Engineering Research Centers

End-of-Year Report

2021

i. 18 ERCs Referenced in Slides 1–5

NSF Nanosystems Engineering Research Center for Nanomanufacturing Systems for Mobile Computing and Mobile Energy Technologies at University of Texas (NASCENT) (Class: 2012; AY: 2012 – 2021; RY: 2012 – 2021)*	ERC for Ultra-wide-area Resilient Electric Energy Transmission Networks at University of Tennessee (CURENT) (Class: 2011; AY: 2011 – 2021; RY: 2011 – 2021)*
NSF Nanosystems Engineering Research Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST) (Class: 2012; AY: 2012 – 2021; RY: 2012 – 2021)*	Nanosystems Engineering Research Center for Nanotechnology Enabled Water Treatment Systems at Rice University (NEWT) (Class: 2015; AY: 2015 – 2021; RY: 2015 – 2021)*
Engineering Research Center for Bio-mediated and Bioinspired Geotechnics at Arizona State University (CBBG) (Class: 2015; AY: 2015 – 2021; RY: 2015 – 2021)*	ERC for Precise Advanced Technologies and Health Systems for Underserved Populations at Texas A&M University (PATHS-UP) (Class: 2017; AY: 2017 – 2021; RY: 2017 – 2021)*
ERC for Directed Multiscale Assembly of Cellular Metamaterials with Nanoscale Precision at Boston University (CELL-MET) (Class: 2017; AY: 2017 – 2021; RY: 2017 – 2021)*	ERC for Power Optimization for ElectroThermal Systems at University of Illinois (POETS) (Class: 2015; AY: 2015 – 2021; RY: 2015 – 2021)*
ERC for Innovative and Strategic Transformation of Alkane Resources at Purdue University (CISTAR) (Class: 2017; AY: 2017 – 2021; RY: 2017 – 2021)*	ERC for Quantum Energy and Sustainable Solar Technologies at Arizona State University (QESST) (Class: 2011; AY: 2011 – 2021; RY: 2011 – 2021)*
ERC for Cell Manufacturing Technologies at Georgia Institute of Technology (CMaT) (Class: 2017; AY: 2017 – 2021; RY: 2017 – 2021)*	NSF Engineering Research Center for Quantum Networks (CQN) (Class: 2020; AY: 2020 – 2021; RY: 2020 – 2021)*
NSF Engineering Research Center for Advancing Sustainability through Powered Infrastructure for Roadway Electrification (ASPIRE) (Class: 2020; AY: 2020 – 2021; RY: 2020 – 2021)*	Nanosystems Engineering Research Center for Translational Applications of Nanoscale Multiferroic Systems at University of California Los Angeles (TANMS) (Class: 2012; AY: 2012 – 2021; RY: 2012 – 2021)*
NSF Engineering Research Center for Advanced Technologies for Preservation of Biological Systems (ATP-Bio) (Class: 2020; AY: 2020 – 2021; RY: 2020 – 2021)*	NSF Engineering Research Center for the Internet of Things for Precision Agriculture (IoT4Ag) (Class: 2020; AY: 2020 – 2021; RY: 2020 – 2021)*
Center for Neurotechnology at University of Washington (CNT) (Class: 2011; AY: 2011 – 2021; RY: 2011 – 2021)*	ERC for Re-inventing the Nation's Urban Water Infrastructure (ReNUWIt) (Class: 2011; AY: 2011 – 2021; RY: 2011 – 2021)*

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

ii. "Annualized ERCs" on slides 1–5 include the 18 ERCs from the previous slide and the following additional 9 ERCs

ERC for Revolutionizing Metallic Biomaterials at North Carolina A&T State University (NCAT) (Class: 2008; AY: 2008 – 2020; RY: 2008 – 2020)*	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 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)*
Center for Biorenewable Chemicals at Iowa State University (IOWA) (Class: 2008; AY: 2008 – 2019; RY: 2008 – 2019)*	ERC for Lighting Enabled Systems & Applications at Rensselaer Polytechnic Institute (LESA) (Class: 2008; AY: 2008 – 2019; RY: 2008 – 2019)*
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 1985–2021*

	FY 2021 (18 ERCs)		FY 2016–2020 Annualized		FY 1985–2021 (69 ERCs)
Intellectual Property Transaction	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
Inventions Disclosed	42	2	69	4	2,610
Patent Applications Filed (Provisional and Full)	80	4	86	5	2,316
Patents Awarded	33	2	27	2	916
Licenses Issued	8	< 1	8	< 1	1,387
Economic Development	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
Spinoff Companies	3	< 1	9	1	243
Spinoff Employees	8	< 1	95	6	1,612

** Does not include centers from the Earthquake Technology Sector*

2 ERC Influence on Curriculum, FY 1985–2021*

	FY 2021 (18 ERCs)		FY 2016–2020 Annualized		FY 1985–2021 (69 ERCs)
Degrees	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
New Full-Degree Programs Based on ERC Research	0	< 1	2	< 1	57
New Degree Minors Based on ERC Research	0	< 1	1	< 1	34
New Certificate Programs Based on ERC Research	2	< 1	2	< 1	45
Courses	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
New Courses Based on ERC Research	25	1	28	2	1,110
Ongoing Courses With ERC Content	189	11	264	15	3,672
Course Modules Based on ERC Research	44	2	29	2	790
Textbooks	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
New Textbooks Based on ERC Research	2	< 1	4	< 1	189
New Textbook Chapters Based on ERC Research	2	< 1	6	< 1	111

** Does not include centers from the Earthquake Technology Sector*

3 ERC Information Dissemination, FY 1985–2021*

	FY 2021 (18 ERCs)		FY 2016–2020 Annualized		FY 1985–2021 (69 ERCs)
Peer-Reviewed Publications (Total)	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
Journals**	915	51	821	47	25,600
Conference Proceedings**	332	18	441	25	18,767
Trade Journals	11	1	7	< 1	655
Coauthored With ERC Students	444	25	500	28	13,437
Education and Outreach	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
Education and Colloquia	420	23	855	49	18,032
Workshops, Short Courses, and Webinars	455	25	385	22	6,472

** Does not include centers from the Earthquake Technology Sector*

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

Curricular Impact of ERCs, FY 2007–2021*

	FY 2021 (18 ERCs)		FY 2016–2020 Annualized		FY 2007–2021 (43 ERCs)
New and Ongoing Courses, Workshops, Short Courses, Webinars, and Textbooks Based on ERC Research	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
With Engineered-System Focus	340	19	312	18	4,322
With Multidisciplinary Content	347	19	256	14	3,786
Offered at Undergraduate Level	216	12	215	12	2,712
Offered at Graduate Level	376	21	247	14	3,652
Used at More Than One ERC Institution	266	15	91	5	1205
Team Taught by Faculty in More Than One Department	244	14	86	5	1156

** Does not include centers from the Earthquake Technology Sector*

*** Data collection of curricular impacts started in 2007*

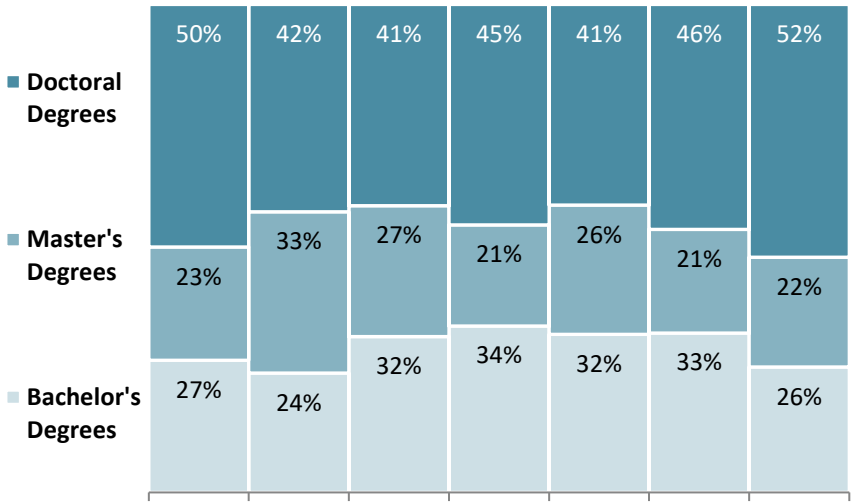
ERC Student Degrees, FY 1985–2021*

	FY 2021 (18 ERCs)		FY 2016–2020 Annualized		FY 1985–2021 (69 ERCs)
Degree Type	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
Bachelor's	64	4	106	6	4,671
Master's	56	3	88	5	4,435
Doctoral	129	7	148	8	5,350
Total	***249***	***14***	***342***	***20***	***14,456***

** Does not include centers from the Earthquake Technology Sector*

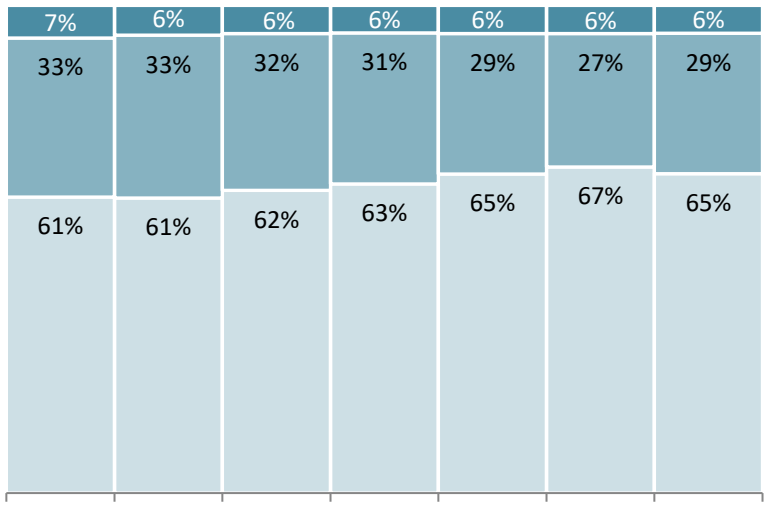
6 Degrees Granted to ERC Students vs. All U.S. Engineering Graduates, FY 2015–2021

Degrees Granted to ERC Students*
(Domestic and Foreign Students)



	2015	2016	2017	2018	2019	2020	2021
Total Degrees Granted	*354*	*384*	*354*	*381*	*287*	*306*	*249*

Degrees Granted From All U.S. Engineering Schools
(Domestic and Foreign Students)

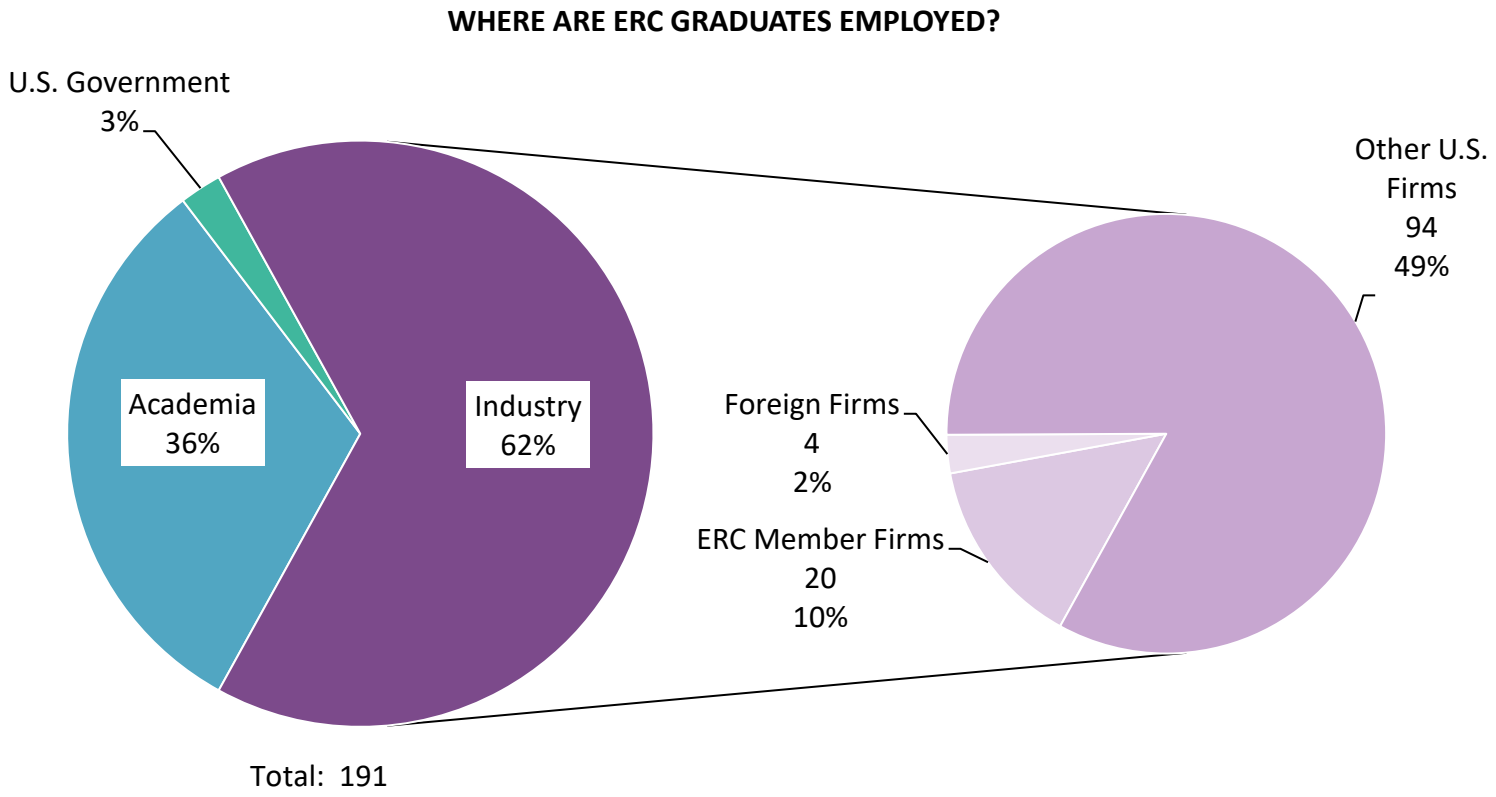


	2015	2016	2017	2018	2019	2020	2021
Total Degrees Granted	*174875*	*192704*	*201260*	*214698*	*216298*	*218310*	*217602*

** Does not include centers from the Earthquake Technology Sector*

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

ERC Graduate Employment (18 Centers), FY 2021



8 ERC Research and Education Personnel, by Underrepresented Group and Citizenship Status, FY 2021

Personnel Category	Total	Total U.S. Citizens and Permanent Residents	Women*		Underrepresented Racial Minorities*		Hispanic*		Foreign	
			Number	%	Number	%	Number	%	Number	%
Faculty										
Total	687	570	154	27%	41	7%	49	9%	66	10%
Graduate Students										
Postdocs	202	62	21	34%	4	6%	5	8%	123	61%
Graduate Students	1,216	540	191	35%	52	10%	88	16%	528	43%
Doctoral	990	433	157	36%	46	11%	67	15%	462	47%
Master's	227	107	34	32%	6	6%	21	20%	67	30%
Total**	1,416	602	212	35%	56	9%	93	15%	650	46%
Undergraduate Students										
ERC Undergraduate Students (Research Assistants, Non-REU Students)	637	464	231	50%	60	13%	111	24%	27	4%
NSF REU Site Award Students	82	82	46	56%	17	21%	28	34%	0	0%
Center Funding Students	128	116	56	48%	30	26%	27	23%	1	1%
Other NSF Supplemental Funding Students	40	35	17	49%	17	49%	13	37%	0	0%
Total**	789	612	312	51%	109	18%	147	24%	27	3%
Community College										
Participants in RET Program	1	0	0	0%	0	0%	0	0%	0	0%
K–12 Teachers										
K–12 RET	103	85	51	60%	18	21%	22	26%	0	0%
K–12 Non-RET	95	88	57	65%	23	26%	18	20%	0	0%
Total	198	173	108	62%	41	24%	40	23%	0	0%
Young Scholars										
Total	147	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grand Total***	***3,267***	***1,986***	***806***	***41%***	***252***	***13%***	***336***	***17%***	***743***	***24%***

** 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, Research Thrust Leaders, and Engineering Workforce Development Program Leaders are included in the Grand Total For the Grand Total row, all columns exclude Young Scholars, except the Total column*

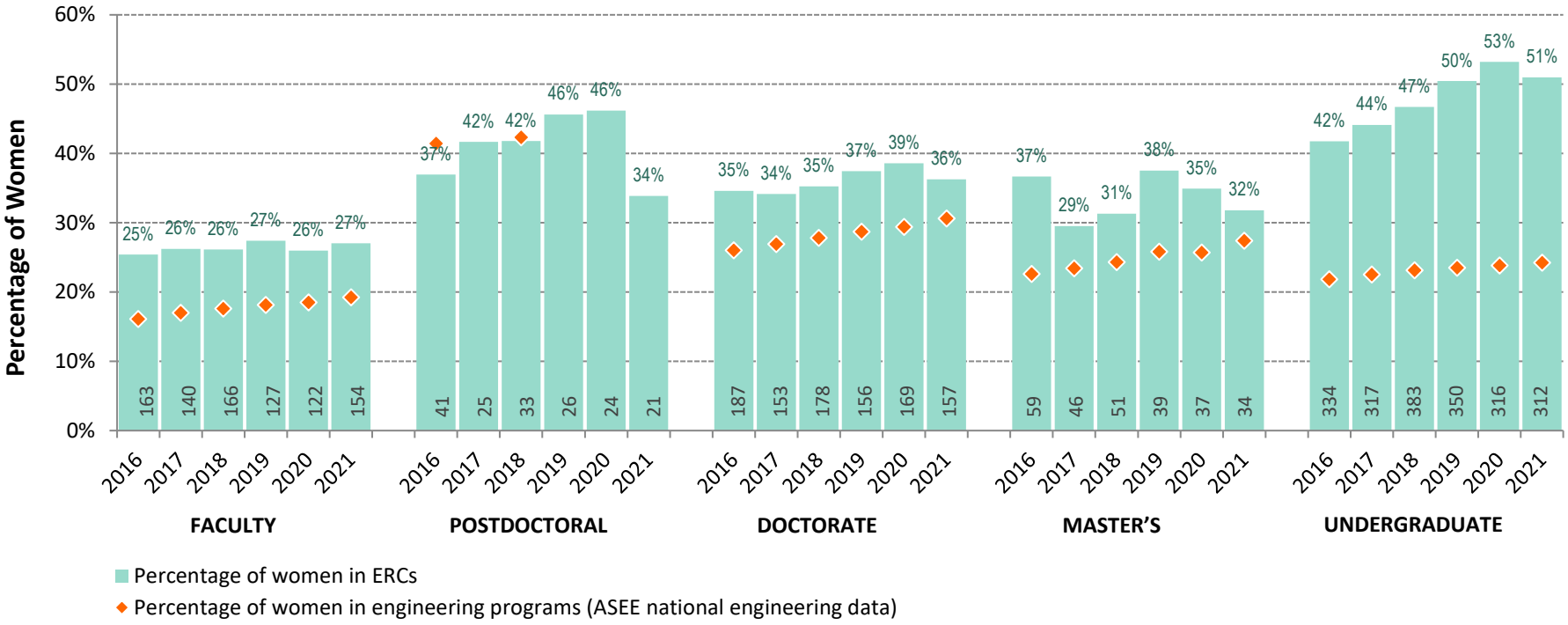
NOTE: *For years in which the center entered demographic data by institution rather than per person, data are not included*

