CONSULTING - SPECIFYING
engineer®

MEP GIANTS 2022

EATON
Powering Business Worldwide

CFE Media and Technology™

EATON CONGRATULATES THE 2022 MEP GIANTS WINNERS

Chris M. Finen, P.E.
Manager
National Application Engineers

It brings us great pride to recognize the best of the best across the engineering community. And, as a longtime supporter of the *Consulting-Specifying Engineer* MEP Giants program, we applaud every engineering firm working to transform our world's infrastructure for a brighter and more sustainable tomorrow.

Today, it is an extraordinarily exciting time to be an engineer. The most substantial changes to energy systems in more than a century are occurring now. At the same time, some of the largest U.S. infrastructure investments in decades are creating a generational opportunity for the engineering community. Work is underway to build a more sustainable and resilient future that capitalizes on trends in digitalization, system reliability and safety.

Achieving this sustainable and resilient future will require electrical systems that are far more flexible and intelligent than ever before. At Eaton, we are investing heavily in resources to help you design critical infrastructure that is ready for whatever comes next. We are innovating construction management programs that will help simplify and expedite projects. We are continuing to develop industry-leading training and educational programs to provide you the technical know-how needed to navigate this rapidly changing industry. You can be sure we will continue to lead the way with product innovation that supports safer, more reliable and efficient building systems.

On behalf of everyone at Eaton, we thank *Consulting-Specifying Engineer* for the opportunity to help recognize the 2022 MEP Giants and congratulate all of you on the work you are doing to build a stronger future.

Chris M. Finen, P.E.
Manager, National Application Engineers
Eaton

MEP GIANTS 2022

BY THE NUMBERS

$70,580,595,944
Grand total gross revenue

$11,011,819,895
Grand total MEP design revenue

75,218
Total engineers employed

8,746
LEED APs on staff

88%
Of MEP design revenue came from projects within the U.S.

28%
Of expenditures are allocated to new tools, such as software or hardware, on average

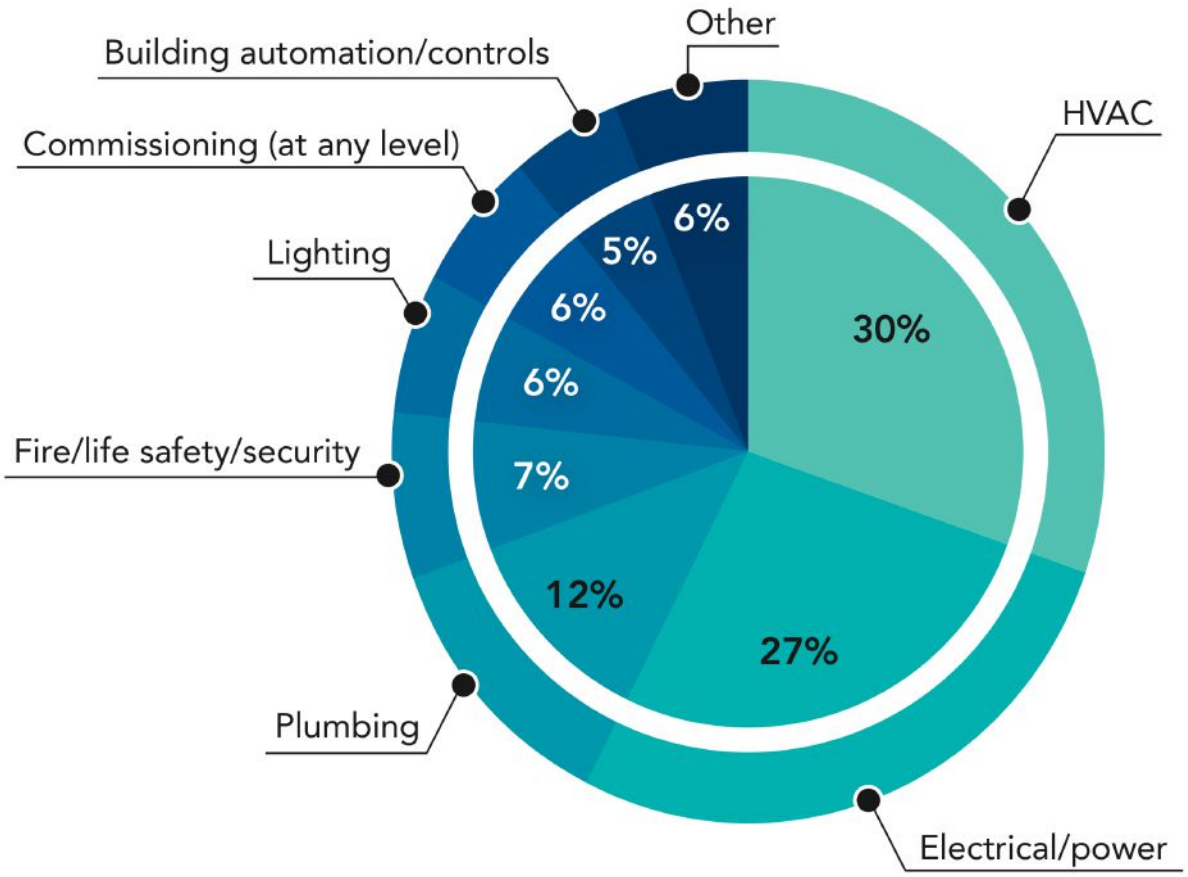
24%
Cite COVID-19 concerns and issues as their biggest corporate challenge

31%
Provided engineering services to the Middle East in 2021

19%
Of engineering staff are female

16%
of 2021 MEP design revenue was earned from hospital or health care facility projects

PERCENTAGE OF MEP DESIGN BILLINGS



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61	Arora Engineers Inc.
14	Arup
43	Bala Consulting Engineers
62	Bernhard
88	Bowman Consulting Group Ltd.
85	Bridgers & Paxton Consulting Engineers Inc.
64	BRPH Architects Engineers Inc.
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67	CJL Engineering
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20	CMTA Inc.
87	Colliers Engineering & Design
77	Concord Engineering Group Inc.
73	Core States Group
22	CRB
59	Cushing Terrell
27	Dewberry
37	DLR Group
56	Dunham Associates
86	EEA Consulting Engineers
24	ESD
46	EwingCole
12	EXP
44	Gannett Fleming
48	Ghafari Associates LLC
90	GHT Limited

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72	H.F. Lenz Co.
47	H2M architects + engineers
8	HDR
49	HEAPY
100	HED
16	Henderson Engineers
55	HGA
75	Highland Associates
40	I. C. Thomasson Associates Inc.
17	IMEG Corp.
11	IPS-Integrated Project Services LLC
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36	Jaros, Baum & Bolles
9	Jensen Hughes
66	Johnson, Mirmiran & Thompson Inc.
38	Jordan & Skala Engineers
89	Karpinski Engineering
83	Kohrs Lonnemann Heil Engineers Inc.
65	LaBella Associates
68	Lilker Associates Consulting Engineers PC
96	LiRo Engineers Inc.
58	Loring Consulting Engineers Inc.
62	M/E Engineering PC
91	Matrix Technologies Inc.
57	Mazzetti
94	McKim & Creed
28	McKinstry
33	ME Engineers
52	MG Engineering DPC
80	Michaud Cooley Erickson
45	Morrison Hershfield
6	Mott MacDonald
54	Newcomb & Boyd

