Engineering Research Centers

End-of-Year Report

2022

i. 15 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 – 2022; RY: 2012 – 2022)*	NSF Engineering Research Center for the Internet of Things for Precision Agriculture (IoT4Ag) (Class: 2020; AY: 2020 – 2022; RY: 2020 – 2022)*
NSF Nanosystems Engineering Research Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST) (Class: 2012; AY: 2012 – 2022; RY: 2012 – 2022)*	Nanosystems Engineering Research Center for Nanotechnology Enabled Water Treatment Systems at Rice University (NEWT) (Class: 2015; AY: 2015 – 2022; RY: 2015 – 2022)*
Engineering Research Center for Bio-mediated and Bioinspired Geotechnics at Arizona State University (CBBG) (Class: 2015; AY: 2015 – 2022; RY: 2015 – 2022)*	ERC for Precise Advanced Technologies and Health Systems for Underserved Populations at Texas A&M University (PATHS-UP) (Class: 2017; AY: 2017 – 2022; RY: 2017 – 2022)*
ERC for Directed Multiscale Assembly of Cellular Metamaterials with Nanoscale Precision at Boston University (CELL-MET) (Class: 2017; AY: 2017 – 2022; RY: 2017 – 2022)*	ERC for Power Optimization for ElectroThermal Systems at University of Illinois (POETS) (Class: 2015; AY: 2015 – 2022; RY: 2015 – 2022)*
ERC for Innovative and Strategic Transformation of Alkane Resources at Purdue University (CISTAR) (Class: 2017; AY: 2017 – 2022; RY: 2017 – 2022)*	ERC for Quantum Energy and Sustainable Solar Technologies at Arizona State University (QESST) (Class: 2011; AY: 2011 – 2022; RY: 2011 – 2022)*
ERC for Cell Manufacturing Technologies at Georgia Institute of Technology (CMaT) (Class: 2017; AY: 2017 – 2022; RY: 2017 – 2022)*	NSF Engineering Research Center for Quantum Networks (CQN) (Class: 2020; AY: 2020 – 2022; RY: 2020 – 2022)*
NSF Engineering Research Center for Advancing Sustainability through Powered Infrastructure for Roadway Electrification (ASPIRE) (Class: 2020; AY: 2020 – 2022; RY: 2020 – 2022)*	Nanosystems Engineering Research Center for Translational Applications of Nanoscale Multiferroic Systems at University of California Los Angeles (TANMS) (Class: 2012; AY: 2012 – 2022; RY: 2012 – 2022)*
NSF Engineering Research Center for Advanced Technologies for Preservation of Biological Systems (ATP-Bio) (Class: 2020; AY: 2020 – 2022; RY: 2020 – 2022)*	

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

ii. "Annualized ERCs" on slides 1–5 include the 15 ERCs from the previous slide and the following additional 8 ERCs

ERC for Revolutionizing Metallic Biomaterials at North Carolina A&T State University (NCAT) (Class: 2008; AY: 2008 – 2020; RY: 2008 – 2020)*	ERC for Ultra-wide-area Resilient Electric Energy Transmission Networks at University of Tennessee (CURENT) (Class: 2011; AY: 2011 – 2021; RY: 2011 – 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)*
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)*

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

1 | ERC Products of Innovation, FY 1985–2022*

	FY 2022 (15 ERCs)		FY 2017–2021 Annualized		FY 1985–2022 (69 ERCs)
Intellectual Property Transaction	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
Inventions Disclosed	76	5	61	4	2,686
Patent Applications Filed (Provisional and Full)	94	6	81	5	2,410
Patents Awarded	13	1	25	1	929
Licenses Issued	13	1	8	< 1	1,400
Economic Development	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
Spinoff Companies	7	< 1	7	< 1	250
Spinoff Employees	29	2	56	3	1,641

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

2 ERC Influence on Curriculum, FY 1985–2022*

	FY 2022 (15 ERCs)		FY 2017–2021 Annualized		FY 1985–2022 (69 ERCs)
Degrees	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
New Full-Degree Programs Based on ERC Research	0	< 1	1	< 1	57
New Degree Minors Based on ERC Research	1	< 1	1	< 1	35
New Certificate Programs Based on ERC Research	3	< 1	1	< 1	48
Courses	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
New Courses Based on ERC Research	50	3	25	1	1,160
Ongoing Courses With ERC Content	166	11	234	14	3,838
Course Modules Based on ERC Research	23	2	35	2	813
Textbooks	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
New Textbooks Based on ERC Research	0	< 1	4	< 1	189
New Textbook Chapters Based on ERC Research	1	< 1	4	< 1	112

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

3 ERC Information Dissemination, FY 1985–2022*

	FY 2022 (15 ERCs)		FY 2017–2021 Annualized		FY 1985–2022 (69 ERCs)
Peer-Reviewed Publications (Total)	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
Journals**	754	50	794	46	26,354
Conference Proceedings**	234	16	408	23	19,001
Trade Journals	26	2	8	< 1	681
Coauthored With ERC Students	399	27	464	27	13,836
Education and Outreach	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
Education and Colloquia	569	38	752	44	18,601
Workshops, Short Courses, and Webinars	254	17	402	23	6,726

** 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 2007–2022*

	FY 2022 (15 ERCs)		FY 2017–2021 Annualized		FY 2007–2022 (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	158	11	285	16	4,480
With Multidisciplinary Content	169	11	249	14	3,955
Offered at Undergraduate Level	168	11	204	12	2,880
Offered at Graduate Level	205	14	267	15	3,857
Used at More Than One ERC Institution	111	7	135	8	1316
Team Taught by Faculty in More Than One Department	42	3	123	7	1198

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

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

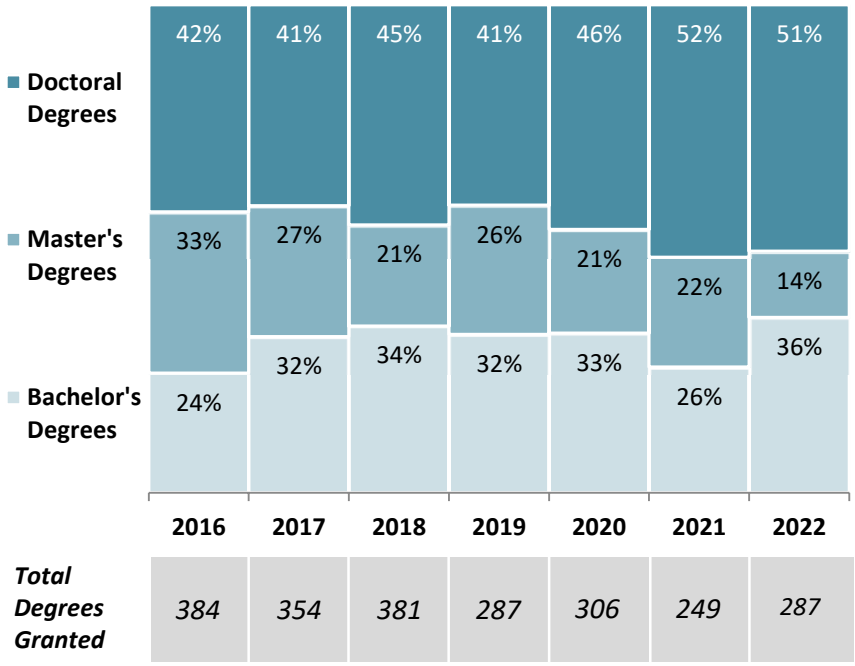
ERC Student Degrees, FY 1985–2022*

	FY 2022 (15 ERCs)		FY 2017–2021 Annualized		FY 1985–2022 (69 ERCs)
Degree Type	***Total***	***Per Center***	***Total***	***Per Center***	***Total***
Bachelor's	103	7	100	6	4,774
Master's	39	3	74	4	4,474
Doctoral	145	10	141	8	5,495
Total	***287***	***19***	***315***	***18***	***14,743***

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

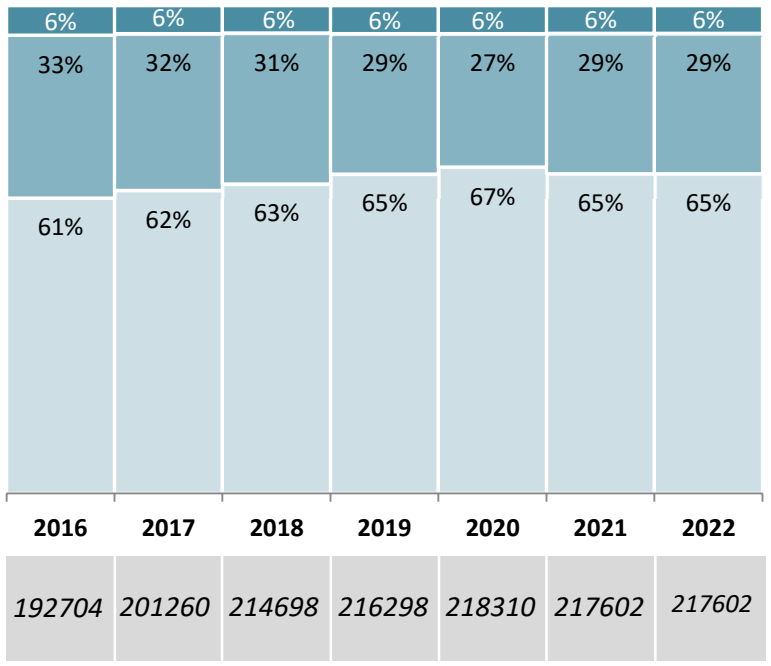
6 Degrees Granted to ERC Students vs. All U.S. Engineering Graduates, FY 2016–2022

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



	2016	2017	2018	2019	2020	2021	2022
Total Degrees Granted	*384*	*354*	*381*	*287*	*306*	*249*	*287*

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

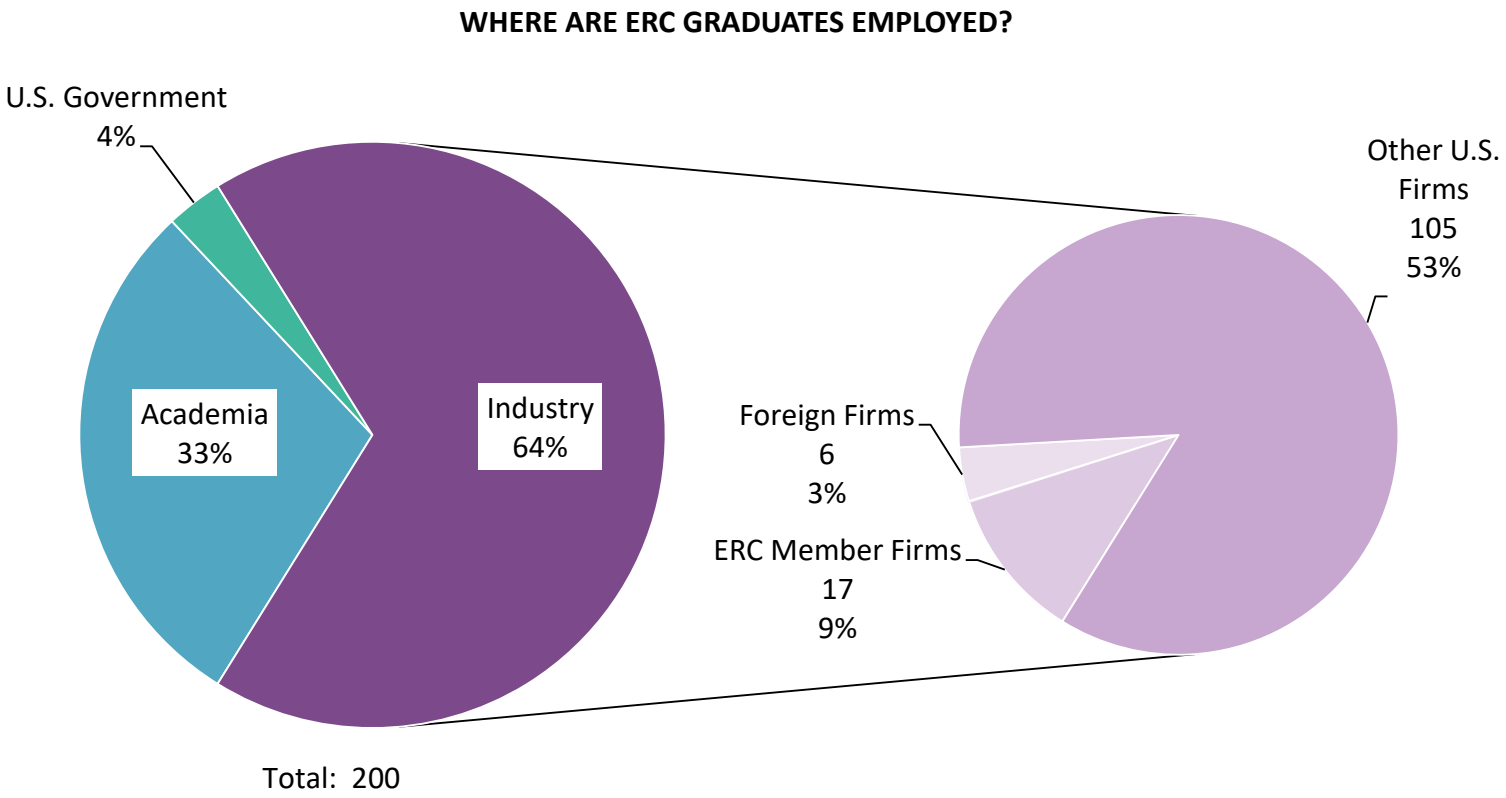


	2016	2017	2018	2019	2020	2021	2022
Total Degrees Granted	*192704*	*201260*	*214698*	*216298*	*218310*	*217602*	*217602*

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

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

ERC Graduate Employment (15 Centers), FY 2022



8 ERC Research and Education Personnel, by Underrepresented Group and Citizenship Status, FY 2022

Personnel Category	Total	Total U.S. Citizens and Permanent Residents	Women*		Underrepresented Racial Minorities*		Hispanic*		Foreign	
			Number	%	Number	%	Number	%	Number	%
Faculty										
Total	573	485	128	26%	33	7%	50	10%	51	9%
Graduate Students										
Postdocs	177	48	16	33%	1	2%	6	13%	111	63%
Graduate Students	1,041	475	172	36%	46	10%	81	17%	432	41%
Doctoral	843	376	139	37%	41	11%	60	16%	373	44%
Master's	198	99	33	33%	5	5%	21	21%	59	30%
Total**	1,218	523	188	36%	47	9%	87	17%	543	45%
Undergraduate Students										
ERC Undergraduate Students (Research Assistants, Non-REU Students)	613	415	203	49%	42	10%	102	25%	23	4%
NSF REU Site Award Students	60	54	25	46%	12	22%	13	24%	0	0%
Center Funding Students	145	132	68	52%	31	23%	35	27%	0	0%
Other NSF Supplemental Funding Students	37	36	15	42%	13	36%	20	56%	0	0%
Total**	785	573	286	50%	92	16%	148	26%	23	3%
Community College										
Participants in RET Program	2	2	2	100%	1	50%	1	50%	0	0%
K–12 Teachers										
K–12 RET	100	81	51	63%	24	30%	25	31%	0	0%
K–12 Non-RET	60	52	35	67%	14	27%	9	17%	1	2%
Total	160	133	86	65%	38	29%	34	26%	1	1%
Young Scholars										
Total	138	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grand Total***	***2,898***	***1,737***	***704***	***41%***	***217***	***12%***	***329***	***19%***	***618***	***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, 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*

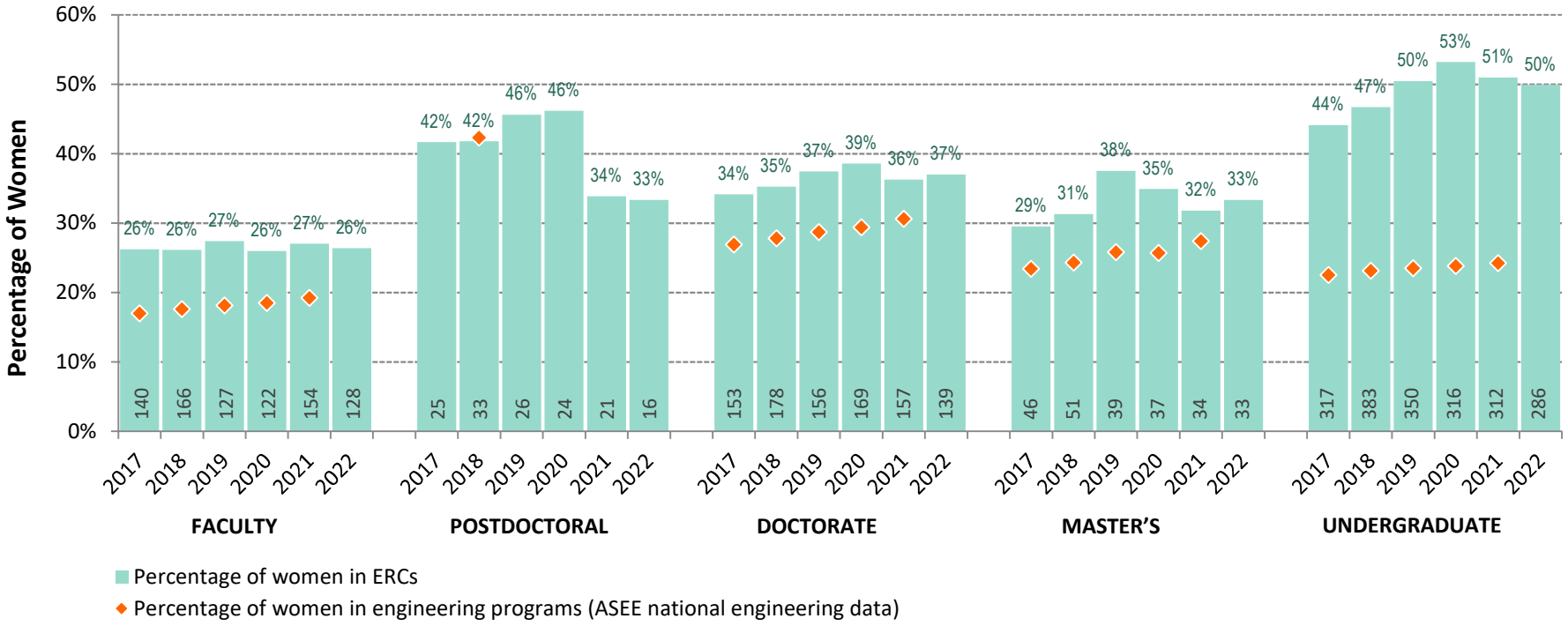
NOTE: *For years in which the center entered demographic data by institution rather than per person, data are not included*

Participants Impacted by ERC Engineering Education Activities, FY 2022

Outreach Participants	Total
Community College Events	
Faculty Who Attended ERC-Sponsored Educational Outreach Events	35
Students Who Attended ERC-Sponsored Educational Outreach Events	313
Total	348
K–12 Events	
Pre-college K–12 Teachers	1,535
K–12 Students	26,411
Total	27,946
Grand Total	***28,294***

