019*



* Does not include centers from the Earthquake Technology Sector

	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
<i>Organization Type</i>							
Contributing Organizations	33	30	50	85	72	93	97
Funders of Associated Projects	224	218	199	171	144	157	108
Funders of Sponsored Projects	7	10	9	13	12	28	11
Foreign Industrial/Practitioner Members	79	81	69	69	45	45	31
U.S. Industrial/Practitioner Members	305	345	333	301	249	274	234
<i>Total Number of Organizations</i>	<i>648</i>	<i>684</i>	<i>660</i>	<i>639</i>	<i>522</i>	<i>597</i>	<i>481</i>
<i>Total Number of Centers</i>	<i>20</i>	<i>20</i>	<i>17</i>	<i>19</i>	<i>16</i>	<i>19</i>	<i>19</i>
<i>Average Number of Organizations per Center</i>	<i>32</i>	<i>34</i>	<i>39</i>	<i>34</i>	<i>33</i>	<i>31</i>	<i>25</i>

* Does not include centers from the Earthquake Technology Sector

Industrial/Practitioner Member Support by Year, FY 2013–2019*

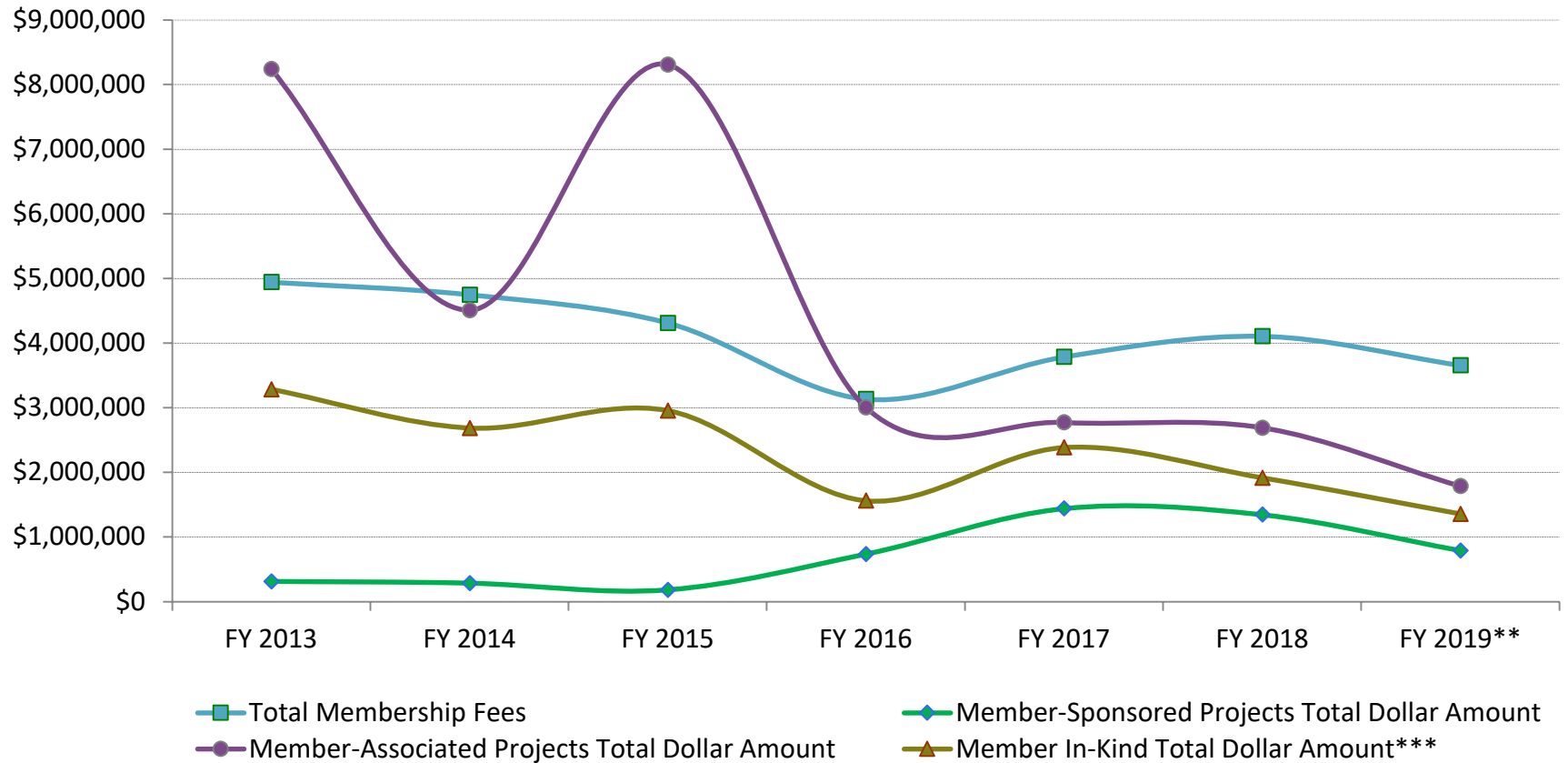
	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019**
<i>Type of Support</i>							
Total Membership Fees	\$4,942,433	\$4,747,675	\$4,309,666	\$3,132,772	\$3,786,620	\$4,105,519	\$3,655,295
Member-Sponsored Projects Total Dollar Amount	\$311,757	\$285,000	\$182,000	\$735,122	\$1,440,493	\$1,344,913	\$790,527
Member-Associated Projects Total Dollar Amount	\$8,239,885	\$4,508,750	\$8,308,585	\$3,001,718	\$2,772,841	\$2,690,570	\$1,787,067
Member In-Kind Total Dollar Amount***	\$3,284,191	\$2,685,819	\$2,954,553	\$1,560,677	\$2,384,789	\$1,914,975	\$1,357,824
Total Dollar Amount, Industrial/Practitioner Member Support to Center	\$16,778,266	\$12,227,244	\$15,754,804	\$8,430,289	\$10,384,743	\$10,055,977	\$7,590,713

* Does not include centers from the Earthquake Technology Sector

** Support received by the end of the current reporting year. Includes data for centers that have entered partial data during a no-cost extension (NCE)

*** Data for this row are from the In-Kind Support reported in the Organizations section

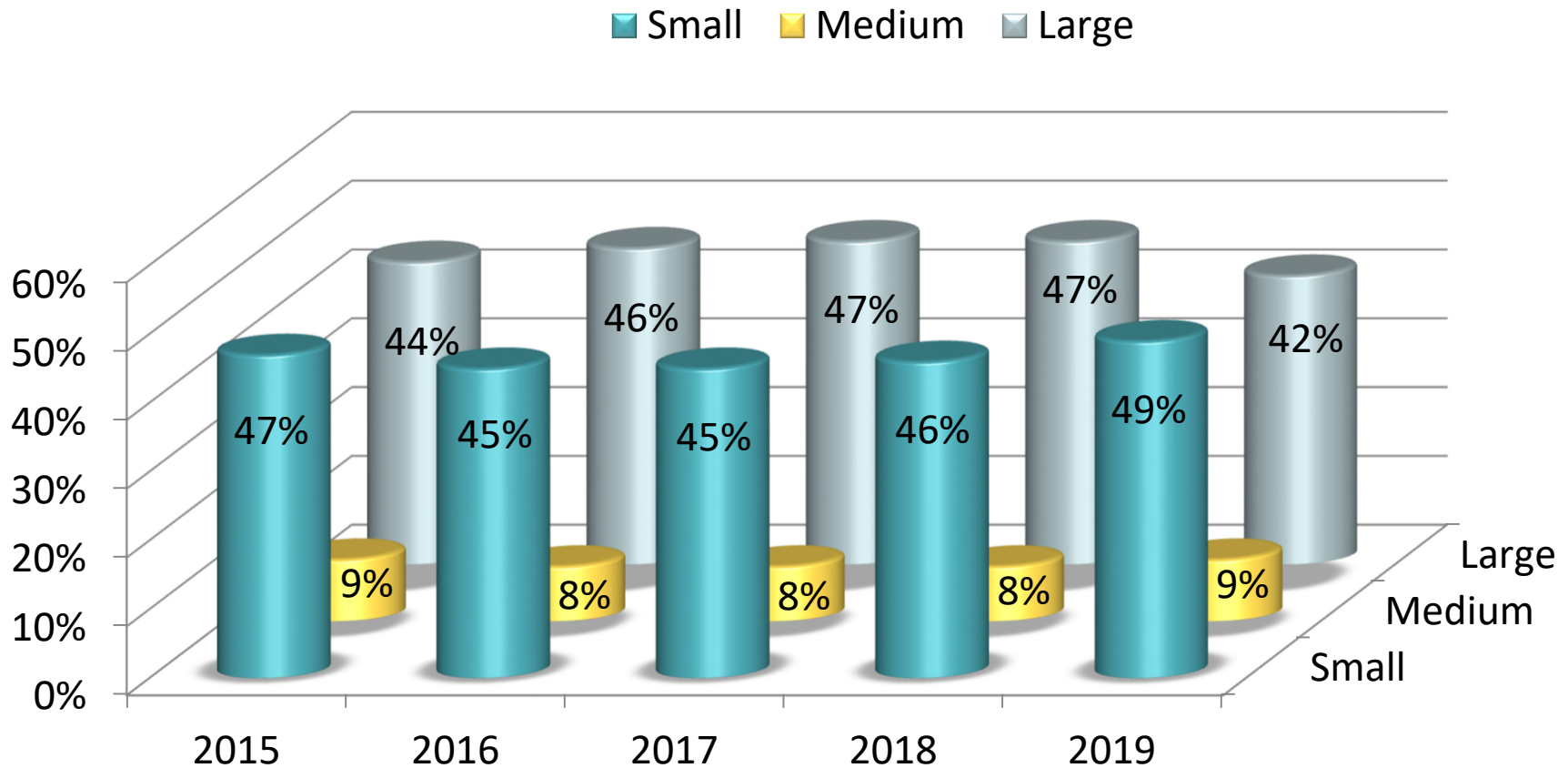
Industrial/Practitioner Member Support by Year, FY 2013–2019*



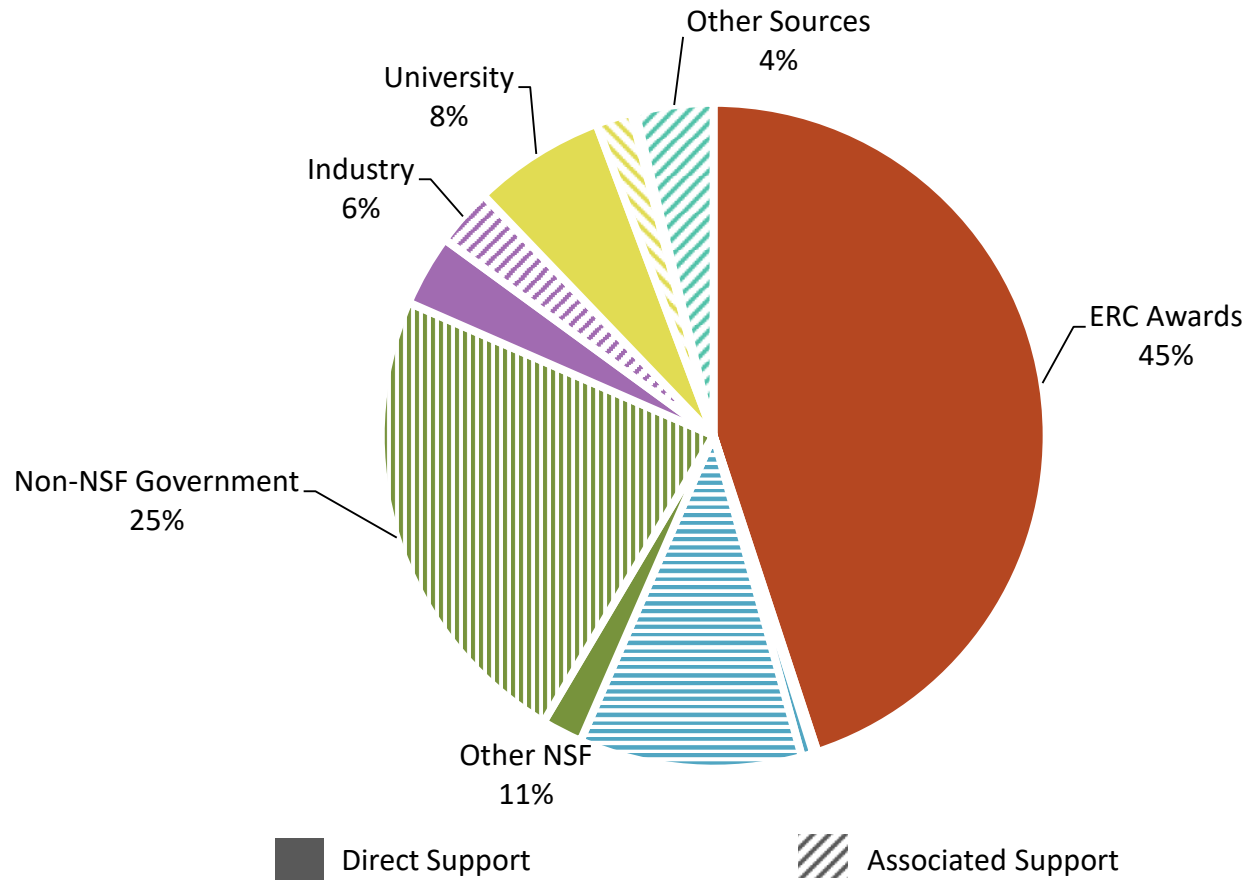
* Does not include centers from the Earthquake Technology Sector