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34	P2S Inc.
26	Page
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99	Pond
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81	Professional Engineering Consultants PA
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60	RTM Engineering Consultants LLC
95	Rushing
13	Salas O'Brien
98	Sazan Group
74	SETTY
41	Smith Seckman Reid Inc.
32	SmithGroup
25	Southland Industries
79	Spectrum Engineers Inc.
23	SSOE Group
39	Stanley Consultants
10	Stantec Inc.
78	STV
19	Syska Hennessy Group
7	Tetra Tech's High Performance Buildings Group
53	ThermalTech Engineering Inc.
35	TLC Engineering Solutions
21	Vanderweil Engineers
51	WB Engineers+Consultants
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2022 MEP GIANTS

RANK	FIRM NAME	LOCATION	TOTAL GROSS REVENUE FOR FISCAL YEAR ($ US)	TOTAL MEP DESIGN REVENUE ($ US)	PERCENT MEP REVENUE	MEP REVENUE, U.S. PROJECTS
1	Jacobs	Dallas, TX, U.S.	$14,092,632,000	$1,890,000,000	13%	8%
2	AECOM	Dallas, TX, U.S.	$13,341,000,000	$1,212,600,000	9%	12%
3	Burns & McDonnell	Kansas City, MO, U.S.	$4,620,000,000	$907,252,426	20%	98%
4	WSP	New York, NY, U.S.	$8,100,000,000	$605,000,000	7%	20%
5	AlfaTech Consulting Engineers Inc.	San Jose, CA, U.S.	$1,500,000,000	$600,000,000	40%	10%
6	Mott MacDonald	Iselin, NJ, U.S.	$2,453,206,000	$536,026,953	22%	22%
7	Tetra Tech's High Performance Buildings Group	Pasadena, CA, U.S.	$3,200,000,000	$350,000,000	11%	40%
8	HDR	Omaha, NE, U.S.	$2,081,300,000	$285,931,928	14%	65%
9	Jensen Hughes	Baltimore, MD, U.S.	$296,000,000	$274,000,000	93%	77%
10	Stantec Inc.	Edmonton, AB, Canada	$3,650,600,000	$273,338,374	7%	33%
11	IPS-Integrated Project Services LLC	Blue Bell, PA, U.S.	$886,284,045	$199,879,574	23%	73%
12	EXP	Brampton, ON, Canada	$749,991,000	$163,042,230	22%	75%
13	Salas O'Brien	Irvine, CA, U.S.	$254,199,997	$160,227,047	63%	99%
14	Arup	New York, NY, U.S.	$463,777,714	$154,689,007	33%	40%
15	Affiliated Engineers Inc.	Madison, WI, U.S.	$165,576,000	$151,578,000	92%	92%
16	Henderson Engineers	Lenexa, KS, U.S.	$186,470,882	$148,674,227	80%	99%
17	IMEG Corp.	Rock Island, IL, U.S.	$271,750,000	$136,800,000	50%	99%
18	NV5 Global Inc.	Hollywood, FL, U.S.	$777,300,000	$105,535,234	14%	81%
19	Syska Hennessy Group	New York, NY, U.S.	$110,148,123	$100,770,848	91%	95%
20	CMTA Inc.	Prospect, KY, U.S.	$210,664,990	$99,244,645	47%	100%
21	Vanderweil Engineers	Boston, MA, U.S.	$99,380,300	$83,686,400	84%	99%
22	CRB	Kansas City, MO, U.S.	$242,781,525	$80,140,795	33%	88%
23	SSOE Group	Toledo, OH, U.S.	$203,748,000	$70,450,000	35%	50%
24	ESD	Chicago, IL, U.S.	$89,437,031	$68,219,448	76%	94%
25	Southland Industries	Garden Grove, CA, U.S.	$1,058,706,126	$65,554,120	6%	100%
26	Page	Austin, TX, U.S.	$226,739,866	$63,487,162	28%	80%
27	Dewberry	Fairfax, VA, U.S.	$488,000,000	$61,308,806	13%	95%
28	CannonDesign	New York, NY, U.S.	$345,000,000	$60,000,000	17%	100%
29	McKinstry	Seattle, WA, U.S.	$720,000,000	$60,000,000	8%	100%
30	AKF Group	New York, NY, U.S.	$60,000,000	$59,000,000	98%	99%
31	Burns Engineering	Philadelphia, PA, U.S.	$71,000,000	$56,800,000	80%	100%
32	SmithGroup	Detroit, MI, U.S.	$301,588,780	$55,790,683	18%	19%
33	ME Engineers	Golden, CO, U.S.	$55,500,000	$55,500,000	100%	82%

2022 MEP GIANTS

RANK	FIRM NAME	LOCATION	TOTAL GROSS REVENUE FOR FISCAL YEAR ($ US)	TOTAL MEP DESIGN REVENUE ($ US)	PERCENT MEP REVENUE	MEP REVENUE, U.S. PROJECTS
34	P2S Inc.	Long Beach, CA, U.S.	$62,401,501	$54,762,037	88%	100%
35	TLC Engineering Solutions	Orlando, FL, U.S.	$70,403,634	$53,765,558	76%	98%
36	Jaros, Baum & Bolles	New York, NY, U.S.	$64,357,800	$52,157,542	81%	99%
37	DLR Group	Minneapolis, MN, U.S.	$268,669,432	$48,131,150	18%	99%
38	Jordan & Skala Engineers	Norcross, GA, U.S.	$49,823,000	$46,000,000	92%	100%
38	Stanley Consultants	Muscatine, IA, U.S.	$184,917,765	$45,576,266	25%	81%
40	I. C. Thomasson Associates Inc.	Nashville, TN, U.S.	$45,238,335	$45,238,335	100%	100%
41	Smith Seckman Reid Inc.	Nashville, TN, U.S.	$87,135,871	$44,928,096	52%	99%
42	RMF Engineering Inc.	Baltimore, MD, U.S.	$55,034,672	$44,446,592	81%	100%
43	Bala Consulting Engineers	King of Prussia, PA, U.S.	$46,100,000	$43,400,000	94%	100%
44	Gannett Fleming	Camp Hill, PA, U.S.	$605,610,000	$43,000,000	7%	100%
45	Morrison Hershfield	Markham, ON, Canada	$151,318,219	$40,506,389	27%	49%
46	EwingCole	Philadelphia, PA, U.S.	$100,000,000	$40,000,000	40%	100%
47	H2M architects + engineers	Melville, NY, U.S.	$86,902,667	$38,805,903	45%	100%
48	Ghafari Associates LLC	Dearborn, MI, U.S.	$121,500,000	$35,000,000	29%	91%
49	HEAPY	Dayton, OH, U.S.	$46,041,160	$33,866,000	74%	99%
50	CDM Smith Inc.	Boston, MA, U.S.	$1,370,852,818	$33,607,691	2%	2%
51	WB Engineers+Consultants	New York, NY, U.S.	$39,489,000	$33,150,000	84%	100%
52	MG Engineering DPC	New York, NY, U.S.	$33,100,000	$33,100,000	100%	90%
53	ThermalTech Engineering Inc.	Cincinnati, OH, U.S.	$147,207,000	$32,977,000	22%	100%
54	Newcomb & Boyd	Atlanta, GA, U.S.	$36,608,491	$32,135,733	88%	98%
55	HGA	Minneapolis, MN, U.S.	$222,813,268	$31,295,983	14%	99%
56	Dunham Associates	Minneapolis, MN, U.S.	$31,266,000	$31,266,000	100%	98%
57	Mazzetti	San Francisco, CA, U.S.	$38,488,181	$30,879,641	80%	100%
58	Loring Consulting Engineers Inc.	New York, NY, U.S.	$31,500,000	$30,500,000	97%	95%
59	Cushing Terrell	Billings, MT, U.S.	$79,757,972	$26,876,814	34%	99%
60	RTM Engineering Consultants LLC	Schaumburg, IL, U.S.	$31,100,000	$26,603,000	86%	100%
61	Arora Engineers Inc.	Chadds Ford, PA, U.S.	$29,338,235	$26,013,803	89%	100%
62	Bernhard	Metairie, LA, U.S.	$709,000,000	$25,000,000	4%	100%
63	M/E Engineering PC	Rochester, NY, U.S.	$26,571,000	$25,000,000	94%	100%
64	BRPH Architects Engineers Inc.	Melbourne, FL, U.S.	$65,896,832	$23,877,911	36%	99%
65	LaBella Associates	Rochester, NY, U.S.	$194,873,693	$23,830,672	12%	100%
66	Johnson, Mirmiran & Thompson Inc.	Hunt Valley, MD, U.S.	$328,730,000	$23,279,794	7%	100%