Women in ERCs, FY 2017–2022

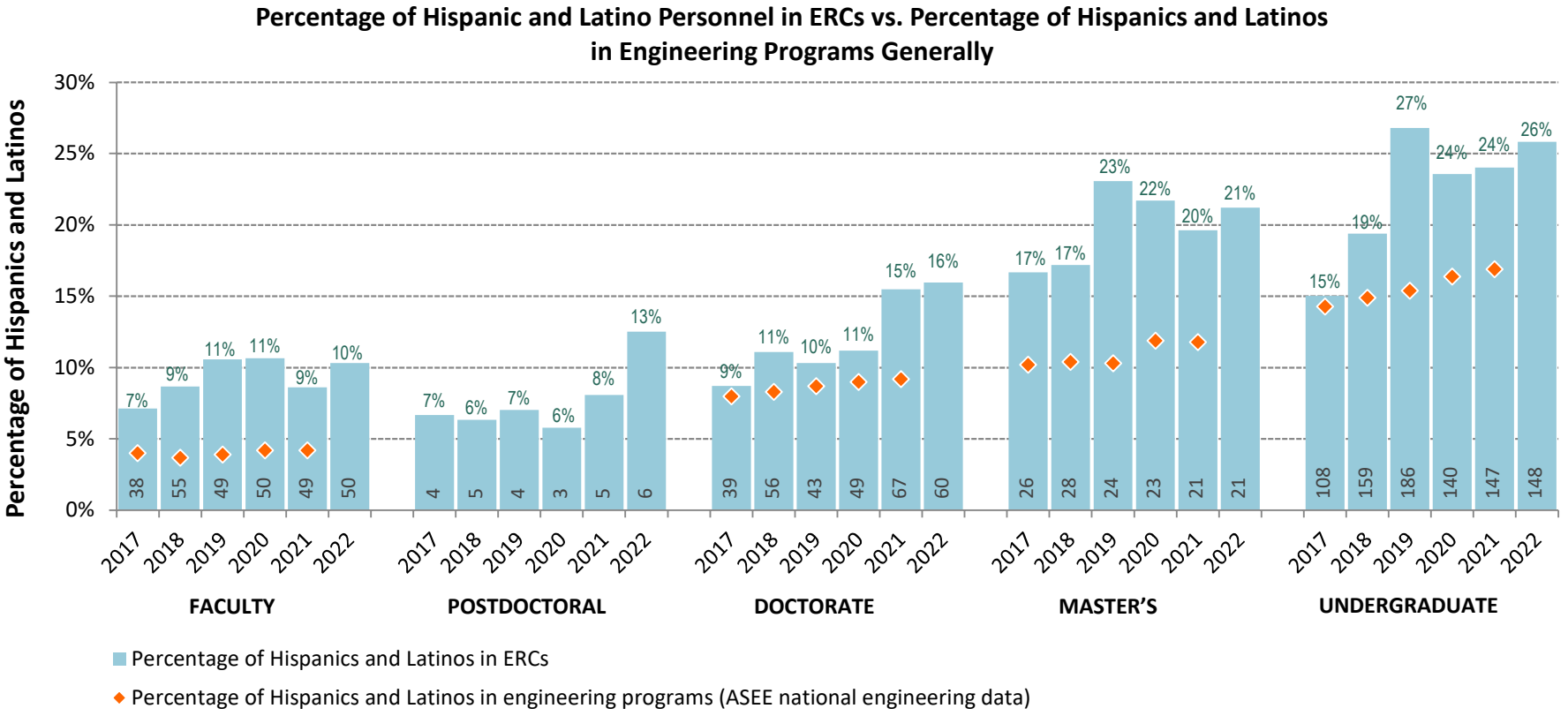
Percentage of Women Personnel in ERCs vs. Percentage of Women in Engineering Programs Generally



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 2022 and postdoctoral for 2017, 2019, 2020, 2021 and 2022*
- *The percentages of personnel who did not report gender are as follows: 2017: 12.06%, 2018: 10.67%, 2019: 10.95%, 2020: 9.94%, 2021: 10.36%, 2022: 10.62%*

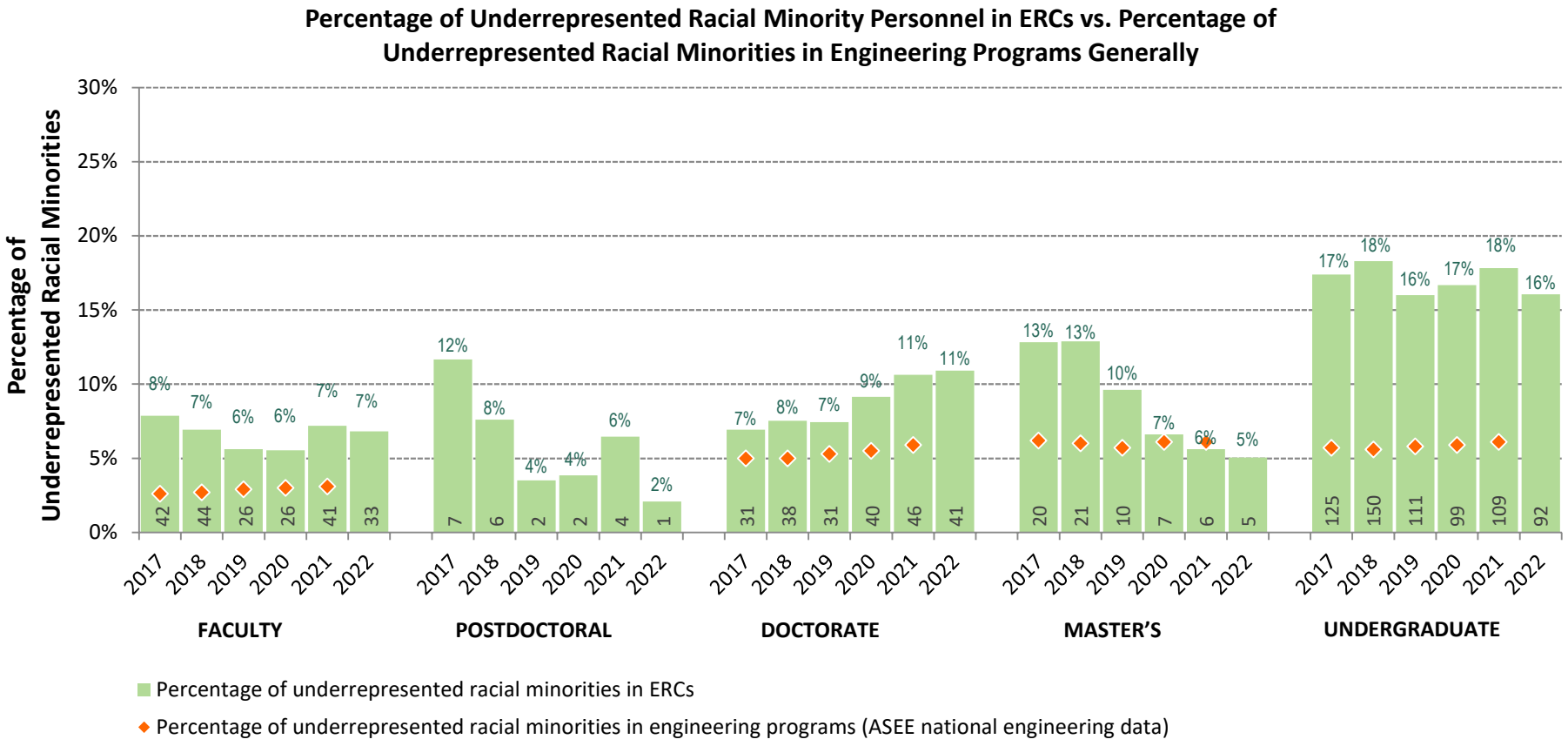
Hispanics and Latinos in ERCs, FY 2017–2022



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 2022 and postdoctoral for 2017–2022*
- *The percentages of personnel who did not report ethnicity are as follows: 2017: 17.43%, 2018: 15.81%, 2019: 15.57%, 2020: 15.11%, 2021: 14.17%, 2022: 16.18%*

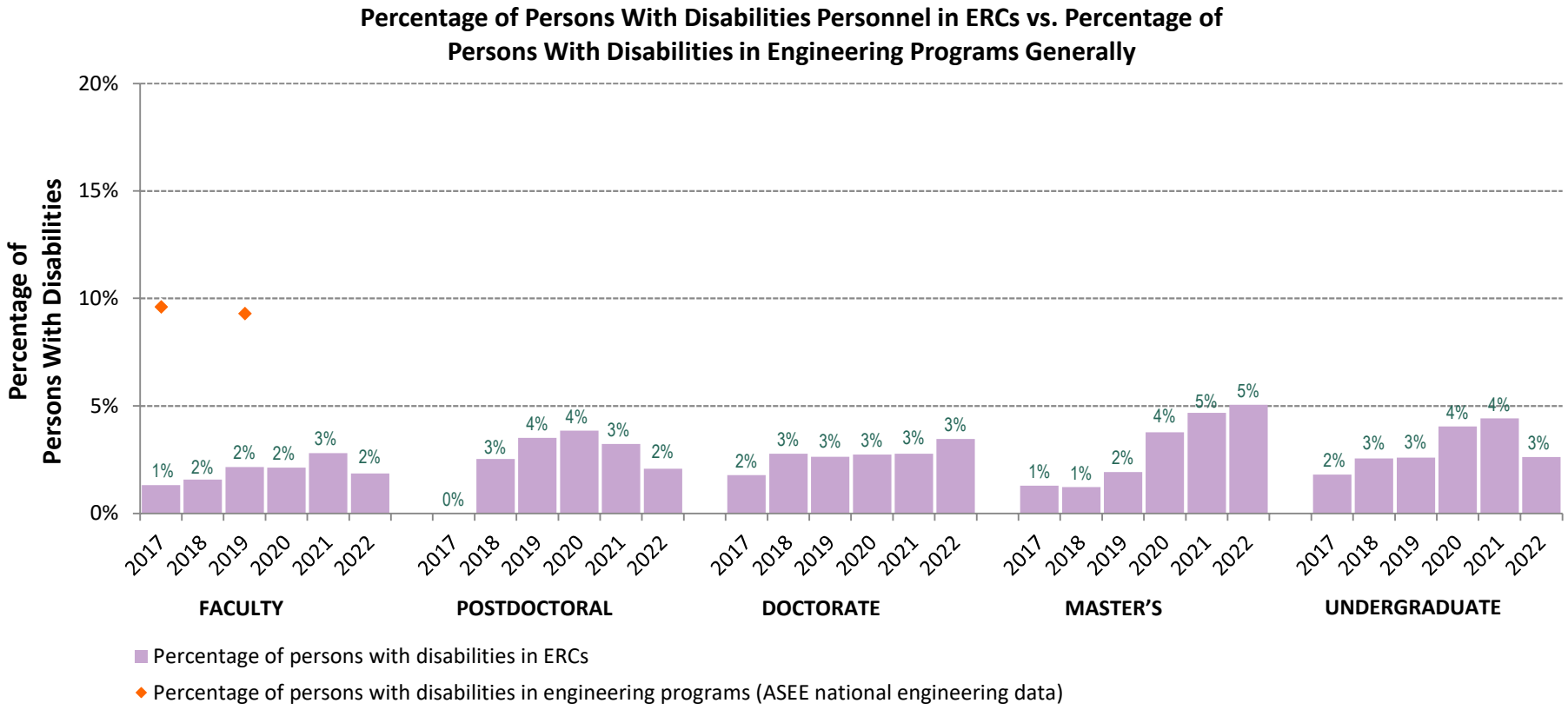
12 Underrepresented Racial Minorities in ERCs, FY 2017–2022



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 2022 and postdoctoral for 2017–2022*
- *The percentages of personnel who did not report race are as follows: 2017: 17.88%, 2018: 16.91%, 2019: 17.68%, 2020: 16.37%, 2021: 16.46%, 2022: 19.12%*

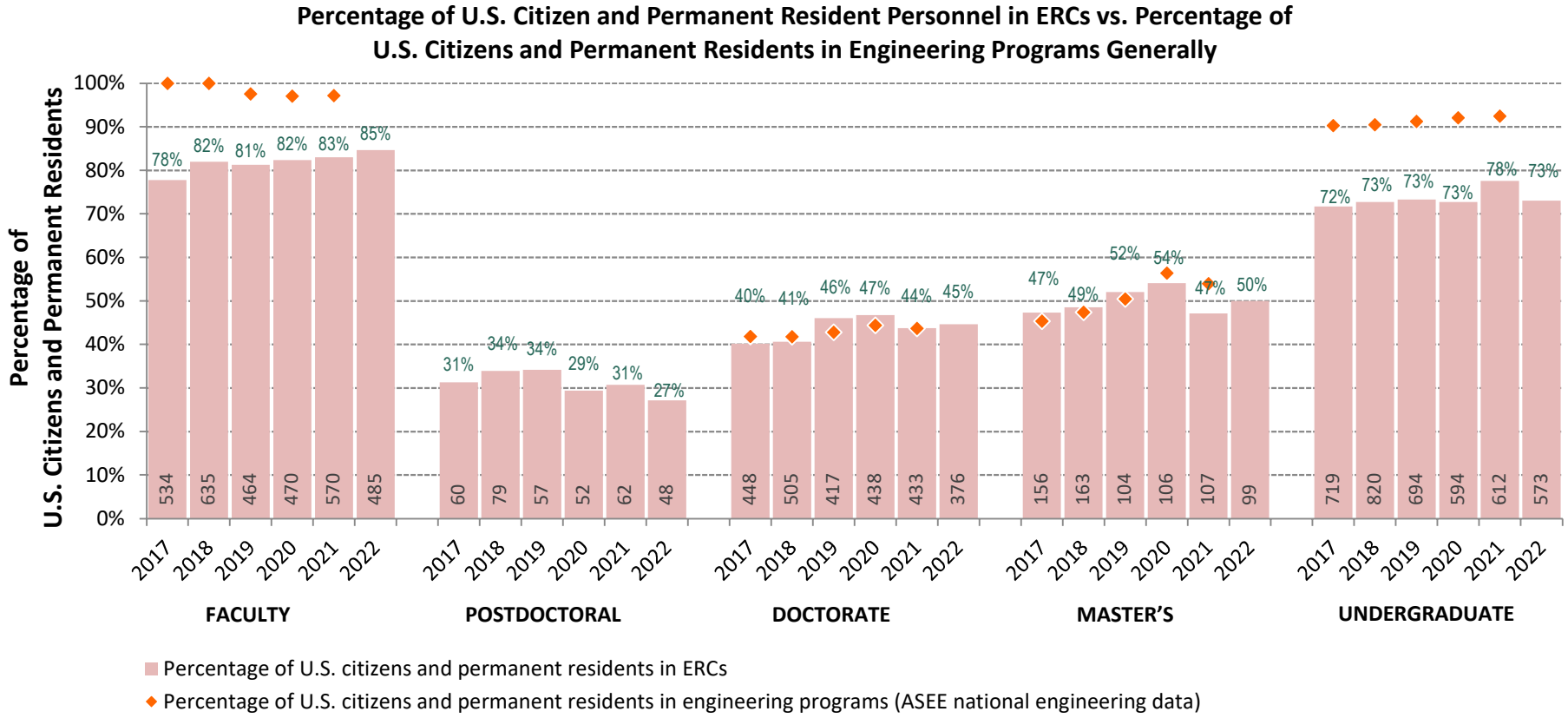
13 Persons With Disabilities in ERCs, FY 2017–2022



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*
- *The percentages of personnel who did not report disability status are as follows: 2017: 27.63%, 2018: 20.44%, 2019: 21.66%, 2020: 18.34%, 2021: 17.21%, 2022: 17.31%*

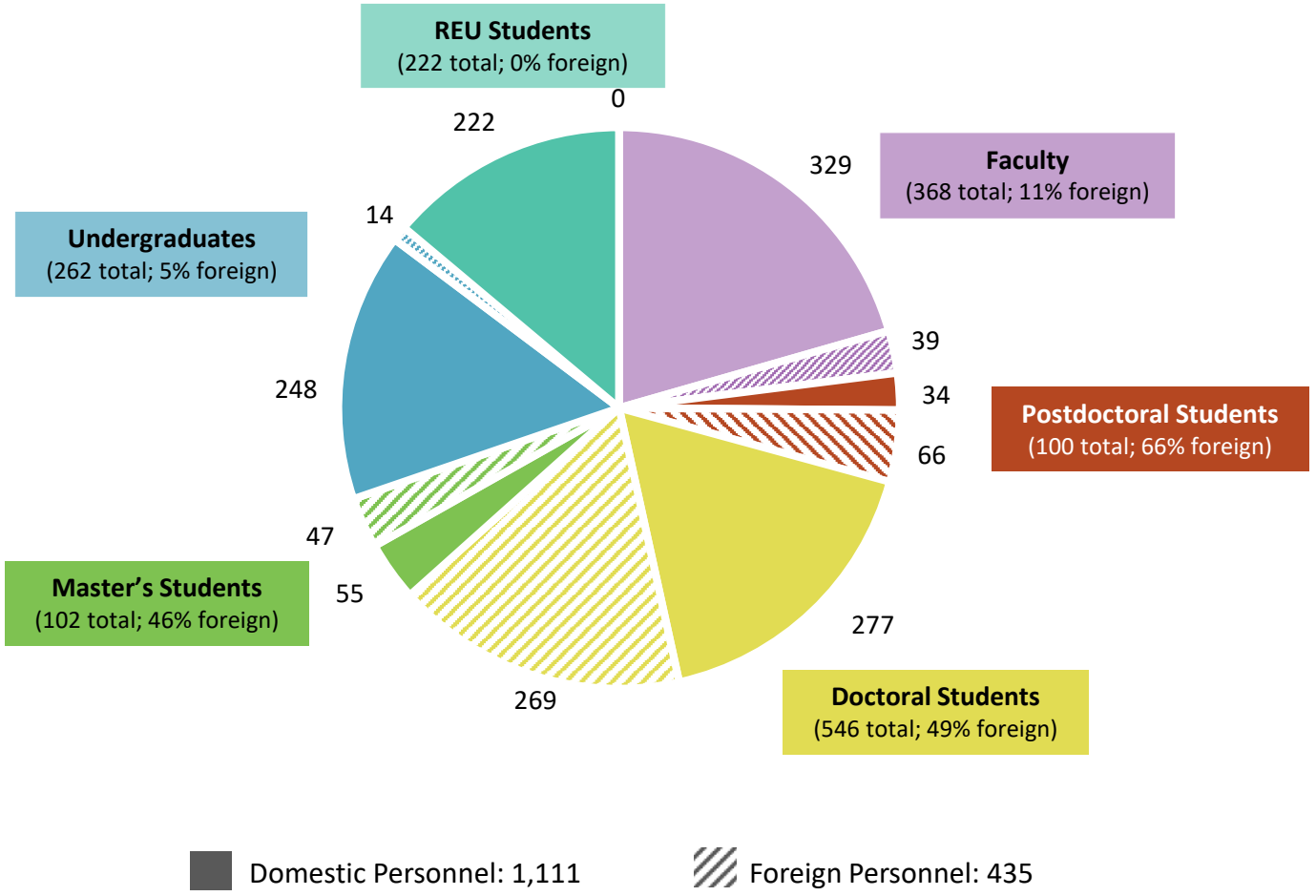
14 U.S. Citizens and Permanent Residents in ERCs, FY 2017–2022



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 2022 and postdoctoral for 2017-2022*
- *The percentages of personnel who did not report citizenship are as follows: 2017: 14.07%, 2018: 13.09%, 2019: 12.73%, 2020: 12.64%, 2021: 12.12%, 2022: 14.63%*