** Support received by the end of the current reporting year. Includes data for centers that have entered partial data during a no-cost extension (NCE)

*** Data for this line are from the In-Kind Support reported in the Organizations section

**NOTES:**

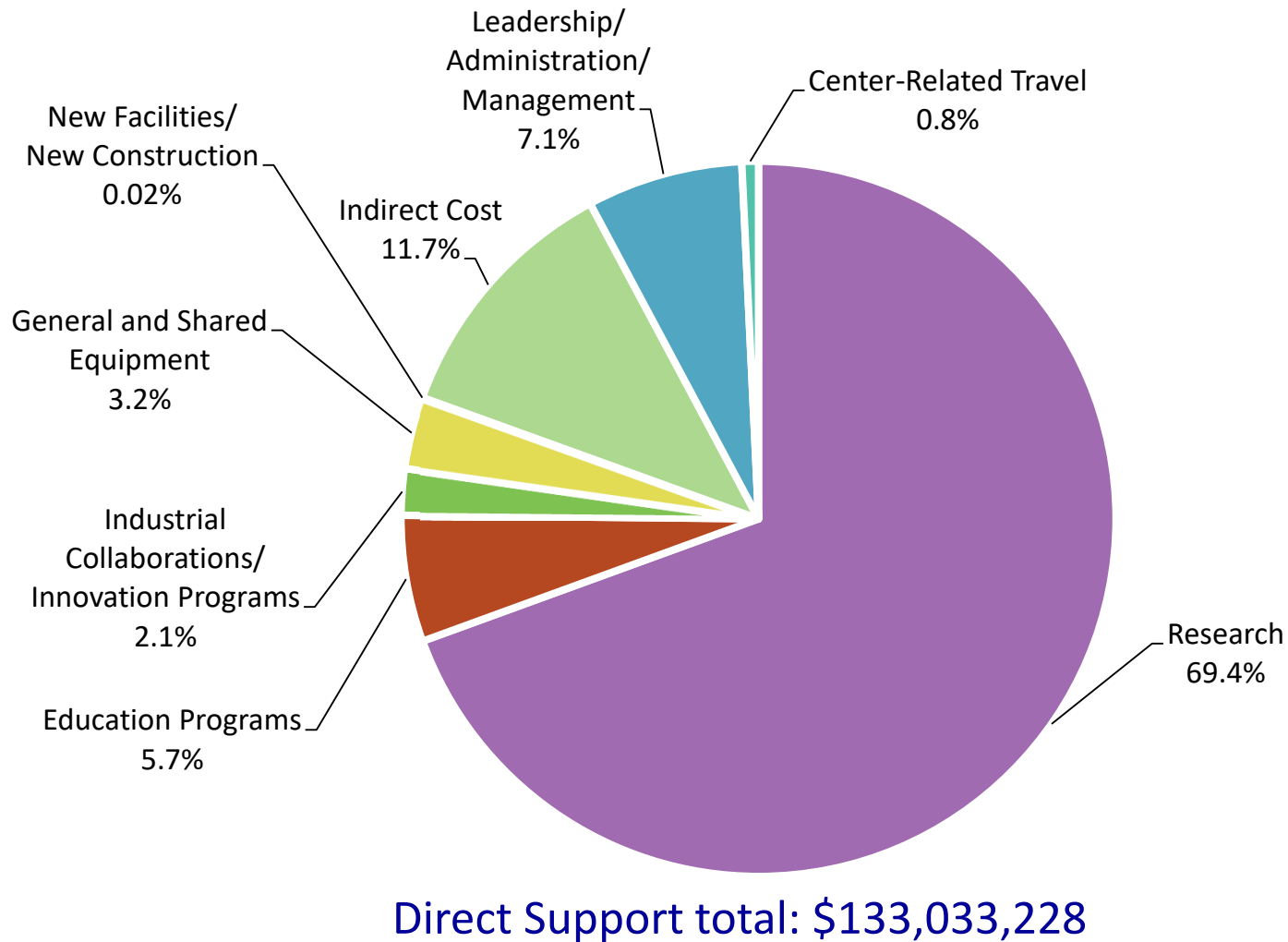
- The total number of firms is as follows: 2015: 342, 2016: 323, 2017: 250, 2018: 276, 2019: 233
- Industry sizes are as follows: Small = <500 employees, Medium = 500–1,000 employees, Large = >1,000 employees



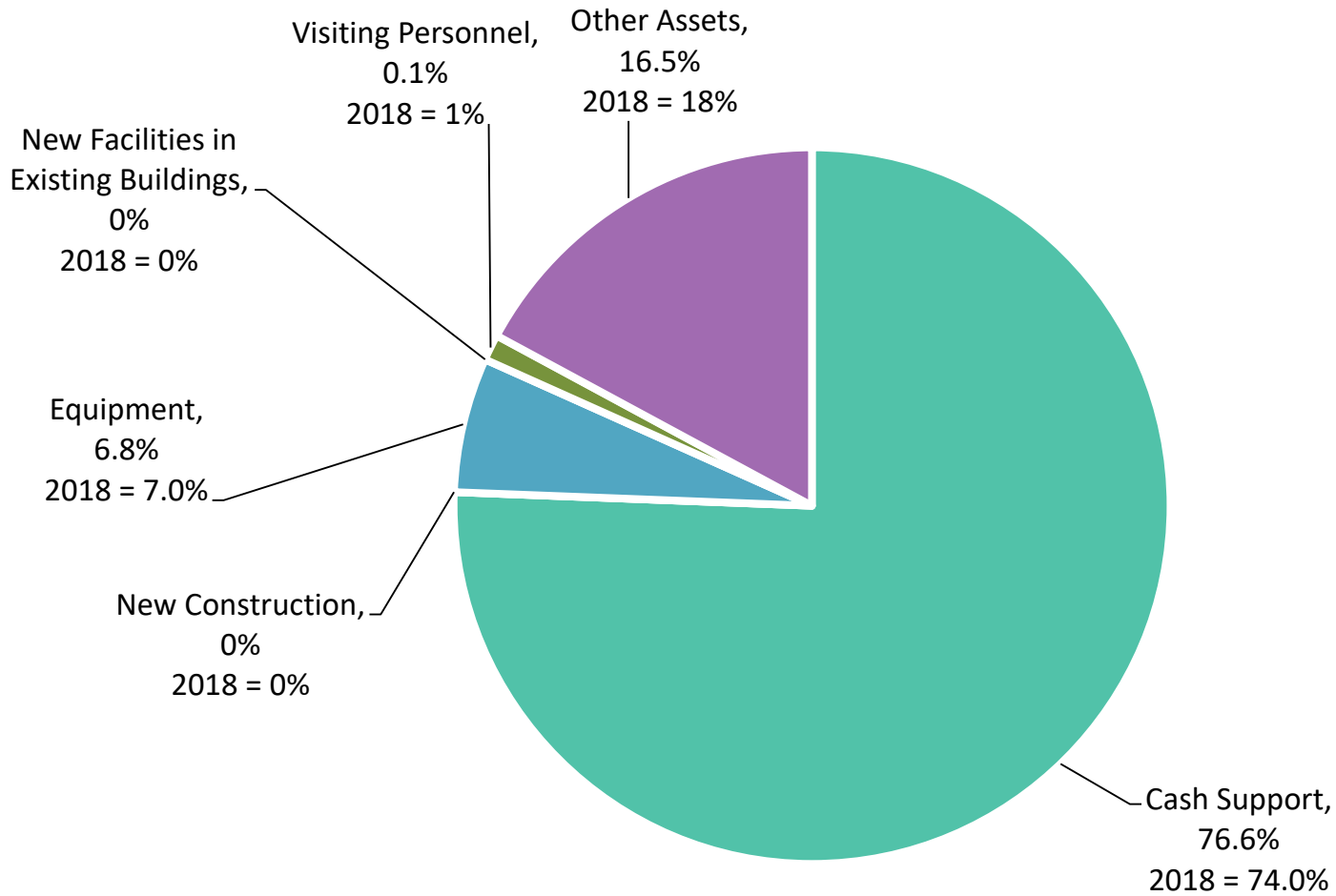
Total value of support: \$123 million

NOTES:

- Percentages shown are Direct Support and Associated Support combined
- Non-NSF Government includes U.S. Government (Not NSF), State Government, Local Government, Foreign Government, and Quasi-government Research Organizations
- Other Sources include Medical Facilities, Nonprofit Organizations, Private Foundations, Venture Capitalists and Other Sources



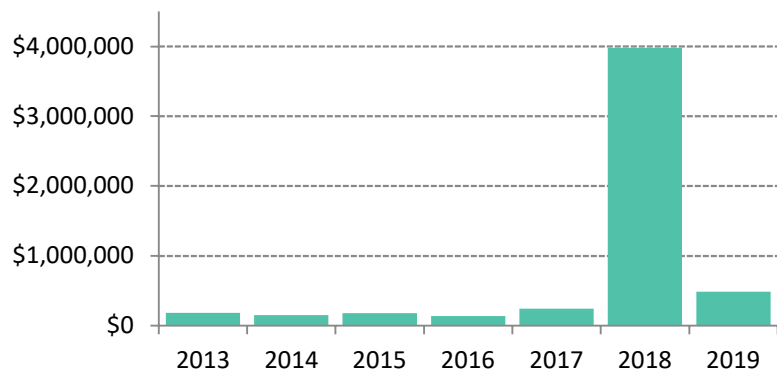
* Includes in-kind support but not residuals



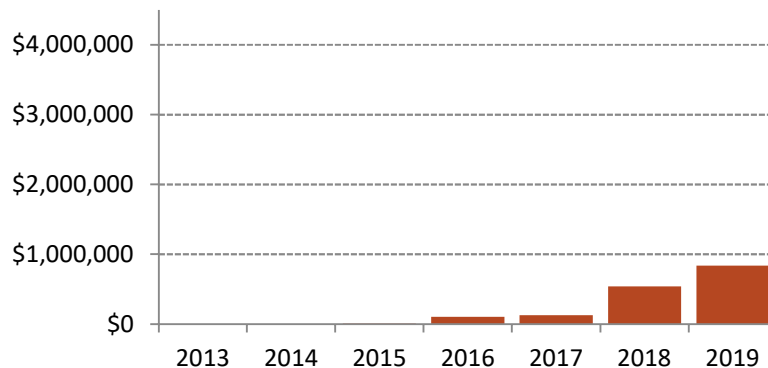
Total value of support: \$7.4 million

Non-NSF Government Support by ERC Technology Sector, FY 2013–2019*,**,***

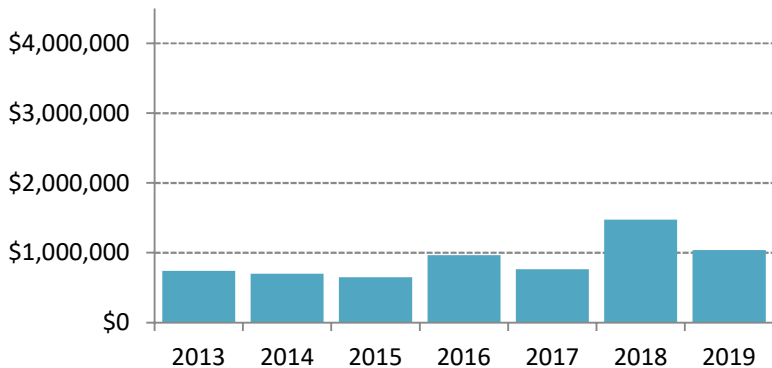
Advanced Manufacturing



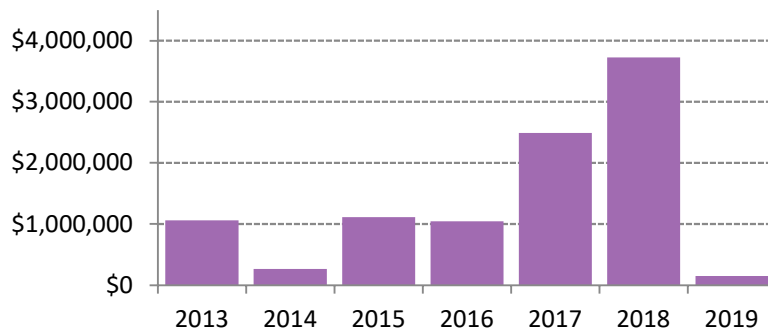
Biotechnology and Healthcare



Energy, Sustainability, and Infrastructure

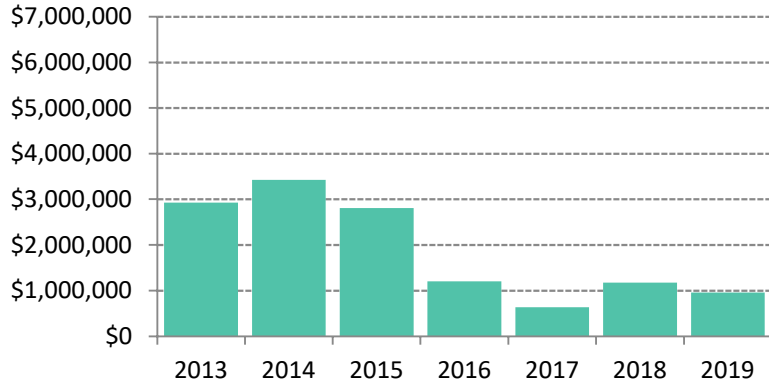


Micro/Optoelectronics, Sensing, and Information Technology

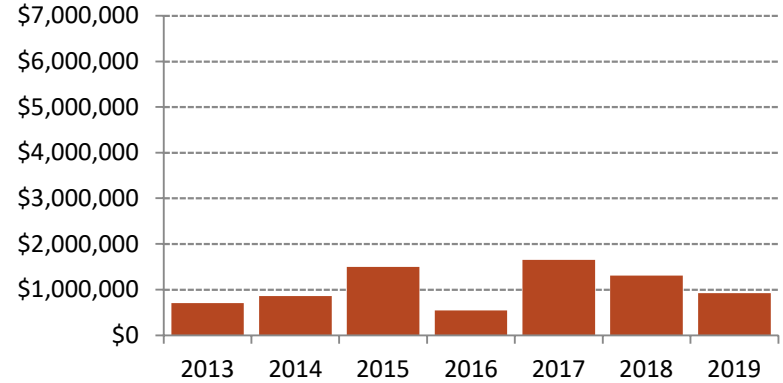


- Does not include centers from the Earthquake Technology Sector
- Support includes Unrestricted Cash, Restricted Cash, and In-Kind Support
- Includes data for centers that have entered partial data during a no-cost extension (NCE)