2022 MEP GIANTS

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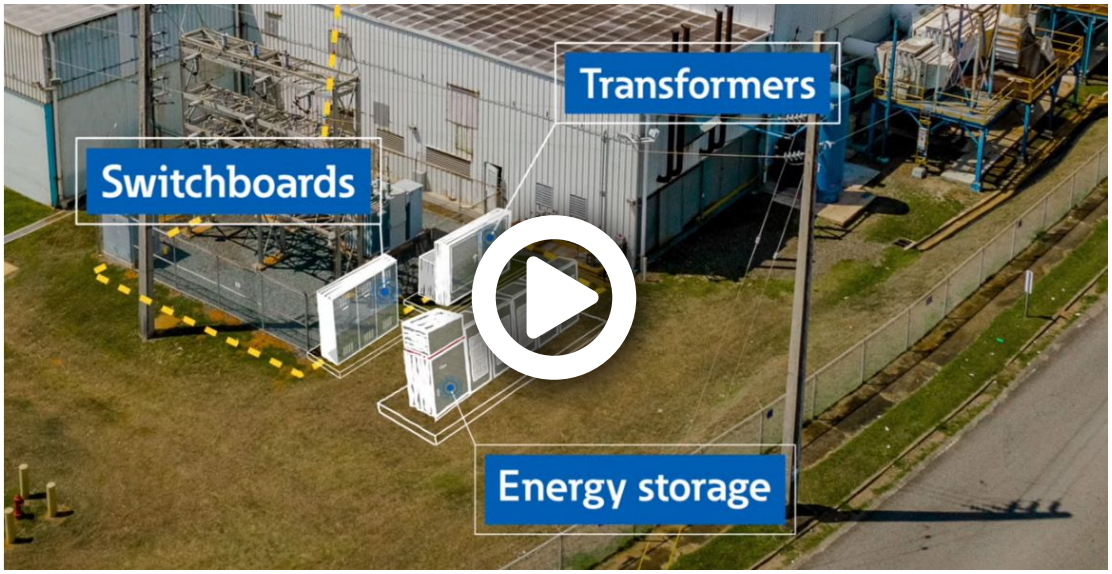
67	CJL Engineering	Moon Township, PA, U.S.	$22,552,000	$22,552,000	100%	100%
68	Lilker Associates Consulting Engineers PC	New York, NY, U.S.	$24,100,000	$22,500,000	93%	100%
69	GPI/Greenman-Pedersen Inc.	Babylon, NY, U.S.	$306,000,000	$22,460,000	7%	100%
70	Re:Build Optimation Technology LLC	Rush, NY, U.S.	$35,540,000	$22,350,000	63%	90%
71	Power Design Inc.	St. Petersburg, FL, U.S.	$875,000,000	$22,200,000	3%	100%
72	H.F. Lenz Co.	Johnstown, PA, U.S.	$26,414,000	$22,054,000	83%	100%
73	Core States Group	Duluth, GA, U.S.	$144,214,841	$21,684,196	15%	99%
74	SETTY	Washington, DC, U.S.	$22,804,697	$21,233,009	93%	100%
75	Highland Associates	New York, NY, U.S.	$34,600,000	$21,200,000	61%	100%
76	Wiley|Wilson	Lynchburg, VA, U.S.	$47,100,000	$21,195,000	45%	100%
77	Concord Engineering Group Inc.	Voorhees, NJ, U.S.	$25,000,000	$21,000,000	84%	100%
78	STV	New York, NY, U.S.	$631,074,000	$20,261,565	3%	100%
79	Spectrum Engineers Inc.	Salt Lake City, UT, U.S.	$19,670,683	$19,670,683	100%	100%
80	Michaud Cooley Erickson	Minneapolis, MN, U.S.	$19,450,000	$19,450,000	100%	100%
81	Professional Engineering Consultants PA	Wichita, KS, U.S.	$47,308,000	$18,832,347	40%	100%
82	Clark Nexsen	Virginia Beach, VA, U.S.	$86,500,000	$18,832,000	22%	95%
83	Kohrs Lonnemann Heil Engineers Inc.	Ft. Thomas, KY, U.S.	$17,304,685	$17,199,654	99%	100%
84	Osborn Engineering	Cleveland, OH, U.S.	$37,200,000	$17,061,954	46%	98%
85	Bridgers & Paxton Consulting Engineers Inc.	Albuquerque, NM, U.S.	$17,007,229	$17,007,229	100%	100%
86	EEA Consulting Engineers	Austin, TX, U.S.	$22,587,022	$16,917,985	75%	100%
87	Colliers Engineering & Design	Red Bank, NJ, U.S.	$236,000,000	$16,337,540	7%	99%
88	Bowman Consulting Group Ltd.	Reston, VA, U.S.	$170,100,000	$16,250,000	10%	100%
89	Karpinski Engineering	Cleveland, OH, U.S.	$16,758,377	$16,200,000	97%	100%
90	GHT Limited	Arlington, VA, U.S.	$15,920,123	$15,920,123	100%	100%
91	Matrix Technologies Inc.	Maumee, OH, U.S.	$55,614,493	$15,847,878	28%	99%
92	Peter Basso Associates Inc.	Troy, MI, U.S.	$16,700,000	$15,600,000	93%	100%
93	PBS Engineers Inc.	Glendora, CA, U.S.	$15,300,000	$15,300,000	100%	100%
94	McKim & Creed	Raleigh, NC, U.S.	$111,480,205	$15,212,263	14%	100%
95	Rushing	Seattle, WA, U.S.	$14,989,242	$14,989,242	100%	100%
96	LiRo Engineers Inc.	Syosset, NY, U.S.	$319,000,000	$14,875,000	5%	100%
97	BSA LifeStructures	Indianapolis, IN, U.S.	$45,130,076	$14,454,294	32%	100%
98	Sazan Group	Seattle, WA, U.S.	$14,969,448	$14,295,545	95%	100%
99	Pond	Peachtree Corners, GA, U.S.	$166,862,898	$13,690,571	8%	98%
100	HED	Southfield, MI, U.S.	$85,515,000	$13,680,000	16%	100%

EATON'S ARECIBO MICROGRID PROJECT

Powering Business Worldwide



Eaton's Arecibo microgrid project

This video shows the benefits and plan for a microgrid at Eaton's Arecibo plant in Puerto Rico.
Learn more at **Eaton.com/MicrogridProjects.**

By Amara Rozgus, Editor-in-Chief, and Amanda Pelliccione, Director of Research, Consulting-Specifying Engineer, Downers Grove, Ill.

MEP Giants design revenue is up dramatically

The 2022 MEP Giants reported an 18% increase in MEP design revenue, and gross revenue has increased 13%

The 2022 MEP Giants generated $11 billion in mechanical, electrical, plumbing and fire protection engineering design revenue, an increase over last year's MEP Giants' revenue of $9.3 billion. This year, the 2022 MEP Giants earned approximately $70.5 billion in gross annual revenue during the previous fiscal year, an increase of about $8.3 billion. Gross revenue was up, and MEP design revenue rose 18% over last year's numbers. Figure 1 shows the various building specialties in which MEP Giants earned revenue.