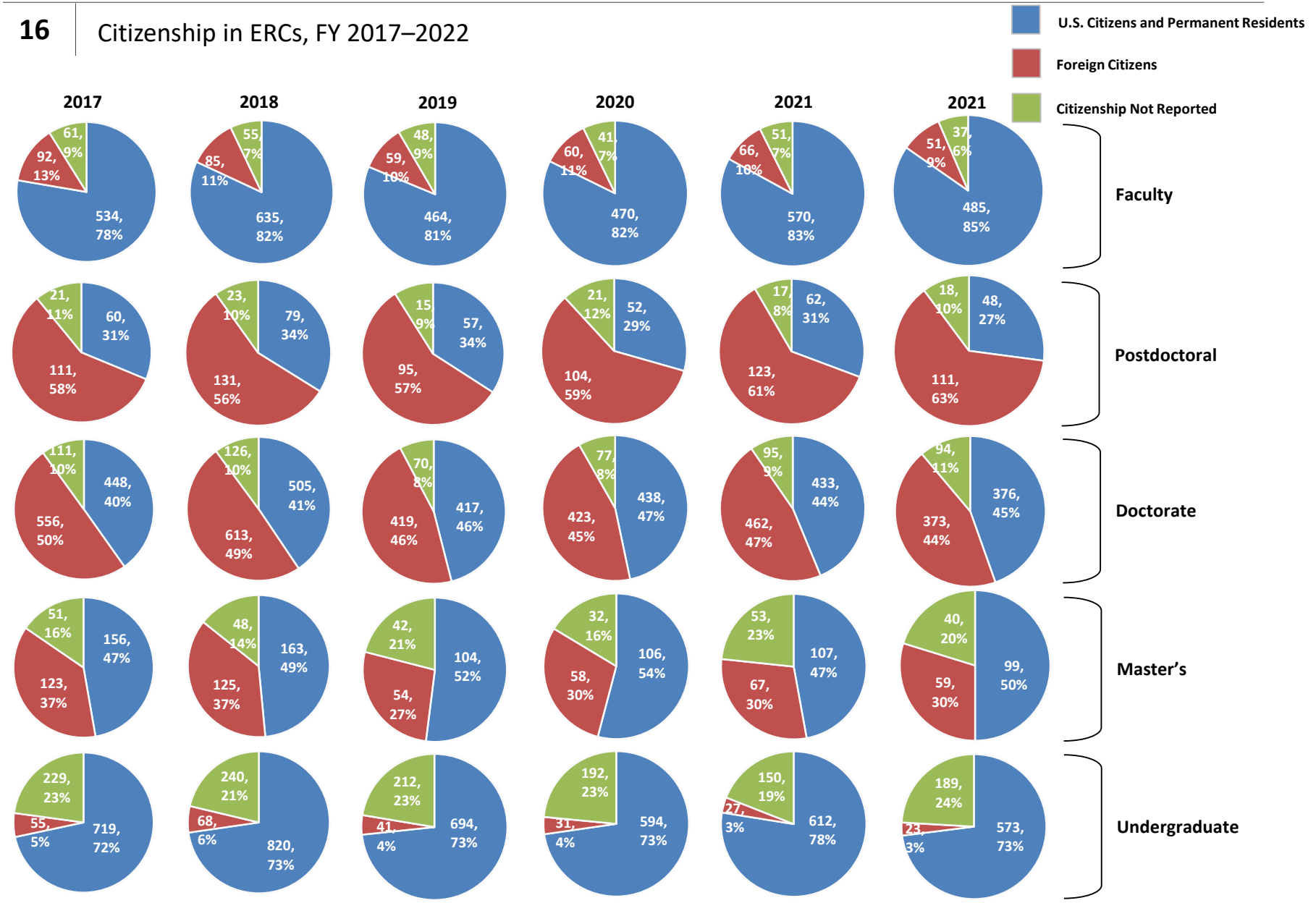
Personnel Conducting ERC Research, FY 2022



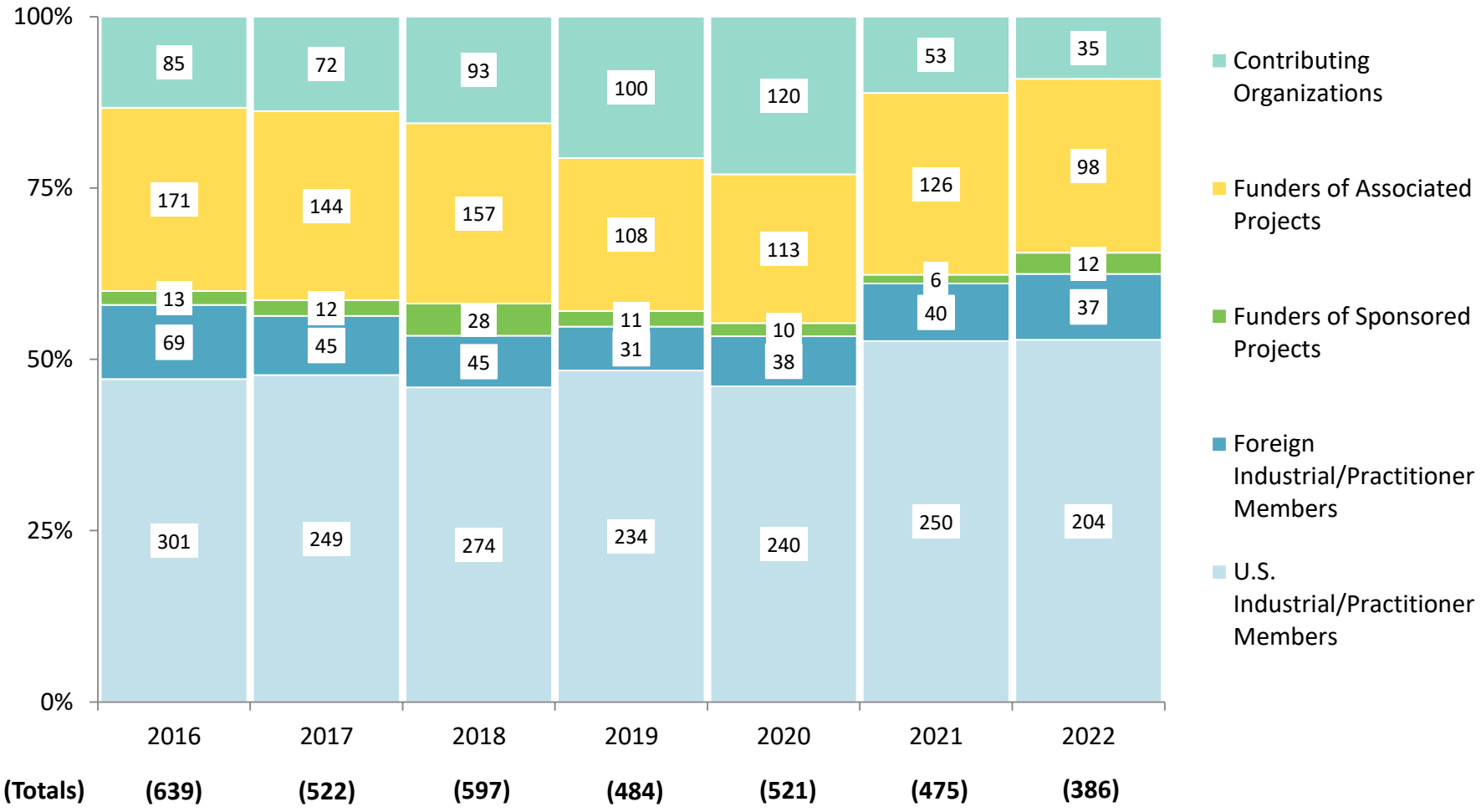
NOTES:

- *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 2017–2022



17 ERC Industrial/Practitioner Members and Supporting Organizations, FY 2016–2022*



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

18 ERC Industrial/Practitioner Members and Supporting Organizations, FY 2016–2022*

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
Organization Type							
Contributing Organizations	85	72	93	100	120	53	35
Funders of Associated Projects	171	144	157	108	113	126	98
Funders of Sponsored Projects	13	12	28	11	10	6	12
Foreign Industrial/Practitioner Members	69	45	45	31	38	40	37
U.S. Industrial/Practitioner Members	301	249	274	234	240	250	204
Total Number of Organizations	***639***	***522***	***597***	***484***	***521***	***475***	***386***
Total Number of Centers	***19***	***16***	***19***	***19***	***15***	***18***	***15***
Average Number of Organizations per Center	***34***	***33***	***31***	***25***	***35***	***26***	***26***

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

19 Industrial/Practitioner Member Support by Year, FY 2016–2022*

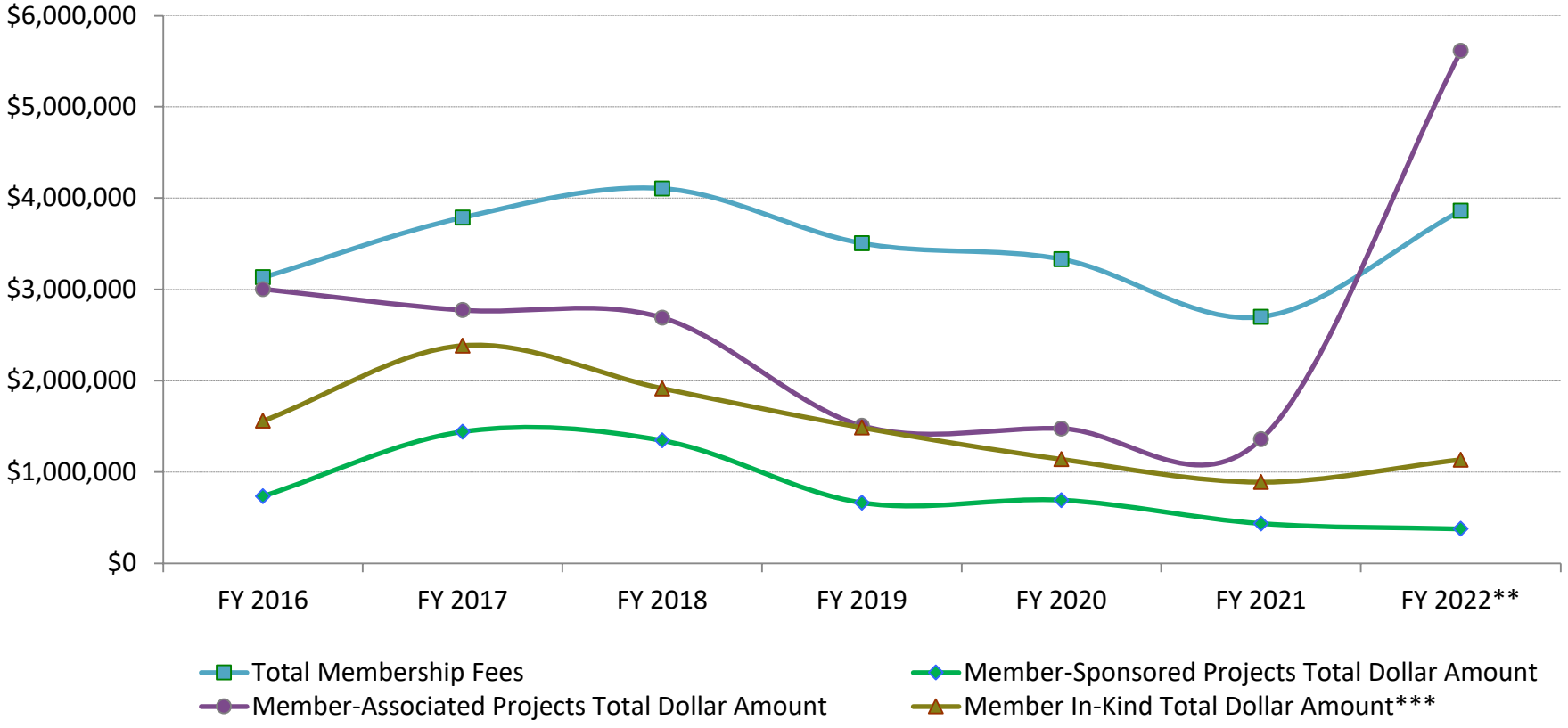
	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022**
Type of Support							
Total Membership Fees	$3,132,772	$3,786,620	$4,105,519	$3,505,352	$3,329,864	$2,699,714	$3,861,169
Member-Sponsored Projects Total Dollar Amount	$735,122	$1,440,493	$1,344,913	$662,354	$691,321	$434,796	$376,869
Member-Associated Projects Total Dollar Amount	$3,001,718	$2,772,841	$2,690,570	$1,506,932	$1,475,615	$1,359,434	$5,612,035
Member In-Kind Total Dollar Amount***	$1,560,677	$2,384,789	$1,914,975	$1,486,785	$1,139,124	$890,196	$1,134,895
Total Dollar Amount, Industrial/Practitioner Member Support to Center	***$8,430,289***	***$10,384,743***	***$10,055,977***	***$7,161,423***	***$6,635,924***	***$5,384,140***	***$10,984,968***

** 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 2016–2022*

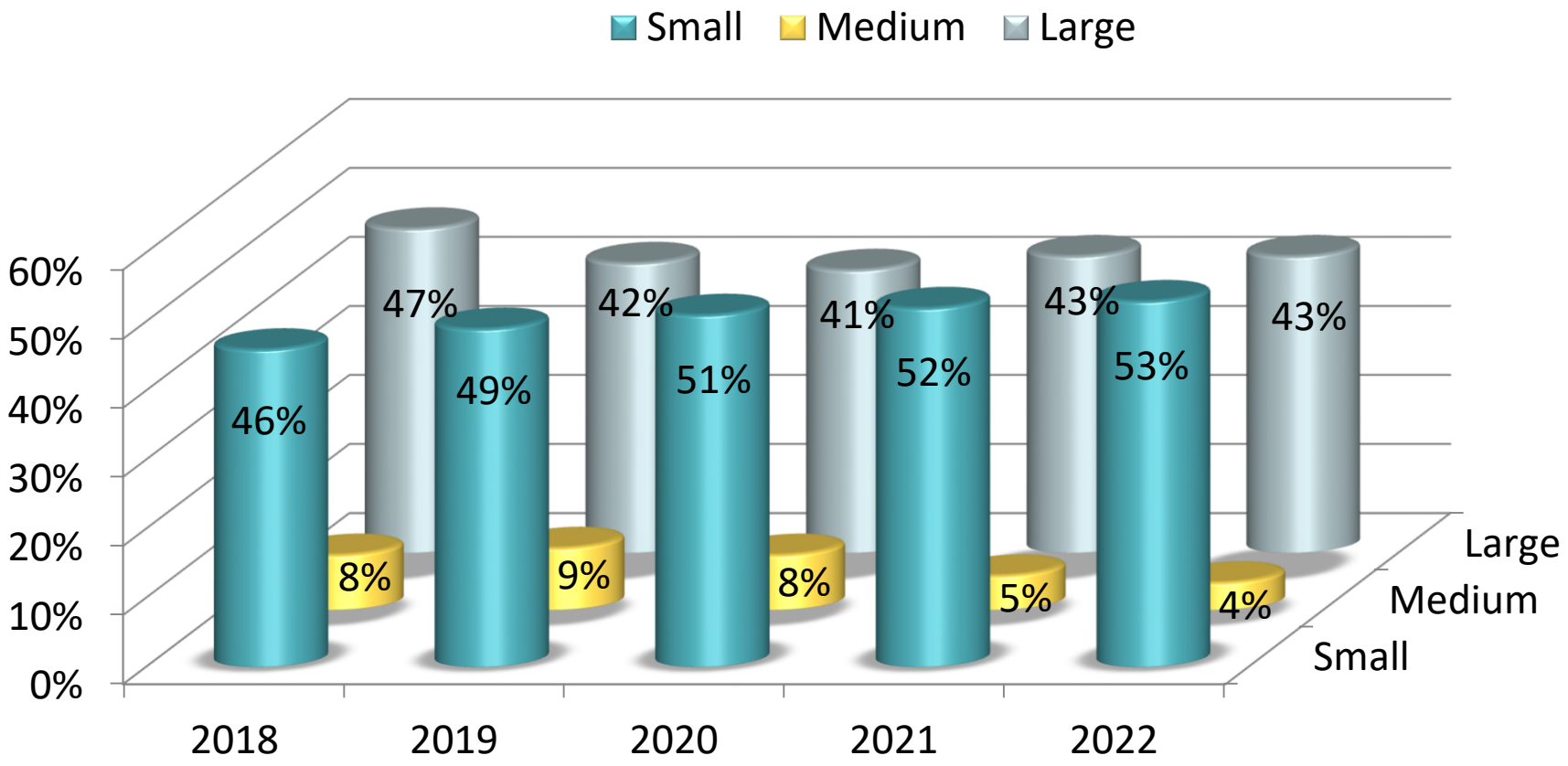


** Does not include centers from the Earthquake Technology Sector*

*** 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*

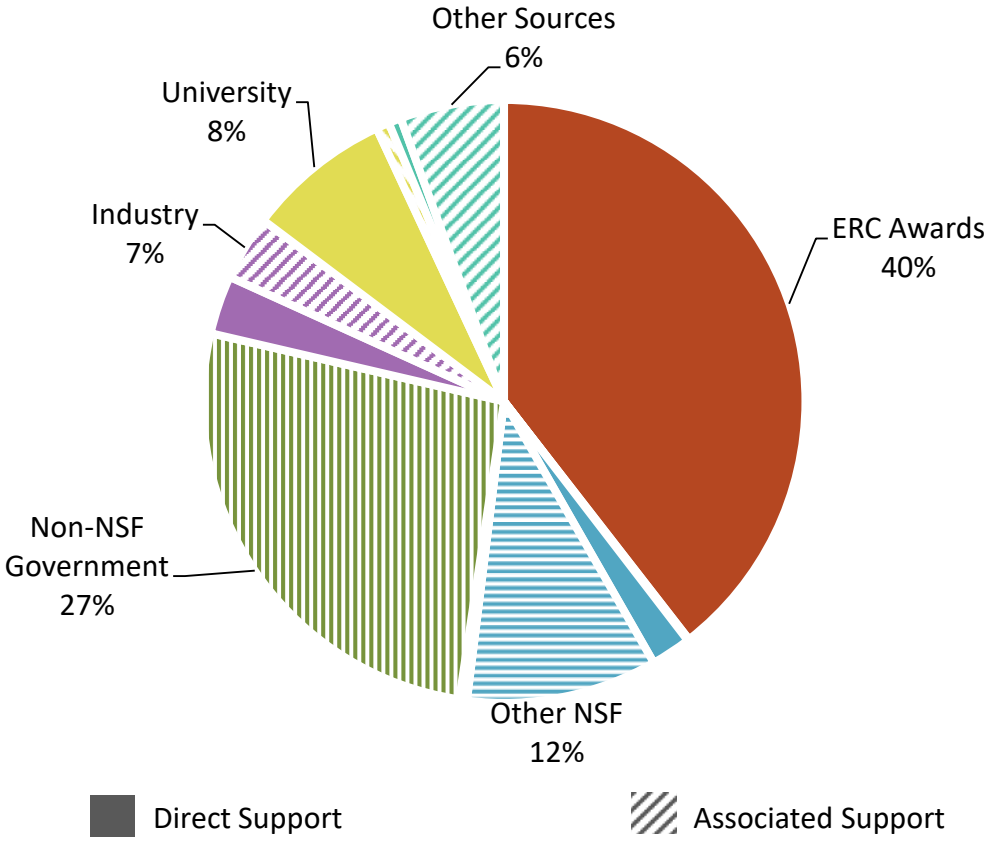
21 | Distribution of Industrial/Practitioner Members by Industry Size, FY 2018–2022