Participants Impacted by ERC Engineering Education Activities, FY 2021

Outreach Participants	Total
Community College Events	
Faculty Who Attended ERC-Sponsored Educational Outreach Events	113
Students Who Attended ERC-Sponsored Educational Outreach Events	560
Total	673
K–12 Events	
Pre-college K–12 Teachers	1,239
K–12 Students	40,435
Total	41,674
Grand Total	***42,347***

Women in ERCs, FY 2016–2021

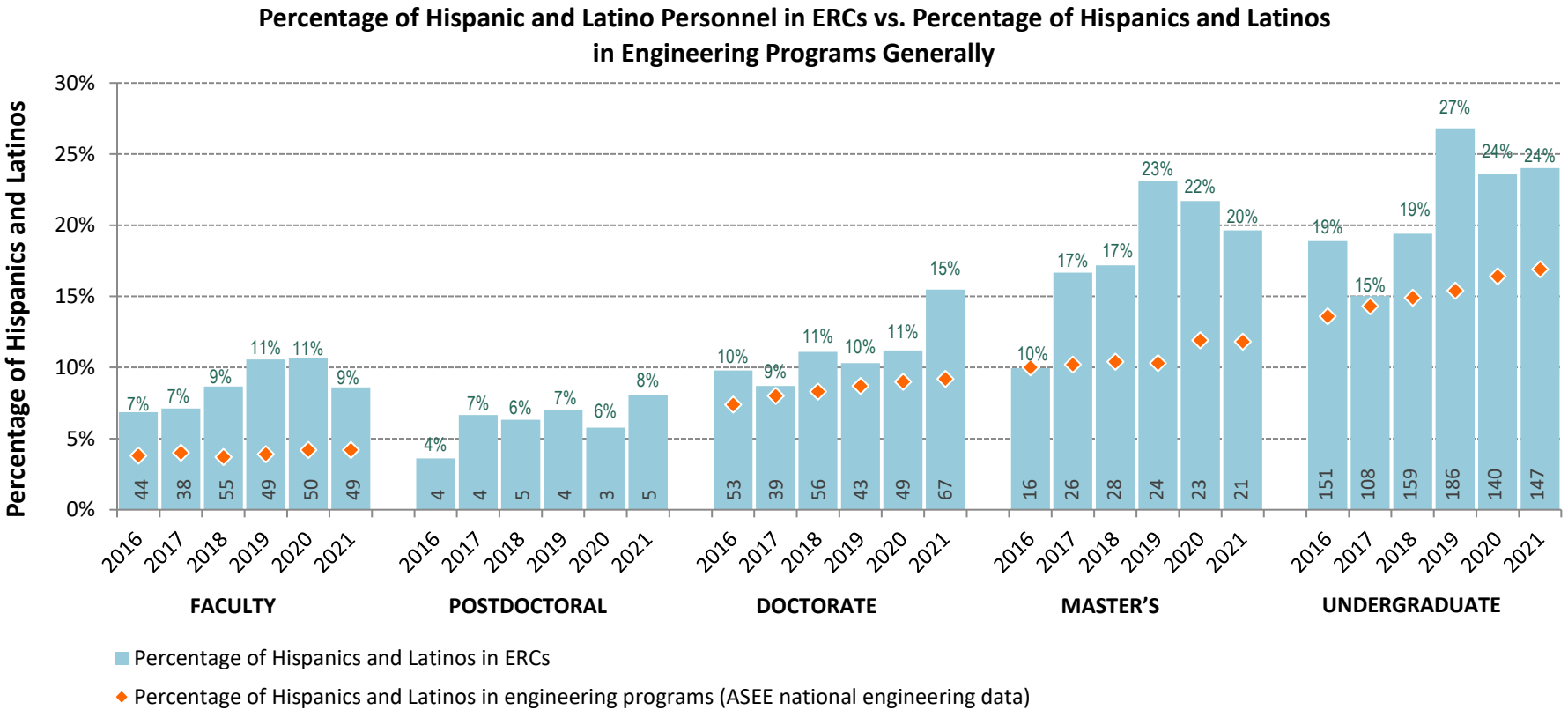
Percentage of Women Personnel in ERCs vs. Percentage of Women in Engineering Programs Generally



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 postdoctoral for 2017, 2019, 2020 and 2021*
- *The percentages of personnel who did not report gender are as follows: 2016: 9.77%, 2017: 12.06%, 2018: 10.67%, 2019: 10.95%, 2020: 9.94%, 2021: 10.36%*

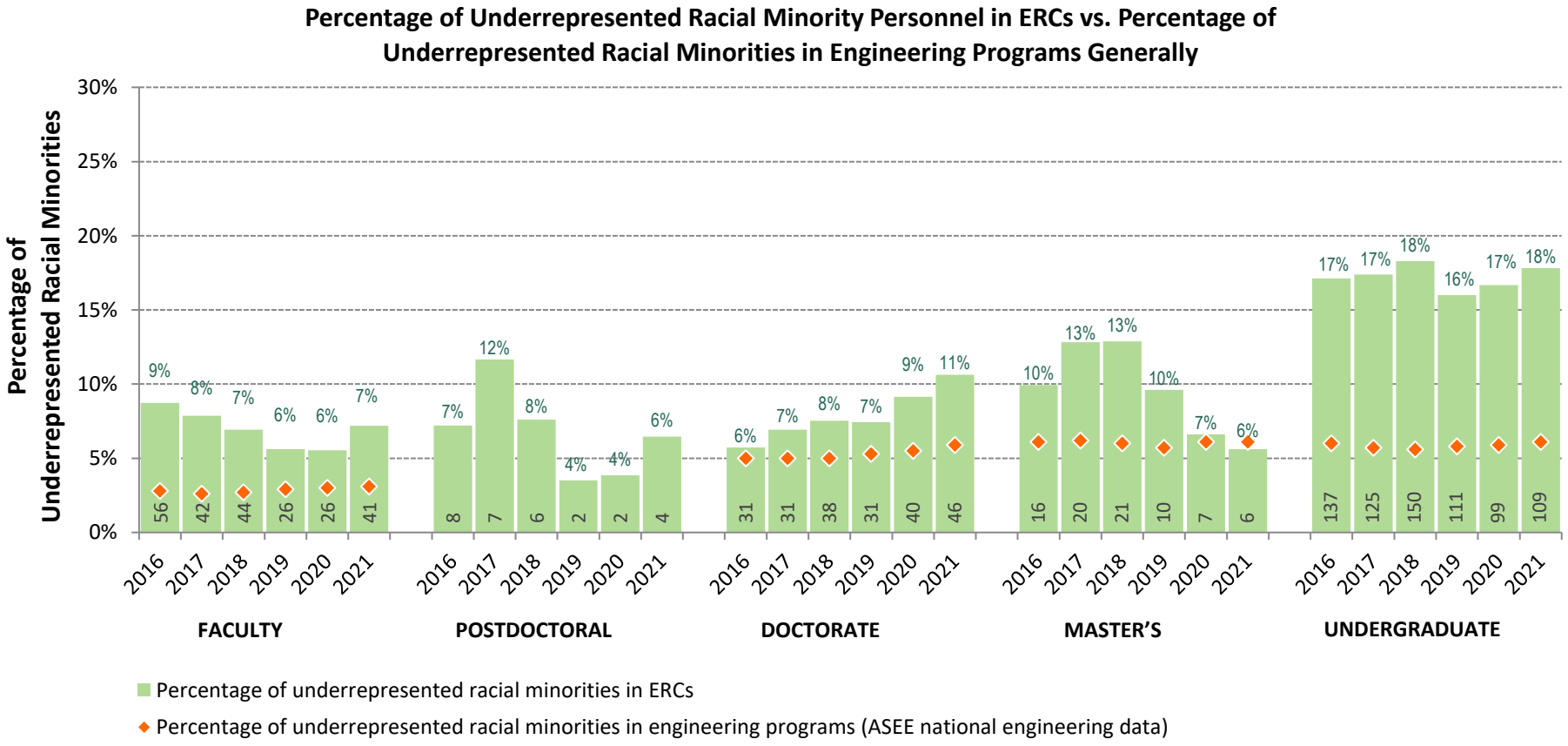
Hispanics and Latinos in ERCs, FY 2016–2021



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 postdoctoral for 2016–2021*
- *The percentages of personnel who did not report ethnicity are as follows: 2016: 20.85%, 2017: 17.43%, 2018: 15.81%, 2019: 15.57%, 2020: 15.11%, 2021: 14.17%*

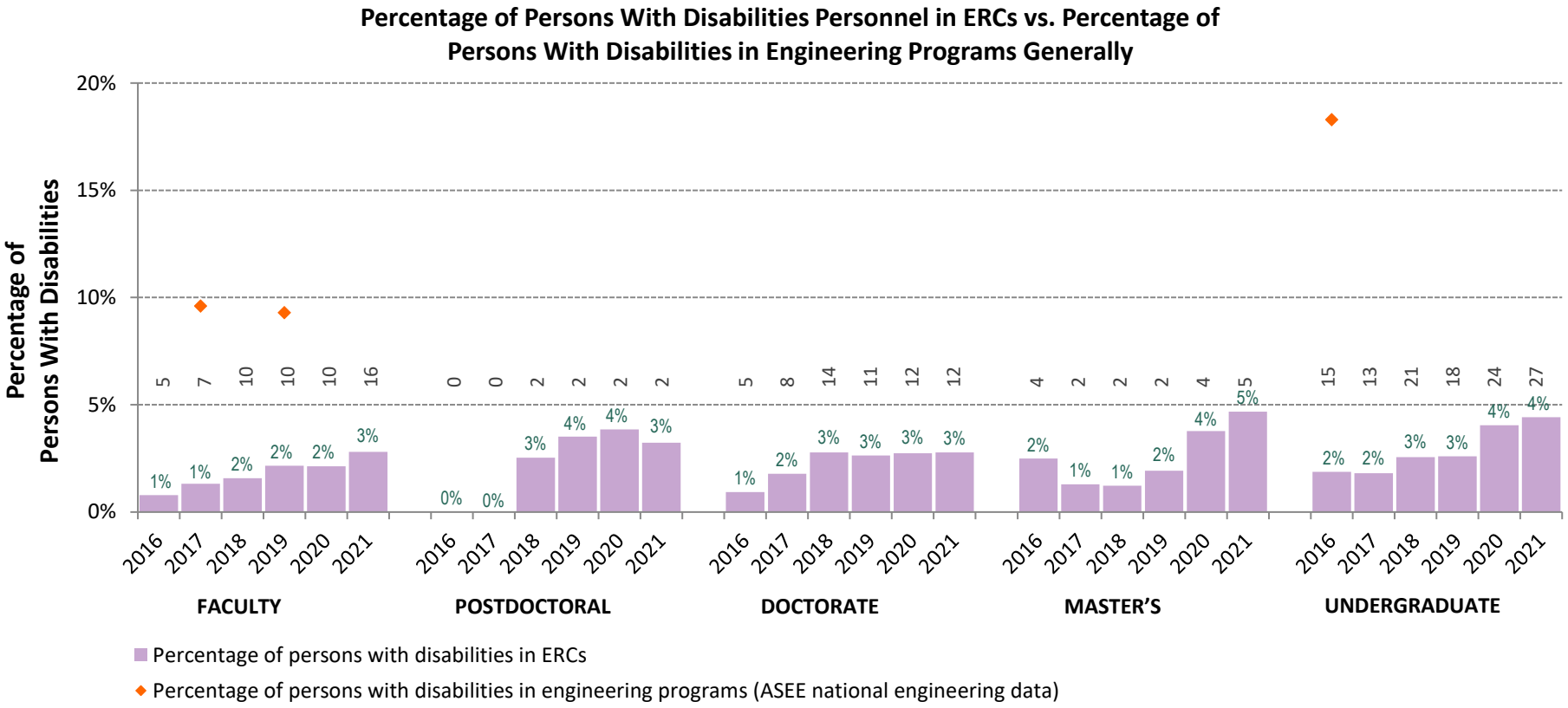
12 Underrepresented Racial Minorities in ERCs, FY 2016–2021



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 2016–2021*
- *The percentages of personnel who did not report race are as follows: 2016: 22.06%, 2017: 17.88%, 2018: 16.91%, 2019: 17.68%, 2020: 16.37%, 2021: 16.46%*

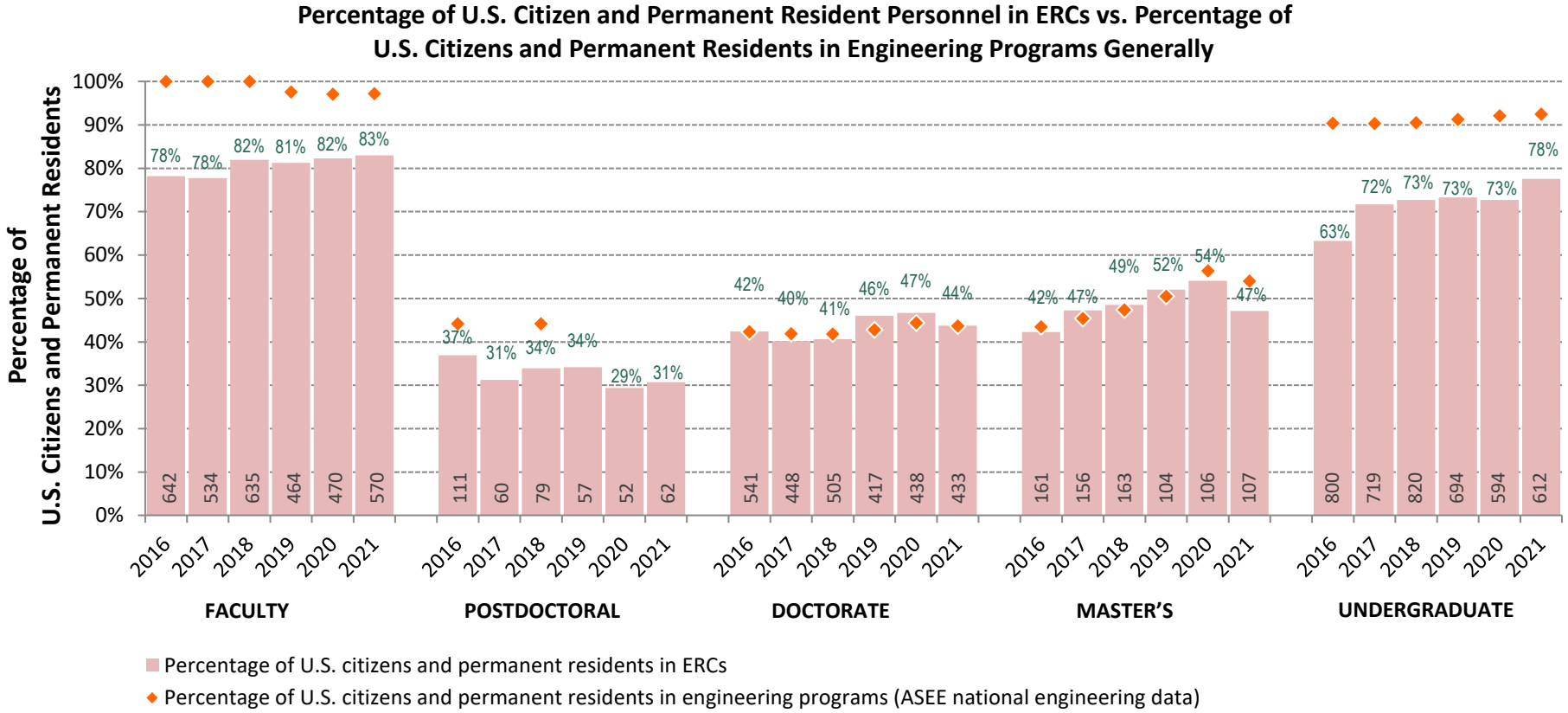
Persons With Disabilities in ERCs, FY 2016–2021



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 2019 and for undergraduate for 2016*
- *The percentages of personnel who did not report disability status are as follows: 2016: 23.79%, 2017: 27.63%, 2018: 20.44%, 2019: 21.66%, 2020: 18.34%, 2021: 17.21%*

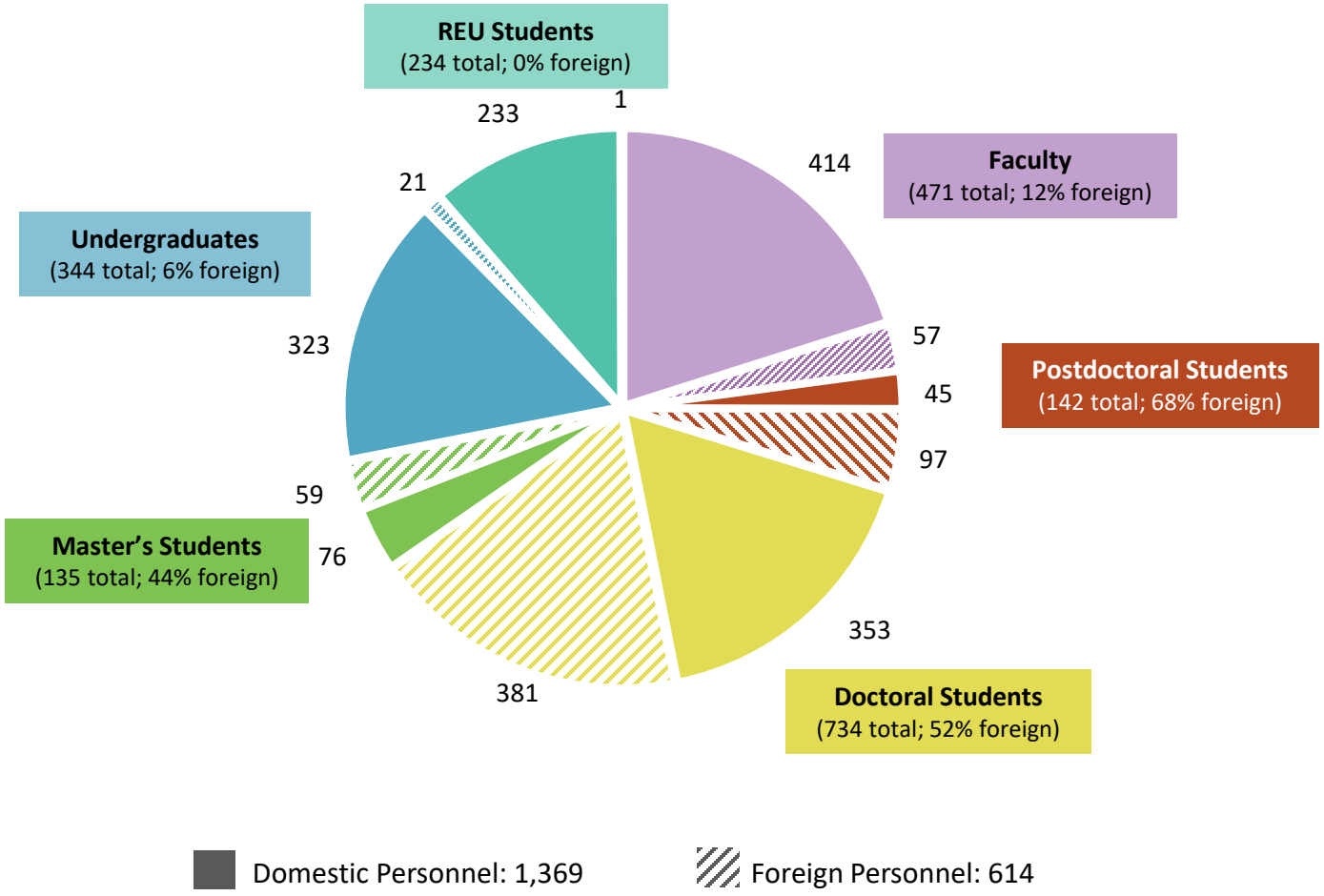
U.S. Citizens and Permanent Residents in ERCs, FY 2016–2021