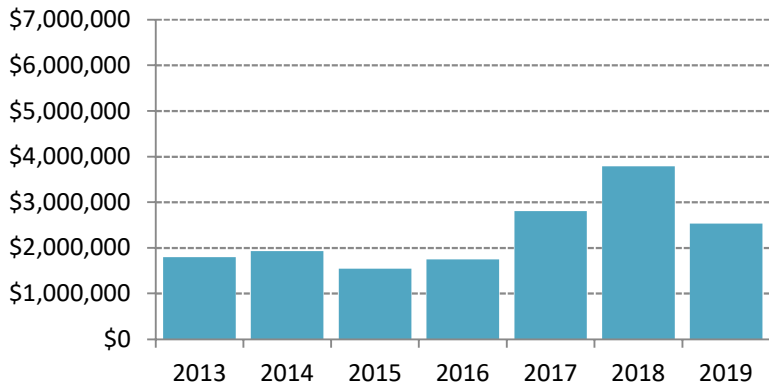
Advanced Manufacturing



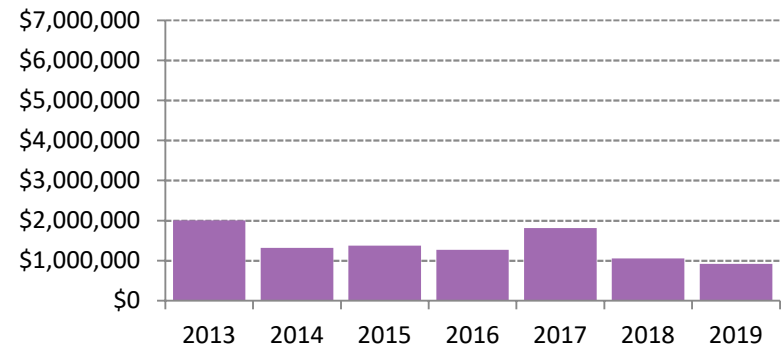
Biotechnology and Healthcare



Energy, Sustainability, and Infrastructure



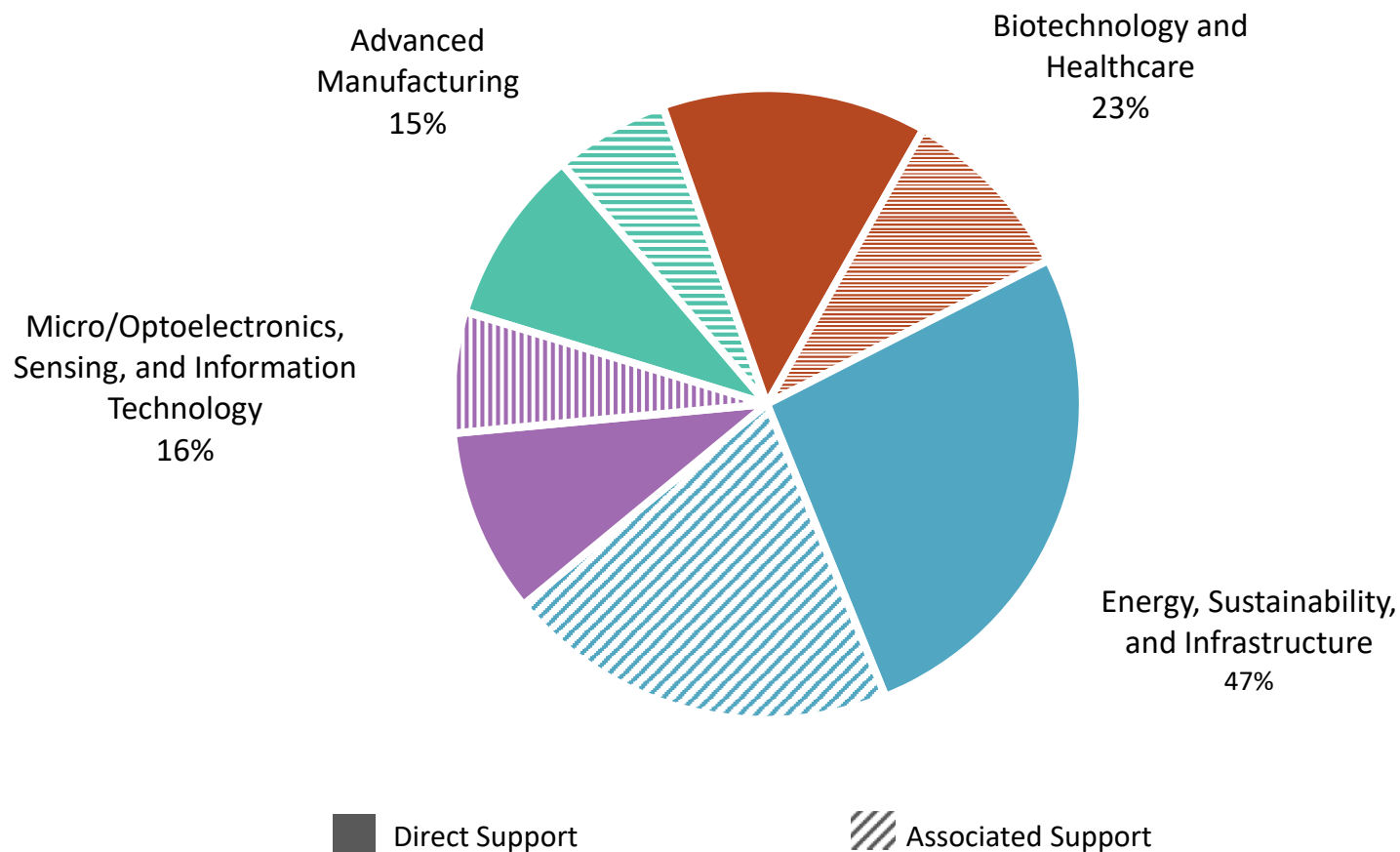
Micro/Optoelectronics, Sensing, and Information Technology



^{*} Does not include centers from the Earthquake Technology Sector

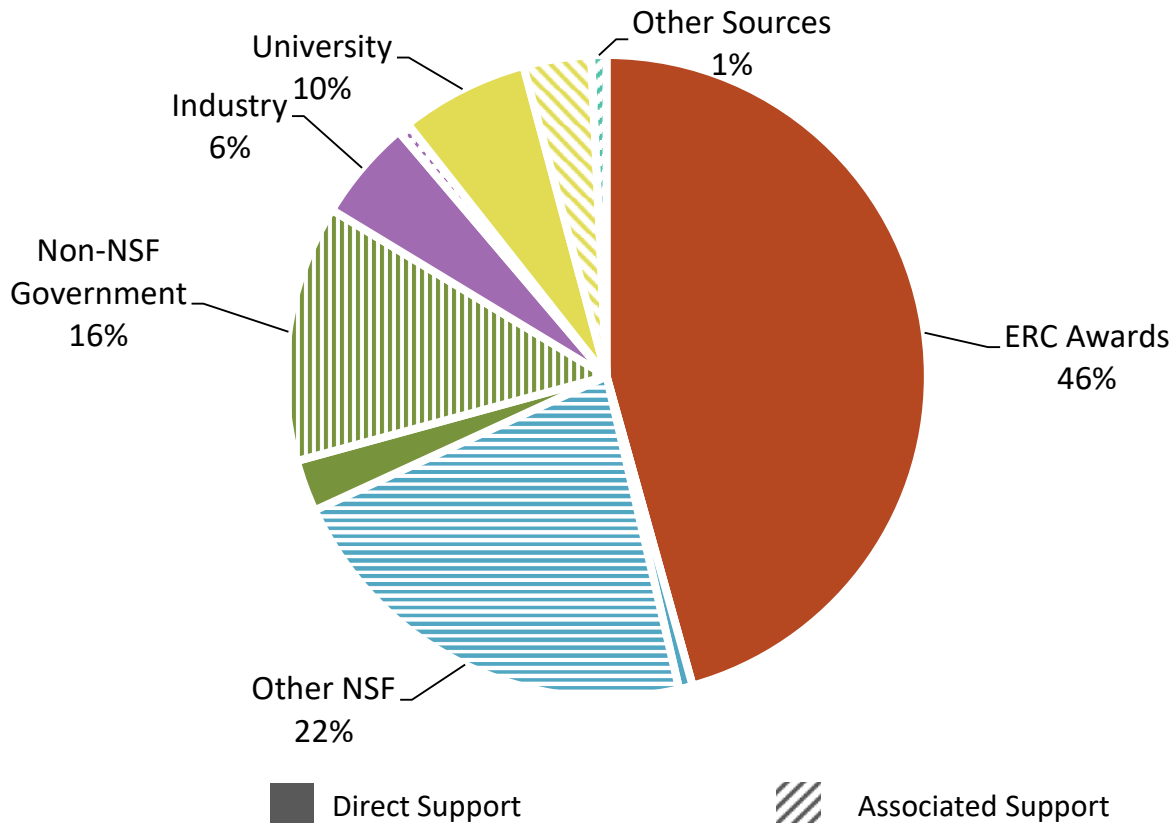
^{**} Support includes Unrestricted Cash, Restricted Cash, and In-Kind Support

^{***} Includes data for centers that have entered partial data during a no-cost extension (NCE)



Total value of support: \$125.2 million

NOTE: Sources of Support include Unrestricted Cash, Restricted Cash, In-Kind, and Associated Projects. Residuals are not included

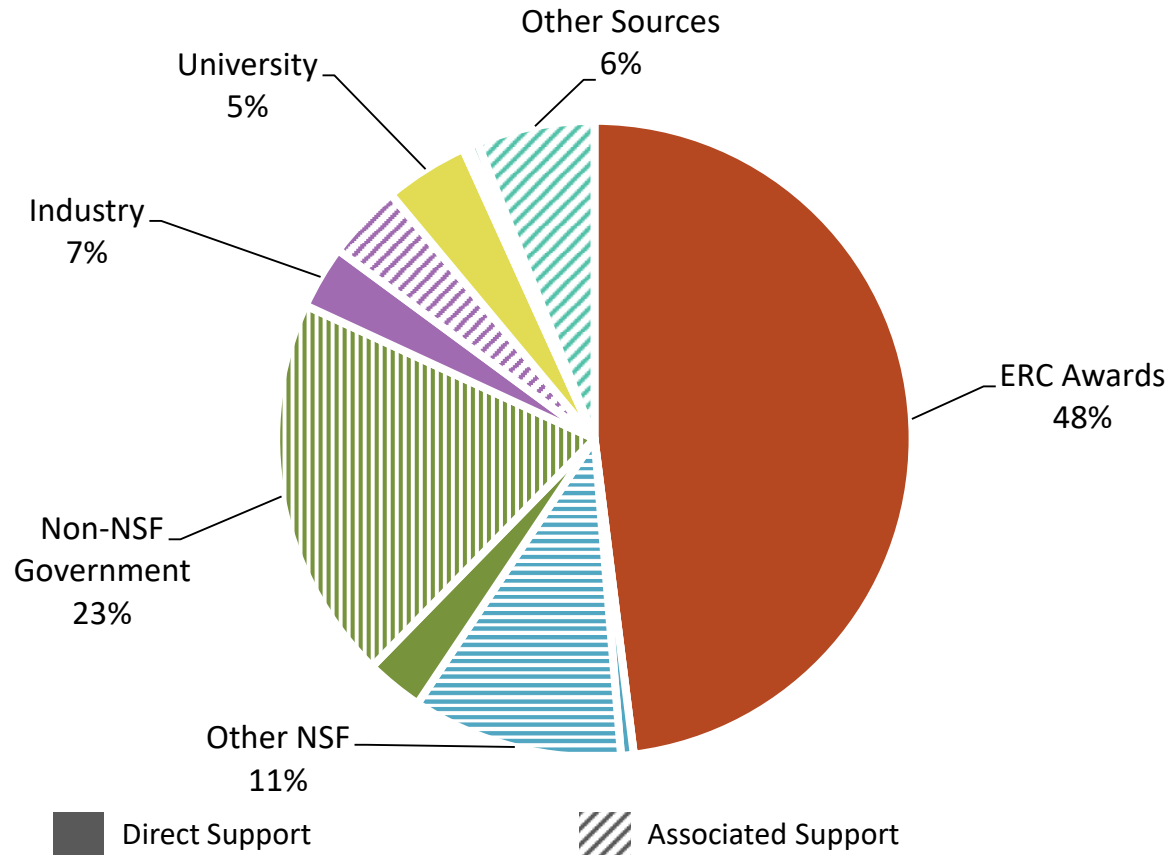


Total value of support: \$.18.7 million

NOTES:

- Sources of Support include Unrestricted Cash, Restricted Cash, In-Kind, and Associated Projects. Residuals are not included
- Non-NSF Government includes U.S. Government (not NSF), State government, local government, foreign government, and quasi-government research organizations
- Other Sources includes medical facilities, nonprofit organizations, private foundations, venture capitalists, and other sources

FY 2019 Support to ERCs in Biotechnology and Healthcare Sector: 5 Centers (ASSIST, CELL-MET, NCAT, PATHS-UP, CNT)

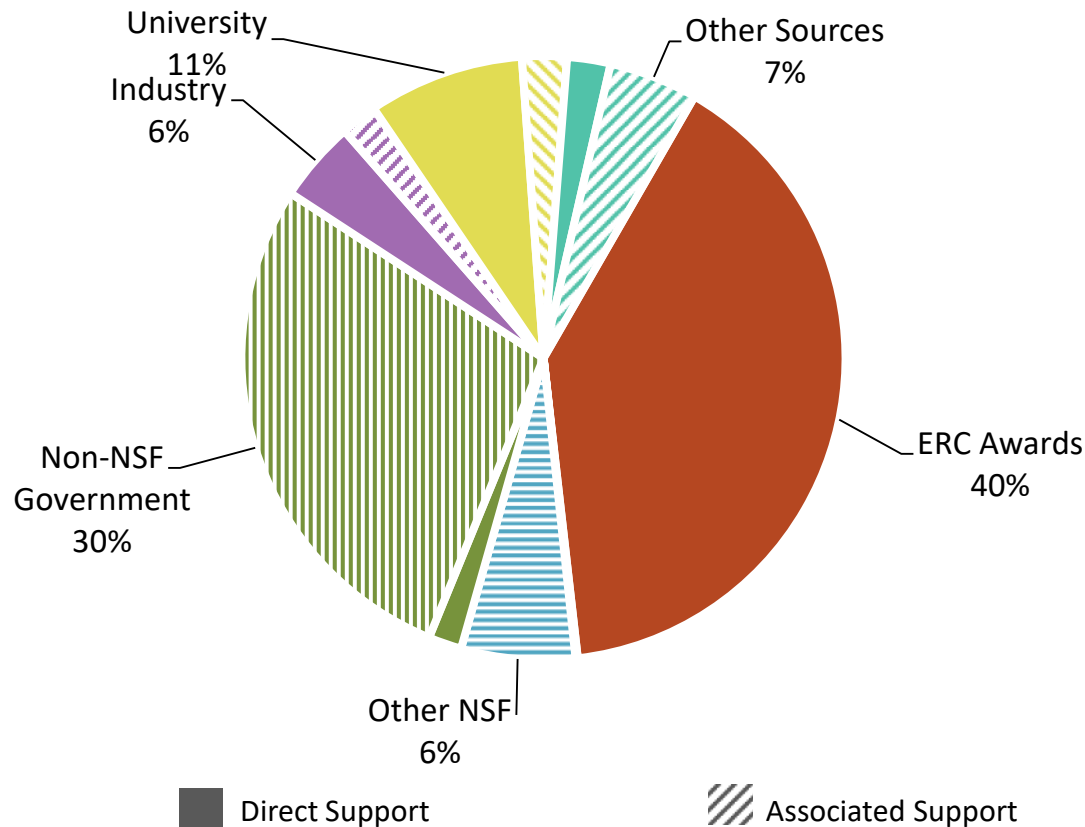


Total value of support: \$28.6 million

NOTES:

- Sources of Support include Unrestricted Cash, Restricted Cash, In-Kind, and Associated Projects. Residuals are not included
- Non-NSF Government includes U.S. Government (not NSF), State government, local government, foreign government, and quasi-government research organizations
- Other Sources includes medical facilities, nonprofit organizations, private foundations, venture capitalists, and other sources

FY 2019 Support to ERCs in Energy, Sustainability, and Infrastructure Sector: 7 Centers (CBBG, CISTAR, FREEDM, NEWT, QESST, ReNUWit, CURENT)

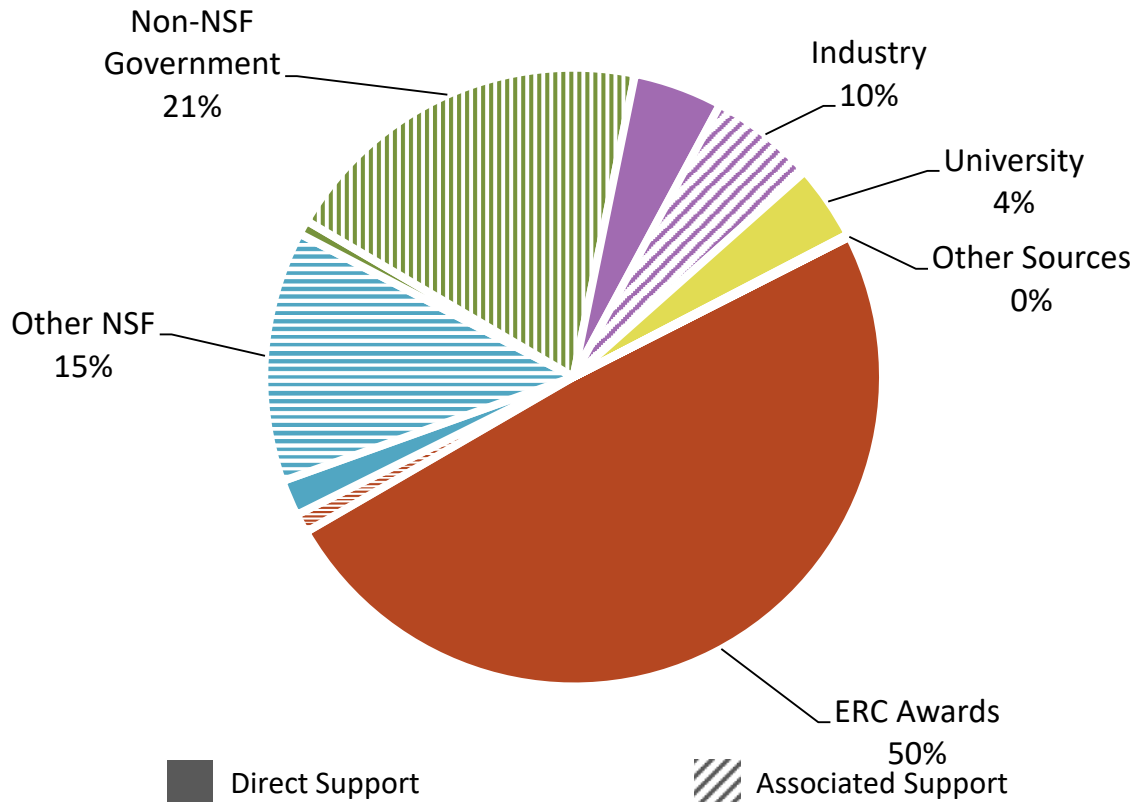


Total value of support: \$58.3 million

NOTES:

- Sources of Support include Unrestricted Cash, Restricted Cash, In-Kind, and Associated Projects. Residuals are not included
- Non-NSF Government includes U.S. Government (not NSF), State government, local government, foreign government, and quasi-government research organizations
- Other Sources includes medical facilities, nonprofit organizations, private foundations, venture capitalists, and other sources

31 FY 2019 Support to ERCs in Micro/Optoelectronics, Sensing, and Information Technology Sector: 4 Centers (CIAN, LESA, POETS, TANMS)

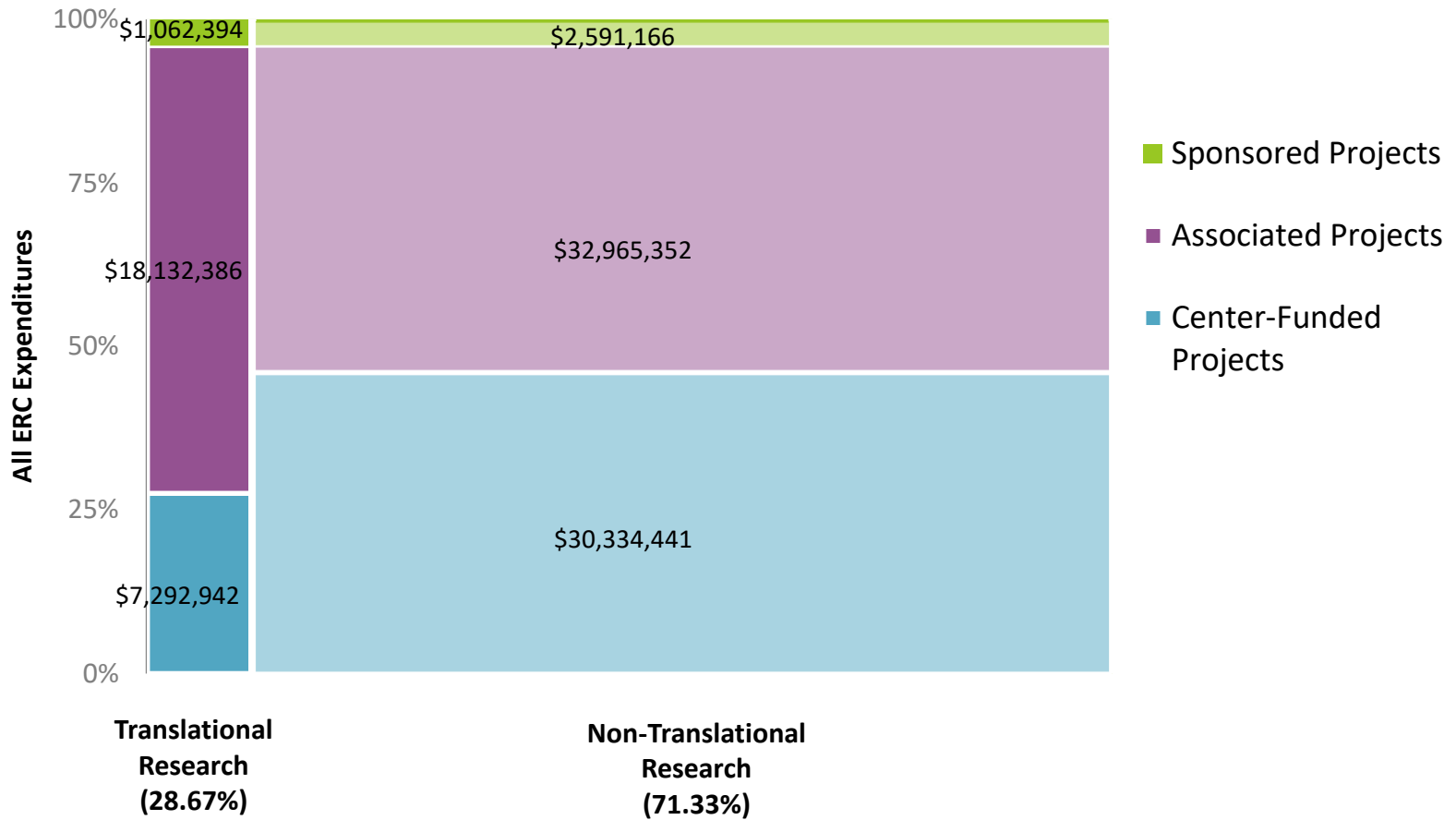


Total value of support: \$19.7 million

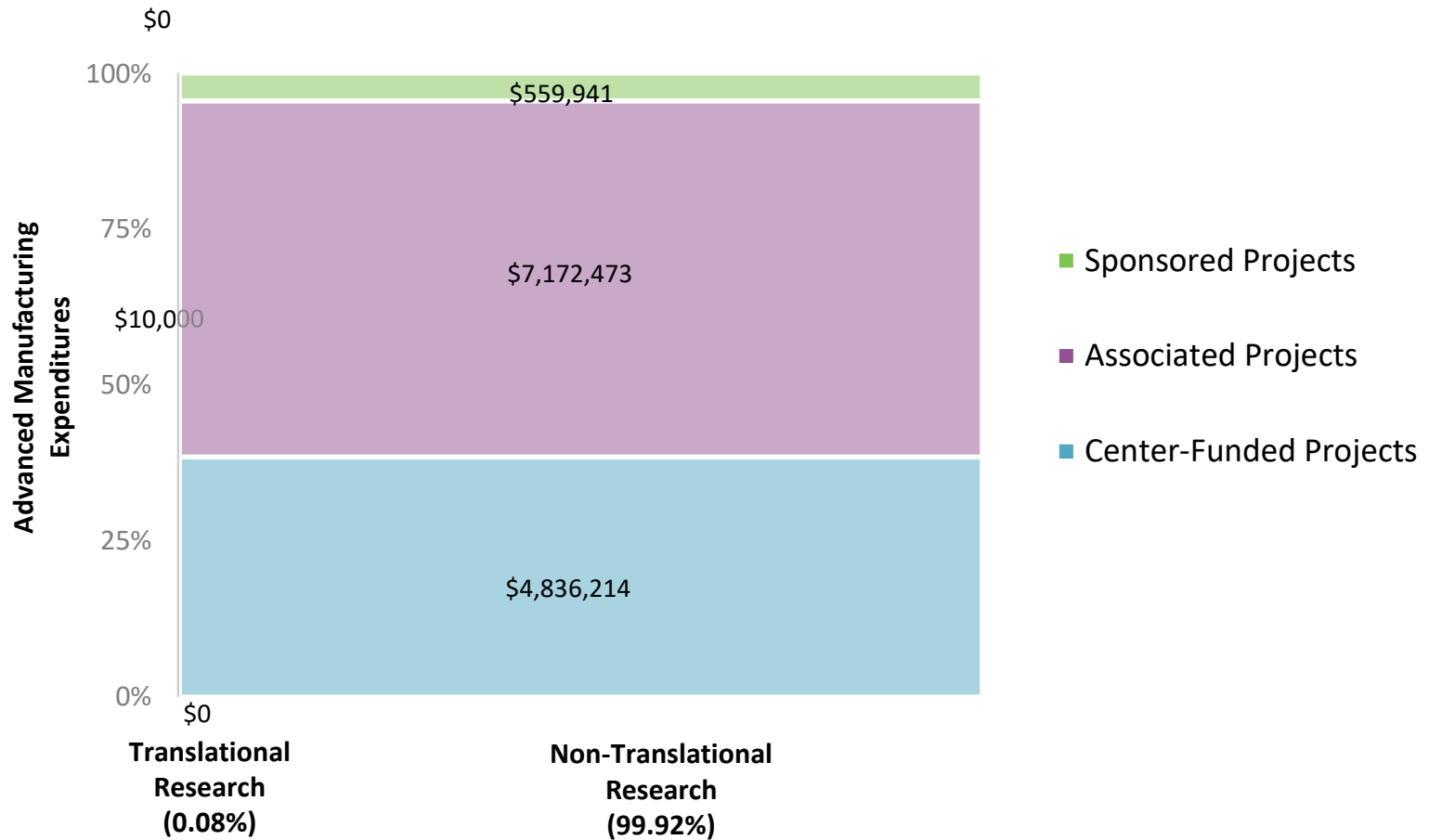
NOTES:

- Sources of Support include Unrestricted Cash, Restricted Cash, In-Kind, and Associated Projects. Residuals are not included
- Non-NSF Government includes U.S. Government (not NSF), State government, local government, foreign government, and quasi-government research organizations
- Other Sources includes medical facilities, nonprofit organizations, private foundations, venture capitalists, and other sources

32 FY 2019 Expenditures by Type of Research: All ERCs

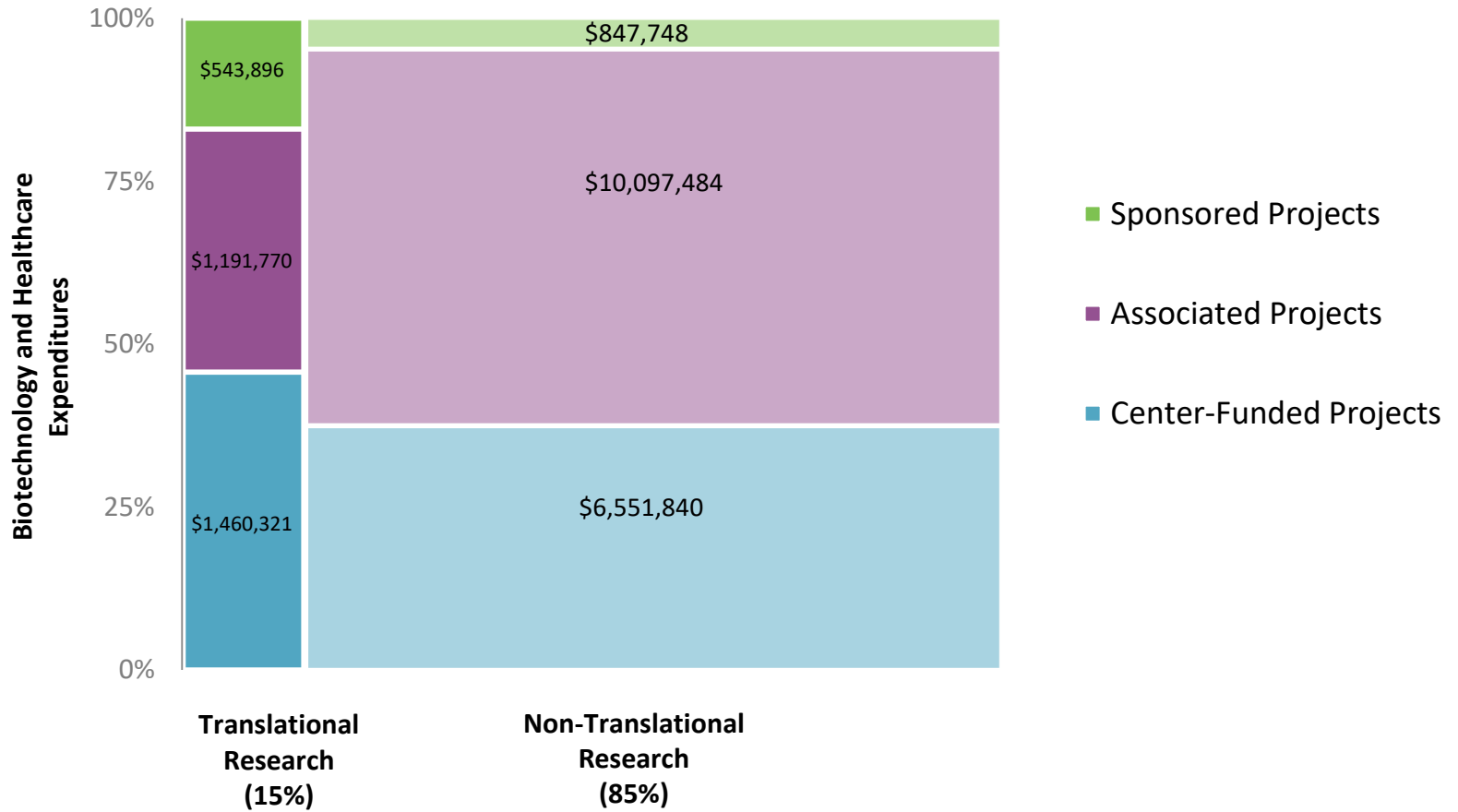


Total value of support: \$92 million

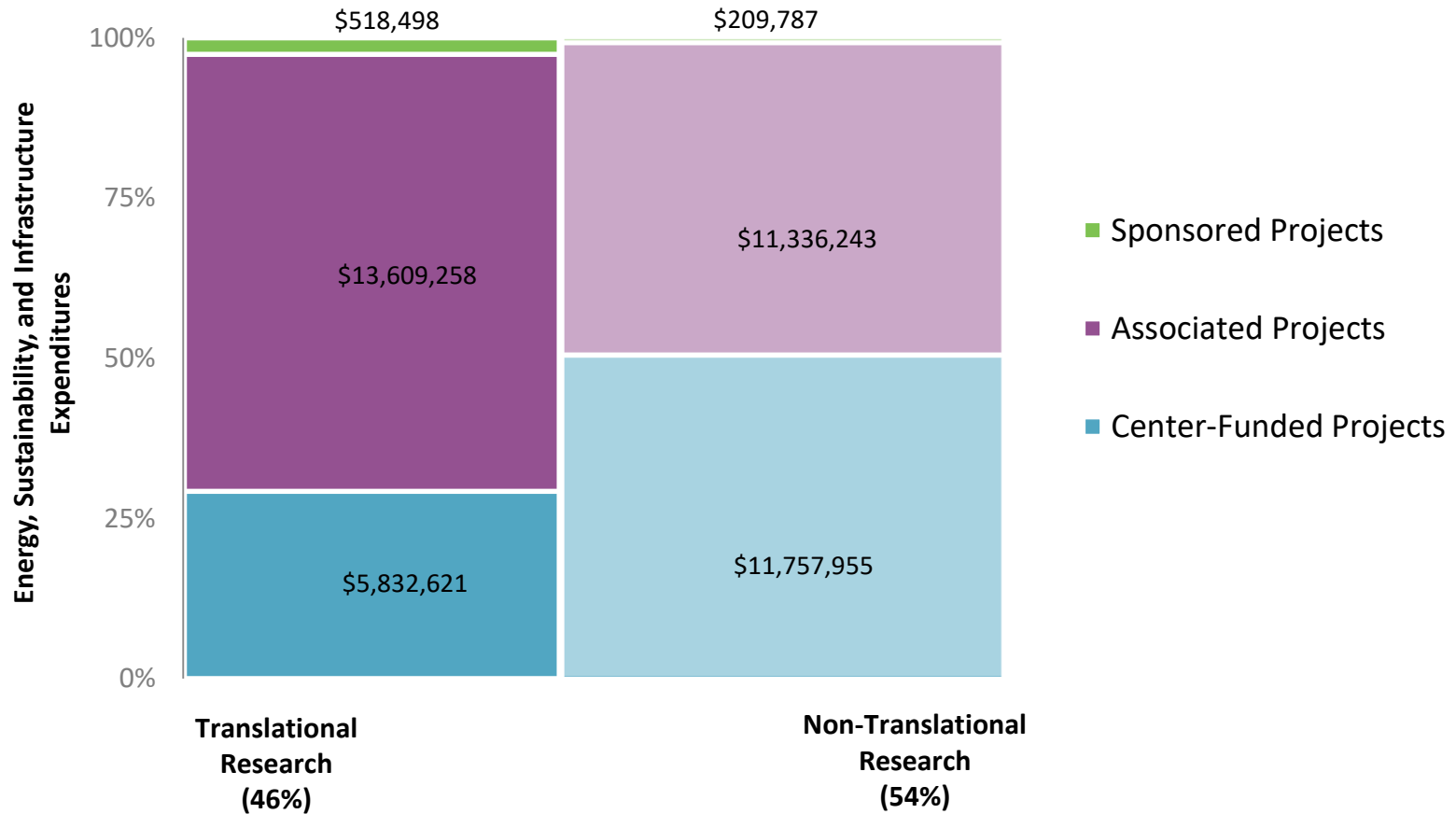


Total value of support: \$13 million

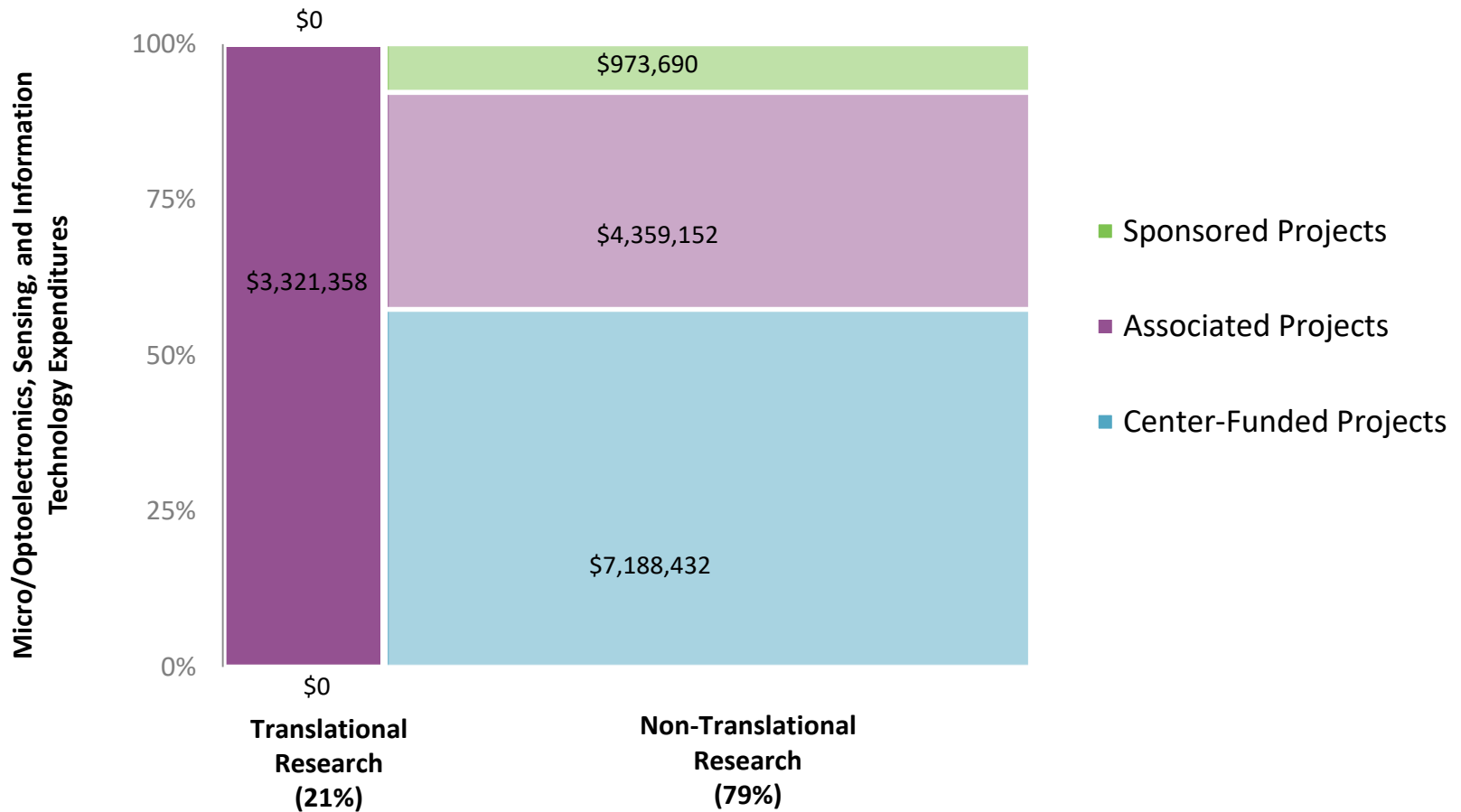
- \$0 corresponds to Center-Funded Projects expenditures for Translational Research. Area is not visible due to the small relative size