NOTES:

- *The total number of firms is as follows: 2018: 276, 2019: 222, 2020: 239, 2021: 263, 2022: 227*
- *Industry sizes are as follows: Small = <500 employees, Medium = 500–1,000 employees, Large = >1,000 employees*

Total ERC New Cash Support, FY 2022 (15 ERCs)

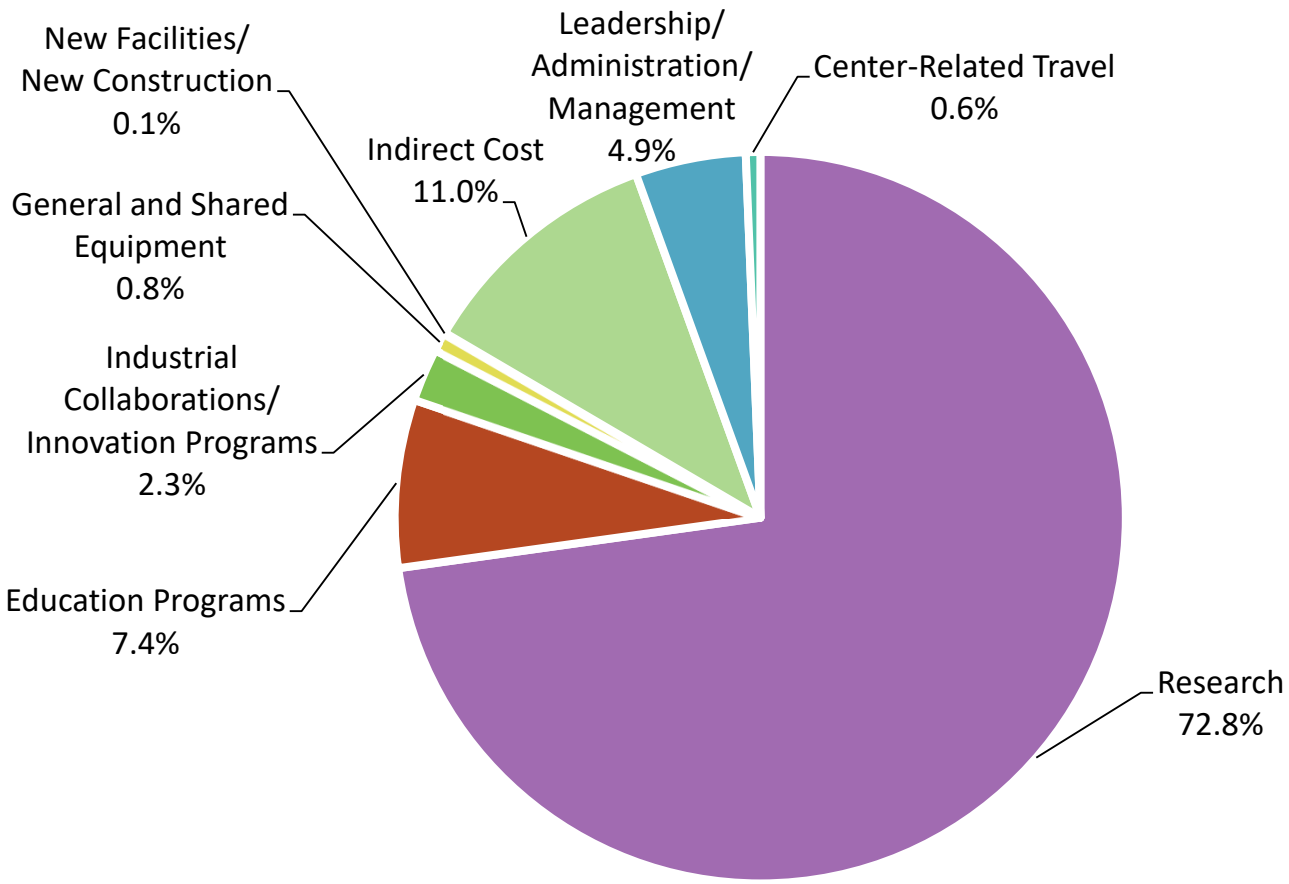


Total value of support: $148 million

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*

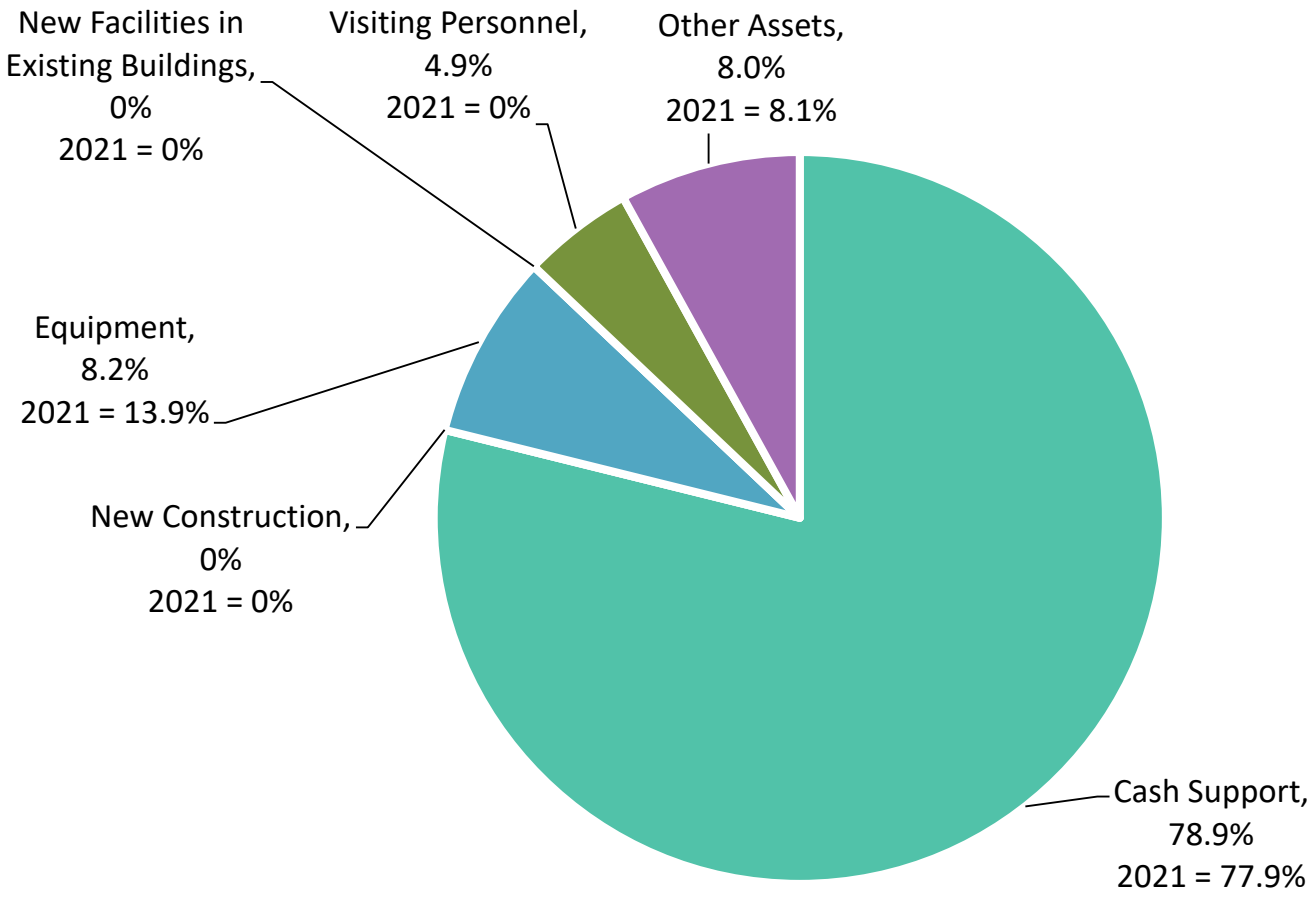
Functional Budgets of ERCs in the Aggregate, FY 2022*



Direct Support total: $129,756,378

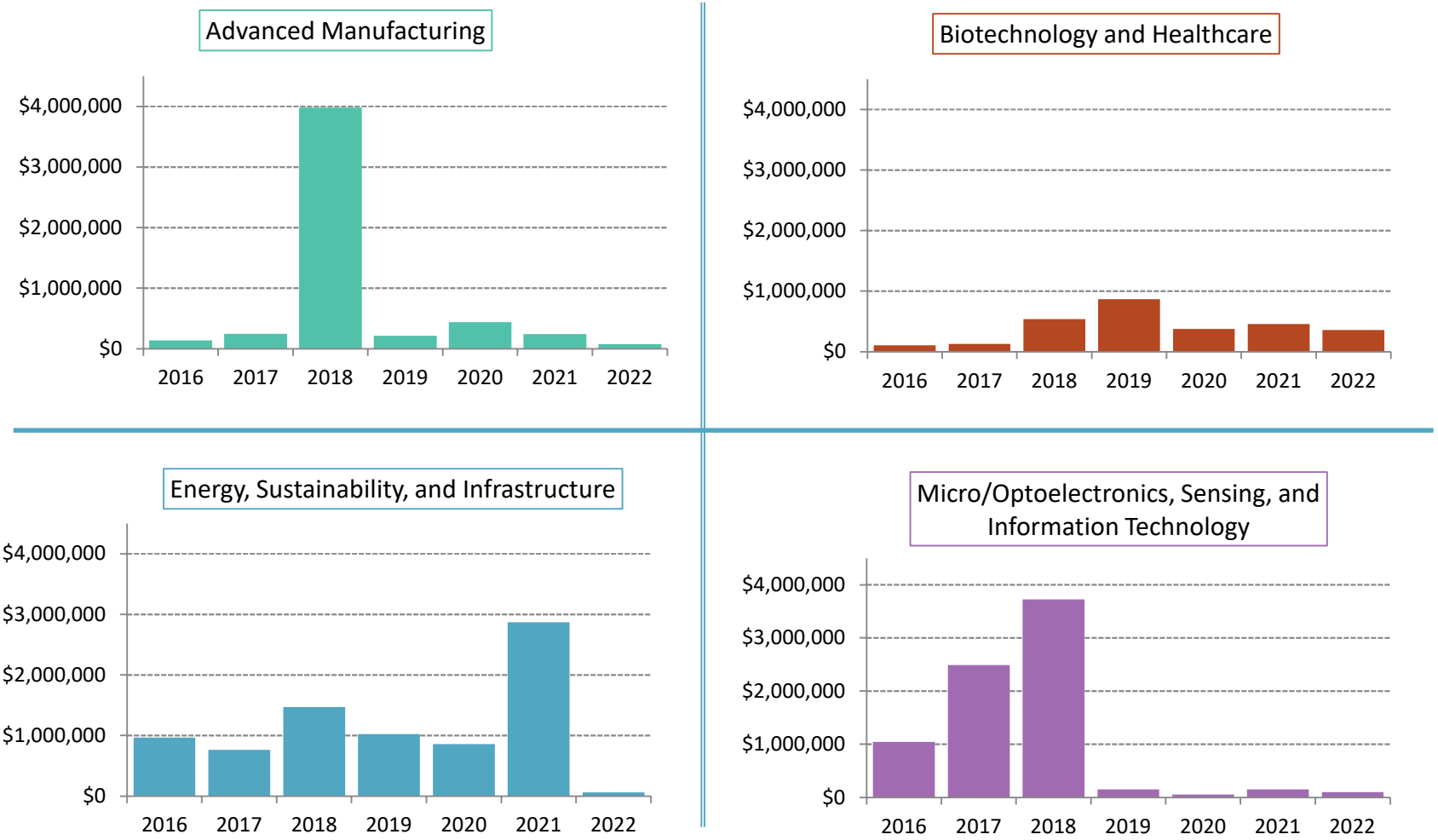
** Includes in-kind support but not residuals*