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 available for postdoctoral for 2017, 2019, 2020 and 2021*
- *The percentages of personnel who did not report citizenship are as follows: 2016: 18.42%, 2017: 14.07%, 2018: 13.09%, 2019: 12.73%, 2020: 12.64%, 2021: 12.12%*

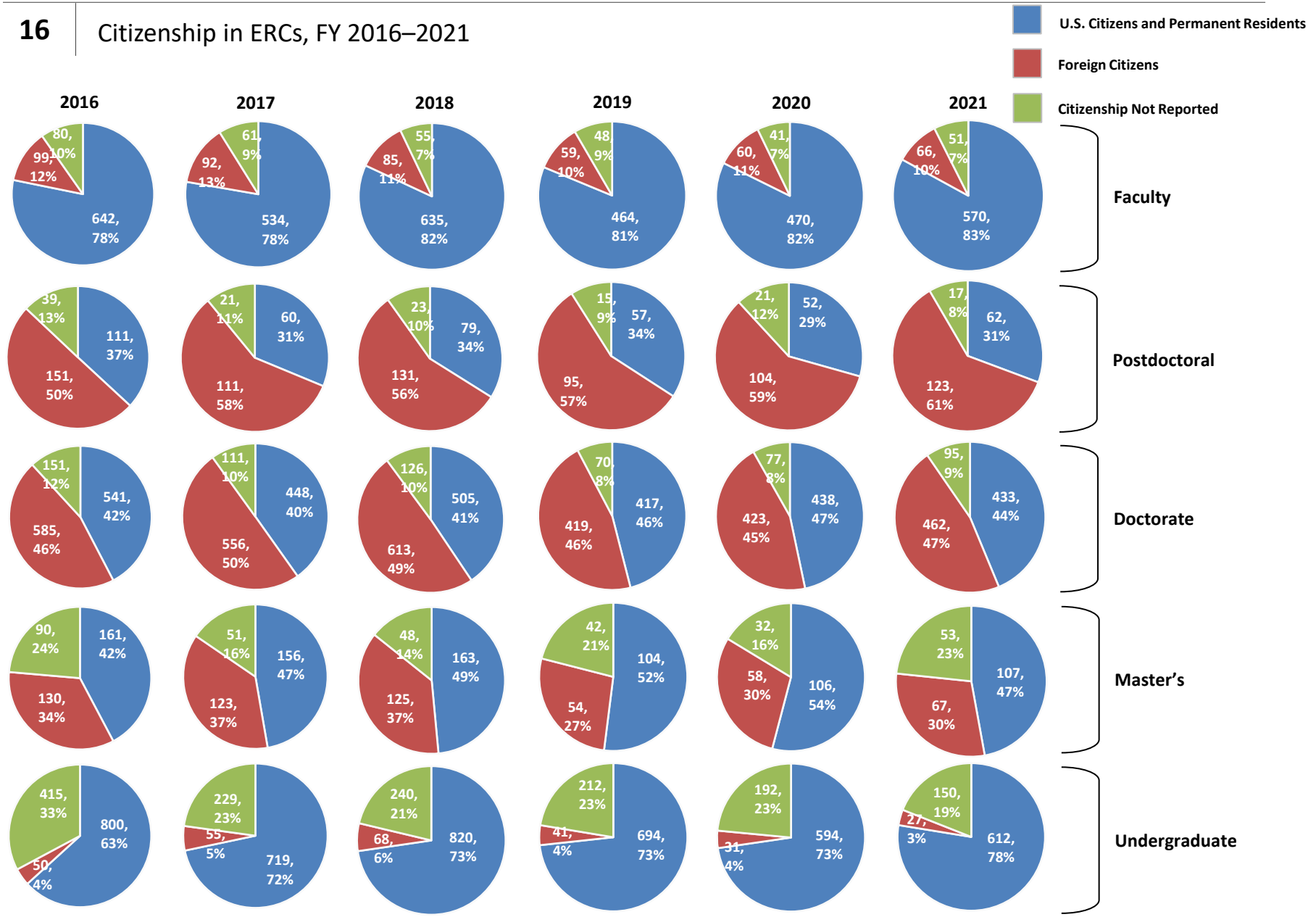
Personnel Conducting ERC Research, FY 2021



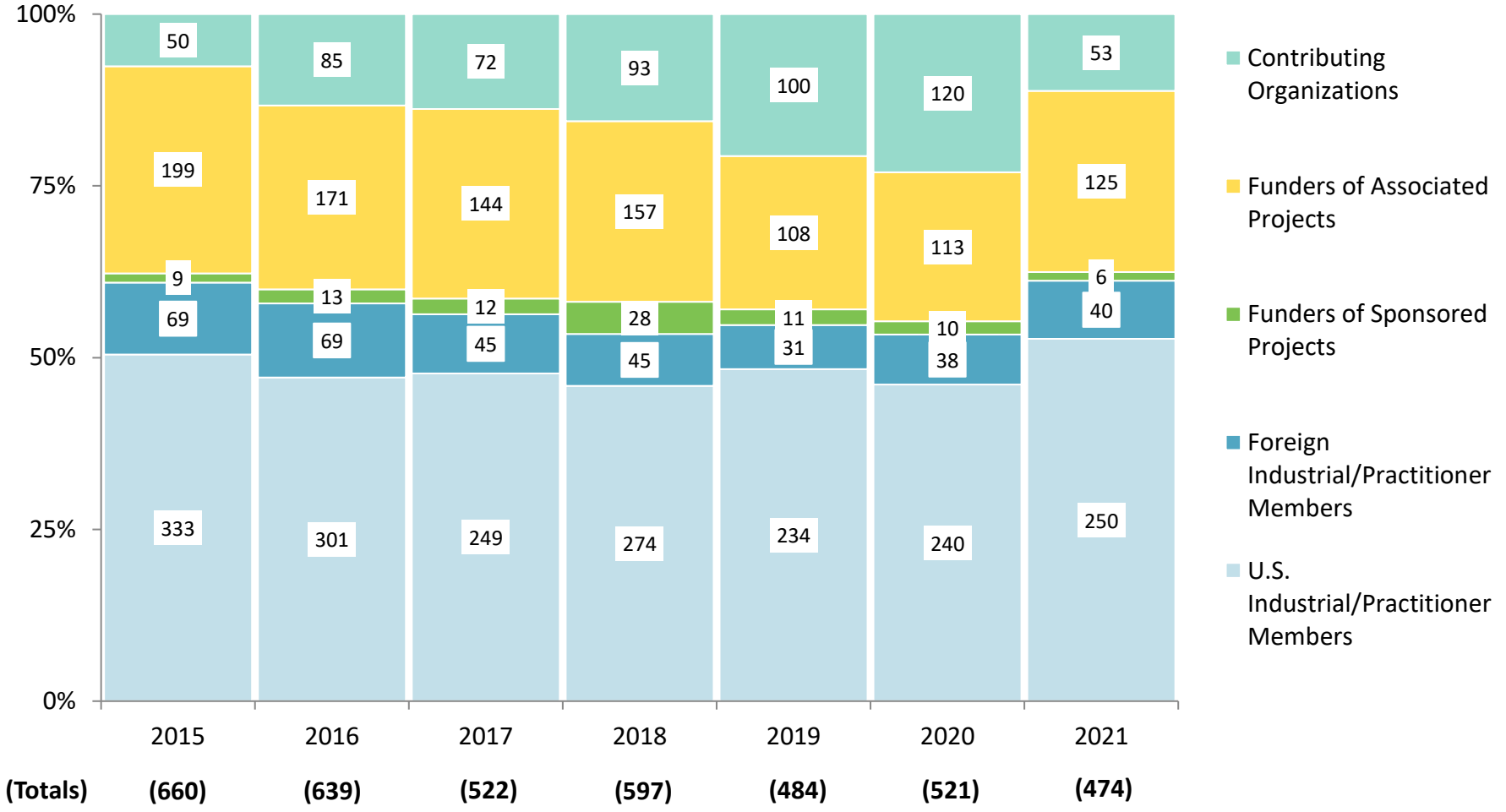
NOTES:

- *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 2016–2021



17 ERC Industrial/Practitioner Members and Supporting Organizations, FY 2015–2021*



** Does not include centers from the Earthquake Technology Sector*

18 ERC Industrial/Practitioner Members and Supporting Organizations, FY 2015–2021*

	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Organization Type							
Contributing Organizations	50	85	72	93	100	120	53
Funders of Associated Projects	199	171	144	157	108	113	125
Funders of Sponsored Projects	9	13	12	28	11	10	6
Foreign Industrial/Practitioner Members	69	69	45	45	31	38	40
U.S. Industrial/Practitioner Members	333	301	249	274	234	240	250
Total Number of Organizations	***660***	***639***	***522***	***597***	***484***	***521***	***474***
Total Number of Centers	***17***	***19***	***16***	***19***	***19***	***15***	***18***
Average Number of Organizations per Center	***39***	***34***	***33***	***31***	***25***	***35***	***26***

** Does not include centers from the Earthquake Technology Sector*

19 Industrial/Practitioner Member Support by Year, FY 2015–2021*

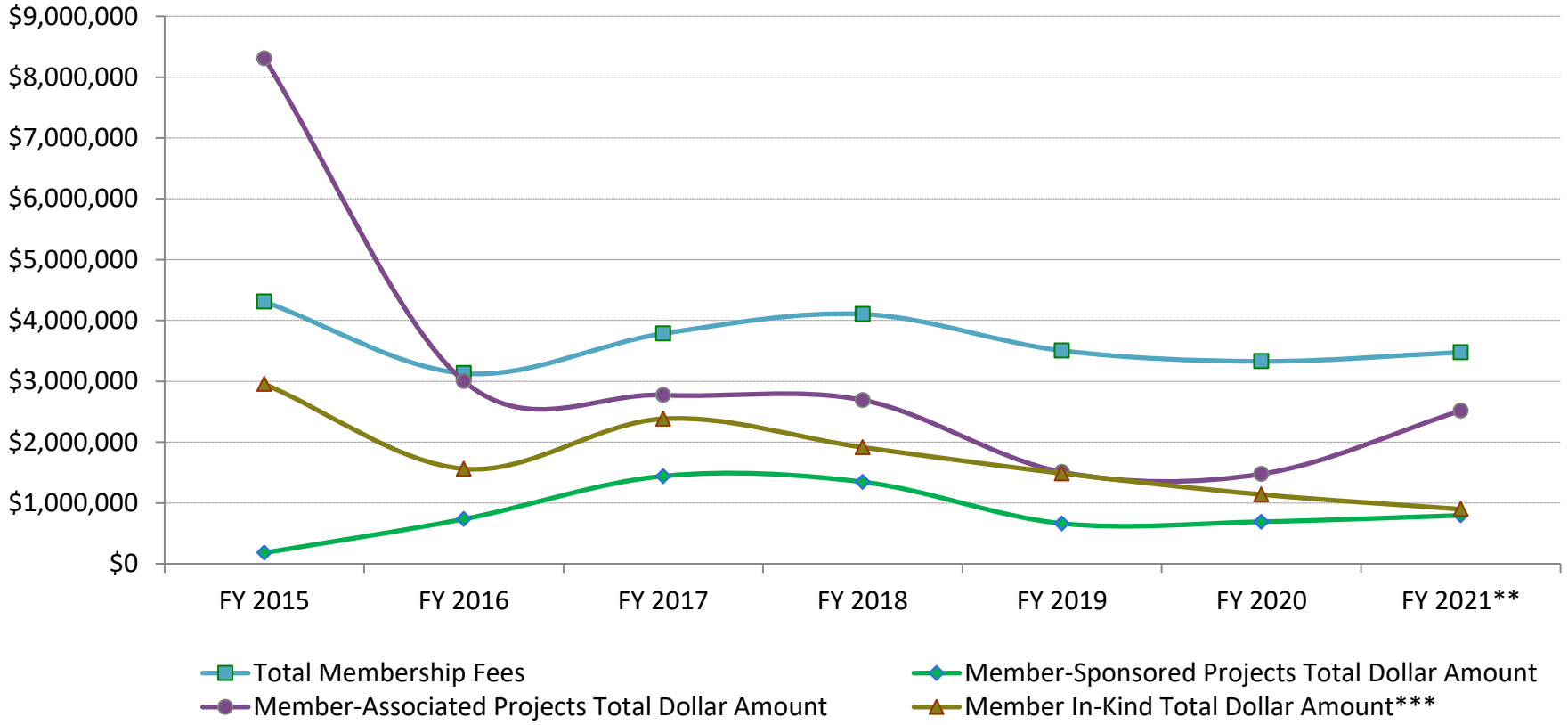
	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021**
Type of Support							
Total Membership Fees	$4,309,666	$3,132,772	$3,786,620	$4,105,519	$3,505,352	$3,329,864	$3,478,249
Member-Sponsored Projects Total Dollar Amount	$182,000	$735,122	$1,440,493	$1,344,913	$662,354	$691,321	$794,861
Member-Associated Projects Total Dollar Amount	$8,308,585	$3,001,718	$2,772,841	$2,690,570	$1,506,932	$1,475,615	$2,517,614
Member In-Kind Total Dollar Amount***	$2,954,553	$1,560,677	$2,384,789	$1,914,975	$1,486,785	$1,139,124	$898,246
Total Dollar Amount, Industrial/Practitioner Member Support to Center	***$15,754,804***	***$8,430,289***	***$10,384,743***	***$10,055,977***	***$7,161,423***	***$6,635,924***	***$7,688,970***

** 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*

20 Industrial/Practitioner Member Support by Year, FY 2015–2021*

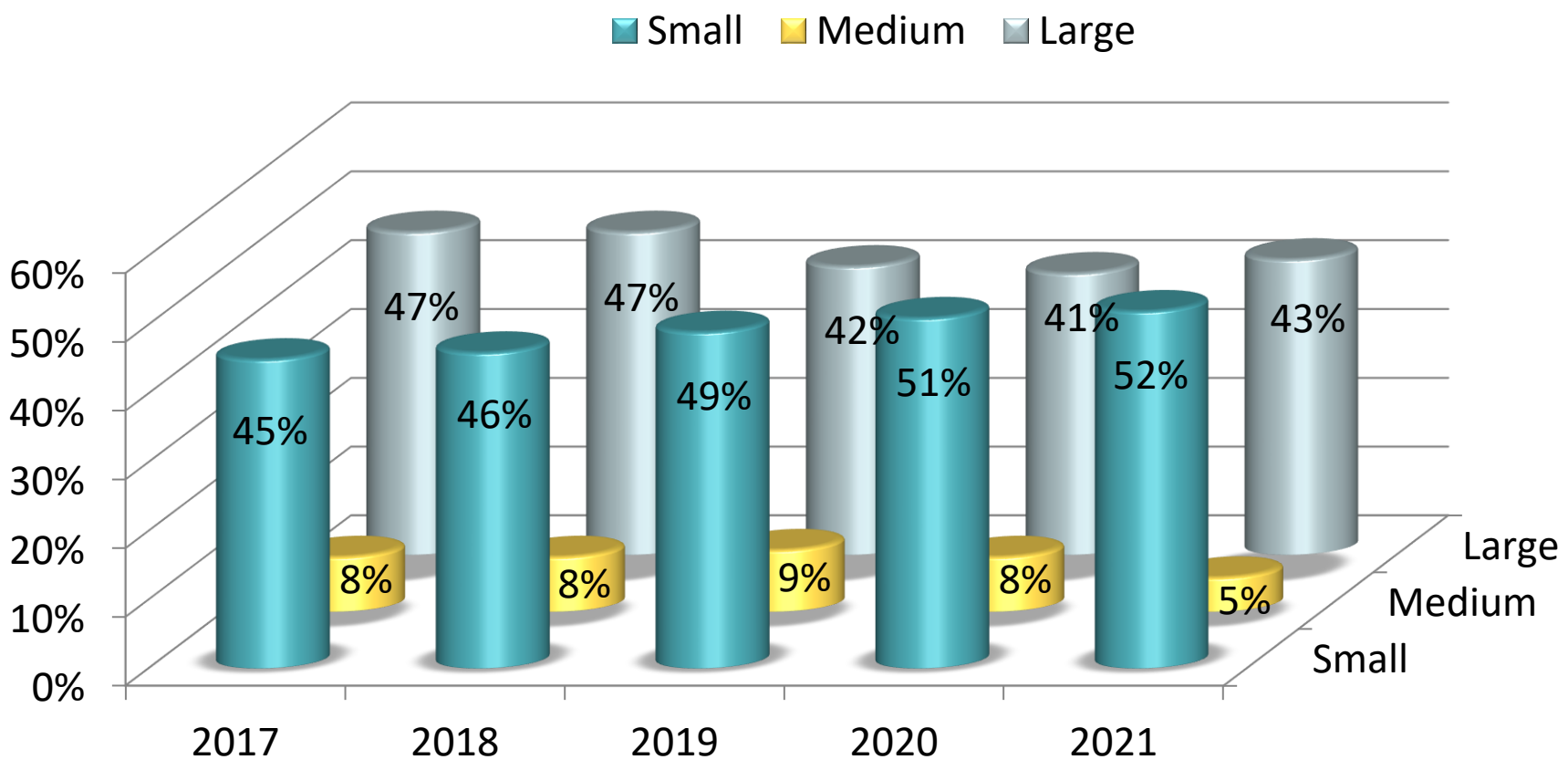


** Does not include centers from the Earthquake Technology Sector*

*** 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*

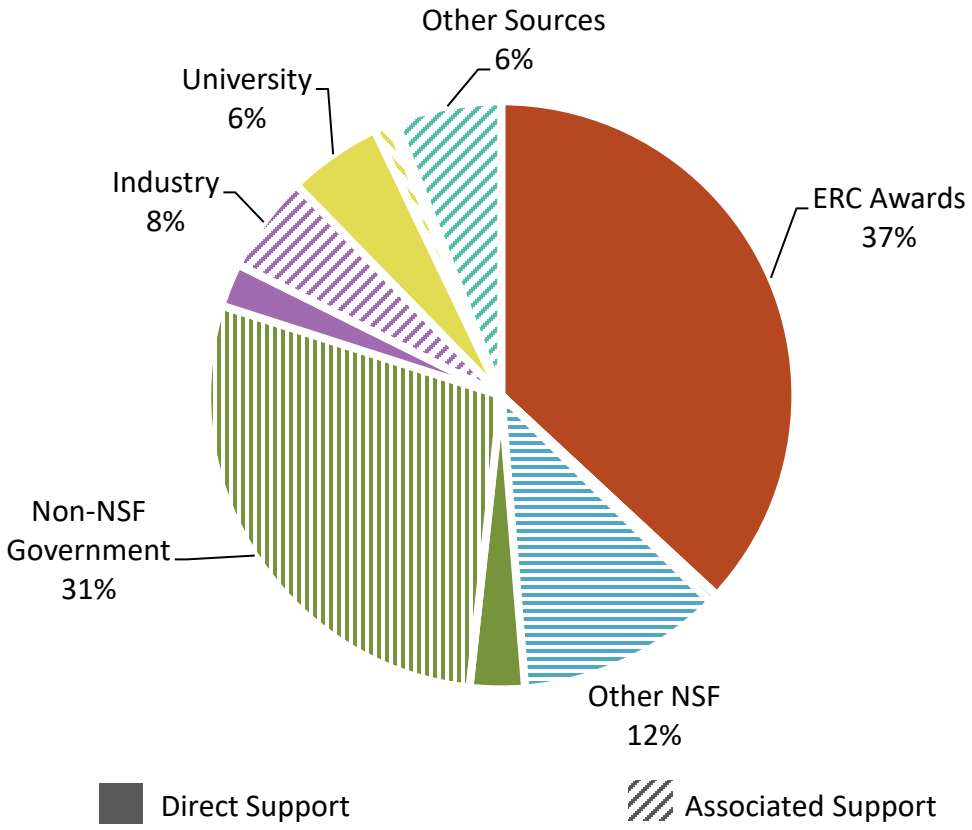
21 | Distribution of Industrial/Practitioner Members by Industry Size, FY 2017–2021