A couple of changes occurred within the top 10 firms on the MEP Giants list — Mott MacDonald and Jensen Hughes were added. There were also some newcomers to the total of 100 companies. Several companies either joined the list for the first time or returned after time away from reporting data (in alphabetical order): Bowman Consulting Group Ltd., Colliers Engineering & Design, Jensen Hughes, Loring Consulting Engineers Inc., McKim

Figure 1: The top two areas in which 2022 MEP Giants earned revenue — HVAC and electrical/power projects — varies very little year over year. Courtesy: *Consulting-Specifying Engineer*

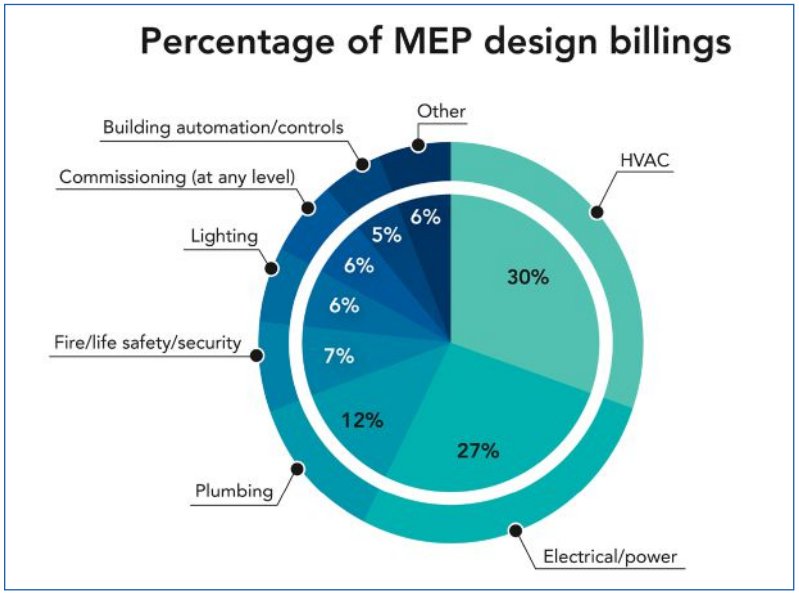


Table 1: Top 10 firms are listed by MEP design revenue. Jacobs topped the list yet again — as it has since 2013 — with $1.8 billion in MEP design revenue, a 26% increase from last year. Courtesy: *Consulting-Specifying Engineer*

& Creed, MG Engineering DPC, Mott MacDonald, PBS Engineers Inc., Re:Build Optimation Technology LLC (a rebranding of Optimation Technology Inc.) and Spectrum Engineers Inc.

Absent from the 2022 MEP Giants, as compared to 2021: Advanced Engineering Consultants, AMA Group, BR_+A Consulting Engineers, Integral Group, LEO A DALY, PAE Consulting Engineers Inc., Ross & Baruzzini Inc., tk1sc and VBFA. Some of this is due to mergers and acquisitions, some from the inability to submit information at this time. The list this year comprises 59% private companies (down from 62% in 2021), 28% employee-owned companies, 7% public companies and 6% limited-liability companies. The 2022 MEP Giants are made up of consulting engineering firms (60%, up from 59% last year) and architectural engineering firms (29%, down from 31% last year).

Several mergers and acquisitions occurred in the past year; 29% of the firms reporting acquired another company, a big jump from last year's 21% acquisition rate (see page 23 for the article "MEP Giants smash M&A records in 2021").

Table 1 shows the top firms based on MEP design revenue, which is how the MEP Giants are ranked.

Human resources

The 2022 MEP Giants firms employ 32,871 MEP/FP engineers, with an average of 328 engineers at each firm.

Table 1: Top 10 firms by MEP design revenue

Rank	Firm	MEP design revenue
1	Jacobs	$1,890,000,000
2	AECOM	$1,212,600,000
3	Burns & McDonnell	$907,252,426
4	WSP	$605,000,000
5	AlfaTech Consulting Engineers Inc.	$600,000,000
6	Mott MacDonald	$536,026,953
7	Tetra Tech's High Performance Buildings Group	$350,000,000
8	HDR	$285,931,928
9	Jensen Hughes	$274,000,000
10	Stantec Inc.	$273,338,374

Last year, 30,304 MEP/FP engineers were employed by the MEP Giants. On average, each 2022 MEP Giants firm has 155 mechanical engineers (up from 145 in 2021), 139 electrical engineers (up from 127), 20 plumbing engineers (no change), 15 fire protection engineers (up from 12) and 35 environmental engineers (up from 33).

This year's MEP Giants employ 210,866 people, including all types of administrative staff and job titles (an increase of 8.9% over last year's staffing total of 193,630 people). For the 2022 MEP Giants, firms averaged 2,109 staff members, both engineering and nonengineering staff (up from 1,936 in the previous reporting period).

The engineering staffs of this year's firms are made up of 19% females, an increase from last year's 17%. When asked "What percentage of your firm's engineering staff are female?" 65% of respondents said 20% or less.

On average, firms had 87 LEED Accredited Professionals (at any level) on their team and 9 commissioning agents or professionals (CxAs or CxPs) on the team.

Table 2: This shows the top MEP Giants firms by gross annual revenue. Courtesy: *Consulting-Specifying Engineer*

Table 2: Top 10 firms by gross annual revenue

Rank	Firm	Gross annual revenue
1	Jacobs	$14,092,632,000
2	AECOM	$13,341,000,000
4	WSP	$8,100,000,000
3	Burns & McDonnell	$4,620,000,000
10	Stantec Inc.	$3,650,600,000
7	Tetra Tech's High Performance Buildings Group	$3,200,000,000
6	Mott MacDonald	$2,453,206,000
8	HDR	$2,081,300,000
5	AlfaTech Consulting Engineers Inc.	$1,500,000,000
50	CDM Smith Inc.	$1,370,852,818

In 2022, the MEP Giants earned 88% of their MEP design revenue for U.S.-based projects, a small decrease from last year (90%). Several opportunities are open to MEP Giants outside the United States. Engineering services are provided in North America (Mexico, Canada) 47% of the time. Other areas of international revenue include Asia (33%, steady), the European Union (29%, slight decrease), the Middle East (31%, slight decrease) and the Caribbean (28%, a decrease).

When it comes to sustainable engineering, the number of U.S. Green Building Council LEED projects increased for this reporting period; 1,423 projects were submitted for LEED certification in the past fiscal year, whereas 1,668 projects were submitted for the previous reporting period. The number of projects submitted in the past fiscal year to the U.S. Environmental Protection Agency's Energy Star Buildings Label decreased to 533 projects, with an average of five projects completed by each of the 2022 MEP Giants, a decrease from six projects in the previous year.

Project types

The 100 firms listed here don't handle all aspects of engineering. Many subcontract specialty services including acoustics (67%, down from 70% the previous year), computational fluid dynamics modeling (28%, down from 30%), construction management (21%, down from 23%) and fire/smoke systems design (14%, down from 15%) and commissioning (14%, down from 15%). Lighting controls, subcontract out at only 6% last year, is up to 10% in 2022.

As shown in Figure 2, MEP Giants indicated that they split their time between new construction (43%, down from 44% last year) and retrofit/renovation (39%, no change). These numbers have deviated only slightly year over year, with a percent or two of change each year based on economic conditions. Rounding out the projects are maintenance, repair and operations (9%); commissioning or retro-commissioning (6%); and "other" (3%). For a more in-depth report on commissioning, read the October 2022 article on the Commissioning Giants.