Industrial/Practitioner New Support to 15 ERCs, FY 2022



Total value of support: $5.4 million

Non-NSF Government Support by ERC Technology Sector, FY 2016–2022*,**,***

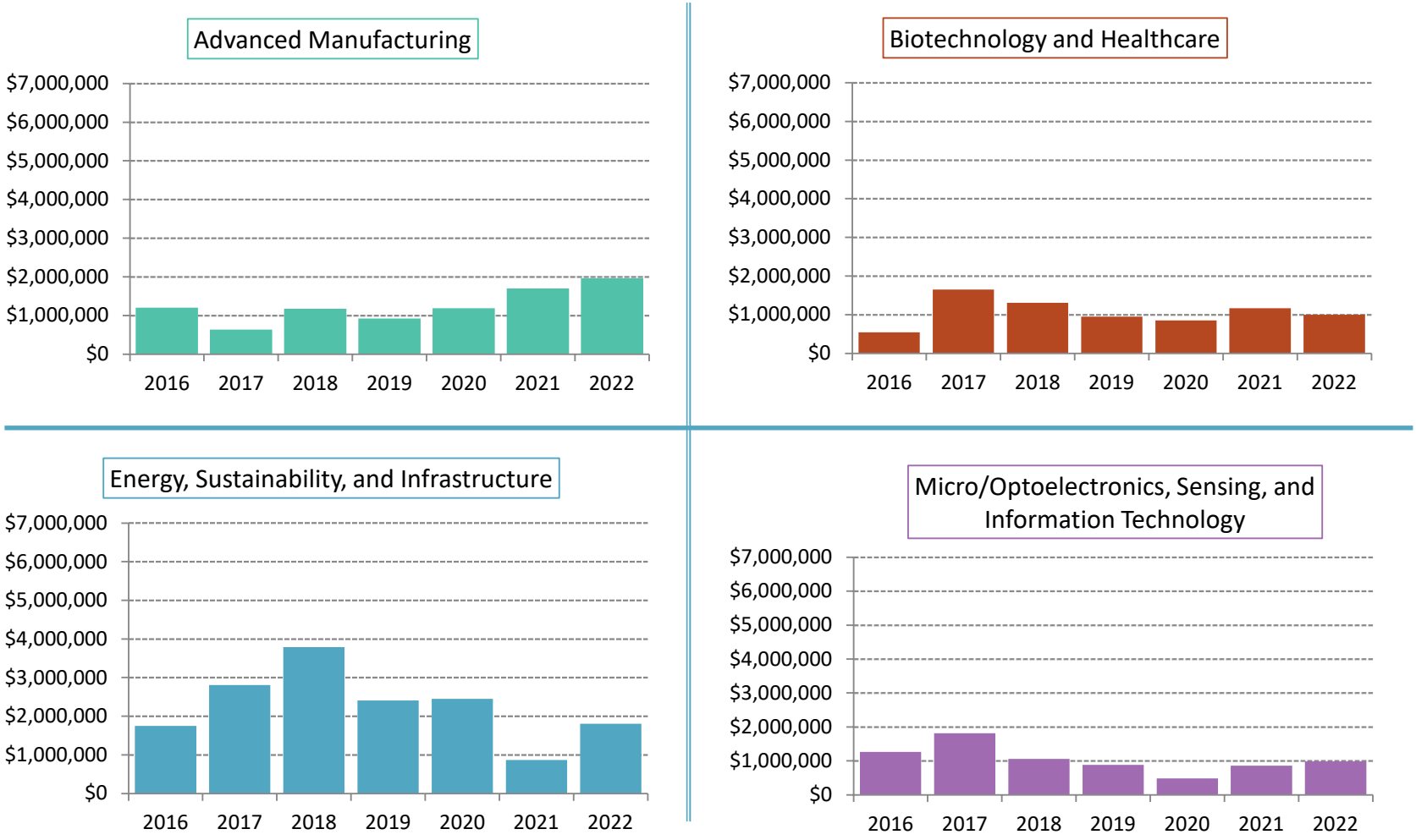


** Does not include centers from the Earthquake Technology Sector*

*** 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 2016–2022 *,**,***

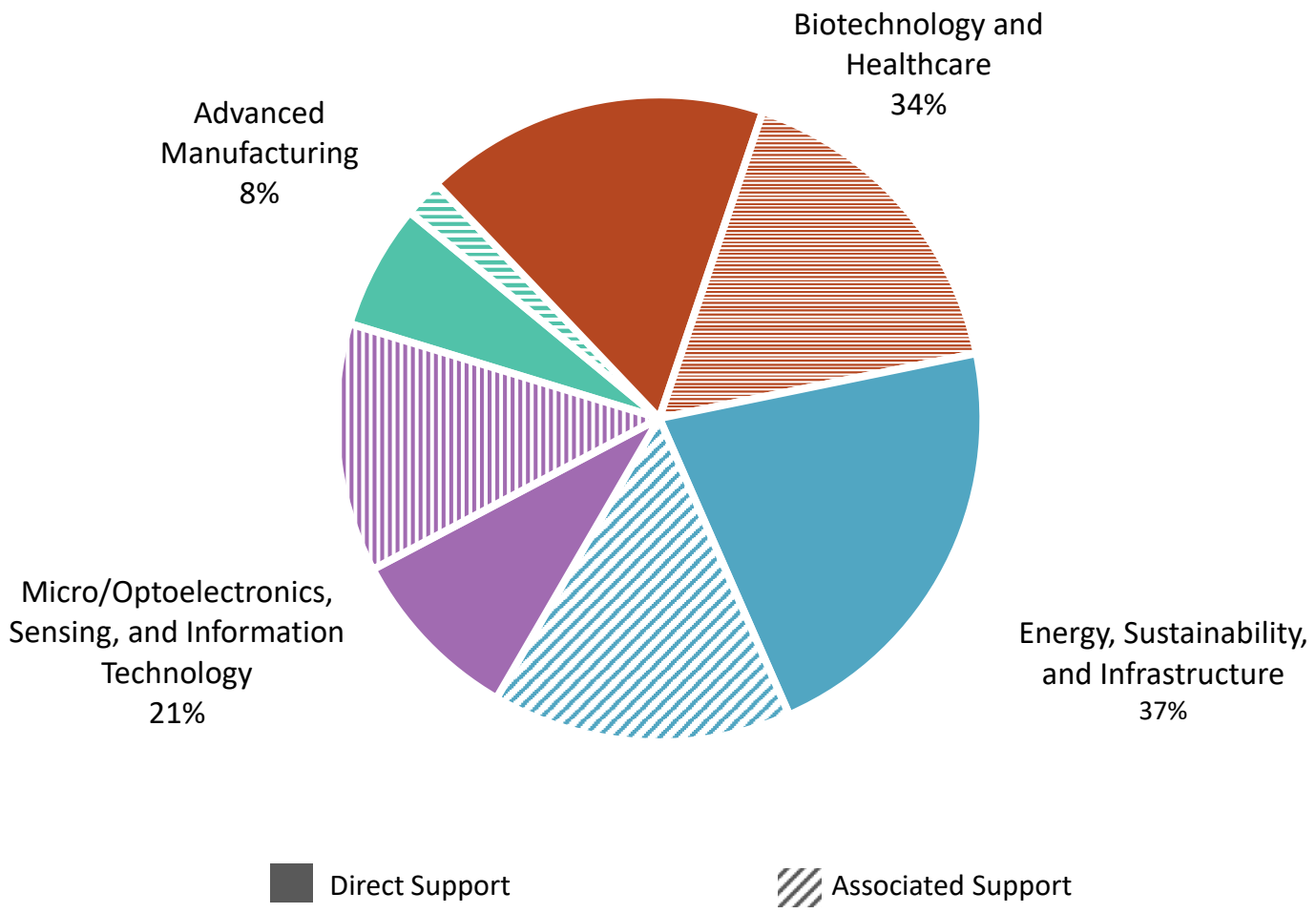


** Does not include centers from the Earthquake Technology Sector*

*** 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)*

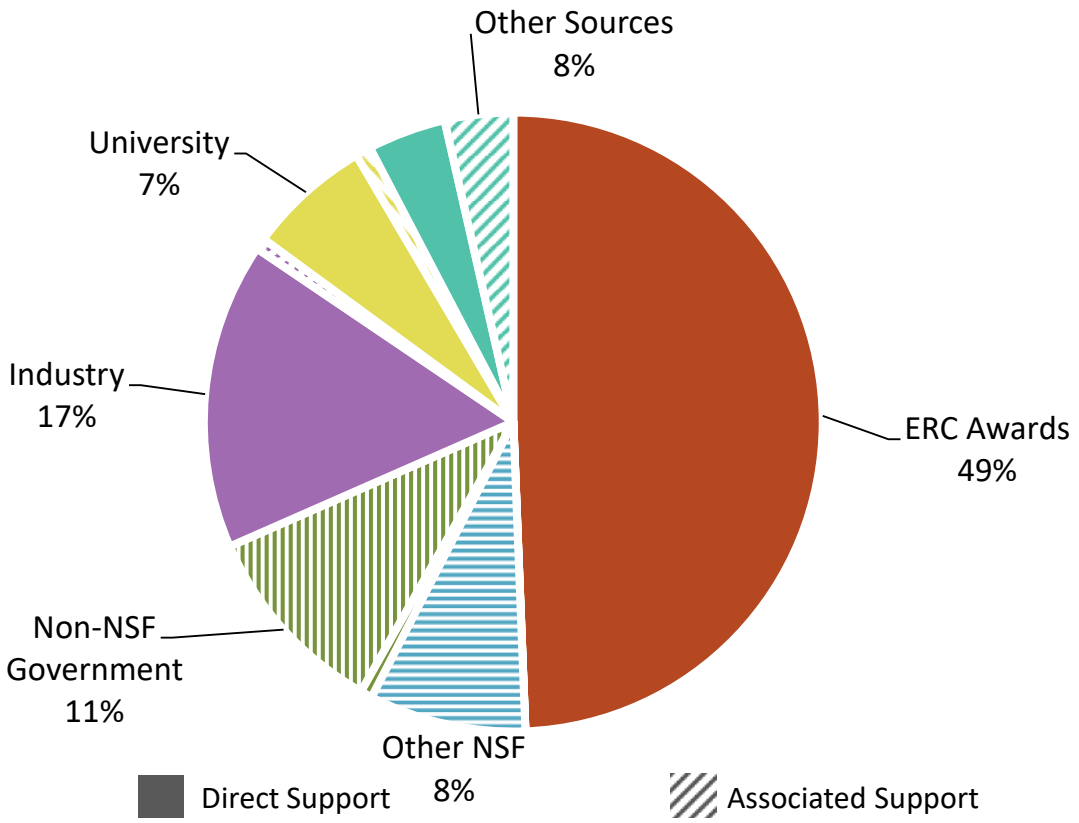
FY 2022 Sources of Support to 15 ERCs, by Technology Sector



Total value of support: $150 million

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

FY 2022 Support to ERCs in Advanced Manufacturing Sector: 2 Centers (NASCENT, CMaT)

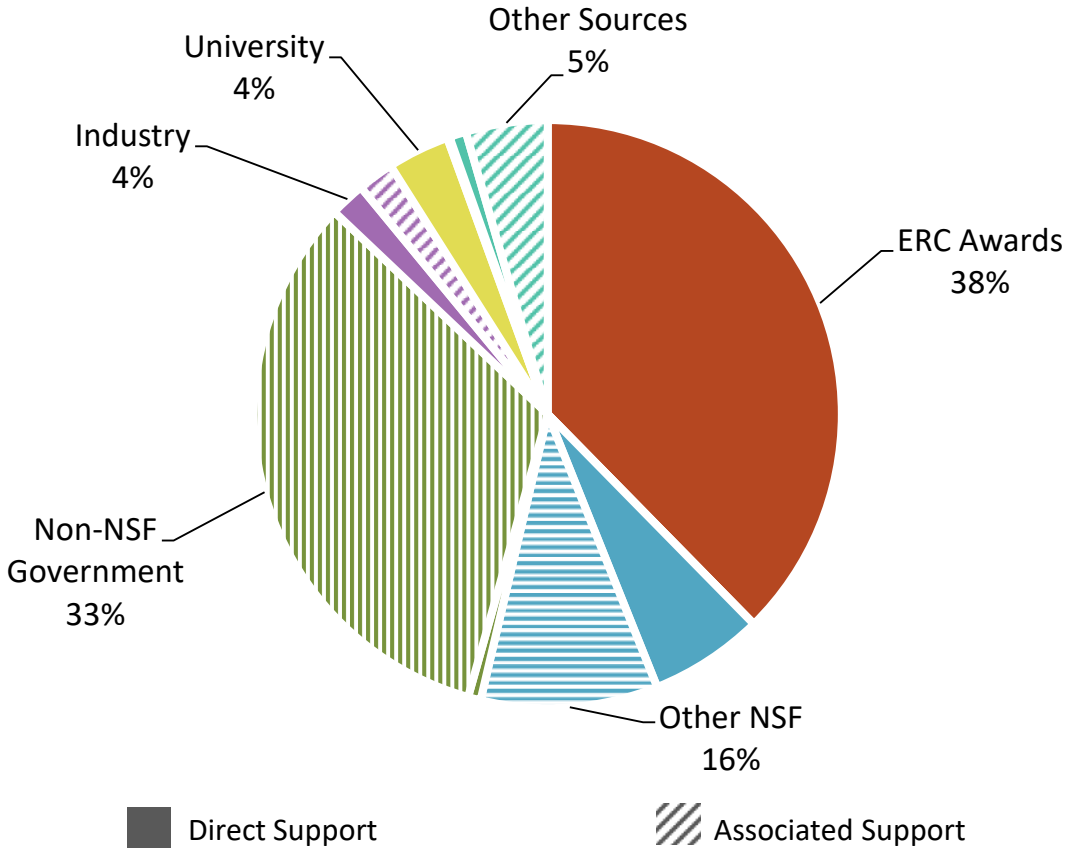


Total value of support: $12.2 million

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 2022 Support to ERCs in Biotechnology and Healthcare Sector: 4 Centers (ASSIST, ATP-Bio, CELL-MET, PATHS-UP)

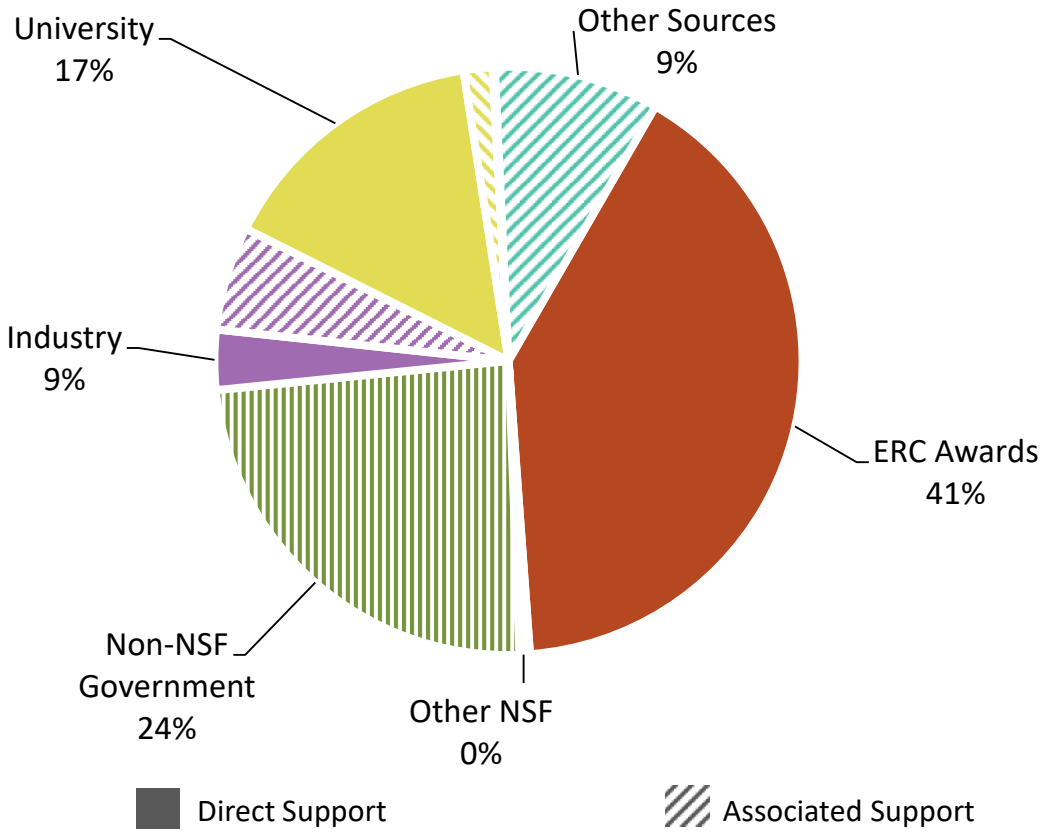


Total value of support: $50.6 million

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*

30 FY 2022 Support to ERCs in Energy, Sustainability, and Infrastructure Sector: 6 Centers (ASPIRE, CBBG, IoT4Ag, CISTAR, NEWT, QESST)

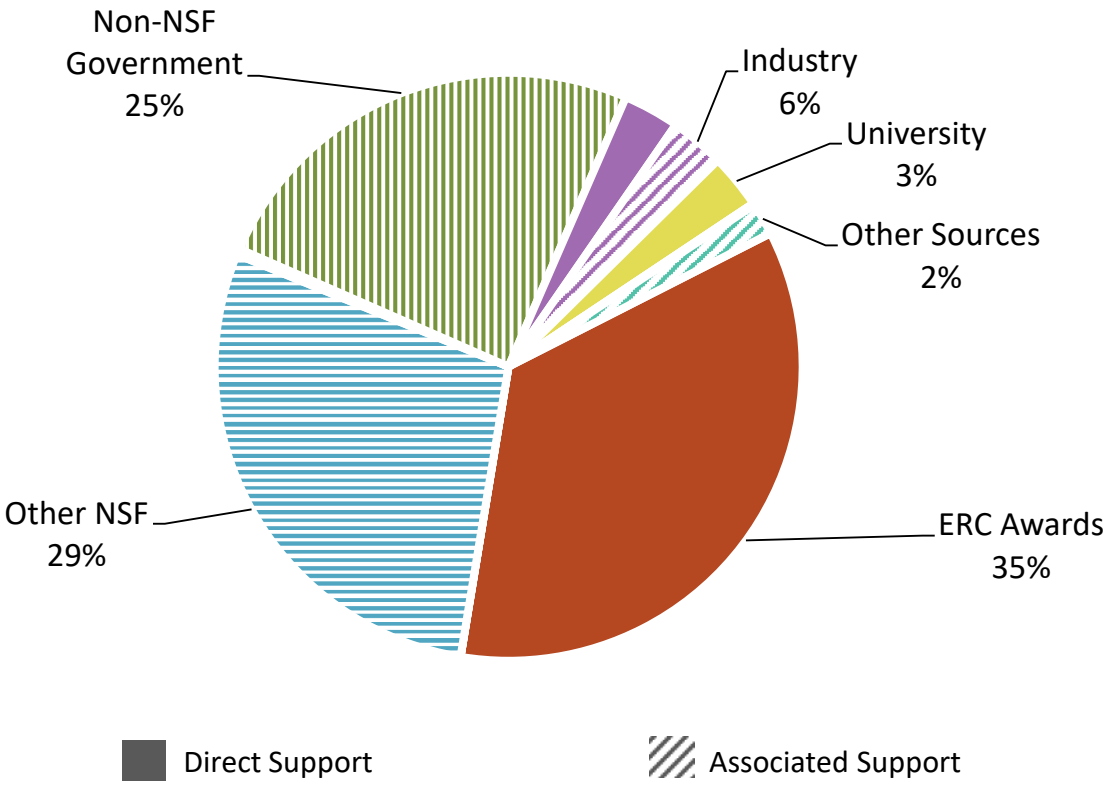


Total value of support: $54.7 million

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*

31 FY 2022 Support to ERCs in Micro/Optoelectronics, Sensing, and Information Technology Sector: 3 Centers (CQN, POETS, TANMS)

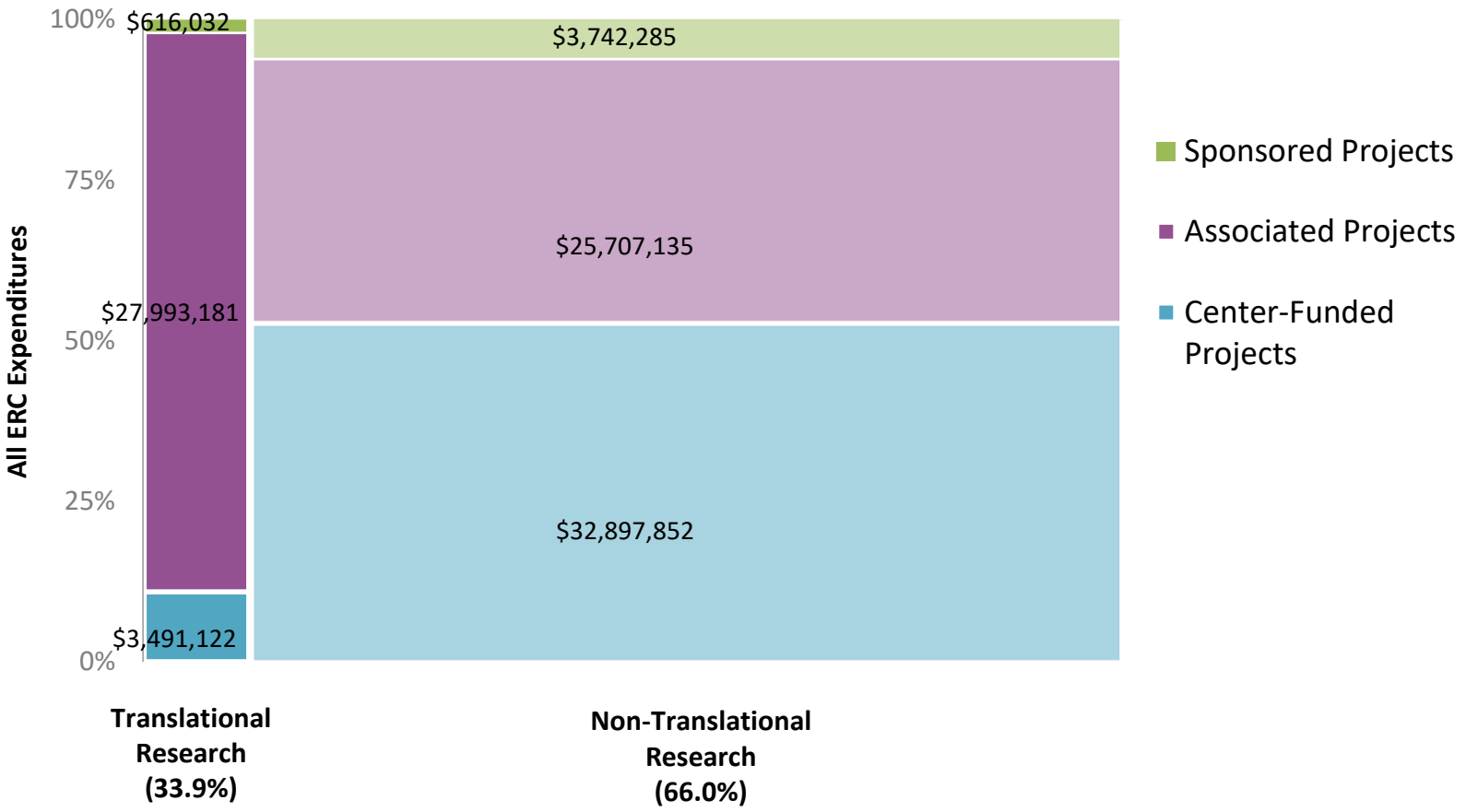


Total value of support: $31.9 million

NOTES:

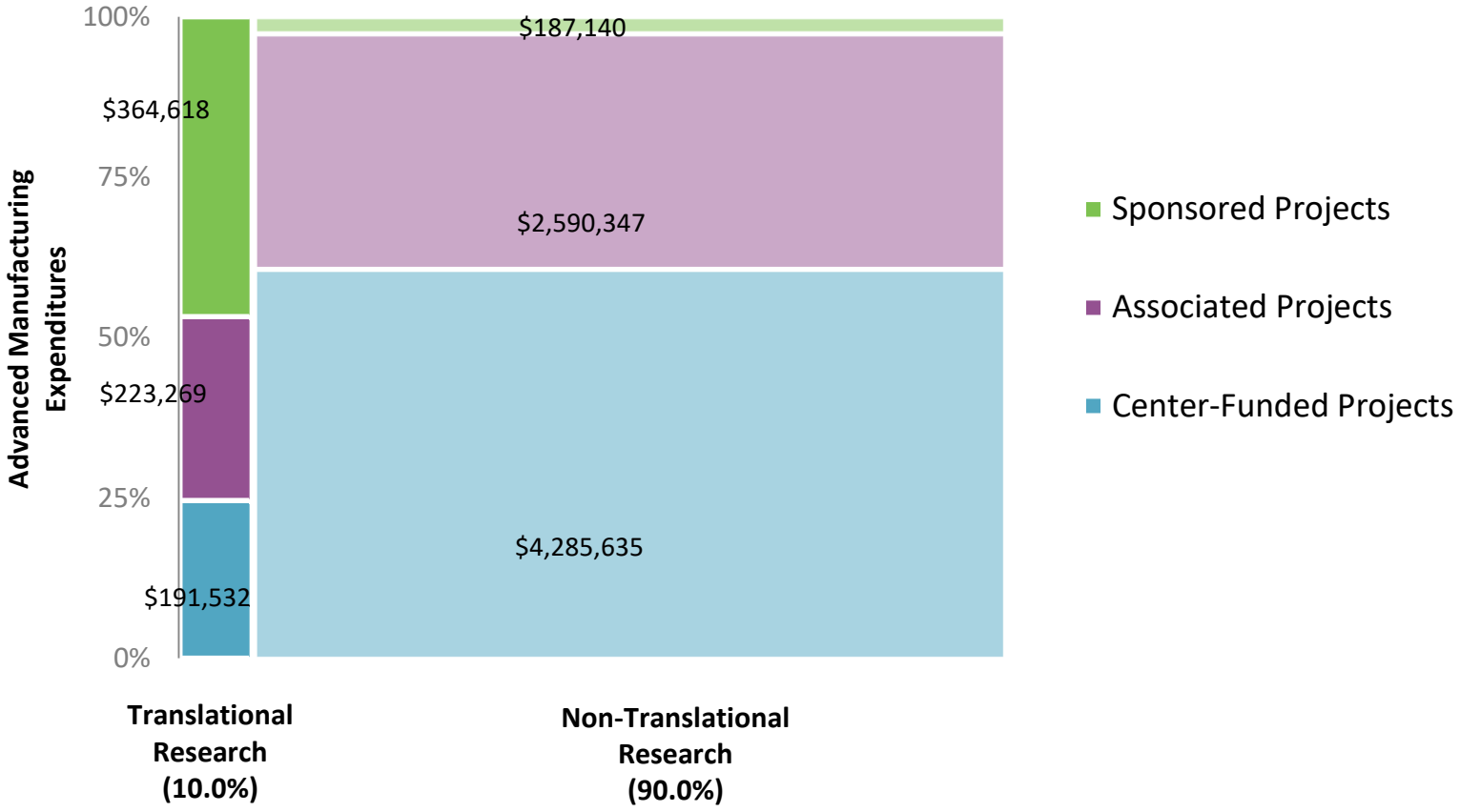
- *Sources of Support include Unrestricted Cash, Restricted Cash, In-Kind, and Associated Projects. Residuals are not included*
- *Non-NSF Government includes U.S. Government (not NSF), State government, local government, foreign government, and quasi-government research organizations*
- *Other Sources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