NOTES:

- *The total number of firms is as follows: 2017: 249, 2018: 276, 2019: 222, 2020: 239, 2021: 263*
- *Industry sizes are as follows: Small = <500 employees, Medium = 500–1,000 employees, Large = >1,000 employees*

Total ERC New Cash Support, FY 2021 (18 ERCs)

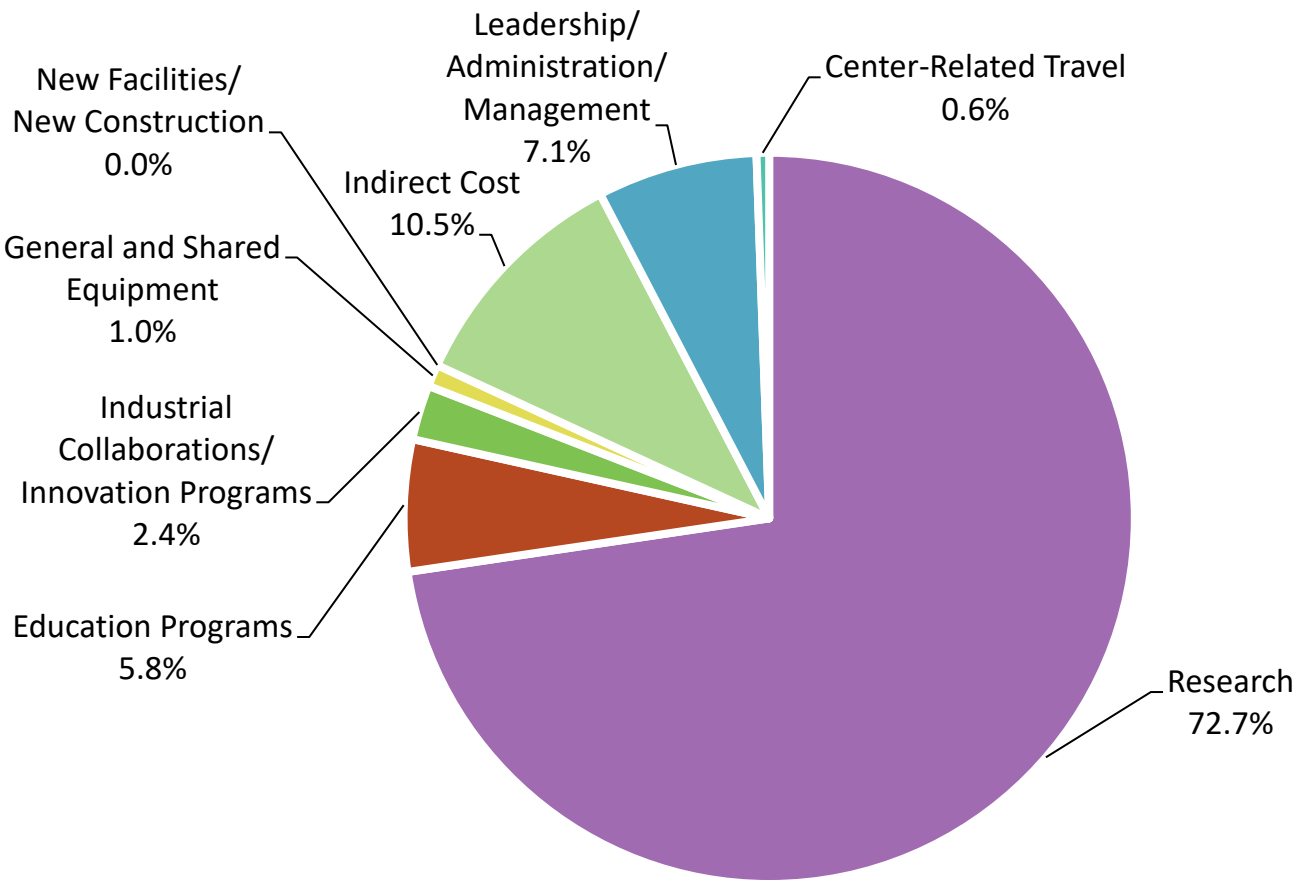


Total value of support: $156 million

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*

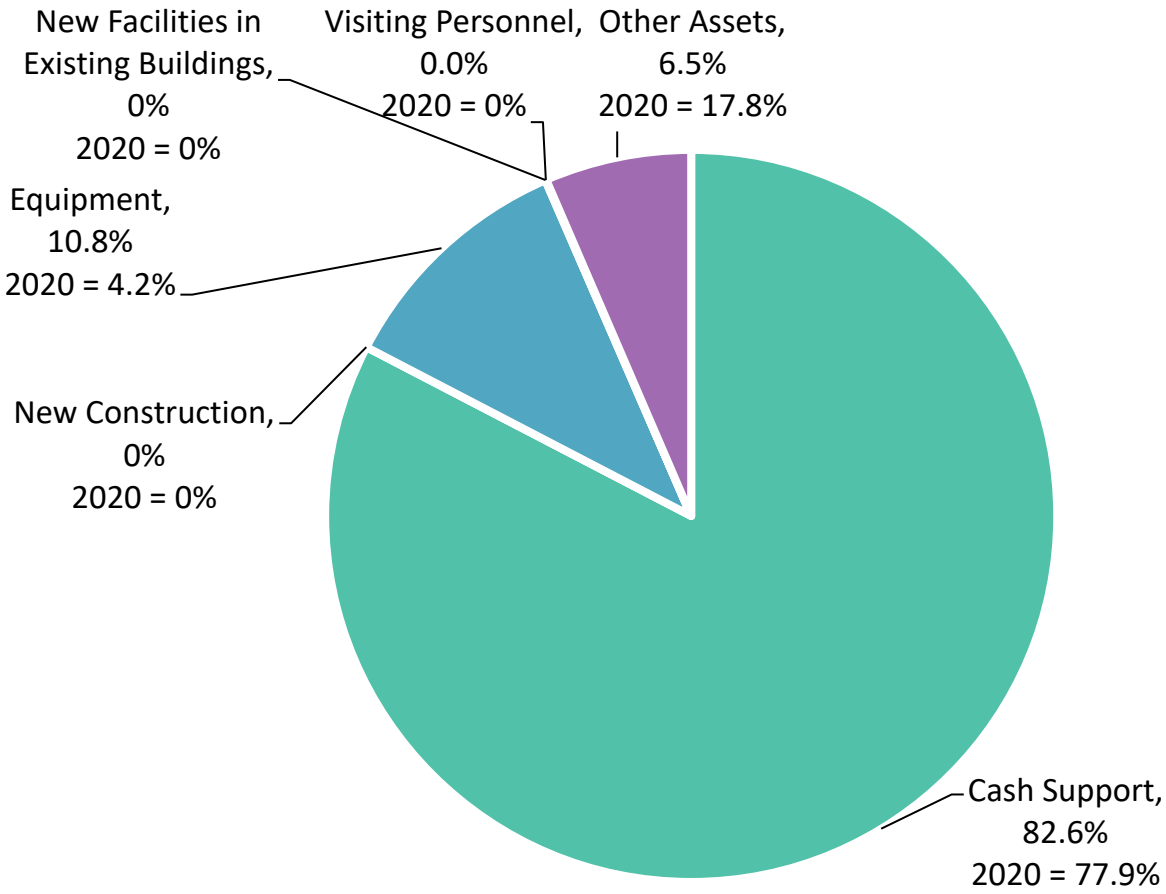
Functional Budgets of ERCs in the Aggregate, FY 2021*



Direct Support total: $145,624,755

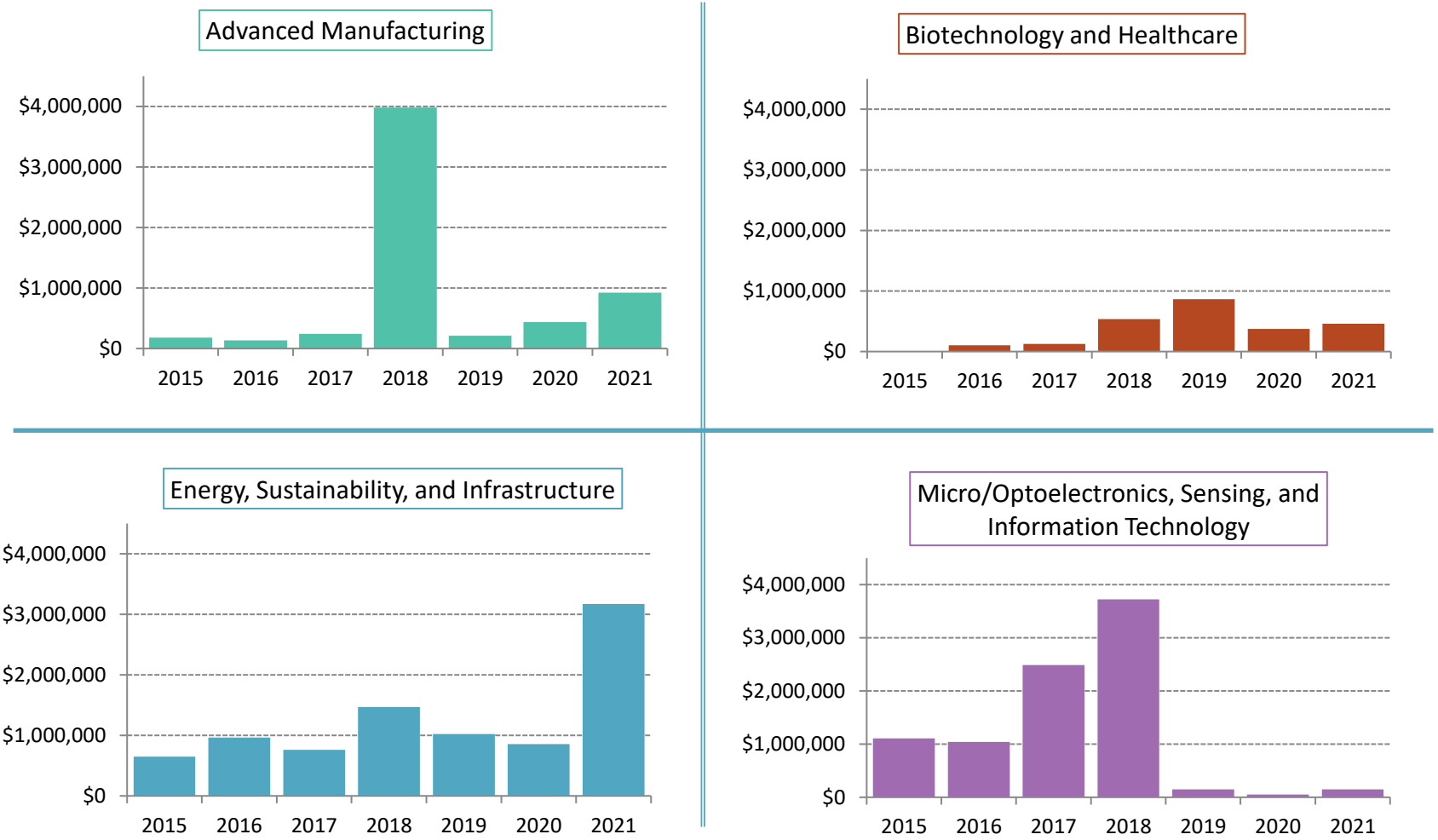
** Includes in-kind support but not residuals*