The average 2022 MEP Giants firm continues to work on several projects in hospitals and health care facilities, industrial or manufacturing facilities/warehouses and utilities, public works, transportation. Falling out of the top three spots were office buildings and government or military facilities. Figure 3 breaks down the various building types in which the average MEP Giants firm works; the health care market was at the top for this reporting period, as it was the past six years.

Figure 2: Very small shifts occur between new construction and retrofit/renovation each year; the 2022 MEP Giants data remains consistent, even during COVID-19. Courtesy: *Consulting-Specifying Engineer*

Also interesting was the number of firms that earned MEP design revenue for various building types. The top five:

- Colleges or universities (92%).
- Office buildings (89%).
- Hospitals/health care facilities (88%).
- Government or military facilities (84%).
- Industrial or manufacturing facilities/warehouses (79%).

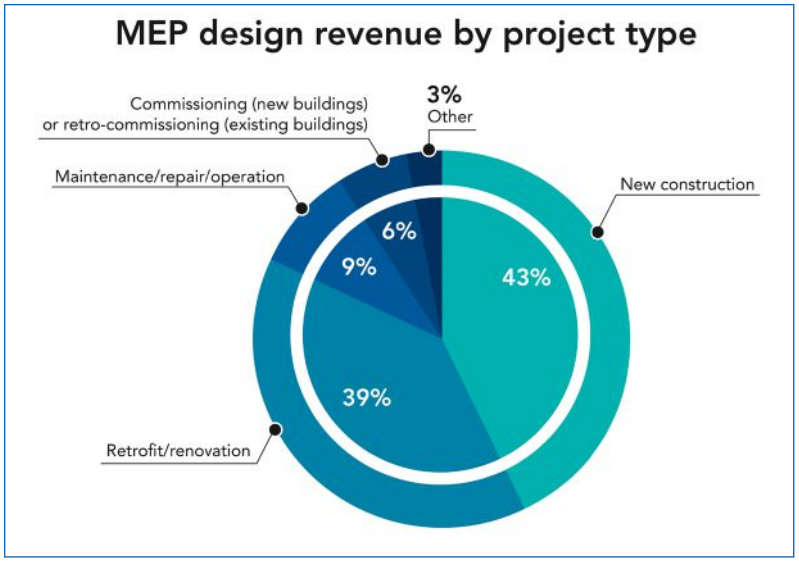
Read about several project profiles at www.csemag.com/giants.

COVID-19

The biggest corporate challenge during this reporting period was COVID-19 concerns and issues, with 24% of MEP Giants firms indicating it was the largest. The major ways in which firms were affected were:

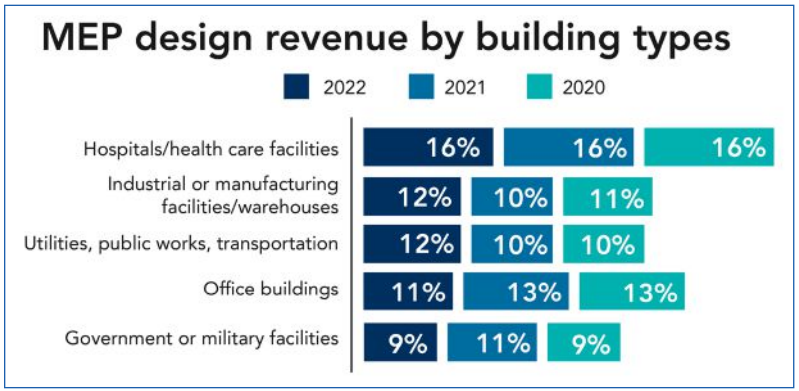
- Backlog of work: 47%.
- Additional new hires: 46%, a dramatic increase from 30%.

Figure 3: For the 2022 MEP Giants, the top five buildings in which the average firms earned revenue did not change, but the order did slightly. For this reporting period, other building types included engineered multidwelling buildings (8%), colleges and universities (8%), K-12 schools (6%), data centers (5%) and research laboratories (4%). Courtesy: *Consulting-Specifying Engineer*



- Provided more/less retrofit/renovation services: 27%.
- Began work in some markets (building types or geographic locations): 25%.
- Provided more/less new construction services: 21%.

Temporary layoffs, at 29% last year, dropped to just 12% during this reporting period.



Survey methodology

At the beginning of 2022, the *Consulting-Specifying Engineer* staff collected and analyzed data from several consulting and engineering firms. Some of the top mechanical, electrical, plumbing and fire protection engineering firms submitted their firms' profiles to *Consulting-Specifying Engineer*; however, not all consulting firms were willing or able to participate in this year's MEP Giants survey. The smallest amount of MEP design revenue reported this year was more than $13.6 million. Some firms were unable to report final data.

In 2022, more than 100 engineering firms provided their information for the MEP Giants program, with some newcomers or firms reentering the program. Data and percentages are based on the top 100 companies that responded to the request for information; the results do not fully represent the construction and engineering market as a whole. However, with nearly identical questions asked in previous years and more than 100 engineering firms participating this year, we present a qualified portrait of where the top engineering firms stand in 2022.

In the electrical industry, safety, efficiency, sustainability and reliability are critical. But people matter most.

We're powering what matters by preparing the next generation of industry leaders through education and training initiatives, at all levels. We shape curricula in partnership with top-tier universities. Our Experience Centers give new and seasoned professionals hands-on opportunities with the latest equipment and techniques. And our experts regularly share their unique insights through webinars, podcasts, presentations and more. Because brighter leaders build a brighter future.

Eaton.com/Electricalinsights

We make what matters work.

EATON

Powering Business Worldwide

Engineering is the foundation for a more resilient, sustainable future

It's an extraordinarily exciting time to be an engineer. The most substantial changes to energy systems in more than a century are occurring now, and infrastructure will work and function differently moving forward. Everything is electrifying. Adoption of renewables is on the rise. And digitalization is delivering new data and insights that is transformative—both for energy systems and how they're constructed.

At the same time, some of the largest **U.S. infrastructure investments** in decades are underway. The bipartisan Infrastructure Investment and Jobs Act (IIJA) will make $1.2 trillion in funding available over the next five years—creating vast new opportunities to rebuild and expand infrastructure. With $47 billion in funding for resilience and another $7.5 billion to build a nationwide network of electric vehicle (EV) chargers, new projects enabling microgrids and EV charging infrastructure (EVCI) are coming fast.

There's a generational opportunity to build a more sustainable and resilient future that capitalizes on trends in digitalization, system reliability and safety. Achieving this sustainable and resilient future requires energy systems that are far more flexible than in the past. Additionally, new intelligent approaches to managing construction projects and continuous investments in training and education are needed for the next generation of consultants.

EVERYTHING AS A GRID

*The energy transition is driving fundamental changes to electrical infrastructure. At Eaton, we've taken the **Everything as a Grid** approach to the energy transition and are unlocking a low-carbon energy future by helping customers safely add more renewables, storage and electric vehicle infrastructure to their energy mix—to become more sustainable and resilient while lowering energy costs.*

How can you and your organization help make the most of current resources while addressing the massive changes on the horizon? We believe you can start by:

1. *Prioritizing education and training programs essential to far more complex engineering environments*
2. *Embracing digital tools that can help speed up project construction to keep infrastructure projects moving*
3. *Understanding how to build microgrid systems and electrical vehicle charging infrastructure (EVCI) as investments in the U.S. and around the world take off*

Eaton xStorage 440 energy storage system and Eaton Green Motion DC fast chargers provide safe, reliable and efficient power management to support electric vehicle charging.