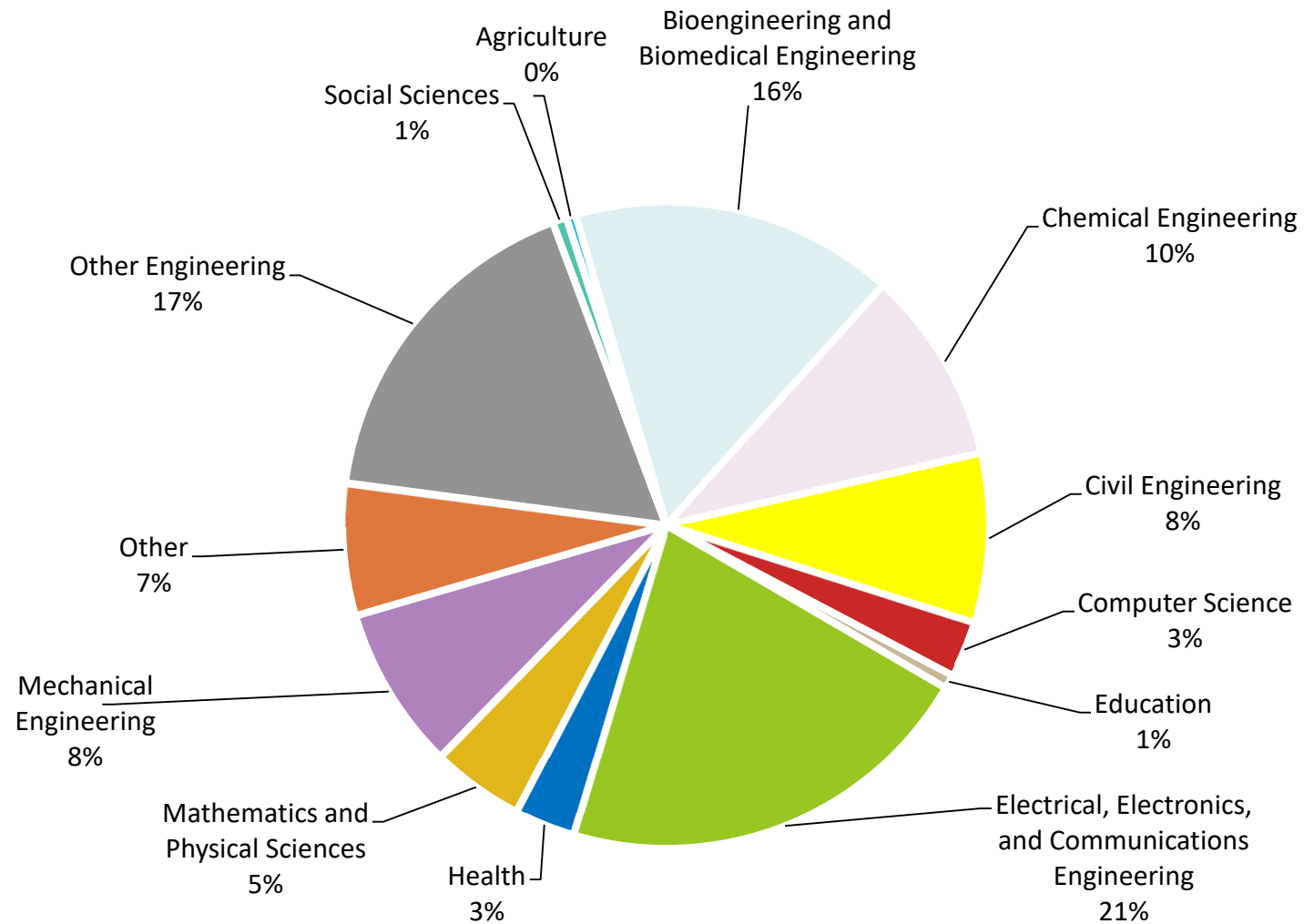
Total value of support: \$21 million



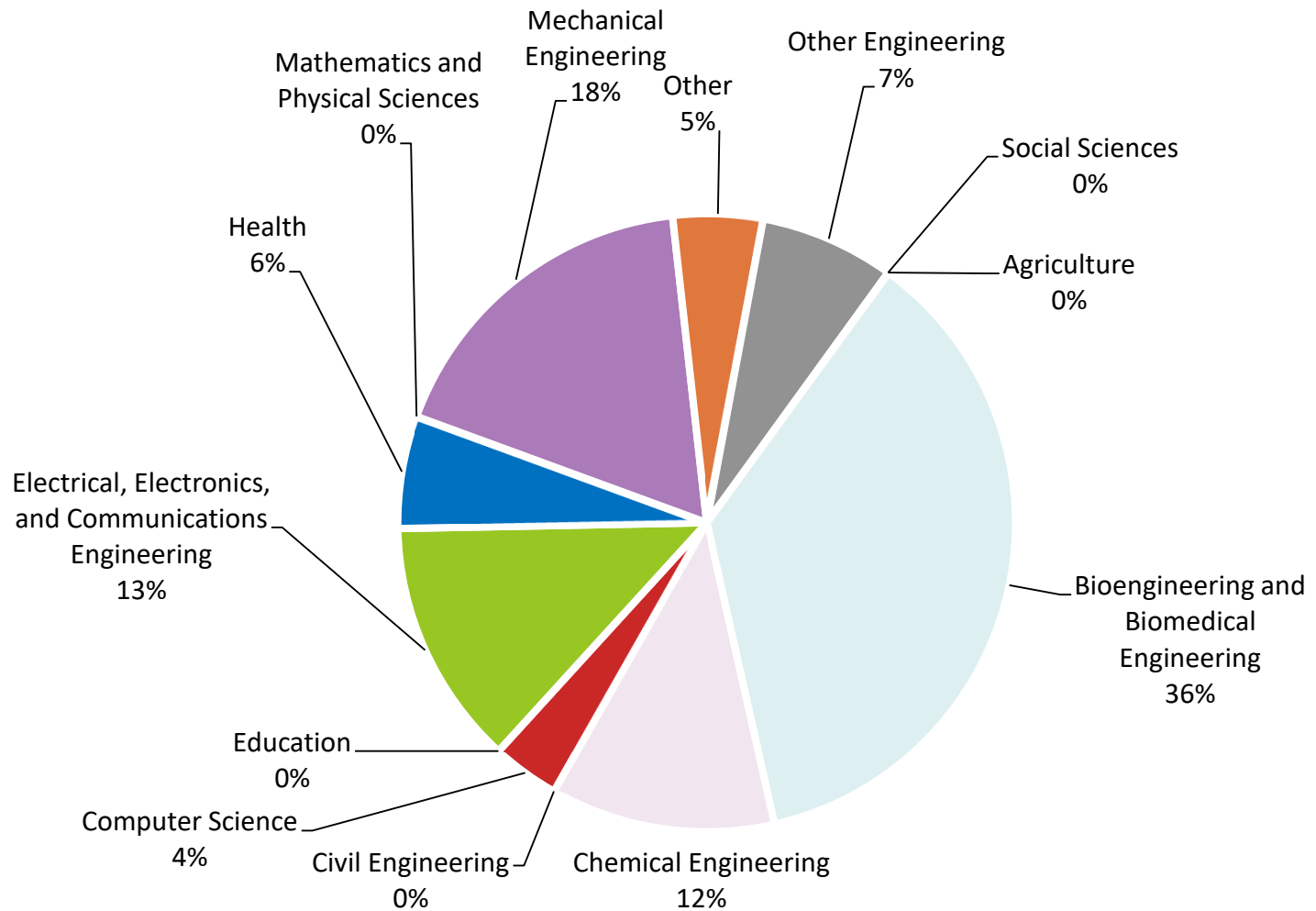
Total value of support: \$43 million



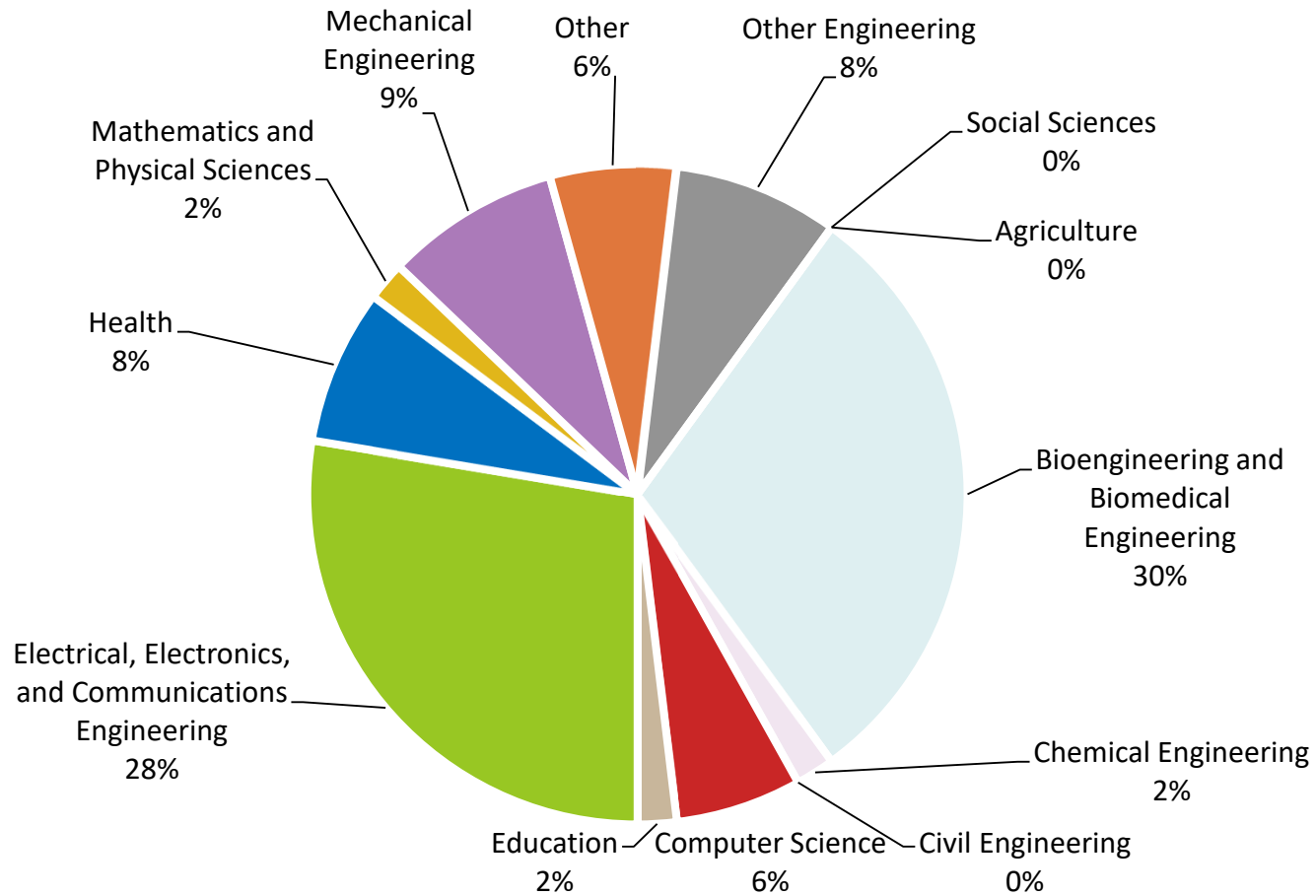
Total value of support: \$16 million



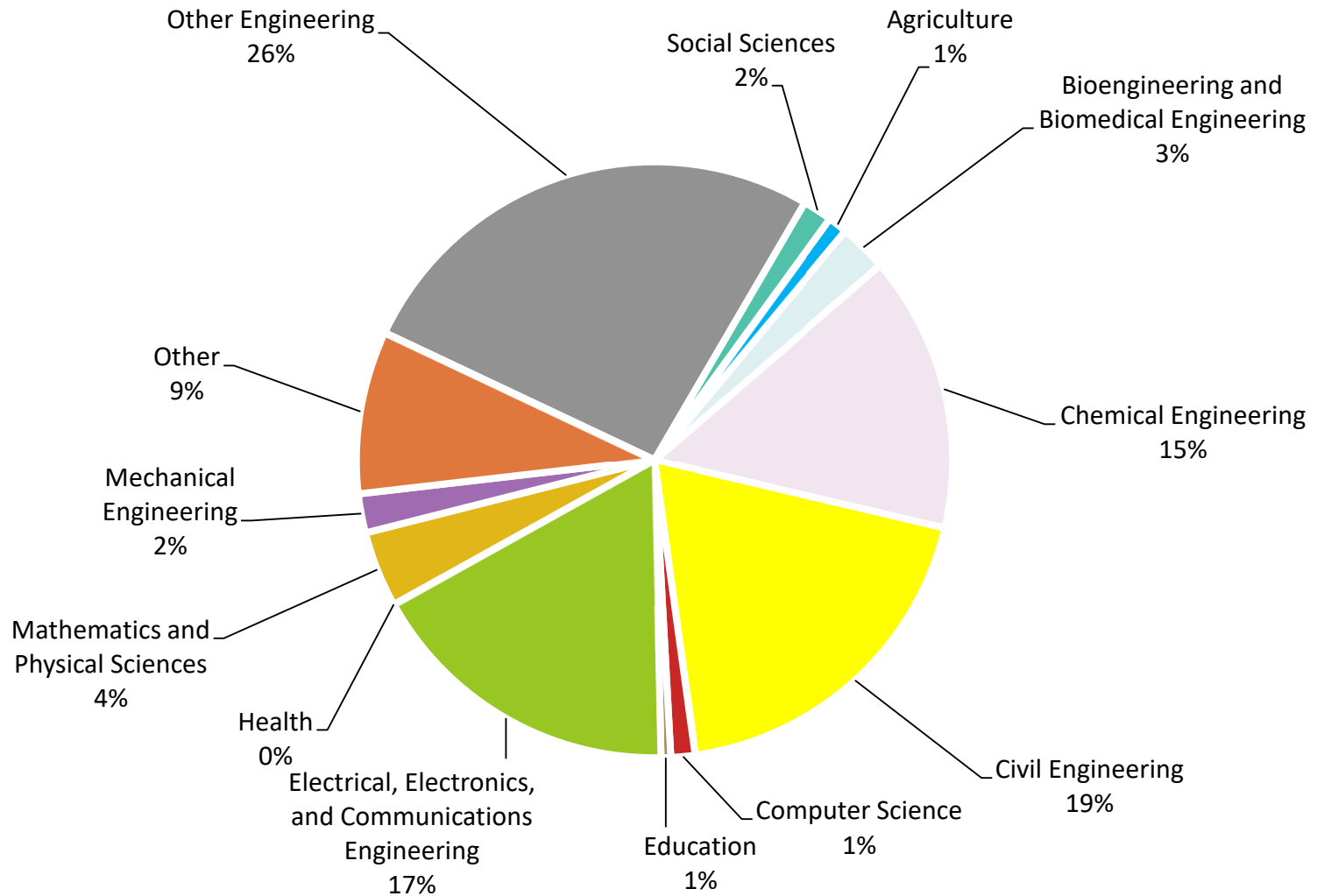
Total number of Project Investigators (PIs): 428