FY 2022 Expenditures by Type of Research: All ERCs



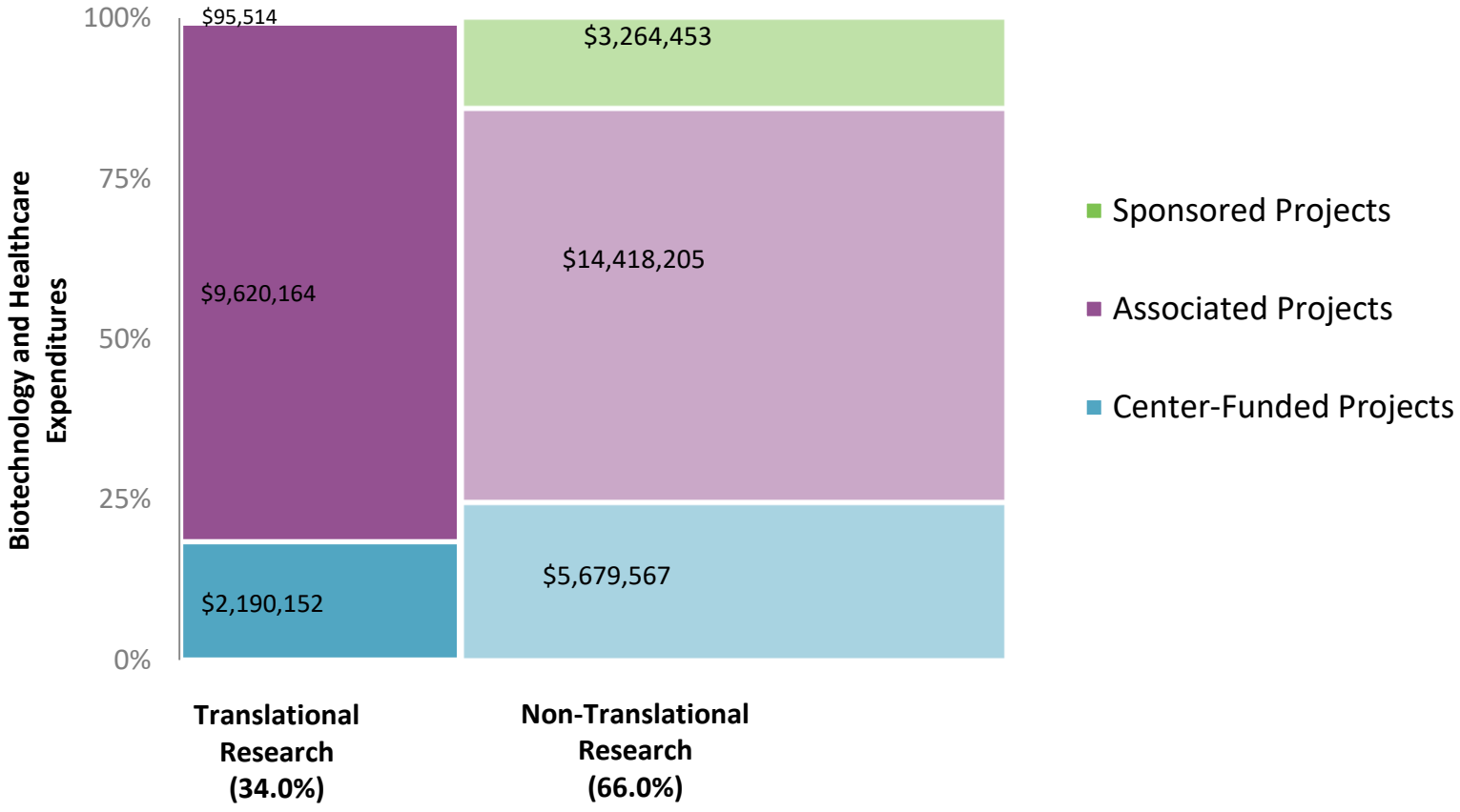
Total value of support: $94.4 million

FY 2022 Expenditures by Type of Research: Advanced Manufacturing



Total value of support: $7.8 million

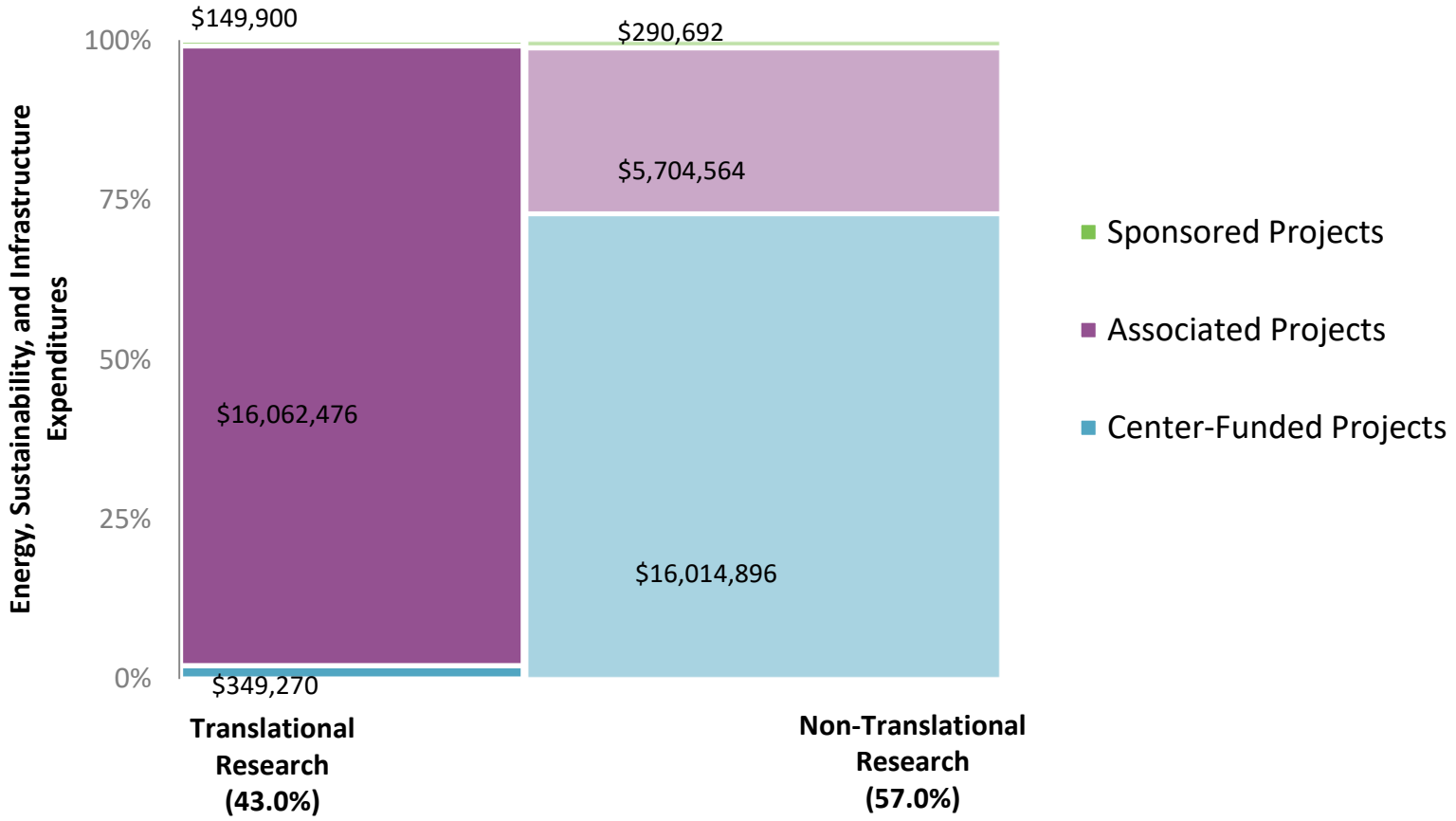
FY 2022 Expenditures by Type of Research: Biotechnology and Healthcare



Total value of support: $34.9 million

NOTE: *$95,514 corresponds to Sponsored Projects expenditures for Translational Research. Area is not visible due to the small relative size*

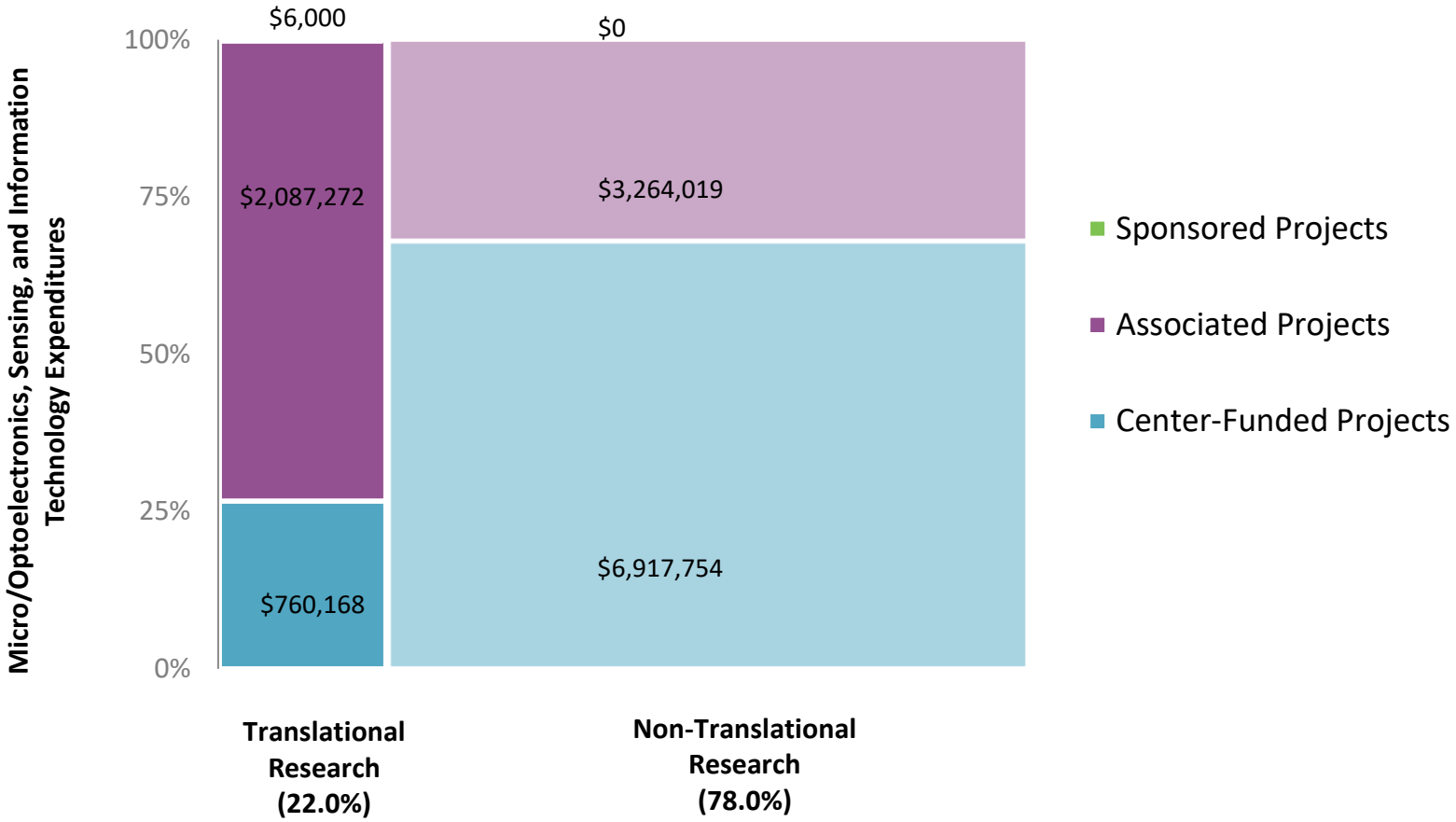
FY 2022 Expenditures by Type of Research: Energy, Sustainability, and Infrastructure



Total value of support: $38.6 million

NOTE: *$149,900 corresponds to Sponsored Projects expenditures for Translational Research. Area is not visible due to the small relative size*

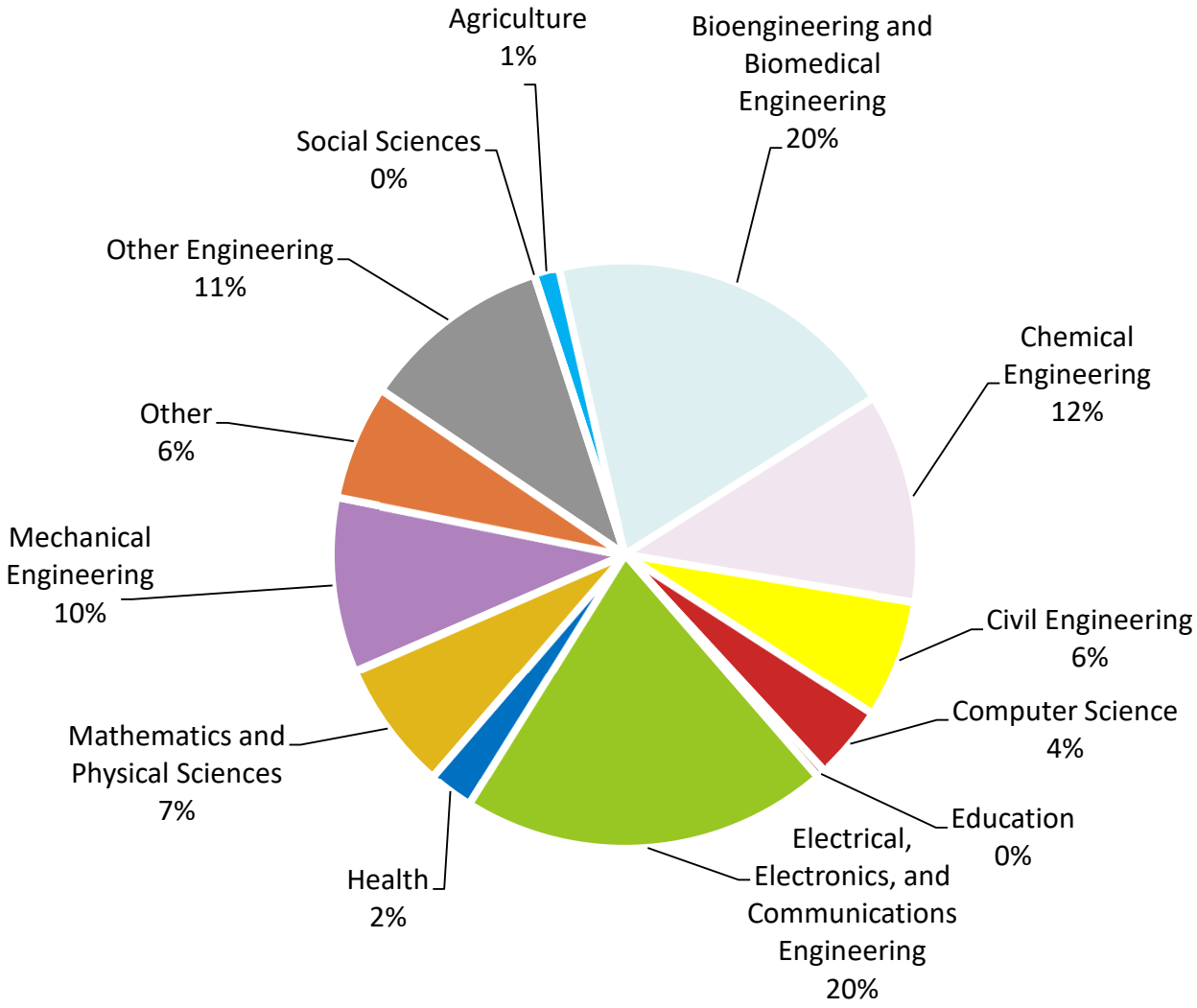
FY 2022 Expenditures by Type of Research: Micro/Optoelectronics, Sensing, and Information Technology



Total value of support: $13 million

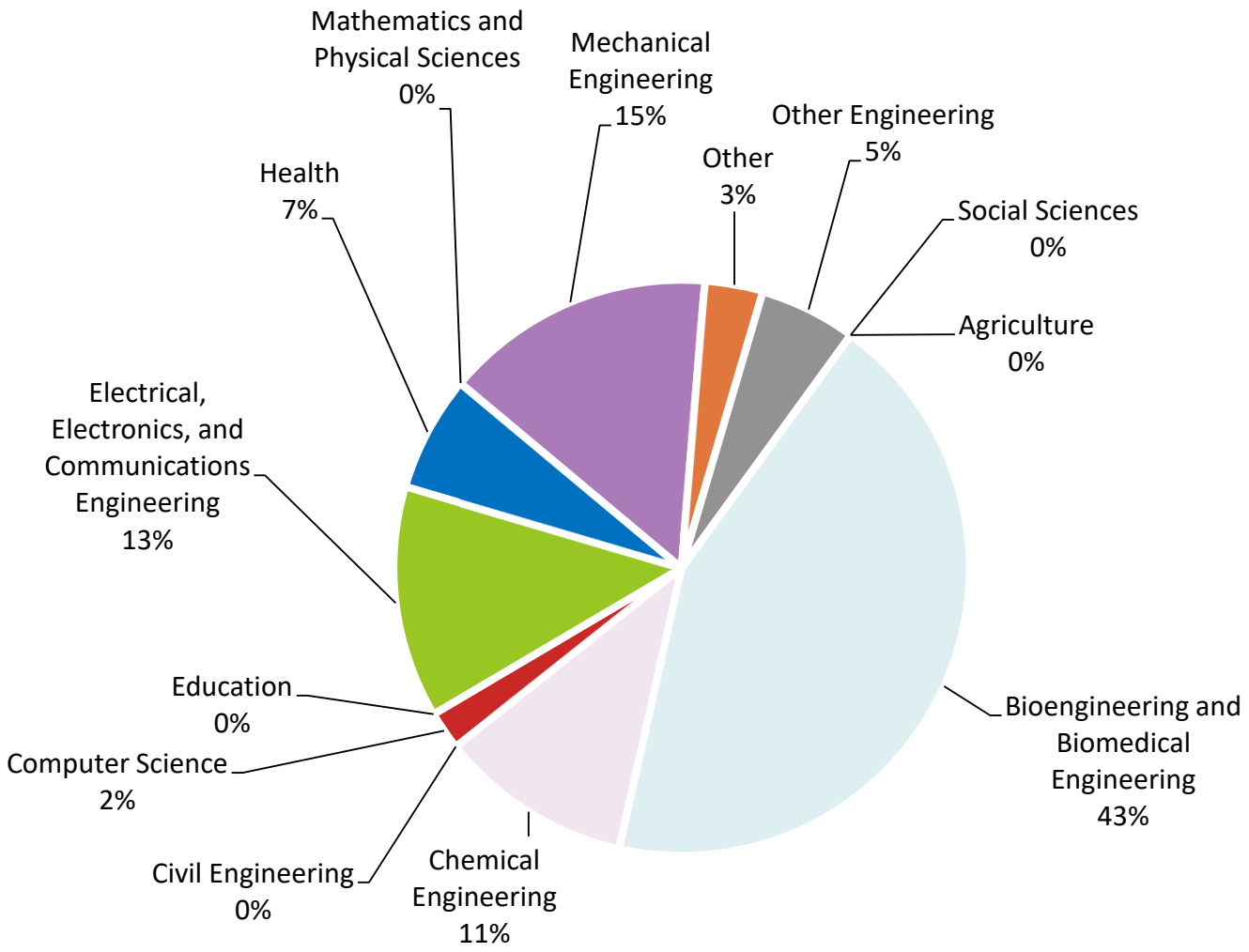
NOTE: *$6,000 and $0 values in top row correspond to Sponsored Projects expenditures for Translational Research and Non-Translational Research. Area is not visible due to the small relative size.*