Education programs matter—a lot

With electrical codes and standards evolving all the time, education and training programs have always been important for new and experienced engineers alike. Today, they are even more important as energy systems become more complicated.

Whereas power once flowed in a single direction away from centralized sources, today's power flows bi-directionally and between an increasing number of distributed energy resources and electrical loads to provide more reliable power across the world. More technical expertise is needed to support the reliability, resilience and safety of these energy systems.

Further, new engineers entering the workforce need to know how electrical equipment is constructed and functions. Out of college, engineers typically know what a piece of electrical equipment looks like in a one-line drawing but may not ever seen actual electrical equipment in person (transformers are a lot more complicated than the squiggly lines shown in a typical drawing). How do you get the hands-on training and experience you need to perform successfully in the field?

For generations, new engineers worked side by side with experienced professionals, getting on-the-job training and mentorship through personal and in-person interactions. Remote work environments are no longer atypical. Additionally, engineer retirements are outpacing new engineers coming into field. This can make critical early-career training and mentorship increasingly hard to come by.

Eaton has a long history of providing **training for the electrical industry**—from new job entrants to industry-seasoned pros—to support long and successful careers and the design of safe and reliable power systems.

More than 150,000 customers from around the world have attended Eaton Experience Center training programs. Today, Eaton offers one of the broadest ranges of virtual and in-person industry education.

Our decades of power management experience, deep investments in specialized learning environments and programs uniquely position us as a trusted, valued resource for industry education.

Through **Eaton Experience Centers**, you can access real-world experiential learning in a safe training environment with multiple application areas. Hands-on education programs conducted here in person and remotely provide insights into industry best practices and the latest innovations. This capability allows industry veterans to stay up to date on emerging technologies while providing new power industry professionals the opportunity to access the practical, hands-on experiences they need to be successful.

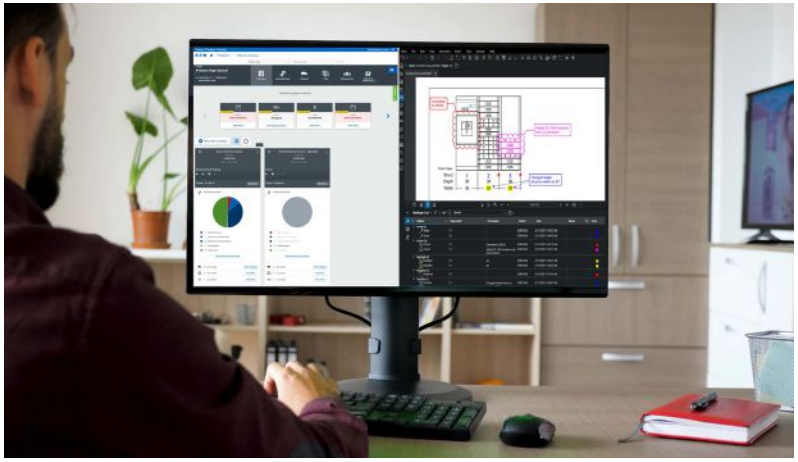
For example, programs like **Power Up** provide immersive training for engineers new to the industry. And we've also developed a consultant-focused training program, enabling new people to the industry to better understand the physical qualities of equipment in a safe training environment.

For both experienced and early professionals who need to better understand how to apply newer technologies, programs like **Power in Focus** bring access to essential industry training online and on-demand—addressing a range of topics including how to connect renewables, microgrids, and energy storage systems to distribution and transmission networks.

Once you understand how power systems work, you can apply that knowledge for the duration of your career. While technologies will certainly change and advance, knowing how things work can be applied to transform energy systems and projects the days and years ahead.

Construction digitalization can help accelerate infrastructure projects

For years, day-to-day construction management has worked pretty much the same. Information is siloed. There is a lot of waiting for input. And key stakeholders—consultants, contractors, manufacturers and distributors—rarely are working together in real-time and collaboratively across teams.



Construction digitalization lags other industries. And more than ever, there is a vast opportunity to increase construction productivity through digitalization.

The **Eaton Project Center** digital platform is improving the day-to-day construction management through real-time collaboration tools, a dashboard view and alerts that help ensure everyone on a project is on the same page. It allows contractors to coordinate schedules and will bring engineers directly into the approval process—so everyone spends less time waiting and more time driving projects forward. This is increasingly important as the industry supports many new infrastructure projects and energy systems increase in complexity.

New capabilities will help speed up the pre-design process, providing digital access to project estimates and Building Information Modeling (BIM). This way you can get a sense of what the project will cost quickly, so you know when you may need to pivot or look for alternative design approaches.

Once the specification is developed, the process from there will be streamlined in Eaton Project Center. Typically, this part of the process, when the equipment details are hammered out, involves a lot of back and forth. The process can be error prone with details overlooked in the flurry of emails to get the final submittal. The Eaton Project Center platform will help reduce errors and simplify this process by providing a single source of truth for the drawings and modifications. So digital drawings can be annotated and marked up and shared in real-time rather than sent over email.

The Eaton approach to project construction digitalization brings all the project stakeholders together—consulting engineers, contractors, distributors and manufacturing—and this multi-stakeholder approach is a critical differentiator. As infrastructure investments continue to increase and projects need to speed up, enabling collaboration with all the project stakeholders is key to spending less time waiting and more time driving projects forward.

Preparing for around-the-clock resilience – no matter what

In the U.S. and around the world, extreme weather is impacting millions of people with increasing frequency. **Microgrids** are progressively being used in the face of extreme weather. As infrastructure investments for resilience increase with the IIJA, more microgrids are likely to come online. It's important that the equipment supporting microgrids is installed to perform reliably and safely no matter how disastrous the weather may be.

Based on years of field experience, here are the four most common challenges to preparing microgrids for resilience during severe weather:

1. Protecting microgrid assets against extreme temperatures

Peak site conditions act individually or in concert to increase the internal operating temperatures in PV system enclosures and can stress components well beyond their UL design ratings. Common peak conditions include ambient operating temperatures approaching or exceeding 40°C, internal heat gain due to direct solar radiance on the enclosure or reflected from the terrain, and geographical elevations above 3,300 feet.

These issues can be addressed by estimating the expected internal heating of the enclosure from solar radiance. To start, study local weather data, including record, daily and average monthly temperatures. PV system designers often use 2% high or 0.4% high weather temperature data as the basis for system design and size the PV system ampacities to minimum National Electrical Code (NEC) requirements without taking additional thermal rating factors into consideration.

On the cold side of the spectrum, electronic equipment such as inverters and controllers typically found in microgrid systems are commonly listed for a minimum ambient

temperature of -40°C (-40°F). In environments where winter temperatures could drop below -40°C (-40°F), equipment is best located in heated indoor locations that maintain temperatures above -40°C.

2. Ensure resilience in high winds

Wind is common yet complex to understand and plan for, and it varies greatly depending on the type of storm. It is vital to ensure the foundation and support structures used for any microgrid component are rated for the intended load and potential environmental conditions. Oftentimes, this can be a challenge when attempting to retrofit an existing rooftop with solar PV modules and racking. Structurally reinforcing an existing rooftop is often cost-prohibitive, so ground-mounted PV installations on a reinforced concrete pad designed for the local environment are common.

3. Provisions for lightning

Lightning strikes can damage structures, while the surge generated can harm sensitive electronic equipment. Several codes and standards exist to help protect microgrid systems against the various types of lightning damage.