Industrial/Practitioner New Support to 18 ERCs, FY 2021



Total value of support: $5.2 million

Non-NSF Government Support by ERC Technology Sector, FY 2015–2021*,**,***

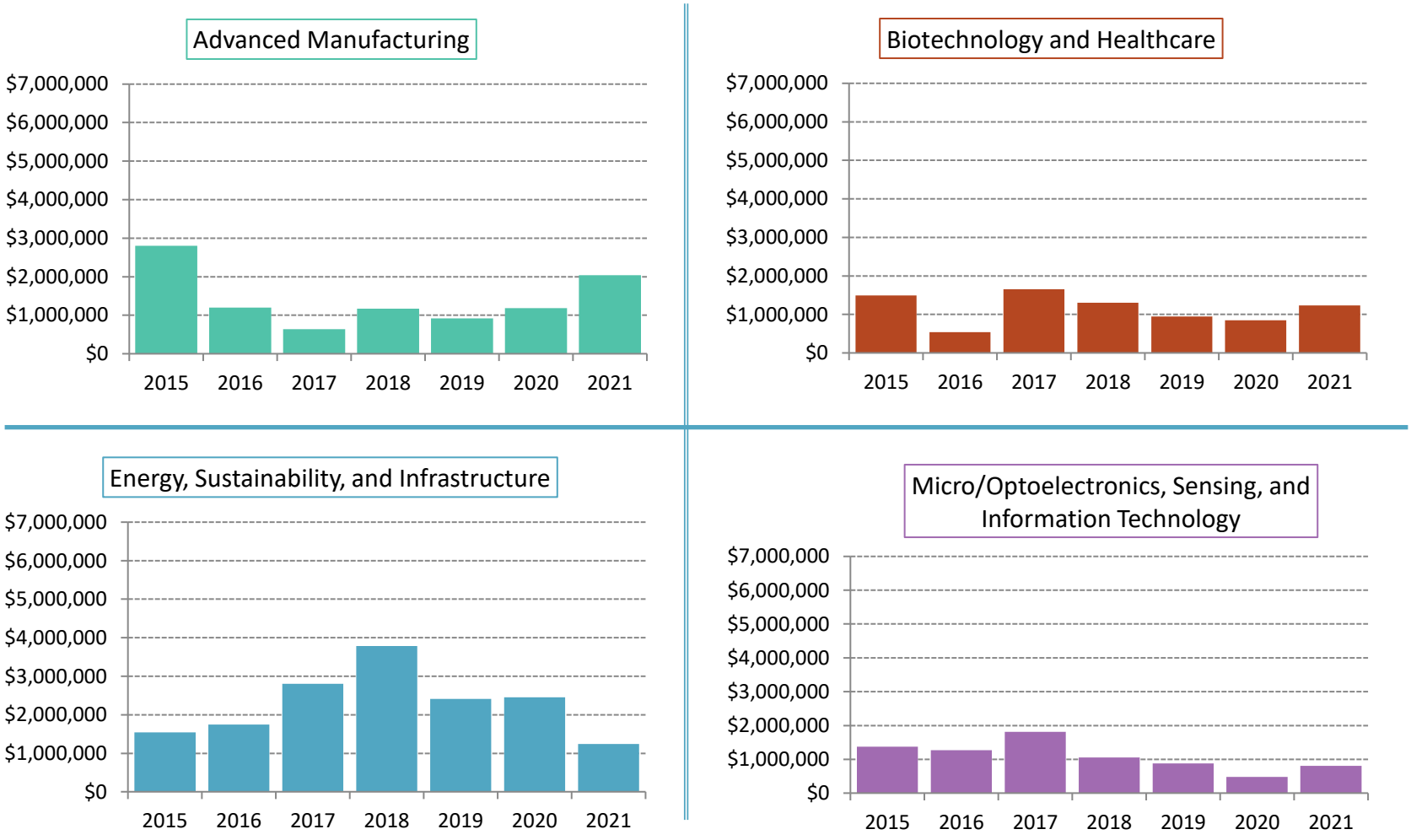


** Does not include centers from the Earthquake Technology Sector*

*** 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)*

Industry Support by ERC Technology Sector, FY 2015–2021 *,**,***

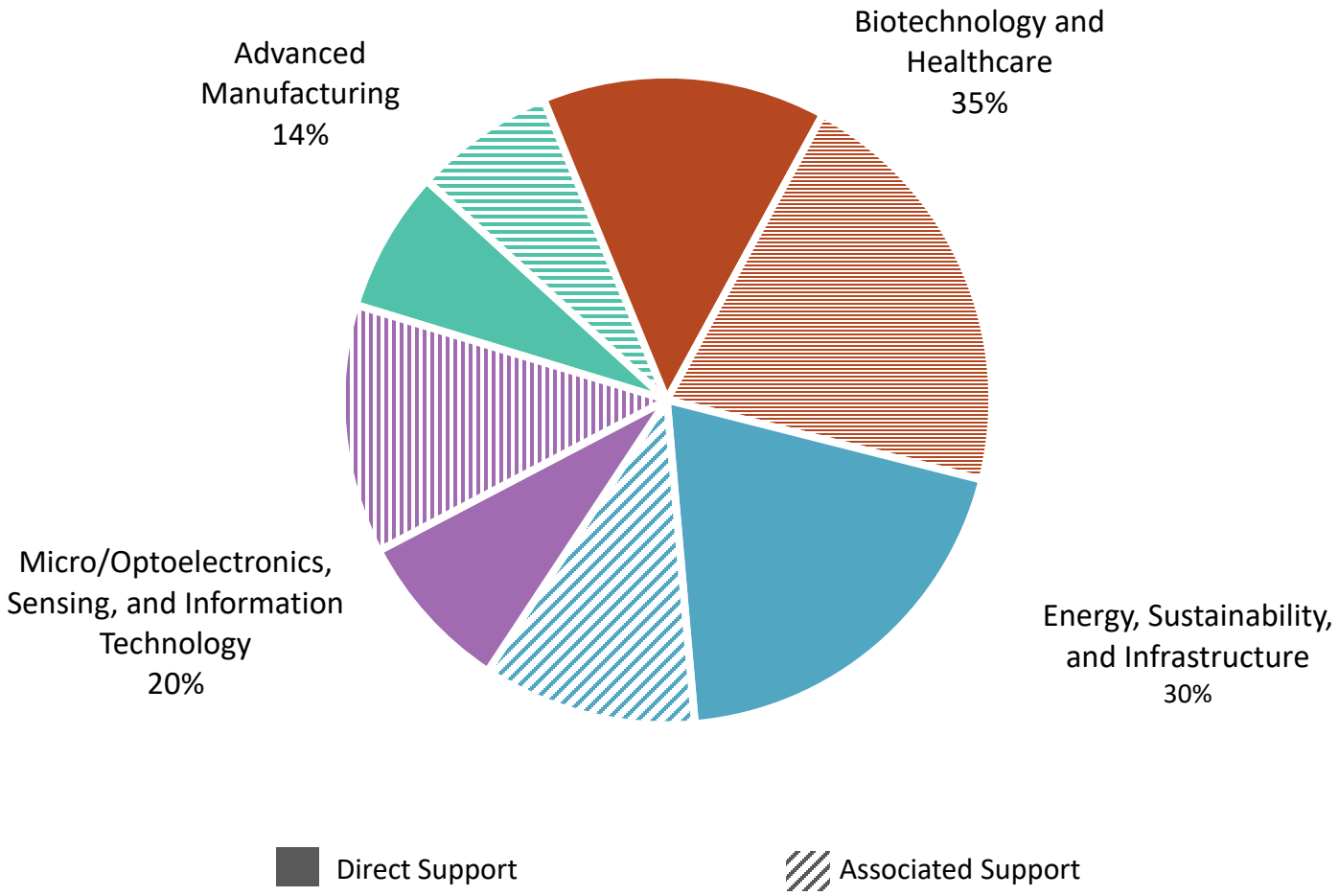


** Does not include centers from the Earthquake Technology Sector*

*** 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)*

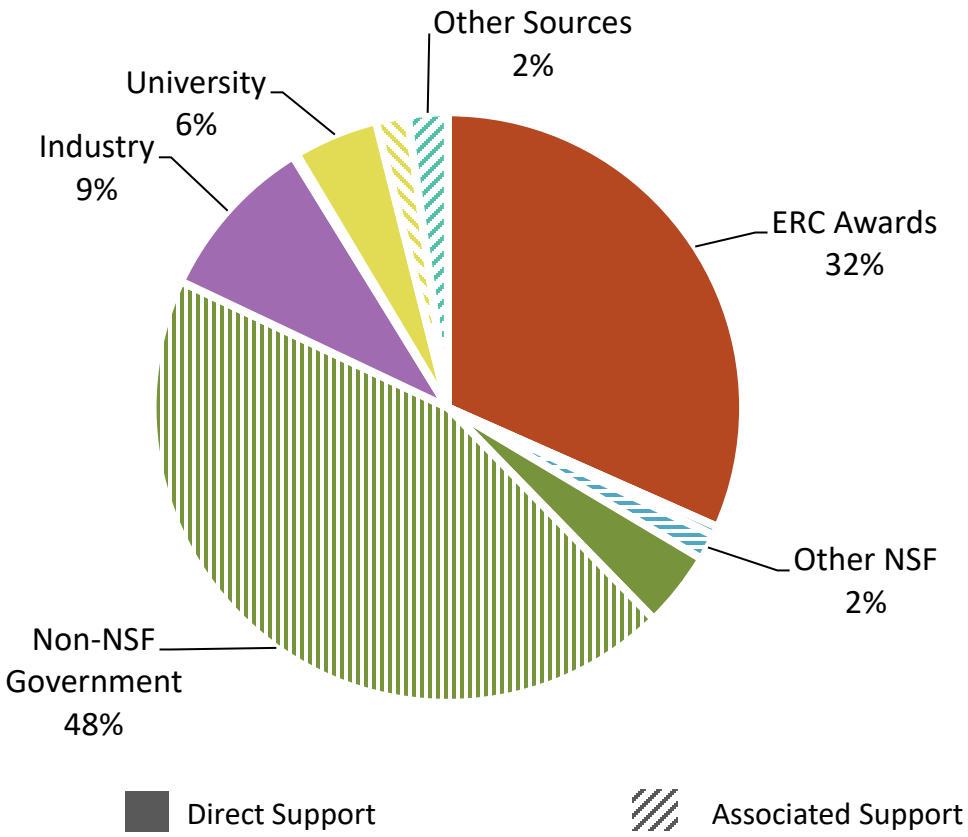
FY 2021 Sources of Support to 18 ERCs, by Technology Sector



Total value of support: $158 million

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

FY 2021 Support to ERCs in Advanced Manufacturing Sector: 2 Centers (NASCENT, CMaT)

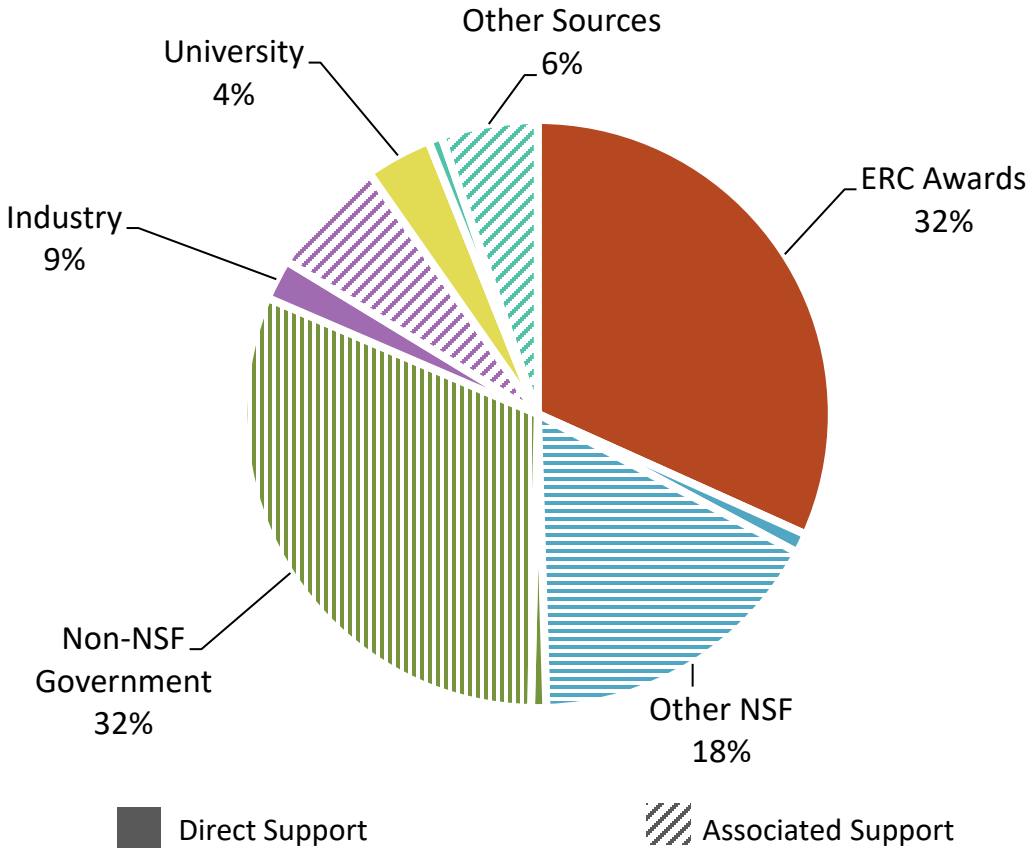


Total value of support: $22.2 million

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*

29 FY 2021 Support to ERCs in Biotechnology and Healthcare Sector: 5 Centers (ASSIST, ATP-Bio, CELL-MET, PATHS-UP, CNT)

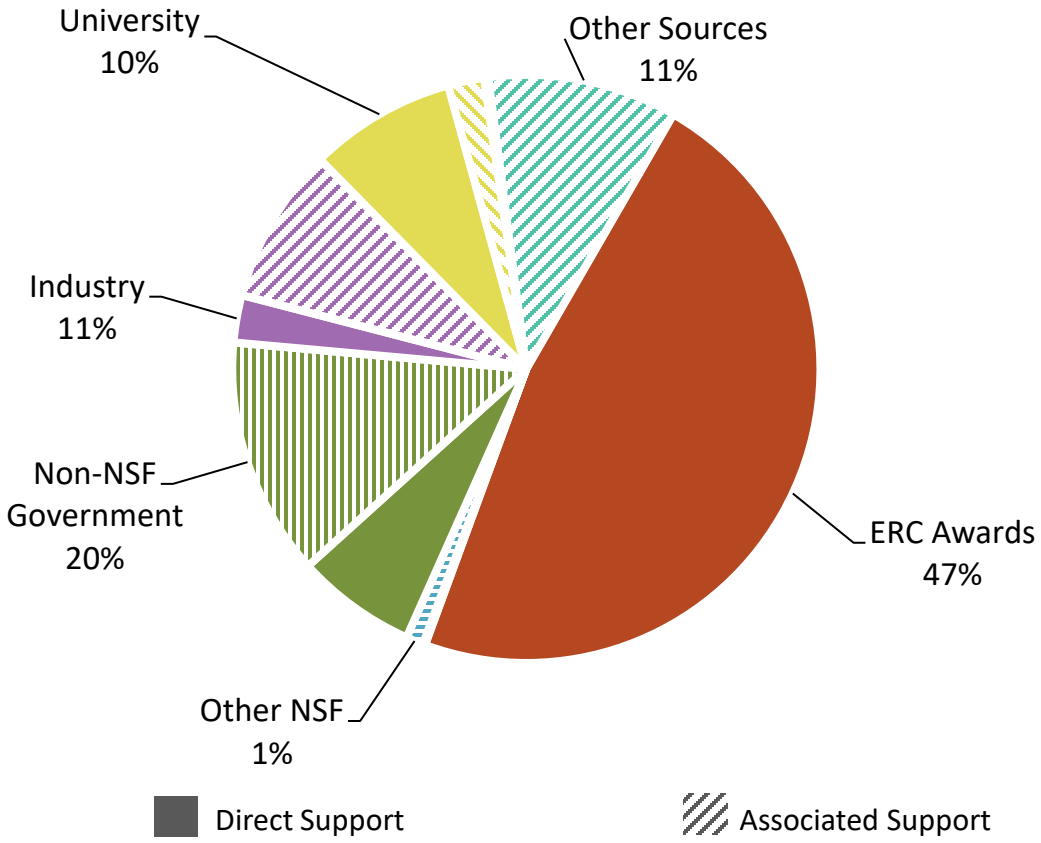


Total value of support: $55.4 million

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 2021 Support to ERCs in Energy, Sustainability, and Infrastructure Sector: 8 Centers (ASPIRE, CBBG, IoT4Ag, CISTAR, NEWT, QESST, ReNUWIt, CURENT)

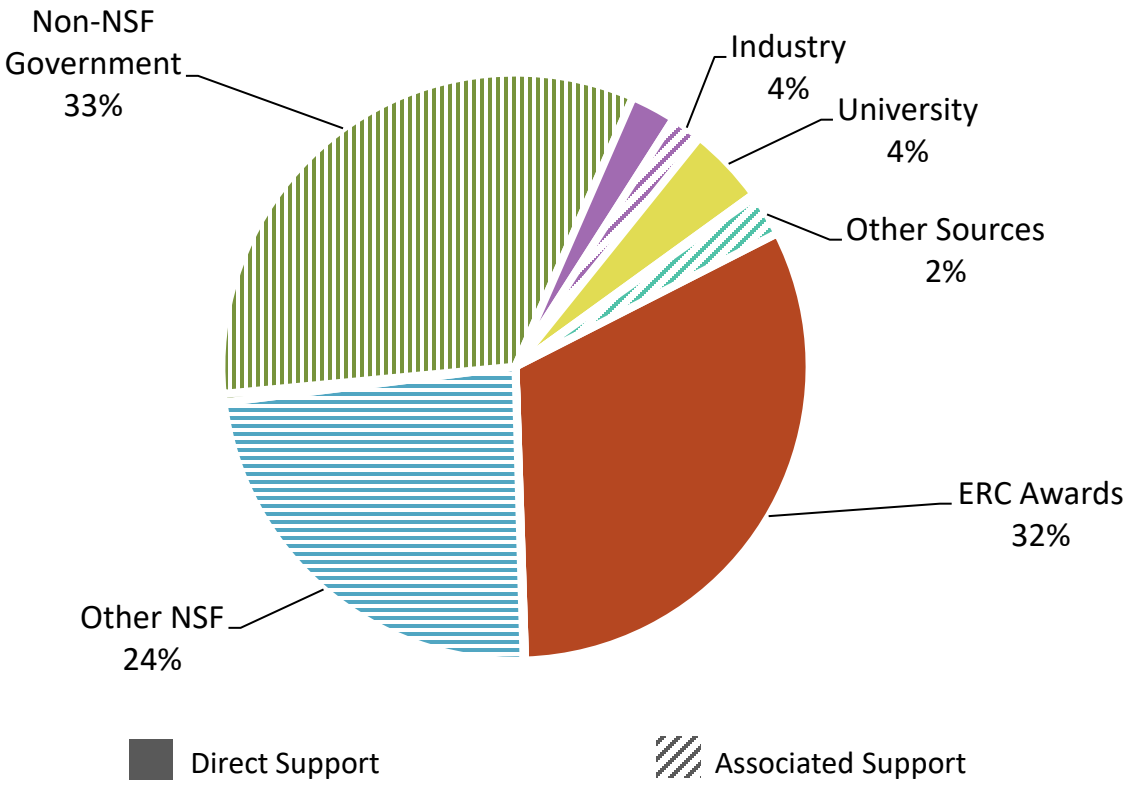


Total value of support: $47.8 million

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 2021 Support to ERCs in Micro/Optoelectronics, Sensing, and Information Technology Sector: 3 Centers (CQN, POETS, TANMS)

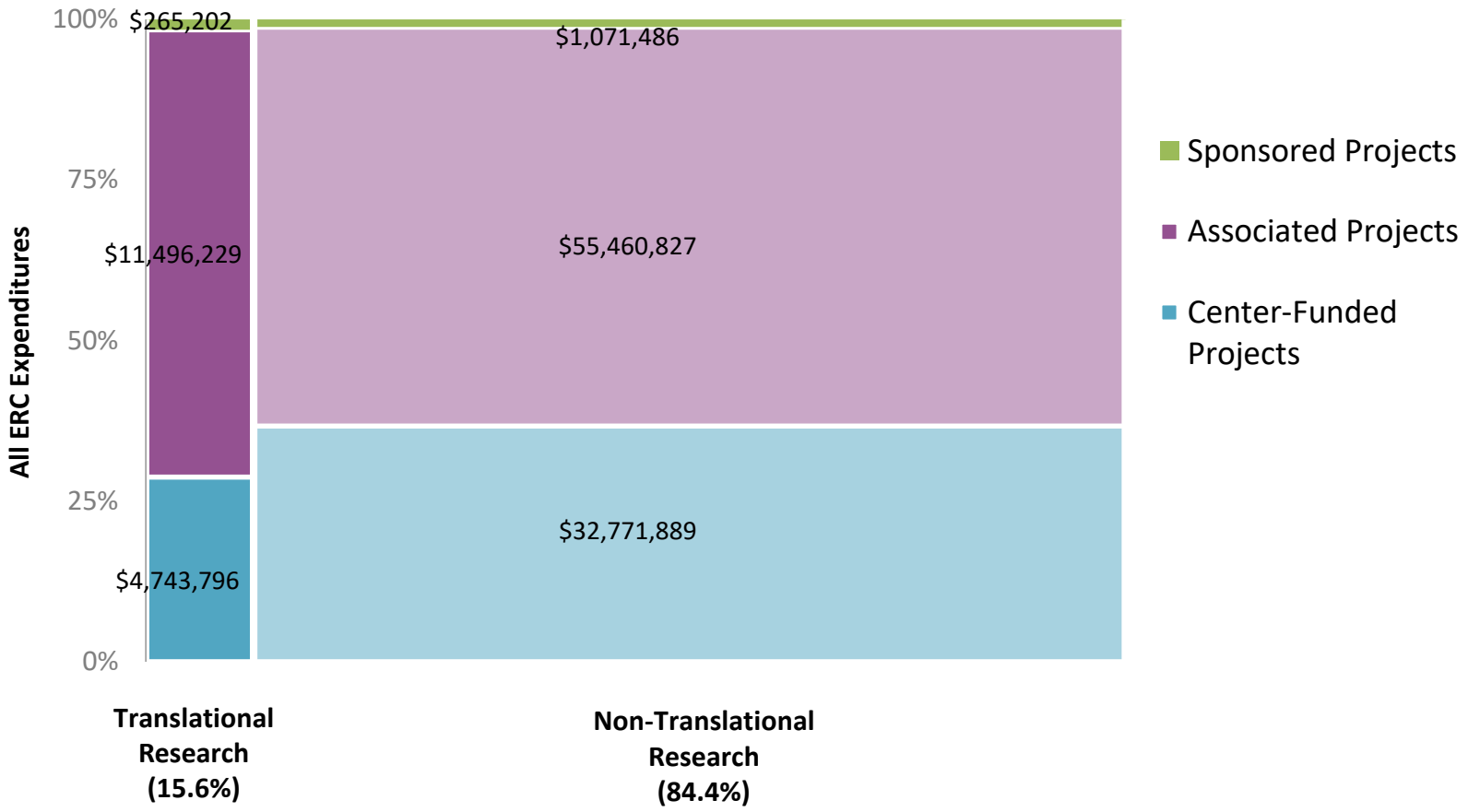


Total value of support: $32.2 million

NOTES:

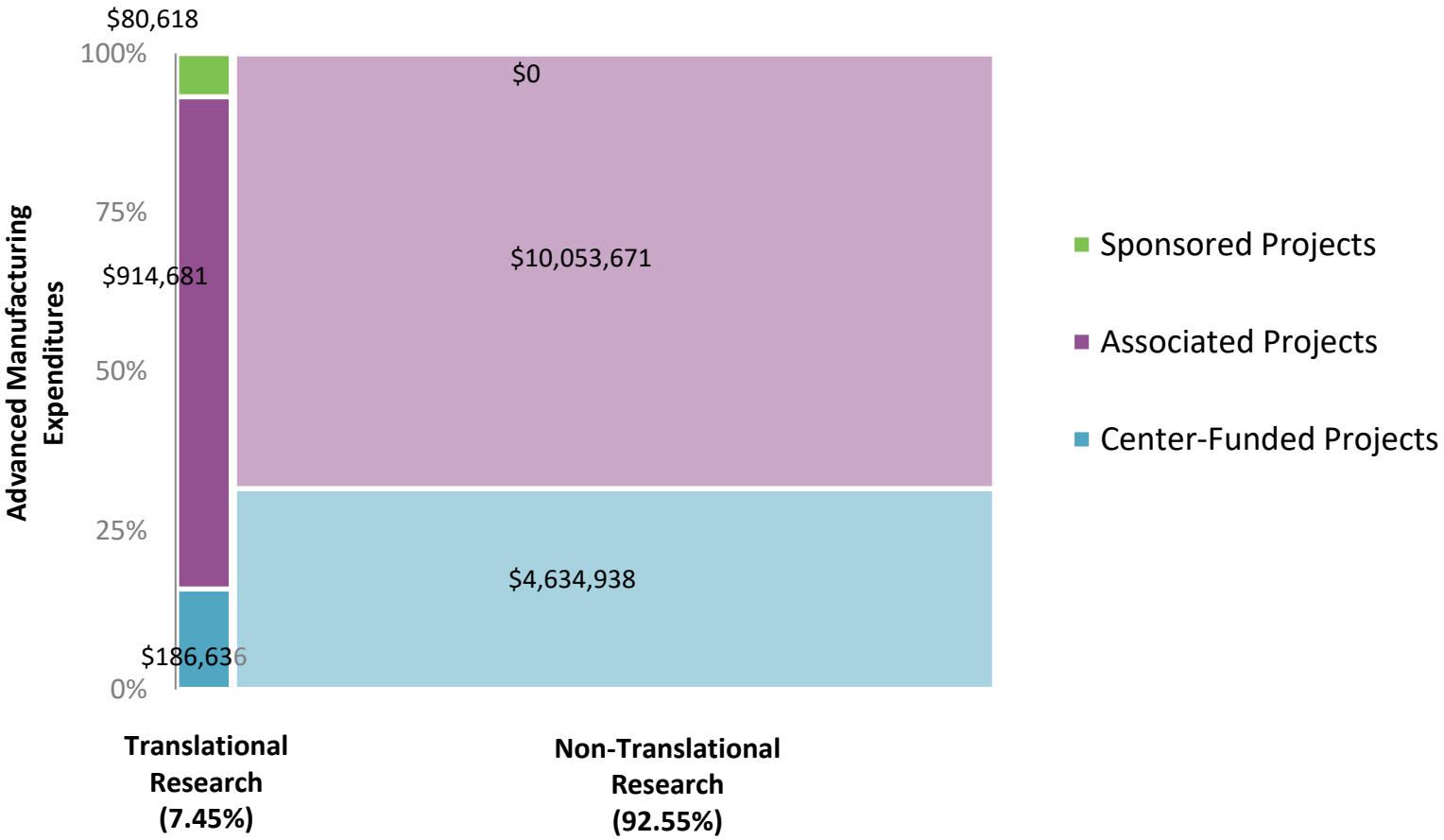
- *Sources of Support include Unrestricted Cash, Restricted Cash, In-Kind, and Associated Projects. Residuals are not included*
- *Non-NSF Government includes U.S. Government (not NSF), State government, local government, foreign government, and quasi-government research organizations*
- *Other Sources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