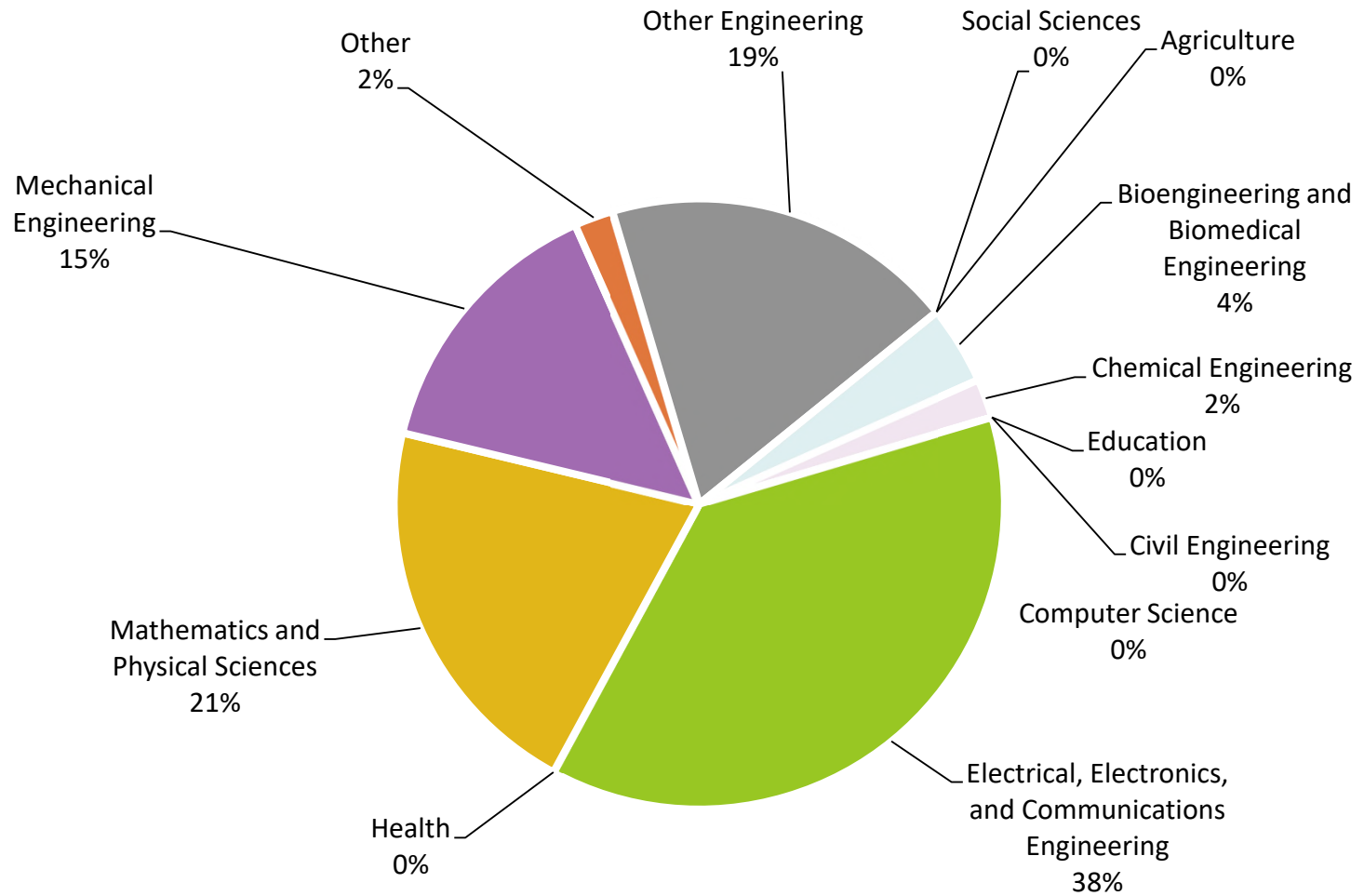
Total number of Project Investigators (PIs): 85



Total number of Project Investigators (PIs): 105

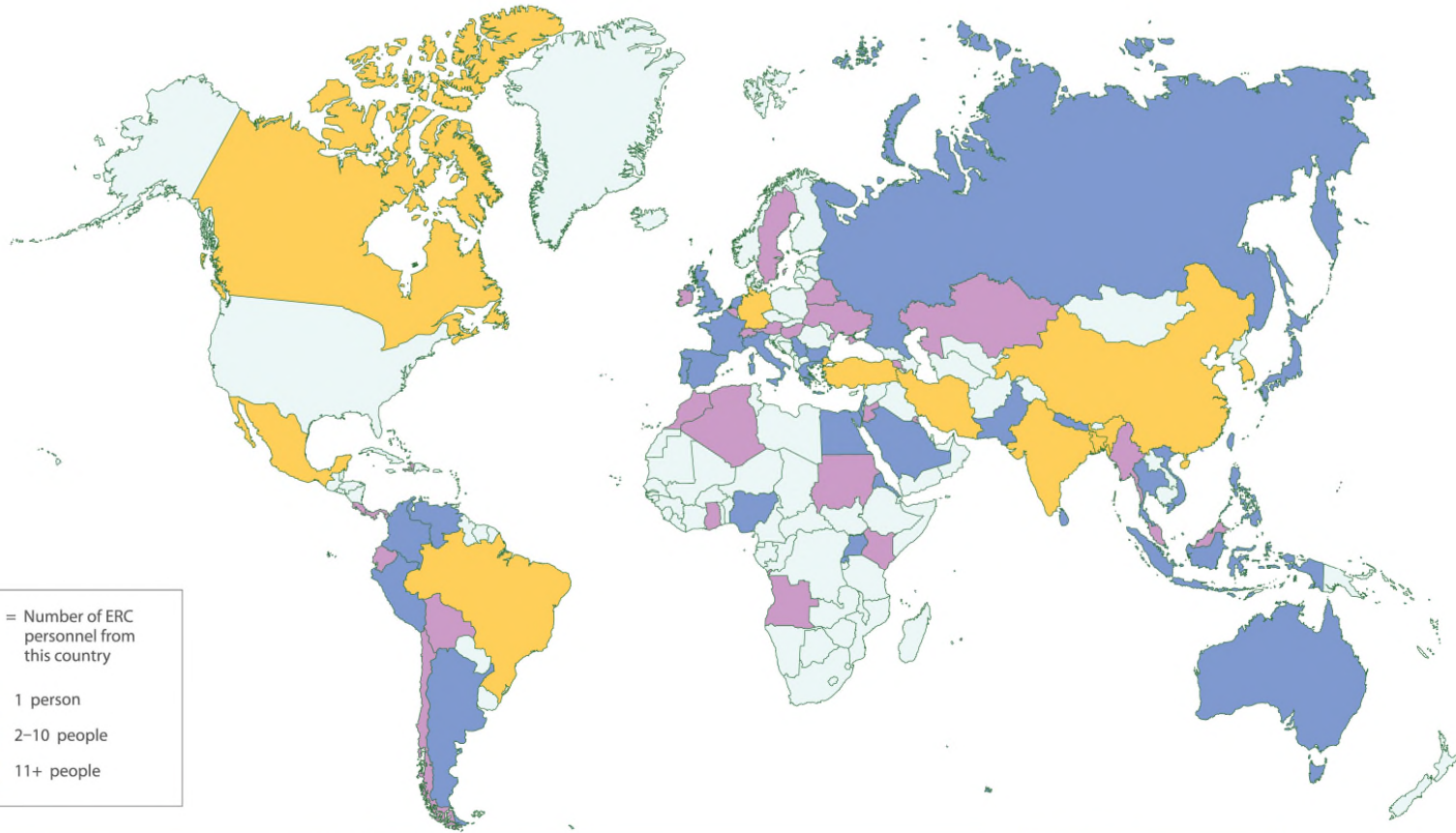


Total number of Project Investigators (PIs): 190



Total number of Project Investigators (PIs): 48

Country of Citizenship of ERC Foreign Personnel, FY 2019



= Number of ERC personnel from this country
 1 person
 2-10 people
 11+ people

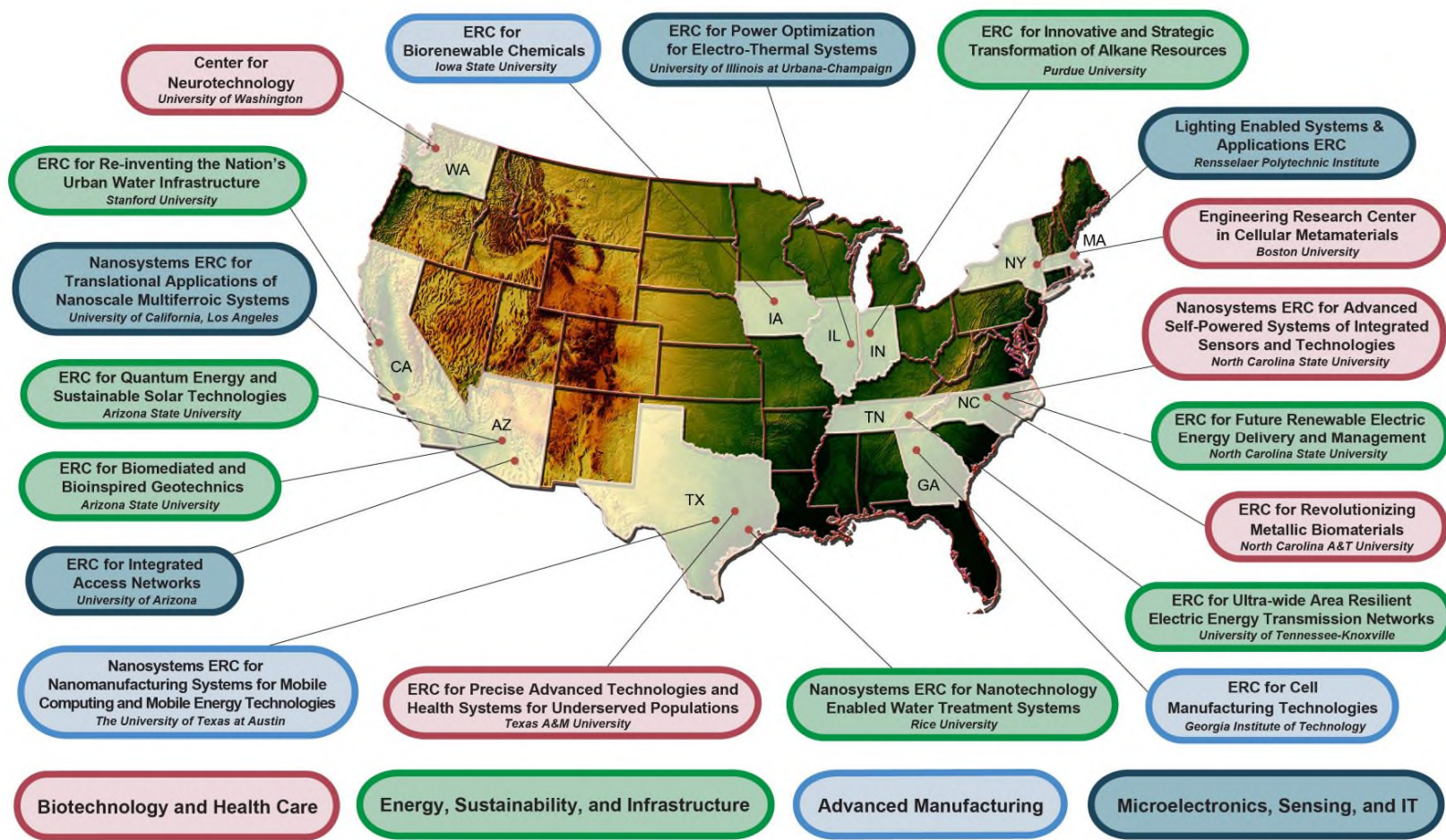
1 person			
Algeria	Bolivia	Hungary	Mauritius
Angola	Burma	Ireland	Morocco
Armenia	Chile	Jordan	Panama
Austria	Costa Rica	Kazakhstan	Sudan
Barbados	Ecuador	Kenya	Sweden
Belarus	Ghana	Kuwait	Switzerland
Belgium	Haiti	Malaysia	Ukraine