NFPA 780 provides lightning protection system installation requirements to safeguard people and property from fire risk and related hazards associated with lightning exposure. For example:

- 12.4.2.1 dictates that surge protection shall be provided on the DC output of the solar panel from positive to ground and negative to ground, at the combiner and recombiner box for multiple solar panels, and at the AC output of the inverter.
- 12.4.2.3 requires additional surge protection devices at the DC input of the inverter if the system inverter is more than 30 meters from the closest combiner or recombiner box.

Further, if the microgrid is connected to the utility grid when a lightning-induced fault occurs, there will be fault currents from the utility grid and the microgrid system. In accordance with NEC Article 705, the primary interconnection equipment must include a circuit breaker supervised by redundant protection relays.

4. Addressing rain, water ingress and flooding

Like protecting against high winds, it's a critical first step to understand the environment a microgrid is placed in. Planning is essential and needs to address the following (at a minimum):

- Historical rainfall averages
- Proximity to 100-year flood plain
- Local building codes
- Drainage solutions
- Potential exposure to corrosive saltwater

Aside from protecting physical building structures from water, sensitive electronic components need appropriate

At Eaton's Experience Center in Pittsburgh, a full-scale demonstration and testing facility, you can get a hands-on look at how microgrids support resilience. The controlled environment has a fully functioning building microgrid that interconnects with multiple onsite sources.

enclosures for the environment. For instance, most components commonly found within a microgrid system have enclosures that are rated NEMA 3R—indicating they will resist a degree of wind-blown rain. These enclosures include ventilation and drainage holes to allow for proper temperature control and allow any internal condensation to escape. They also will remain undamaged by the external formation of ice on the enclosure. Installations that could potentially be exposed to saltwater require stainless steel enclosures, which provide an additional level of protection against corrosion.

In more extreme environments, NEMA 4 and 4X enclosures may be required to provide a dust- and water-tight seal to protect against windblown particles, rain, splashing water and hose-directed water.

5. Intelligent controls maintain microgrid system stability

The brain of the microgrid system is the microgrid controller with standardized communications that enables easy system configuration, commissioning and future adaptability to changing system assets.

When disaster strikes, these controllers can quickly and accurately react to changing conditions to maintain power to critical loads. Once the controller is properly programmed, it can adjust energy production, storage and consumption to maintain overall system stability, shave peak demand, shift loads, maximize renewable energy contribution and more.

In all, microgrids have emerged as an ideal solution to support resilience and counter the risk of weather-related power disruptions by bolstering operational resilience. And the functionality of a microgrid relies upon the success of its design.

The Evolute is a smart panel system, collaboratively developed between EVdirect and Eaton, to achieve dynamic load management for electric vehicle charging.

Engineering safe EVCI to support the future of low-carbon transportation

The federal IIJA includes $7.5 billion to build a nationwide network of 500,000 electric vehicle chargers over the next five years. It's important to understand that EVCI will have a cascading impact on electrical infrastructure due to the incremental energy loads created by chargers. The ability to charge electric vehicles efficiently and economically without overloading the power system is critical and depends on reliable infrastructure.

This increased energy consumption for EV charging can impact incoming utility service, power distribution system design and even necessitate distributed energy resources (DER) like solar and battery storage to offset utility demand and time-of-use rates.

Eaton is working with customers to provide a delivery-of-power system, not just EV charging. This smart control panel provides dynamic load management. Learn more about this **case study project with EVdirect.**

Charging options at the ready

Both AC and DC charging options have their place, and each comes with business and installation considerations. It is expected that AC charging will represent the largest global public installs in the next few years, and DC charging will provide critical network support on long travel routes like interstate highways.

DC charging is preferred in some applications and for specific needs, depending on the vehicle routes and dwell time. This type of charging involves more power and delivers a charge in as little as 30 minutes.

Energy storage systems can reduce operating expenses and enable peak demand shaving, stretching the ability of existing infrastructure.

AC charging is typically used to charge where you park for work, school, shopping, entertainment or hotel stays. Level 1 charging takes eight hours or more to fully charge an electric vehicle and is where you park overnight to charge. Level 2 charging typically takes around four hours to charge.

Strategies to increase electrical capacity

When upgrading or designing building systems, planning for future EVCI capacity needs can help avoid significant changes and costs later. Electrical architecture needs to be future-proof and plan for what's to come. How many chargers will be required? How much additional power do you need to accommodate for growth? It is critical that incoming utility electrical service and power distribution feeders are sized appropriately to be able to power EV charging safely and reliably.

Optimizing EVCI with load management technology will enable more installed chargers that deliver the optimal amount of power that the chargers need. Further, when available capacity is reached, load management software limits energy consumption and reduces the available power. This integral approach to load management enables load shedding and avoids exceeding the incoming service capacity. However, if current electrical capacity simply cannot meet expected demand, electrical capacity must be increased at the utility service.

An alternative to increasing service entrance upgrades is to incorporate onsite renewables and energy storage. This strategy enables owners and building managers to avoid expensive electrical capacity additions while supporting a more sustainable, low-carbon future.

There's an enormous opportunity to manage power far more effectively, taking advantage of a power paradigm that is decentralized, electrified and decarbonized. Learn more about the codes and standards impacting EVCI and microgrid design, visit the **For Safety's Sake blog**.

Electrifying engineering to power a more sustainable future

There's never been a more electrifying time to be an engineer. We're at the tipping point of a global energy transition that will transform the world as we shift towards renewables and unlock a low-carbon future. And, extraordinary engineering opportunities feel like they are everywhere, especially as federal infrastructure funding opens up.

Creating a stronger future with resilient and sustainable energy systems relies on building more flexible energy systems, education programs that provide resources and mentorship opportunities, and leveraging digitalization that make projects easier. Know that at Eaton, we'll be here today and in all the days ahead to support you with the training support you need, the technologies to make it happen and the digital tools to make the process better.

Visit us at **Eaton.com/consultants** for valuable tools and resources for engineers, designers and consultants.

By Nick Belitz, CVA, Morrissey Goodale LLC, Denver

MEP Giants smash M&A records in 2021

Publicly traded, privately held and private-equity-backed firms all vied for deals, combining for the hottest year ever

Driven by the energy of economic expansion following the first pandemic year of 2020, *Consulting-Specifying Engineer's* MEP Giants stepped up deal-making to never before seen levels in 2021. As a group, the largest mechanical, electrical, plumbing and fire protection engineering firms recorded 70 transactions, a tally amounting to more than double the 33 transactions made in all of 2020 and up more than one-third (35%) from pre-pandemic 2019, during which 52 deals were consummated.

The past year also saw the highest number of MEP Giants getting, well, gianter.

In 2021, those 70 transactions were made by 29 of the MEP Giants or nearly one-third of all firms ranked, which qualifies as an all-time high. By comparison, only 21 of the MEP Giants reported a transaction in 2020, down from 28 in 2019 and 25 in 2018. Without a doubt, more MEP Giants closing more deals was the theme of 2021.