FY 2021 Expenditures by Type of Research: All ERCs



Total value of support: $105.8 million

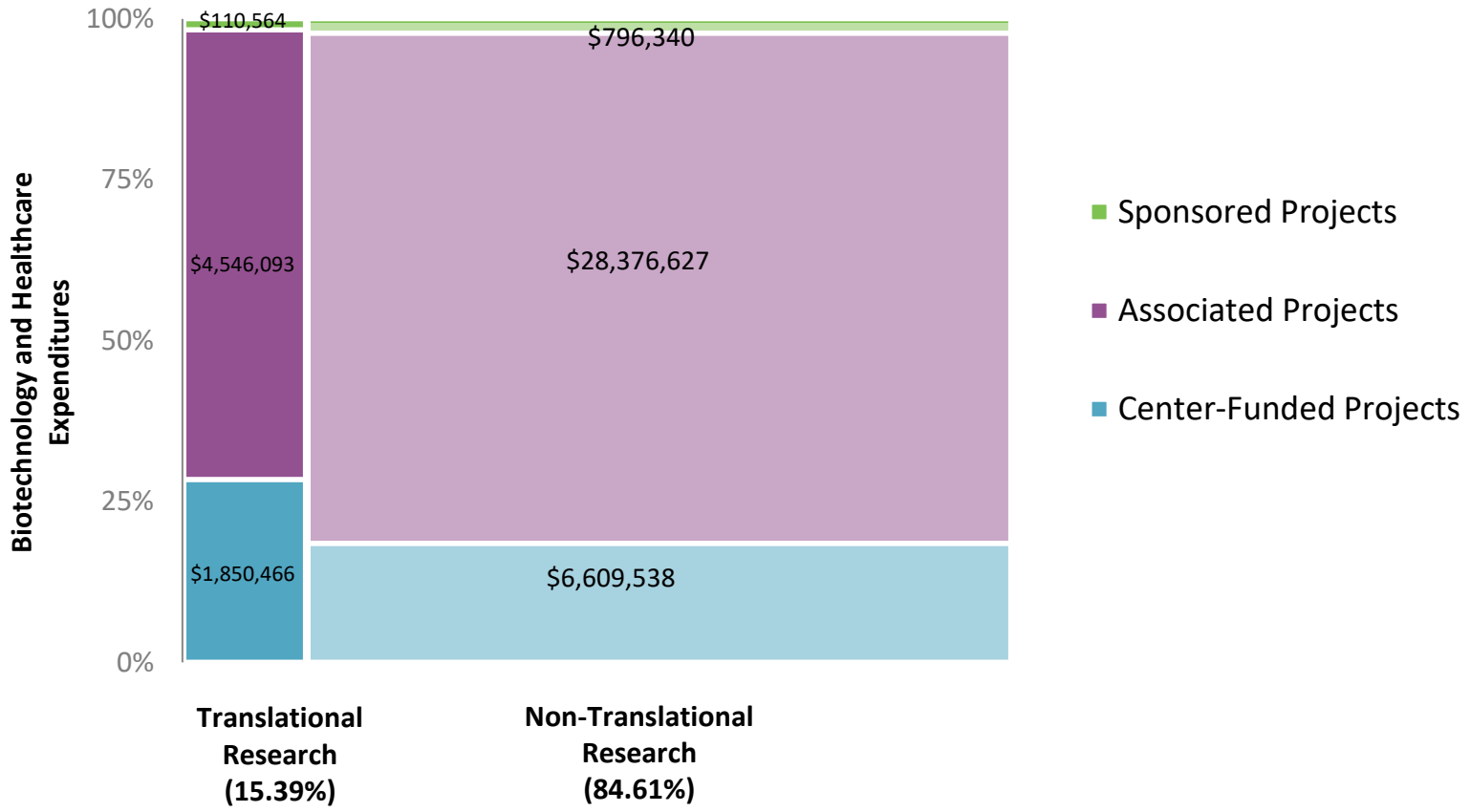
FY 2021 Expenditures by Type of Research: Advanced Manufacturing



Total value of support: $15.8 million

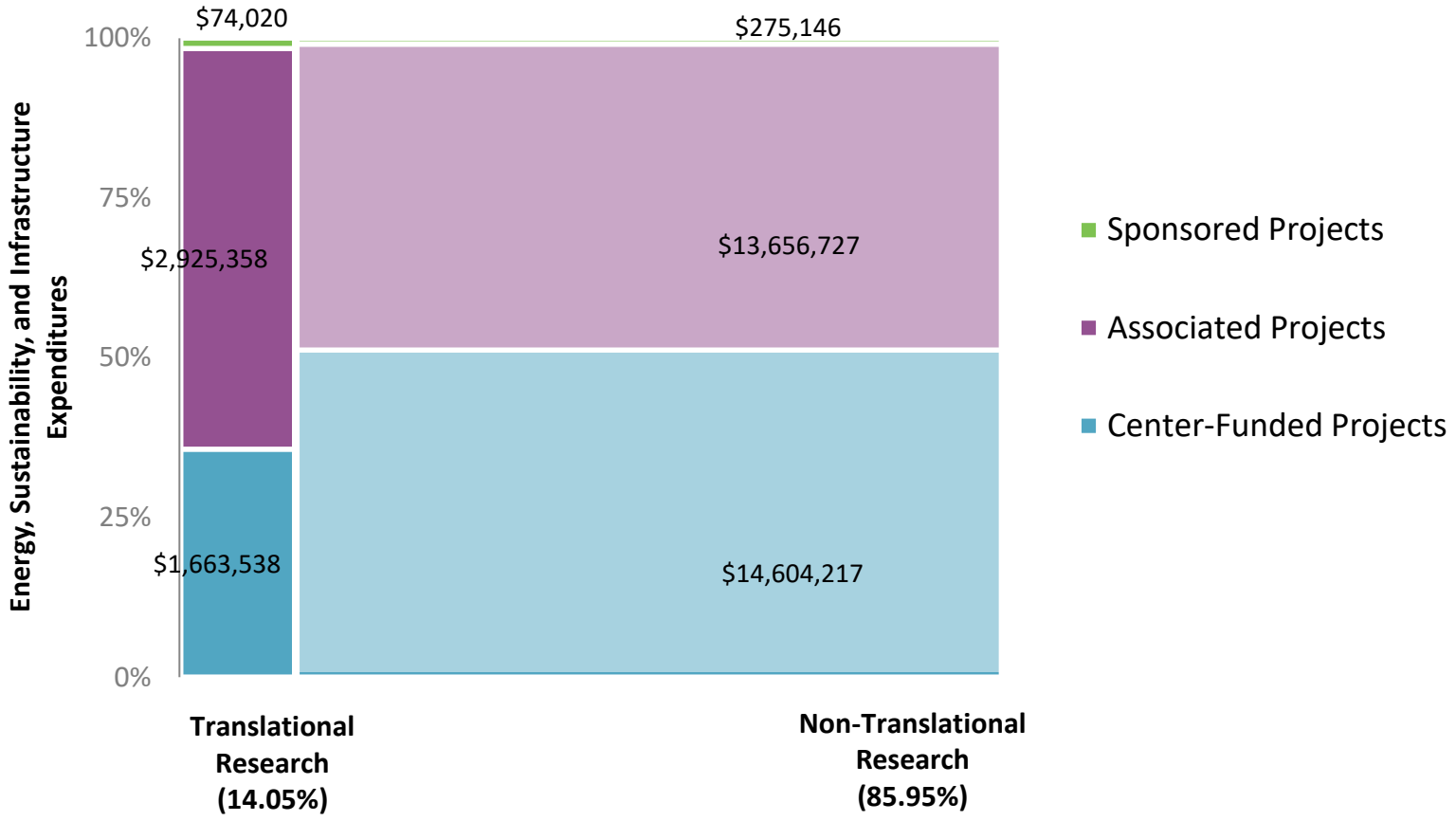
NOTE: *$0 corresponds to Non-Translational Research. Area is not visible due to the small relative size*

FY 2021 Expenditures by Type of Research: Biotechnology and Healthcare



Total value of support: $42.2 million

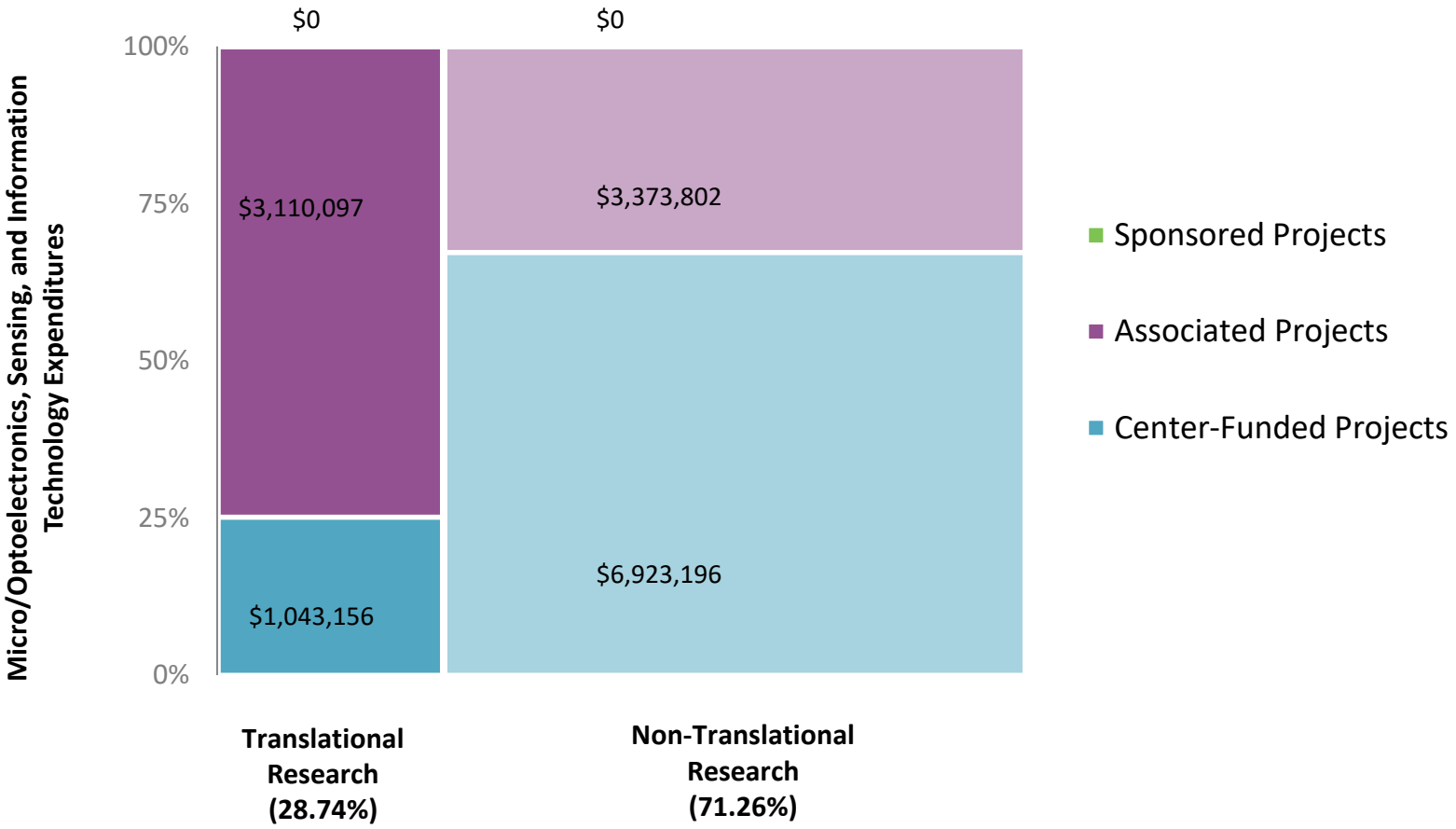
FY 2021 Expenditures by Type of Research: Energy, Sustainability, and Infrastructure



Total value of support: $33 million

NOTE: *$275,146 corresponds to Sponsored Projects expenditures for Non-Translational Research. Area is not visible due to the small relative size*

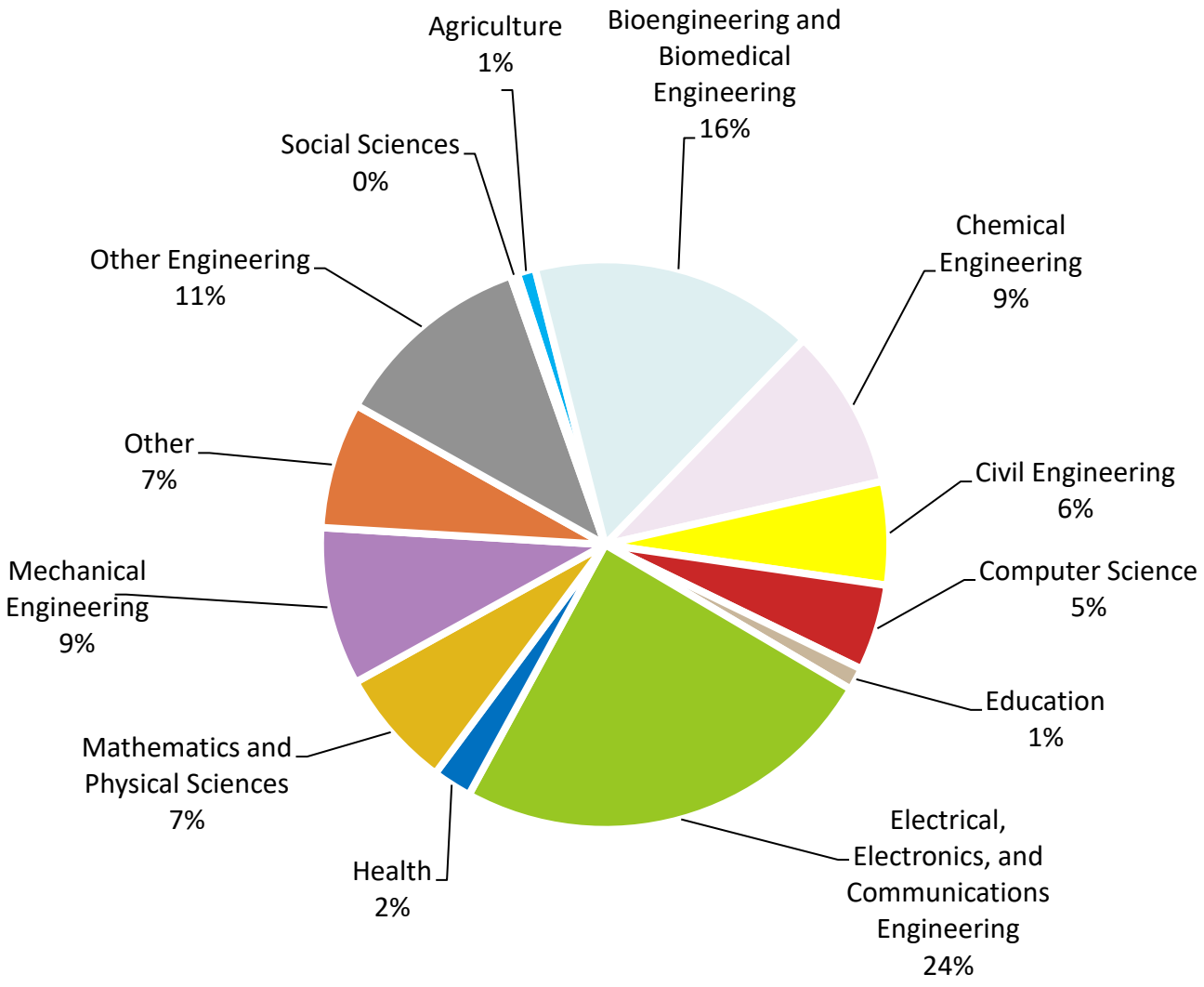
FY 2021 Expenditures by Type of Research: Micro/Optoelectronics, Sensing, and Information Technology



Total value of support: $14.4 million

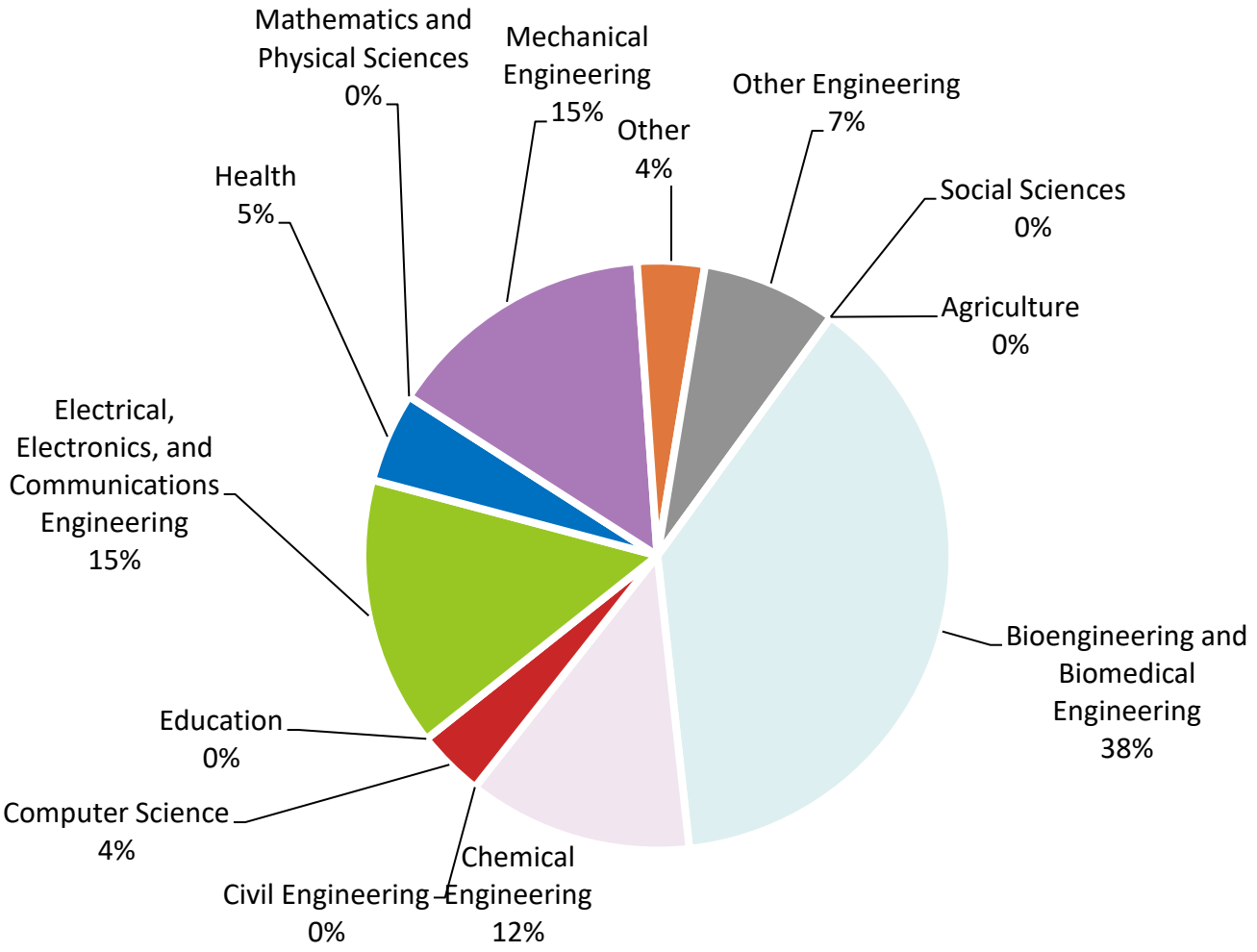
NOTE: *$0 and $0 values in top row correspond to Sponsored Projects expenditures for Translational Research and Non-Translational Research. Area is not visible due to the small relative size*