2-10 people				
Argentina (2)	Greece (8)	Nepal (2)	Russia (9)	Taiwan (8)
Australia (3)	Hong Kong (2)	Netherlands (2)	Rwanda (2)	Thailand (4)
Bulgaria (2)	Indonesia (4)	Nigeria (8)	Saudi Arabia (6)	Uganda (2)
Colombia (9)	Israel (4)	Pakistan (3)	Serbia (2)	United Kingdom (7)
Egypt (5)	Italy (4)	Peru (3)	Singapore (3)	Venezuela (3)
Eritrea (2)	Japan (6)	Philippines (3)	Spain (6)	Vietnam (6)
France (4)	Lebanon (3)	Portugal (2)	Sri Lanka (7)	

11+ people	
Bangladesh (15)	Mexico (17)
Brazil (13)	South Korea (45)
Canada (11)	Turkey (15)
China (265)	
Germany (12)	
India (117)	
Iran (35)	

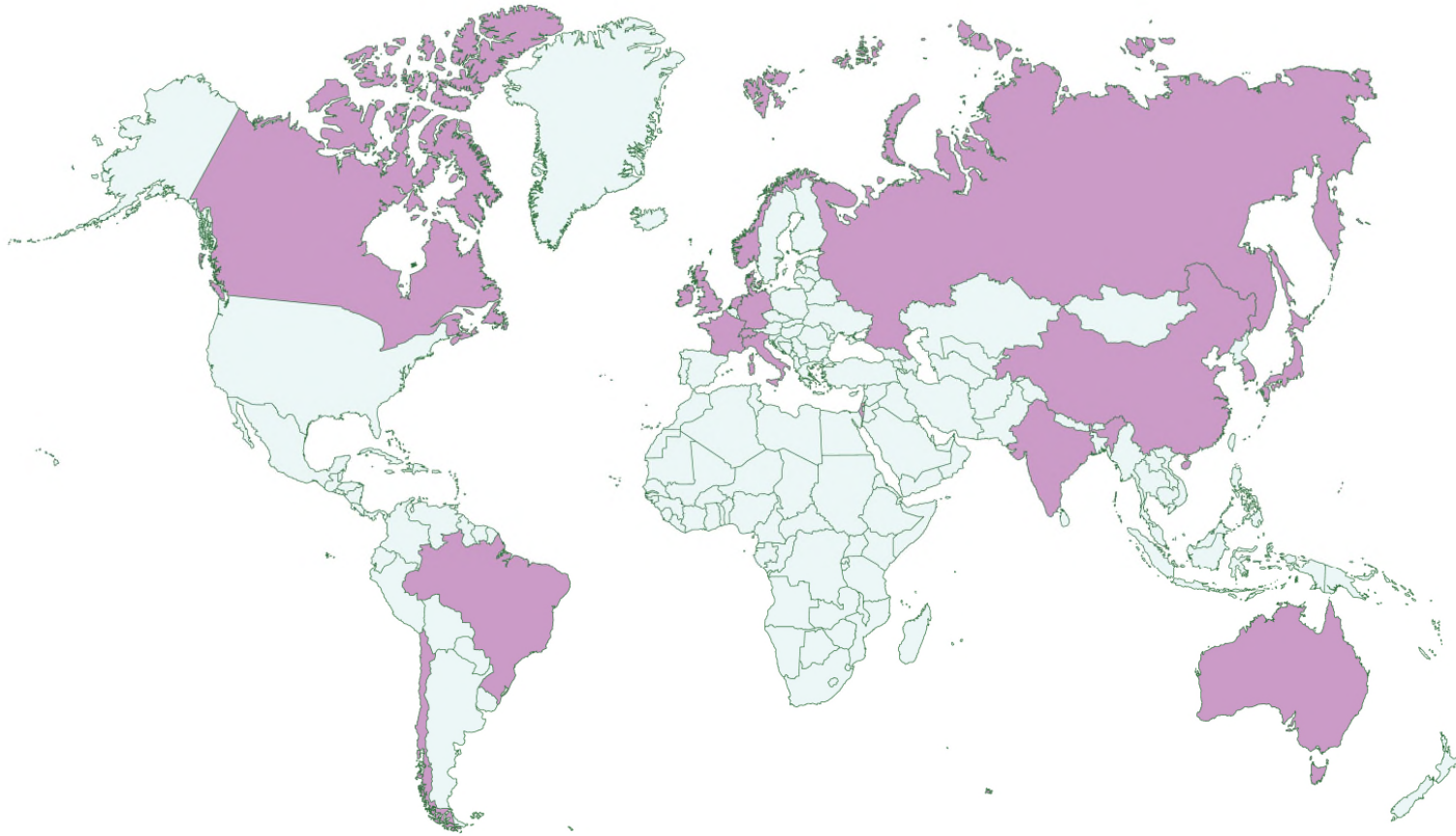
Country Not Reported	
	16*

43 Locations of the Active ERCs, FY 2019



Note: All centers are multi-university partnerships; university shown is lead institution.

Locations of Foreign Participating Organizations, FY 2019

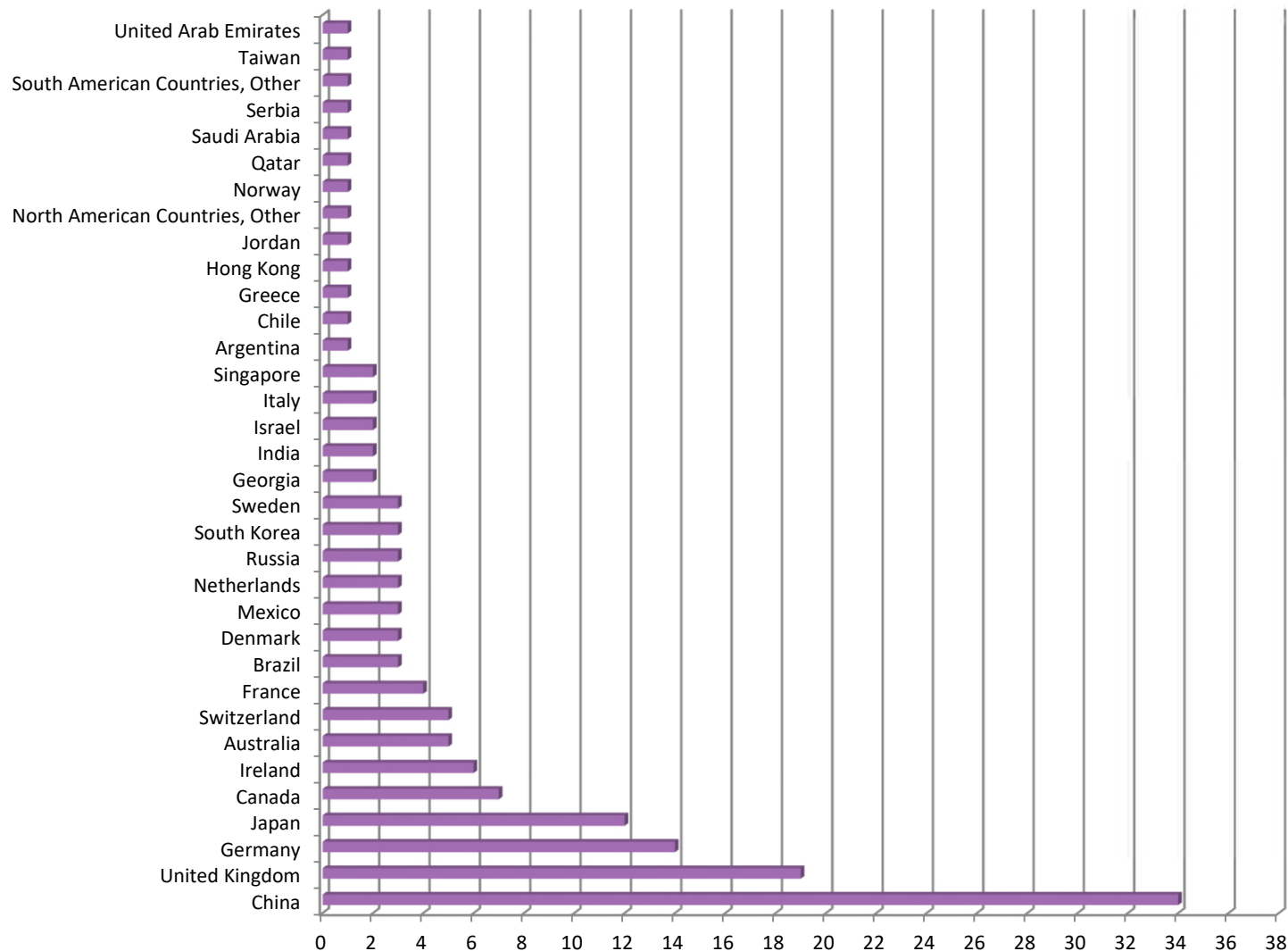


Countries with 1 - 20 Collaborators			
Australia (2)	France (3)	Japan (7)	Switzerland (2)
Brazil (1)	Germany (6)	Netherlands (2)	United Kingdom (8)
Canada (2)	India (1)	Norway (1)	
Chile (1)	Ireland (2)	Russia (2)	
China(3)	Israel (1)	Singapore (1)	
Denmark (2)	Italy (1)	South Korea (2)	

Countries with 21 - 40 Collaborators
No countries reported

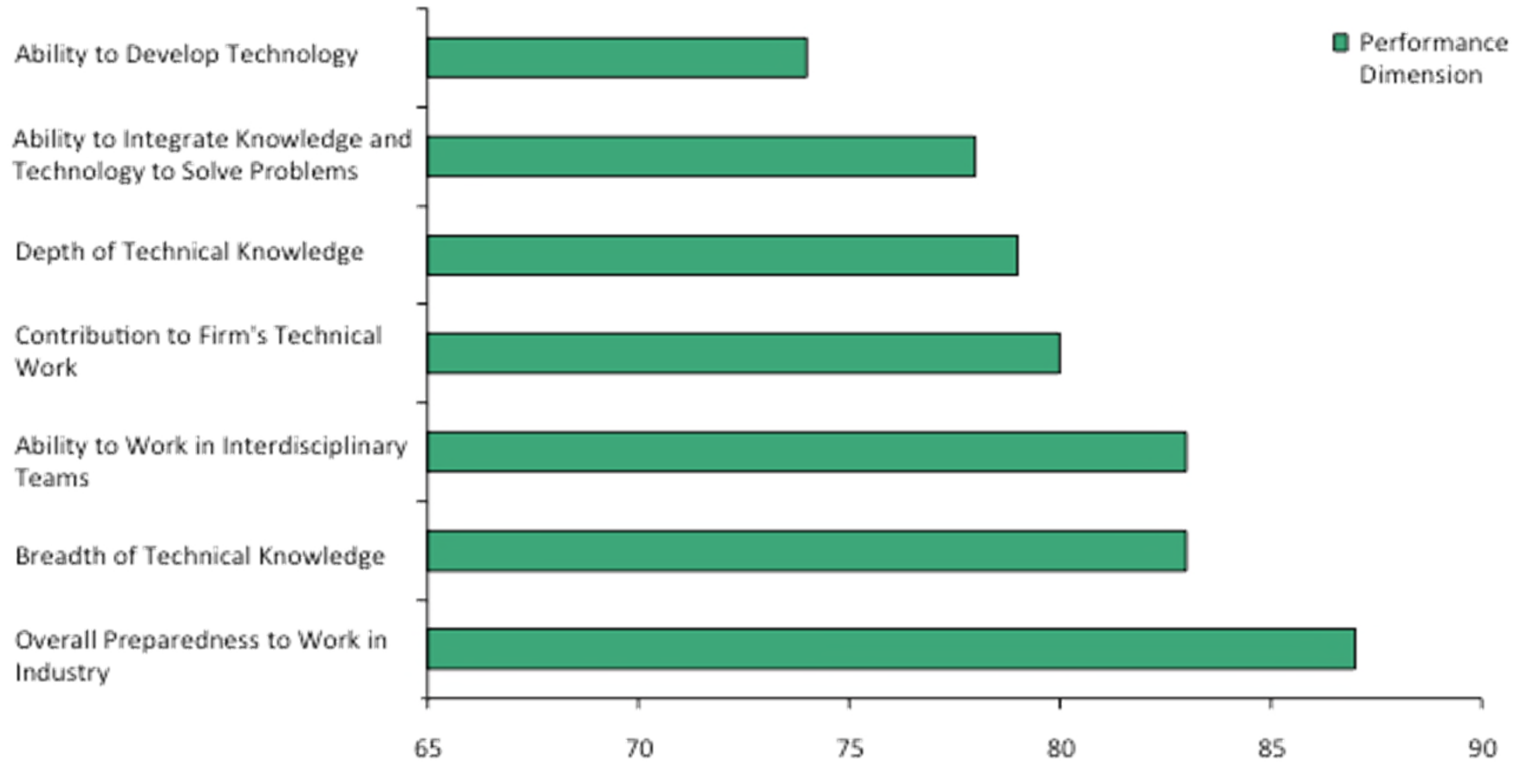
Countries with 21 - 40 Collaborators
No countries reported

46 Number of Institutions and Organizations With Financial Headquarters Abroad Collaborating With ERCs, by Country of Origin, FY 2019*,**



* Displays counts of Industrial/Practitioner members, Funders of Associated Projects, Funders of Sponsored Projects, Contributing Organizations, Collaborating Institutions, Non-ERC Institutions Providing REU Students, and Foreign Partner Institutions

** Community college and Pre-college institutions are excluded



* Percentage of industrial supervisors rating the former ERC students/graduates hired by their firms as "Better Than" or "Much Better Than" equivalent hires without ERC experience