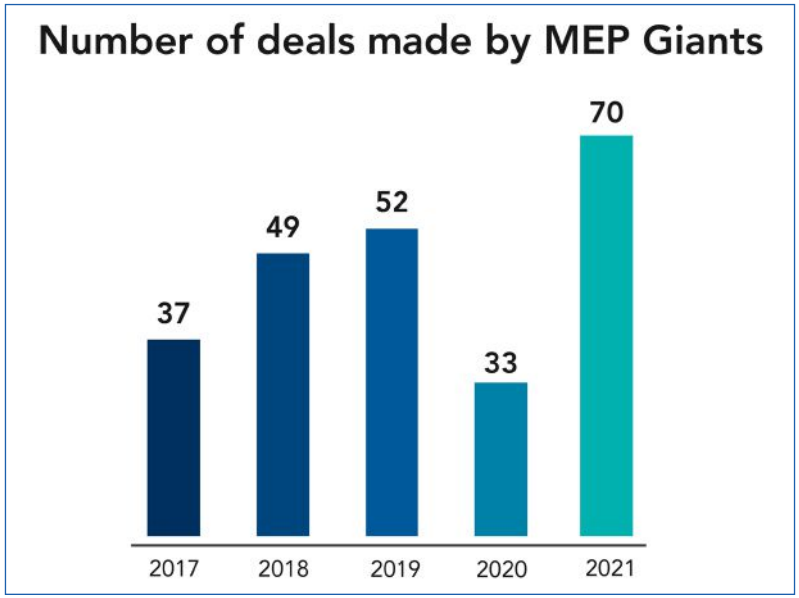


Figure 1: The number of deals made by the MEP Giants firms in 2021 rose significantly as the group recorded 70 transactions, a 112% increase from the 33 deals made by the firms in 2020. Courtesy: Morrissey Goodale

Activity by MEP Giants mirrors rise in deals globally

Looking around the wider world, we see the rising acquisition activity of the MEP Giants reflected in the broader consolidation of the industry at large. Globally, the engineering and architecture industry closed 637 deals in 2021, a stunning 47% increase over the 434 deals notched in 2020 and a 37% increase from the previous record set in 2019.

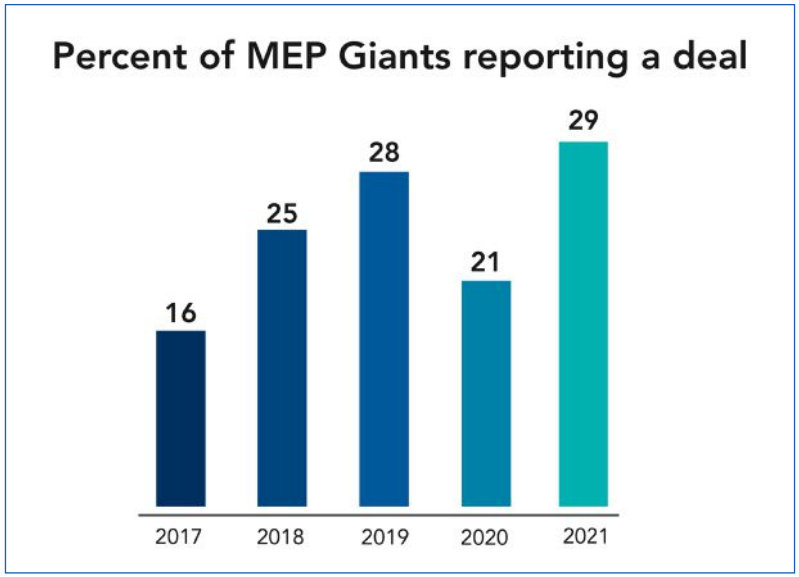


Figure 2: After a dip in 2020, 29% of the MEP Giants reported a transaction in 2021. Courtesy: Morrissey Goodale

Critically, two-thirds of the transactions last year occurred with sellers based in the U.S. as acquirers sought to expand domestic market positions and take advantage of the post-pandemic economic boom. With flush balance sheets and record backlogs, buyers in the overall engineering industry announced 426 U.S. transactions over the course of the year. The number of announced transactions exceeded prior year activity by more than 100 deals and also smashed 2019's pre-pandemic record levels by a whopping 34%.

What drove all the wheeling and dealing? In a word: great expectations. Anticipating public spending on infrastructure and the private sector investment that traditionally follows it, industry acquirers, including the MEP Giants, aggressively used mergers and acquisitions as a means of getting in front of spending on design services.

Bucking the private equity trend, publicly traded buyers lead the pack

With all the deals being made, even a casual observer of industry M&A may quickly assume private equity firms drove most of the transactions. Private equity firms and private equity backed engineering firms have made significant inroads in the industry in recent years on the strength of ready access to capital and the ability to swiftly evaluate, aggressively price and quickly close deals.

But a closer look at the 2021 data reveals something different. In fact, the most prolific acquirers of the MEP Giants in 2021 were publicly traded NV5 (Hollywood, Florida, eight deals), Bowman Consulting Group (Reston, Virginia, seven deals) and Stantec (Edmonton, Canada, six deals), with an honorable mention for WSP (Montreal, Canada, five deals). Rounding out the top five most active MEP Giants, only Salas O'Brien (Santa Ana, California, six deals) counts as private equity-backed.

In a historical context, this makes sense because big, publicly traded firms have traditionally constituted the most reliable group of buyers for the past 20-plus years, accounting for between one-quarter and one-fifth of all transactions in a given year. But in view of the total engineering M&A market in the past one to two years, which has seen private equity firms account for 40% of all transactions (and climbing!), it comes as a bit of a surprise.

Overall, publicly traded MEP Giants accounted for 27 transactions in 2021, while their private equity-backed

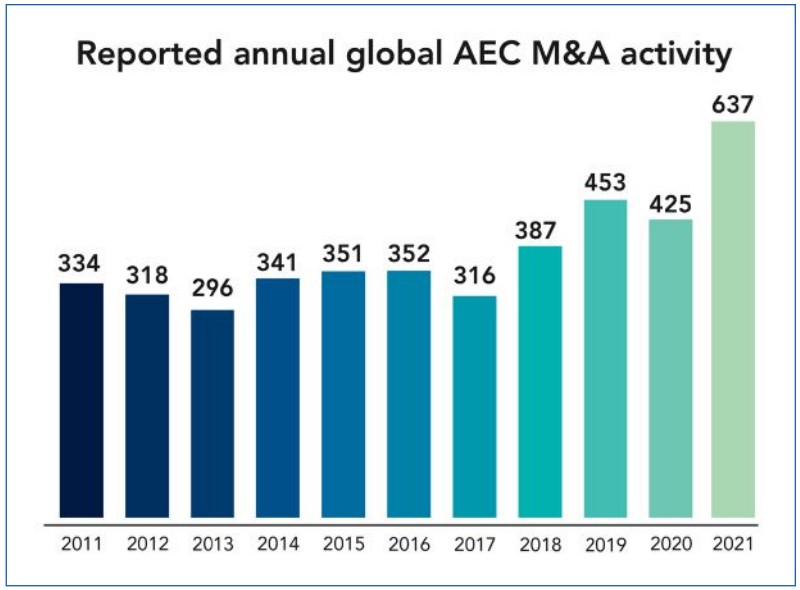


Figure 3: Global merger and acquisition activity in the engineering and architecture industry recognized a record-setting number of transactions in 2021. Courtesy: Morrissey Goodale

peers accounted for "only" 14 deals. Why did this happen? First, publicly traded firms in general have even easier access to growth capital than private equity firms — that's why a firm goes public. Second, public buyers often self-finance transactions, with no need to borrow money or solicit lender or anybody else's approval beyond the board of directors. Third, Morrissey Goodale data indicates that publicly traded firms, all else equal, pay slightly more for deals than even the PE firms, thus making offers more attractive to potential sellers.

With interest in the MEP sector high in 2021, no doubt the publicly traded buyers used their capital to jump on the deals most critical to achieving their strategic plans and reporting growth to Wall Street analysts.

In 2022, we fully expect the acquisitive dynamic to remain in play as MEP Giants of all capital structures seek growth, but we also expect the rise of private equity to continue unabated. For that reason, we anticipate next year's results to show private equity firms take the top spot for number of transactions among the MEP Giants.

Nick Belitz *is a principal with Morrissey Goodale LLC, a management consulting and research firm that exclusively serves the architecture, engineering and environmental consulting industries. Morrissey Goodale is a CFE Media content partner.*

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Thank you for downloading the 2022 MEP Giants eBook!

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