All ERC Disciplines, FY 2022



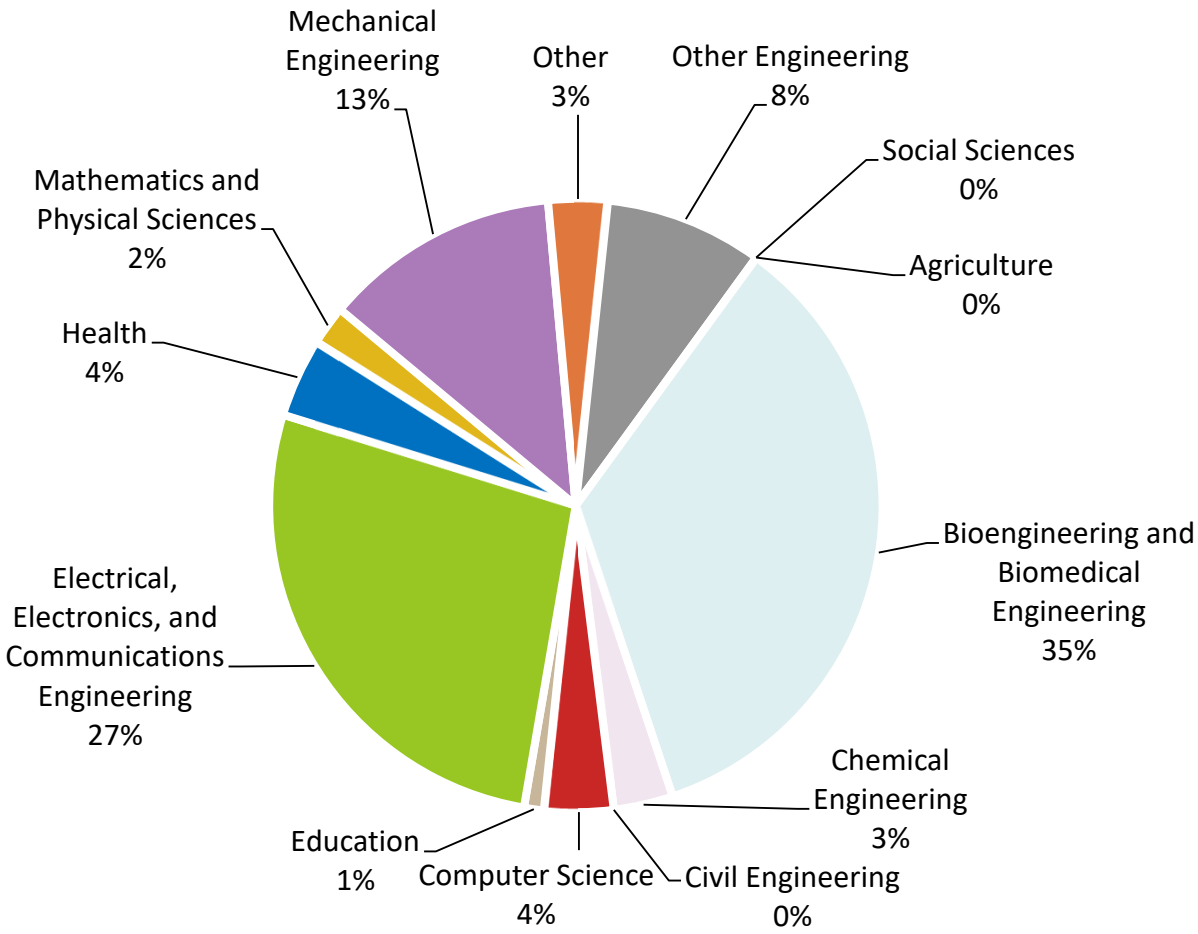
Total number of Project Investigators (PIs): 408

Disciplines by Technology Sector: Advanced Manufacturing, FY 2022



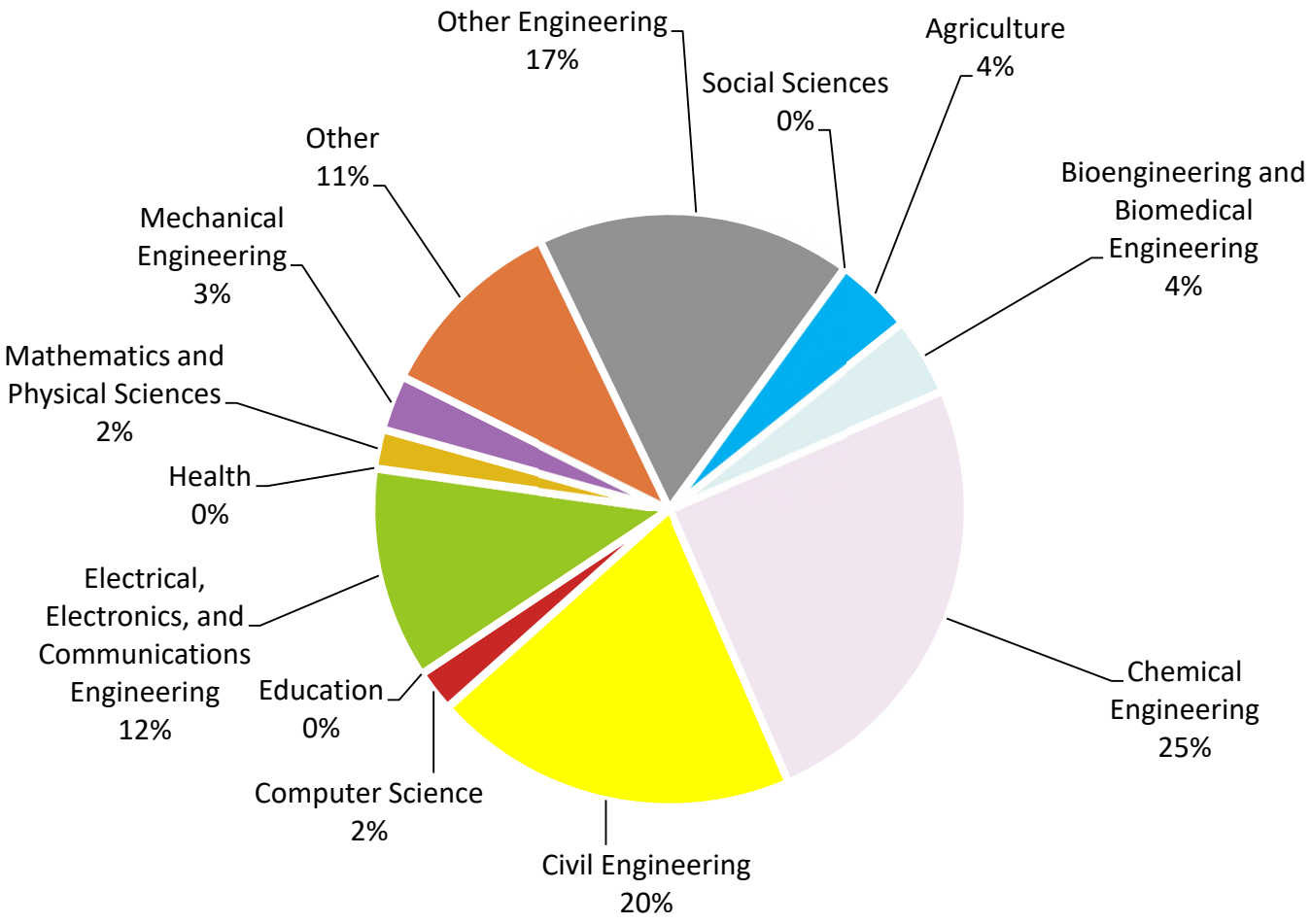
Total number of Project Investigators (PIs): 92

Disciplines by Technology Sector: Biotechnology and Healthcare, FY 2022



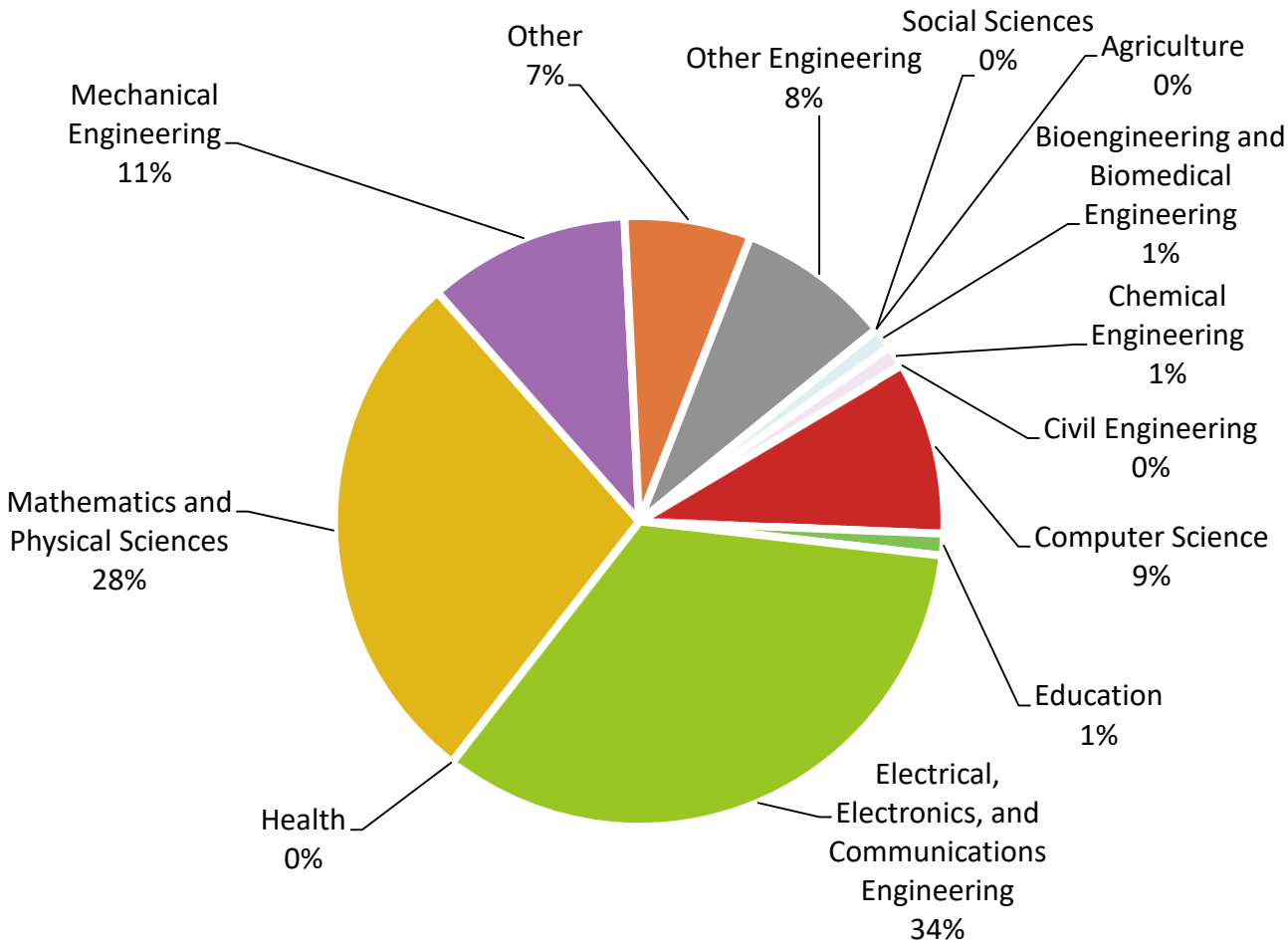
Total number of Project Investigators (PIs): 96

Disciplines by Technology Sector: Energy, Sustainability, and Infrastructure, FY 2022



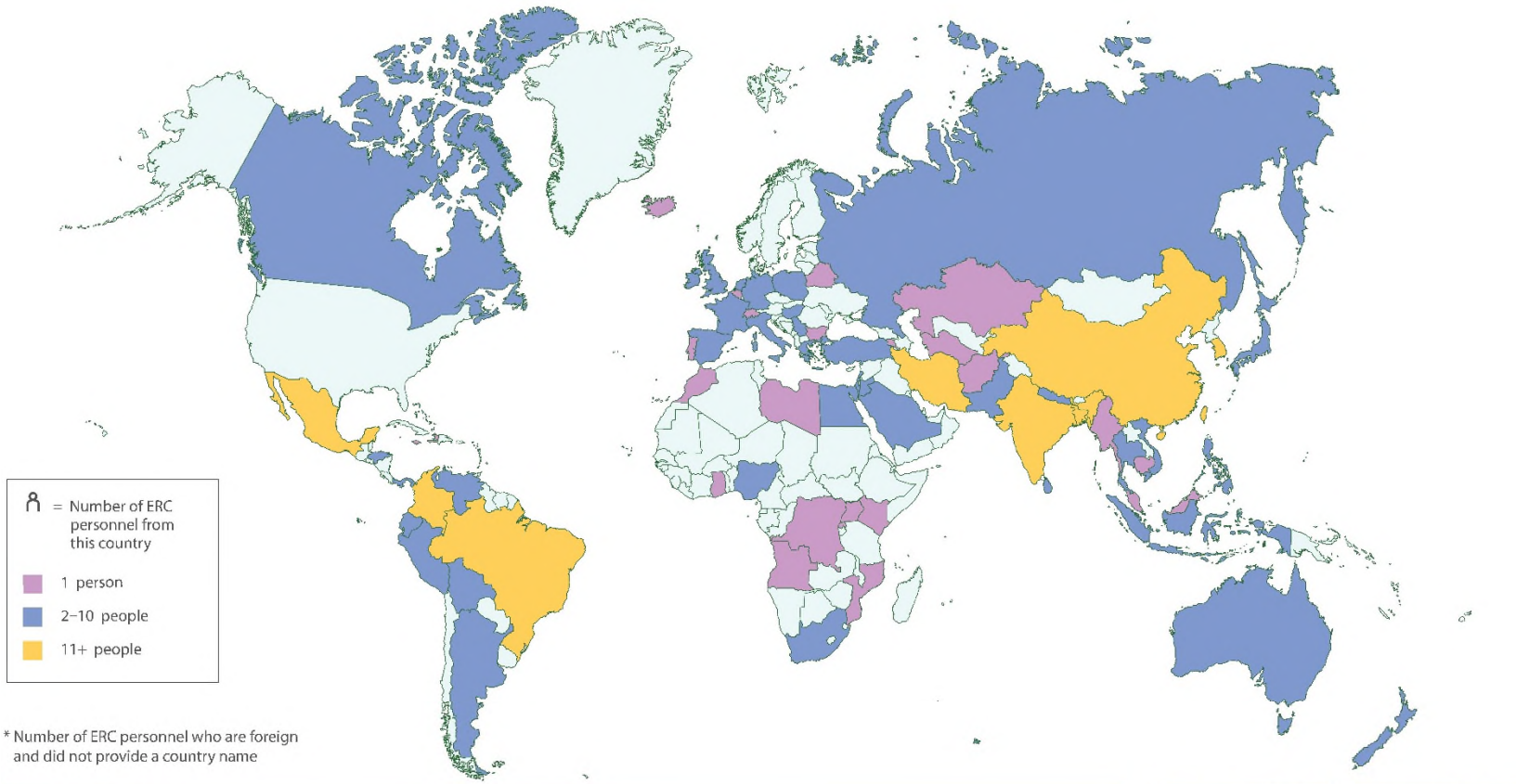
Total number of Project Investigators (PIs): 133

Disciplines by Technology Sector: Micro/Optoelectronics, Sensing, and Information Technology, FY 2022



Total number of Project Investigators (PIs): 87

Country of Citizenship of ERC Foreign Personnel, FY 2022



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

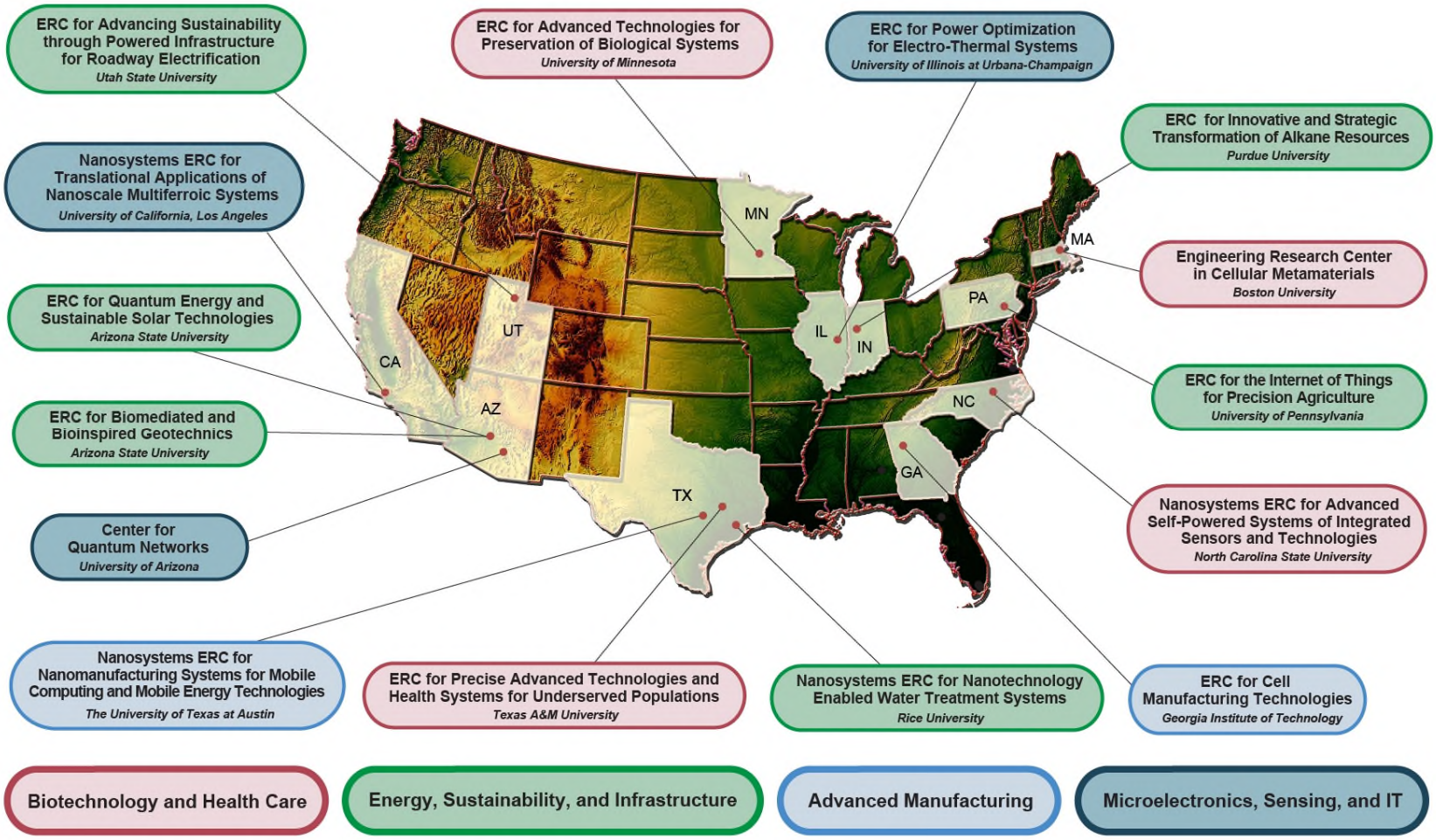
1 person
Afghanistan
Angola
Antigua and Barbuda
Armenia
Asian Countries, Other
Barbados
Belarus
Belgium
Bulgaria
Burma
Cambodia
Ghana
Haiti
Hong Kong
Iceland
Jamaica
Kazakhstan
Kenya
Libya
Malaysia
Morocco
Mozambique
Portugal
Republic of the Congo
Rwanda
Switzerland
Turkmenistan
Uganda