All ERC Disciplines, FY 2021



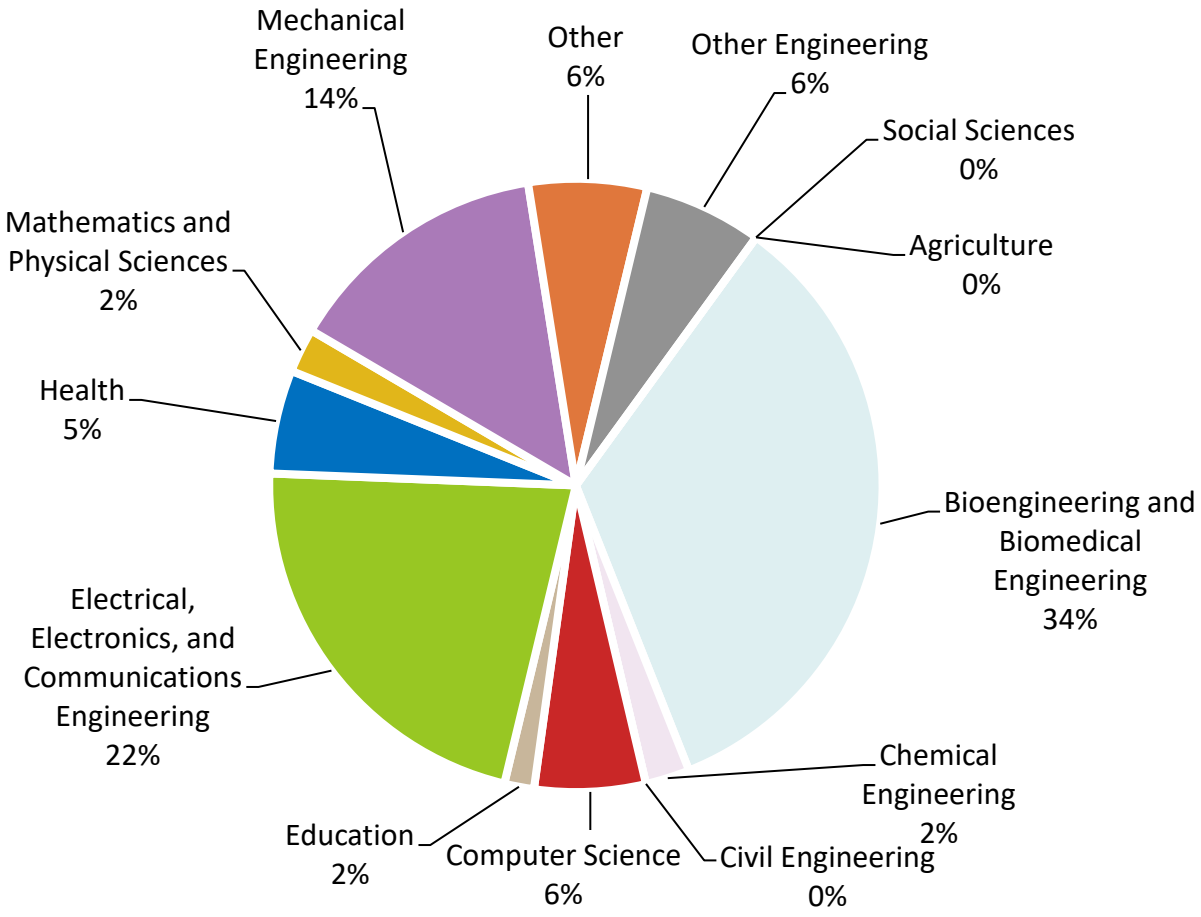
Total number of Project Investigators (PIs): 509

Disciplines by Technology Sector: Advanced Manufacturing, FY 2021



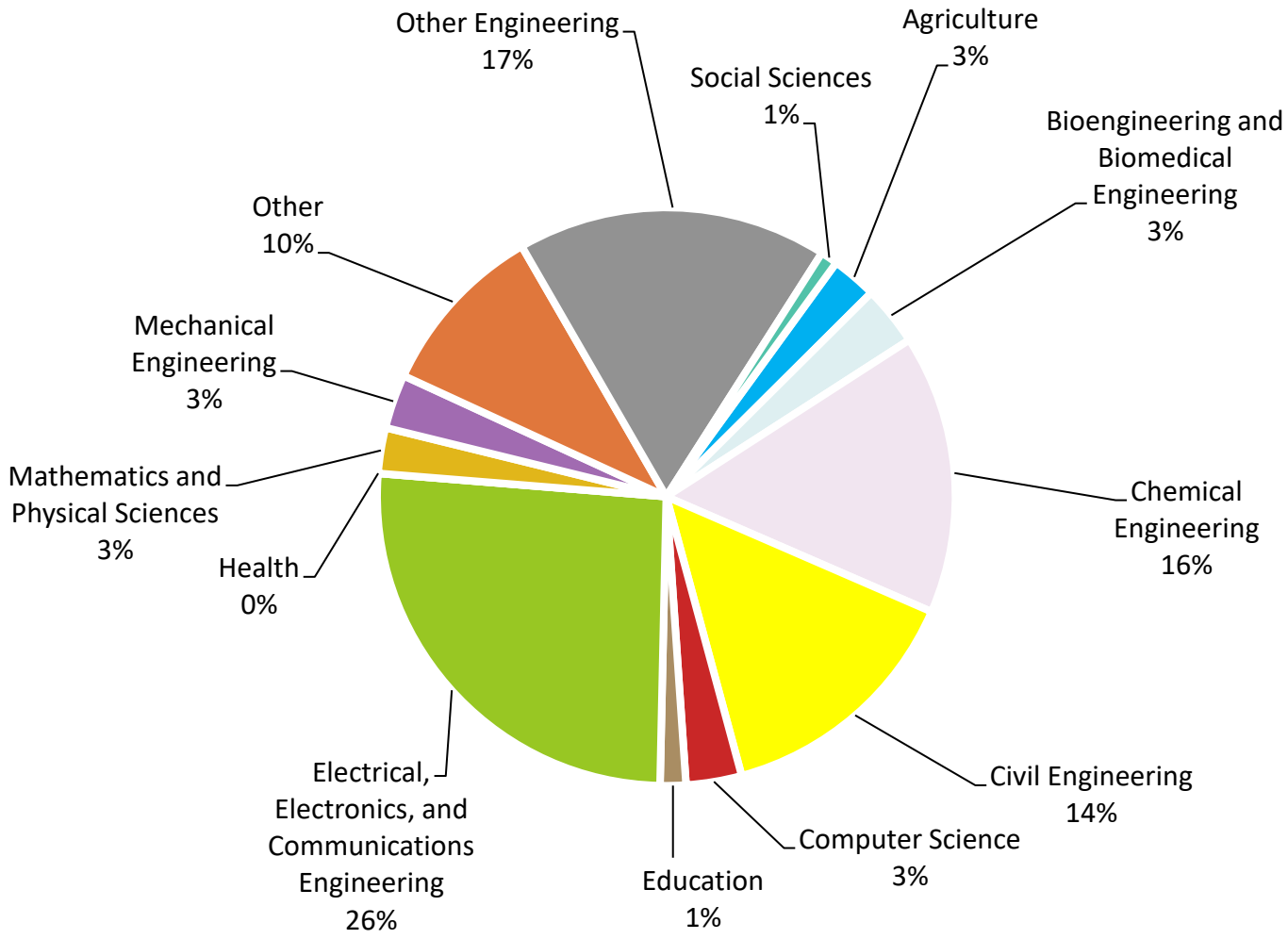
Total number of Project Investigators (PIs): 81

Disciplines by Technology Sector: Biotechnology and Healthcare, FY 2021



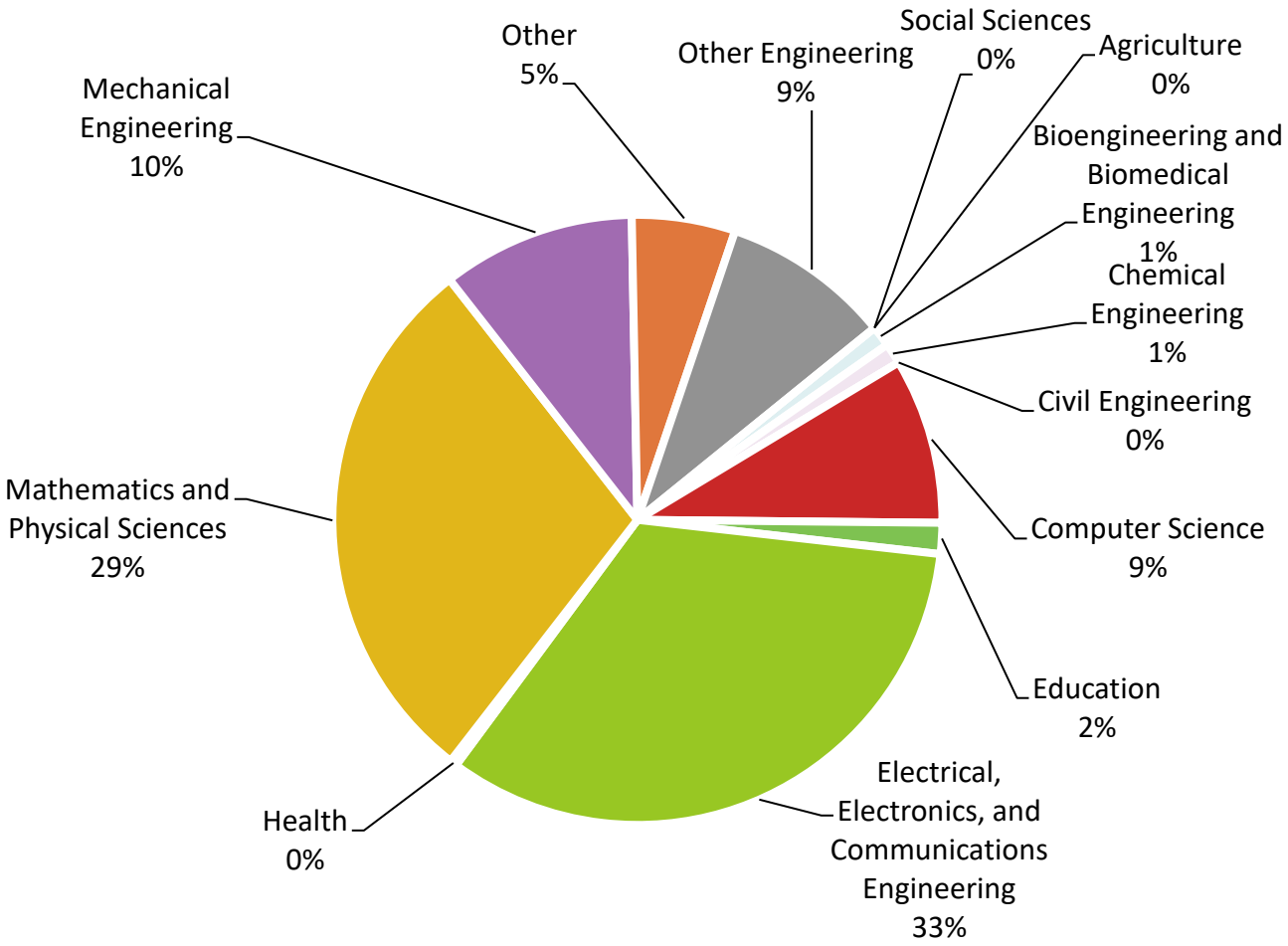
Total number of Project Investigators (PIs): 128

Disciplines by Technology Sector: Energy, Sustainability, and Infrastructure, FY 2021



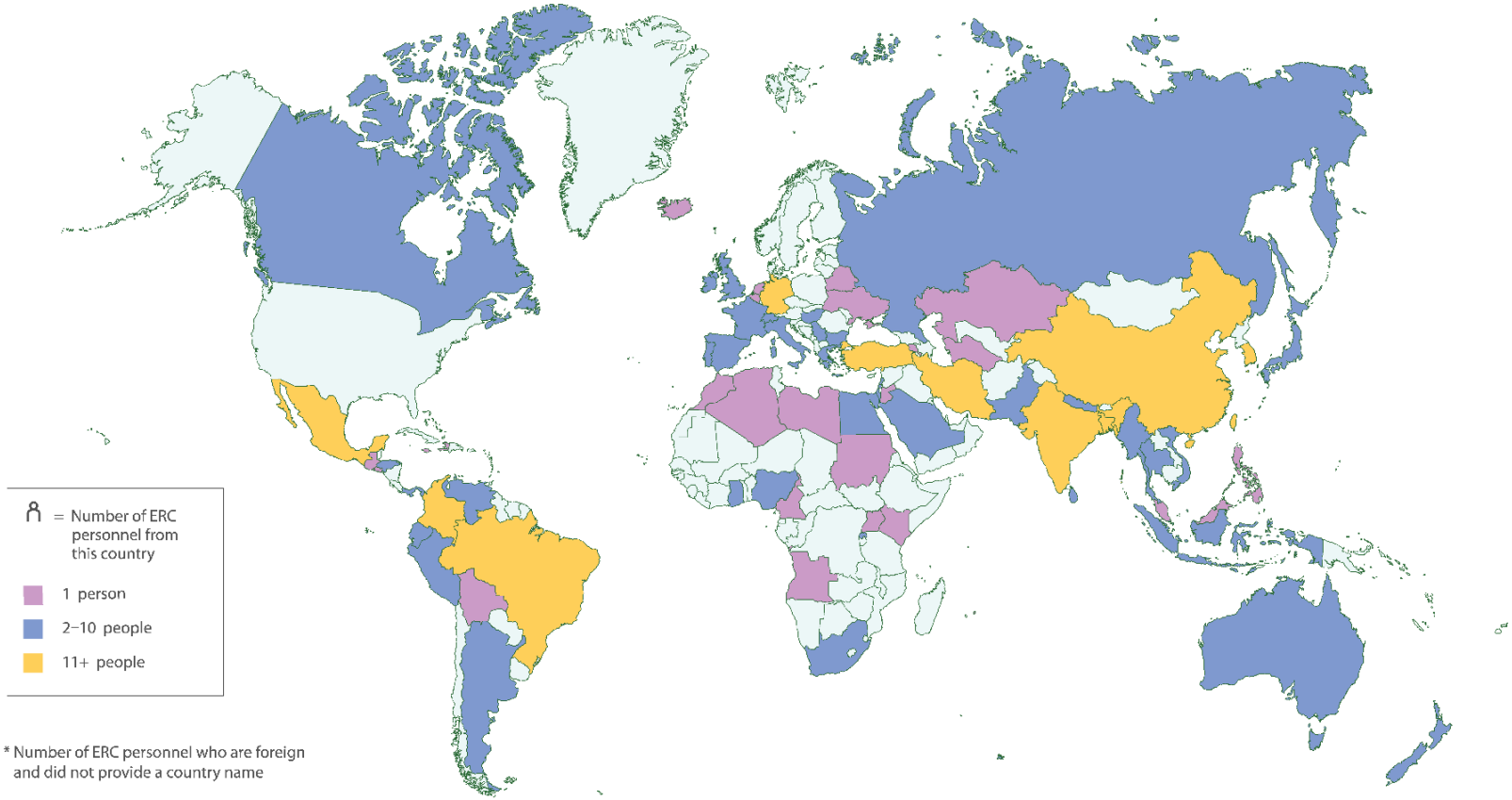
Total number of Project Investigators (PIs): 209

Disciplines by Technology Sector: Micro/Optoelectronics, Sensing, and Information Technology, FY 2021



Total number of Project Investigators (PIs): 91

Country of Citizenship of ERC Foreign Personnel, FY 2021



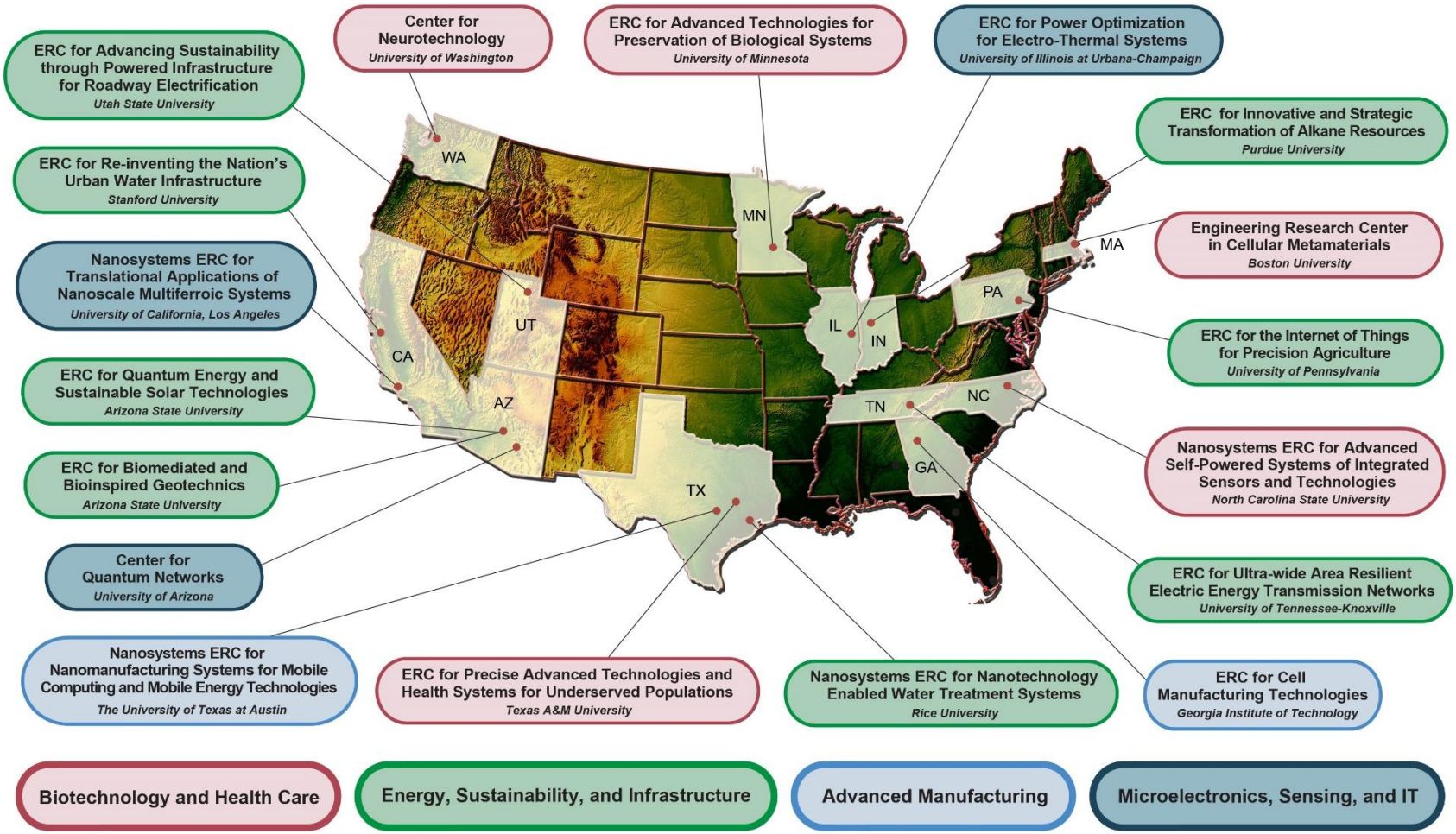
* Number of ERC personnel who are foreign and did not provide a country name