2–10 people				
Argentina (4)	Greece (8)	Jordan (2)	Peru (3)	Spain (4)
Australia (2)	Honduras (2)	Lebanon (6)	Philippines (2)	Sri Lanka (5)
Bolivia (2)	Hungary (3)	Nepal (2)	Poland (2)	Thailand (4)
Canada (7)	Indonesia (3)	Netherlands (2)	Russia (8)	Turkey (9)
Ecuador (3)	Ireland (2)	New Zealand (3)	Saudi Arabia (5)	United Kingdom (6)
Egypt (5)	Israel (2)	Nigeria (10)	Serbia (3)	Venezuela (4)
France (6)	Italy (5)	Pakistan (3)	Singapore (2)	Vietnam (4)
Germany (10)	Japan (5)	Panama (3)	South Africa (3)	

11+ people	
Bangladesh	25
Brazil	12
China	166
Colombia	16
India	127
Iran	28
Mexico	24

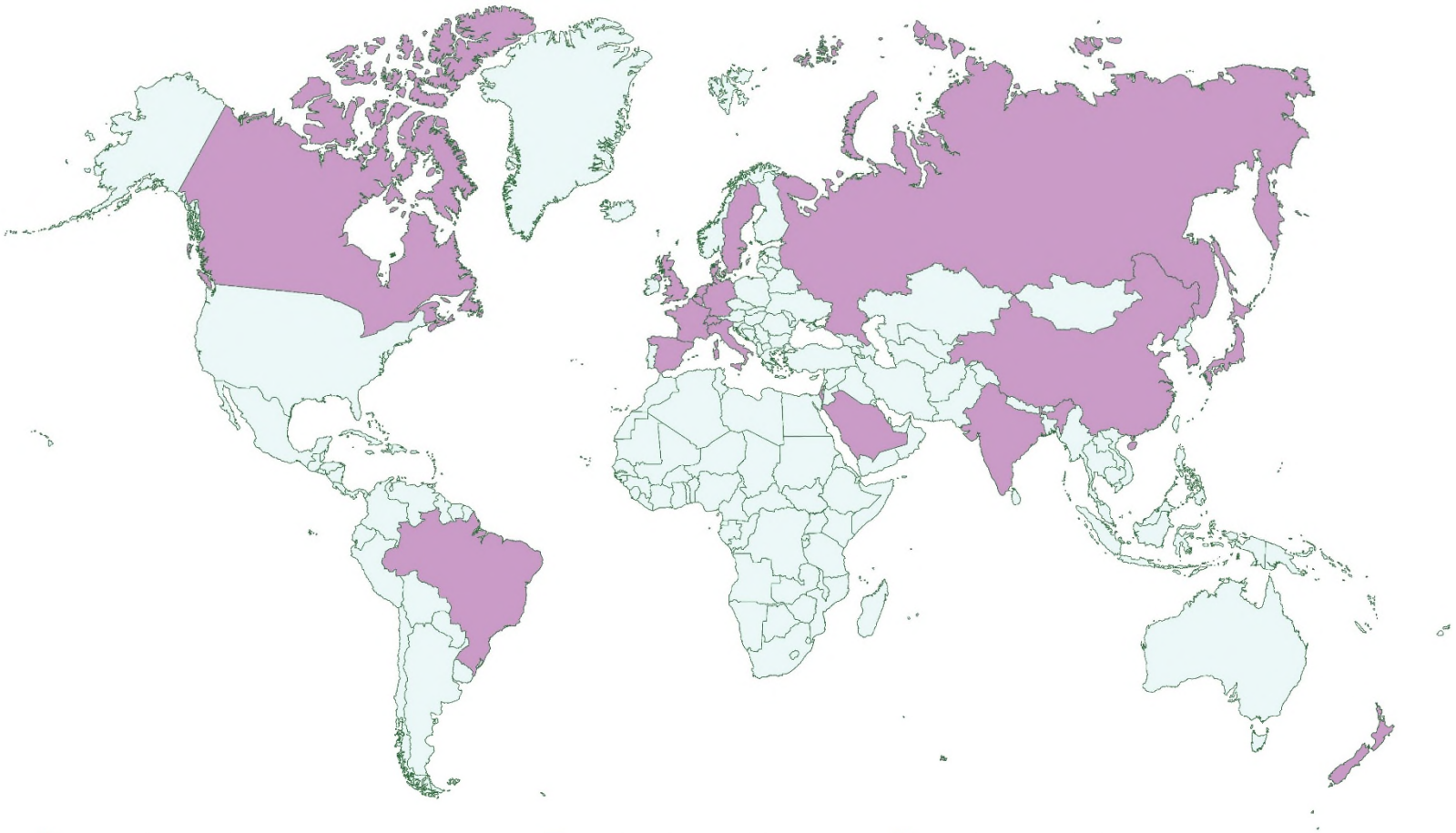
11+ people	
South Korea	36
Taiwan	14
Country Not Reported	19*

Locations of the Active ERCs, FY 2022



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

Locations of Foreign Participating Organizations, FY 2022



Countries with 1- 20 collaborators

Barbados (1)	India (1)	South Korea (3)
Belgium (1)	Israel (3)	Spain (1)
Brazil (2)	Italy (1)	Sweden (1)
Canada (2)	Japan (6)	Switzerland (2)
China (1)	Netherlands (2)	United Kingdom (7)
Denmark (1)	New Zealand (1)	
France (2)	Russia (2)	
Germany (6)	Saudi Arabia (1)	

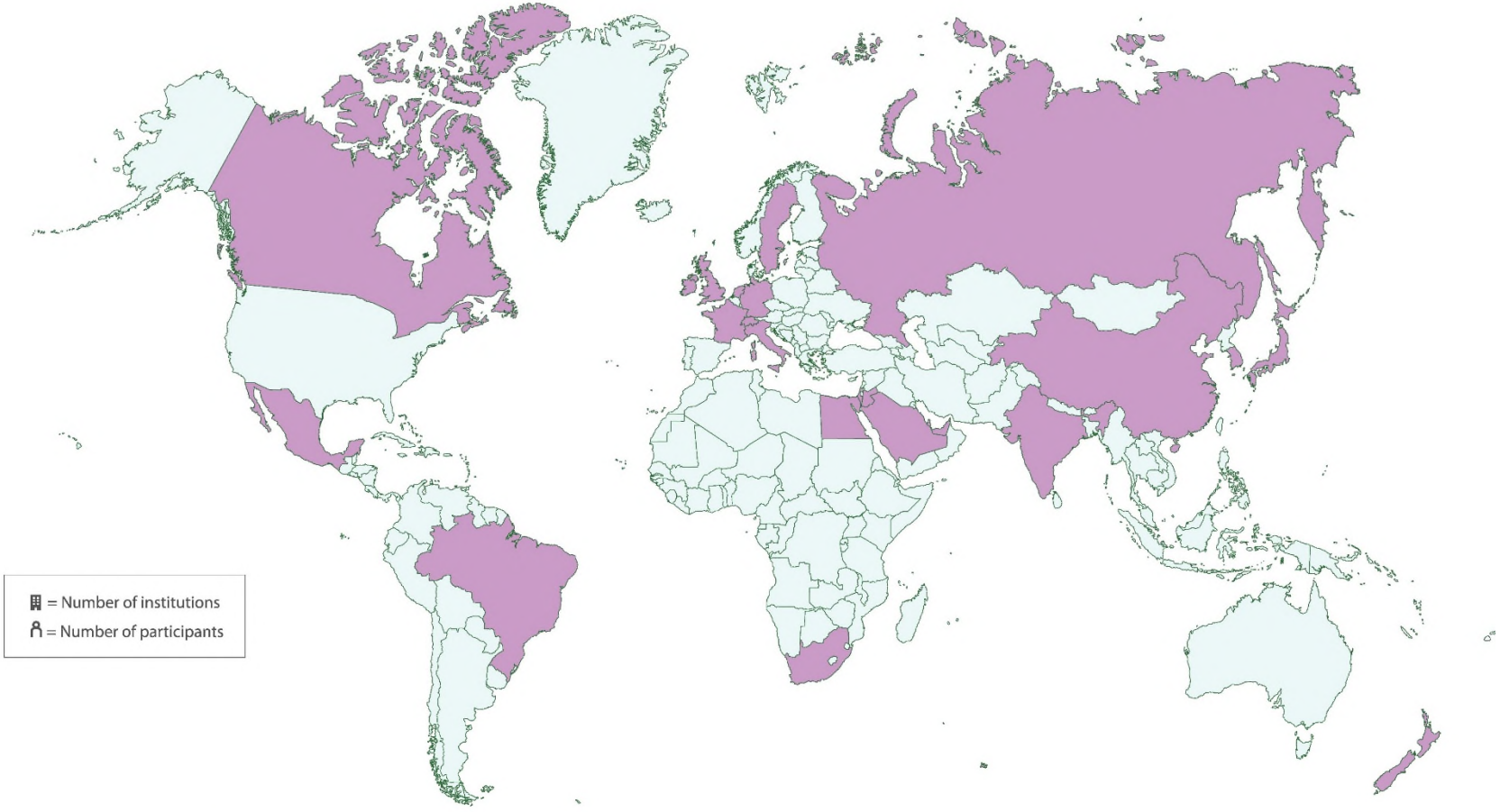
Countries with 21- 40 collaborators

No Countries Reported

Countries with 41+ collaborators

No Countries Reported

Locations of Foreign Participating Institutions, FY 2022



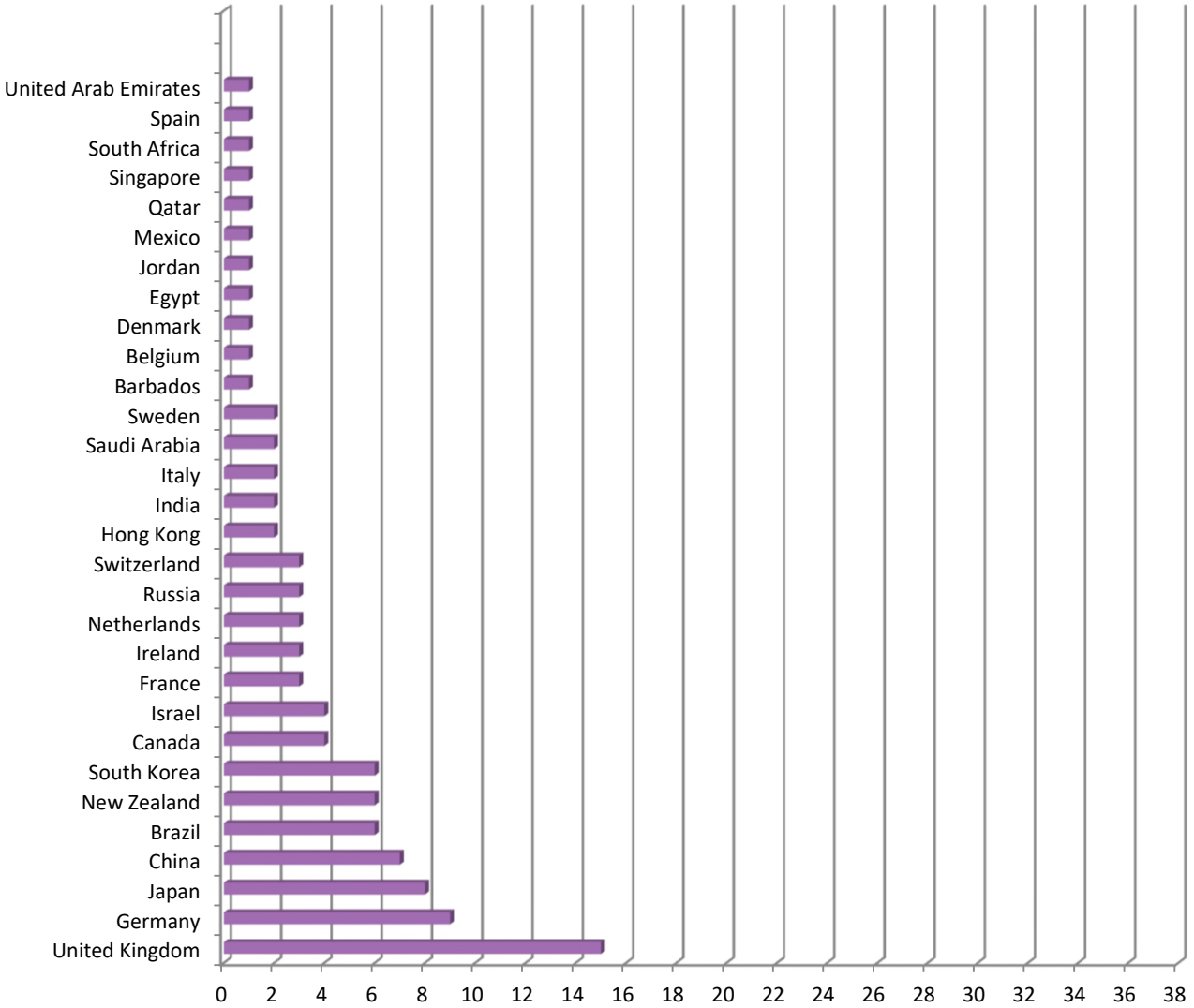
Brazil	4	1
Canada	2	3
China	6	5
Egypt	1	0
France	1	1
Germany	3	2
Hong Kong	2	1
India	1	0

Ireland	3	10
Israel	1	0
Italy	1	0
Japan	2	1
Jordan	1	1
Mexico	1	0
Netherlands	1	0
New Zealand	5	30

Qatar	1	0
Russia	1	5
Saudi Arabia	1	0
Singapore	1	0
South Africa	1	0
South Korea	3	4
Sweden	1	1
Switzerland	1	1

United Arab Emirates	1	0
United Kingdom	8	5

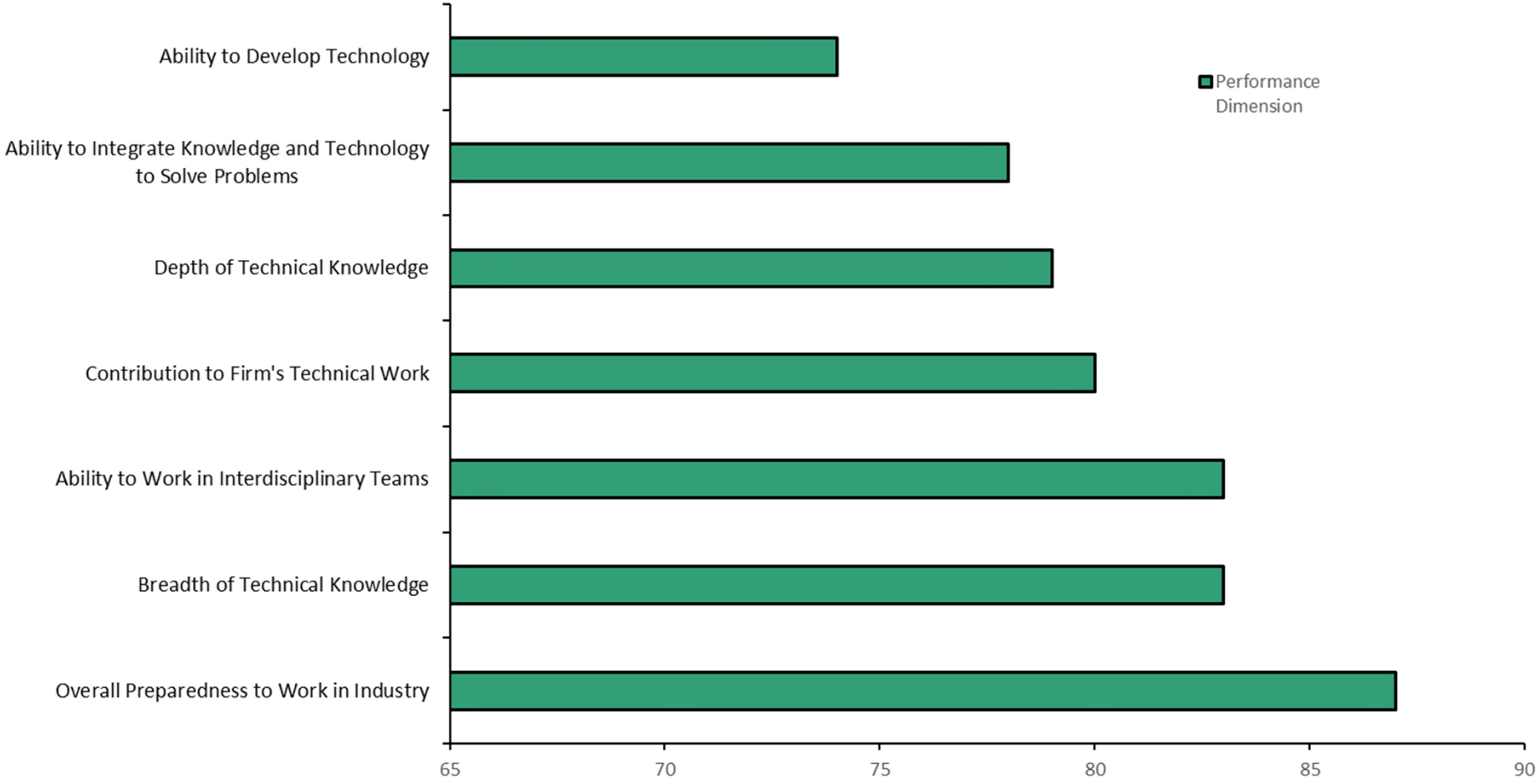
46 Number of Institutions and Organizations With Financial Headquarters Abroad Collaborating With ERCs, by Country of Origin, FY 2022*,**



** 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*

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*