1 person
Algeria
Angola
Antigua and Barbuda
Armenia
Asian Countries, Other
Barbados
Belarus
Belgium
Bolivia
Cameroon
El Salvador
Guatemala
Haiti
Iceland
Jamaica
Jordan
Kazakhstan
Kenya
Libya
Malaysia
Mauritius
Morocco
Netherlands
Philippines
Sudan
Turkmenistan
Uganda
Ukraine

2–10 people				
Argentina (5)	Ghana (2)	Italy (3)	Peru (5)	Spain (6)
Australia (4)	Greece (10)	Japan (5)	Portugal (2)	Sri Lanka (2)
Bulgaria (3)	Honduras (2)	Lebanon (6)	Russia (9)	Switzerland (2)
Burma (2)	Hong Kong (2)	Nepal (2)	Rwanda (2)	Thailand (7)
Canada (9)	Hungary (3)	New Zealand (3)	Saudi Arabia (6)	United Kingdom (8)
Ecuador (3)	Indonesia (2)	Nigeria (6)	Serbia (5)	Venezuela (6)
Egypt (6)	Ireland (3)	Pakistan (4)	Singapore (5)	Vietnam (4)
France (3)	Israel (3)	Panama (3)	South Africa (3)	

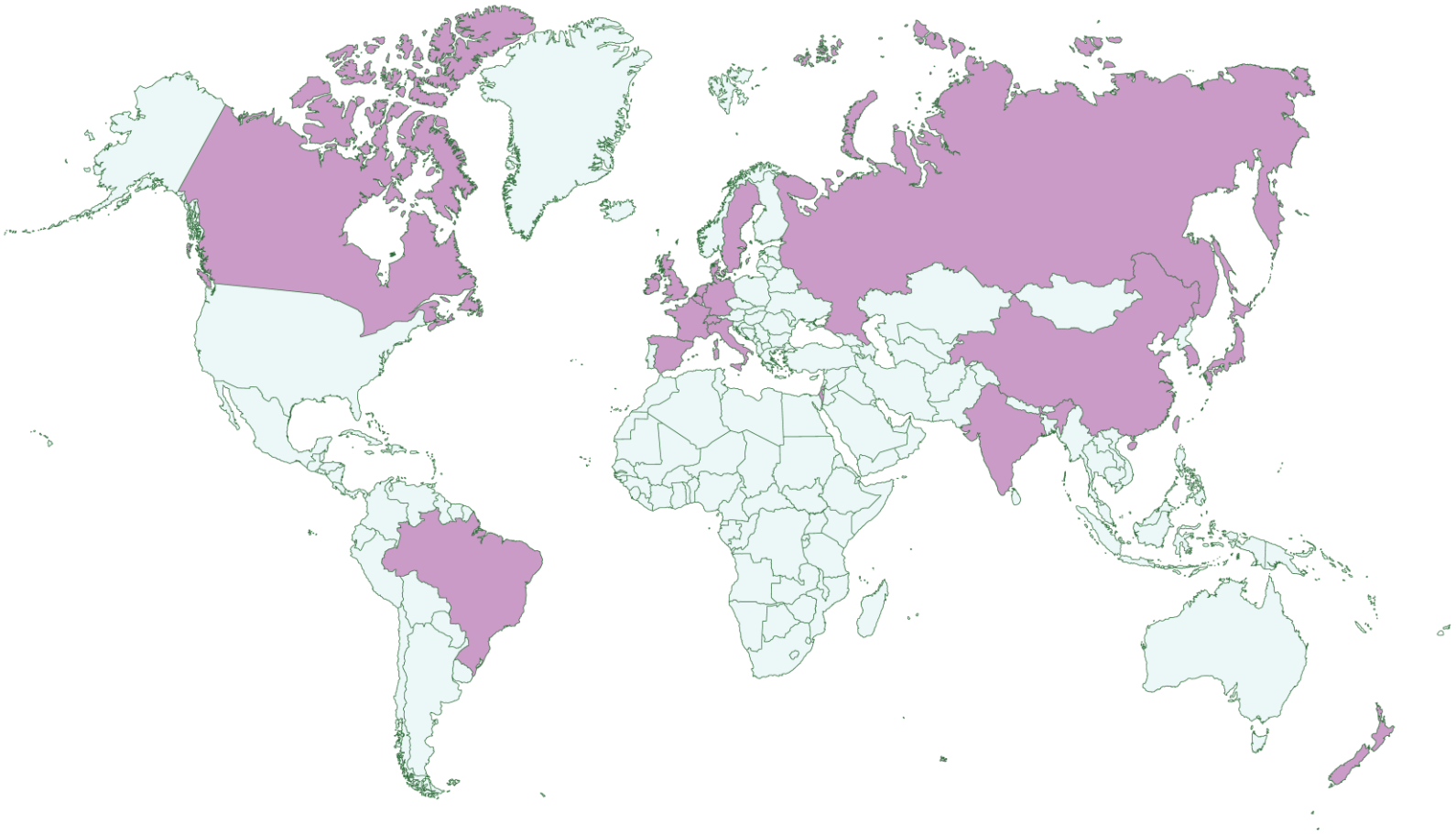
11+ people	
Bangladesh	27
Brazil	11
China	261
Colombia	11
Germany	11
India	149
Iran	36
Mexico	19
South Korea	43
Taiwan	16
Turkey	12
Country Not Reported	10*

Locations of the Active ERCs, FY 2021



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

Locations of Foreign Participating Organizations, FY 2021



Countries with 1- 20 collaborators

Belgium (1)	Ireland (2)	Spain (1)
Brazil (2)	Israel (2)	Sweden (1)
Canada (4)	Italy (1)	Switzerland (5)
China(2)	Japan (7)	Taiwan (1)
Denmark (1)	Netherlands (1)	United Kingdom (10)
France (3)	New Zealand (1)	
Germany (5)	Russia (2)	
India (1)	South Korea (5)	

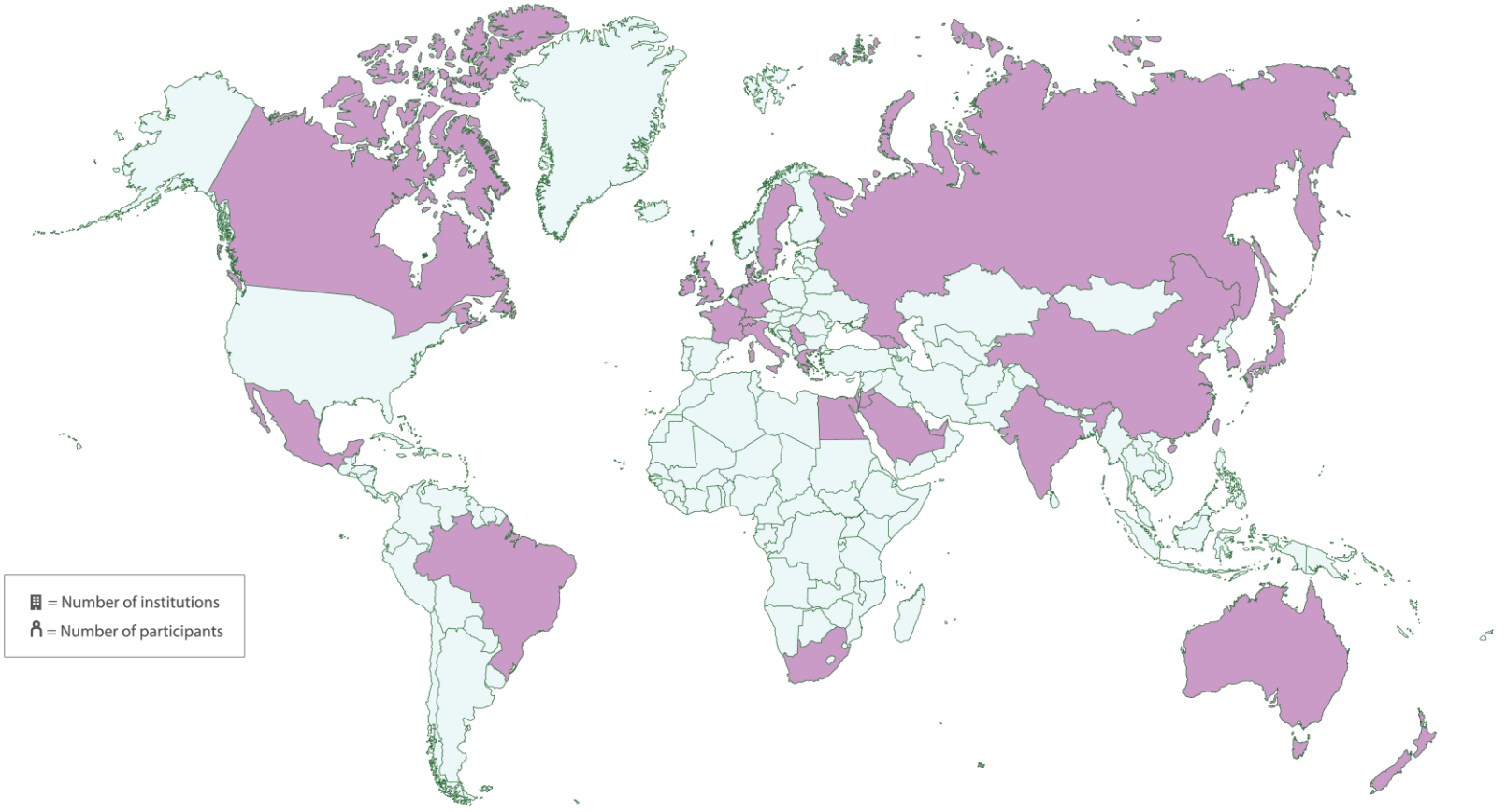
Countries with 21- 40 collaborators

No Countries Reported

Countries with 41+ collaborators

No Countries Reported

Locations of Foreign Participating Institutions, FY 2021



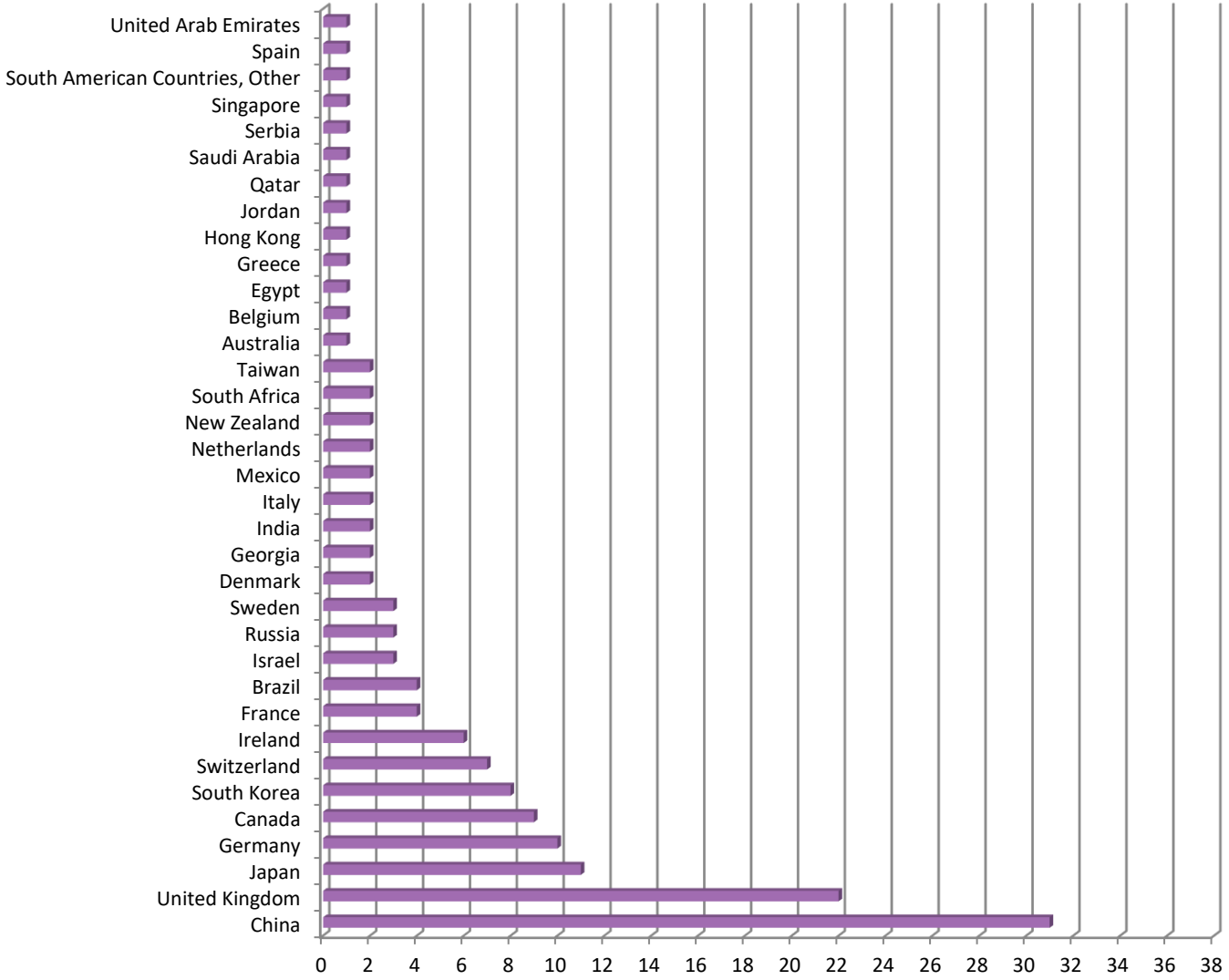
	🏢	👤
Australia	1	1
Brazil	2	1
Canada	5	4
China	29	7
Denmark	1	0
Egypt	1	0
France	1	1
Georgia	2	0

	🏢	👤
Germany	5	5
Greece	1	0
Hong Kong	1	1
India	1	0
Ireland	4	14
Israel	1	0
Italy	1	0
Japan	4	1

	🏢	👤
Jordan	1	1
Mexico	2	0
Netherlands	1	0
New Zealand	1	27
Qatar	1	0
Russia	1	5
Saudi Arabia	1	0
Serbia	1	0

	🏢	👤
Singapore	1	0
South Africa	2	0
South American Countries, Other	1	0
South Korea	3	2
Sweden	2	1
Switzerland	2	4
Taiwan	1	0
United Arab Emirates	1	0
United Kingdom	12	6

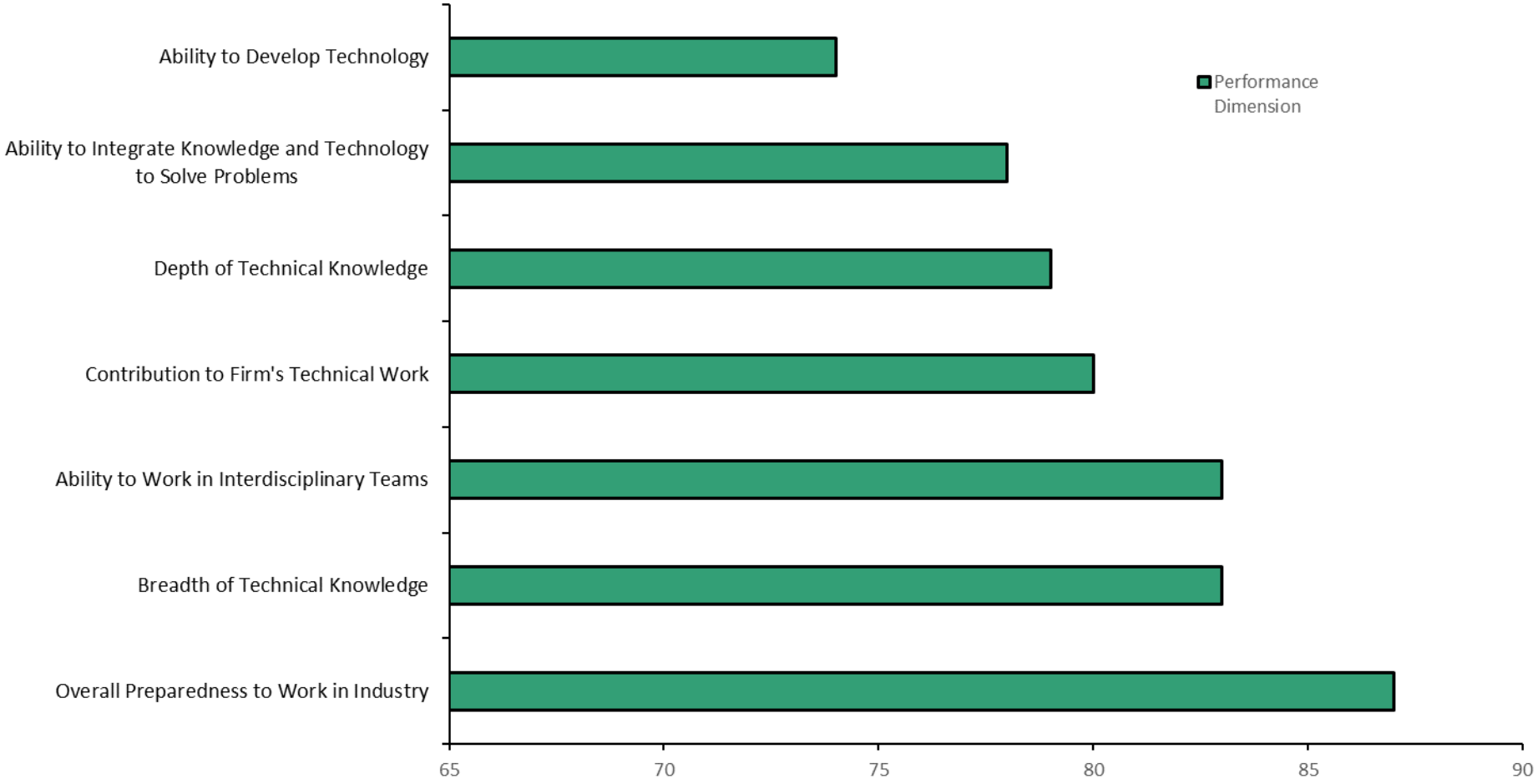
46 Number of Institutions and Organizations With Financial Headquarters Abroad Collaborating With ERCs, by Country of Origin, FY 2021*,**



** 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*

47 Comparisons by Member Firms of the Performance of ERC Hires vs. Non-ERC Hires*



** 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*